

Case Number
4690

Application

Transcripts

Small Exhibits

ETC.

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BEFORE THE
 NEW MEXICO OIL CONSERVATION COMMISSION
 CONFERENCE ROOM, STATE LAND OFFICE BUILDING
 SANTA FE, NEW MEXICO
 April 5, 1972

EXAMINER HEARING

IN THE MATTER OF:

Application of Shell Oil
 Company for downhole com-
 mingling, Lea County, New
 Mexico.

Case No. 4690

BEFORE: Daniel S. Nutter,
 Alternate Examiner

TRANSCRIPT OF HEARING

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1 MR. NUTTER: We'll call next case number
 2 4690.

3 MR. HATCH: Case 4690. Application of Shell
 4 Oil Company for downhole commingling, Lea County, New Mexico.

5 MR. BUELL: Mr. Examiner, I am Sumner Buell,
 6 of the firm of Montgomery, Federici, Andrews, Hannahs and
 7 Morris, Santa Fe, appearing on behalf of Shell Oil Company.
 8 We have two witnesses, Mr. Ron Suckle and Mr. Larry Snyder,
 9 and we ask that they be sworn at this time.

10 (THEREUPON, the witnesses were duly sworn.)
 11

12 RONALD R. SUCKLE

13 was called as a witness on behalf of the applicant, and having
 14 been first duly sworn, testified upon his oath as follows,
 15 to-wit:

16
 17 DIRECT EXAMINATION

18 BY MR. BUELL:

19 Q Would you state your name, please?

20 A Ronald Suckle.

21 Q And where do you reside, Mr. Suckle?

22 A Midland, Texas.

23 Q And by whom are you employed and in what capacity?

24 A Shell Oil, as a production engineer.

25 Q And you have not previously testified before

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1 this Commission?

2 A. I have not.

3 Q. Would you give the Commission your educational
 4 background?

5 A. I have a B.S. degree from the Colorado School of
 6 Mines; it was granted in 1966.

7 Q. And did you study any particular field at the
 8 School of Mines?

9 A. Petroleum engineering.

10 Q. And what has been your employment experience
 11 since you have graduated from college?

12 A. I have had five years in production engineering
 13 experience in downhole equipment, production, equipment
 14 design, and production surveillance in addition to a year's
 15 reservoir production.

16 Q. Where was this?

17 A. Four years in Denver and two years in Midland.

18 Q. And are you particularly familiar with the
 19 Antelope Ridge unit in question?

20 A. Yes. It has been under my area of responsi-
 21 bility since coming to Midland two years ago.

22 Q. Okay. Are you familiar with what Shell Oil
 23 Company seeks in this case, 4690?

24 A. I am.

25 Q. And would you briefly state what that is?

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1 A. Shell Oil hopes to amend the rule R2787, which
 2 has permitted downhole isolation dual order to produce the
 3 Morrow and Devonian zones in the Antelope Ridge unit number
 4 two. This order was granted in 1965.

5 Q. Referring to what has been marked as Applicant's
 6 Exhibit Number One, would you briefly outline for the exam-
 7 iner what that shows?

8 A. The exhibit number one is a plat of the Antelope
 9 Ridge Unit located in Section -- in Township 23 and 24 South,
 10 Range 34 East, Lea County, New Mexico. It consists of six
 11 sections, the Devonian participating area is the -- delineated
 12 by the heavy dashed line, and the light textured line depicts
 13 the Morrow participating area.

14 This plat also shows the location of the three
 15 producing wells in the unit, the number one well located in
 16 Section 27 is a single Morrow producer; the number two well
 17 which is the subject of this hearing, is located in Section 4,
 18 and it is a dual Morrow-Devonian completion.

19 Number three is a single Devonian producer and
 20 it is located in Section 34. Number four well is a temporarily
 21 abandoned Atoka well, so it is not producing at the present
 22 time.

23 Q. Now, referring to what has been marked as
 24 Applicant's Exhibit Number Two, would you explain what this
 25 indicates?

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1 A. Exhibit number two is a schematic diagram of the
 2 downhole production equipment that we have in our Antelope
 3 Ridge unit number two. It also depicts the perforated inter-
 4 vals of the Morrow and the Devonian. The Morrow perforations
 5 are in the interval of twelve thousand eight hundred and
 6 ninety-eight to fifteen thousand one hundred and -- pardon me.
 7 Thirteen thousand one hundred and fifty-three.

8 The Devonian is in the interval fourteen thousand
 9 six sixty-seven to fourteen thousand seven ninety-eight.

10 In the well we have two packers, a lower packer
 11 is a single Baker Model D, located at thirteen thousand five
 12 hundred and sixty. We have a model FA Baker packer at eleven
 13 thousand four hundred and sixty-five, which has a parallel
 14 flow tube in it.

15 The tubing strings are as follows: The long
 16 string is two and a half inches down to the upper packer, and
 17 we have two-inch heavy wall in between the packers. The
 18 short string is two inches all the way. We first encountered
 19 difficulty on October 1st, 1971, after running successfully,
 20 conducting a packer leakage test in which no leak was indi-
 21 cated between the two zones. Upon returning the well to
 22 production, we noticed sour gas being produced up the sweet
 23 Morrow side.

24 To give a little history of this well, it was
 25 completed in the end of 1963. It was completed as a single

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1 Morrow producer, and it was dualled in the Devonian in 1965
 2 as previously stated, under administrative order R2787.

3 Q All right. Now, would you give a little history
 4 of the difficulties since October, when you noticed sour gas
 5 coming up the sweet side, and your efforts to correct the
 6 problem?

7 A Well, at this time I think we ought to present
 8 exhibit number three, which summarizes these attempts in more
 9 detail than what I am going to give at the hearing, and
 10 verbally, right now.

11 Q All right. Now, referring to exhibit number
 12 three, would you briefly state what that is?

13 A As previously mentioned, we -- upon return of
 14 the well to production after our packer leakage test on
 15 October 1st, 1971, we noticed sour gas being produced up the
 16 Morrow sweet -- normally sweet side production tubing string.
 17 We are not equipped to handle the sour gas on the Morrow
 18 side, so our first attempt, we rigged up on October 2nd,
 19 1971, an attempt to run a wire line plug and set it at the
 20 bottom of the long tubing string, and one of the "S" nipple,
 21 as shown on the drawing, to accomplish, if we took pressure
 22 up on the tubing string.

23 We felt that if we could put pressure up on the
 24 tubing string, that the leaks by the packer would seal them-
 25 selves. If we could not pressure up, then we knew that the

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1 tubing string was incompetent below the packer.

2 In an attempt to run the wire line plug, we
3 could only get one hundred feet below the upper packer in the
4 long string. We found that tubing severely corkscrewed and
5 conducted star drill operations as in milling, trying to
6 get down in the long string, and because the tubing was so
7 severely corkscrewed in the two-inch I.D. did not permit
8 getting very rough with it, we rigged down on October 13th,
9 1971.

10 We took a second shot at it on October 26th,
11 1971. We decided that we would try and pull the well without
12 ascertaining the nature of the problem. We started pumping
13 calcium carbonate based kill fluid. The reason the calcium
14 carbonate fluid was necessary was because of extreme pressure
15 gradient differential in the two zones, the Devonian being
16 a strong water drive zone, and the Morrow being an initially
17 hydropressured and state depletion zone, which we have reser-
18 voir history of having a twenty-five P.S.I. pressure at the
19 time of the work or a point two gradient P.S.I. per foot.

20 At the time we had extreme difficulty pumping
21 this fluid by the fish in the short string. The origin of
22 the fish was from a bottom hole pressure survey when we had
23 run a tubing stop in the short string, and we couldn't ever
24 get the tubing string out, and it consists of some additional
25 wire line tools --

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1 MR. NUTTER: How long has that fish been in
 2 there?

3 THE WITNESS: Since 1966.

4 Our pumping operations appeared to be success-
 5 ful. We eventually did get some of it, although it wasn't
 6 as large a particle size as we wanted to get by the fish on
 7 our spot to the Morrow, but all of a sudden we noticed that
 8 we had opened up a high pressure zone in the Morrow, and we
 9 took a second look at it and ran a bottom hole pressure survey,
 10 and we had pretty good handle, even though our measurement
 11 point was at eighty-nine hundred feet in the short string,
 12 which is roughly three thousand feet above the Morrow perfora-
 13 tion. We did have fluid above the mop at this time, so we
 14 could extrapolate a pressure fairly accurately, and this
 15 extrapolation was sixty-six hundred P.S.I., which was roughly
 16 a five-point-ten gradient. Knowing that we couldn't handle
 17 this kind of pressure differential with the Devonian being
 18 just almost a straight water gradient, we produced the well,
 19 put the well back on production in an attempt to deplete some
 20 of this high pressure Morrow gas pressure.

21 The well produced one point sixty-five million
 22 a day at this time. We produced the well to February, and as
 23 I said, in an attempt to deplete this high pressure Morrow
 24 zone and the bottom hole pressure survey indicated that we
 25 had depleted it to the point where we felt we could have another

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1 go at it, so on February 1st, we perforated a hole in the
 2 long string roughly fifty below the upper packer to facili-
 3 tate circulating our calcium carbonate based lost circulation
 4 material down on the Morrow. As I said, we had difficulty
 5 trying to get this by the fish.

6 We used different weights of kill fluid to try
 7 and use as light a weight as we could so that we couldn't
 8 get too much water into the Devonian. Our experience with
 9 the Devonian is that if you go over -- much over nine pounds
 10 per gallon on the -- on kill fluid, it drinks the water
 11 excessively, and it runs into quite a few problems.

12 We eventually had to use a ten-pound brine,
 13 which is salt-saturated brining, to hold this Morrow zone.

14 One problem we have had with this workover, is
 15 our upper packer is set roughly fourteen hundred feet above
 16 the Morrow perforation, so this makes our injection point to
 17 try and kill the well too far above the purse. We have got
 18 all this trap gas that we have had to try and work out of
 19 this lower zone that has made all our pumping operations very
 20 difficult.

21 MR. NUTTER: Now, Mr. Suckle, you said you
 22 tried to use as light a brine as possible because you didn't
 23 want to hit the water on the Devonian? You meant the Morrow,
 24 didn't you?

25 THE WITNESS: No, I mean the Devonian. The

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1 Devonian is on a fresh water gradient roughly, and if you
 2 exceed this much, it is real susceptible to taking this water.
 3 We try and keep this light an overbalance on the Devonian
 4 in any workover operations we have in this area.

5 MR. NUTTER: So in other words, you were going
 6 down the long string and trying to pump into the Morrow, but
 7 the Devonian, of course, was still exposed to --

8 THE WITNESS: Well, at this time we felt that
 9 the Devonian is plugged, is plugged water calcium carbonate
 10 material, that we plugged it on our first operation in trying
 11 to get this kill spotted down. We're not really sure if
 12 we do have any of this kill down on the Devonian itself.

13 MR. NUTTER: I see.

14 THE WITNESS: Using this ten-pound brine, we
 15 felt we still might be able to control the well, but it was
 16 in a delicate balance at this time, but we got to the point
 17 we could install back pressure valves or remove our head against
 18 all back blow-out preventures. We then engaged a short string
 19 tubing and this is to pull the well. You have to get your
 20 short string out first, and we pulled to the yield of the
 21 short string tubing, and it wouldn't budge, and so we aban-
 22 doned operations on March 4th, after analyzing consequences of
 23 further operation.

24 Q Now, referring to exhibit number three, this is
 25 a rather detailed statement of the summary that you have just

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1 given.

2 A. It is -- it goes into more detail as far as
 3 the actual pressures and numbers that I have been referring
 4 to.

5 Q Now, handing you what has been marked as
 6 exhibits four and five, would you please indicate what is
 7 shown there?

8 A. Exhibit four and five are reservoir character-
 9 istics of the two zones in question in the Antelope Ridge number
 10 two. I would like to emphasize the pressure differential
 11 again. It is about, oh, the eighth or ninth item down in
 12 the Devonian. It is roughly six thousand P.S.I., whereas we
 13 had a twenty-four-hundred P.S.I. Morrow pressure, at the time
 14 of workover, and as I said previously, we opened -- we
 15 encountered this high pressure Morrow zone, so actually we
 16 have been dealing with three zones, three different pressure
 17 zones in our workover operations since breaking down that
 18 high pressure Morrow zone.

