

CASE NO.

6553

APPLICATION,
TRANSCRIPTS,
SMALL EXHIBITS,
ETC.

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STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
Oil Conservation Division
State Land Office Building
Santa Fe, New Mexico
13 June 1979

EXAMINER HEARING

IN THE MATTER OF:)
)
)

Application of The Atlantic Rich-)
field Company for approval of in-)
fill drilling, Eddy County, New)
Mexico.)

CASE
6553

BEFORE: Daniel S. Nutter

TRANSCRIPT OF HEARING

A P P E A R A N C E S

For the Oil Conservation
Division:

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JERRY TWEED

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1 MR. NUTTER: Call Case Number 6533 -- 53.

2 MR. PADILLA: Application of The Atlantic
3 Richfield Company for approval of infill drilling, Eddy
4 County, New Mexico.

5 MR. COFFIELD: Conrad Coffield with the
6 Hinkle Law Firm of Midland, Texas, appearing on behalf of
7 the applicant, and I have one witness.

8
9 (Witness sworn.)

10
11 JERRY TWEED

12 being called as a witness and having been duly sworn upon
13 his oath, testified as follows, to-wit:

14
15 DIRECT EXAMINATION

16 BY MR. COFFIELD:

17 Q Mr. Tweed, would you please state your
18 name, address, occupation, and employer?

19 A Jerry Tweed of Midland, Texas. I am em-
20 ployed by ARCO Oil and Gas Company as a District Petroleum
21 Engineer.

22 Q And are you familiar with ARCO's applica-
23 tion in this case?

24 A Yes, I am.

25 Q And have you previously testified before

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1 the Oil Conservation Division as a petroleum engineer?

2 A Yes, I have.

3 Q And were your qualifications made a matter

4 of record and accepted by the Division?

5 A Yes, they were.

6 MR. COFFIELD: Is the witness considered

7 qualified?

8 MR. NUTTER: Yes, he is.

9 Q (Mr. Coffield continuing.) Mr. Tweed,

10 would you please give your -- state your connection with

11 the Empire Abo Unit?

12 A It's one of a number of fields that are

13 under my direct supervision.

14 Q Furthermore, are you familiar with testi-

15 mony and the record which was before this -- before the Oil

16 Conservation Division in Cases 4952, 4953, which were heard

17 on April 25, 1973, together with Cases Numbered 5211, 5212,

18 and 5213, heard on April 10, 1974?

19 A Yes, I am.

20 MR. COFFIELD: If the Examiner please,

21 reference will be made to these cases and we would respect-

22 fully request administrative notice be taken of the matters

23 which were considered in those cases.

24 MR. NUTTER: Administrative notice will

25 be taken of the hearing and the record in the cases cited

1 by counsel.

2 Q All right, Mr. Tweed, would you please
3 state briefly what ARCO Oil and Gas Company seeks by this
4 application?

5 A We're seeking a finding that the Division
6 waived existing well spacing requirements and found that
7 the drilling of additional wells was necessary to effective-
8 ly and efficiently drain those portions of the proration
9 units in the Empire Abo Unit, located in Townships 17 and
10 18 South, Ranges 27, 28, and 29 East, which could not be
11 so drained by existing wells.

12 Q And what else to you propose to show with
13 respect to --

14 A We will show that prior to ARCO's first
15 submittal of a request for approval of an infill location,
16 on September 10th, 1974, the Oil Conservation Division
17 had before it ample evidence on which to base the finding
18 of additional hydrocarbon recovery as stated above.

19 This was in the form of sworn testimony
20 at formal hearings, unit plans of operation, both formally
21 submitted into evidence at hearings and submitted regularly
22 to the Division for approval, as well as a report of a
23 detailed reservoir study submitted and discussed at an
24 informal meeting on May 11th, 1972.

25 Q May I interrupt just a moment, Mr. Tweed?

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1 With whom was that informal meeting? Did
2 that also involve the Oil Conservation Division?

3 A Yes, with members of the Oil Conservation
4 Division.

5 Q Mr. Tweed, please refer to what we've
6 marked as Exhibit One and explain what this represents.

7 A Okay. Exhibit One is a unit map, showing
8 all wells, including infill locations already completed,
9 there are some 141 infill wells that have been completed,
10 and those still to be completed. There are some 17 wells
11 still to be completed, as well as non-infill wells, both
12 those still producing, some 86, and those shut-in due to
13 high gas/oil ratios, some 126.

14 There are 17 gas injection wells and 2
15 water injection wells.

16 Q Mr. Tweed, refer to what's been marked as
17 Exhibit Two and explain this exhibit for us.

18 A This packet contains copies of all of
19 Empire Abo Unit infill well applications for administrative
20 approval under Order No. R-4549-B, Rule 14, "Special
21 Rules and Regulations for the Empire Abo Pressure Maintenance Project."
22

23 Also included are copies of the approval
24 letters from the Conservation Commission or Conservation
25 Division.

1 ARCO's letters generally contain a statement
2 similar to that in the first letter, dated September 10th,
3 1974, which states:

4 "The proposed drilling of Unit Wells
5 G-3301 and J-2101 will be necessary to complete a more
6 efficient producing pattern, promote the greatest ultimate
7 recovery of reserves, prevent waste, and protect correla-
8 tive rights."

9 The well numbers on these two wells were
10 subsequently changed to F-331 and J-211.

11 This packet also contains a table which
12 lists all approved infill wells, along with the date ap-
13 plication was submitted, phase, and completion status as
14 of 6-1-79.

15 Q Mr. Tweed, go to Exhibit Three, please,
16 and explain that to the Examiner.

17 A Exhibit Three is the first of a series
18 which are designed to show some of the wealth of reservoir
19 and production data that the Oil Conservation Division had
20 available prior to submittal of ARCO's first application
21 for an infill location.

22 In order for the Conservation Division to
23 determine that the infill wells would recover additional
24 oil, it was necessary for them to be aware of the following
25 facts:

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1 That this was a gravity drainage reservoir
2 with good vertical communication.

3 That there was an extensive, expanding
4 gas cap.

5 That individual producing wells had a
6 tendency to cone in gas, shortening their life and re-
7 ducing recovery.

8 That reserves would be increased by pro-
9 ducing the oil at low gas/oil ratios.

10 That the proposed infill wells were
11 being located so as to take advantage of the gravity
12 drainage mechanism.

13 Exhibit Three is a copy of a portion of
14 the transcript of the hearing on Case Number 4952, appli-
15 cation of Atlantic Richfield Company for a unit agreement,
16 and Case Number 4953, application of Atlantic Richfield
17 Company for a pressure maintenance project, Eddy County,
18 New Mexico, the cases having been consolidated and heard
19 by Examiner R. L. Stamets on April 25th, 1973.

20 The testimony is on page 14, lines 10
21 through 25. The witness is entering Exhibit Four, which
22 will also be entered in this hearing.

23 Q Okay, Mr. Tweed, go to Exhibit Four and
24 please explain what that is and what it represents.

25 A Exhibit Four is the same as presented in

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1 the hearing April 25th, 1973. It is a structure map on
2 top of the Abo porosity.

3 What it showed to the Conservation Divi-
4 sion and its technical staff back in April, 1973, was:

5 As the witness pointed out, it showed over
6 1000 feet of structural relief and hydrocarbon column.
7 Large structural relief occupied by hydrocarbons is import-
8 ant to effective gravity drainage recovery.

9 It shows that the Abo hydrocarbon reser-
10 voir is some 12-1/2 miles long by 1-1/2 miles in average
11 width.

12 This map would be useful for the Division
13 staff to verify that proposed infill locations were placed
14 to take good advantage of structural position in this
15 gravity drainage reservoir.

16 It shows the original gas cap was very
17 minor and located in the far west portion of the reservoir.
18 It's shown as a dotted line in the far west portion of the
19 reservoir, at --- at a minus 1750 feet subsea location.

20 It shows that the water table underlies
21 only a small part of the reservoir, mainly the far east
22 end, and therefore natural water influx is likely to be
23 minor in effect on recovery of hydrocarbons.

24 All right, Mr. Wood, refer to what we've
25 marked as Exhibits Five through Ten, inclusive, and ex-

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1 plain what these represent or show.

2 A Exhibits Five through Ten consist of
3 copies of a number of sheets from a transcript of the
4 April 25th, 1973 hearing.

5 ARCO's technical witness is presenting
6 several points which the Conservation Division technical
7 staff would know are indicative of a gravity drainage
8 reservoir.

9 On Exhibit Five the witness states that
10 production to 2-1-73 amounts to 23.4 percent of the origi-
11 nal oil in place. This is page 16, lines 4, 5, and 6.
12 The Division technical staff would know this is a sub-
13 stantially higher percentage recovery than a typical solu-
14 tion gas drive reservoir recovers all the way to depletion
15 and abandonment.

16 Exhibit Six, and yet it is further shown
17 that pressure decline with this large production has been
18 relatively small, from original of 2355 psi to 1418 psi.
19 This is on page --

20 MR. NUTTER: Wait a minute, now. I've
21 got two page 16s for Exhibits Five and Six. I think you
22 probably have another page for Exhibit Six.

23 Three 16s. Exhibit Seven is page 16.

24 A Yeah, that -- Exhibit Five was lines 4,
25 5, and 6.

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1 MR. NUTTER: Okay.

2 A Exhibit Six is lines 16 through 24.

3 MR. NUTTER: Of the same page?

4 A Yes, sir.

5 MR. NUTTER: Okay.

6 A I guess we could have showed them in one

7 exhibit.

8 MR. NUTTER: Okay. Go ahead.

9 A And what this shows, as I stated, is the

10 small amount of original pressure -- of pressure decline.

11 Original pressure was 2355 psi and it declined to 1418 psi

12 at the time of the hearing.

13 As a matter of interest, the current

14 pressure is 1160 psi as of December, 1978.

15 Exhibit Seven, the produced gas/oil ratio

16 has increased only slightly from original of 1100 cubic

17 feet per barrel to the current of 1300 to 1500 cubic feet

18 per barrel.

19 This is again page 16, lines 24 to 25,

20 and page 17, lines 1 through 9.

21 On Exhibit Eight, water production is

22 low. Only about 9 percent of the total water-oil production.

23 This is page 15a, lines 24, 25, and page 16, lines 1, 2,

24 3, and 4.

25 I might point out on line 2 I believe

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1 that's probably a typographical error there. They show
2 25,036 barrels of water per day. That should have been
3 2536 barrels per day.

4 Exhibit Nine, a secondary gas cap has
5 expanded to extend over most of the reservoir.

6 This is page 30, lines 20 through 26, and
7 page 31, lines 1 through 17.

8 Exhibit Ten, Field production history and
9 reservoir numeric models studies have demonstrated that
10 reservoir recovery is governed by a gravity drainage
11 mechanism.

12 Statement read from Unit Plan of Operation
13 by ARCO technical witness. Page 25a, lines 4, 5, and 6.

14 In summary, all points above were in the
15 sworn record prior to the Oil Conservation Division con-
16 sideration of the first ARCO infill proposal.

17 They show that the Division had plenty
18 of evidence to establish that the Empire Abo reservoir was
19 governed by gravity drainage with an overlying expanding
20 gas cap.

21 Q All right. Please refer to what we've
22 marked as Exhibits 11, 12, 13, and 14, and identify these,
23 please.

24 A First, having established as shown in
25 Exhibits Five through Ten that the Empire Abo reservoir

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1 recovery mechanism is governed by gravity drainage with an
2 expanding gas cap, the Division technical people would have
3 known what is widely known among experienced reservoir
4 engineers, that there are at least two major ways to in-
5 crease hydrocarbon recovery from such a reservoir.

6 They are, first, conservation of gas
7 energy, and that is to retain gas in the reservoir, void a
8 minimum of reservoir space per barrel of oil produced,
9 achieved by shutting in or curtailing inefficient, high
10 GOR, producers, aided by injection.

11 Second would be minimum -- minimize gas
12 coning into producing wells by dispersing withdrawal points
13 going to closer well spacing, especially mid- and down-
14 structure.

15 The Conservation Division would have seen
16 that ARCO's proposal to produce oil from the more efficient
17 infill wells, using them to replace production from inef-
18 ficient high GOR wells, would act toward achieving both
19 one and two above, hence increasing recovery.

20 But the Division also had much evidence
21 available to support this conclusion. Some of this evi-
22 dence will be shown in Exhibits Eleven through Fourteen.

23 The reservoir voidage efficiency factor
24 defined as the ratio of barrels of reservoir space voided
25 to barrels of stock tank oil produced is a good yardstick

1 for determining whether conservation of gas energy is going
2 on.

3 And Exhibit Eleven, this is a copy of a
4 portion of the transcript from Case Number 5212 and 5213,
5 application of Cities Service Oil Company for a unit agreement
6 and pressure maintenance project in a portion of Empire Abo
7 Pool.

8 The hearing was held on April 10th, 1974,
9 before Examiner Richard L. Stamets.

10 The ARCO technical witness testified that
11 a low reservoir voidage efficiency factor means you are
12 maintaining reservoir pressure better and the longer you
13 can hold the pressure up relative to oil production, the
14 more recovery you are going to have.

15 This transcript is page 61, lines 1
16 through 17, of Exhibit Eleven.

17 MR. NUTTER: Which is line 17, so I won't
18 have to count? These aren't numbered.

19 A It's the end of the paragraph.

20 MR. NUTTER: Okay.

21 A On Exhibit Twelve, here the ARCO techni-
22 cal witness testified that a reservoir voidage limit will
23 increase recovery and to quote, "It creates quite an in-
24 centive to go for the low ratio wells in terms of pro-
25 duction, and this is what you'd want to do in this reser-

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1 voir if you want to maximize ultimate recovery."

2 Also, with a voidage limit, operators will
3 "... try to get as low in the reef as they can and pro-
4 duce at as low a gas/oil ratio as they can ...".

5 There again this is Case 5212 and 13,
6 transcript page 92, lines 9 through 23, and page 93, lines
7 1 through 7.

8 Line 9 is the one right after the A and
9 the start of a new paragraph.

10 MR. NUTTER: And then it's the rest of
11 that paragraph?

12 A. Yes, sir, the rest of that page.

13 MR. NUTTER: All right.

14 A. And the first seven lines on the following
15 page.

16 MR. NUTTER: We've got that.

17 A. Okay, here is Exhibit Thirteen. I have
18 only one copy of this exhibit.

19 This is a copy of a report on ARCO's re-
20 servoir study prior to unitization, including results of
21 reservoir numeric model runs. Its purpose will be to show
22 the wealth of engineering data that the Division staff had
23 available prior to the infill well proposals, plus how
24 that data could show the potential for added recovery by
25 infill drilling.

1 The Exhibit Thirteen report, Field
2 Management Study, October and, 1970, was presented to
3 various members of the Oil Conservation Division staff by
4 ARCO representatives at a background meeting held May 11th,
5 1972 in Santa Fe, New Mexico.

6 Attending this meeting for the Conservation
7 Division were Messrs. A. L. Porter, Richard Stamets, Dan
8 Nutter, Elvis Utz, Jim Kapteina, and George Hatch.

9 This meeting lasted several hours and
10 ranged over every area of the reservoir mechanics and the
11 status of unitization at that time.

12 The ARCO review of the report included
13 field history, geology, performance, evidence of secondary
14 gas cap, gas cap "drape" along structure, details on how
15 the Reservoir Numeric Simulator was built and applied,
16 and how future projections were made, as to recovery.

17 It was pointed out that ARCO's method of
18 operations would be to shut in high GOR wells and trans-
19 fer production to low structure, low GOR locations, and
20 that shutting in high GOR wells to conserve gas cap gas
21 was equivalent in reservoir voidage terms to re-injecting
22 residue gas into the gas cap.

23 Key points in the report were that under
24 ultimate recovery under natural depletion was estimated to
25 be 172.6 million barrels. Ultimate recovery under uniti-

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1 zation, that's maximum gas conservation in the case, were
2 estimated to be 260.3 million barrels.

