BEFORE THE
OIL CONSERVATION COMMISSION
STATE OF NEW MEXICO

In re: This case involves the rate of production of the Brunson pool to August 21, 1951, in order that evidence might be collected and analyzed.

Case No. 202

TRANSCRIPT OF HEARING

August 21, 1951

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OIL CONSERVATION COMMISSION
STATE OF NEW MEXICO

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In re: This case involves the rate of production of the Brunson pool and has been successively continued to August 21, 1951, in order that evidence might be colleced and analyzed.

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MR. SPURRIER: The next case is 202. It will be taken up first by request.

(Mr. Graham reads the notice of publication.)

MR. SPURRIER: State your name for the record, please.

MR. DURST: I am Roy T. Durst, representing Rowan Oil Company.

MR. SPURRIER: Do you have any witnesses?

MR. DURST: Yes, I have one witness. I would like to briefly review what has previously taken place with reference to Case No. 202.

During the latter part of 1949, Brunson Pool operators met and reviewed the production history of the Brunson Pool. The available data indicated a comparatively rapid decline in bottom hole pressure for the reservoir as a whole. On the strength of this data the majority of the Brunson Pool operators through the Rowan Oil Company petitioned the Oil Conservation Commission on November 22, 1949, to reduce the per well allowable in the Brunson Pool from its then current 122 barrels per day to 90 barrels per day for a six month test period. During this test period field-wide bottom hole pressures were to be taken and gas-oil ratios checked in order that the performance of the reservoirs under reduced rates of flow could be observed. The 90 barrel allowable was effective February 1, 1950, by Order R-4 of the Oil Conservation Commission, dated January 11, 1950. The six month test period was completed and due to the lack of conclusive data the Oil Conservation Commission was requested

on August 24, 1950, to continue the test period for an additional six months. Order R-30, dated September 29, 1950, granted this request. The re-hearing on this case originally scheduled for April 24th, this year, has been successfully postponed until today in order that the factual data accumulated and results of the studies of the engineering sub-committee could be presented to the Commission.

At this time I would like to introduce Mr. A. T. Guernsey of the Shell Oil Company, Hobbs, New Mexico. Mr. Guernsey is a member of the Brunson Pool Engineering Sub-Committee and will present a summary of the factual and engineering data accumulated and compiled by this committee.

MR. GUERNSEY: Oil Production Rate, that is the lower most curve on the graph.

The Brunson Pool was discovered in September, 1945, when N. G. Penrose completed his Federal Fee Well, No. 1 in Section 9, Township 22S, Range 37E, Lea County, New Mexico. Since discovery, a total of 105 producing wells have been drilled in the Brunson Pool. Oil and gas production is obtained from the Ellenburger formation and the various wells produce from intervals between 7300 feet and 8100 feet. To the east, the up-dip limits of the pool have been defined by post-Ellenburger erosion -- which process has caused complete removal of the producing formation along the east edge of the field. To the west, the down-dip limits of the pool are defined by the contact of the bottom water level and the top of the steeply dipping producing sediments. To the

south, the limits of the pool are determined by minor cross-faulting and/or by poor reservoir development of porosity and permeability. In these three directions, the pool is considered effictively developed, and about 4100 acres have thus far been proved by development. Current drilling is extending the pool to the north. At present, 94 wells are producing and 11 have either been abandoned, shut down, or plugged back to the shallower pay zone.

Until July 1, 1951, the Brunson Pool has produced 10,668,780 barrels of oil, 509,351 barrels of water, and 18,841,964 Mcf of gas. The cumulative gas-oil ratio has been 1766 cubic feet per barrel and the cumulative water cut has been 4.6 per cent of total fluids produced. The original bottom hole pressure at 4300 feet subsea was 2945 psi and the average bottom hole pressure measured in April, 1951, was 1797 psi. The saturation pressure has been reported as 2472 psi and the solution gas-oil ratio at this pressure is 1010 cubic feet per barrel.

