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

July 1, 1970

EXAMINER HEARING

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| IN THE MATTER OF: | ) | |
| Application of Benson-Montin-Greer Drilling Corporation for pool redelineation, Rio Arriba County, New Mexico. | ) | Case No. 4373 |
| Application of Benson-Montin-Greer Drilling Corporation for expansion of a unit area, Rio Arriba County, New Mexico. | ) | Case No. 4374 |

BEFORE: Elvis A. Utz, Examiner

TRANSCRIPT OF HEARING

MR. COOLEY: William J. Cooley, Farmington, New Mexico, appearing on behalf of the Applicant. We have one witness, Mr. Greer, I'd like to have sworn.

(Witness sworn.)

ALBERT R. GREER

BEING duly sworn according to law, upon his oath, testified as follows:

MR. COOLEY: Mr. Examiner, for purposes of presenting this case we would like to, at this time, move that Case 4374 be consolidated for purposes of the Hearing at least with 4373 in as much as practically all the data pertinent to one case is also pertinent to the other.

MR. UTZ: On the original Unit you do have a separate Order for that Unit at this time, don't you?

MR. COOLEY: Approving it, yes, sir, we do, and I am not proposing that.

MR UTZ: The dispatch would be in separate Order also.

MR. COOLEY: The results of 4374 should be a separate order. However, for purposes of the Hearing alone, we would, which we have done in the past -- I would move the Examiner to allow us to present testimony in both cases simultaneously.

MR. UTZ: For purposes of testimony, 4373 and 74 will be consolidated. Separate Orders will be written.

DIRECT EXAMINATION

BY MR. COOLEY:

Q State your full name for the record, please.

A Albert R. Greer.

Q Where do you reside, Mr. Greer?

A Farmington.

Q What connection do you have with the Applicant, Benson-Montin-Greer Drilling Corporation?

A I am an officer and an engineer in the Corporation.

MR. COOLEY: Mr. Greer has testified many times before this Commission. I presume his qualifications are admitted?

MR. UTZ: He is qualified, particularly in this case.

Q (By Mr. Cooley) Mr. Greer, as a preface to this presentation I'd like to review briefly for the Commissioner the history that has taken place with respect to this matter and the pools involved. On August 14, 1963 Case No. 2881 was heard by the Commission which resulted in Order R-2565 establishing temporary 160 acre spacing in what was then the signal pool known as the Puerto Chiquito-Mancos Oil Pool or Puerto Chiquito Gala Pool. On November 16, 1966, in Case 3445, which resulted in Order R-2565B, the Pool formerly known as Puerto Chiquito Gala Pool was divided into two pools known as the West

Puerto Chiquito-Mancos Oil Pool and the East Puerto Chiquito-Mancos Oil Pool. The 160-acre spacing that had previously been made temporary was then made permanent and 320-acre temporary spacing was established with respect to the West Puerto Chiquito-Mancos Oil Pool. April 11, 1968, in Case 3743, the Commission authorized the injection of gas and water and establishment of a pressure maintenance project in the West Puerto Chiquito-Mancos Oil Pool in Order R-3401. On December 17, 1969 further hearing was had in Case 3455, results of which were that 320-acre spacing was made permanent in the West Puerto Chiquito-Mancos Oil Pool. The Canada Ojitos Unit as it presently exists has been previously approved by the Commission and the purpose of the Applicant's appearance here today is to extend the horizontal limits of the West Puerto Chiquito-Mancos Oil Pool to include a portion of what is now delineated as the East Puerto Chiquito-Mancos Oil Pool and to further extend the West Puerto Chiquito-Mancos Oil Pool to the South to include certain additional acreages that is not presently included in either of the pools.

In Case 3445, at the Hearing of December 17, 1969, there was presented Exhibit 2 which is rather voluminous and after thorough review of this Exhibit we find that there were certain typographical and clerical errors contained in that Exhibit and it involved five pages of that Exhibit and at

this time we would move the Commission to allow us to amend that Exhibit to make it entirely accurate and correct these errors.

Now, to enumerate, the first correction is Page 39 of Exhibit 2 of Case 3455. The second Appendix 6, Page 3. The third corrected sheet is Appendix 6, Page 6. The fourth is Appendix 6, Page 8 and the fifth is Figure 13 -- just Figure 13 of the transmissability.