3 I think as the Commission knows, we later
4 did reinject residue gas and the ultimate recovery with the
5 reinjected residue gas was estimated to be 203, 203 million
6 barrels.

7 MR. NUTTER: This is the report that was
8 submitted at the time you did not have plans for reinjection
9 of residue gas.

10 A. That is correct. At the time that report
11 was submitted we did not have plans for reinjection.

12 The graphs of projected field performance
13 on pages 12A and 12B show the dramatic reserve increase
14 gained by maximizing oil production from low gas/oil ratio
15 wells. Relating the GOR versus time curve to the cumula-
16 tive oil production versus time curve, we see that under
17 maximum gas conservation that a cumulative GOR, or at a
18 GOR of 2500 to 1, under competitive natural depletion we
19 would recover 145 million barrels when we would reach that
20 GOR.

21 Under maximum gas conservation we would
22 recover 180 million barrels.

23 Competitive depletion to abandonment
24 ultimate recovery, competitive depletion would again be
25 172.6 million barrels. At maximum gas conservation it

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1 would be 200.3 million barrels.

2 As an item of interest, I think as of
3 June the 1st we had recovered approximately 178 million
4 barrels out of this reservoir.

5 Coning of gas, at the bottom of page 3
6 there is a list of wells which have required recompletion
7 lower to reduce high GOR.

8 At the top of page 4 gas coning is men-
9 tioned as a problem that has already shown up in the per-
10 formance of these wells.

11 The discussion of the future forecasts
12 went into the probability that coning of gas into pro-
13 ducing wells would be a factor in future reservoir per-
14 formance.

15 Referring to Exhibit Fourteen, this was
16 distributed at that meeting. It is a background report
17 on the type of coning simulator that was used in con-
18 junction with the field-wide model to forecast future
19 performance. A three-dimensional drawing of a single well
20 coning model was used to show development of a typical
21 gas cone.

22 The drawing was also used to examine the
23 coning phenomenon and discuss the fact that the chief
24 reason gas coning would be a problem in this reservoir
25 was the fact that vertical permeability was equal to hori-

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1 zontal permeability, and therefore, gas cap gas, much more
2 mobile than the oil, had to move vertically a matter of
3 only 200 feet or less to reach the perforated interval,
4 while the more viscous oil had to move much greater dis-
5 tances horizontally. This was especially true with the
6 40-acre spacing then in effect.

7 The point being made with the above
8 coning discussion rehash is that in May, 1972, before
9 submittal of the first infill application, which was Sep-
10 tember 10th, 1974, the Conservation Division staff had
11 enough background on gas coning flow mechanics in the
12 Empire Abo to be able to reach the same conclusion as ARCO
13 engineers, that closer spacing of the wells in the Abo
14 should result in recovery of additional oil due to reducing
15 gas coning effects.

16 In addition, dispersal of withdrawal
17 points can mean less pressure drawdown at each point,
18 therefore less tendency to cone gas, and greater recovery.

19 The Division staff also had prior informa-
20 tion on the added recovery to be gained by maximizing low
21 GOR production from sworn testimony and the ARCO Reservoir
22 Simulator results in the October 2nd, 1970 report.

23 Thus, they could see that the low GOR
24 production to come from the infill wells was going to in-
25 crease ultimate recovery.

Q Now, then, refer to what we've marked as Exhibit Fifteen, please, and explain what that shows.

A Exhibit Fifteen, this is a copy of the written portion of the first plan of operation proposed for the Empire Abo Unit, dated April 25th, 1973.

This plan was entered into evidence as Exhibit Six of Case Number 4952 and Case Number 4953, application of Atlantic Richfield Company for a unit agreement and for a pressure maintenance project, heard before Examiner R. L. Stamets on April 25th, 1973.

Entry of the plan of operation into evidence is made on the transcript on page 23, line 10.

Discussion continues through page 28, line 19.

The plan of operations contains a great deal of background material that could have been used by the Conservation Division in a determination of added recovery resulting from infill drilling.

Following are several examples:

On page 3, under "1. Project Area, history, and background", in the second paragraph, fourth through seventh lines from the top we see, "Vugs, fractures, and fissures have been observed in cores throughout the main reef with local anhydrite -- in cores throughout the main reef, excuse me, with local anhydrite infilling sometimes restricting flow."

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1 In applying this statement to the infill
2 drilling proposals, the Conservation Division could have
3 reasoned, as ARCO engineers did, that increasing well
4 density might recover some added oil by drilling into zones
5 where anhydrite infilling or other irregularities would
6 have prevented flow to wells on wider spacing.

7 On page four, first paragraph, lines 4
8 through 7 down from the top, we see, "Field performance
9 and detailed study of cores indicate excellent vertical
10 permeability. The principal producing mechanism is gravity
11 drainage with an expanding gas cap."

12 On page four, second paragraph, lines 6
13 through 9 from the top, we see, "Unitized residue gas
14 injection for pressure maintenance is calculated to in-
15 crease future recovery by about 30 million barrels compared
16 to continued primary operations."

17 In comparing this 30 million barrels
18 gain from residue gas injection to the 27.7 million bar-
19 rels gain over primary by simply maximizing production from
20 low GOR wells, the Conservation Division could have reasoned
21 that control of the GOR was more important to added recovery
22 than gas injection, and addition of the infill wells at
23 low GORs would help control the overall GOR.

24 On page four we see, "Basic Concepts
25 Governing Future Unit Operations.

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1 Field production history and reservoir
2 numeric model studies have demonstrated that reservoir
3 recovery is governed by a gravity drainage mechanism. With
4 unitization the operator will be able to maximize benefi-
5 cial effects of this most efficient recovery mechanism by
6 careful observation of well performance and shutting in or
7 curtailing production from inefficient wells."

8 The Conservation Division could have seen
9 the infill wells as a chance to replace the production
10 from inefficient high GOR wells, thus gaining reserves.

11 Q Mr. Tweed, go to what we've marked as
12 Exhibit Sixteen and explain that to the Examiner.

13 A This is a table listing several studies
14 that ARCO has made to determine added reserves resulting
15 from infill drilling.

16 To summarize ARCO's reservoir studies re-
17 lating to infill drilling:

18 a. The study covered in the October 2nd,
19 1970 report showed added recovery by keeping the producing
20 GOR low.

21 The 8-74 study was preliminary but was to
22 justify the first two infill wells. The 8-74 study was
23 just a preliminary study to determine if enough additional
24 recovery could be obtained from the new wells to make it
25 economical. It did show that it would be economical to

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1 drill the infill wells and therefore, we proceeded.

2 The 1975 study took more factors into ac-
3 count and evaluated 20-acre spacing. And you might see at
4 that time, the 1975 study indicated that we would recover
5 some 100,000 barrels per well additional recovery due to
6 the infill drilling program.

7 The 1977 study was the more complete
8 reservoir model and evaluated both 20-acre and 10-acre
9 development. This study indicated that the average of
10 the 153 wells we proposed to drill would recover -- the
11 average well would recover some 92,000 barrels.

12 Of course, these studies were necessary
13 to get a better fix on added reserves as more data and more
14 sophisticated simulators became available and to evaluate
15 conomic benefits.

16 Having done these studies, ARCO then
17 sought and received administrative approval rather than a
18 formal hearing. In doing this we felt that the Conserva-
19 tion Division and its staff, with their solid technical
20 abilities and considerable background in the Empire Abo
21 reservoir mechanics, would see that there are indeed in-
22 creased reserves to be gained from infill drilling.

23 In addition, I might point out that all
24 of our studies, especially our 1977 study, which was the
25 most sophisticated numeric simulator that we run, indicated

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1 that the total recovery from all of our infill drilling
2 would be some 14,510,000 barrels.

3 He had submitted to the Commission on our
4 original hearing a -- okay, it was in NMOCB Order R-4549,
5 Attachment B, was a table of gas volume factors versus
6 reservoir pressure. At that time our estimate was, and
7 still is, that the abandoned pressure of the reservoir
8 would be 100 psia. At that, at that pressure a barrel of
9 oil would have 180 standard cubic feet of gas still in
10 solution. The additional recovery of some 14,560,000
11 barrels would thus recover some additional 2,611,800 Mcf
12 of gas.

13 Q Okay, Mr. Tweed, in your opinion what
14 will be your -- what has been the effect of ARCO's infill
15 drilling program as you've discussed it here today?

16 A The effect of ARCO's infill drilling pro-
17 gram has been to increase the recovery of hydrocarbon re-
18 serves from the reservoir both due to the closer spacing
19 to take advantage of the heterogeneity of the reservoir to
20 reduce the effect of coning, and also to allow more pro-
21 duction at lower GOR -- more efficient low GOR wells than
22 high GOR production.

23 I might add that as of 5-1-79 the 129
24 infill wells that were on production had recovered some
25 16,292,000 barrels of oil.

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1 Q Do you have anything else to add, Mr.
2 Tweed?

3 A No, not other than the fact that in my
4 opinion the infill drilling of these wells is necessary to
5 effectively and efficiently recover reserves that would
6 not otherwise have been recovered.

7 Q All right, Mr. Tweed, were these exhibits
8 One through Sixteen either prepared or assembled by you
9 or under your supervision?

10 A Yes, they were.

11 MR. COFFIELD: I move the admission of
12 Exhibits One through Sixteen.

13 MR. NUTTER: ARCO Exhibits One through
14 Sixteen will be admitted.

15 MR. COFFIELD: I have no further questions
16 on direct examination.

17
18 CROSS EXAMINATION

19 BY MR. NUTTER:

20 Q Mr. Tweed, I presume what we're seeking
21 here is actually a sort of a retroactive order, isn't it,
22 that we would find that when we originally approved this
23 infill drilling program that these wells were necessary
24 to effectively and efficiently -- and more efficiently
25 drain those production units that they're located on.

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1 A Yes, sir, that is correct.

2 Q And what you've attempted to do here today
3 is to go back and bring forth some of the testimony and
4 the exhibits that were presented at the previous hearings
5 that are aimed in that direction to show that those wells
6 were necessary.

7 A Yes, sir. This, I think this evidence
8 presented shows the Commission had a preponderance of data
9 and evidence, reservoir data in front of it, that they could
10 easily have made the determination.

11 Q And while we didn't actually make those
12 findings, that these wells were necessary to more effi-
13 ciently and effectively drain the proration unit that's
14 not being so drained, those are words out of the NGPA that
15 have just been adopted in the last few months.

16 A That is correct. It was certainly implied
17 or known that they were needed and an administrative pro-
18 cedure was set up for the approval of that additional in-
19 fill wells.

20 Q And what we were trying to do was get
21 more efficient drainage, even if we didn't say so.

22 A Yes, sir, that's correct.

23 MR. MUSTER: Are there any further ques-
24 tions of Mr. Tweed? He may be excused.

25 Do you have anything further, Mr. Coffield?

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MR. COFFIELD: No, sir, I don't.

MR. NUTTER: Does anyone have anything
they wish to offer in Case Number 6553?

We'll take the case under advisement.

(Hearing concluded.)

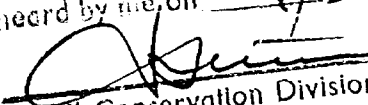
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REPORTER'S CERTIFICATE

I, SALLY WALTON BOYD, a Court Reporter, DO HEREBY CERTIFY that the foregoing and attached Transcript of Hearing before the Oil Conservation Division was reported by me; that said transcript is a full, true, and correct record of the hearing, prepared by me to the best of my ability, knowledge, and skill, from my notes taken at the time of the hearing.

Sally W. Boyd, C.S.R.

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 6553 heard by me, on 6/13 1979.

 Examiner
Oil Conservation Division

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STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
Oil Conservation Division
State Land Office Building
Santa Fe, New Mexico
13 June 1979

EXAMINER HEARING

IN THE MATTER OF:

Application of The Atlantic Rich-) CASE
field Company for approval of in-) 6553
fill drilling, Eddy County, New)
Mexico.)

BEFORE: Daniel S. Nutter

TRANSCRIPT OF HEARING

A P P E A R A N C E S

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Legal Counsel for the Division
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JERRY TWEED

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1 MR. NUTTER: Call Case Number 6533 -- 53.

2 MR. PADILLA: Application of The Atlantic
3 Richfield Company for approval of infill drilling, Eddy
4 County, New Mexico.

5 MR. COFFIELD: Conrad Coffield with the
6 Hinkle Law Firm of Midland, Texas, appearing on behalf of
7 the applicant, and I have one witness.

8
9 (Witness sworn.)

10
11 JERRY TWEED
12 being called as a witness and having been duly sworn upon
13 his oath, testified as follows, to-wit:

14
15 DIRECT EXAMINATION

16 BY MR. COFFIELD:

17 Q Mr. Tweed, would you please state your
18 name, address, occupation, and employer?

19 A Jerry Tweed of Midland, Texas. I am em-
20 ployed by ARCO Oil and Gas Company as a District Petroleum
21 Engineer.

22 Q And are you familiar with ARCO's applica-
23 tion in this case?

24 A Yes, I am.

25 Q And have you previously testified before

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1 the Oil Conservation Division as a petroleum engineer?

2 A. Yes, I have.

3 Q And were your qualifications made a matter
4 of record and accepted by the Division?

5 A. Yes, they were.

6 MR. COFFIELD: Is the witness considered
7 qualified?

8 MR. NUTTER: Yes, he is.

9 Q (Mr. Coffield continuing.) Mr. Tweed,
10 would you please give your -- state your connection with
11 the Empire Abo Unit?

12 A. It's one of a number of fields that are
13 under my direct supervision.

14 Q Furthermore, are you familiar with testi-
15 mony and the record which was before this -- before the Oil
16 Conservation Division in Cases 4952, 4953, which were heard
17 on April 25, 1973, together with Cases Numbered 5211, 5212,
18 and 5213, heard on April 10, 1974?

19 A. Yes, I am.

20 MR. COFFIELD: If the Examiner please,
21 reference will be made to these cases and we would respect-
22 fully request administrative notice be taken of the matters
23 which were considered in those cases.

24 MR. NUTTER: Administrative notice will
25 be taken of the hearing and the record in the cases cited

1 by counsel.

2 Q All right, Mr. Tweed, would you please
3 state briefly what ARCO Oil and Gas Company seeks by this
4 application?

5 A We're seeking a finding that the Division
6 waived existing well spacing requirements and found that
7 the drilling of additional wells was necessary to effective-
8 ly and efficiently drain those portions of the proration
9 units in the Empire Abo Unit, located in Townships 17 and
10 18 South, Ranges 27, 28, and 29 East, which could not be
11 so drained by existing wells.

12 Q And what else do you propose to show with
13 respect to --

14 A We will show that prior to ARCO's first
15 submittal of a request for approval of an infill location,
16 on September 10th, 1974, the Oil Conservation Division
17 had before it ample evidence on which to base the finding
18 of additional hydrocarbon recovery as stated above.

19 This was in the form of sworn testimony
20 at formal hearings, unit plans of operation, both formally
21 submitted into evidence at hearings and submitted regularly
22 to the Division for approval, as well as a report of a
23 detailed reservoir study submitted and discussed at an
24 informal meeting on May 11th, 1972.

25 Q May I interrupt just a moment, Mr. Tweed?

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1 With whom was that informal meeting? Did
2 that also involve the Oil Conservation Division?

3 A. Yes, with members of the Oil Conservation
4 Division.

5 Q. Mr. Tweed, please refer to what we've
6 marked as Exhibit One and explain what this represents.

7 A. Okay. Exhibit One is a unit map, showing
8 all wells, including infill locations already completed,
9 there are some 141 infill wells that have been completed,
10 and those still to be completed. There are some 17 wells
11 still to be completed, as well as non-infill wells, both
12 those still producing, some 86, and those shut-in due to
13 high gas/oil ratios, some 126.