19 Q Now, referring to what has been marked for
 20 identification as Applicant's Exhibit Number Six, would you
 21 give some history as to how that was arrived at and what it
 22 shows?

23 A. As I said, at the time of abandoning our opera-
 24 tions on March 4th, we took a real long look at what we felt
 25 we needed to do, the well being in the condition that it was,

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1 that we would go ahead and pull the equipment and return
2 the well back to production.

3 This exhibit here was drafted by a superintendent,
4 the foreman on the job, an expert fisherman, and myself, just
5 after we had engaged the short string tubing and pulled the
6 deal, and it would not come.

7 Basically, from this point on, we feel we have
8 to cut both tubing strings and conduct jarring and milling
9 operations under the stream pressure differentials that we
10 have experienced in the well, which is going to make the kill
11 fluid and -- an operation slow and expensive.

12 In addition, we feel there is an extreme risk
13 of losing a well when we pull out of the lower packer. As I
14 said, we are not sure we have a pill on the Devonian forma-
15 tion itself, and having to use this ten pound per gallon
16 brine fluid, it would generate a fifteen hundred pound over-
17 balance on the Devonian formation at the time that it is
18 exposed to this kill fluid and we have not exposed this pill
19 to this much differential.

20 We are not sure that it would hold, and if it
21 would start taking the hydrostatic head off of the Morrow and
22 pumping operations had to be excessive or pumping, say, some-
23 thing more of a calcium chloride water, which is six dollars
24 a barrel, we could lose in the order of five hundred barrels
25 a day. We would have to cement the well for safety reasons

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1 at that time.

2 Q Exhibit number six is a detailed, step-by-step
3 outline of what would be necessary to work over this well, is
4 that correct?

5 A Yes, it is.

6 Q And referring you to exhibit number seven, would
7 you indicate what that shows?

8 A Okay. Using this exhibit six for a basis for
9 determining the right time, and some of the items which are
10 line work and fishing through minerals, I have tabulated the
11 cost from this point on that would be necessary to restore
12 the well to production.

13 Now, this is our best estimate, and it is a
14 fairly educated estimate, because we have had a lot of exper-
15 ience working on the well, and know what kind of mud belts
16 we have been having, and pumping costs and everything, and
17 in summary it would cost an additional hundred and twelve
18 thousand dollars in addition to the forty-two thousand that
19 we have already spent, to get this well back under the current
20 downhole conditions.

21 Q And what is the present status of that well at
22 this time?

23 A The well has been shut in since March 4th, 1972,
24 after we abandoned the pumping operations.

25 Q And do you feel that there is any communication

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1 between the Devonian and the Morrow at this time, with the
 2 well shut in?

3 A. Yes. I feel that under the extreme pressure
 4 differential, it would be logical that the high pressure
 5 zone, Devonian, would be charging the low pressure Morrow zone,
 6 and maybe the Morrow -- the high pressure Morrow zone charging
 7 both the low pressure and -- low pressure Morrow zone and
 8 the Devonian so we could have considerable cross-flow under
 9 a shut-in condition.

10 Q. And if your application is granted to permit
 11 this commingled production, what are your plans as to the
 12 handling of the gas? Referring you to what has been marked
 13 as exhibit number eight, can you tell me what that indicates?

14 A. Exhibit eight is a tabulation of the production
 15 history of both zones in this Antelope Ridge unit number two,
 16 and the -- page three depicts the production that we have
 17 had since commingling.

18 Q. What are your plans for production of the well
 19 if the application is granted?

20 A. We would like to -- as previously stated, we
 21 would like to commingle the well downhole on a temporary basis
 22 until we get to the point that we can safely pull the well
 23 with a safe -- say nine pound per gallon kill fluid.

24 We would like to allocate the gas on a basis of
 25 the H₂S content. We feel that we have got a real handle on

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1 what the H₂S is running in our Antelope Ridge unit number
 2 three. Shown on the plat here, it is a direct offset to our
 3 northeast -- each offset to our Antelope Ridge unit number
 4 two. These are producing from the same reservoir, and on
 5 initial completion we took H₂S readings on the two wells and
 6 they were for all practical purposes the same.

7 We monitored the H₂S on Antelope Ridge unit
 8 number three this last week, with three good data points, and
 9 the range on the data is from five hundred and sixty-five to
 10 five hundred and eighty grains per hundred cubic feet, which
 11 is the way that H₂S is generally represented, and using
 12 number three as a control, we would like to allocate the
 13 Devonian production of number two.

14 MR. NUTTER: Now, this five sixty-five to five
 15 eighty was the grains per M.C.F. in the number three, right?

16 THE WITNESS: Grains per hundred standard
 17 cubic feet.

18 MR. NUTTER: But that was from the number
 19 three Devonian?

20 THE WITNESS: That is from number three, correct.

21 MR. NUTTER: Now, does this compare with what
 22 the Devonian in this well used to produce?

23 THE WITNESS: It's slightly high because of
 24 the change in reservoir conditions, but it is more constant
 25 over a short period of time.

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1 MR. NUTTER: Well, you did have an analysis
 2 on the Devonian gas from the number two well prior to the
 3 commingling, didn't you?

4 THE WITNESS: Yes, we did.

5 MR. NUTTER: What was the analysis?

6 THE WITNESS: It was four hundred and twenty-
 7 eight grains per hundred standard cubic feet.

8 MR. NUTTER: Now, when was that analysis made?

9 THE WITNESS: This was June 9, '65.

10 MR. NUTTER: And what is -- was any subse-
 11 quent analysis made on gas at any time?

12 THE WITNESS: We had commingled samples that
 13 were going in the plant that had one -- all the wells, the
 14 Devonian wells, they ran four hundred.

15 MR. NUTTER: You only had the one analysis from
 16 the gas?

17 THE WITNESS: Yes, that's correct, and we had
 18 on completion of our Antelope Ridge unit number three, it
 19 had three hundred and eighty grains per hundred, and this was
 20 run 9-5-64.

21 MR. NUTTER: So it has increased now, then,
 22 hasn't it?

23 THE WITNESS: Yes, it increases with time.

24 MR. NUTTER: Now, that first analysis on the
 25 number two, wasn't it in '63, you said?

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1 THE WITNESS: Our number three was in '64,
 2 September.

3 MR. NUTTER: September, '64?

4 THE WITNESS: Yes.

5 MR. NUTTER: And the analysis of four hundred
 6 and forty on the number two, was -- what was the date on
 7 that?

8 THE WITNESS: February, '65.

9 MR. NUTTER: February, '65? Okay, go ahead.

10 THE WITNESS: Yes, sir.

11 Q Have you entered into an agreement for the treat-
 12 ment of the produced gas?

13 A Yes, we have. The Morrow will not have to share
 14 any burden of the treating costs. We have arranged with the
 15 treating outfit to charge us on a basis of the H₂S emitted.
 16 As an example, if it normally runs six hundred grains per
 17 hundred, and the commingled stream runs three hundred grains
 18 per hundred, we would have to pay one-half of the normal cost
 19 for the gross volume, and this would be not shared by the
 20 Morrow. It will be charged all to the Devonian production.

21 Q Now, you have testified that you would like to
 22 have this commingling permitted on an indefinite basis until
 23 the pressures return to a workable range. However, one of
 24 the interest owners has required that a time limit be placed
 25 on this, is this correct.

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1 A. This is correct. We feel that the well oper-
2 ates on a pressure basis, rather than a calendar basis, so
3 we feel that the order should be granted, when the pressure
4 is depleted to a point where we could safely work the well
5 over.

6 However, the U.S.G.S. would prefer this order
7 to be granted for one year only.

8 Q. Now, is it your opinion that the granting of the
9 application would prevent waste and protect correlative rights?

10 A. Yes. It is my feeling that under a producing
11 condition to minimize the pressure in the well bore, all the
12 zones would flow into the well bore rather than having the
13 cross-flow situation that you encounter in any setting condi-
14 tion. Flow of pressure at the surface would cause the
15 pressure to sink downhole, and so all your flow would be from
16 the reservoirs to the well bores.

17 Our line pressure up there runs six hundred
18 pounds, which would generate in the order of eight hundred
19 pounds at the Morrow perforation, and since the Morrow pressure
20 zone is twenty-five hundred, then the flow would be from the
21 Morrow into the well bore, and also the Devonian would flow
22 into the well bore.

23 Q. Were exhibits one through eight either prepared
24 by you or under your supervision?

25 A. They were.

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1 MR. BUELL: Move the introduction of
 2 exhibits one through eight.

3 MR. NUTTER: Shell Exhibits One through Eight
 4 will be admitted in evidence.

5 MR. BUELL: I have nothing else, Mr. Examiner.
 6

7 CROSS EXAMINATION

8 BY MR. NUTTER:

9 Q Mr. Suckle, as I understand it, during your
 10 attempts to go in and fill the Morrow with the kill, do you
 11 think that you opened up a new zone, and this is higher
 12 pressure than either the old Morrow or the Devonian, is this
 13 correct?

14 A It is not higher than the original pressure.
 15 It is somewhere intermediate.

16 Q But it is higher than the Morrow pressure was
 17 before the leak occurred?

18 A Yes. We had twenty-five hundred P.S.I. before
 19 leak, and roughly sixty-six hundred after the leak, we feel.

20 Q And this is really the pressure you are trying
 21 to deplete, correct?

22 A This is correct, exactly.

23 Q You have no idea what size stringer this is,
 24 or how much reserves it would be in this zone or anything?

25 A Well we have monitored the pressure as I have

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1 previously mentioned, and we have seen some depletion in the
2 period of three to four months of flow, so I feel that it is
3 fairly low volume, just high pressure.

4 Q So even during the period of testing and working
5 over, you have depleted the pressure somewhat?

6 A That's correct.

7 Q And it is your request that an order be entered
8 that would permit this commingling in the well until this
9 pressure has been depleted, but as you stated, one of the
10 interest owners has requested a one-year limit to that?

11 A That's correct.

12 Q And presumably at the end of a year, if you
13 hadn't depleted the pressure to a safe working limit, you
14 would come back in and ask for an extension of time on that?

15 A That is what we would have to do.

16 Q Now, in checking your -- no. You have already
17 covered that.

18 A I would like to add that we feel that we need
19 immediate action to prevent further cross-flow between the
20 two reservoirs.

21 Q In other words, so that right now there is more
22 harm being done to the well by being shut-in, than there would
23 be if it were being produced?

24 A I believe this is true, because of the pressure
25 differential.

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Q Now, exhibit number eight gives the amount of gas that has been produced from each of these two zones over a period of time. Do you have a cumulative total for those two zones?

A Yes, I do.

Q I guess that would go down through September of 1971?

A This is correct. The number two well has a cumulative of seven point nine billion cubic feet.

Q That is from both zones?

A No, this is from the Devonian. Excuse me.

Q Seven point nine billion?

A The number two Morrow has a cumulative of nine point three billion cubic feet.

Q Do you have any idea at what stage of the original reserve you were at when this leak occurred?

A Yes, it is tabulated on the exhibit summarizing it.

Q Oh, I see it here.

A The original reservoir characteristics.

Q Exhibit five and exhibit four?

A We feel that the Devonian is seventy-five percent depleted in this one.

Q And the Morrow, you estimate it was thirty-four percent depleted?

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1 A. The total reservoir.

2 Q Now, does that include the new zone or is
 3 that just the original zone in the Morrow?

4 A. This is the total Morrow reservoir.

5 Q Including the new zone?

6 A. Yes.

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

9 (THEREUPON, the witness was excused.)

10

11

LARRY R. SNYDER

12

13

14

15

16

DIRECT EXAMINATION

17

BY MR. BUELL:

18

Q Would you state your name, please?

19

A. Larry R. Snyder.

20

Q And what is your occupation, Mr. Snyder?

21

A. I am a land man with Shell Oil Company in
 22 Midland, Texas.

23

Q Are you familiar with the -- what is sought in
 24 application 4690?

