BEFORE THE
NEW MEXICO OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
January 4, 1967

IN THE MATTER OF:

Application of Phillips Petroleum Company for a unit agreement, Lea County, New Mexico

Case No. 3508

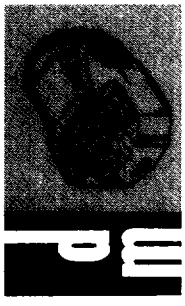
IN THE MATTER OF:

Application of Phillips Petroleum Company for a pressure maintenance project, Lea County, New Mexico.

Case No. 3509

BEFORE: DANIEL S. NUTTER, Examiner

Transcript of Hearing



MR. NUTTER: We will call next, Case 3508.

MR. HATCH: Case 3508: Application of Phillips Petroleum Company for a unit agreement, Lea County, New Mexico.

MR. KELLAHIN: If the Examiner please, Jason Kellahin, representing the applicant. Case 3508 is an application for approval of the Vacuum Abo Unit Area by this Commission and Case 3509 is an application for approval of a pressure maintenance project in the unit area. Since the testimony will be similar in both cases, we move that the two cases be consolidated for the purposes of the hearing and that separate orders be entered by the Commission.

MR. NUTTER: We will call next, Case 3509.

MR. HATCH: Case 3509: Application of Phillips Petroleum Company for a pressure maintenance project, Lea County, New Mexico.

MR. NUTTER: Case 3508 and 3509 will be consolidated for purposes of testimony.

MR. KELLAHIN: We have three witnesses I would like to have sworn, please.

(Witnesses sworn)

MR. KELLAHIN: I would like to call as our first witness Mr. M.J. Kaufman.

M.J. KAUFMAN, called as a witness, having been first duly sworn on oath, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. KELLAHIN:

Q Would you state your name, please?

A My name is M. J. Kaufman.

Q By whom are you employed and in what position?

A I am employed by Phillips Petroleum Company as Director of Reservoir Engineering and Unitization.

Q Where are you located?

A In Bartlesville, Oklahoma.

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

A No, sir, I have not.

Q For the benefit of the Examiner, would you outline your education and experience as a petroleum engineer and in the field of unitization?

A I am a graduate in petroleum engineering with a B.S. Degree in petroleum engineering from the University of Kansas in 1947. I went to work for Phillips immediately after graduation and I have been employed in various engineering capacities for over nineteen years.

Q In connection with your work, have you had anything to do with the development of the Vacuum Abo Unit?

A Yes, sir, I have.

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

Q Referring to what has been marked as Exhibit Number 1, would you identify that exhibit, please?

A Yes, sir. That's a Unit Agreement, Development and Operation of Vacuum Abo Unit, Vacuum Field, Lea County, New Mexico.

MR. KELLAHIN: Are the witness's qualifications acceptable?

MR. NUTTER: Yes, sir, they are.

Q (By Mr. Kellahin) Mr. Kaufman, did you work on the preparation of this particular Unit Agreement?

A Yes, sir.

Q Is it generally patterned after the Federal form?

A Yes, sir, that is correct.

Q Is it a form that has been approved by this Commission in other cases?

A Yes, sir.

Q The unit actually makes no reference to any Federal agencies or officials, does it?

A No, sir.

Q Why is that?

A Because there are no Federal or Indian lands located within the Unit Area.

Q What type of lands are located in the Unit Area?

A State principally, and forty acres of Fee land.

Q It's practically 99% State Land and one per cent Fee land, is this approximately correct?

A That's correct.

Q Would you discuss briefly the provisions of this Unit Agreement?

A Well, as I mentioned a moment ago, it's generally patterned after the Federal form. It has twenty-two specific defined terms. Under the section described as Definitions, the unit area is described total as 3,640 acres of which forty acres is Fee land and 3,600 is State land. The agreement describes the participation basis, which is based 100% on relative tract ultimate primary recovery. The agreement designates a unit operator and Phillips Petroleum Company is designated as the initial unit operator. The agreement further provides for resignation and removal of the unit operator and for selection of a successor unit operator. It specifies how tracts are qualified for inclusion in the unit; provides for enlargement of the unit and subsequent joinder of the interests which are not committed initially. It provides for allocation of unitized substances for tracts and for taking unitized substances in kind. The agreement requires a plan of pressure maintenance operation. It provides

for an effective date and term and requires approval by this Oil Conservation Commission and by the Commissioner of Public Lands before the unit can be made effective.

Q Has it been submitted to the Commissioner of Public Lands?

A Yes, sir, it has, and preliminary approval has been received by a representative of the Commissioner.

Q There are attached to the Unit Agreement certain exhibits, are there not?

A Yes, sir, two principal exhibits. First Exhibit A is a map of the unit area. It shows the unit boundary tract numbers, the Abo Wells, tract operators, lease names, State of New Mexico lease numbers.

Q Then Exhibit B covers the tabulation of similar information, is this correct?

A Yes, sir.

Q And it shows the State of New Mexico lease numbers, lessee of record, and the other information required?

A That is correct.

Q Does it also show royalty and overriding royalty owners?

A Yes, sir, it does.

Q Working interest owners?

A Yes, sir.

Q And the per cent of participation as agreed upon?

A Yes, sir.

(Whereupon, Applicant's Exhibit 2 marked for identification.)

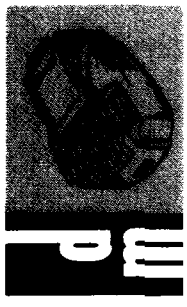
Q Referring now to what has been marked as Exhibit No. 2, would you identify that Exhibit 2?

A Exhibit 2 is merely tabulation of major owners in the Vacuum Abo Unit, tabulated first the working interest owners. Phillips Petroleum Company is the large owner, 39.6 per cent unitization; Chevron Oil Company, formerly Standard Oil Company of Texas has 19.4%; Shell 18.6; Mobil Oil Company 7.6; Tidewater Oil Company 3.8%; Skelly 3.7%; Marathon 2.0%; Aztec Oil and Gas 1.9%; Pan American Petroleum Corporation 1.1% and others each with less than one per cent, 2.3%. As mentioned earlier, the principal royalty owners in the State of New Mexico with 99% of the basic royalty and 1% is owned by fee royalty owners.

(Whereupon, Applicant's Exhibit 3 marked for identification.)

Q Now referring to what has been marked as Exhibit No. 3, would you identify that exhibit?

A Exhibit 3 is entitled "Sign-up Status by Tracts," dated December 28, 1966, and this shows the per cent working interest approval and the per cent royalty interest approval



in each of the fifteen tracts within the unit area as of December 28th and there have been no changes since that time. The column entitled, "Per cent Royalty Interest Approval by the State of New Mexico," and again as mentioned earlier, we do have preliminary approval and will submit it for final approval shortly after this hearing. You will note that opposite Tract Four and opposite Tract Eight under the column "Working Interest Approval" no number is shown. This was done in this manner because we have been informed verbally by Mobil, operator of both tracts, that they do intend to execute ratifications for the unit agreement but do not have, as of this date, an executed ratification by Mobil. Now, when we receive that, then Tracts Four and Eight would be 100% approved by the working interests. Now, down at the bottom of tabulation calculated on the unit participation basis as of this time 85.63% of the working interest owners have approved and the royalty interest approval exceeds 99% on a unit participation basis. On an acreage basis the approval is about 83% of the working interest and 97% of the royalty interests.