14 There are 17 gas injection wells and 2
15 water injection wells.

16 Q. Mr. Tweed, refer to what's been marked as
17 Exhibit Two and explain this exhibit for us.

18 A. This packet contains copies of all of
19 Empire Abo Unit infill well applications for administrative
20 approval under Order No. R-4549-B, Rule 14, "Special
21 Rules and Regulations for the Empire Abo Pressure Maintenance Project."
22

23 Also included are copies of the approval
24 letters from the Conservation Commission or Conservation
25 Division.

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1 ARCO's letters generally contain a statement
2 similar to that in the first letter, dated September 10th,
3 1974, which states:

4 "The proposed drilling of Unit Wells
5 G-3301 and J-2101 will be necessary to complete a more
6 efficient producing pattern, promote the greatest ultimate
7 recovery of reserves, prevent waste, and protect correla-
8 tive rights."

9 The well numbers on these two wells were
10 subsequently changed to F-331 and J-211.

11 This packet also contains a table which
12 lists all approved infill wells, along with the date ap-
13 plication was submitted, phase, and completion status as
14 of 6-1-79.

15 Q Mr. Tweed, go to Exhibit Three, please,
16 and explain that to the Examiner.

17 A Exhibit Three is the first of a series
18 which are designed to show some of the wealth of reservoir
19 and production data that the Oil Conservation Division had
20 available prior to submittal of ARCO's first application
21 for an infill location.

22 In order for the Conservation Division to
23 determine that the infill wells would recover additional
24 oil, it was necessary for them to be aware of the following
25 facts:

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1 That this was a gravity drainage reservoir
2 with good vertical communication.

3 That there was an extensive, expanding
4 gas cap.

5 That individual producing wells had a
6 tendency to cone in gas, shortening their life and re-
7 ducing recovery.

8 That reserves would be increased by pro-
9 ducing the oil at low gas/oil ratios.

10 That the proposed infill wells were
11 being located so as to take advantage of the gravity
12 drainage mechanism.

13 Exhibit Three is a copy of a portion of
14 the transcript of the hearing on Case Number 4952, appli-
15 cation of Atlantic Richfield Company for a unit agreement,
16 and Case Number 4953, application of Atlantic Richfield
17 Company for a pressure maintenance project, Eddy County,
18 New Mexico, the cases having been consolidated and heard
19 by Examiner R. L. Stamets on April 25th, 1973.

20 The testimony is on page 14, lines 10
21 through 25. The witness is entering Exhibit Four, which
22 will also be entered in this hearing.

23 Q Okay, Mr. Tweed, go to Exhibit Four and
24 please explain what that is and what it represents.

25 A Exhibit Four is the same as presented in

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1 the hearing April 25th, 1973. It is a structure map on
2 top of the Abo porosity.

3 What it showed to the Conservation Divi-
4 sion and its technical staff back in April, 1973, was:

5 As the witness pointed out, it showed over
6 1000 feet of structural relief and hydrocarbon column.
7 Large structural relief occupied by hydrocarbons is import-
8 ant to effective gravity drainage recovery.

9 It shows that the Abo hydrocarbon reser-
10 voir is some 12-1/2 miles long by 1-1/2 miles in average
11 width.

12 This map would be useful for the Division
13 staff to verify that proposed infill locations were placed
14 to take good advantage of structural position in this
15 gravity drainage reservoir.

16 It shows the original gas cap was very
17 minor and located in the far west portion of the reservoir.
18 It's shown as a dotted line in the far west portion of the
19 reservoir, at -- at a minus 1750 feet subsea location.

20 It shows that the water table underlies
21 only a small part of the reservoir, mainly the far east
22 end, and therefore natural water influx is likely to be
23 minor in effect on recovery of hydrocarbons.

24 Q All right, Mr. Tweed, refer to what we've
25 marked as Exhibits Five through Ten, inclusive, and ex-

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1 plain what these represent or show.

2 A. Exhibits Five through Ten consist of
3 copies of a number of sheets from a transcript of the
4 April 25th, 1973 hearing.

5 ARCO's technical witness is presenting
6 several points which the Conservation Division technical
7 staff would know are indicative of a gravity drainage
8 reservoir.

9 On Exhibit Five the witness states that
10 production to 2-1-73 amounts to 23.4 percent of the orig-
11 inal oil in place. This is page 16, lines 4, 5, and 6.
12 The Division technical staff would know this is a sub-
13 stantially higher percentage recovery than a typical solu-
14 tion gas drive reservoir recovers all the way to depletion
15 and abandonment.

16 Exhibit Six, and yet it is further shown
17 that pressure decline with this large production has been
18 relatively small, from original of 2355 psi to 1418 psi.
19 This is on page --

20 MR. NUTTER: Wait a minute, now. I've
21 got two page 16s for Exhibits Five and Six. I think you
22 probably have another page for Exhibit Six.

23 Three 16s. Exhibit Seven is page 16.

24 A. Yeah, that -- Exhibit Five was lines 4,
25 5, and 6.

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1 MR. NUTTER: Okay.

2 A. Exhibit Six is lines 16 through 24.

3 MR. NUTTER: Of the same page?

4 A. Yes, sir.

5 MR. NUTTER: Okay.

6 A. I guess we could have showed them in one
7 exhibit.

8 MR. NUTTER: Okay. Go ahead.

9 A. And what this shows, as I stated, is the
10 small amount of original pressure -- of pressure decline.
11 Original pressure was 2355 psi and it declined to 1418 psi
12 at the time of the hearing.

13 As a matter of interest, the current
14 pressure is 1160 psi as of December, 1978.

15 Exhibit Seven, the produced gas/oil ratio
16 has increased only slightly from original of 1100 cubic
17 feet per barrel to the current of 1300 to 1500 cubic feet
18 per barrel.

19 This is again page 16, lines 24 to 25,
20 and page 17, lines 1 through 9.

21 On Exhibit Eight, water production is
22 low. Only about 9 percent of the total water-oil production.
23 This is page 15a, lines 24, 25, and page 16, lines 1, 2,
24 3, and 4.

25 I might point out on line 2 I believe

1 that's probably a typographical error there. They show
2 25,036 barrels of water per day. That should have been
3 2536 barrels per day.

4 Exhibit Nine, a secondary gas cap has
5 expanded to extend over most of the reservoir.

6 This is page 30, lines 20 through 26, and
7 page 31, lines 1 through 17.

8 Exhibit Ten, Field production history and
9 reservoir numeric models studies have demonstrated that
10 reservoir recovery is governed by a gravity drainage
11 mechanism.

12 Statement read from Unit Plan of Operation
13 by ARCO technical witness. Page 25a, lines 4, 5, and 6.

14 In summary, all points above were in the
15 sworn record prior to the Oil Conservation Division con-
16 sideration of the first ARCO infill proposal.

17 They show that the Division had plenty
18 of evidence to establish that the Empire Abo reservoir was
19 governed by gravity drainage with an overlying expanding
20 gas cap.

21 Q. All right. Please refer to what we've
22 marked as Exhibits 11, 12, 13, and 14, and identify these,
23 please.

24 A. First, having established as shown in
25 Exhibits Five through Ten that the Empire Abo reservoir

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1 recovery mechanism is governed by gravity drainage with an
2 expanding gas cap, the Division technical people would have
3 known what is widely known among experienced reservoir
4 engineers, that there are at least two major ways to in-
5 crease hydrocarbon recovery from such a reservoir.

6 They are, first, conservation of gas
7 energy, and that is to retain gas in the reservoir, void a
8 minimum of reservoir space per barrel of oil produced,
9 achieved by shutting in or curtailing inefficient, high
10 GOR, producers, aided by injection.

11 Second would be minimum -- minimize gas
12 coning into producing wells by dispersing withdrawal points
13 going to closer well spacing, especially mid- and down-
14 structure.

15 The Conservation Division would have seen
16 that ARCO's proposal to produce oil from the more efficient
17 infill wells, using them to replace production from inef-
18 ficient high GOR wells, would act toward achieving both
19 one and two above, hence increasing recovery.

20 But the Division also had much evidence
21 available to support this conclusion. Some of this evi-
22 dence will be shown in Exhibits Eleven through Fourteen.

23 The reservoir voidage efficiency factor
24 defined as the ratio of barrels of reservoir space voided
25 to barrels of stock tank oil produced is a good yardstick

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1 for determining whether conservation of gas energy is going
2 on.

3 And Exhibit Eleven, this is a copy of a
4 portion of the transcript from Case Number 5212 and 5213,
5 application of Cities Service Oil Company for a unit agreement
6 and pressure maintenance project in a portion of Empire Abo
7 Pool.

8 The hearing was held on April 10th, 1974,
9 before Examiner Richard L. Stamets.

10 The ARCO technical witness testified that
11 a low reservoir voidage efficiency factor means you are
12 maintaining reservoir pressure better and the longer you
13 can hold the pressure up relative to oil production, the
14 more recovery you are going to have.

15 This transcript is page 61, lines 1
16 through 17, of Exhibit Eleven.

17 MR. NUTTER: Which is line 17, so I won't
18 have to count? These aren't numbered.

19 A. It's the end of the paragraph.

20 MR. NUTTER: Okay.

21 A. On Exhibit Twelve, here the ARCO techni-
22 cal witness testified that a reservoir voidage limit will
23 increase recovery and to quote, "It creates quite an in-
24 centive to go for the low ratio wells in terms of pro-
25 duction, and this is what you'd want to do in this reser-

1 voir if you want to maximize ultimate recovery."

2 Also, with a voidage limit, operators will
3 "... try to get as low in the reef as they can and pro-
4 duce at as low a gas/oil ratio as they can ...".

5 There again this is Case 5212 and 13,
6 transcript page 92, lines 9 through 23, and page 93, lines
7 1 through 7.

8 Line 9 is the one right after the A and
9 the start of a new paragraph.

10 MR. NUTTER: And then it's the rest of
11 that paragraph?

12 A. Yes, sir, the rest of that page.

13 MR. NUTTER: All right.

14 A. And the first seven lines on the following
15 page.

16 MR. NUTTER: We've got that.

17 A. Okay, here is Exhibit Thirteen. I have
18 only one copy of this exhibit.

19 This is a copy of a report on ARCO's re-
20 servoir study prior to unitization, including results of
21 reservoir numeric model runs. Its purpose will be to show
22 the wealth of engineering data that the Division staff had
23 available prior to the infill well proposals, plus how
24 that data could show the potential for added recovery by
25 infill drilling.

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1 The Exhibit Thirteen report, Field
2 Management Study, October 2nd, 1970, was presented to
3 various members of the Oil Conservation Division staff by
4 ARCO representatives at a background meeting held May 11th,
5 1972 in Santa Fe, New Mexico.

6 Attending this meeting for the Conservation
7 Division were Messrs. A. L. Porter, Richard Stamets, Dan
8 Nutter, Elvis Utz, Jim Kapteina, and George Hatch.

9 This meeting lasted several hours and
10 ranged over every area of the reservoir mechanics and the
11 status of unitization at that time.

12 The ARCO review of the report included
13 field history, geology, performance, evidence of secondary
14 gas cap, gas cap "drape" along structure, details on how
15 the Reservoir Numeric Simulator was built and applied,
16 and how future projections were made, as to recovery.

17 It was pointed out that ARCO's method of
18 operations would be to shut in high GOR wells and trans-
19 fer production to low structure, low GOR locations, and
20 that shutting in high GOR wells to conserve gas cap gas
21 was equivalent in reservoir voidage terms to re-injecting
22 residue gas into the gas cap.

23 Key points in the report were that under
24 ultimate recovery under natural depletion was estimated to
25 be 172.6 million barrels. Ultimate recovery under uniti-

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1 zation, that's maximum gas conservation in the case, were
2 estimated to be 200.3 million barrels.

3 I think as the Commission knows, we later
4 did reinject residue gas and the ultimate recovery with the
5 reinjected residue gas was estimated to be 203, 203 million
6 barrels.

7 MR. NUTTER: This is the report that was
8 submitted at the time you did not have plans for reinjection
9 of residue gas.

10 A. That is correct. At the time that report
11 was submitted we did not have plans for reinjection.

12 The graphs of projected field performance
13 on pages 12A and 12B show the dramatic reserve increase
14 gained by maximizing oil production from low gas/oil ratio
15 wells. Relating the GOR versus time curve to the cumula-
16 tive oil production versus time curve, we see that under
17 maximum gas conservation that a cumulative GOR, or at a
18 GOR of 2500 to 1, under competitive natural depletion we
19 would recover 145 million barrels when we would reach that
20 GOR.

21 Under maximum gas conservation we would
22 recover 180 million barrels.

23 Competitive depletion to abandonment
24 ultimate recovery, competitive depletion would again be
25 172.6 million barrels. At maximum gas conservation it

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1 would be 200.3 million barrels.

2 As an item of interest, I think as of
3 June the 1st we had recovered approximately 178 million
4 barrels out of this reservoir.

5 Coning of gas, at the bottom of page 3
6 there is a list of wells which have required recompletion
7 lower to reduce high GOR.

8 At the top of page 4 gas coning is men-
9 tioned as a problem that has already shown up in the per-
10 formance of these wells.

11 The discussion of the future forecasts
12 went into the probability that coning of gas into pro-
13 ducing wells would be a factor in future reservoir per-
14 formance.

15 Referring to Exhibit Fourteen, this was
16 distributed at that meeting. It is a background report
17 on the type of coning simulator that was used in con-
18 junction with the field-wide model to forecast future
19 performance. A three-dimensional drawing of a single well
20 coning model was used to show development of a typical
21 gas cone.

22 The drawing was also used to examine the
23 coning phenomenon and discuss the fact that the chief
24 reason gas coning would be a problem in this reservoir
25 was the fact that vertical permeability was equal to hori-

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1 zontal permeability, and therefore, gas cap gas, much more
2 mobile than the oil, had to move vertically a matter of
3 only 200 feet or less to reach the perforated interval,
4 while the more viscous oil had to move much greater dis-
5 tances horizontally. This was especially true with the
6 40-acre spacing then in effect.

7 The point being made with the above
8 coning discussion rehash is that in May, 1972, before
9 submittal of the first infill application, which was Sep-
10 tember 10th, 1974, the Conservation Division staff had
11 enough background on gas coning flow mechanics in the
12 Empire Abo to be able to reach the same conclusion as ARCO
13 engineers, that closer spacing of the wells in the Abo
14 should result in recovery of additional oil due to reducing
15 gas coning effects.

16 In addition, dispersal of withdrawal
17 points can mean less pressure drawdown at each point,
18 therefore less tendency to cone gas, and greater recovery.

19 The Division staff also had prior informa-
20 tion on the added recovery to be gained by maximizing low
21 GOR production from sworn testimony and the ARCO Reservoir
22 Simulator results in the October 2nd, 1970 report.

23 Thus, they could see that the low GOR
24 production to come from the infill wells was going to in-
25 crease ultimate recovery.

1 Q Mr. Tweed, refer to what we've marked as
2 Exhibit Fifteen, please, and explain what that shows.

3 A Exhibit Fifteen, this is a copy of the
4 written portion of the first plan of operation proposed for
5 the Empire Abo Unit, dated April 25th, 1973.

6 This plan was entered into evidence as
7 Exhibit Six of Case Number 4952 and Case Number 4953, ap-
8 plication of Atlantic Richfield Company for a unit agreement
9 and for a pressure maintenance project, heard before
10 Examiner R. L. Stamets on April 25th, 1973.

11 Entry of the plan of operation into evi-
12 dence is made on the transcript on page 23, line 10.

13 Discussion continues through page 28, line 19.

14 The plan of operations contains a great
15 deal of background material that could have been used by
16 the Conservation Division in a determination of added re-
17 covery resulting from infill drilling.

18 Following are several examples:

19 On page 3, under "1. Project Area, his-
20 tory, and background", in the second paragraph, fourth
21 through seventh lines from the top we see, "Vugs, fractures,
22 and fissures have been observed in cones throughout the
23 main reef with local anhydrite -- in cores throughout the
24 main reef, excuse me, with local anhydrite infilling some-
25 times restricting flow."