25

A. Yes, sir, I am.

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1 Q As part of your duties, are you required to
 2 become familiar with and be aware of the various interest
 3 owners in the Antelope Ridge unit?

4 A Yes.

5 Q And would you briefly outline for the Examiner
 6 what those interests are, first as to working interests, and
 7 then as to the royalty interests?

8 A The Devonian participating unit has a total of
 9 fifty-three point one percent federal acreage.

10 Q What is the working interest, first?

11 A Well, the working interest in the Shell Oil
 12 Company has ninety-four point seventy-nine percent, Continental
 13 Oil Company has five point twenty-one percent.

14 Q And what are the royalty interests in the unit?

15 A The royalty interest in the Morrow, the U.S.G.S.
 16 has forty-eight point six percent, the State of New Mexico has
 17 thirty-four point seven percent, and the fee owners have
 18 sixteen point seven percent, and in the Devonian participating
 19 area, the U.S.G.S. has fifty-three point one percent, State
 20 of New Mexico thirty-four point four percent, and the fee
 21 owners twelve point five percent.

22 Q And have you made efforts to contact these
 23 various interest owners?

24 A Yes, sir, I have.

25 Q Just briefly, very briefly, what have you done

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1 by way of contacting these people?

2 A. I have attempted to contact as many as I could,
 3 especially of the larger interest owners, by telephone, and
 4 in the Devonian participating area, I have contacted ninety-
 5 eight point seventy-nine percent of the fee owners, and in the
 6 Morrow participating area, I have contacted ninety-eight
 7 point sixty-one percent of the fee owners.

8 Q. And have any of them expressed opposition to the
 9 commingling arrangement?

10 A. I have had no opposition at all. They have all
 11 expressed approval of what we plan to do.

12 Q. And you have contacted the government, federal
 13 government and the state government?

14 A. Yes, and Continental Oil Company has been con-
 15 tacted.

16 Q. And you are willing to take what other additional
 17 steps are necessary to secure the permission of the remaining
 18 interest owners?

19 A. Yes, sir, I have. Yes, sir, I am.

20 MR. BUELL: I have nothing else.

21 MR. NUTTER: I don't believe I have any ques-
 22 tions of this witness. Does anyone have any questions of
 23 him? He may be excused.

24 (THEREUPON, the witness was excused.)

25 MR. NUTTER: I thought maybe he was going to

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1 deal a little more in detail with the method by which
 2 production would be allocated on the basis of the H₂S, but
 3 apparently not.

4 Mr. Suckle, could you elaborate a little bit
 5 on how you are going to allocate the production on each of
 6 the two participating areas on the basis of the gas analysis
 7 of the commingled flow?

8 MR. SUCKLE: What we plan on doing to the
 9 cumulative production that has been produced since commingling,
 10 is allocating -- we have the H₂S reading of two fifty grains
 11 per hundred on the gas, the gross gas stream from the well.

12 MR. NUTTER: That is what is flowing now?
 13 Two fifty?

14 MR. SUCKLE: That is what it flows, the well
 15 shut-in, and we plan on using this five hundred and seventy-
 16 four average of the three tests that we have taken on the
 17 Antelope Ridge unit number three over the past week, and on a
 18 ratio, this comes out forty-three point four three five, and
 19 we plan on allocating forty-three and a half percent of the gas
 20 to the Devonian, and the rest to the Morrow, and this will
 21 be the procedure in the future.

22 We plan on monitoring number three and number
 23 two monthly using an independent testing unit out of Odessa
 24 and then using this direct ratio to allocate the production.

25 MR. NUTTER: And then if you are going to

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1 continue to monitor the number three and the H₂S content
 2 changes with time, then this change will automatically be
 3 applied to the number two well, also, then, wouldn't it?

4 MR. SUCKLE: Right, since the wells are pro-
 5 ducing out of the same reservoir, the H₂S should be the same
 6 within a period of time, this is true.

7 MR. NUTTER: And within the last -- these
 8 last three average -- these last three tests of the Devonian,
 9 gas from the number three have averaged four hundred seventy
 10 four grains per hundred?

11 MR. SUCKLE: Yes; yes, sir.

12 MR. NUTTER: And your combined flow from the
 13 number two is two fifty?

14 MR. SUCKLE: Yes.

15 MR. NUTTER: And this gives you the calculated
 16 total of forty-three and a half percent to the Devonian?

17 MR. SUCKLE: Devonian, that's correct.

18 MR. NUTTER: I see. Okay, any further ques-
 19 tions of the witness?

20 MR. BUELL: I have nothing else, Mr. Examiner.

21 MR. NUTTER: Witness may be excused. Does
 22 anyone have anything they wish to offer in case number 4690?

23 MR. GRAHAM: Mr. Examiner, I am Ray Graham
 24 with New Mexico State Land Office, representing the Commissioner
 25 of Public Lands, and we have no objection to the applicant

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1 commingling the Morrow and Devonian gas and in paying the
2 royalty based on the tests outlined and taking monthly tests
3 and allocating the State's royalty on the percentage of its
4 participation of the participating area.

5 MR. NUTTER: Thank you, Mr. Graham. Anyone
6 else? We'll take the case under advisement.

7
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STATE OF NEW MEXICO)
) SS.
 COUNTY OF BERNALILLO)

I, LINDA MALONE, a Certified Shorthand Reporter, 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.

Linda Malone
 CERTIFIED SHORTHAND REPORTER

I do hereby certify that the foregoing is a complete record of the proceedings of the Bernalillo Hearing of Case No. 4690, held by me on 4/5, 1972.

[Signature], Secretary
 New Mexico Oil Conservation Commission

dearnley-meier reporting

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OIL CONSERVATION COMMISSION

STATE OF NEW MEXICO
P. O. BOX 2088 - SANTA FE
87501

GOVERNOR
BRUCE KING
CHAIRMAN

**LAND COMMISSIONER
ALEX J. ARMJO
MEMBER**

STATE GEOLOGIST
A. L. PORTER, JR.
SECRETARY - DIRECTOR

April 17, 1972

Mr. Sumner Buell
Montgomery, Federici, Andrews,
Hanna & Morris
Attorneys at Law
Post Office Box 2307
Santa Fe, New Mexico

Re: Case No. 4690
Order No. R-4289
Applicant:

Shell Oil Company

Dear Sir:

Enclosed herewith are two copies of the above-referenced Commission order recently entered in the subject case.

Very truly yours,

A. L. Porter, Jr.

A. L. PORTER, Jr.
Secretary-Director

ALP/ir

Copy of order also sent to:

Hobbs OCC _____ X
Artesia OCC _____
Aztec OCC _____

Other _____

BEFORE THE OIL CONSERVATION COMMISSION
OF THE STATE OF NEW MEXICO

IN THE MATTER OF THE HEARING
CALLED BY THE OIL CONSERVATION
COMMISSION OF NEW MEXICO FOR
THE PURPOSE OF CONSIDERING:

CASE NO. 4690
Order No. R-4289

APPLICATION OF SHELL OIL COMPANY
FOR DOWNHOLE COMMINGLING, LEA
COUNTY, NEW MEXICO.

ORDER OF THE COMMISSION

BY THE COMMISSION:

This cause came on for hearing at 9 a.m. on April 5, 1972,
at Santa Fe, New Mexico, before Examiner Daniel S. Nutter.

NOW, on this 17th day of April, 1972, the Commission, a
quorum being present, having considered the testimony, the record,
and the recommendations of the Examiner, and being fully advised
in the premises,

FINDS:

(1) That due public notice having been given as required by
law, the Commission has jurisdiction of this cause and the subject
matter thereof.

(2) That the applicant, Shell Oil Company, is the owner and
operator of the Antelope Ridge Well No. 2, a dual completion,
located in Unit B of Section 4, Township 24 South, Range 34 East,
NMPM, Lea County, New Mexico.

(3) That pursuant to authority granted by Order No. R-2787
the subject well was completed as a dual completion (conventional)
to produce gas from the Antelope Ridge-Morrow Pennsylvanian and
Antelope Ridge-Devonian Gas Pools.

(4) That communication between the two zones developed in
the Fall of 1971.

(5) That the applicant has made diligent efforts to repair
the well.

(6) That during the efforts to repair the well a new high
pressure zone in the Morrow formation was opened to the well-bore
which makes workover attempts extremely hazardous.

(7) That the new high pressure Morrow zone is believed to
be of limited extent.

-2-

CASE NO. 4690
Order No. R-4289

(8) That the applicant should be allowed to produce the well, commingling in the well-bore the production from the Devonian and Morrow zones, for one year or until such time as gas pressures have decreased to such an extent that the well can be safely repaired, whichever occurs first.

(9) That the applicant proposes to allocate production to each of the commingled zones upon the basis of the H₂S content of the commingled stream as compared to the H₂S content of the Devonian gas from its Antelope Ridge Well No. 3 located in Unit K of Section 34, Township 23 South, Range 34 East.

(10) That the reservoir characteristics of the Antelope Ridge-Morrow Pennsylvanian and Antelope Ridge-Devonian zones in the subject well are such that underground waste would not be caused by the proposed commingling in the well-bore.

(11) That approval of the subject application will prevent waste and protect correlative rights.

IT IS THEREFORE ORDERED:

(1) That the applicant, Shell Oil Company, is hereby authorized to produce its Antelope Ridge Well No. 2, located in Unit B of Section 4, Township 24 South, Range 34 East, NMPM, Lea County, New Mexico, in such a manner as to produce gas from the Antelope Ridge-Morrow Pennsylvanian and Antelope Ridge-Devonian Gas Pools, commingling in the well-bore the production from said zones.

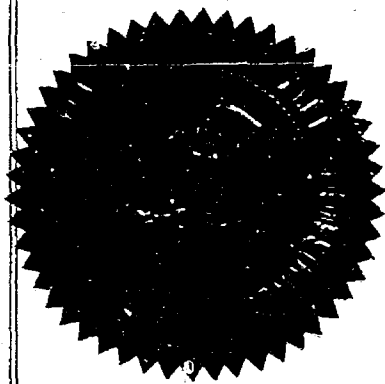
PROVIDED HOWEVER, that the operator shall so produce the subject well for a period of one year or until such time as gas pressures have decreased to such an extent that the well can be safely repaired, whichever occurs first.

(2) That the commingled production shall be allocated to the Antelope Ridge-Morrow Pennsylvanian and Antelope Ridge-Devonian zones upon the basis of the H₂S content of the commingled stream as compared to the H₂S content of the Devonian gas from its Antelope Ridge Well No. 3 located in Unit K of Section 34, Township 23 South, Range 34 East, NMPM, as determined by gas analyses conducted at least once each month.

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

-3-
CASE NO. 4690
Order No. R-4289

DONE at Santa Fe, New Mexico, on the day and year hereinabove designated.



STATE OF NEW MEXICO
OIL CONSERVATION COMMISSION

Bruce King
BRUCE KING, Chairman

Alex J. Armitage
ALEX J. ARMITAGE, Member

A. L. Porter, Jr.
A. L. PORTER, Jr., Member & Secretary

S E A L

dr/



RECEIVED
APR 19 1972
United States Department of the Interior

GEOLOGICAL SURVEY

Drawer 1857
Roswell, New Mexico 88201

April 6, 1972

File Case
4690
—

Mr. D. S. Nutter
Chief Engineer
New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico 87501

Dear Mr. Nutter:

This letter will confirm that this office has no objection to the allocation of oil and gas production from the Antelope Ridge unit well No. 2 to the Morrow and Devonian participating areas based on the H₂S content of the gas as proposed by Shell in N.M.O.C.C. Case No. 4690. We will accept royalty distribution for the Federal leases in the individual participating areas on the basis of such allocation which we believe to be the best method of allocating the commingled production, if such commingling is allowed by the Commission, in view of the subsurface mechanical conditions of the Antelope Ridge No. 2 unit well on Federal lease NM 021422.