Q Under the terms of the royalty agreement, is that sufficient to make the agreement effective?

A Yes, sir, it is.

Q Do you anticipate that all of the other acreage will

be committed to the unit?

A We do not think at this time that the Pan American tract which is Tract Three will be committed to the unit initially.

(Whereupon, Applicant's Exhibit 4 marked for identification)

Q Now, referring to what has been marked as Exhibit No. 4, would you identify that exhibit and discuss the information shown by the colored tracts on that exhibit?

A This is a plat, actually the same as Exhibit A in the Unit Agreement with various colors shown. First, the red area is the area which has been approved by 100% of the working interests in the area and more than 75% of the royalty interests and therefore the red tracts will qualify automatically under Paragraph Eleven of the Unit Agreement. The blue area has less than 100% working interest approval but the tract operators have approved and the tract can therefore be qualified under Paragraph Eleven C of the Unit Agreement. The green tracts cannot qualify with the present sign-up status and again, you will note that Tracts Four and Eight are indicated by special symbols. They are painted green, but have red X's drawn through them. Those are the two Mobil tracts where we have been informed that Mobil intends to sign. So it now appears that all tracts except the Pan American tract

will qualify for inclusion in the original unit area and this, of course, would give us a nice workable unit area.

Q Will the committment of the tracts as you have outlined them give Phillips Petroleum Company as operator effective control of the pressure maintenance program that is proposed for the unit?

A Yes, sir, it will.

Q Now, in that connection, would you discuss briefly just what is proposed by Phillips Petroleum Company?

A We plan a pressure maintenance that will be reinjection of produced gas. Of course, there is gas produced with the oil throughout the unit area. This gas will be collected as it is now, sent through a gasoline plant for extraction of liquids contained in the plant, then all the gas produced or 70% of all the gas produced from the entire unit area will be reinjected through two injection wells initially.

Q This will be further discussed by another witness, will it not?

A Yes, sir, in detail.

Q Now, in your opinion the unitization is necessary in order to realize the benefits of the pressure maintenance program?

A Yes, sir, it is necessary.

Q Is there any estimate as to the initial recovery that

might be made?

A Yes, sir, it is estimated that the unitized pressure maintenance program will result in the recovery of about 10,000,000 barrels of oil over and above that which would be recovered by continued primary operation.

Q In that regard it would result in a prevention of waste, is that your opinion?

A Yes, sir, it is.

Q Did Phillips or the other operators consider any other alternatives to the unitization of this area?

A Well, only to the extent necessary to compare them to the program which is being recommended and one such other alternative might be pressure maintenance on a lease basis and that alternative as well as any others would certainly be inadequate as indicated by the plat heretofore marked Exhibit 4. The Abo Reservoir is long and narrow in shape. There are fifteen tracts with diverse ownership and the most effective plan in terms of conservation and waste prevention is to operate on a unitized basis.

Q What are the plans for making the unit effective?

A If approval of the Commission and approval by the Commissioner of Public Lands can be obtained in the next two or at most, three weeks, it is planned to make the unit effective on February 1, 1967.

Q Now, in that connection on Page 22 of the former Unit Agreement it provides that the effective date shall come on or before January 1, 1967 or the unit by its terms terminates. Has anything been done in this regard?

A Well, the Paragraph 22 to which you have referred, also states that if 75% of the working interest ownership has approved and has voted to extend the termination date, it can be extended for another six months. A ballot has been taken, of course, over 85% of the working interests have executed and about 83% have voted to extend the termination date for six months, so the termination date has been extended to July 1,1967.

Q Now, were Exhibits 1 through 4 prepared by you or under your supervision?

A Yes, sir.

MR. KELLAHIN: I would like to offer Exhibits 1 through 4 in evidence.

MR. NUTTER: Exhibits 1 through 4 will be admitted in evidence.

(Whereupon, Applicant's Exhibits 1-4 admitted in evidence.)

MR. KELLAHIN: That's all I have on direct examination.

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

BY MR. NUTTER:

Q The blue acreage on your plat, Exhibit No. 4 apparently belongs to the Vac-Edge Unit. That's committed to this unit, is that correct?

A Yes, sir.

Q This is a case of two overlapping units then?

A Yes, sir, a portion of the Vac-Edge Unit is included in the Vacuum-Abo Unit.

Q Now as a result, your Exhibit B to the Unit Agreement shows that Tract 13 has ownership there of about seven different companies who are the owners, I guess, of the Vac-Edge Unit?

A That's correct.

Q Then Exhibit No. 2 shows that several of these companies have not committed their acreage. Is this being handled on a unit basis or individually with the various owners of the Vac-Edge Unit?

A Well, there are two owners in the Vac-Edge Unit who have not signed the Vacuum-Abo Unit Agreement. Those two are Tidewater Oil Company and Aztec Oil and Gas Company. Now, we plan to bring this tract and include it in the unit by indemnity from the signed owners in the Vac-Edge Unit to indemnify the other owners in the Vacuum-Abo Unit. We also plan to maintain production separate and over Tidewater and Aztec, let them at their option, decide whether they wish to

accept production on a measured basis or allocated basis.

Q Do you believe that Tidewater and Aztec will committ their interests in Tract Thirteen to the Abo Unit Agreement?

A I don't think they will initially, no, sir. I think they will at some subsequent date.

Q And the other two companies with the asterisks on Page 2 are Mobil and Pan American, you don't anticipate that Pan American is going to come in initially?

A No, sir, I do not.

Q But you do expect Mobil to be committed before too long?

A Yes, sir, before the effective date.

MR. NUTTER: Are there any other questions of Mr. Kaufman? You may be excused.

(Witness excused)

MR. KELLAHIN: I would like to call Mr. Templeton, please.

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

DIRECT EXAMINATION

BY MR. KELLAHIN:

Q Would you state your name, please?

A Elmer Templeton.

Q By whom are you employed and in what position?

A I am employed by Phillips Petroleum Company and I am presently Associate Reservoir Engineer in new recovery processes.

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

A No, sir, I have not.

Q For the benefit of the Examiner, would you briefly outline your education and experience as an engineer?

A I graduated from Marietta College in 1959 with a B.S. Degree in Petroleum and from Pennsylvania State in 1961 with an M.S. in Petroleum and Natural Gas Engineering. I went to work for Phillips in February of 1961 and was on a training program there until September, and at that time I went to work in Midland, Texas as an assistant to the Division Reservoir Engineer and I worked in that capacity both in Midland and later in Odessa when the office was moved back to Odessa until July of 1965. At this time I assumed my present job in Bartlesville, working on new recovery processes.

MR. KELLAHIN: Are the witness's qualifications acceptable?