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1 In applying this statement to the infill
2 drilling proposals, the Conservation Division could have
3 reasoned, as ARCO engineers did, that increasing well
4 density might recover some added oil by drilling into zones
5 where anhydrite infilling or other irregularities would
6 have prevented flow to wells on wider spacing.

7 On page four, first paragraph, lines 4
8 through 7 down from the top, we see, "Field performance
9 and detailed study of cores indicate excellent vertical
10 permeability. The principal producing mechanism is gravity
11 drainage with an expanding gas cap."

12 On page four, second paragraph, lines 6
13 through 9 from the top, we see, "Unitized residue gas
14 injection for pressure maintenance is calculated to in-
15 crease future recovery by about 30 million barrels compared
16 to continued primary operations."

17 In comparing this 30 million barrels
18 gain from residue gas injection to the 27.7 million bar-
19 rels gain over primary by simply maximizing production from
20 low GOR wells, the Conservation Division could have reasoned
21 that control of the GOR was more important to added recovery
22 than gas injection, and addition of the infill wells at
23 low GORs would help control the overall GOR.

24 On page four we see, "Basic Concepts
25 Governing Future Unit Operations.

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1 Field production history and reservoir
2 numeric model studies have demonstrated that reservoir
3 recovery is governed by a gravity drainage mechanism. With
4 unitization the operator will be able to maximize benefi-
5 cial effects of this most efficient recovery mechanism by
6 careful observation of well performance and shutting in or
7 curtailing production from inefficient wells."

8 The Conservation Division could have seen
9 the infill wells as a chance to replace the production
10 from inefficient high GOR wells, thus gaining reserves.

11 Q Mr. Tweed, go to what we've marked as
12 Exhibit Sixteen and explain that to the Examiner.

13 A This is a table listing several studies
14 that ARCO has made to determine added reserves resulting
15 from infill drilling.

16 To summarize ARCO's reservoir studies re-
17 lating to infill drilling:

18 a. The study covered in the October 2nd,
19 1970 report showed added recovery by keeping the producing
20 GOR low.

21 The 8-74 study was preliminary but was to
22 justify the first two infill wells. The 8-74 study was
23 just a preliminary study to determine if enough additional
24 recovery could be obtained from the new wells to make it
25 economical. It did show that it would be economical to

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1 drill the infill wells and therefore, we proceeded.

2 The 1975 study took more factors into ac-
3 count and evaluated 20-acre spacing. And you might see at
4 that time, the 1975 study indicated that we would recover
5 some 100,000 barrels per well additional recovery due to
6 the infill drilling program.

7 The 1977 study was the more complete
8 reservoir model and evaluated both 20-acre and 10-acre
9 development. This study indicated that the average of
10 the 158 wells we proposed to drill would recover -- the
11 average well would recover some 92,000 barrels.

12 Of course, these studies were necessary
13 to get a better fix on added reserves as more data and more
14 sophisticated simulators became available and to evaluate
15 conomic benefits.

16 Having done these studies, ARCO then
17 sought and received administrative approval rather than a
18 formal hearing. In doing this we felt that the Conserva-
19 tion Division and its staff, with their solid technical
20 abilities and considerable background in the Empire Abo
21 reservoir mechanics, would see that there are indeed in-
22 creased reserves to be gained from infill drilling.

23 In addition, I might point out that all
24 of our studies, especially our 1977 study, which was the
25 most sophisticated numeric simulator that we run, indicated

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1 that the total recovery from all of our infill drilling
2 would be some 14,510,000 barrels.

3 We had submitted to the Commission on our
4 original hearing a -- okay, it was in NMOCD Order R-4549,
5 Attachment B, was a table of gas volume factors versus
6 reservoir pressure. At that time our estimate was, and
7 still is, that the abandoned pressure of the reservoir
8 would be 100 psia. At that, at that pressure a barrel of
9 oil would have 180 standard cubic feet of gas still in
10 solution. The additional recovery of some 14,560,000
11 barrels would thus recover some additional 2,611,800 Mcf
12 of gas.

13 Q Okay, Mr. Tweed, in your opinion what
14 will be your -- what has been the effect of ARCO's infill
15 drilling program as you've discussed it here today?

16 A The effect of ARCO's infill drilling pro-
17 gram has been to increase the recovery of hydrocarbon re-
18 serves from the reservoir both due to the closer spacing
19 to take advantage of the heterogeneity of the reservoir to
20 reduce the effect of coning, and also to allow more pro-
21 duction at lower GOR -- more efficient low GOR wells than
22 high GOR production.

23 I might add that as of 5-1-79 the 129
24 infill wells that were on production had recovered some
25 16,292,000 barrels of oil.

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1 Q Do you have anything else to add, Mr.
2 Tweed?

3 A No, not other than the fact that in my
4 opinion the infill drilling of these wells is necessary to
5 effectively and efficiently recover reserves that would
6 not otherwise have been recovered.

7 Q All right, Mr. Tweed, were these exhibits
8 One through Sixteen either prepared or assembled by you
9 or under your supervision?

10 A Yes, they were.

11 MR. COFFIELD: I move the admission of
12 Exhibits One through Sixteen.

13 MR. NUTTER: ARCO Exhibits One through
14 Sixteen will be admitted.

15 MR. COFFIELD: I have no further questions
16 on direct examination.

17
18 CROSS EXAMINATION.

19 BY MR. NUTTER:

20 Q Mr. Tweed, I presume what we're seeking
21 here is actually a sort of a retroactive order, isn't it,
22 that we would find that when we originally approved this
23 infill drilling program that these wells were necessary
24 to effectively and efficiently -- and more efficiently
25 drain those proration units that they're located on.

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1 A. Yes, sir, that is correct.

2 Q. And what you've attempted to do here today
3 is to go back and bring forth some of the testimony and
4 the exhibits that were presented at the previous hearings
5 that are aimed in that direction to show that those wells
6 were necessary.

7 A. Yes, sir. This, I think this evidence
8 presented shows the Commission had a preponderance of data
9 and evidence, reservoir data in front of it, that they could
10 easily have made the determination.

11 Q. And while we didn't actually make those
12 findings, that these wells were necessary to more effi-
13 ciently and effectively drain the proration unit that's
14 not being so drained, those are words out of the NGPA that
15 have just been adopted in the last few months.

16 A. That is correct. It was certainly implied
17 or known that they were needed and an administrative pro-
18 cedure was set up for the approval of that additional in-
19 fill wells.

20 Q. And what we were trying to do was get
21 more efficient drainage, even if we didn't say so.

22 A. Yes, sir, that's correct.

23 MR. NUTTER: Are there any further ques-
24 tions of Mr. Tweed? He may be excused.

25 Do you have anything further, Mr. Coffield?

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MR. COFFIELD: No, sir, I don't.

MR. NUTTER: Does anyone have anything
they wish to offer in Case Number 6553?

We'll take the case under advisement.

(Hearing concluded.)

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REPORTER'S CERTIFICATE

I, SALLY WALTON BOYD, a Court Reporter, DO HEREBY CERTIFY that the foregoing and attached Transcript of Hearing before the Oil Conservation Division was reported by me; that said transcript is a full, true, and correct record of the hearing, prepared by me to the best of my ability, knowledge, and skill, from my notes taken at the time of the hearing.

Sally W. Boyd C.S.R.
Sally W. Boyd, C.S.R.

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 6553, heard by me on 6/13 1979.

[Signature], Examiner
Oil Conservation Division

SALLY WALTON BOYD
CERTIFIED SHORTHAND REPORTER
3030 Plaza Blanca (505) 471-2452
Santa Fe, New Mexico 87501



STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION

JERRY APDACA
GOVERNOR

NICK FRANKLIN
SECRETARY

July 12, 1979

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SANTA FE, NEW MEXICO 87501
(505) 827-2434

Mr. Conrad E. Coffield Re: CASE NO. 6553
Hinkle, Cox, Eaton, Coffield ORDER NO. R-6054
& Hensley
Attorneys at Law
P. O. Box 3580 Applicant:
Midland, Texas 79702

The Atlantic Richfield Company

Dear Sir:

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

Yours very truly,

JOE D. RAMEY
Director

JDR/fd

Copy of order also sent to:

Hobbs OCC	<u>x</u>
Artesia OCC	<u>x</u>
Aztec OCC	

Other _____

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION

IN THE MATTER OF THE HEARING
CALLED BY THE OIL CONSERVATION
DIVISION FOR THE PURPOSE OF
CONSIDERING:

CASE NO. 6553
Order No. R-6054

APPLICATION OF THE ATLANTIC
RICHFIELD COMPANY FOR APPROVAL
OF INFILL DRILLING, EDDY COUNTY,
NEW MEXICO.

ORDER OF THE DIVISION

BY THE DIVISION:

This cause came on for hearing at 9 a.m. on June 13, 1979,
at Santa Fe, New Mexico, before Examiner Daniel S. Nutter.

NOW, on this 10th day of July, 1979, the Division
Director, 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 Division has jurisdiction of this cause and the
subject matter thereof.

(2) That the applicant, The Atlantic Richfield Company,
is the operator of the Empire Abo Unit Area, Empire-Abo Pool,
Eddy County, New Mexico.

(3) That said unit area covers most of the Empire-Abo
Pool, and includes all or portions of Sections 34 through 36,
Township 17 South, Range 27 East, Sections 25 through 27 and
31 through 36, Township 17 South, Range 28 East, Sections 29
and 30, Township 17 South, Range 29 East, Sections 1 through
4, 8 through 11, and 15 through 17, Township 18 South, Range
27 East, and Sections 4 through 6, Township 18 South, Range
28 East, NMPM.

(4) That the applicant is conducting a pressure mainte-
nance project in the aforesaid Empire Abo Unit Area, and as
project operator has drilled and is drilling additional wells
on various 40-acre proration units within said unit area as
infill wells to further enhance production from the pool and
increase recovery.

Case No. 6553
Order No. R-6054

(5) That the applicant herein, The Atlantic Richfield Company, seeks a finding that the drilling of each of the aforesaid additional wells on various 40-acre proration units in its Empire Abo Unit Area was, and is, necessary to effectively and efficiently drain the portions of the proration units which could not be so drained by the existing well(s) on the unit.

(6) That the applicant further seeks approval of a waiver of existing well spacing requirements for the aforesaid infill wells.

(7) That the reservoir rock of the Empire-Abo Pool is the Abo reef, a long narrow barrier type reef approximately 12.5 miles in length from Southwest to Northeast and 1.5 miles in width from backreef (north) to forereef (south); that the reef dips gradually from Southwest to Northeast and, as is characteristic for barrier reefs, dips sharply from the crest toward the forereef.

(8) That the gas injection pressure maintenance program which the applicant is conducting requires the injection of gas in wells high on the structure along the North flank of the reef, and depends largely on the expanding gas cap and gravity drainage through the reef to achieve maximum ultimate recovery.

(9) That there is good horizontal permeability through the reef with respect to oil, but the relative vertical permeability with respect to gas is even more pronounced.

(10) That said pronounced vertical permeability with respect to gas causes gas to cone into the producing wells as the gas cap expands, resulting in the premature abandonment of the oil wells and a decrease in the ultimate recovery under individual proration units in the pool and under the pool as a whole.

(11) That the most effective manner in which to reduce the coning of gas into the producing wells and yet maintain production of oil at a reasonable level is to increase the number of withdrawal points within the reef.

(12) That the only way in which to so increase the number of withdrawal points within the reef is to drill additional wells.

-3-

Case No. 6553
Order No. R-6054

(13) That the Division has recognized the necessity for the drilling of such additional wells in order to more effectively and efficiently drain the portion of the proration units upon which said wells are located which could not be so drained by the existing well(s) thereon, and, by its Orders Nos. R-4549-B and R-5906, has approved their being drilled as infill wells in exception to the applicable well spacing requirements for the Empire-Abo Pool.

IT IS THEREFORE ORDERED:

(1) That the establishment of a procedure for administrative approval for unorthodox producing well locations in the Empire Abo Unit Area, Empire-Abo Pool, Eddy County, New Mexico, by Division Order No. R-4549-B, and the unorthodox locations which have been approved pursuant to such procedure, as well as by Division Order No. R-5906, be and the same are hereby ratified and confirmed.

(2) That such unorthodox producing well locations as have been approved pursuant to said Order No. R-4549-B or Order No. R-5906 as infill producing wells were, and are hereby found, to be necessary to effectively and efficiently drain the portion of the reservoir covered by their respective existing proration units which could not be so drained by the existing wells on the units, and that the existing well spacing requirements were waived to permit their approval.

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

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

STATE OF NEW MEXICO
OIL CONSERVATION DIVISION


JOE D. RAMEY
Director


S E A L

Ed/

North American Producing Division
Permian Division
Post Office Box 1610
Midland, Texas 79701
Telephone 915 682 8631

September 10, 1974

EXH. 2



New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico

Attn: Mr. A. L. Porter, Jr.

Re: Proposed Locations for Infill
Drilling of Empire Abo Unit
G-3301 and J-2101
ARCO-Empire Abo Unit Pressure
Maintenance Project
Eddy County, New Mexico

Gentlemen:

Atlantic Richfield, as operator of the Empire Abo Unit Pressure Maintenance Project, acting on behalf of itself and the other participating working interest owners, requests administrative approval under the provisions of Order No. R-4549-B, Rule 14, under "Special Rules and Regulations for the Empire Abo Pressure Maintenance Project," for the drilling of Unit Wells G-3301 and J-2101 (locations shown on the attached exhibits).

The proposed drilling of Unit Wells G-3301 and J-2101, meets all requirements of Order R-4549-B, Rule 14, said wells being located "no closer than 660 feet to the outer boundary of said unit, nor closer than 10 feet to any quarter-quarter section or subdivision inner boundary."

The proposed drilling of Unit Wells G-3301 and J-2101 will be necessary to complete a more efficient producing pattern, promote the greatest ultimate recovery of reserves, prevent waste, and protect correlative rights.

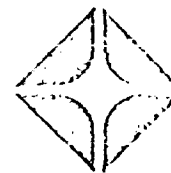
Very truly yours,


Jerry L. Tweed

JMB/agp

Attachments

BEFORE EXAMINER MEETING
OIL CONSERVATION COMMISSION
ARCO EXHIBIT NO. 2
CASE NO. 6553



September 27, 1974

New Mexico Oil and Gas Conservation Commission
P. O. Box 2068
Santa Fe, New Mexico

Attn: Mr. A. L. Porter, Jr.

Re: Amended Unorthodox Well Locations
Empire Abo Unit
Eddy County, New Mexico

Gentlemen:

Atlantic Richfield Company, as operator of the ARCO-Empire Abo Unit Pressure Maintenance Project, requested administrative approval of two unorthodox well locations within the project area by letter dated September 10, 1974. Due to the recent period of inclement weather we were not able to survey the locations prior to submitting the application. We have recently completed the surveying of the two locations and submit for your approval the amendments as shown below. Our intent in submitting the original application was to place the locations approximately in the center of F-33, F-34, G-33, G-34, and J-21, J-22, K-21 K-22. The sections these wells are located in are irregular in size, and shape, and due to surface conditions and existing pipelines and rights-of-way, we request our original application be amended as shown.

Locations

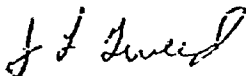
<u>As shown in original application</u>	<u>Amended to</u>
1) Empire Abo Unit Lease G Well No. 3301 1310' FWL & 2610' FSL Sec. 34, T-17S, R-28E Eddy County, New Mexico	Empire Abo Unit Lease F Well No. 331 1250' FWL & 2576' FNL Sec. 34, T-17S, R-28E Eddy County, New Mexico
2) Empire Abo Unit Lease J Well No. 2101 1310' FWL & 2610' FNL Sec. 6, T-18S, R-28E Eddy County, New Mexico	Empire Abo Unit Lease J Well No. 211 1300' FWL & 2630' FNL Sec. 6, T-18S, R-28E Eddy County, New Mexico

New Mexico Oil & Gas Conservation Commission
September 27, 1974
Page 2

These amended locations still meet all requirements of Commission Order R-4549 as amended by R-4549-B, Rule 14, said amended locations are "no closer than 660' to the outer boundary of said Unit, nor closer than 10' to any quarter-quarter section or subdivision inner boundary."