Sincerely yours,

N. O. Frederick
N. O. FREDERICK
Regional Oil and Gas Supervisor

cc:
Shell Oil Company
P. O. Box 1509
Midland, Texas 79701
Attention: Mr. Ron Suckle

Com. Pub. Lands, Santa Fe

DOCKET: EXAMINER HEARING - WEDNESDAY - APRIL 5, 1972

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

The following cases will be heard before Elvis A. Utz, Examiner,
or Daniel S. Nutter, Alternate Examiner:

CASE 4539: (Continued from the November 17, 1971, Examiner
Hearing)

In the matter of the hearing called by the Oil Conservation Commission on its own motion to permit Doanbuy Lease & Company, Inc., and all other interested persons to appear and show cause why its following described wells in Section 27, Township 14 South, Range 33 East, Saunders Pool, Lea County, New Mexico, should not be plugged and abandoned in accordance with a Commission-approved plugging program.

CASE 4690: Application of Shell Oil Company for downhole commingling, Lea County, New Mexico. Applicant, in the above-styled cause, seeks authority to commingle production from the Antelope Ridge-Morrow Pennsylvanian and Antelope Ridge-Devonian Gas Pools in the wellbore of its Antelope Ridge Well No. 2, a dual completion, in Unit B of Section 4, Township 24 South, Range 34 East, Lea County, New Mexico.

CASE 4688: Application of Gulf Oil Corporation for a non-standard proration unit, Lea County, New Mexico. Applicant, in the above-styled cause, seeks the consolidation of two non-standard gas proration units to form one 600-acre non-standard gas proration unit comprising the SW/4, S/2 NW/4, NW/4 NW/4, and E/2 of Section 4, Township 22 South, Range 36 East, Jalmat Gas Pool, Lea County, New Mexico, to be dedicated to its J. F. Janda (NCT-F) Wells Nos. 7 and 13 located, respectively, in Units K and P of said Section 4.

CASE 4683: Application of Mark Production Company for the creation of a new oil pool and special pool rules, Lea County, New Mexico. Applicant, in the above-styled cause,

OIL CONSERVATION COMMISSION

P. O. BOX 2088

SANTA FE, NEW MEXICO 87501

April 30, 1973

Shell Oil Company
P. O. Box 1509
Midland, Texas 79701

Attention: Mr. Jack L. Mahaffey

Re: Antelope Ridge Well No. 2

Gentlemen:

Reference is made to your letter of April 2, 1973, and more specifically, to your letter of April 18, 1973, concerning an extension of time in which to operate your Antelope Ridge Well No. 2 in the manner authorized by Commission Order No. R-4289.

We are in concurrence with your determination that further production and further depletion of the Morrow zone in Well No. 2 is necessary prior to again attempting workover operations on the well, particularly if communication between this well and the No. 4 cannot be established.

Shell Oil Company is, therefore, hereby authorized to continue to produce the Antelope Ridge Well No. 2, located in Unit B of Section 4, Township 24 South, Range 34 East, NMPM, Lea County, New Mexico, in the same manner as prescribed by Order No. R-4289, until October 17, 1973.

Very truly yours,

A. L. PORTER, Jr.
Secretary-Director

ALP/DSN/dr

cc: Oil Conservation Commission - Hobbs

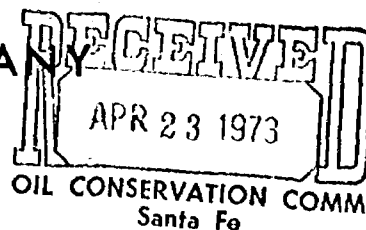
Case 4690



SHELL OIL COMPANY

PETROLEUM BUILDING
P.O. BOX 1509
MIDLAND, TEXAS 79701

April 18, 1973



Subject: Antelope Ridge Unit
(No. 14-08-0001-8492)
Lea County, New Mexico
Order No. R-4289
Extension Request

Oil and Gas Supervisor
United States Geological Survey
Post Office Drawer 1857
Roswell, New Mexico 88201

Commissioner of Public Lands
State of New Mexico
Post Office Box 1148
Santa Fe, New Mexico 87501

Oil Conservation Commission
State of New Mexico
Post Office Box 871
Santa Fe, New Mexico 87501

Gentlemen:

With reference to our letter of April 2, 1973, outlining our development plan for 1973 and requesting an extension to Order No. R-4289, we wish to submit the following additional information and explanation for this request.

Operations began on October 6, 1972, to deepen Well No. 4 to the Morrow reservoir and use this well as a replacement for the Morrow zone in Well No. 2. This operation has been very difficult and expensive, and is not satisfactorily completed as yet. The Morrow in Well No. 4 now produces less than 1 MMCF per day and may not be connected to the main Morrow reservoir. The Morrow in Well No. 2 consistently produced 3 MMCF per day prior to a mechanical failure in October 1971. To prevent a possible loss of reserves by a failure to adequately drain the Morrow reservoir, a sand-frac stimulation treatment is currently underway to open possibly unopened productive intervals in Well No. 4.

In an attempt to determine if Wells No. 2 and No. 4 were in communication, a seven day interference test was run in February 1973. No change in the producing capacity or BHP could be seen in Well No. 4 when Well No. 2 was first flowed and then shut in. These wells are less than 800 feet apart and Well No. 2 now produces about 2 MMCF of Morrow gas per day.

The Morrow reservoir pressure in Well No. 4 was measured at 7923 psi at 11,320 feet on February 12, 1973. This projects to between 8052 psi and 8735 psi at the Morrow pressure datum depth (-9450 feet) using a gas (.076 psi/ft) and water (.480 psi/ft) pressure gradient, respectively. The Morrow reservoir pressure in Well No. 2 was measured at 3489 psi at 11,000 feet on February 20, 1973. This projects to between 3642 psi and 4457 psi at the Morrow pressure datum using the same gas and water gradients. This pressure difference between wells is further evidence of little or no communication in the Morrow zone now opened in these two wellbores.

It now appears that the high pressured Morrow zone (6619 psi) encountered in Well No. 2 in October 1971 has been depleted to some extent and that workover operations on the well can begin as soon as it can be determined that gas reserves will not be lost by abandoning this Morrow zone. Maintaining pressure control during workover operations will be difficult even now, but by the use of formation blocking materials we believe sufficient control can be achieved. However, we feel that even by taking special precautions the fluid sensitive Morrow zone will probably be damaged by any workover operation on the well. For this reason we feel it will be to the advantage of all parties that we be prepared to abandon the Morrow zone in Well No. 2 when we begin workover operations and that Well No. 4 should be proven an adequate Morrow replacement prior to beginning.

The attachments for your files show the H₂S content measured in Well No. 2 (Morrow-Devonian) and Well No. 3 (Devonian) since commingled production was begun in April 1972. Also attached are updated monthly production curves for the Morrow and Devonian zones in Well No. 2 illustrating the results of the H₂S allocation method being used.

We will be happy to furnish additional data and to discuss this request for an extension to Order No. R-4289 with you at any time.

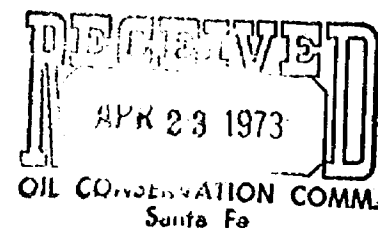
SHELL OIL COMPANY
Unit Operator

H. J. Conrad
For: Jack L. Mahaffey
Production Manager
Mid-Continent Division

WRG:LA

Attachments

H₂S CONTENT OF GAS
(GRAINS / 100 SCF)
ANTELOPE RIDGE FIELD
April 16, 1973



<u>DATE</u>	<u>WELL NO. 2</u>	<u>WELL NO. 3</u>
3-31-72	—	579.22
4-2-72	—	502.69
4-4-72	—	565.50
4-25-72	220.06	447.93
5-22-72	273.00	436.00
6-15-72	286.46	401.20
7-20-72	250.36	458.68
8-15-72	250.36	458.68
9-29-72	130.46	370.14
10-18-72	120.24	397.80
11-19-72	170.50	530.00
12-14-72	158.10	408.00
1-13-73	156.80	481.60
2-13-73	89.90	270.00
3-15-73	185.40	370.82
4-15-73	165.02	350.14

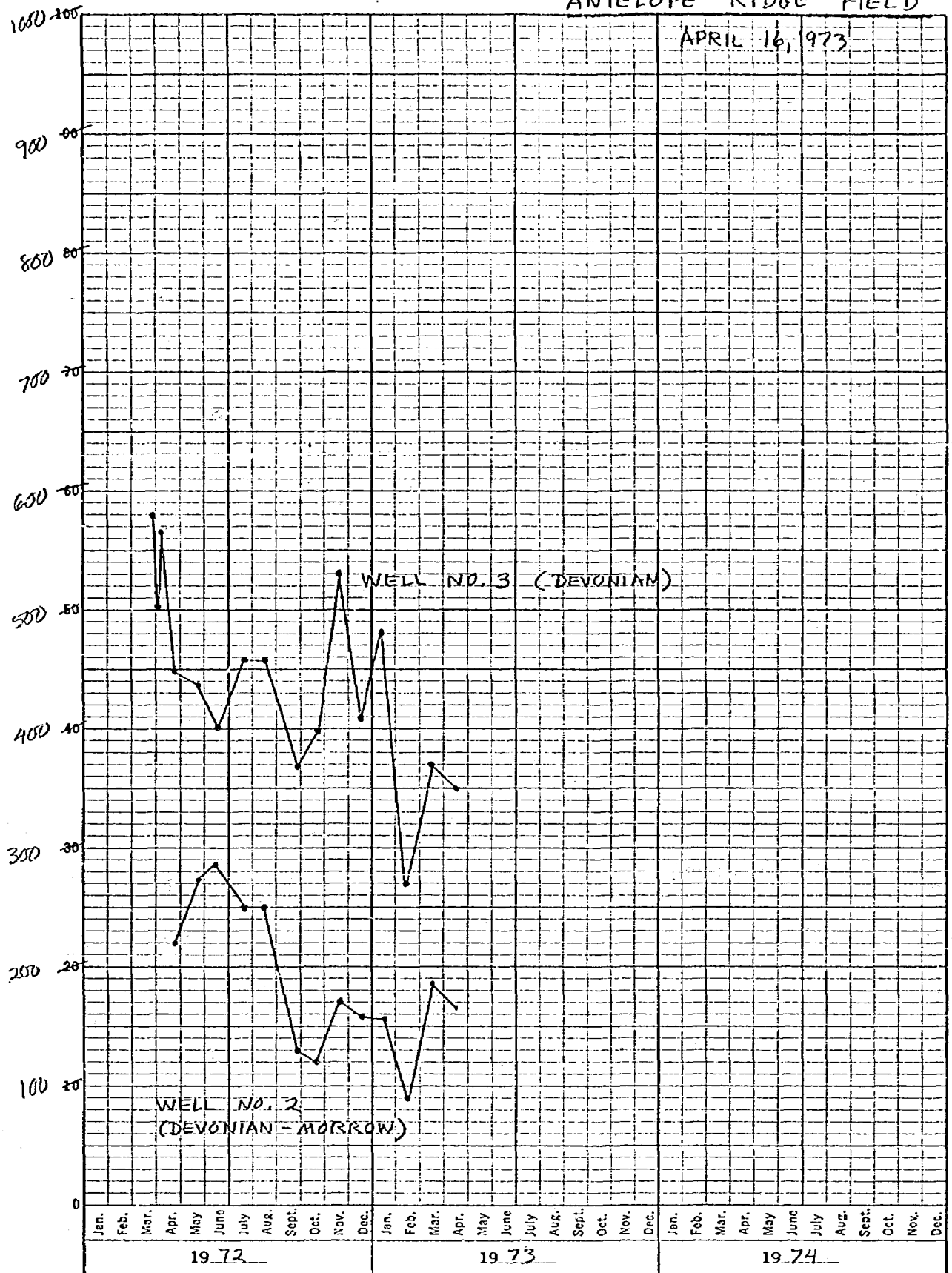
NOTE: NMOCC approved allocation of Morrow and Devonian production from Well No. 2 based upon H₂S content of Well No. 3 on April 17, 1972.