MR. NUTTER: Yes, sir, they are.

Q (By Mr. Kellahin) Would you briefly outline the work that was done in connection with this program in setting up the pressure maintenance program?

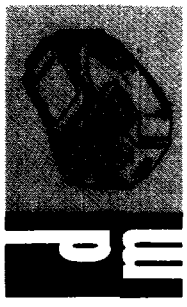
A Well, an engineering committee for the Vacuum-Abo Reef Field was formed at the first operators' meeting held on April 5, 1961, with a representative of Standard of Texas as the chairman. A Phillips representative became chairman in 1962 and the committee meeting on August 2, 1963 reviewed the work that had been done to date and remained in continuous session thereafter until the report was completed in August of 1964. Additional sessions have been held to update and review the work done to that time. During this work session period there were separate sessions for both geology and engineering where specialists in both fields work independently.

Q Generally, what is the nature of the Vacuum-Abo Reef Pool?

A The pool is located about twenty miles northwest of Hobbs in Lea County, central Lea County. The discovery well completed October 17, 1960 was the Standard of Texas Vac-Edge Number 2. The well initially potentialed about 240 barrels of oil per day with no water. Most completions were effected by setting five and a half inch casing through pay and perforating. All wells were logged and most were given a small acid treatment.

Q What is the geology of the pool?

A The reservoir or pool is a northeast-southwest trending reef-type development grading in thickness up to 928 feet. It's about a half, to mile and a half wide and eight



to nine miles long. The reef is located on the northwest shelf of the Delaware Basin and it's lower Leonard or Permian in age. The reef grades from a clean buff-colored dolomite in the top to crystaline tan dolomite in the base. The back reef is characterized by green shales, and limestone. The fore reef is primarily gold sand and dark dolomite. In our investigation we considered a small patch reef in front of the main reef. It consisted of two separate reef-type lenses and was examined by us primarily to determine that separation existed between the two reservoirs and the patch reef is a separate reservoir.

Q Will that be shown on a later exhibit?

A I believe so. Other developments in association with our main reef body had been explored since there is a small lens-type development to the northeast and one to the southwest, but these lenses are similar to the one we examined and are separate from our main reef.

Q Have you made any examination of the structure and pay of the area?

A Yes, sir, in the geological work sessions many cross sections were constructed to aid in determining the geology of the reef and our Exhibit No. 5 presents a typical cross section of the reef. This particular one was constructed to show one of our proposed injection wells. It presents the

reef. It associated overlying and underlying formations, presents an average oil-water contact field-wide. Recognizing that there were thin reef-type structures in association with a reefal development of this size that would be near the main reef body that would be penetrated by associated wells. The committee defined the contoured top of the reef that we worked with as the first reef penetrated that was near enough to the massive reef body and of sufficient thickness to be in communication with the massive reef. This contoured top is presented as our Exhibit 6 and shows the contoured top of the main reef body.

Q The exhibit also shows the small lens developments offsetting the main reef?

A That's correct.

Q To which you referred a while ago?

A Yes, sir, but the contours for this small reef were deleted from this. Our recommendations as a committee excluded this small reef-type lens in the front and for the purpose of our report we deleted these contours.

Q What determination did you make as to the oil-water contact?

A The oil-water contact in the reservoir, primarily due to poor distribution and variation in permeability, was somewhat erratic and the committee concluded that a field-wide

average oil-water contact, that the date of discovery was about minus 5070 for the true contact did vary from well to well, we concluded that no free gas saturation existed in the reservoir at discovery and in determining net pay we found some inconsistency in the tools available in that the different logs used did not always agree in the interpretation of net pay and for this reason we constructed a gross reef isopac. This was used by the committee as a rough check for a field-wide estimate of the volume of the reservoir.

Q Is that your Exhibit No. 7?

A That is correct.

Q That shows the gross reef isopac that was used?

A That's correct.

Q On this basis you determined the reservoir volume?

A Yes, sir, this was a rough check.

Q Now, were any core analyses available?

A Yes, sir, this particular reservoir or pool was cored quite a good deal and 2,726.8 feet of core was available to be analyzed by the committee and a considerable amount of time was devoted to this data. It was processed and bracketed by a computer program. The print out and analysis showed the permeability distribution in this particular reservoir to be heterogenous, but the committee concluded that the reservoir was homogeneous in the degree of permeability. The productive

reef has an average permeability of about 13.8 millidarcies and average porosity of 4.69%. In addition to the routine core analysis special core analyses were available from four wells. There were sixteen capillary pressure tests which we used to determine our conic water saturation. There were thirteen KGK on data tests from which our relative gas-oil permeability was determined for use in predicting primary performance and second performance under gas injection. In addition to these water-oil relative permeability data was available from twelve samples and the summary of this was used in our treatment of water injection.

Q Did you have any information on the reservoir fluid characterstics?

A Yes, sir, fluid analyses were available from two wells, the Vac-Edge Unit Number 2, the discovery well was sampled very early in the field's life and it was the opinion of the committee that this well would have a more stabilized sample was collected from this well since it was taken while the well was some six or seven hundred pounds above the bubble point. A second sample was available from the Texas State AE Number 11 but this well was completed and sample taken when the reservoir was very near the bubble point and it was concluded that this sample was not stabilized. The samples were similar but the Texaco sample indicated it was not quite stable. The pressure

in the reservoir 3,230 pounds, bubble point 2,368 pounds, the reservoir temperature 136 degrees Fahrenheit. The solution gas was 960 cubic feet per barrel in the initial oil form volume 3,201.495, 1.592 and besides the analyses of the sample reflected in the Vac-Edge was used in our engineering.

Q Did you give the degree API of the fluids or do you have it?

A No, sir, I don't have it. I can get it. I am not real sure; it's close to forty.

Q Do you have any information now on the reservoir performance?

A Well, the performance at the time the committee was investigating the reservoir, at the time our findings were published was related primarily to development since we were initiating our study and making it very early in the reservoir's life we did notice an abnormally low pressure decline rate for a reservoir producing above the saturation pressure. We interpreted this as indicative of unknown volume of water influx.

Q Is this shown on your Exhibit No. 8 or is that later pressure decline curve?

A I have an Exhibit No. 8 that I intended to submit a little later.

Q Go right ahead with your testimony then.

A This water production has been observed since the earliest completions. It occurs predominantly in the four reef wells along the leading edge of the reet. At the time of our studies reef data was not available to determine the magnitude of water influx. We were dealing with fluid expansion and relatively small amount of the field's ultimate recovery. The pressure continues to decline, however, in the reservoir presently, showing that the influx has been inadequate to maintain pressure and production to date has been primarily from fluid expansion and solution gas drive and not from water influx. Water influx has probably been the result of an expansion of finite water body through restricted permeability.

Q Now, you made a calculation of the original oil in place in this reservoir?

A Yes, sir, we calculated an original oil in place in the unit area of 138,000,000 stock tank barrels. This was checked with our gross reef isopac. However, we recognized that a material balance was a rough two above the bubble point because of the water influx and we are using a product of very large production figures and have a small fluid expansion figures. Our only check was the gross reef volume.