It is now obvious that the great bulk of the Brunson Pool is producing under the influence of a dissolved gas drive mechanism, although there may be isolated portions which contain less than 9 per cent of the currently producing wells and probably less than 6 per cent of the acreage which will ultimately become productive, which may behave in a different manner.

At the end of January, 1950, there were 81 producing wells in the Brunson Pool. These wells had accumulated to this date 7,645,647 barrels of oil, 210,703 barrels of water, and 11,011,273

Mcf of gas. The cumulative gas-oil ratio at this time was 1440 cubic feet per barrel and the cumulative water cut was 2.7 per cent of total fluids produced. The average bottom hole pressure in the pool was 1880 psi which represented a drop of 1065 psi from the original pressure.

At this time most operators realized that the Brunson Pool was producing under the influence of a dissolved gas drive, which sort of drive is one of the more inefficient types of reservoir recovery mechanisms. Therefore, the operators felt that if another type of reservoir recovery mechanism could be encouraged ultimate oil recovery from the field could be increased. It was believed that if oil production rates were curtailed, edge water or bottom water might be encouraged to encroach into the reservoir in amounts more nearly equal to reservoir withdrawals. Hence, a higher bottom hole pressure would be maintained, gas-oil ratios would be lessened, wells would flow longer, less gas would break out of solution in the reservoir, operating costs would be reduced, and ultimate recovery would be increased.

Therefore, at the request of one of the Brunson Pool operators, the per well allowable for the Brunson Pool was reduced from 126 to 90 barrels of oil per day for an experimental period of six months during which time the operators would conduct tests and gather data as to the characteristics of the reservoir. The experimental period commenced February 1, 1950. In order to conduct additional

tests and to gather additional data, the Oil Conservation Commission, at the operator's request, ordered the experiment continued for a second six-month period. After this date, the experimental period has been continued about seven more months because of two requests from the operators asking postponement of re-hearing of Case 202. These postponements were asked in order to permit the operators to conduct one more bottom hole pressure survey and to complete their final studies as to the characteristics of the reservoir. On September 1, 1951 the allowable reduction experiment in the Brunson Pool will have lasted 19 months.

During the experimental period oil, water, and gas production have, of course, been measured each month; four field-wide bottom hole pressure surveys have been conducted; numerous operators' meetings have been held; several sub-committees have been appointed for special study purposes; and the operators are now prepared to present the results of their study to the Oil Conservation Commission and to make their recommendations for the manner of producing the pool in the future.

Attachment A is a composite graph of statistics for the Brunson Pool from first production and until July 1, 1951. Oil production rate, gas-oil ratio, percentage water in total fluids, number of producing wells, arithmetic average bottom hole pressure, and weighted average bottom hole pressure are plotted against cumulative oil production from the entire field. The beginning

and end of each year are also shown on the composite graph. The following observations from Graph A are worthy of especial comment:

Oil Production Rate, that is the lowermost curve on the graph, during January, 1950, the pool produced 254,889 barrels of oil. During February, 1950 (the first month of the allowable reduction experiment), the pool produced 159,336 barrels of oil. Because of subsequent development, the production rate increased to 195,474 barrels of oil in June, 1951. This latter rate is still less than the rate in effect at the beginning of the experiment.

At the end of January, 1950, there were 81 producing wells in the pool. During the period of the allowable reduction experiment, 20 additional wells were completed and 7 were abandoned or shut down. Hence, 94 wells were producing in June, 1951.

During January, 1950, the field's producing gas-oil ratio was 2078 cubic feet per barrel. After reduction of allowable in the field, the gas-oil ratio commenced to rise at a rate more rapid than before. The reduction in allowable curtailed production from the wells whose capacities were higher and whose gas-oil ratios were generally lower while the marginal wells whose gas-oil ratios are generally high were not curtailed as much. Hence, a larger percentage of the field's oil was produced by the high gas-oil ratio wells which in turn caused an increase

in pool GOR.

Water production during January, 1950 amounted to 3.4 per cent of total fluids produced. After reduction in allowable, water production percentage continued to increase at a rate higher than before. During June, 1951, water production in total fluids amounted to 9.8 per cent.