Your consideration in this matter will be greatly appreciated.

Very truly yours,



J. L. Tweed

GES/agp

cc: Mr. J. E. Kapteina

OIL CONSERVATION COMMISSION

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

I. R. TRUJILLO
CHAIRMAN
LAND COMMISSIONER
ALEX J. ARMBO
MEMBER
STATE GEOLOGIST
A. L. PORTER, JR.
SECRETARY - DIRECTOR

October 1, 1974

Atlantic Richfield Company
P.O. Box 1610
Midland, Texas 79701

Attention: Mr. Jerry L. Tweed.

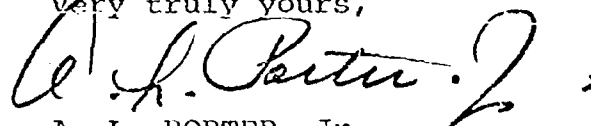
Administrative Order NSL-687

Gentlemen:

Reference is made to your application for approval of a non-standard location for your Empire Abo Unit Lease C Well No. 331 to be located 1310 feet from the West line and 2610 feet from the South line of Section 34, Township 17 South, Range 28 East, and your Empire Abo Unit Lease J Well No. 211 to be located 1310 feet from the West line and 2610 feet from the North line of Section 6, Township 18 South, Range 28 East, both in Eddy County, New Mexico.

By authority granted me under the provisions of Rule 14 of Order No. R-4549-B, of the Commission Rules and Regulations, the above-described unorthodox locations are hereby approved.

Very truly yours,



A. L. PORTER, Jr.
Secretary-Director

ALP/JEK/jr

cc: Oil Conservation Commission - Artesia
Oil & Gas Engineering Committee - Hobbs
State Land Office - Santa Fe

OIL CONSERVATION COMMISSION

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

October 10, 1974

I. R. TRUJILLO
CHAIRMAN

LAND COMMISSIONER
ALEX J. ARMijo
MEMBER

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

Atlantic Richfield Company
P. O. Box 1610
Midland, Texas 79701

Attention: Mr. Jerry L. Tweed

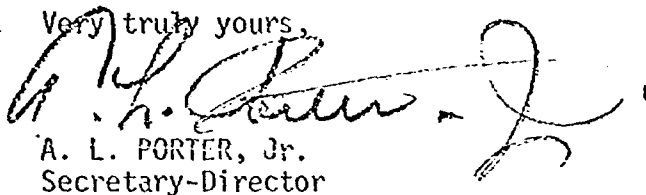
Amendment
Administrative Order NSL-687

Gentlemen:

Preference is made to your application for approval of a non-standard location for your Empire Abo Unit Lease G Well No. 331 ^{← F} to be located 2576 feet from the North line and 1250 feet from the West line of Section 34, Township 17 South, Range 28 East, and your Empire Abo Unit Lease J Well No. 211 to be located 2630 feet from the North line and 1300 feet from the West line of Section 6, Township 18 South, Range 28 East, both in Eddy County, New Mexico.

By authority granted me under the provisions of Rule 14 of Order No. R-4549-B, of the Commission Rules and Regulations, the above-described unorthodox locations are hereby approved.

Very truly yours,


A. L. PORTER, Jr.
Secretary-Director

ALP/JEK/dr

cc: Oil Conservation Commission - Artesia
Oil & Gas Engineering Committee - Hobbs
State Land Office - Santa Fe

Atlantic Richfield Company

North American Producing Division

Permian District

Post Office Box 1510

Midland, Texas 79701

Telephone 915 682 8631



March 6, 1975

New Mexico Oil Conservation Commission

P. O. Box 2088

Santa Fe, New Mexico 87501

Attn: Mr. A. L. Porter, Jr.

Re: Request for Non-Standard Drilling Locations
Within the Project Area of the
ARCO-Empire Abo Unit Pressure Maintenance Project
Eddy County, New Mexico

Gentlemen:

Atlantic Richfield Company, as operator of the Empire Abo Unit Pressure Maintenance Project, acting on behalf of itself and the other participating working interest owners, requests administrative approval under the provisions of Order No. R-4549-B, Rule 14, under "Special Rules and Regulations for the Empire Abo Pressure Maintenance Project," for the drilling of 15 unit wells at non-standard locations (locations shown on attached exhibits).

The proposed drilling of the subject wells at the non-standard locations meets all requirements of Order R-4549-B, Rule 14, said wells being located "no closer than 660 feet to the outer boundary of said unit, nor closer than 10 feet to any quarter-quarter section or subdivision inner boundary."

The proposed drilling of the wells will be necessary to complete a more efficient producing pattern to conserve reservoir energy, promote the greatest ultimate recovery of unit reserves, prevent waste, and protect correlative rights.

Very truly yours,

C. R. Leggett, Jr.
C. R. Leggett, Jr.

GES/agp

Attachments

ATLANTIC RICHFIELD COMPANY
EMPIRE ABO UNIT
Proposed Non-Standard Locations

Well Name and No.	Location
Empire Abo Unit "E" 371	1195' FNL & 10' FWL, Sec. 35, T-17S, R-28E, Eddy County, New Mexico
Empire Abo Unit "E" 381	2475' FWL & 1155' FNL, Sec. 35, T-17S, R-28E, Eddy County, New Mexico
Empire Abo Unit "F" 351	2550' FNL & 1650' FEL, Sec. 34, T-17S, R-28E, Eddy County, New Mexico
Empire Abo Unit "G" 291	1320' FSL & 1280' FWL, Sec. 33, T-17S, R-28E, Eddy County, New Mexico
Empire Abo Unit "G" 311	1430' FEL & 1350' FSL, Sec. 33, T-17S, R-28E, Eddy County, New Mexico
Empire Abo Unit "H" 261	1400' FWL & 150' FSL, Sec. 32, T-17S, R-28E, Eddy County, New Mexico
Empire Abo Unit "H" 271	1450' FEL & 330' FSL, Sec. 32, T-17S, R-28E, Eddy County, New Mexico
Empire Abo Unit "H" 291	200' FSL & 50' FWL, Sec. 33, T-17S, R-28E, Eddy County, New Mexico
Empire Abo Unit "I" 231	1260' FNL & 1580' FEL, Sec. 6, T-18S, R-28E, Eddy County, New Mexico
Empire Abo Unit "J" 191	2500' FEL & 2500' FNL, Sec. 1, T-18S, R-27E, Eddy County, New Mexico
Empire Abo Unit "J" 201	2501' FNL & 20' FEL, Sec. 1, T-18S, R-27E, Eddy County, New Mexico
Empire Abo Unit "K" 181	1440' FWL & 2050' FSL, Sec. 1, T-18S, R-27E, Eddy County, New Mexico
Empire Abo Unit "L" 141	1360' FWL & 1050' FSL, Sec. 2, T-18S, R-27E, Eddy County, New Mexico
Empire Abo Unit "L" 151	1110' FSL & 1322' FEL, Sec. 2, T-18S, R-27E, Eddy County, New Mexico
Empire Abo Unit "M" 121	900' FEL & 10' FNL, Sec. 10, T-18S, R-27E, Eddy County, New Mexico

OIL CONSERVATION COMMISSION

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

March 27, 1975

I. R. TRUJILLO
CHAIRMAN

LAND COMMISSIONER
PHIL R. LUCERO
MEMBER

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

Atlantic Richfield Company
P. O. Box 1610
Midland, Texas 79701

Attention: C. R. Leggott, Jr.

Administrative Order NSL-706

Gentlemen:

Reference is made to your application for approval of non-standard locations for the following fifteen wells in Eddy County, New Mexico:

WELL NAME AND NO.	LOCATION
Empire Abo Unit "E" 371	1195' FNL & 10' FWL, Section 35, T-17-S, R-28-E
Empire Abo Unit "E" 381	2475' FWL & 1155' FNL, Section 35, T-17-S, R-28-E
Empire Abo Unit "F" 351	2550' FNL & 1650' FEL, Section 34, T-17-S, R-28-E
Empire Abo Unit "G" 291	1320' FSL & 1280' FWL, Section 33, T-17-S, R-28-E
Empire Abo Unit "G" 311	1430' FEL & 1350' FSL, Section 33, T-17-S, R-28-E
Empire Abo Unit "H" 261	1400' FWL & 150' FSL, Section 32, T-17-S, R-28-E
Empire Abo Unit "H" 271	1450' FEL & 330' FSL, Section 32, T-17-S, R-28-E
Empire Abo Unit "H" 291	200' FSL & 50' FWL, Section 33, T-17-S, R-28-E
Empire Abo Unit "I" 231	1260' FNL & 1580' FEL, Section 6, T-18-S, R-28-E
Empire Abo Unit "J" 191	2500' FEL & 2500' FNL, Section 1, T-18-S, R-27-E
Empire Abo Unit "J" 201	2501' FNL & 20' FEL, Section 1, T-18-S, R-27-E
Empire Abo Unit "K" 181	1440' FWL & 2050' FSL, Section 1, T-18-S, R-27-E
Empire Abo Unit "L" 141	1360' FWL & 1050' FSL, Section 2, T-18-S, R-27-E

Atlantic Richfield Co.

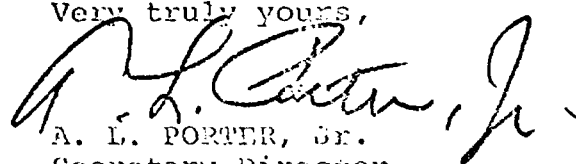
-2-

Administrative Order
NSL-706

<u>WELL NAME AND NO.</u>	<u>LOCATION</u>
Empire Abo Unit "L" 151	1110' FSL & 1322' FEL, Section 2, T-18-S, R-27-E
Empire Abo Unit "M" 121	900' FEL & 10' FNL, Section 10, T-18-S, R-27-E

By authority granted me under the provisions of Rule
14 of Order No. R-4549-B, the above-described unorthodox
locations are hereby approved.

Very truly yours,

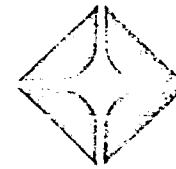

A. L. PORTER, Sr.
Secretary-Director

ALP/JEK/dr

cc: Oil Conservation Commission - Artesia
Oil & Gas Engineering Committee - Hobbs

Atlantic Richfield Company

North American Producing Division
Permian District
Post Office Box 1610
Midland, Texas 79701
Telephone 915 682 3631



December 8, 1975

New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico 87501

Attn: Mr. Joe Ramey

Re: Request for Non-Standard Drilling Locations
Within the Project Area of the
ARCO-Empire Abo Unit Pressure Maintenance Project
Eddy County, New Mexico

Gentlemen:

Atlantic Richfield Company, as operator of the Empire Abo Unit Pressure Maintenance Project, acting on behalf of itself and the other participating working interest owners, requests administrative approval under the Provisions of Order No. R-4549-B, Rule 14, under "Special Rules and Regulations for the Empire Abo Pressure Maintenance Project," for the drilling of 17 Unit wells at non-standard locations (locations shown on attached exhibit).

The proposed drilling of the subject wells at the non-standard locations meet all requirements of Order R-4549-B, Rule 14, said wells being located "no closer than 660 feet to the outer boundary of said unit, nor closer than 10 feet to any quarter-quarter section or subdivision inner boundary."

The proposed drilling of the wells will be necessary to complete a more efficient producing pattern to conserve reservoir energy, promote the greatest ultimate recovery of Unit reserves, prevent waste, and protect correlative rights.

Very truly yours,

ATLANTIC RICHFIELD COMPANY

J. L. Tweed
District Engineer

PMB/agp

ATLANTIC RICHFIELD COMPANY
Empire Abo Unit
Proposed Non-Standard Locations
Eddy County, New Mexico

<u>Well Name and Number</u>	<u>Location</u>
Empire Abo Unit "E" 382	1175' FNL & 1316' FWL, Section 35, T-17S, R-28E
Empire Abo Unit "E" 391	135' FNL & 2567' FEL, Section 35, T-17S, R-28E
Empire Abo Unit "E" 401	90' FNL & 1296' FEL, Section 35, T-17S, R-28E
Empire Abo Unit "F" 371	2220' FNL & 25' FWL, Section 35, T-17S, R-28E
Empire Abo Unit "G" 312	1550' FSL & 2511' FEL, Section 33, T-17S, R-28E
Empire Abo Unit "G" 321	1520' FSL & 230' FEL, Section 33, T-17S, R-28E
Empire Abo Unit "G" 331	1580' FSL & 1140' FWL, Section 34, T-17S, R-28E
Empire Abo Unit "G" 341	1850' FSL & 2591' FWL, Section 34, T-17S, R-28E
Empire Abo Unit "I" 271	670' FNL & 1700' FEL, Section 5, T-18S, R-28E
Empire Abo Unit "J" 202	2490' FNL & 1299' FEL, Section 1, T-18S, R-28E
Empire Abo Unit "J" 221	2610' FNL & 2713' FWL, Section 6, T-18S, R-28E
Empire Abo Unit "J" 232	2253' FNL & 1576' FEL, Section 6, T-18S, R-28E
Empire Abo Unit "K" 182	1533' FSL & 2370' FWL, Section 1, T-18S, R-27E
Empire Abo Unit "L" 111	20' FSL & 2485' FEL, Section 3, T-18S, R-27E
Empire Abo Unit "L" 131	100' FSL & 100' FWL, Section 2, T-18S, R-27E
Empire Abo Unit "L" 132	275' FSL & 1243' FWL, Section 2, T-18S, R-27E
Empire Abo Unit "L" 152	320' FSL & 2602' FEL, Section 2, T-18S, R-27E



OIL CONSERVATION COMMISSION

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



DIRECTOR
JOE D. RAMEY

LAND COMMISSIONER
PHIL R. LUCERO

STATE GEOLOGIST
EMERY C. ARNOLD

December 31, 1975

Atlantic Richfield Company
Post Office Box 1610
Midland, Texas 79701

Attention: Mr. J. L. Tweed


Administrative Order NSL-743

Gentlemen:

Reference is made to your application for approval of non-standard locations for the seventeen wells listed on the attached page. All seventeen wells are located within the project area of the Arco-Empire Abo Unit Pressure Maintenance Project, Eddy County, New Mexico.

By the authority granted me by the provisions of Rule 14 of Order No. R-4549-B, the described unorthodox locations are hereby approved.