Q What was your predicted primary performance and how was it determined?

A We predicted primary performance using the gas-oil relative permeability data and checked with a few points in the field and utilized the technique of Tarner to predict ultimate primary recovery in the unit area of 23.4 million stock tank barrels.

Q What techniques did your committee consider for the increase of the recovery from this reservoir through pressure maintenance?

A In our engineering work we analyzed three possible pressure maintenance techniques. These measure the water injection and gas injection. Gas injection was the most attractive of the three techniques and involved the least risk. The Tarner technique was used in our gas injection evaluation. The gas injection was the most attractive even though the Tarner technique does not consider such plus factors as gravity, segregation, gas cap effects and frontal displacement. In our treatment of gas injection we assumed that all our gas available from produced gas was reintroduced into the reservoir, 70% figure that we arrived at was obtained by estimating that 25% of the produced gas volume would be withdrawn at the plant as liquids and five per cent would be utilized as fuel in the operation of the unit. Thus, 70% of the volume of produced gas for injection, the optimum performance achieved when the 70% of the produced gas is

injected and this 70% will not maintain pressure or increase pressure but retards the rate of decline. This results in the recovery of 38.8 million stock tank barrels of oil or 10.4 million stock tank barrels of oil that would not be recovered by primary depletion and it includes the possibility of converting the injection system to missible displacement later if a gas cap is formed.

Q On the basis of the studies that you have made and the studies made by the committee as discussed by you, what conclusions do you make?

A The committee concluded that the ultimate primary recovery on a continued primary depletion within the unit area would be 20.6% of the original in place. We conclude that water influx would cause some additional oil to be produced even under primary depletion. We concluded that any unitized pressure maintenance project would recover more oil than primary depletion. We conclude that many of the conditions and that gas injection is the recommended pressure maintenance.

Q What recommendations do you make to this Commission at this time?

A The engineering committee recommended first that bottom pressure surveys be conducted each March and September so that the most efficient method of operating this field can

be determined and the reservoir performance analyzed periodically in the future. Second, that the Vacuum-Abo Reef Pool be unitized and third, that crestal gas injection be initiated and performance analyzed for possible application later of missible displacement.

Q Mr. Templetom, you are familiar with the proposed unit area, are you not?

A Yes, sir.

Q This proposed unit area does not encompass the entire pool or source of supply, does it?

A No, sir.

Q Have you made any observations as to the pressure performance of the proposed unit area as compared to the remainder of the reservoir?

A Yes, sir.

Q Is that your Exhibit No. 8?

A Yes, sir.

(Whereupon, Applicant's Exhibit No. 8 marked for identification.)

Q Would you discuss Exhibit No. 8, please?

A Well, this presents the pressure time performance of the entire Vacuum-Abo Reef Pool and it breaks the pressure performance into two groups. One, here designated as blue, is the group of properties within the proposed unit area and

the second, which is the little squares connected by the solid dark lines, presents the pressure-time performance of the group of properties inside the pool but outside the proposed unit area. This demonstrates that the proposed unit area has been operating at approximately 200 pounds higher than the rest of the field, that the pressure decline versus time has been about the same in both areas except that there is a 200 pound pressure differential and that pressure differential existed today. There is an apparent flattening in a pressure-time relationship in both these areas. This is the result of not surveying low-pressure wells along the back side of the reef where, for reasons either of artificial lift equipment or inability to make up lost allowable during the survey these wells aren't surveyed. No pressure is taken and thus, the field-wide average, which is the blue line in the unit area, does not include these low-pressure wells and gives a misleading average reservoir pressure. Now, the red line is wells within the unit area that have been surveyed every time a survey was run since they were completed. For instance, the last 2.30 and 31 wells were surveyed then these wells, the pressure on these wells was used in every point preceding that. This line is presented to show that the reservoir pressure is still declining although the apparent flattening here would indicate that perhaps it was not flattening as a result of not

surveying the low-pressure wells every time and the red line is to demonstrate that the reservoir pressure is declining.

Q From the dashed line for both areas are the predicted pressure histories under primary operations and with present allowable, is that correct?

A Yes, sir.

Q When the Vacuum-Abo Unit becomes effective certain operations are implied which will tend to maintain pressure or stated another way, probably retard the pressure decline, is this the proposal?

A That is right.

Q By way of review, what operations are implied?

A We are going to return approximately 70% of the produced gas to the reservoir.

Q What will happen to the gas off of it?

A The rate of pressure decline will decrease.

Q Will the differential between the properties in the unit area and outside the unit area change?

A Yes, sir, with the decrease in the rate of pressure decline for the properties in the unit area and the same rate for the properties outside the differential between the area and the remainder of the pool will increase.

Q What would be the result of this differential in pressure?

A The obvious result of a pressure differential is fluid movement and with an increase of fluid differential, increased movement of fluid will occur.

Q As I understand your answer, then you are saying that gas and injection in the unit area will increase the pressure differential and that area outside the area which will establish conditions favorable to increased drainage from the unit area to the outside area?

A Yes, sir.

Q That results, in your opinion, in drainage?

A Yes, sir.

Q And the drainage would be increased?

A Yes, sir.

Q Is there any way to prevent this drainage or prevent the establishment of these conditions that might be conducive to drainage?

A Yes, sir.

Q How would you do that?

A Well, in order to maintain the present pressure differential between the proposed unit area and properties outside the proposed unit area the net liquid withdrawal from the unit area would have to remain constant since 70% of the gas produced will be returned to the reservoir. It would be necessary to withdraw a liquid volume equivalent to the

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Q Is there any way to prevent this drainage or prevent the establishment of these conditions that might be conducive to drainage?

A Yes, sir.

Q How would you do that?

A Well, in order to maintain the present pressure differential between the proposed unit area and properties outside the proposed unit area the net liquid withdrawal from the unit area would have to remain constant since 70% of the gas produced will be returned to the reservoir. It would be necessary to withdraw a liquid volume equivalent to the

volume of the gas being reinjected. Therefore, the only real solution to the problem would be an increase in the oil producing rate inside the unit area.

Q And that would have to be instituted once gas injection has started. Will it have an adverse effect to the non-unit wells?

A If the increased allowable inside the unit area is in line with the amount of gas injection and the pressure differential between the unit area and the properties outside the unit area maintains the same there would be no change, no, sir.

(Whereupon, Applicant's Exhibit No. 9 marked for identification)

Q Now, referring to what has been marked as Exhibit 9, would you identify that exhibit?