If it please the Commissioner, we'd like to have these pages substituted for the pages in that Exhibit which contains the various errors and clerical inadvertance.

MR. UTZ? Is that all right, counsel?

MR. HATCH: Yes.

MR. UTZ: It will be accepted as a correction to the former Exhibit. That Exhibit was Exhibit No. 2?

MR. COOLEY: That was Exhibit 2 in Case 3455 at the Hearing of December 17, 1967.

THE WITNESS: There is one other correction we should make.

MR. COOLEY: Mr. Greer has another correction he'd like to just call to your attention.

THE WITNESS: In Appendix 7, Figure 7-1, next to the last sheet -- the third from the last, in the book, the title should be "Channeling Potential" rather than the words

"Producing Potential". Just a drafting error -- "Channeling Potential" instead of "Producing".

MR. COOLEY: It should be "Channeling Potential" instead of "Producing Potential".

To make the record entirely clear with respect with what we have just done, the Exhibit 2 to which we have referred, is entitled "Oil Recoveries Under Gravity Drainage Depletion and Present Maintenance as Dependent on Physical Reservoir Characteristics as Affected by Well Spacing in Fractured Shale Reservoirs." Mr. Examiner, the reason for the attention to this particular Exhibit 2 at this time and in this case is that we wish to move that the record of all the cases to which I have referred that have dealt with Puerto Chiquito area be incorporated by reference into the record of this case. Specific reference will be made by Mr. Greer to the gravity drainage aspect of this Exhibt 2 which we have discussed because it has bearing upon the area of which we concern ourselves here today.

Will the Examiner grant our motion to incorporate the records of these other cases into the record of this case, by reference?

MR. UTZ: Sure. We will so do.

MR. COOLEY: The testimony of Mr. Greer in Case No. 3455 of December 17, 1969 was in no way directed to any of

the pages that have errors that we have asked to be corrected. What I am getting at is the corrections that we have given you here today have no bearing upon the testimony that Mr. Greer gave you. If you recall these Exhibits, due to their size were not gone through in that case page by page and graf by graf and the point being that these corrections have no bearing upon his opinions as expressed then or now --

MR. UTZ: In other words, he testified to the right figures, but he didn't write them correct.

MR. COOLEY: That is correct. Thank you.

Mark this Exhibit 1 in this case, please.

(Whereupon, Applicant's Exhibit 1 is marked for identification.)

MR. HATCH: This will be used in both cases?

MR. COOLEY: Please.

Q (By Mr. Cooley) Mr. Greer, I hand you what has been marked as Exhibit 1 in consolidated cases 4373 and 4374 and ask you if this contains engineering data which you have prepared or has been prepared under your supervision with respect to the Puerto Chiquito area?

A Yes. It sure does.

Q Directing your attention, Mr. Greer, to the map which appears under Section A of Exhibit 1 in this case, I would ask you to explain to the Commission the various color codes and symbols that are shown there on.

A The plan under Section A of Exhibit 1 shows the boundaries of the East and West Puerto Chiquito Pools as they now exist. The red coloring is for the East Puerto Chiquito Pool, the blue boundary is the West boundary of the Puerto Chiquito Pool. Within the West Puerto Chiquito Pool with the brown colored boundary is the outline of the Canada Ojitos Unit and within that unit, inside the boundary colored in orange is the seventh expanded participating area. Inside the boundary colored in green is the area we asked be added to the West Chiquito Pool as a South extension to it and the area shaded in yellow is the area we ask to be deleted from the East Puerto Chiquito Pool and be added to the West Puerto Chiquito Pool and the area shaded in gray is the first proposed expansion to the Canada Ojitos Unit. The area colored in yellow has the significance of being the area we request for the second expansion to the Canada Ojitos Unit. There is also shown in this plat a few wells we consider significant at this time in that activity currently being conducted at either location proposed to be drilled are locations in which we have recently worked wells over or recompleted them or propose in the near future to work them over.

Q Are the green wells under recompletion or workover and the wells shaded in red those that are proposed to be drilled in the near future?

A Yes, sir.

Q Is there a particular time which you propose to drill the C-34 well in Section 34 of Township 25 North, Range 1 West?

A Yes, sir. We have a rig moving on that well in the next day or two and perhaps I should point out at this time that the approximate spacing that we have determined as practical for this area calls for the drilling of wells approximately one and a half to two miles apart on the down-dip side of the reservoir, so the next off setting to this C-34 will fall outside the pool boundary the way it is now established.