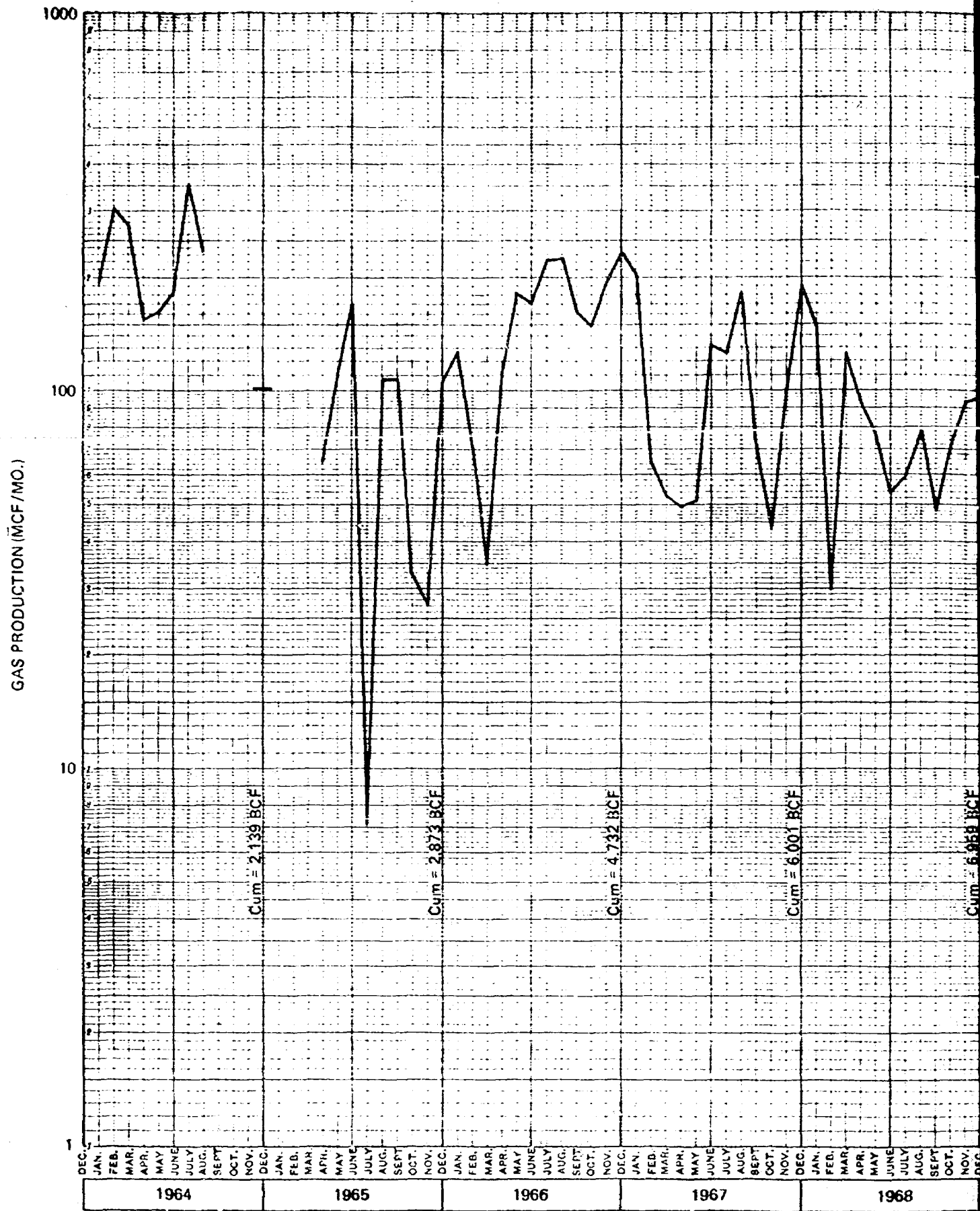
H₂S CONTENT ANTELOPE RIDGE FIELD

APRIL 16, 1973

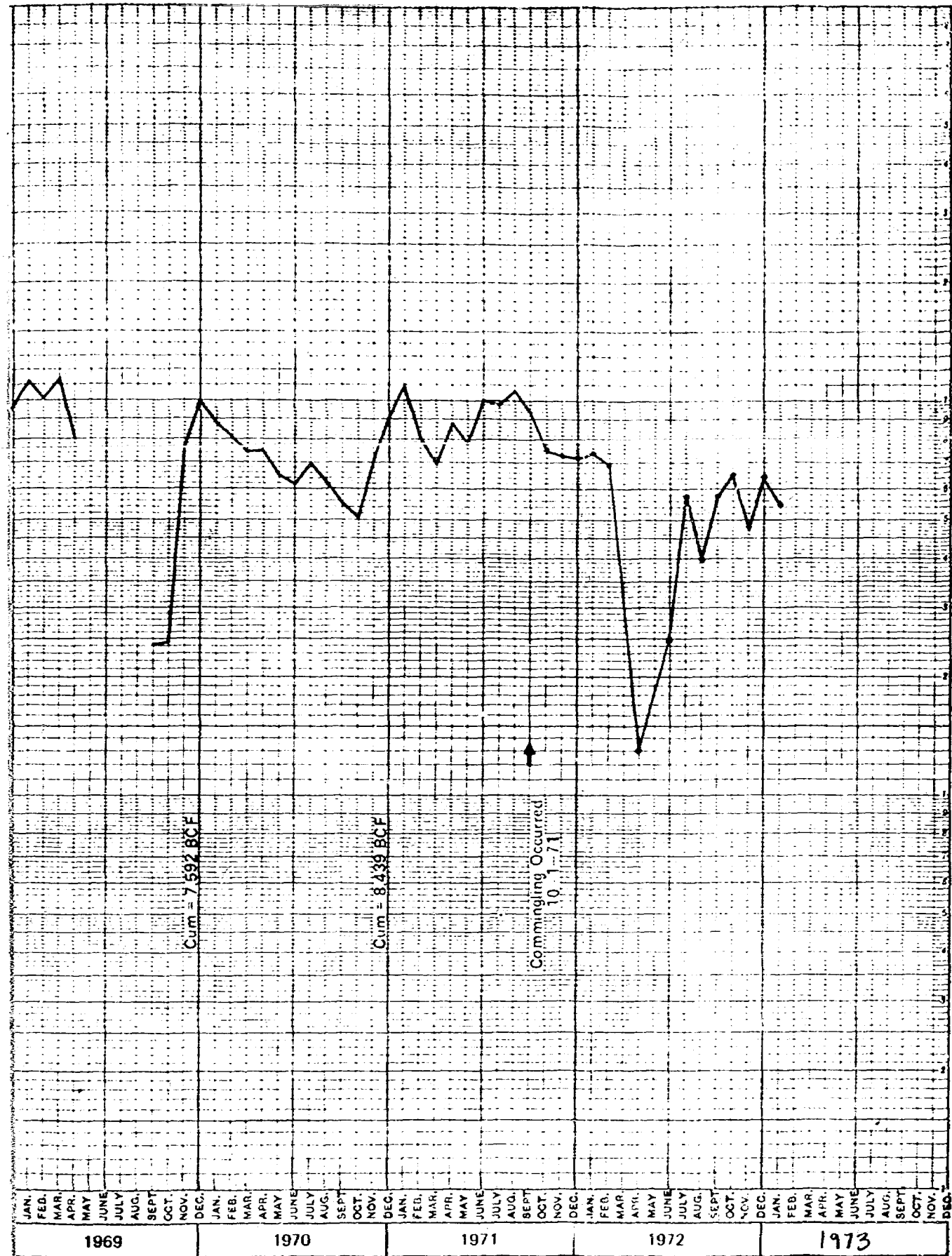
H₂S CONTENT - (GRS/100 SCF)

KE 3 YEARS BY MONTHS 46 3290
X 100 DIVISIONS
MADE IN U.S.A.
KEUFFEL & ESSER CO.