A Well, this is the basic data. Here the circles and the squares is the same pressure time information presented in Exhibit 8. The circles in this case present the pressure time performance of the group of properties inside the proposed unit area and the squares present the same information for the remainder of the properties in the pool. What I have done here is show the projected pressure time relationship for the two groups of properties under continued primary depletion if allowables and withdrawal rates remain the same

and on the pressure time relationship for the properties within the unit area I have superimposed the predicted pressure time performance as predicted by the Tarner technique for varying producing rates. The uppermost of the three superimposed curves shows the pressure time relationship for the unit area assuming that a top allowable is maintained and 70% of the produced gas is reinjected as residue and this shows that the pressure differential between the unit area and the rest of the field will be increased. The second of the superimposed curves shows the case with 70% reinjection and 125% top allowable. Now, this demonstrates that the pressure differential is not quite as great as it would have been with top allowable and the lower of the three superimposed curves shows the case of 70% reinjection and 150% top allowable. This case shows a pressure performance history similar to primary depletion and a pressure differential between the unit area and the properties outside the unit area that is similar to that under primary depletion.

Q Actually, the performance is very closely approximate to primary performance, is that correct, on 150% allowables?

A Yes, sir. This shows that if 70% of the produced gas is returned to the reservoir and the unit area produces at 150% of top allowable and the pressure time performance will very closely approximate performance under continued

primary depletion and between the properties outside the unit area would be about the same as it would have been under continued primary depletion. Thus, the reinjection of the 70% of the produced gas is a conservation measure that will result in the recovery of about 10,000,000 stock tank barrels of oil that otherwise would not be recovered and justifies, I think, an additional allowable, not only from an engineering standpoint, but from an economic standpoint.

Q In order to operate the proposed unit and pressure maintenance project from an engineering standpoint is it your opinion that an increase in the allowable is necessary?

A To prevent drainage?

Q For the efficient operation of the pressure maintenance project, you consider it necessary?

A Yes, sir.

Q To that extent, would that prevent waste?

A Yes, sir.

Q Again this Exhibit shows a flattened portion of the curve. What is your explanation of that?

A At the top?

Q Yes, sir.

A This is the period of top allowable. This is the period of top producing allowable for the area.

Q There is a portion of the area outside the unit area

showing a flattened part of the curve?

A This is the same flattening that I explained in my Exhibit A which was the result of not including low pressure wells in the most recent pressure surveys.

Q To that extent the curve would be misleading and you have projected the true measure decline as you interpreted that?

A Yes, sir.

Q Were Exhibits 5 through 9 prepared by you or under your supervision?

A Yes, sir.

MR. KELLAHIN: I would like to offer Exhibits 5 through 9.

MR. NUTTER: Exhibits 5 through 9 will be admitted in evidence.

(Whereupon, Applicant's Exhibits 5-9 admitted in evidence.)

MR. KELLAHIN: That's all.

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

BY MR. NUTTER:

Q Mr. Templeton, studying your Exhibit No. 6 which is the contour of the Abo Reef Pool and correlating that with Exhibit No. 4 which is the boundary of the unit area, it would appear that the unit area as shown on Exhibit 4 is not the same

as the proposed unit boundary which is shown on Exhibit No. 6. I suppose that this Exhibit 6 dates back to some preliminary studies that were made long ago when you were first thinking of unitizing the entire pool, is that correct?

A Exhibit 6 was taken from the engineering report that the committee submitted to the operators in August of 1964 and was submitted just to show the engineering committee's conclusions and analysis of the reservoir.

Q At that time the proposed unit area would encompass the entire pool?

A At that time we included what we felt were too possible unit areas. One was the main Abo Reef Pool and we, for purposes of informing our operators even showed a small unit.

Q This patch reef, is that what is sometimes referred to as Abo Detritus.

A Yes, sir, this is an example.

Q Taking Exhibit No. 6 and looking at the actual unit boundary, the furtherest west that the unit boundary goes is to Section Five, is that correct?

A Yes, sir, between Sections Five and Six.

Q And between Seven and Eight?

A Yes, sir.

Q And this area -- I have drawn a red line here on my

exhibit -- then the area to the left of that red line would be the area which is some 200 pounds lower in pressure than the area to the right?

A Yes, sir.

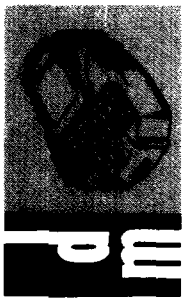
Q To what do you attribute this pressure differential at this time?

A Well, the engineering committee recognized that the area to the left of your red line was not as high quality a reservoir as the remainder and this is not surprising to me as an engineer since I personally don't think there is the volume of oil in place per acre foot. I think probably that area is a little more depleted than the proposed unit area.

Q Actually, referring to your Exhibit 7, there is more gross reef there in that west end than there is in the northeast end, is there not?

A This is one of the reasons we went to a gross rather than a net. We couldn't determine net and this is why I say it was a rough check. Some of the performance out here was due to things perhaps other than reef. This was an igneous intrusive in Section Twelve that caused quite a bit of thickening and we recognized that there was more gross reef here but it was meaningless as far as net pay and oil in place.

Q So as far as the gross pay is concerned, there may be more of it, but the net oil is less out there in the west



end?

A Yes, sir.

Q And withdrawals have been approximately the same per well with the result that the pressure has declined more in the west end. Original pressures were the same in both areas, weren't they?

A Right, this section was developed later than the proposed unit area and they encountered pressure very nearly the same or within 100 pounds, but because of less oil in place the area has depleted faster. We went to some lenths to explain to the operators that gross reef was very misleading with regards to oil in place.

Q The operators to the west were members of this original engineering committee?

A Yes, sir.

Q They were afforded the opportunity to go into this Abo Unit?

A Yes, sir.

Q Do you know if they have any plans for pressure?

A At one time they came to myself as the expediter of this engineering work and gathered up that portion of the engineering data that applied to their properties and were making motions toward engineering work in that area, but at this time I know of no work being done.

Q You haven't gotten into the wells that would be used for gas injection wells. I suppose the third witness will go into those?

A Yes, sir.

Q You have vaguely referred to allowables, top allowable, 125%, 150%, will this other witness also go into these things?

A Yes, sir.

MR. NUTTER: I believe that's all. Are there other questions of Mr. Templeton? He may be excused.

(Witness excused)

MR. KELLAHIN: I call Mr. Jukes.

R.H. JUKES, called as a witness, having been first duly sworn on oath, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. KELLAHIN:

Q Would you state your name, please?

A My name is R.H. Jukes.

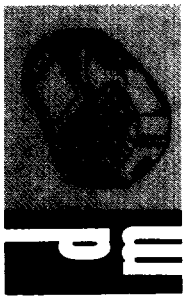
Q By whom are you employed and in what position?

A I am employed by Phillips Petroleum Company as a Reservoir Engineer and Unitization Supervisor.

Q Have you ever testified before the Oil Conservation Commission, Mr. Jukes?

A No, sir, I have not.

Q For the benefit of the Examiner, would you outline



your education and experience as an engineer?

A I received a B.S. Degree in Petroleum Engineering from the University of Kansas in 1952. After two years in the service, I went back to work for Phillips and during the past twelve, thirteen years have held various engineering assignments in various areas of the company's operations.

MR. KELLAHIN: Are the witness's qualifications acceptable?

MR. NUTTER: Yes, they are.