Q The area that is now shaded in gray?

A Yes, sir.

Before we leave this, if I might add, I think it is significant to point out the well in Township 27 North, Range 1 East identified as the D-21 --

Q The northern most well?

A Yes, in the West Puerto Chiquito Pool. We have just recently opened up a new zone within the Mancos formation in this well and currently testing it to determine its production possibilities. Also in Township 26 North, Range 1 West, well designated as O-9 in Section 9, we are just now preparing to test the Mancos formation in this well. These two wells are rather old wells. In fact, the well in Section 9 has been in a temporarily shut-in status for seven years. The reason for

this is we did not have adequate control of the acreage in that area and we delayed doing completion work of the well until we did have control of the acreage, so although the pool is several years old now we really just now are reaching the edges of the pool to determine its producing possibilities.

MR. UTZ: Mr. Greer, this map doesn't show all the wells in this area?

THE WITNESS: Oh, no. These are just significant wells.

Q (By Mr. Cooley) The purpose of showing these wells is that there is something currently being done with respect to them other than just producing them.

A Yes, sir, and that it covers quite an area in the West Puerto Chiquito Pool.

Q With this program of currently to be drilled or currently being worked over wells you are exploring approximately how many miles of this pool along the strike?

A Approximately 12 to 14.

Q Mr. Greer, over what period of time have you been gathering engineering data with respect to the West Puerto Chiquito, the area that is now designated as the West Puerto Chiquito Area?

A Ever since we drilled the first well in 1962.

Q Now, during that period of time would you estimate

what the expenditure has been by Benson-Montin-Greer solely in an effort to develop engineering data with respect to this area?

A Yes, sir. If I might summarize by parts, we have one observation well -- A-23 in Section 23, Township 25 North, Range 1 West -- a well capable of producing approximately 150 barrels per day which was shut in immediately after completion and used as an observation well solely for the purpose of determining reservoir pressures. That was an expenditure of approximately $200,000. Observation in gathering bottom hole samples, condition wells and related engineering costs; that we had approximately $100,000. In the conduct of an interferance test in '65 and '66, conduct of an interferance test, we lost production in the amount of approximately $300,000 and additional miscellaneous types of information, particularly the gathering of pressures which ordinarily would not be taken, I would judge another hundred to $150,000 -- a total of some seven or $800,000.

Q From the data that you have been able to develop as a result of this expenditure, do you have an opinion as to whether the common source of supply or reservoir from which you are presently producing in the West Puerto Chiquito-Mancos Oil Pool extends beyond the presently delineated horizontal limits of the West Puerto Chiquito-Mancos Oil Pool?

A Yes, sir. An analysis of this information indicates to me that reservoir presently being produced does indeed

extend beyond the present limits of the West Puerto Chquito Pool.

Q Would you detail the data that you have assimilated which leads you to believe that this is the fact?

A Yes, sir. I'd like to refer to Section B of Exhibit 1 on which we have a plat. This particular plat is a reporduction of a Figure 1-16 of Appendix 1 of the Exhibit 2 in the December Hearing. We show on this plat three areas in which we have determined information as to transmissibility. The two areas shaded diagonally Northwest to Southeast and Northeast to Southwest is given in detail with analysis in Exhibit 2 of the December Hearing. There the area shaded in blue -- information as to this area was developed from the 1965, 1966 interference test and was reported in Case 3455, November 16, 1966. The details of the information being under Sections J and M of Exhibit 3 of that case and a method of calculation used was shown in Exhibt 1 of that same Hearing. To summarize this information, the blue area has an oil-in-place value of 1,000 to 2,500 barrels per acre. We could not define this any closer in the range at the time the test was run because of the indefinite value of the compressability of the fractured shale formation. For the area shaded Northeast to Southwest, information regarding which is Exhibit 2 of the last December Hearing, we calculated the transmissibility to be 2.5 to 3.5