Very truly yours,


JOE D. RAMEY
Secretary-Director

JDR/JEK/jr

cc: Oil Conservation Commission - Artesia
Oil & Gas Engineering Committee - Hobbs
U. S. Geological Survey - Artesia
State Land Office - Santa Fe

ATLANTIC RICHFIELD COMPANY
 Empire Abo Unit
 Proposed Non-Standard Locations
 Eddy County, New Mexico

Well Name and Number

Location

Empire Abo Unit "E" 382
 Empire Abo Unit "E" 391
 Empire Abo Unit "E" 401
 Empire Abo Unit "F" 371
 Empire Abo Unit "G" 312
 Empire Abo Unit "G" 321
 Empire Abo Unit "G" 331
 Empire Abo Unit "G" 341
 Empire Abo Unit "I" 271
 Empire Abo Unit "J" 202
 Empire Abo Unit "J" 221
 Empire Abo Unit "J" 232
 Empire Abo Unit "K" 182
 Empire Abo Unit "L" 111
 Empire Abo Unit "L" 131
 Empire Abo Unit "L" 132
 Empire Abo Unit "L" 152

1175' FNL & 1316' FWL, Section 35, T-17S, R-28E
 135' FNL & 2567' FEL, Section 35, T-17S, R-28E
 90' FNL & 1296' FEL, Section 35, T-17S, R-28E
 2220' FNL & 25' FWL, Section 35, T-17S, R-28E
 1550' FSL & 2511' FEL, Section 33, T-17S, R-28E
 1520' FSL & 230' FEL, Section 33, T-17S, R-28E
 1580' FSL & 1140' FWL, Section 34, T-17S, R-28E
 1850' FSL & 2591' FWL, Section 34, T-17S, R-28E
 670' FNL & 1700' FEL, Section 5, T-18S, R-28E
 2490' FNL & 1299' FEL, Section 1, T-18S, R-28E
 2610' FNL & 2713' FWL, Section 6, T-18S, R-28E
 2253' FNL & 1576' FEL, Section 6, T-18S, R-28E
 1533' FSL & 2370' FWL, Section 1, T-18S, R-27E
 20' FSL & 2485' FEL, Section 3, T-18S, R-27E
 100' FSL & 100' FWL, Section 2, T-18S, R-27E
 275' FSL & 1243' FWL, Section 2, T-18S, R-27E
 320' FSL & 2602' FEL, Section 2, T-18S, R-27E

Atlantic Richfield Company

North American Producing Division
Permian Division
Post Office Box 1610
Midland, Texas 79701
Telephone 915 682 8631



October 22, 1976

New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico 87501

Attn: Mr. Joe Ramey

Re: Request for Non-Standard Drilling Locations
Within the Project Area of the
ARCO-Empire Abo Unit Pressure Maintenance Project
Eddy County, New Mexico

Gentlemen:

Atlantic Richfield Company, as operator of the Empire Abo Unit Pressure Maintenance Project, acting on behalf of itself and the other participating working interest owners, requests administrative approval under the Provisions of Order No. R-4549-B, Rule 14, under "Special Rules and Regulations for the Empire Abo Pressure Maintenance Project," for the drilling of 3 Unit wells at non-standard locations (locations shown on attached exhibit).

The proposed drilling of the subject wells at the non-standard locations meet all requirements of Order R-4549-B, Rule 14, said wells being located "no closer than 660 feet to the outer boundary of said unit, nor closer than 10 feet to any quarter-quarter section or subdivision inner boundary."

The proposed drilling of the wells will be necessary to complete a more efficient producing pattern to conserve reservoir energy, promote the greatest ultimate recovery of Unit reserves, prevent waste, and protect correlative rights.

Very truly yours,

ATLANTIC RICHFIELD COMPANY

J. L. Tweed
J. L. Tweed
District Engineer

REH/agp

ATLANTIC RICHFIELD COMPANY
Empire Abo Unit
Proposed Non-Standard Locations
Eddy County, New Mexico

WELL NAME AND NUMBER

LOCATION

Empire Abo Unit F-332

2581.95' FNL & 150' FWL, Sec. 34, T-17S, R-28E

Empire Abo Unit F-361

1765' FNL & 1270' FEL, Sec. 34, T-17S, R-28E

Empire Abo Unit G-342

2400' FSL & 2080' FWL, Sec. 34, T-17S, R-28E



DIRECTOR
JOE D. RAMEY

OIL CONSERVATION COMMISSION

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

LAND COMMISSIONER
PHIL R. LUCERO



STATE GEOLOGIST
EMERY C. ARNOLD

November 5, 1976

Atlantic Richfield Company
P. O. Box 1610
Midland, Texas 79701

Attention: Mr. J. L. Tweed

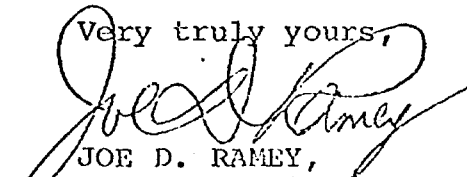
Administrative Order NSL-802

Gentlemen:

Reference is made to your application for approval of non-standard locations for your Empire Abo Unit Well No. F-332 to be located 2581.95 feet from the North line and 150 feet from the West line, Empire Abo Unit Well No. F-361 to be located 1765 feet from the North line and 1270 feet from the East line and your Empire Abo Unit Well No. G-342 to be located 2400 feet from the South line and 2080 feet from the West line, all in Section 34, Township 17 South, Range 28 East, NMPM, Empire Abo Pool, Eddy County, New Mexico.

By authority granted me under the provisions of Rule 14 of Order No. R-4549-B, the above-described unorthodox locations are hereby approved.

Very truly yours,


JOE D. RAMEY,
Secretary-Director

JDR/JEK/dr

cc: Oil Conservation Commission - Artesia
Oil & Gas Engineering Committee - Hobbs
Central Leasing, State Land Office - Santa Fe

Atlantic Richfield Company

North American Producing Division
Permian District
Post Office Box 1610
Midland, Texas 79701
Telephone 915 652 6631



November 3, 1976

New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico 87501

Attn: Mr. Joe Ramey

Re: Request for Non-Standard Drilling Locations
Within the Project Area of the ARCO-Empire
Abo Unit Pressure Maintenance Project
Eddy County, New Mexico

Gentlemen:

Atlantic Richfield Company, as operator of the Empire Abo Unit Pressure Maintenance Project, acting on behalf of itself and the other participating working interest owners, requests administrative approval under the Provisions of Order No. R-4549-B, Rule 14, under "Special Rules and Regulations for the Empire Abo Pressure Maintenance Project," for the drilling of 20 Unit wells at non-standard locations (locations shown on attached exhibit).

The proposed drilling of the subject wells at the non-standard locations meet all requirements of Order R-4549-B, Rule 14, said wells being located "no closer than 660 feet to the outer boundary of said unit, nor closer than 10 feet to any quarter-quarter section or subdivision inner boundary."

The proposed drilling of the wells will be necessary to complete a more efficient producing pattern to conserve reservoir energy, promote the greatest ultimate recovery of Unit reserves, prevent waste, and protect correlative rights.

Very truly yours,

ATLANTIC RICHFIELD COMPANY

J. L. Tweed
J. L. Tweed
District Engineer

REH/agp

ATLANTIC RICHFIELD COMPANY
EMPIRE ADO UNIT
Proposed Non-Standard Locations
Eddy County, New Mexico

Phase III, Part B

<u>Well Name & Number</u>	<u>Location</u>		<u>G.L. Elev.</u>
Empire Abo Unit			
E-372	100' FNL & 1291.14' FWL	Sec. 35, T-17S, R-28E	3681.1'
E-401	90' FNL & 1296' FEL	Sec. 35, T-17S, R-28E	3669.1'
F-372	2490' FNL & 1100' FWL	Sec. 35, T-17S, R-28E	3676.8'
F-381	1900' FNL & 2260' FWL	Sec. 35, T-17S, R-28E	3679.0'
G-351	1850' FSL & 1650' FEL	Sec. 34, T-17S, R-28E	3663.2'
H-272	2481' FEL & 330' FSL	Sec. 32, T-17S, R-28E	3661.4'
H-292	1225' FWL & 180' FSL	Sec. 33, T-17S, R-28E	3665.7'
H-293	1248.88' FSL & 50' FWL	Sec. 33, T-17S, R-28E	3671.4'
H-311	2490' FEL & 313' FSL	Sec. 33, T-17S, R-28E	3661.4'
I-281	450' FEL & 700' FNL	Sec. 5, T-18S, R-28E	3659.8'
J-222	1350' FNL & 1572' FWL	Sec. 6, T-18S, R-28E	3656.7'
K-141	1370' FSL & 2445' FWL	Sec. 2, T-18S, R-27E	3521.0'
K-183	2370' FSL & 1510' FWL	Sec. 1, T-18S, R-27E	3694.0'
L-112	1186' FSL & 1372' FEL	Sec. 3, T-18S, R-27E	3516.7'
L-121	1186' FSL & 200' FEL	Sec. 3, T-18S, R-27E	3509.3'
L-153	90' FSL & 1456' FEL	Sec. 2, T-18S, R-27E	3585.0'
M-91	1300' FNL & 1220' FWL	Sec. 10, T-18S, R-27E	3507.7'
M-101	1100' FNL & 2170' FWL	Sec. 10, T-18S, R-27E	3506.8
M-122	990' FNL & 1300' FEL	Sec. 10, T-18S, R-27E	3499.9
N-91	2390' FNL & 940' FWL	Sec. 10, T-18S, R-27E	3596.3



DIRECTOR
JOE D. RAMEY

OIL CONSERVATION COMMISSION

STATE OF NEW MEXICO
P. O. BOX 2058 - SANTA FE
87501

LAND COMMISSIONER
PHIL R. LUCERO



STATE GEOLOGIST
EMERY C. ARNOLD

November 12, 1976

Atlantic Richfield Company
P. O. Box 1610
Midland, Texas 79701

Attention: Mr. J. L. Tweed

Administrative Order NSL-809

Gentlemen:

Reference is made to your application for approval of the following non-standard locations in the Empire Abo Pool, Eddy County, New Mexico:

<u>Well Name and Number</u>	<u>Location</u>
<u>Empire Abo Unit Wells</u>	
<u>Nos.</u>	
E-372	100' FNL & 1291' FWL of Sec. 35, T-17-S, R-28-E
E-401	90' FNL & 1296' FEL of Sec. 35, T-17-S, R-28-E
F-372	2490' FNL & 1100' FWL of Sec. 35, T-17-S, R-28-E
F-381	1900' FNL & 2260' FWL of Sec. 35, T-17-S, R-28-E
G-351	1850' FSL & 1650' FEL of Sec. 34, T-17-S, R-28-E
H-272	2481' FEL & 330' FSL of Sec. 32, T-17-S, R-28-E
H-292	1225' FWL & 180' FSL of Sec. 33, T-17-S, R-28-E
H-293	1249' FSL & 50' FWL of Sec. 33, T-17-S, R-28-E
H-311	2490' FEL & 313' FSL of Sec. 33, T-17-S, R-28-E
I-281	450' FEL & 700' FNL of Sec. 5, T-18-S, R-28-E
J-222	1350' FNL & 1572' FWL of Sec. 6, T-18-S, R-28-E
K-141	1370' FSL & 2445' FWL of Sec. 2, T-18-S, R-27-E
K-183	2370' FSL & 1510' FWL of Sec. 1, T-18-S, R-27-E
L-112	1186' FSL & 1372' FEL of Sec. 3, T-18-S, R-27-E
L-121	1186' FSL & 200' FEL of Sec. 3, T-18-S, R-27-E
L-153	90' FSL & 1456' FEL of Sec. 2, T-18-S, R-27-E
M-91	1300' FNL & 1220' FWL of Sec. 10, T-18-S, R-27-E
M-101	1100' FNL & 2170' FWL of Sec. 10, T-18-S, R-27-E
M-122	990' FNL & 1300' FEL of Sec. 10, T-18-S, R-27-E
N-91	2390' FNL & 940' FWL of Sec. 10, T-18-S, R-27-E

Atlantic Richfield Company

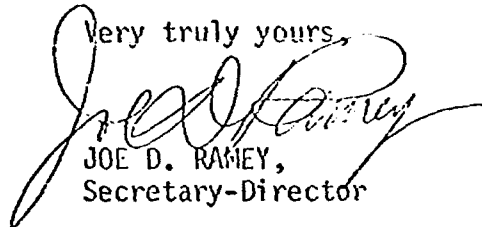
-2-

November 12, 1976

Administrative Order HSL-809

By authority granted me under the provisions of Rule 14 of Order No. R-4549-B, the above-described unorthodox locations are hereby approved.

Very truly yours,



JOE D. RAMEY,
Secretary-Director

JDR/JEK/dr

cc: Oil Conservation Commission - Artesia
Oil & Gas Engineering Committee - Hobbs

Atlantic Richfield Company

North American Producing Division
Permian District
Post Office Box 1010
Midland, Texas 79701
Telephone 915 682 8631



December 29, 1977

New Mexico Oil and Gas Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico 87501

Attn: Mr. J. D. Ramey

Re: Request for Non-Standard Drilling Locations
Within the Project Area of the ARCO-Empire
Abo Unit Pressure Maintenance Project
Eddy County, New Mexico

Gentlemen:

Atlantic Richfield Company, operator of the Empire Abo Unit Pressure Maintenance Project, acting on behalf of itself and the other participating working interest owners, requests administrative approval under the provisions of Order No. R-4549-B, Rule 14, under "Special Rules and Regulations for the Empire Abo Pressure Maintenance Project," for the drilling of 25 Unit wells at non-standard locations shown on the attached Exhibit 1.

The proposed non-standard locations meet all requirements of Order R-4549-B, Rule 14, said wells being located "no closer than 660 feet to the outer boundary of said Unit, nor closer than 10 feet to any quarter-quarter section or subdivision inner boundary."

The proposed drilling of these wells is necessary to complete a more efficient producing pattern to conserve reservoir energy, promote the greatest ultimate recovery of Unit reserves, prevent waste, and protect correlative rights.

Very truly yours,

ATLANTIC RICHFIELD COMPANY

J. L. Tweed
District Engineer

IJN/sgp

cc: Mr. Bill Gressett
NMOCC
Artesia, New Mexico

EXHIBIT 1

ATLANTIC RICHFIELD COMPANY
 EMPIRE ABO UNIT
 PROPOSED NON-STANDARD LOCATIONS
 Eddy County, New Mexico

PHASE IV


WELL NAME & NUMBER	LOCATION	G. L. ELEVATION
Empire Abo Unit		
E-373	150' FNL & 15' FWL Section 35 T-17S R-28E	3670.4'
E-361	620' FNL & 1200' FEL Section 34 T-17S R-28E	3671.6'
E-351	610' FNL & 2601' FEL Section 34 T-17S R-28E	3673.9'
E-341	660' FNL & 1560' FWL Section 34 T-17S R-28E	3675.7'
F-321	1610' FNL & 250' FEL Section 33 T-17S R-28E	3674.3'
G-322	2350' FSL & 1100' FEL Section 33 T-17S R-28E	3665.6'
I-272	1300' FNL & 2345' FEL Section 5 T-18S R-28E	3651.9'
K-231	1700' FSL & 2350' FEL Section 6 T-18S R-28E	3649.3'
M-152	560' FNL & 2588' FEL Section 11 T-18S R-27E	3589.8'
M-131	1100' FNL & 1200' FWL Section 11 T-18S R-27E	3568.3'
G-343	1500' FSL & 1820' FWL Section 34 T-17S R-28E	3659.5'
G-332	1575' FSL & 660' FWL Section 34 T-17S R-28E	3658.4'
G-323	1500' FSL & 700' FEL Section 33 T-17S R-28E	3663.9'
H-331	1000' FSL & 1200' FWL Section 34 T-17S R-28E	3658.4'
H-321	1050' FSL & 250' FEL Section 33 T-17S R-28E	3662.4'
H-322	750' FSL & 1150' FEL Section 33 T-17S R-28E	3662.4'
H-301	150' FSL & 1650' FWL Section 33 T-17S R-28E	3659.8'
I-282	1150' FNL & 1270' FEL Section 5 T-18S R-28E	3655.1'
J-233	2550' FNL & 2050' FEL Section 6 T-18S R-28E	3668.9'
K-232	2300' FSL & 1570' FEL Section 6 T-18S R-28E	3653.1'
K-184	2120' FSL & 2465' FWL Section 1 T-18S R-27E	3623.8'
J-223	2630' FNL & 1930' FWL Section 6 T-18S R-28E	3644.3'
K-192	2020' FSL & 1390' FEL Section 1 T-18S R-27E	3636.7'
M-151	400' FNL & 1450' FEL Section 11 T-18S R-27E	3604.1'
I-273	1300' FNL & 1595' FEL Section 5 T-18S R-28E	3651.3'

OIL CONSERVATION COMMISSION

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

DIRECTOR
JOE D. RAMEY

LAND COMMISSIONER
PHIL R. LUCERO


STATE GEOLOGIST
EMERY C. ARNOLD

January 16, 1978

Atlantic Richfield Company
P. O. Box 1610
Midland, Texas 79701

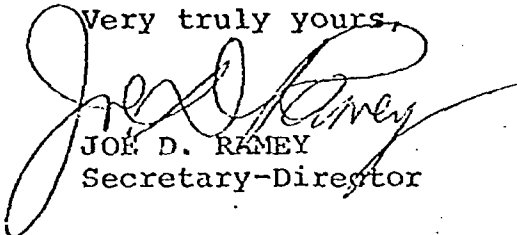
Administrative Order NSL-915

Gentlemen:

The Secretary-Director hereby approves the non-standard location for 25 Atlantic Richfield Company Empire Abo Unit Wells, Empire Abo Pool, Eddy County, New Mexico, as shown on Exhibit 1 of their application dated 12-29-1977 and attached hereto.