Q (By Mr. Kellahin) Are you familiar with the proposed pressure maintenance program of Phillips Petroleum Company in the Vacuum-Abo Unit?

A Yes, sir, I am.

Q Have you done any work on this yourself?

A Yes, sir, I have.

Q What are you requesting presently of a pressure maintenance program?

A We are requesting approval to conduct pressure maintenance operations by the injection of gas into the Abo Reef Pool.

(Whereupon, Applicant's Exhibit 10 marked for identification)

Q Now, referring to what has been marked as Exhibit No. 10, would you identify that exhibit, please?

A Exhibit 10 is an area map and it shows the proposed unit boundary of the Vacuum-Abo Unit in a heavy dark line. It shows all wells completed within the proposed unit area and within approximately two miles of the unit boundary and it has the completions of these wells noted by symbols which are located in the lower right-hand corner of the exhibit.

Q What do you propose to do in the way of initiating this pressure maintenance program?

A We are requesting approval at this time to convert two wells to gas injection operations. The two wells being the Standard of Texas Vac-Edge Unit Well Number 11 and the Shell State Teles Well Number 6. These wells are shown on Exhibit 10 with large circles.

Q Now, you will propose to convert additional wells as the project progresses, will you not?

A Yes, sir. As a matter of fact, we are requesting through administrative action by the Commission to convert future wells to gas injection along the crest of this reservoir. The tentative selection of the future injection wells is shown by the triangular symbols on Exhibit No. 10.

Q You do ask for administrative procedure for the conversion of these wells?

A Yes, sir.

Q Have you prepared schematic diagrams of the proposed

injection wells?

A Yes, I have.

Q That would be Exhibits Numbers 11 and 12, is that correct?

A Yes, that's correct.

(Whereupon, Applicant's Exhibits 11 and 12 marked for identification.)

Q Would you discuss what is shown on those two exhibits?

A All right, sir. Exhibit No. 11 is a schematic diagram of the Standard of Texas Vac-Edge Unit Well Number 11, which is located 1,650 feet from the north line, 1,980 feet from the west line of Section Four, Township 18 South, Range 35 East, Lea County, New Mexico. This schematic shows that the surface pipe which is thirteen and three eighths was set at 305 feet and cemented with 375 sacks of cement which circulated cement to the surface; shows the intermediate string of casing which is eight and five eighths set at 3,244 feet cemented with 640 sacks of cement which was also circulated to the surface. It shows that the five and a half inch oil string was set at 9,100 feet and cemented with a total of 679 sacks of cement and the calculated top of this cement behind the oil string is at 3,240 feet. This schematic further shows that when the well is converted to injection, there will be an injection string of tubing which

will be landed at approximately 8,310 feet in a permanent type packer which will be set at approximately 8,300 feet. Now, on the left-hand side of the exhibit we have shown what are tentative perforated intervals for the injection of gas. I want to emphasize that these are very tentative. Our plan here is to put this gas in the immediate top of this reservoir and through perforating and then producing and injecting we are going to attempt to open up the very minimum amount of formation that is necessary to get the desired amount of gas into the ground. It will be a balance between injection pressures, amount of perforations, and the number of wells. We will try to optimize, using these three variables.

MR. NUTTER: I presume this well is already completed and it has perforations other than these which will be squeezed and then reperforated?

A Yes, sir, this well is located on the cross section which was Exhibit 5 and I believe the present completion interval is shown on that exhibit. The next exhibit, No. 12, is a schematic on the Shell Oil Company State T Number 6 Well which is to be the other initial injection well. This well is located 330 feet from the south line, 660 feet from the east line of Section 33, Township 17 South, Range 35 East, Lea County, New Mexico. This exhibit shows that the thirteen and three eighths surface pipe was set at 297 feet cemented

with 275 sacks of cement which put the cement back to the surface. The intermediate string of eight and five eighths was set at 3,133 feet and cemented with 1,050 sacks of cement which also circulated to the surface. The oil string which is five and a half inch casing, was set at 909 feet and cemented with 525 sacks of cement and by temperature survey the top of the cement behind the oil string was recognized to be at 3,575 feet. Again on the left-hand side of the exhibit we have shown some tentative perforated intervals which will be used for injection of gas, but again I want to point out that these are only tentative.

Q All right. Completion of the other proposed injection wells compare with the schematics you have shown on Exhibit 11 and 12?

A Yes, they would be similar. We would plan, of course, as is required to furnish similar exhibits upon request.

Q Were logs of the two wells shown on Exhibits 11 and 12 furnished to the Commission?

A Yes, sir, they were.

MR. KELLAHIN: Does the Examiner desire any additional logs?

MR. NUTTER: That's fine.

Q (By Mr. Kellahin) Now, what is the source of the gas that will be injected in this pressure maintenance program?

A The source of the gas will be residue gas from the Phillips League gasoline plant which is located just north of the proposed unit area. We propose to inject this gas, which at the current production rate, would amount to approximately six to seven million cubic feet per day at a maximum pressure of approximately 3,000 pounds.

Q Now, in order to efficiently operate the proposed project will you need special rules for the unit area?

A Yes, sir.

Q What do you proposed in that connection?

A We are requesting permission to transfer top allowable from wells converted to gas injection. We are also requesting permission to shut in wells for efficiency of operation and to transfer top allowable from these wells also. And we are requesting, of course, to assign these transferred allowables to other wells in the unit area. We are requesting a bonus allowable when gas injection operations are started equal to approximately twenty-five per cent of top allowable for the unit area when 70% of the total produced gas is injected. If the injection rate drops below this amount, we would expect and suggest that the allowable bonus be reduced proportionately.

(Whereupon, Applicant's Exhibit 13 marked for identification.)

Q Now, referring to what has been marked Exhibit No. 13, would you identify that exhibit?

A Yes. This is merely a plot of per cent of produced gas reinjected plotted against bonus allowable expressed as a per cent of top allowable and this would show that when we are injecting 70% of produced gas the bonus allowable would be twenty-five per cent of top. If for some reason, the injection rate dropped to thirty per cent of the produced gas the bonus allowable would amount to approximately eleven per cent of top allowable. We further request that a gas bank be established for the purpose of using injected gas as a means of eliminating or reducing at least, future gas-oil ratio penalties.

Q Are you familiar with other or similar orders that have been entered by this committee that have been entered in relation to GOR penalties?

A Yes, sir.

Q Something similar in other fields?

A Yes, sir, I think that would be satisfactory.

Q You heard Mr. Templeton's testimony in regard to pressure maintenance by gas injection versus the per cent of allowable to be assigned to the wells, did you not?

A Yes, sir.

Q Did you recall that his testimony would seem to

indicate that production at the rate of 150% would nearly parallel primary production if you are injecting gas at the rate of 70%?

A Yes, that is correct.

Q But you are not proposing 150% allowable?

A No, sir.

Q Why is that?

A Well, first of all, I doubt that the unit area would be capable of producing at that rate for a very long period of time and secondly twenty-five per cent is a realistic figure which will, although not keep the pressure differential parallel considering the area inside and outside, it will approximate it.