Darcy feet, an oil in-place value of approximately 1600 barrels per acre. For the area shaded from Northwest to Southeast, by information shown in Exhibit 2 of the last December Hearing, we determined the transmissibility of 10 to 12 Darcy feet. For this particular area we did not make a directed determination of oil in place. We have estimated, however, by extrapolating from the oil in-place value known of 1600 barrels per acre for two and a half to three and a half Darcy feet, by the relation of transmissibility to oil in place as shown by the Y and S relations of Figure 3-5 of Appendix 3 of Exhibit 2 of the December Hearing as to oil in-place figures for the area as a whole, we have extrapolated the areas shown under Section B through the assumption that the oil in-place amounts will be approximately the same for different parts of the pool lying along the same strike of the formation and this is summarized under Section B, the second plat. Here we have colored in oil in-place values by color. The area colored in blue is approximately 1500 barrels per acre. The area colored in green is approximately 2500 barrels per acre and I believe you have another graph there -- this Exhibit shows two thousand. It should be 2500. The area colored in tan I estimate is approximately 1000 barrels per acre -- exucse me. The area code for the green says "2,000 stock tank barrels" and should read "2500"?

A Yes, sir. That is an error.

Going to the next graph which is the graph following the plat, which shows relation of oil recovery to reservoir pressure for the West Puerto Chiquito Pool, this graph is taken from the Exhibit 2 of the last December Hearing; being Figure 4-1 under Appendix 4. The details of calculations as to how this relation was determined is in that Exhibit. Generally what it shows is that for any given initial reservoir pressure in any given final reservoir pressure we can determine from these two pressures at any one contour interval the percent of depletion which the reservoir has suffered at that particular contour interval in terms of oil in place. As for example, for a contour interval at which the initial pressure is 1800 pounds and a final pressure of 1520 pounds we conceive from this graph there would be a resulting depletion of the reservoir at that contour interval of one percent of the oil in place. Below the bubble point of 1520 pounds there is a higher percent of depletion for a corresponding drop in reservoir pressure. You can take this information now and go into the plat under Section C of Exhibit 1. We can now make an estimate of the amount of oil produced from any particular area. In this intance we chose the seventh expanded participating area which shows the data as of August 1, 1968 which was the time at which we commenced gas injection. Pressure at the time prior to that time was a

result solely of production. I might explain some of the numbers on this plat. For example, in Section 22, the second row from the bottom, along the contour interval there are two figures; 1860 and 1560. As indicated by the legend on the left-hand side of the page these represent initial reservoir pressures and pressure at that contour interval on August 1, 1968. From that pressure decline in the graph you just looked at we can determine the reservoir at that contour suffered a depletion of approximately one percent. The depletion figures for each contour interval in terms of percent of oil in place are shown in the circles and these range from one percent to 8.8 percent at the 1600 foot contour interval. Just below those figures are average depletion figures for each contour interval. As for instance, from the 600 to the 800 foot contour interval we have 1.25 percent average depletion for the area bounded by the two contour intervals in the seventh expanded participating area boundary. The number of acres within each one of these areas is also shown as the next number. As for example, the one we are just looking at is 2,844 acres. Barrels of oil in place in terms of thousands of barrels is shown in the next line of figures and for the contour interval we are looking at is 7,110,000 barrels. The depletion suffered by the area bounded by this same contour interval at which we are reviewing is 89,000 barrels. Now, the significance of this is that we can

total the amounts of depletion for each of the areas within the contour intervals shown and we arrive at 596,000 barrels was the depletion suffered by the area within the seventh expanded participating area as of August 1, 1968. The area shown above the 1600 foot contour interval we believe is primarily gas cap and probably contributed very little, if any, to the oil recovery.

Now, the wells within this seventh expanded participating area have produced, as of August 1, 1968, 1,350,492 barrels. Now, this means that more than half of the oil produced by these wells came from outside the boundary of the seventh expanded area. If we take a direct proportion, we arrive at a total reservoir volume of approximately 50,000,000 barrels. Since there is 22,000,000 barrels as shown on the plat and the 22,000,000 barrels represents only 44 percent of the reservoir, we also may estimate the total reservoir area directly since 596,000 barrels is about 44 percent of the total produced of 1,350,000 barrels and there the recovery is 15,000 acres. The direct proportion indicates the reservoir surface area covered would be 34,000 acres.