These producing wells are approved under the provisions of Rule 14 of Order No. R-4549 as amended, in order to permit the operator to complete a more efficient production pattern within said unit in said pool.

Very truly yours,


JOE D. RAMEY
Secretary-Director

JDR/RLS/jr

cc: Oil & Gas Engineering Committee - Hobbs
Oil Conservation Commission - Artesia

EXHIBIT 1
ATLANTIC RICHFIELD COMPANY
EMPIRE ADO UNIT
PROPOSED NON-STANDARD LOCATIONS
Eddy County, New Mexico

PHASE IV

WELL NAME & NUMBER	LOCATION			G. L. ELEVATION
Empire Abo Unit				
E-373	150' FNL & 15' FWL	Section 35	T-17S R-28E	3670.4'
E-361	620' FNL & 1200' FEL	Section 34	T-17S R-28E	3671.6'
E-351	610' FNL & 2601' FEL	Section 34	T-17S R-28E	3673.9'
E-341	660' FNL & 1560' FWL	Section 34	T-17S R-28E	3675.7'
F-321	1610' FNL & 250' FEL	Section 33	T-17S R-28E	3674.3'
G-322	2350' FSL & 1100' FEL	Section 33	T-17S R-28E	3665.6'
I-272	1300' FNL & 2345' FEL	Section 5	T-18S R-28E	3651.9'
K-231	1700' FSL & 2350' FEL	Section 6	T-18S R-28E	3649.3'
M-152	560' FNL & 2588' FEL	Section 11	T-18S R-27E	3589.8'
M-131	1100' FNL & 1200' FWL	Section 11	T-18S R-27E	3568.3'
G-343	1500' FSL & 1820' FWL	Section 34	T-17S R-28E	3659.5'
G-332	1575' FSL & 660' FWL	Section 34	T-17S R-28E	3658.4'
G-323	1500' FSL & 700' FEL	Section 33	T-17S R-28E	3663.9'
H-331	1000' FSL & 1200' FWL	Section 34	T-17S R-28E	3658.4'
H-321	1050' FSL & 250' FEL	Section 33	T-17S R-28E	3662.4'
H-322	750' FSL & 1150' FEL	Section 33	T-17S R-28E	3662.4'
H-301	150' FSL & 1650' FWL	Section 33	T-17S R-28E	3659.8'
I-282	1150' FNL & 1270' FEL	Section 5	T-18S R-28E	3655.1'
J-233	2550' FNL & 2050' FEL	Section 6	T-18S R-28E	3668.9'
K-232	2300' FSL & 1570' FEL	Section 6	T-18S R-28E	3653.1'
K-184	2120' FSL & 2465' FWL	Section 1	T-18S R-27E	3623.8'
J-223	2630' FNL & 1930' FWL	Section 6	T-18S R-28E	3644.3'
K-192	2020' FSL & 1390' FEL	Section 1	T-18S R-27E	3636.7'
M-151	400' FNL & 1450' FEL	Section 11	T-18S R-27E	3604.1'
I-273	1300' FNL & 1595' FEL	Section 5	T-18S R-28E	3651.3'

Atlantic Richfield Company

North American Producing Division
Permian District
Post Office Box 1610
Midland, Texas 79701
Telephone 915 682 8631

April 4, 1978

New Mexico Oil and Gas Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico 87501

Attn: Mr. J. D. Ramey

Re: Request for Non-Standard Drilling Locations
Within the Project Area of the ARCO-Empire
Abo Unit Pressure Maintenance Project
Eddy County, New Mexico

Gentlemen:

Atlantic Richfield Company, operator of the Empire Abo Unit Pressure Maintenance Project, acting on behalf of itself and the other participating working interest owners, requests administrative approval under the provisions of Order No. R-4549-B, Rule 14, under "Special Rules and Regulations for the Empire Abo Pressure Maintenance Project," for the drilling of 25 Unit wells at non-standard locations shown on the attached Exhibit 1.

The proposed non-standard locations meet all requirements of Order R-4549-B, Rule 14, said wells being located "no closer than 660 feet to the outer boundary of said Unit, nor closer than 10 feet to any quarter-quarter section or subdivision inner boundary."

The proposed drilling of these wells is necessary to complete a more efficient producing pattern to conserve reservoir energy, promote the greatest ultimate recovery of Unit reserves, prevent waste, and protect correlative rights.

Very truly yours,

ATLANTIC RICHFIELD COMPANY

J. L. Tweed
J. L. Tweed
District Engineer

ILN/asp

cc: Mr. Bill Gressett
New Mexico Oil Conservation Commission
Artesia, New Mexico

EXHIBIT 1

ATLANTIC RICHFIELD COMPANY
EMPIRE ABO UNIT
PHASE V

UNIT WELL	LOCATION	ELEV. - G.L.
F-362	1850' FNL & 350' FEL Sec. 34, T-17S, R-28E	3674.6'
F-352	1330' FNL & 1980' FEL Sec. 34, T-17S, R-28E	3670.3'
F-353	2400' FNL & 2350' FEL Sec. 34, T-17S, R-28E	3661.4'
F-322	2480' FNL & 500' FEL Sec. 33, T-17S, R-28E	3665.2'
G-333	2100' FSL & 1100' FWL Sec. 34, T-17S, R-28E	3660.2'
G-313	2000' FSL & 2450' FEL Sec. 33, T-17S, R-28E	3662.5'
H-312	815' FSL & 2525' FEL Sec. 33, T-17S, R-28E	3664.9'
H-302	1250' FSL & 1925' FWL Sec. 33, T-17S, R-28E	3670.9'
H-303	800' FSL & 1340' FWL Sec. 33, T-17S, R-28E	3665.6'
H-294	1200' FSL & 700' FWL Sec. 33, T-17S, R-28E	3666.2'
H-295	700' FSL & 10' FWL Sec. 33, T-17S, R-28E	3666.4'
H-281	200' FSL & 660' FEL Sec. 32 T-17S, R-28E	3663.4'
I-291	200' FNL & 350' FWL Sec. 4, T-18S, R-28E	3662.7'
I-283	175' FNL & 300' FEL Sec. 5, T-18S, R-28E	3661.0'
J-234	1900' FNL & 2441' FEL Sec. 6, T-18S, R-28E	3677.6'
J-212	1900' FNL & 100' FWL Sec. 6, T-18S, R-28E	3649.7'
J-213	1950' FNL & 1300' FWL Sec. 6, T-18S, R-28E	3647.8'
J-214	2450' FNL & 400' FWL Sec. 6, T-18S, R-28E	3650.1'
J-203	2400' FNL & 700' FEL Sec. 1, T-18S, R-27E	3650.9'
K-193	2150' FSL & 2450' FEL Sec. 1, T-18S, R-27E	3635.4'
K-194	1500' FSL & 2130' FEL Sec. 1, T-18S, R-27E	3618.3'
L-154	750' FSL & 2550' FEL Sec. 2, T-18S, R-27E	3553.4'
L-142	100' FSL & 1950' FWL Sec. 2, T-18S, R-27E	3555.6'
L-143	1200' FSL & 1900' FWL Sec. 2, T-18S, R-27E	3528.0'
M-132	625' FNL & 175' FWL Sec. 11, T-18S, R-27E	3540.6'



STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION

April 26, 1978

JERRY APODACA
GOVERNOR

NICK FRANKLIN
SECRETARY

POST OFFICE BOX 2088
STATE LAND OFFICE BUILDING
SANTA FE, NEW MEXICO 87501
(505) 827-2434

Atlantic Richfield Company
P. O. Box 1610
Midland, Texas 79701

Attention: J. L. Tweed

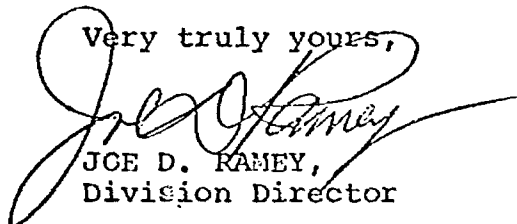
Administrative Order NSL-937

Gentlemen:

The Division Director hereby approves the non-standard location for 25 Atlantic Richfield Company Empire Abo Unit Wells, Empire Abo Pool, Eddy County, New Mexico, as shown on Exhibit 1 of their application dated April 4, 1978 and attached hereto.

These producing wells are approved under the provisions of Rule 14 of Order No. R-4549-B, in order to permit the operator to complete a more efficient production pattern within said unit in said pool.

Very truly yours,


JOE D. RAMEY,
Division Director

JDR/RLS/dr

cc: Oil & Gas Engineering Committee - Hobbs
Oil Conservation Division - Artesia
Central Leasing - State Land Office - Santa Fe

EXHIBIT 1

ATLANTIC RICHFIELD COMPANY
EMPIRE ABO UNIT
PHASE V

UNIT WELL	LOCATION	ELEV. - G.L.
F-362	1850' FNL & 350' FEL Sec. 34, T-17S, R-28E	3674.6'
F-352	1330' FNL & 1980' FEL Sec. 34, T-17S, R-28E	3670.3'
F-353	2400' FNL & 2350' FEL Sec. 34, T-17S, R-28E	3661.4'
F-322	2480' FNL & 500' FEL Sec. 33, T-17S, R-28E	3665.2'
G-333	2100' FSL & 1100' FWL Sec. 34, T-17S, R-28E	3660.2'
G-313	2000' FSL & 2450' FEL Sec. 33, T-17S, R-28E	3662.5'
H-312	815' FSL & 2525' FEL Sec. 33, T-17S, R-28E	3664.9'
H-302	1250' FSL & 1925' FWL Sec. 33, T-17S, R-28E	3670.9'
H-303	800' FSL & 1340' FWL Sec. 33, T-17S, R-28E	3665.6'
H-294	1200' FSL & 700' FWL Sec. 33, T-17S, R-28E	3666.2'
H-295	700' FSL & 10' FWL Sec. 33, T-17S, R-28E	3666.4'
H-281	200' FSL & 660' FEL Sec. 32 T-17S, R-28E	3663.4'
I-291	200' FNL & 350' FWL Sec. 4, T-18S, R-28E	3662.7'
I-283	175' FNL & 300' FEL Sec. 5, T-18S, R-28E	3661.0'
J-234	1900' FNL & 2441' FEL Sec. 6, T-18S, R-28E	3677.6'
J-212	1900' FNL & 100' FWL Sec. 6, T-18S, R-28E	3649.7'
J-213	1950' FNL & 1300' FWL Sec. 6, T-18S, R-28E	3647.8'
J-214	2450' FNL & 400' FWL Sec. 6, T-18S, R-28E	3650.1'
J-203	2400' FNL & 700' FEL Sec. 1, T-18S, R-27E	3650.9'
K-193	2150' FSL & 2450' FEL Sec. 1, T-18S, R-27E	3635.4'
K-194	1500' FSL & 2130' FEL Sec. 1, T-18S, R-27E	3618.3'
L-154	750' FSL & 2550' FEL Sec. 2, T-18S, R-27E	3553.4'
L-142	100' FSL & 1950' FWL Sec. 2, T-18S, R-27E	3555.6'
L-143	1200' FSL & 1900' FWL Sec. 2, T-18S, R-27E	3528.0'
M-132	625' FNL & 175' FWL Sec. 11, T-18S, R-27E	3540.6'



November 20, 1978

Energy & Minerals Department
Oil Conservation Division
P. O. Box 2088
Santa Fe, New Mexico 87501

Attn: Mr. J. D. Ramey

Re: Request for Non-Standard Drilling Locations
Within the Project Area of the ARCO-Empire
Abo Unit Pressure Maintenance Project
Eddy County, New Mexico

Gentlemen:

Atlantic Richfield Company, as operator of the Empire Abo Unit Pressure Maintenance Project, acting on behalf of itself and the other participating working interest owners, requests administrative approval under the provisions of Order No. R-4549-B, Rule 14 under "Special Rules and Regulations for the Empire Abo Pressure Maintenance Project," for the drilling of 50 Unit wells at non-standard locations shown on the attached Exhibit 1.

The proposed non-standard locations meet all requirements of Order R-4549-B, Rule 14, said wells being located "no closer than 660 feet to the outer boundary of said Unit, nor closer than 10 feet to any quarter-quarter section of subdivision inner boundary.

The proposed drilling of these wells is necessary to complete a more efficient producing pattern to conserve reservoir energy, promote the greatest ultimate recovery of Unit reserves, prevent waste, and protect correlative rights.

Very truly yours,

ATLANTIC RICHFIELD COMPANY

J. L. Tweed
District Engineer

IJN/agp

cc: Mr. Bill Gressett
Energy & Minerals Dept.,
Oil Conservation Div.,
Artesia, New Mexico

EXHIBIT I
EMPIRE ABO UNIT

PHASE VI

ELEV. GL	WELL NAME	LOCATION	SEC.	TWP-S	RANGE-E
3675.9	E-362	1200' FNL & 1200' FEL	34	17	28
3665.5	D-361	136' FSL & 800' FEL	27	17	28
3673.5	E-363	650' FNL & 120' FEL	34	17	28
3680.7	E-374	220' FNL & 700' FWL	35	17	28
3679.3	E-383	1190' FNL & 1910' FWL	35	17	28
3681.0	E-384	600' FNL & 1400' FWL	35	17	28
3685.5	E-392	959' FNL & 2400' FEL	35	17	28
3686.1	E-393	1100' FNL & 2250' FEL	35	17	28
3677.9	E-394	1000' FNL & 1600' FEL	35	17	28
3676.2	E-395	75' FNL & 1820' FEL	35	17	28
3674.8	F-334	1700' FNL & 620' FWL	34	17	28
3664.3	F-335	2250' FNL & 570' FWL	34	17	28
3672.1	F-342	1450' FNL & 1900' FWL	34	17	28
3662.2	F-343	2300' FNL & 1675' FWL	34	17	28
3666.9	F-354	1850' FNL & 2550' FEL	34	17	28
3663.3	F-363	2250' FNL & 1250' FEL	34	17	28
3679.3	F-373	1820' FNL & 150' FWL	35	17	28
3674.8	F-374	2525' FNL & 520' FWL	35	17	28
3681.2	F-375	1780' FNL & 1175' FWL	35	17	28
3685.3	F-376	1335' FNL & 700' FWL	35	17	28
3675.6	F-382	2400' FNL & 1600' FWL	35	17	28
3678.4	F-383	1600' FNL & 2350' FWL	35	17	28
3680.6	F-391	1545' FNL & 1625' FEL	35	17	28
3665.7	G-291	2000' FSL & 1200' FWL	33	17	28
3661.7	G-314	1450' FSL & 2000' FEL	33	17	28
3662.6	G-315	1900' FSL & 1450' FEL	33	17	28
3662.3	G-324	2250' FSL & 235' FEL	33	17	28
3661.4	G-334	2400' FSL & 500' FWL	34	17	28
3662.2	G-352	2200' FSL & 1450' FEL	34	17	28
3663.8	G-353	1420' FSL & 2050' FEL	34	17	28
3670.5	G-361	2400' FSL & 300' FEL	34	17	28

Exhibit 1
Empire Abo Unit
Phase VI
(cont'd.)