Q Actually, it could result in some slight increase in the pressure?

A As a matter of fact, that is a prediction, yes, sir.

Q Under those circumstances, will the unit area be protected from drainage?

A Yes, sir, it will to a reasonable degree.

Q Now, what are you recommending with respect to maximum permissible production from wells offsetting non-unit tracts?

A I am recommending that wells offsetting non-unit tracts be permitted to produce no more than 200% of top

allowable.

Q Now, what is your reason for that recommendation?

A Well, this affords an opportunity for the unit to capture oil that might migrate off the unit premises.

Q This would protect the unit against drainage?

A Yes, sir, it would.

Q At the same time, would it permit you to impair the correlative rights of the offset operators?

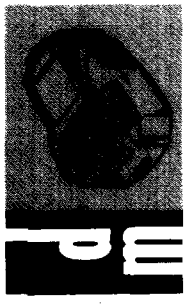
A No, sir, in my opinion, it would not.

Q In connection with your recommendations, Mr. Jukes, you are, are you not, asking for rules which are somewhat different from those that have been adopted in other pressure maintenance projects?

A Yes, sir, they are.

Q How do you justify this?

A Well, there are several reasons. First of all, I think it should be recognized that we are dealing with a long narrow reservoir here and secondly, we should recognize that only a portion of the pool is going to be unitized at this time and subjected to pressure maintenance operations. Another factor for consideration is that when we are injecting six to seven million cubic feet of gas per day this would be equivalent to injection approximately 5,000 barrels of water a day in terms of reservoir volume equivalents, it would be



possible under a disperse -- it would be probable, I would say, under disperse water injection program that you would convert approximately eight or ten wells to water injection to achieve this rate of injection. Converting this many wells to injection, it would be possible to qualify a project area which would approximate the size of the proposed unit area in this case.

Q In your opinion, will approval of the Unit Agreement and the pressure maintenance program as proposed by Phillips result in the production of oil that would not otherwise be recovered?

A Yes, sir.

Q Will that prevent waste?

A Yes, sir, it will.

Q Will the correlative rights of all the operators and offset operators be protected?

A In my opinion, they will, yes, sir.

Q Is there any necessity for prompt approval of this project?

A Yes, sir, there is.

Q Would you state the reasons?

A Several reasons. Of course, first and foremost is for reasons of conservation. The pressure is continuing to decline and the earlier you start it the more oil you

will recover. Secondly, many of the items of equipment that will be required in this operation are becoming extremely hard to acquire. The delivery dates are long and we are most anxious to get this equipment on order.

Q Were Exhibits 10 through 13 inclusive prepared by you or under your supervision?

A Yes, sir, they were.

MR. KELLAHIN: At this time, I offer Exhibits 10 through 13. I believe I offered 1 through 9 already, but if I didn't I will offer them at this time.

MR. NUTTER: They have been entered. Exhibits 10 through 13 will be admitted in evidence.

(Whereupon, Applicant's Exhibits 10-13 admitted in evidence)

MR. KELLAHIN: That's all I have on direct examination. I would like to state that we have a copy of a letter from Mr. Frank Irby, Office of the State Engineer, dated December 23, 1966, stating he has no objection to the proposed pressure maintenance projection as outlined.

MR. NUTTER: We have a similar letter, Mr. Kellahin.

MR. KELLAHIN: That's all we have on direct examination.

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

BY MR. NUTTER:

Q How many wells are in this unit area?

A Seventy-four wells are in this unit area.

Q How much gas are those seventy-four wells making at the present time?

A Approximately nine and a half million cubic feet of gas per day.

Q I believe you stated that your plan would be to inject between six and seven million?

A That would be the maximum injection rate because that represents approximately all the residue gas attributable to the gas produced at this time.

Q That's the maximum that you would have with these two immediate injection wells?

A Yes, sir, and there is a good possibility that it won't reach that point.

Q What is the trend of the GOR's at the present time, up?

A Slightly up, yes, sir. The present gas-oil ratio I believe, is about 950 to 1,000 cubic feet per barrel.

Q That's the average?

A Yes, sir.

Q Your ultimate plan calls for seven injection wells?

A Yes, sir.

Q Do you think when you have got seven injection wells you would be averaging three to three and a half million cubic

feet per day into each one of those?

A That's kind of a difficult question to answer. We could be averaging that much, yes, sir.

Q They will be put on as the GOR's go up?

A That's correct. Like I said before, first of all, our desire here is to create a gas cap and to have this gas cap expand uniformly downward through the reservoir and we are going to put as many of these seven wells on injection as we need to to accomplish this purpose, at the same time, attempt to keep the gas injected in the immedate top of the reef.

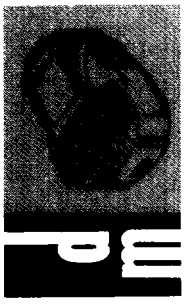
Q Will the amount of gas that is injected ever include gas other than the gas which is produced?

A It's not presently contemplated. However, as the previous witness testified, we are going to continue looking at other means of improving the recovery from this reservoir.

Q Now, your proposed rules for this project would permit the transfer of top allowable from these two injection wells and later on from the other five?

A Yes, sir.

Q Top allowable to producing wells. It would also permit you to shut in certain wells from time to time to obtain an efficient pattern, I presume, if you had gas chaneling into a well, you would want to shut that well in?



A Yes, sir.

Q And transfer top allowable from that well?

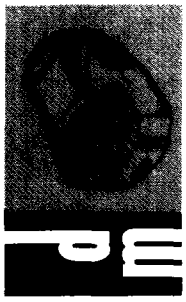
A Yes, sir, that's correct.

Q You would also request that a bonus allowable be afforded the project in accordance with the curve shown on Exhibit 13 so that when 70% of the total produced gas is reinjected, 25% of top allowable would be assigned to the unit above and beyond the regular allowable?

A That is correct, the maximum of that amount, yes, sir.

Q Mr. Jukes, this particular phase of the proposed rules comes as something of a surprise to me. I don't think that the notice of the hearing expressly states that there is a request for any additional allowable above and beyond the regular allowable. As a matter of fact, the application for this project requests or states as follows: "Item No. Four: It is requested that project rules be established for the pressure maintenance project which should include assignment of an allowable as provided by the Commission's rules and regulations." Now, I am aware that the rules for pressure maintenance projects in the Rule Book states that each pressure maintenance project would receive an allowable in accordance with --

A 701, yes, sir.



MR. NUTTER: An individual allowable to be determined after notice and hearing --

MR. KELLAHIN: That is correct.

MR. NUTTER: -- For pressure maintenance project, project area and the allowable formula for any pressure maintenance project shall be fixed by the Commission on an individual basis after notice and hearing. Do you think, Mr. Kellahin, that this notice should have included some specific mention of a bonus allowable?

MR. KELLAHIN: I don't think it should. I think that in my opinion, that the Applicant further seeks special rules to govern reading of said pressure maintenance project would be adequate to give notice that we are asking rules as provided under 701 which would certainly include assignment of allowable. We did ask for assignment of allowable under the provisions of the rule.