Now, there are a number of reasons why I believe the surface area is larger even than this and the primary one is that a direct proportion assumes that the pressures were equalized throughout the entire reservoir and it is apparent that the

reservoir extends for several miles beyond the present wells and even with the high transmissibility of this reservoir there is undoubtedly some pressure grading from the outer limits of the reservoir, particularly from the north and south and to the center, so the pressures certainly were not completely equalized. This means then that the total reservoir volume, total surface area is probably in excess of 34,000 acres. Presently I estimate forty to fifty thousand acres. The question now, once we have determined by these engineering methods and based on what I consider excellent information, is where is the reservoir. We know that it covers something on this order, but, of course, the engineering information pressure data is non-directional. In order to make an estimate of as to where this reservoir lies we must go back to geological considerations and we have done this. These geological considerations for this particular reservoir finds as a basis that the reservoir is formed primarily from fractures caused by stress relief of the formation as the structure in the general area was being formed. We recognize four different types of flexing which would cause these fractures. I think we should list them. They are anticlinal type flexion in which the dip increases progressingly down dip; the incline type flexion in which the dip decreases progressively down dip; a tortional type flexion in which the dip changes along the

strike in contrast to synclinal and anticlinal type flexions which the dip changes down the dip; and the last type we consider is flexing caused by the formation of a structural nose. Now, in East and West Puerto Chiquito we have three of these types of flexes and two of them have been drilled. We found them to be productive. The third we propose to drill in the near future.

Q Well, Mr. Greer, you are -- the two you have drilled are what type of flexion?

A Well, really, I am afraid I am getting ahead of myself. I think we should look at those in detail in a few minutes, perhaps look at Section D next. One of the first methods, of course, in determining the location of the reservoir in conjunction with an analysis of the areas which have been stressed by flexing is an analysis of the electricl logs of the wells that are available. Under Section D we show some cross sections with this type of information. Under Section D the first plat shows a typical log with zones as we have identified them, identified as zones A, B and C. The top of zone A we use as a contour marker. Next following the type log is the three well cross sections which is made from logs of wells which were drilled some fifteen years ago and although the information is helpful, it is not as dependable as information we now obtain. Even so, we can see from this cross section

the area colored in yellow is the area in which production has been obtained in East and West Puerto Chiquito. The cross-hatched area at the bottom of the yellow zone is the one in which production is primarily in the south part of the Canada Ojitos Unit. We interpret, from the logs shown on this cross section, that this zone extends south beyond the present boundaries of the West Puerto Chiquito Pool to the well shown as the Reading and Bates No. 1 Duff. Extending on farther south to No. 1 Schmitz there appears to be a possibility that the zone is deteriorating. I would not at this time say that this definitely is the case in view of the indefinite quality of these old logs and I point out in that regard, if you look at, for example, the Greenhorn Chart, the one colored in brown at the bottom, this zone ordinarily exhibits the same log characteristics throughout the area and we can see the log on the left, the definite decrease in resistivity of the zone which indicates to me a possibility that the resistivity is not as dependable in this well as in the other. So for the purpose of estimating at this time how far the pool might go, we would say from this particular cross section that it could extend to the No. 1 Schmitz.

The next cross section is a five-well-cross section in which four of the wells are within the present Canada Ojitos Unit; the fifth well on the right-hand side is the well outside

outside the Canada Ojitos Unit to the Southeast. These are all recent logs. We consider their characteristics reliable and there is a definite indication here of the deterioration of the producing zones within the Mancos. As we reach the last well on the right-hand side of the cross section this is particularly true of zone C colored in brown which I feel this particular well is non-productive. I might point out that this well is outside the area we are requesting to be included in expansion of the West Puerto Chiquito Pool.

Q Well, to summarize the geological inferences that you draw from your entire experience there, Mr. Greer, is it your opinion that this additional acreage that is indicated by your figures must extend generally speaking to the south rather than to the west or the east?

A Yes, sir. That is my thinking at this time.

Q And is this information or this opinion based upon your experience in drilling to the east and to the west?

A It is based upon our analysis of wells that have been drilled to the east and to the west.

Q Either wells that you have drilled or other companies have drilled to the east and west indicate that it doesn't go either east or west -- it must go along the strike?

A Yes, sir. I will qualify that a little later as to exactly what we mean in that regard.

Q All right. Proceeding further on, Mr. Greer, do you have under Section E of Exhibit 1 -- would you explain the contour map which you have there.