The arithmetic average bottom hole pressure of the field continued decline at an ever decreasing rate. This general flattening of bottom hole pressure trends had been commenced prior to the allowable reduction experiment and continued during the experiment. This behavior of bottom hole pressure trends is because of inclusion of first observed pressures of new wells in the various surveys. For instance, between February, 1950 and April, 1951 the average bottom hole pressure varied from 1880 to 1797 psi while the average first observed pressure from new wells drilled in the northern portion of the field amounted to 2513 psi. The inclusion of five such wells in an arithmetic average of 85 wells would be sufficient to raise the average bottom hole pressure from 1700 psi to 1745 prsi. An example of the effect of new wells is noted from comparison of the August, 1950 and April, 1951 surveys. Between the two surveys, the average bottom hole pressure of 68 comparable wells run during each survey declined 133 psi while the average bottom hole pressure of all wells surveyed (72 in August and 82 in April) declined only 12 psi. The error thus introduced by averaging in nearly virgin pressures from

new wells amounted to 121 psi between these two surveys.

A system of weighting the bottom hole pressures for cumulative oil produced at the time of each survey yielded data for the weighted average bottom hole pressure curve. This system resulted in a truer relationship, yet did not completely remove the effect of new wells.

Graphs B and C are comparable well survey plots which show the bottom hole pressure decline for 19 wells which have been surveyed in all except the first of the eleven pool-wide pressure surveys. As no new wells were included in these two graphs, no weighing procedure was necessary and simple arithmetic average bottom hole pressures were used. A graph of this nature is most valuable for studying reservoir performance. Graph B shows the average pressures of these comparable wells plotted against the cumulative oil production of these wells. This case would apply in a very poorly connected reservoir in which case each well would in a sense drain its own reservoir. Graph C shows the same pressures plotted against the cumulative oil production of the entire pool. This case would apply to very permeable reservoirs in which individual well pressures would reflect field-wide conditions. Observations of bottom hole pressures of newly completed wells in the north end of the field which are always less than original but greater than the then current pressure of older wells indicate conditions at Brunson to be somewhere between those implied by Graphs B and C. However, it should be

noted that change in oil production rate at Brunson did not affect the slope of either relationship.

During June, 1951 which is the most recent month for which production figures are available, the pool produced 195,474 barrels of oil, 21,120 barrels of water, and 551,426 Mcf of gas. The gas-oil ratio during this month was 2821 cubic feet per barrel and the water cut was 9.8 per cent.

From Graphs A, B, and C, it is apparent that performance of the Brunson Pool during the period of reduction in allowable experiment may be summarized as follows:

1. Oil production rates have been curtailed to amounts varying from 62 per cent to 77 per cent of previous production rates.

2. 20 additional wells have been drilled.

3. Percentage water production in total fluids has remained small but has increased during the experiment at rates slightly higher than previously.

4. Gas-oil ratios have increased during the experiment at a rate more rapid than before which is partially caused by allowing the higher-gas-oil ratio wells to produce a larger share of the pool's total oil

5. Bottom hole presure decline trends have not been noticeably affected by the change in the oil production rates.

All of these observations are reasonable and are to be

expected in dissolved gas drive reservoirs. Apparently there is no large water quifer in the Ellenburger formation which is in active communication with the Brunson Pool for drastic reduction in producing rates was not able to cause any appreciable movement of this water which could be observed by change in bottom hole pressure trends or any other trends. It is therefore believed, from data thus far accumulated, that the reasonable fluctutations in producing rate, observed in the past, have not affected the ultimate recovery to be expected from the Brunson Pool."

At this time, I believe Mr. Durst with the Rowan Oil Company will present the recommendations for continued production in the Brunson Pool and for the Brunson Pool Operators.

MR. DURST: In view of this information that Mr. Guernsey has submitted the Brunson Pool operators recommend and request that effective September 1, 1951, the allowable reduction experiment at Brunson be ended and that the Brunson Pool be restored to the normal allowable applicable to wells in the 7000 to 8000 depth bracket. The previous depth bracket at Brunson used for allowable purposes prior to the allowable reduction was the 8000 to 9000 foot bracket. However, the Brunson Pool operators respectfully submit the following reasons for using the 7000 to 8000 instead of the 8000 to 9000 foot bracket:

1. 62 wells or 66 per cent of the 94 wells currently producing at Brunson have

total depths in the 7000 to 8000 foot depth range.