MR. NUTTER: The witness did testify that this particular phase of these rules is different from any other pressure maintenance project offered by the Commission.

MR. KELLAHIN: I think this is probably true, but I don't think this would be material to the question of notice.

MR. NUTTER: I am wondering if the offset operators to the west here are aware of this 125% bonus request?

MR. KELLAHIN: I don't think all of them were, certainly

not until yesterday.

A I think some of those operators are present in this hearing, Mr. Nutter.

MR. KELLAHIN: Tidewater is present here in the hearing room. They can say whether they are aware of it.

MR. NUTTER: They are one of the offset operators?

A Yes, sir.

Q Which offsets a non-unitized well to 200% of top allowable?

A Yes, sir, that's correct.

Q There would be no limitation on the amount of oil that could be produced from any interior well?

A That's correct.

Q What is top allowable for this pool?

A For December top allowable was 156 barrels per day.

Q In other words, --

MR. KELLAHIN: If the Examiner please, I think there is one phase of this perhaps we should give a little clarification to and this pertains to the Vac-Edge Unit. What provision are you going to make for the handling of allowables for the wells that are in the Vac-Edge Unit?

A Recognizing that there is an unsigned -- two unsigned working interests in the Vac-Edge Unit and recognizing that one of the proposed injection wells is located on the Vac-Edge

Unit, what we propose to do, first of all, we will make every effort to protect correlative rights. We propose that any transferred allowables or bonus allowables earned on the Vac-Edge Unit will be utilized on the Vac-Edge Unit up to the ability of that tract to utilize such allowables. Any excess would be transferred outside of the Vac-Edge Unit. That treatment likewise would apply to the need for GOR penalties. We would use injected gas to the Vac-Edge Unit up to the need of that and use the balance --

MR. NUTTER: You would treat the acreage in the Vac-Edge Unit as a lease of its own within this unit?

A That's correct.

Q (By Mr. Nutter) As far as transferable allowables --

A Up to the limit of that tract to utilize.

Q If the tract couldn't utilize it all, what would you do with the excess?

A We would use it on the other wells in the rest of the unit area.

Q If my arithmetic is right here, you have got seventy-four wells and top allowable is 156. Assuming that all wells could make the top allowable, you would have something like 11,000 barrels of allowable?

A That is about right, yes, sir.

Q And 25% excess would be pretty close to 3,000 barrels

here today?

A Over 2,500 a day, yes, sir.

Q Is this unit at the present time, capable of making 14,000 barrels per day?

A Under the present conditions my opinion is no, sir, they are not. We contemplate some remedial work on the wells, possible the installation of some lift equipment which would increase the productivity but based, if you are asking this current, today, I would say it would not be able to produce that much oil today.

Q Do you expect that the producing capacity of the well will increase when you start producing gas?

A Just because of injecting gas some wells will experience an increase in production, but since we are not going to increase the weighted average pressure in the reservoir there will not be a general increase in productivity reservoir-wise due to gas injection per se.

Q Individual wells offsetting the injection wells would have a temporary response?

A Yes, that undoubtedly will occur.

Q Overall, no increase?

A There should not be an increase due to gas injection per se, no, sir.

MR. NUTTER: We will take a fifteen minute recess.

(Recess)

MR. NUTTER: Hearing will come to order. Are there any further questions of the witness?

MR. KELLAHIN: I think one question you asked the witness calls for a little clarification in regard to the perforations on the well. Would you explain that?

A Referring to Exhibit No. 5, Mr. Examiner, I believe you made the statement that the red shows the present completion interval and that is incorrect. The black below the red bridge is the present interval in this well.

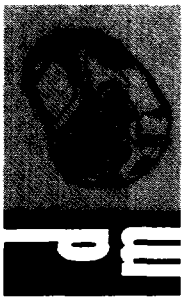
MR. NUTTER: The red is the area of the tentative injection?

A Yes, sir.

MR. NUTTER: Are there any further questions of the witness? He may be excused. Do you have anything further in this case?

(Witness excused)

MR. KELLAHIN: I would like to make a very brief statement. If the Examiner please, reference has been made to what we probably mistakenly called a bonus allowable which, I think, adds a little bit of confusion to the situation. Personally, I feel that the bonus of an allowable is something of a misnomer and I think we should look at it in this fashion: Phillips Petroleum Company as unit operator and those



participating in the unit are agreeing to take all of the produced gas from the Vacuum-Abo Pool and that portion they are operating and after processing, reinject the gas as a conservation measure for the production of additional oil. Those who are not participating in the unit are in an area in which there already exists a pressure differential. They are not proposing to reinject any gas. They are marketing their gas, we assume. I am certain that under the Commission's rules they are not firing it, so under those circumstances we feel that an incentive allowable or protection allowable would probably be a better name for it should be granted to the operator as a means of controling pressure which exists within the unit area. We feel that the testimony and the exhibits that have been offered here today show that if we are going to maintain the pressures at approximately the level of primary production, we would have to have an allowable of 150%. Admittedly, the wells won't make 150% and we don't think this would be a proper figure. We propose 125%, at least, at the initial stages of the operation because a slight rise in the pressures in the reservoir, which would in turn, in crease the pressure differential between the unit area and offsetting area this protection is needed as a means to protect the unit and certainly I think the unit is entitled to some consideration for the conservation work they are doing

in performing this service, this conservation program. I think our testimony and exhibits further show that if we inject less than the 70% figure, we are talking about 70% being all of the gas that we anticipate can be recovered, if we inject less than that 70% figure, the result will be a reduction in the ultimate recovery of oil and that would certainly constitutewaste, so we feel that combining the two, looking at the two factors, the ultimate recovery, the greatest ultimate possible recovery, and protection of the unit against drainage the 125% figure is fully justified. In addition to that, we think that the additional allowable will prove to be an incentive outside the unit either to join the unit or set up their own pressure maintenance program with resultant saving in oil production in the State of New Mexico and we think this is a substantial factor that should be considered also.

MR. NUTTER: Thank you.

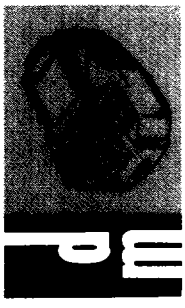
MR. KELLAHIN: I would like to also add that Standard of Texas which is the operator of the Vac-Edge Unit is in support of the proposals that have been made by Phillips Petroleum Company.

MR. NUTTER: Does anyone else have anything to offer in these cases?

MR. HATCH: I have telegrams from Aztec Oil and Gas,

from Skelly Oil Company and from Shell Oil Company in support of the Applicant's request in both cases, 3508 and 3509.

MR. NUTTER: Thank you, Mr. Hatch. Anyone else? We will take these cases under advisement.



STATE OF NEW MEXICO)
) ss
COUNTY OF BERNALILLO)

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

Kay Embree
Court Reporter

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 3508-3509 heard by me on 1-4, 1967.

Examiner
New Mexico Oil Conservation Commission