A Yes, sir. Under Exhibit E -- I mean, Section E of Exhibit 1, we have shown in a rather colorful fashion the areas which we interpret from our theory of flexing to be productive. This is a structural contour map contoured on the top of zone A and we did not have time to prepare another map specifically for this Hearing. This one is marked "confidential" which, of course, is material that is, of course, no longer confidential. We spoke of four different types of flexing. I'd like to point out at this time two of them which we have drilled. The area colored in yellow is in the East Puerto Chiquito Pool and it is a nose and we believe that the flexing caused when that structural nose was formed is the reason for the fracturing in that area. The area colored in brown is a strictly synclinal type of flexion area in which most of the high capacity wells in the West Puerto Chiquito Pool have now been drilled. The green area is primarily a synclinal type flexion area where on its northern and southern extension is evidence of torsional flexing too. The two areas colored in blue are torsional type flexes in which the dip changes along the strike. The area shaded in gray is the final area to the west in which there is a significant flexing and is generally marginal. Two wells

drilled in it so far have indicated to be low-capacity wells. I think the flexing is best understood by looking at the cross section in the pocket in the back of Exhibit 1. On this cross section we show two sections which have locations of these two sections shown on the map under Section E as AA Prime and BB Prime under the AA Prime section the flexion areas are color coded the same as the colors on the map under Section E. The first flexion area was colored in blue; the second in green and brown and gray. The blue, of course, being the tortional flexion area. The green is the first synclinal flexion; the brown the second and the gray the third. We can see here that all of these flexion areas have a flexion both to the east and to the west except the gray area in which we think that it represents the ending of the flexing in that particular area.

Now, for the cross section through BB Prime we can see that there is only one flexion and our experience in drilling in an area like this is that there might be a fracturing at the base of the steep dip on the flat-dip side, but not probably extending very far basinward, so we interpret at this time that the end of the reservoir to the south would be somewhere around the South Township line of 24 North, Range 1 West. It could extend farther south. We think, however, if it does, that it will probably be a rather narrow reservoir at that point.

I believe that if we point out just one thing more, a separation of the areas -- the wells shown in the orange-colored area on the south part of the map in the vicinity of Section 5, Township 24 North, Range 1 East, are wells which are essentially depleted at this time and we believe that this particular little reservoir is not in communication with the reservoir of the West Puerto Chiquito Pool. The reason for that is that we estimate the original pressure at the point at which these wells were drilled to have been approximately 1200 pounds. We do not have any reservoir pressure on those particular wells. They are operated by other people, but the fact that they are practically depleted indicates to me that the pressure is probably low at this time. We have accurate pressures in the West Puerto Chiquito Pool and we know that the pressure declined approximately 300 pounds from inseption to August 1968 and since that time pressures have been maitained by pressure maintenance. This means that if the wells just referred to were in communication with the West Puerto Chiquito Pool they should, at this time, have a pressure of 900 pounds and should still be capable of producing at high rates. Since they are not, I assume that these wells are in a separate reservoir from the West Puerto Chiquito Pool.

Now, we would also interpret that, from our geological inference, I feel that an area of steep dip which is an area in which these wells are drilled, and uniform dip, that there

is very little chance of commercial production.

Now, as to the area colored in yellow, we have definite information of separation of that pool from the West Puerto Chiquito Pool and all the details of that, the information leading to that analysis is given in Case 3455 of November 16, 1966 Hearing.

Now, our interpretation at this time is that the east boundary of the West Puerto Chiquito Pool must lie either at the east or west boundary of the area shaded in blue, on the east side of the Canada Ojitos Unit. It is possible that there is enough change in the dip between the blue and green area to cause faulting which would separate the blue from the green. A more likely choice, however, is that the east side of the blue area -- and this is our present thinking -- is probably the eastern limit of the West Puerto Chiquito Pool and the reason we have asked that the change be made as to that particular area, taking it out of the East Puerto Chiquito and putting it in the West Puerto Chiquito Pool.

Q Is it your thinking, Mr. Greer, that the area shaded in blue that you have just referred to is oil productive or gas cap or what do you think is in that area?

A Our present thinking is that it will probably be in the gas cap and particularly as to zone C which is a zone in which we are now injecting gas in injection wells in Section 13

which, incidentally, when measuring the pressure in the gas cap in Well B-18 in Section 18, 25 North, Range 1 West, it is only logical to assume updip from this point it would be gas productive.