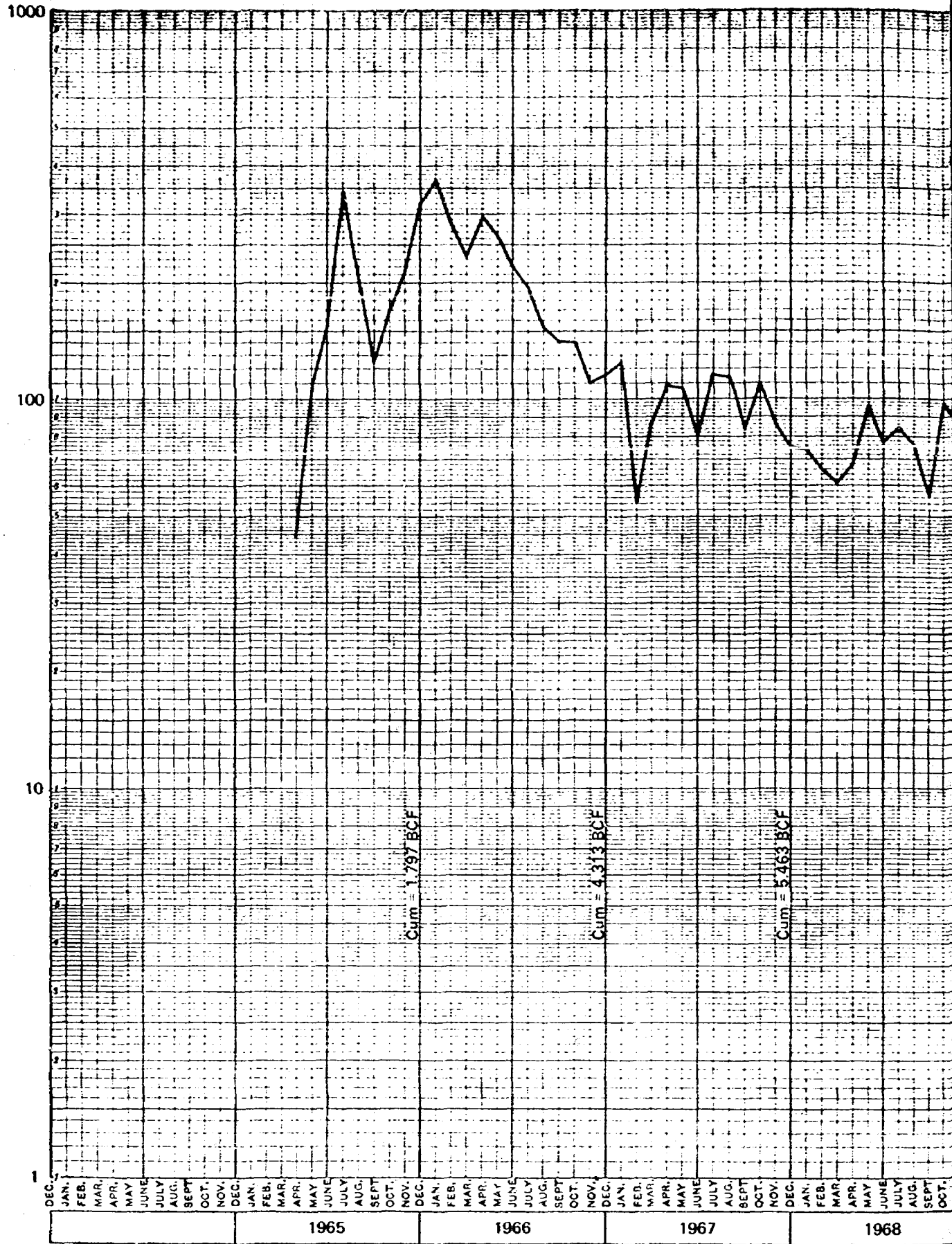


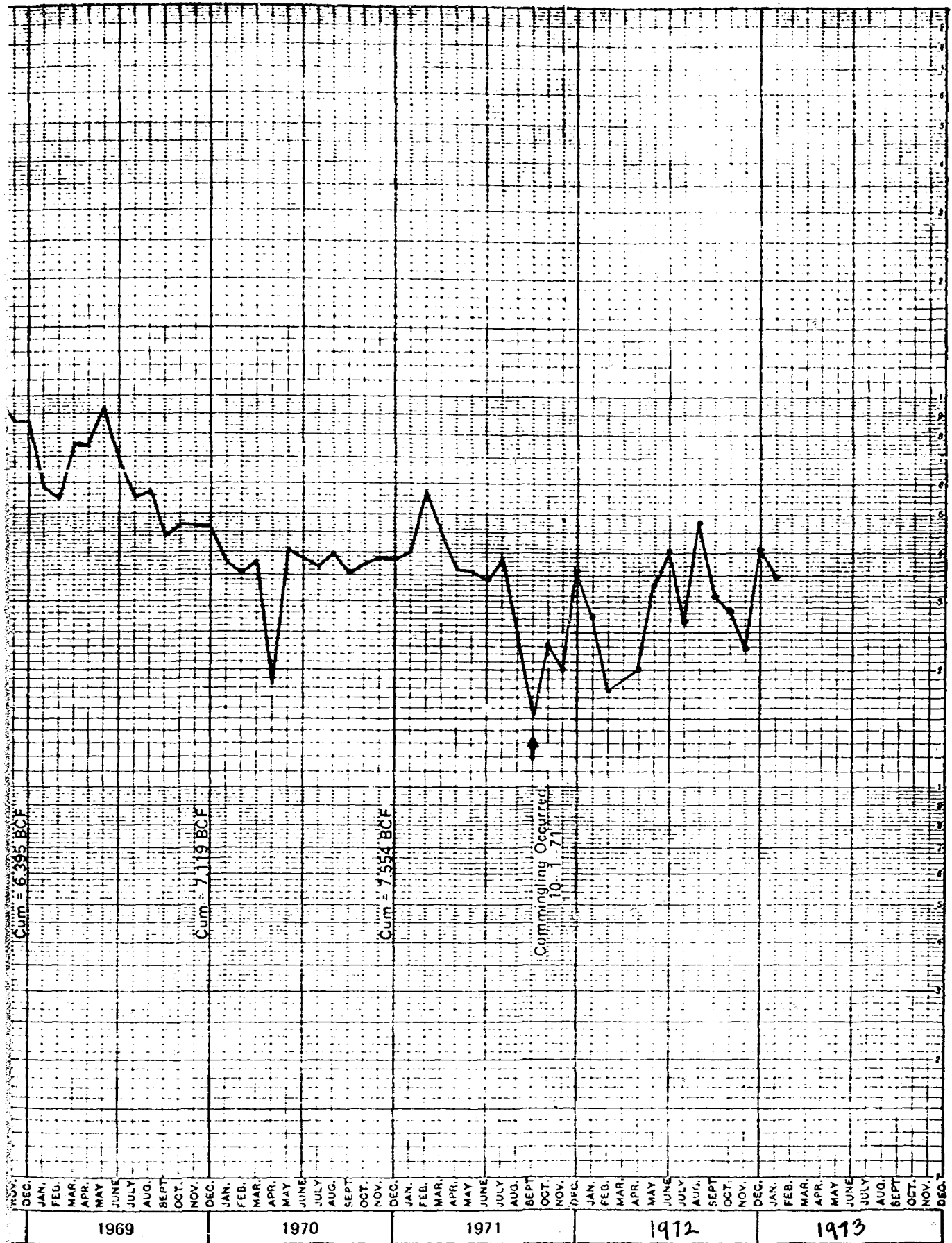


1964	1965	1966	1967	1968
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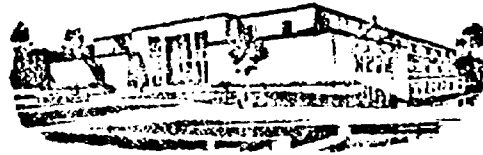
GAS PRODUCTION (MCF/MO.)





State of New Mexico

TELEPHONE
505-827-2748



Commissioner of Public Lands

September 24, 1973

ALEX J. ARMIJO
COMMISSIONER

P. O. BOX 1148
SANTA FE, NEW MEXICO

Shell Oil Company
P. O. Box 1509
Midland, Texas 79701

*Case 4690
File*

Re: Antelope Ridge Unit
(No. 14-08-0001-8492)
Lea County, New Mexico
Commingle Extension Request

ATTENTION: Mr. Jack L. Mahaffey

Gentlemen:

Reference is made to your request to extend the temporary commingling permit (R-4289) until Antelope Ridge Unit 2 is depleted.

You are hereby given approval to the above request. Any deviation from your proposed request will be reason to cancel approval. This approval is subject to like approval by the New Mexico Oil Conservation Commission.

Please remit a Ten (\$10.00) Dollar filing fee.

Very truly yours,

RAY D. GRAHAM, Director
Oil and Gas Department

AJA/RDG/s
encl.
cc:

OCC-Santa Fe, New Mexico
New Mexico Oil and Gas Accounting Commission
Antelope Ridge Unit File



SHELL OIL COMPANY

RECEIVED
PETROLEUM BUILDING

P.O. BOX 1509 SEP 19 9 23 AM '73
MIDLAND, TEXAS 79701
STATE LAND OFFICE
SANTA FE, N.M.
September 11, 1973

Subject: Antelope Ridge Unit
(No. 14-08-0001-8492)
Lea County, New Mexico
Commingling Extension Request

Oil and Gas Supervisor
United States Geological Survey
Post Office Drawer 1857
Roswell, New Mexico 88201

Commissioner of Public Lands
State of New Mexico
Post Office Box 1148
Santa Fe, New Mexico 87501

Oil Conservation Commission
State of New Mexico
Post Office Box 871
Santa Fe, New Mexico 87501

Gentlemen:

Shell Oil Company, in behalf of itself and partners, respectfully requests that the temporary commingling permit (R-4289), expiring October 17, 1973, be extended until Antelope Ridge Unit 2 is depleted. Production would continue to be allocated on the basis of H_2S content as approved in April 1972. As a result of attempting to resolve the commingling problem, two wells now share the same proration unit. As both wells are at a near marginal producing status, we propose sharing the Morrow proration unit with Unit Well 4.

Data pertaining to the commingling and subsequent workover problems are contained in considerable correspondence beginning in March 1972. Since our most recent letter dated April 18, 1972, the Morrow in the replacement well, ARU 4, has been fracture treated with disappointing results. Maximum capacity still remains at +700 MCF/D and it does not appear that it will be possible to effect reservoir communication with the zone producing in ARU 2.

Due to mechanical conditions that resulted in downhole commingling, production from the Morrow and Devonian in ARU 2 is currently allocated on the basis of H_2S content. Comparison of the combined stream with a single zone Devonian (sour) gas well is made monthly to determine the amount of dilution and, in turn, the percentage of Morrow gas being produced. Attached are updated data showing the gas analysis and production curves showing the results of the allocation method.

To date, expenses to correct the commingling in ARU 2 total \$42,000. An additional \$453,000 has been spent in deepening ARU 4 to the Morrow in an effort to create a replacement drainage point that would permit abandonment of the zone in ARU 2.

*AR. well #2
Sec 4 - 245 - 34E*

Briefly, we make the request to continue commingling for the following reasons:

1. A no-trouble repair of ARU 2 is estimated to cost an additional \$105,000. From experience in the deep gas wells in this area, the cost could easily double.
2. Experience has also shown that the chances of damaging the Morrow formation with workover fluids are not only possible but probable. The net result would be loss of valuable reserves.
3. In its present condition, pressures are contained below packers and the present producing method is relatively safe. Because of lost circulation problems encountered in previous workover attempts, a safety and potential fire hazard exists if workover efforts are pursued.
4. The wells and zones involved are either marginal now or approaching marginal status. The combined stream from the Devonian and two Morrow zones is less than four million cubic feet per day. Well No. 4 has a maximum capacity of 740 MCF gas per day and makes four barrels condensate and four barrels water while the commingled well that includes the water-drive Devonian zone produces gas at the rate of three million cubic feet per day and 23 barrels condensate plus 25 barrels water. Both wells are producing into the 520 psi gathering system.
5. Shell operates the only Devonian wells on the small closure at Antelope Ridge; however, the field now has an additional operator in the Atoka and Morrow zones. From the data obtained from reservoir interference tests in ARU 2 and 4 that are located some 800 feet apart, it is doubtful that commingled production would change or be influenced by production from the new offset well.
6. The Morrow and Devonian reserves in the subject wells are either marginal or approaching the advanced stages of depletion.

Since a high risk of failure accompanied by an expensive workover is present, we recommend that our request for permanent commingling on Antelope Ridge Unit 2 be approved.

Approved *September 24, 1973*
Alfred J. Lanning
 COMMISSIONER OF PUBLIC LANDS

RWK:LA

Attachments

Very truly yours,

Shell Oil Company
 Unit Operator

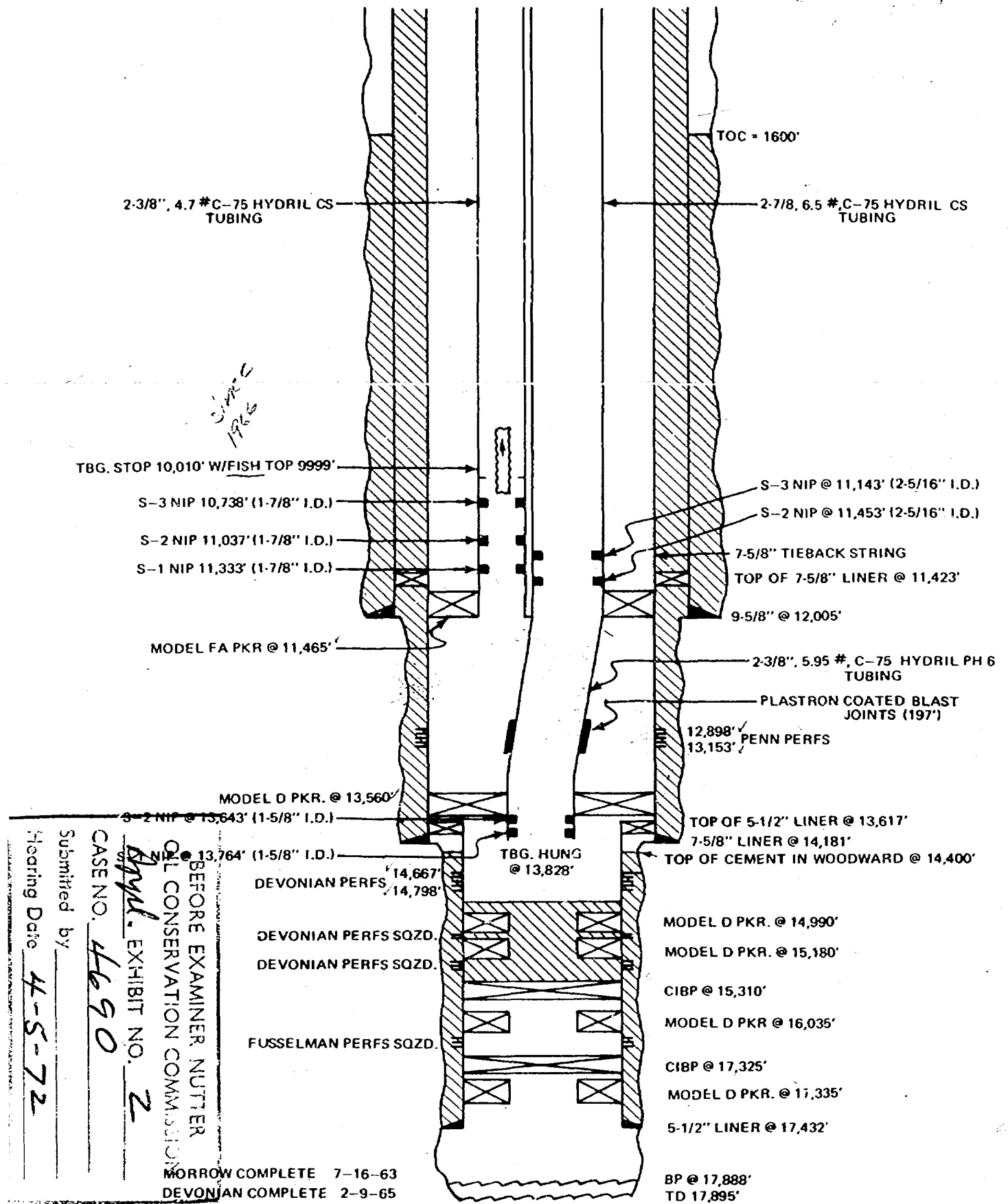
W. J. Quigley
 for Jack L. Mahaffey
 Production Manager
 Mid-Continent Division