2. Allowable production rates commensurate with this depth bracket (currently 122 BOPD) have been observed at Brunson and are known to cause no waste.

3. The 7000 to 8000 foot depth bracket is in use at North Brunson and it is felt that because of probable combination of the pools, the allowables in both pools should be identical.

The Brunson Pool operators further recommend and request the Oil Conservation Commission order semi-annual gas-oil ratio surveys in the Brunson Pool during the months of February-March and August-September. These gas-oil ratios are to be filed with the Commission by the 15th of the month following each survey period and used for proration purposes.

MR. SPURRIER: Anything further?

MR. DURST: That is all.

MR. SPURRIER: Any further questions?

MR. SMITH: M. T. Smith, Shell Oil Company. In regard to the Brunson case, Shell Oil has a producer and purchaser in the field, have a firm market for any additional crude that you might allocate to the Brunson formation and we have transportation facilities for moving it.

MR. SENTER: Frank W. Senter. We would like to join with Mr. Smith as a purchaser in the Brunson Field with a firm market demand and pipeline facilities transporting this, which is to be filed with the Commission.

MR. SPURRIER: Anyone else?

MR. SPELLMAN: D. K. Spellman with Ohio Oil Company. We wish to state that Ohio is in agreement with Rowan on its conclusions and recommendations for the Brunson Pool.

MR. SPURRIER: Anyone else?

MR. SHAFER: E. L. Shafer, Continental Oil Company. Continental is also in agreement with Rowan Oil Company in their recommendation to the Oil Conservation Commission regarding the Brunson Pool.

MR. McPHERON: R. G. McPheron, Gulf Oil Corporation. We would like to say that we helped on the study just presented and we concur with it.

MR. SPURRIER: Anyone else?

MR. GUERNSEY: A. T. Guernsey, Shell Oil Company. Shell Oil Company concurs with the recommendation of the Brunson Pool Sub-Committee.

MR. SPURRIER: Anyone else? You may be excused.

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

I HEREBY CERTIFY that the foregoing and attached Transcript of Hearing in Case No. 202, before the Oil Conservation Commission, taken at Santa Fe, New Mexico, on August 21, 1951, is a true and correct record of the same to the best of my knowledge, skill and ability.

DATED at Albuquerque, New Mexico this 17th day of September, 1951.

Ada Dearnley
REPORTER

My Commission Expires:
June 19, 1955

BEFORE THE

OIL CONSERVATION COMMISSION

STATE OF NEW MEXICO

TRANSCRIPTION OF HEARING

CASE NO. 202

21 June 1951

(DATE)

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BEFORE THE
OIL CONSERVATION COMMISSION
STATE OF NEW MEXICO

Case 202: This case involves the rate of production of the Brunson Pool and has been successively continued to June 21, 1951.

MR. SPURRIER: Case 202.

(Mr. Graham reads the notice of publication.)

MR. SPURRIER: Is there anyone to appear in this case?

(No response.)

MR. SPURRIER: We have a letter from the Rowan Oil Co. dated June 13, 1951.

(Mr. Spurrier reads the letter, which is not reproduced here.)

MR. SPURRIER: The regular August hearing falls on August 21. Now, does anyone have any comment or objection to this proposal?

MR. COLLISTON: I represent Continental Oil Co. I would like to urge that the case be postponed until August 21.

MR. SPURRIER: Thank you. Anyone else? Without objection, and with Continental Oil Co.'s recommendation, we will continue this case to the date of August 21 at the regular hearing.

STATE OF NEW MEXICO
ss
COUNTY OF BERNALILLO

I HEREBY CERTIFY That the foregoing transcript is a true record of the matters therein contained.

DONE at Albuquerque, N. M., July 5, 1951.

E. E. Greer

My Commission Expires Aug. 4, 1952.