Q If this is the case and the blue area is primarily a gas cap, the drilling of a well in that gas cap and outside of the Unit could have an extremely detrimental affect upon your pressure-maintenance program, could it not?

A Yes, sir. This is true. We would like to inject gas at that point and that is our plan -- to drill a well there and inject gas at that point. Of course, to zones A and B, they might even be oil productive and that we want to inject gas at that point.

Q Has the Unit Agreement for the Puerto Chiquito Unit been amended to protect against the drilling of a well in their gas cap and destroying the effectiveness of your pressure-maintenance program?

A Yes, sir. The Puerto Chiquito Unit Agreement has been amended to permit the bringing into the participating area of non-commercial-gas-cap acreage.

Q Has it ever been done before, to your knowledge?

A I don't know of any directly that have been. I assume, however, that other people have had similar problems.

Q This was the purpose of this, simply to insure the

effectiveness of your pressure-maintenance program?

A Yes, sir. It is not a customary provision of Unit Agreements. It had to be realized through an amendment.

Q Proceeding then, Mr. Greer, to the plat which is the second page under Section F, would you briefly explain the significance of this?

A This plat shows a lease-ownership in so far as leases operated by Benson-Montin-Greer Drilling Corporation are concerned. The yellow colored acreage -- we own fifty percent or more in operating rights as to the Mancos formation. The area colored in orange is acreage under a farm-out agreement and the red outlined boundary shows our proposed expansion to the south of the Unit whereas the green shows the proposed extension of the West Puerto Chiquito Pool.

Q Mr. Greer, is there any reason why the request for expansion of the Canada Ojitos Unit does not contain all the acreage that you have requested to be included in the West Puerto Chiquito Pool?

A Yes, sir. Our initial plans were to include the expansion of the Canada Ojitos Unit the Township 24 North, Range 1 West area, most of the lands in the eastern two-thirds of the Township at the time that we found it necessary to commence to make our Application for expansion of the Canada Ojitos Unit and this timing is based on a number of different factors.

Q This is the Application --

A For the expansion of the Unit.

Q To the United States Geological Survey?

A Yes, sir. That is one of the first parties to whom we must apply. We found that there is a cloud on the Title of the acreage colored in oragne and, of course, had we expanded the Unit to include most of that map, we would have had to commit ourselves to the drilling of a well on that yellow-colored acreage and, of course, we hesitate to --

Q The yellow?

A Or the orange-colored acreage -- and we hesitate, of course, to drill or to commit to drill a well on land which the Title is clouded, so we found it necessary to ask for a smaller expansion and delete most of the orange-colored acreage.

Q It is standard practice, is it not, sir, that when you request the expansion of a federal-type unit or authorization from the United States Geological Survey for an expansion of a unit, that there are certain drilling commitments?

A Yes, sir.

Q That are attendant to this request?

A Yes, sir.

Q And have you made any such commitments?

A Yes, sir.

Q We have agreed to drill two wells in the proposed

first-expansion area and one well in the second-proposed expansion area.

Q Now, again to orient the Examiner on this, the first expansion area as outlined on this plat is outlined in green and what is now in the East Puerto Chiquito Mancos Pool?

A Yes, sir.

Q And there will be one well you are committed to in that area?

A Yes, sir.

Q And you have committed two wells in the area outlined in red to the south?

A Yes, sir. Perhaps I should point out the land to which we do not have the operating rights. In the first proposed expansion area of the Canada Ojitos Unit it is primarily open federal land which we presume will come up for sale subject to the Unit Agreement and accordingly at this time we feel that there is no question that all of the critical acreage in the expansion area will be committed to the Unit Agreement.

Q Mr. Greer, have you applied for or received preliminary approval from the United States Geological Survey with respect to the first and second expansions of the unit area?

A Yes, sir. We have received this approval and we are now in the process of sending out notices to the interested parties.

Q Mr. Greer, if, as it proves to be true, as your opinion presently is held, based upon all the engineering data and geological data available to you that the reservoir from which the bulk of the production -- which all of the production is now coming, in the West Puerto Chiquito Pool, extended southward in the area which you have requested to be included in the pool, do you expect them to be in as great a communication or nearly great a communication as the area you already developed?

A At this time we assume that is entirely possible. Of course, we won't know until we drill the wells.