H₂S CONTENT OF GAS
(GRAIN/100 SCF)
ANTELOPE RIDGE FIELD
AUGUST 31, 1973

DATE	WELL NO. 2	WELL NO. 3	DEV GAS IN
			COMMINGLED STREAM WELL NO. 2
3-31-72	-	579.22	-
4-02-72	-	502.69	-
4-04-72	-	565.50	-
4-25-72	220.06	447.93	.49
5-22-72	273.00	436.00	.63
6-15-72	286.46	401.20	.71
7-20-72	250.36	458.68	.55
8-15-72	250.36	458.68	.55
9-29-72	130.46	370.14	.35
10-18-72	120.24	397.80	.30
11-19-72	170.50	530.00	.32
12-14-72	158.10	408.00	.39
1-13-73	156.80	481.60	.33
2-13-73	89.90	270.00	.33
3-15-73	185.40	370.82	.50
4-15-73	165.02	350.14	.47
5-15-73	200.34	399.82	.50
6-15-73	242.14	398.06	.61
7-15-73	94.26	355.04	.26
8-18-73	118.44	335.28	.35

NOTE: NMOCC approved allocation of Morrow and Devonian production from Well No. 2 based upon H₂S content of Well No. 3 on April 17, 1973

ANTELOPE RIDGE UNIT NO. 2
D# 3567



BEFORE EXAMINER, NUTTER
OIL CONSERVATION COMMISSION
CASE NO. 4690
EXHIBIT NO. 2
Submitted by
Hearing Date 4-5-72

R.R.S.
3/8/72

STATUS OF
ANTELOPE RIDGE UNIT NO. 2

BEFORE EXAMINER NUTTER
OIL CONSERVATION COMMISSION

Appl. EXHIBIT NO. 3

CASE NO. 4690

Submitted by _____

Hearing Date 4-8-71

Shell Oil Company, as operator of the Antelope Ridge Unit, has

scheduled a hearing before the New Mexico Oil and Gas Conservation Commission on April 5, 1972 to request an amendment to the dual completion, Order R-2787, to allow downhole commingling of the Morrow and Devonian gas zones in the Antelope Ridge Unit No. 2. Based on the current mechanical and producing conditions of this well, Shell Oil Company recommends that the only economic and prudent course of action at this time is to leave the zones in communication in the well bore.

On September 31, 1971 the Morrow zone was shut in for twenty-four hours during a packer leakage test. Upon return to flow on October 1, 1971, the Morrow (normally sweet gas) tubing string started producing sour gas. (Attachment I is a drawing depicting the downhole production equipment in the well.) An attempt was made on October 2, 1971 to run and set a wireline plug in the S-1 Nipple at 13,643' to pressure test the long string tubing. An obstruction was encountered at 11,553' which would not pass a 1-7/16" impression block. The impression block indicated that the tubing was either corkscrewed or collapsed at that point. On October 12, 1971 a 1-1/2" OD star drill was run and spudded through the tight spot at 11,553' and drilled to 12,440'. Excessive increases in drag with depth indicated that the tubing was severely corkscrewed below 11,553' and the star drill operations were abandoned on October 13, 1971.

On October 26, 1971 an attempt was made to kill the well by pumping a calcium carbonate slurry down the short string tubing. The calcium carbonate slurry was used as a loss circulation material in order to keep the hole loaded with fresh water during the workover operations. The estimated pressures in the Morrow and Devonian zones were 2500 psi (.19 psi/ft.) and 6000 psi (.41 psi/ft.), respectively, at the time of the workover. Considerable difficulty was

encountered in pumping the slurry by the fish down the short string tubing. As shown on the drawing, the short string tubing has a fish from 9999' to 10,010', consisting of a tubing stop, a retrieving tool, knuckle joints, sinker bars, and wireline jars. Previous attempts to remove this fish have failed. After finally spotting the slurry across the Morrow perforations, a new high pressure Morrow zone appeared to open and a bottom hole pressure survey (dated November 4, 1971) recorded a 5340 psi pressure at 9900'. At the time of this survey the fluid level in the short string tubing was at 8000', so an accurate extrapolation of the pressure at the Morrow perforations could be made. This calculated pressure was 6619 psi (.517 psi/ft.). The well was then returned to production in an attempt to deplete some of the pressure in this newly opened Morrow zone in order to continue the workover safely. The cumulative expenditure at this time was \$13,490. The well tested 1.65 MMCFD + 5 BOPD + 105 BWPD against a 700 psi line pressure at this point.

The well produced through the short string tubing until December 25, 1971 when it was shut in for another pressure survey. The survey, run January 1, 1972 (5 days after the well had been shut in), showed that the Morrow pressure had been depleted to 4678 psi with the fluid level unknown at a point below the 9900' survey depth. Depending on where the static fluid level was, the extrapolated pressure at the Morrow perforations was in the range of 4950 psi (.38 psi/ft.) to 6050 psi (.47 psi/ft.).

The well was produced for most of the remainder of January. On February 1, 1972 the long string was perforated with 4-3/8" holes @ 11,510' (45' below upper packer) in order to facilitate the circulation of calcium carbonate slurry. A pressure survey (dated February 9, 1972) was run in the long tubing string to a

depth of 11,400' and a 5340 psi pressure was recorded. This yielded an extrapolated range of the Morrow zone pressure to be from 5475 psi (.42 psi/ft.) to 6000 psi (.47 psi/ft.), again depending upon the position of the fluid level in the tubing string.

On February 29, 1972, additional calcium carbonate slurries were spotted on the Morrow formation by pumping 10# brine down the long tubing string. On March 3, 1972 the well was dead to the point that the wellhead could be removed and blowout preventers installed. The short string tubing was engaged, but the seal assembly would not come out of the upper packer when pulled to the yield point of the short string tubing. The workover operations were abandoned on March 4, 1972 with a cumulative expenditure of \$42,047.

Shell Oil Company does not recommend any further attempts to isolate the zones in Antelope Ridge Unit No. 2 due to the existing mechanical and pressure conditions of the well. Attachment II is our best estimate of the steps that would have to be followed in order to restore the well to production in an isolated state. The cost of this work, as shown in Attachment III, is estimated to be an additional \$105,000. Furthermore, at the point where the long string tubing (believed to be internally plugged with calcium carbonate material) is pulled from the lower packer, a 1500 psi pressure overbalance (caused by the 10#/gallon workover fluid) will exist into the Devonian formation. If the loss circulation material does not prevent the Devonian from taking fluid and thereby reducing the hydrostatic fluid head on the Morrow formation, the well might have to be cemented in place due to the high risk of a blowout. Shell Oil Company contends that the present risks and the high costs involved preclude any further workover action to isolate the two zones.

RRS
3/22/72

149 - USGS

Handwritten notes:
H2S content
#3D 565-580 grains / 100 cuft H2S content
#2D 1120 grains 2/65
#3D 380 9/64
present 250.
574 ave .435

PERTINENT FIELD STATISTICS
DEVONIAN RESERVOIR
ANTELOPE RIDGE FIELD
LEA COUNTY, NEW MEXICO

Average Porosity	6.5%
Average Permeability	4.5 md
Average Water Saturations	30%
Average Oil Saturations	---
Average Net Effective Pay Thickness	173'
Average Gravity of Gas	.67
Average Gravity of Oil	50° API Cond.
Original Reservoir Pressure	6410
Reservoir Temperature	217° F.
Additional Reservoir Pressure Data (8/70)	6161 psi ✓
Condition of Well During Pressure Test	Shut-In
Cumulative Devonian Reservoir Gas Production to 10/1/72	26 BCF
Cumulative Devonian Production of Antelope Ridge #2 to 10/1/72	7.9 BCF
Stage of Depletion of Reservoir	<u>75% depleted 1/1/72</u>

BEFORE EXAMINER NUTTER
OIL CONSERVATION COMMISSION
Appl. EXHIBIT NO. 4
CASE NO. 4690
Submitted by _____
Hearing Date 4-5-72

PERTINENT FIELD STATISTICS
MORROW RESERVOIR
ANTELOPE RIDGE FIELD
LEA COUNTY, NEW MEXICO

Average Porosity	9%
Average Permeability	40.4 md
Average Water Saturations	25%
Average Oil Saturations	75%
Average Net Effective Pay Thickness	29'
Average Gravity of Gas	0.60
Average Gravity of Oil	48°
Original Reservoir Pressure	8731 ✓
Reservoir Temperature	184° F.
Additional Reservoir Pressure Data (8/70) (Prior to Communication)	2407 psi ✓
Condition of Well During Pressure Test	Shut-In
Cumulative Morrow Reservoir Gas Production to 1/1/72	21.2 BCF
Cumulative Morrow Production of Antelope Ridge #2 to 10/1/72	9.3 BCF
Stage of Depletion of Reservoir	<u>34% depleted 1/1/72</u>

BEFORE EXAMINER NUTTER
OIL CONSERVATION COMMISSION
Appl. EXHIBIT NO. 5
CASE NO. 4690
Submitted by _____
Hearing Date 1-5-72

ATTACHMENT II

GENERAL PROGNOSIS
TO ISOLATE MORROW & DEVONIAN
ANTELOPE RIDGE NO. 2
660' FNL & 1650' FEL SEC. 4,
T-24-S, R-34-E, NMPM SURVEY,
LEA COUNTY, NEW MEXICO

<u>OPERATION:</u>	<u>RIG TIME (DAYS)</u>	<u>FISHING TOOL RENTALS (\$)</u>	<u>WIRELINE WORK (\$)</u>
1. Rig up and kill well.	1		
2. Cut off short string @ 9950+'.	1/6		500
3. Pull short string.	2/3		
4. Cut off long string @ 11,450+'.	1/6		500
5. Pull long string--pick up work string.	1-1/3		
6. Run overshot and jars and attempt to fish short string w/2-7/8" work string.	2/3	1,300	
a. If not successful in Step 6 above, wash over and attempt OD cut of short string @ 11,460+' and retrieve short string stub.	2	1,500	
7. Run over shot and bumper subs, latch onto long string and attempt to jar long string out.	1	900	
a. If not successful in Step 7, mill out top packer.	3	800	
8. Run free point survey in long string and cut off as deep as possible or above the free point.	1/2		1,250
9. Pull upper packer and long string.	1/2		
10. If long string has not been cut deep enough, wash over long string and OD cut just above lower packer.	2	1,500	
11. Pluck lower packer.	1-1/3	1,000	
12. Retrieve lower packer.	1/6		
13. Set Model D packer with knockout plug at 13,500+'.	1/2		500
14. Run A-5 Baker packer on long string to 12,800+'. Pressure test long string connections above slips hydraulically to 6000 psi. Run tail pipe to 14,500' and latch in long string to lower packer and set 4000# on Model D.	1		
15. Run short string and sting into dual packer--pressure test short string connections above slips hydraulically to 8000 psi. Land short string with 5000# compression.	1		

BEFORE EXAMINER NUTTER
OIL CONSERVATION COMMISSION
AM EXHIBIT NO. 6
CASE NO. 4690
Submitted by _____
Hearing Date 4-5-72

<u>OPERATION:</u>	<u>RIG TIME (DAYS)</u>	<u>FISHING TOOL RENTALS (\$)</u>	<u>WIRELINE WORK (\$)</u>
16. Remove BOPS and install wellhead.	1/4		
17. Circulate annulus with inhibited fresh water.	1/4		
18. Run wireline standing valve and set upper packer with 1400 psi pressure @ surface.	1/4		250
19. Retrieve standing valve.			
20. Place well on production.			