Q Well, this Application is unusual in this respect, Mr. Greer, that it has been the historical practice of the Oil Commission to extend pools after the wells have been drilled. What particular reason, in your opinion, exists for reversing the procedure in this case?

A The reason here is that, as indicated in the last December Hearing, the recovery, the oil recovery from the pool is potentially as great as sixty to sixty-five percent of the oil in place and this can only be brought about by controlled rates of withdrawal and relatively low rates of withdrawal. For instance, our spacing now within the 15,000 acre seventh expanded participating area is approximately a density of one well per four sections. This is about the way the pool needs to be developed.

Q Approximately what percent of your potential production are you actually producing at this time?

A The wells have capabilities of producing several times as much or at rates several times greater than that which they are now producing. We have voluntarily restricted them to stay within the gravity drainage potential.

Q You voluntarily restricted your production below your authorized allowable rate?

A Yes, sir.

Q As granted by the Oil Conservation Commission?

A Yes, sir. The problem then is that if we were to let drilling take place on 40-acre patterns, for instance, the gravity drainage potential should be exceeded. The withdrawal rate of approximates fifteen-hundredths of a barrel per day per acre and on forty acres that would be six barrels per day and anyone who drills a $200,000 well is going to produce at a relatively higher rate than that so there is no way under a narrow-spacing program that the wells can first be drilled and that they would progress into a unitized program with low-withdrawal rates.

Q If the pool is not expanded as requested and the unit is not expanded as requested, do the lease-ownership situations that exist in the proposed expanded areas create the potential of a drilling race, so to speak, creating offset obligations

that would require various operators to protect their correlative rights by drilling numerous offset wells?

A Yes, sir. That is exactly what would happen. The wells have capabilities of producing hundreds of barrels a day and there would be exactly the same thing result here that has happened in other pools; namely, to be drilled up on forty or eighty acres and this would not only destroy the recovery potential of the area we have asked to be included in the pool, but it could extend back into the present pool and undoubtedly would and could destroy 80 to 90 percent of the future possible recovery of the present pool.

Q Would this also have an adverse effect on the pressure-maintenance program that you are presently conducting?

A Yes, sir. It would have to be abandoned.

Q In summary then, Mr. Greer, do you see any risk or any chance of violating anyone's correlative rights if this Application is granted?

A No, sir. The only thing that might happen different from what we have assumed is that it could be -- the expansion area could be a separate reservoir. But, if so, no one has been harmed and new reservoirs can be, of course, developed, depending upon the facts which we determine when we drill the well.

Q If it proves that your engineering calculations are

correct and it is the same pool, what magnitude of loss of production could occur from the drilling?

A We estimate 80 to 90 percent of the future recoverable reserve to be lost by drilling too many wells. This is a situation in which the fewer the wells the greater the ultimate recovery.

MR. COOLEY: No further questions.

We offer into evidence Exhibit No. 1 in consolidated Cases 4373 and 4374.

MR. UTZ: Without objection, Exhibit 1 in the above mentioned cases will be entered into the record of this case.

(Whereupon, Applicant's Exhibit 1 was offered and admitted in evidence.)

CROSS EXAMINATION

BY MR. UTZ:

Q Mr. Cooley has mentioned in the testimony here that this is probably the most unique pool and engineering project that we have today in the State and because of this special situation that is the main reason that you are asking for somethink that has never been allowed before by the Commission -- that is extension of a pool without proof of production and extension of an unit beyond the present limits. Without this your testimony is that you would virtually scuttle a secondary-recovery project which is working out?

A Yes, sir.

MR. UTZ: I have no other questions of the witness.

The witness may be excused.

(Witness excused.)

Any statement?

The case will be taken under advisement.

The Hearing will be adjourned until 2:00 o'clock.

(Whereupon, the Hearing were adjourned for lunch.)

# I N D E X

STATE OF NEW MEXICO )
)
COUNTY OF BERNALILLO )

I, PETER A. LUMIA, Certified Shorthand Reporter, in and for the County of Bernalillo, State of New Mexico, do hereby certify that the foregoing and attached Transcript of Hearing before the New Mexico Oil Conservation Commission was reported by me and that the same is a true and correct record of the said proceedings, to the best of my knowledge, skill and ability.

Peter A. Lumia
COURT REPORTER

NOTARY PUBLIC

My Commission Expires:

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 4373 heard by me on [illegible], 1970.

New Mexico Oil Conservation Commission