RRS
3/22/72

ATTACHMENT III

SUMMARY OF
ANTELOPE RIDGE UNIT NO. 2
WORKOVER COSTS

<u>ITEM:</u>	<u>AMOUNT</u>
17-3/4 Days Rig Time @ \$1000/Day	\$ 17,750
17-3/4 Days Pump Truck Expense @ \$400/Day	6,300
14 Days Drill Pipe Rental @ \$400/Day	5,600
14 Days Mud Costs @ \$5/Bbl. - 250 Bbl./Day (Does not include loss circulation material)	17,500
Calcium Chloride Pill (Loss Circulation Material) and Preservatives, Ten 50-bbl. Pills @ \$1,250/50-Bbl. Pill Plus \$5,000 Preservatives	17,500
17-3/4 Days Blowout Preventer Rental (5000 psi Working Pressure @ \$30/Day)	550
1800' - 2-7/8", 6.5# Hydril CS Tubing @ \$2.50/ft.	4,700
1600' - 2-3/8", 4.7# Hydril CS Tubing @ \$1.60/ft.	2,600
Packers (1 Dual Baker A-5 and 1 Model D)	6,000
Wellhead Service	1,000
Profile Nipples	1,000
Wireline Work (As Tabulated)	3,000
Fishing Tool Rentals (As Tabulated)	7,000
Tubing Hydrotesting	4,000
Water Hauling	4,000
Devonian Stimulation	4,000
200' - 2-7/8" Blast Joints	2,500
TOTAL	\$105,000

BEFORE EXAMINER NUTTER OIL CONSERVATION COMMISSION	
<u>APR</u>	EXHIBIT NO. <u>7</u>
CASE NO. <u>4690</u>	
Submitted by _____	
Hearing Date <u>4-5-72</u>	

TABULATION OF GAS AND CONDENSATE
PRODUCTION FOR ANTELOPE RIDGE NO. 2

YEAR	MONTH	MORROW		DEVONIAN	
		GAS (MCF/Mo.)	CONDENSATE (BC/Mo.)	GAS (MCF/Mo.)	CONDENSATE (BC/Mo.)
1964	January	195,103	1,619		
	February	307,187	2,016		
	March	272,371	1,750		
	April	156,040	1,001		
	May	162,651	1,149		
	June	181,537	1,574		
	July	352,944	2,229		
	August	236,159	1,010		
	September				
	October				
	November				
	December	102,421	588		
1965	January				
	February				
	March				
	April	65,713	618	44,674	1,070
	May	109,436	312	107,432	5,727
	June	169,631	1,100	155,074	4,014
	July	7,147		341,123	8,034
	August	108,925	2,136	218,221	7,141
	September	107,127	2,130	125,904	2,985
	October	33,130	741	170,621	4,352
	November	27,270	537	212,358	5,960
	December	106,323	2,275	318,530	6,968
1966	January	128,567	2,921	362,432	8,007
	February	46,979	842	283,177	5,454
	March	34,999	816	235,831	4,866
	April	111,746	2,401	294,357	6,031
	May	181,613	1,399	261,835	5,471
	June	171,342	1,104	219,486	4,736
	July	220,591	1,149	196,625	3,434
	August	225,134	1,220	152,563	3,304
	September	162,004	853	140,733	2,651
	October	149,924	799	139,457	2,574
	November	194,738	619	111,510	2,239
	December	230,459	686	117,704	2,473
1967	January	205,932	1,124	124,292	2,760
	February	64,707	263	54,165	1,060
	March	53,294	127	87,192	2,468
	April	49,893	331	108,581	3,025
	May	51,314	25	107,782	3,503
	June	131,370	664	80,332	3,405
	July	127,161	681	117,361	2,433
	August	181,030	626	114,067	2,710
	September	70,311	818	83,806	2,040
	October	43,321		111,534	2,000
	November	101,577	609	85,606	2,267
	December	189,544	1,129	75,470	1,951

BEFORE EXAMINER NUTTER
OIL CONSERVATION COMMISSION
Appl. EXHIBIT NO. 8
CASE NO. 4690
Submitted by _____
Hearing Date 4-5-72

TABULATION OF GAS AND CONDENSATE
PRODUCTION FOR ANTELOPE RIDGE NO. 2 (CONT'D.)

2

YEAR	MONTH	MORROW		DEVONIAN	
		GAS (MCF/Mo.)	CONDENSATE (BC/Mo.)	GAS (MCF/Mo.)	CONDENSATE (BC/Mo.)
1968	January	148,314	538	74,734	1,674
	February	30,016	170	65,456	1,443
	March	126,864	547	60,486	2,139
	April	93,708	722	68,040	1,165
	May	77,164	660	96,710	1,294
	June	53,637	577	77,836	1,069
	July	60,566	597	84,484	1,160
	August	78,471	638	75,945	1,032
	September	48,336	795	56,409	1,107
	October	71,223	878	97,459	1,294
	November	83,639	1,067	86,451	966
	December	85,888	805	87,281	1,554
1969	January	112,695	1,308	58,099	1,183
	February	100,935	1,288	55,725	1,008
	March	114,262	1,295	75,426	1,451
	April	79,580	395	75,232	1,096
	May			93,463	1,118
	June			68,742	1,267
	July			55,524	1,135
	August			57,137	810
	September	24,108	24	44,490	1,082
	October	24,768	34	46,941	898
	November	77,515	437	46,915	530
	December	99,604	761	46,361	1,330
1970	January	88,896	741	37,901	1,060
	February	81,802	744	35,349	645
	March	73,929	605	38,101	1,019
	April	75,377	549	18,483	911
	May	64,197	479	40,713	964
	June	62,210	516	38,709	867
	July	69,308	613	36,825	943
	August	62,805	608	39,709	768
	September	55,136	547	35,114	745
	October	50,533	570	37,529	728
	November	70,993	597	38,931	781
	December	91,621	1,057	38,079	591
1971	January	109,439	661	40,265	978
	February	80,578	689	57,043	788
	March	69,764	755	44,712	874
	April	88,046	723	36,294	837
	May	78,371	681	35,634	838
	June	99,576	1,020	33,858	596
	July	98,555	937	38,666	835
	August	106,088	996	24,623	1,223
	September	91,700	1,150	15,579	50

7.9 billion

9.3 billion

7.9 billion

TABULATION OF GAS AND CONDENSATE
PRODUCTION FOR ANTELOPE RIDGE NO. 2 (CONT'D.)

3

YEAR	MONTH	MORROW-DEVONIAN	
		GAS (MCF/Mo.)	CONDENSATE (BC/Mo.)
1971	October*	40,000	400
	November*	28,930	247
	December*	47,190	403
1972	January*	45,030	400
	February**	0	0

*Production commingling occurred on October 1, 1972.
**Well has been shut in since February 1, 1972.

RECEIVED

APR 15 1972

CONSERVATION COMM.

BEFORE THE OIL CONSERVATION COMMISSION
OF THE STATE OF NEW MEXICO

APPLICATION OF SHELL OIL COMPANY
FOR MODIFICATION OF ORDER NO.
R-2787 TO PERMIT COMMINGLED
PRODUCTION.

NO. 4690

A P P L I C A T I O N

1. Applicant is the operator of Antelope Ridge No. 2 located 660 feet from the north line and 1,650 feet from the east line of Section 4, Township 24 South, Range 34 East, N.M.P.M., Lea County, New Mexico.


2. The subject well was completed in the Antelope Ridge - Morrow Pennsylvanian Gas Pool and in the Antelope Ridge - Devonian Gas Pool and by Order No. R-2787, applicant was granted permission to produce these two gas zones through parallel strings of tubing.

3. Since the entry of Order No. R-2787 on the 21st day of October, 1964, the down hole equipment in said well has become altered making it necessary to commingle the production of the Devonian and Morrow Pennsylvanian gases.

4. The granting of this application will prevent waste and protect correlative rights.

WHEREAS, applicant asks the Commission to enter its order amending Order No. R-2787 permitting the down hole commingling of produced gas from the Antelope Ridge - Morrow Pennsylvanian gas pool and the Antelope Ridge - Devonian gas pool.

MONTGOMERY, FEDERICI, ANDREWS,
HANNAHS & MORRIS

By 
Attorneys for Shell Oil Company

RECEIVED

Date 3-23-72

DRAFT

GMH/dr

BEFORE THE OIL CONSERVATION COMMISSION
OF THE STATE OF NEW MEXICO

IN THE MATTER OF THE HEARING
CALLED BY THE OIL CONSERVATION
COMMISSION OF NEW MEXICO FOR
THE PURPOSE OF CONSIDERING:

CASE No. 4690

Order No. R-4289

APPLICATION OF SHELL OIL COMPANY
FOR DOWNHOLE COMMINGLING, LEA
COUNTY, NEW MEXICO.

ORDER OF THE COMMISSION

BY THE COMMISSION:

This cause came on for hearing at 9 a.m. on April 5, 1972,
at Santa Fe, New Mexico, before Examiner Daniel S. Nutter.

NOW, on this day of April, 1972, the Commission, a
quorum being present, having considered the testimony, the record,
and the recommendations of the Examiner, and being fully advised
in the premises,

FINDS:

(1) That due public notice having been given as required by
law, the Commission has jurisdiction of this cause and the subject
matter thereof.

(2) That the applicant, Shell Oil Company, is the owner and
operator of the Antelope Ridge Well No. 2, a dual completion,
located in Unit B of Section 4, Township 24 South, Range 34 East,
NMPM, Lea County, New Mexico.

*Called Summer
Buell and
advised
Shell to turn
well on pending
issuance of
order
4/7/72*

(3) That pursuant to authority granted by Order No. R-2787 the subject well was completed as a dual completion (conventional) to produce ^{gas} ~~oil~~ from the Antelope Ridge-Morrow Pennsylvanian and Antelope Ridge-Devonian Gas Pools.

(4) That communication between the two zones developed in the Fall of 1971.

(5) That the applicant has made diligent efforts to repair the well.

(6) That during the efforts to repair the well a new high pressure zone in the Morrow formation was opened to the well-bore which makes workover attempts extremely hazardous.

(7) That ^{the} ~~a~~ new high pressure Morrow zone is believed to be of limited extent.

(8) That the applicant should be allowed to produce the well, commingling in the well-bore the production from the Devonian and Morrow zones, for one year or until such time as gas pressures have decreased to such an extent that the well can be safely repaired, whichever occurs first.

(9) That the applicant proposes to allocate production to each of the commingled zones upon the basis of the H₂S content of the commingled stream as compared to the H₂S content ^{of the Devonian gas from} ~~of its~~ ^A Antelope Ridge Well No. 3 located in Unit K of Section 34, ~~same~~ ^{23 South, Range 34 East.} Township ~~and Range.~~

(10) That the reservoir characteristics of the Antelope Ridge-Morrow Pennsylvanian and Antelope Ridge-Devonian zones in the subject well are such that underground waste would not be caused by the proposed commingling in the well-bore.

(11) That approval of the subject application will prevent waste and protect correlative rights.

IT IS THEREFORE ORDERED:

(1) That the applicant, Shell Oil Company, is hereby authorized to produce its Antelope Ridge Well No. 2, located in Unit B of Section 4, Township 24 South, Range 34 East, NMPM, Lea County, New Mexico, in such a manner as to produce gas from the Antelope Ridge-Morrow Pennsylvanian and Antelope Ridge-Devonian Gas Pools, commingling in the well-bore the production from said zones.

PROVIDED HOWEVER, that the operator shall so produce the subject well for a period of one year or until such time as gas pressures have decreased to such an extent that the well can be safely repaired, whichever occurs first.

(2) That the commingled production shall be allocated to the Antelope Ridge-Morrow Pennsylvanian and Antelope Ridge-Devonian zones upon the basis of the H_2S content of the commingled stream as compared to the H_2S content of ^{the Devonian gas from its} the Antelope Ridge Well No. 3 located in Unit K of Section 34, ^{Township 28 South, Range 34 East,} ~~same Township and Range~~ ^{as determined by gas analyses conducted at least once each month.}

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

DONE at Santa Fe, New Mexico, on the day and year hereinabove designated.

CASE 4691:MOTION OF OCC TO AMEND
GENERAL RULES & REGULATIONS
GOVERNING PRORATED GAS POOLS.