<u>ELEV. GL</u>	<u>WELL NAME</u>	<u>LOCATION</u>	<u>SEC.</u>	<u>TWP-S</u>	<u>RANGE-E</u>
3660.9	H-341	1200' FSL & 2500' FWL	34	17	28
3663.6	I-292	485' FNL & 1070' FWL	4	18	28
3672.9	J-235	1750' FNL & 1600' FEL	6	18	28
3517.0	K-131	1500' FSL & 600' FWL	2	18	27
3523.4	K-142	1700' FSL & 1400' FWL	2	18	27
3533.0	K-143	1820' FSL & 2550' FWL	2	18	27
3558.7	K-161	1310' FSL & 590' FEL	2	18	27
3521.4	L-122	100' FSL & 430' FEL	3	18	27
3501.4	L-123	660' FSL & 250' FEL	3	18	27
3518.5	L-133	800' FSL & 950' FWL	2	18	27
3535.3	L-134	10' FSL & 640' FWL	2	18	27
3552.7	L-155	1040' FSL & 2025' FEL	2	18	27
3574.8	L-156	600' FSL & 1330' FEL	2	18	27
3588.6	L-171	670' FSL & 300' FWL	1	18	27
3630.3	L-191	1120' FSL & 1440' FEL	1	18	27
3533.2	M-123	1050' FNL & 100' FEL	10	18	27
3557.0	M-133	450' FNL & 1175' FWL	11	18	27
3574.8	M-141	225' FNL & 2280' FWL	11	18	27
3593.0	M-153	200' FNL & 1925' FEL	11	18	27

Due to surface conditions, the following wells will be drilled directionally at the surface location mentioned above, and bottomed within a circle of 150' radius with its center being the bottom hole location specified below.

D-361	Surface location 136' FSL & 800' FEL, Sec. 27, T-17S, R-28E Bottom hole location 300' FNL & 500' FEL, Sec. 34, T-17S, R-28E
E-392	Surface location 959' FNL & 2400' FEL, Sec. 35, T-17S, R-28E Bottom hole location 600' FNL & 2500' FEL, Sec. 35, T-17S, R-28E
K-131	Surface location 1500' FSL & 600' FWL, Sec. 2, T-18S, R-27E Bottom hole location 1600' FSL & 250' FWL, Sec. 2, T-18S, R-27E
L-133	Surface location 800' FSL & 950' FWL, Sec. 2, T-18S, R-27E Bottom hole location 1250' FSL & 700' FWL, Sec. 2, T-18S, R-27E



STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION

JERRY APODACA
GOVERNOR

NICK FRANKLIN
SECRETARY

December 12, 1978

POST OFFICE BOX 2088
STATE LAND OFFICE BUILDING
SANTA FE, NEW MEXICO 87501
(505) 827-2433

Atlantic Richfield Company
P. O. Box 1610
Midland, Texas 79702

Attention: J. L. Tweed

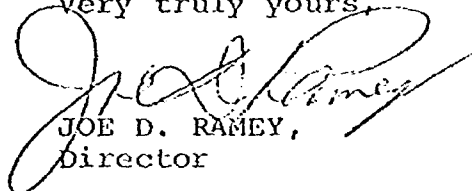
Administrative Order NSL-999

Gentlemen:

Reference is made to your application for 46 non-standard locations for your ARCO-Empire Abo Unit Wells as per the attached list, Eddy County, New Mexico.

By authority granted me under the provisions of Rule 14 of Order No. R-4549-B, the 46 listed non-standard locations are hereby approved.

Very truly yours,


JOE D. RAMEY,
Director

JDR/RLS/dr

cc: Oil Conservation Division - Artesia
Oil & Gas Engineering Committee - Hobbs
U. S. Geological Survey - Artesia
Oil & Gas Division - State Land Office - Santa Fe

EMPIRE ABO UNIT WELLS

WELL NAME	LOCATION	SEC.	TWP-S	RANGE-E
E-362	1200' FNL and 1200' FEL	34	17	28
E-363	650' FNL and 120' FEL	34	17	28
E-374	220' FNL and 700' FWL	35	17	28
E-383	1190' FNL and 1910' FWL	35	17	28
E-384	600' FNL and 1400' FWL	35	17	28
E-393	1100' FNL and 2250' FEL	35	17	28
E-394	1000' FNL and 1600' FEL	35	17	28
E-395	75' FNL and 1820' FEL	35	17	28
F-334	1700' FNL and 620' FWL	34	17	28
F-335	2250' FNL and 570' FWL	34	17	28
F-342	1450' FNL and 1900' FWL	34	17	28
F-343	2300' FNL and 1675' FWL	34	17	28
F-354	1850' FNL and 2550' FEL	34	17	28
F-363	2250' FNL and 1250' FEL	34	17	28
F-373	1820' FNL and 150' FWL	35	17	28
F-374	2525' FNL and 520' FWL	35	17	28
F-375	1780' FNL and 1175' FWL	35	17	28
F-376	1335' FNL and 700' FWL	35	17	28
F-382	2400' FNL and 1600' FWL	35	17	28
F-383	1600' FNL and 2350' FWL	35	17	28
F-391	1545' FNL and 1625' FEL	35	17	28
G-291	2000' FSL and 1200' FWL	33	17	28
G-314	1450' FSL and 2000' FEL	33	17	28
G-315	1900' FSL and 1450' FEL	33	17	28
G-324	2250' FSL and 235' FEL	33	17	28
G-334	2400' FSL and 500' FWL	34	17	28
G-352	2200' FSL and 1450' FEL	34	17	28
G-353	1420' FSL and 2050' FEL	34	17	28
G-361	2400' FSL and 300' FEL	34	17	28
H-341	1200' FSL and 2500' FWL	34	17	28
I-292	485' FNL and 1070' FWL	4	18	28
J-235	1750' FNL and 1600' FEL	6	18	28
K-142	1700' FSL and 1400' FWL	2	18	27
K-143	1820' FSL and 2550' FWL	2	18	27
K-161	1310' FSL and 590' FEL	2	18	27
L-122	100' FSL and 430' FEL	3	18	27
L-123	660' FSL and 250' FEL	3	18	27
L-134	10' FSL and 640' FWL	2	18	27
L-155	1040' FSL and 2025' FEL	2	18	27
L-156	600' FSL and 1330' FEL	2	18	27
L-171	670' FSL and 300' FWL	1	18	27
L-191	1120' FSL and 1440' FEL	1	18	27
M-123	1050' FNL and 100' FEL	10	18	27
M-133	450' FNL and 1175' FWL	11	18	27
M-141	225' FNL and 2280' FWL	11	18	27
M-153	200' FNL and 1925' FEL	11	18	27

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION

IN THE MATTER OF THE HEARING
CALLED BY THE OIL CONSERVATION
DIVISION FOR THE PURPOSE OF
CONSIDERING:

CASE NO. 6409
Order No. R-5906

APPLICATION OF ATLANTIC RICHFIELD
COMPANY FOR DIRECTIONAL DRILLING,
EDDY COUNTY, NEW MEXICO.

ORDER OF THE DIVISION

BY THE DIVISION:

This cause came on for hearing at 9 a.m. on December 20,
1978, at Santa Fe, New Mexico, before Examiner Daniel S. Nutter.

NOW, on this 16th day of January, 1979, the Division
Director, 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 Division has jurisdiction of this cause and the
subject matter thereof.

(2) That the applicant, Atlantic Richfield Company, seeks
approval for the directional drilling of four wells on its
Empire Abo Unit Area, Empire-Abo Pool, Eddy County, New Mexico,
as follows:

In Township 17 South, Range 28 East:

Well No. D-361, surface location 136 feet from the South
line and 800 feet from the East line of Section 27,
bottom-hole location 300 feet from the North line and
500 feet from the East line of Section 34; this well
would be designated as being in Unit A of Section 34.

Well No. E-392, surface location 959 feet from the North
line and 2400 feet from the East line, bottom-hole
location 600 feet from the North line and 2500 feet
from the East line, in Unit C of Section 35.

In Township 18 South, Range 27 East:

Well No. K-131, surface location 1500 feet from the South line and 600 feet from the West line, bottom-hole location 1600 feet from the South line and 250 feet from the West line, in Unit L of Section 2; and

Well No. L-133, surface location 800 feet from the South line and 950 feet from the West line, bottom-hole location 1250 feet from the South line and 700 feet from the West line, in Unit M of Section 2.

(3) That all of the above wells would be bottomed at unorthodox locations within 150 feet of the described bottom-hole locations.

(4) That the applicant should be required to determine the subsurface locations of the bottom of the holes of each of the wells by means of a continuous multi-shot directional drilling, if said well is to be completed as a producing well.

(5) That approval of the subject application will prevent the drilling of unnecessary wells, avoid the augmentation of risk arising from the drilling of an excessive number of wells, and otherwise prevent waste and protect correlative rights.

IT IS THEREFORE ORDERED:

(1) That the applicant, Atlantic Richfield Company, is hereby authorized to directional drill four wells on its Empire Abo Unit Area, Empire-Abo Pool, Eddy County, New Mexico, bottoming them at unorthodox locations as follows:

In Township 17 South, Range 28 East:

Well No. D-361, surface location 136 feet from the South line and 800 feet from the East line of Section 27, bottom-hole location 300 feet from the North line and 500 feet from the East line of Section 34 in Unit A;

Well No. E-392, surface location 959 feet from the North line and 2400 feet from the East line, bottom-hole location 600 feet from the North line and 2500 feet from the East line, Section 35 in Unit C.

In Township 18 South, Range 27 East:

Well No. K-131, surface location 1500 feet from the South line and 600 feet from the West line, bottom-hole location 1600 feet from the South line and 250 feet from the West line, Section 2 in Unit L; and

Well No. L-133, surface location 800 feet from the South line and 950 feet from the West line, bottom-hole location 1250 feet from the South line and 700 feet from the West line, Section 2 in Unit M.

(2) That all of the above wells would be bottomed at unorthodox locations within 150 feet of the described bottom-hole locations.

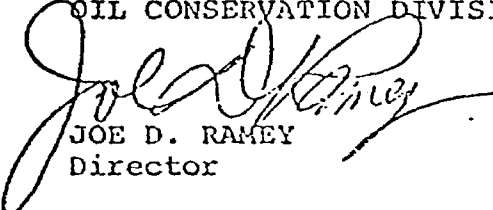
PROVIDED HOWEVER, that subsequent to the above-described directional drilling, should any of said wells be a producer, a continuous multi-shot directional survey shall be made of the wellbore from total depth to the surface with shot points not more than 100 feet apart; that the operator shall cause the surveying company to forward a copy of the survey report directly to the Santa Fe office of the Division, Box 2088, Santa Fe, New Mexico, and that the operator shall notify the Division's Artesia District Office of the date and time said survey is to be commenced.

(3) That Form C-105 shall be filed in accordance with Division Rule 1105 and the operator shall indicate thereon true vertical depths in addition to measured depths.

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

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

STATE OF NEW MEXICO
OIL CONSERVATION DIVISION


JOE D. RAMEY
Director

S E A L

fd/

-3-

Case No. 6409
Order No. R-5906

Well No. L-133, surface location 800 feet from the South line and 950 feet from the West line, bottom-hole location 1250 feet from the South line and 700 feet from the West line, Section 2 in Unit M.

(2) That all of the above wells would be bottomed at unorthodox locations within 150 feet of the described bottom-hole locations.

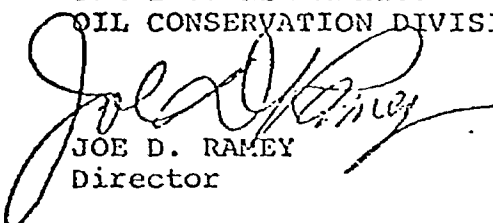
PROVIDED HOWEVER, that subsequent to the above-described directional drilling, should any of said wells be a producer, a continuous multi-shot directional survey shall be made of the wellbore from total depth to the surface with shot points not more than 100 feet apart; that the operator shall cause the surveying company to forward a copy of the survey report directly to the Santa Fe office of the Division, Box 2088, Santa Fe, New Mexico, and that the operator shall notify the Division's Artesia District Office of the date and time said survey is to be commenced.

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

STATE OF NEW MEXICO
OIL CONSERVATION DIVISION


JOE D. RAMEY
Director

S E A L

fd/

Empire Abo Unit
Infill Wells Approved
By New Mexico Oil
Conservation Division

<u>Application Submittal Date</u>	<u>Phase</u>	<u>Well</u>	<u>Status 6-1-79</u>	
			<u>Completed</u>	<u>To Be Completed</u>
9/10/74	<i>I-A</i>	F-331	X	
		J-211	X	

Empire Abo Unit
 Infill Wells Approved
 By New Mexico Oil
 Conservation Division

Application Submittal Date	Phase	Well	Status 6-1-79	
			Completed	To Be Completed
3/6/75	I	E-371	X	
		E-381	X	
		F-351	X	
		G-291	Deleted	
		G-311	X	
		H-261	X	
		H-271	X	
		H-291	X	
		I-231	X	
		J-191	X	
		J-201	X	
		K-181	X	
		L-141	X	
		L-151	X	
		M-121	X	
Added Well		J-231	X	

Empire Abo Unit
 Infill Wells Approved
 By New Mexico Oil
 Conservation Division

Application Submittal Date	Phase	Well	Status 6-1-79	
			Completed	To Be Completed
12/8/75	II	E-382	X	
		E-391	X	
		E-401	Deleted	
		F-371	X	
		G-312	X	
		G-321	X	
		G-331	X	
		G-341	X	
		I-271	X	
		J-202	X	
		J-221	X	
		J-232	X	
		K-182	X	
		L-111	X	
		L-131	X	
		L-132	X	
		L-152	X	
Added Wells		K-191	X	
		G-301	X	

Empire Abo Unit
Infill Wells Approved
By New Mexico Oil
Conservation Division

Application Submittal Date	Phase	Well	Status 6-1-79	
			Completed	To Be Completed
10/22/76	III-A	F-332	X	
		F-361	X	
		G-342	X	

Empire Abo Unit
 Infill Wells Approved
 By New Mexico Oil
 Conservation Division

Application Submittal Date	Phase	Well	Status 6-1-79	
			Completed	To Be Completed
11/3/76	III-B	E-372	X	
		E-401	Deleted	
		F-372	X	
		F-381	X	
		G-351	X	
		H-272	X	
		H-292	X	
		H-293	X	
		H-311	X	
		I-281	X	
		J-222	X	
		K-141	X	
		K-183	X	
		L-112	Deleted	
		L-121	X	
		L-153	X	
		M-91	X	Changed Number to M-901
		M-101	X	
		M-122		X
		N-91	X	Changed Number to N-901
Added Wells		F-341	X	
		F-372	X	
		F-333	X	

Empire Abo Unit
 Infill Wells Approved
 By New Mexico Oil
 Conservation Division

Application Submittal Date	Phase	Well	Status 6-1-79	
			Completed	To Be Completed
12/29/77	IV	E-373	X	
		E-361	X	
		E-351	X	
		E-341	X	
		F-321	X	
		G-322	X	
		I-272	X	
		K-231	X	
		M-152	X	
		M-131		X
		G-343	X	
		G-332	X	
		G-323	X	
		H-331	X	
		H-321	X	
		H-322	X	
		H-301	X	
		I-282	X	
		J-233	X	
		K-232		X
		K-184	X	
		J-223	X	
		K-192	X	
		M-151	X	
		I-273	X	

Empire Abo Unit
Infill Wells Approved
By New Mexico Oil
Conservation Division

Application Submittal Date	Phase	Well	Status 6-1-79	
			Completed	To Be Completed
4/4/78	V	F-362	X	
		F-352	X	
		F-353	X	
		F-322	X	
		G-333	X	
		G-313	X	
		H-312	X	
		H-302	X	
		H-303	X	
		H-294	X	
		H-295	X	
		H-281	X	
		I-291	X	
		I-283	X	
		J-234	X	
		J-212	Deleted	
		J-213	Deleted	
		J-214	Completed as J-212	
		J-203	X	
		K-193	X	
		K-194	X	
		L-154	X	
		L-142	X	
		L-143	X	
		M-132		X
Added Wells		I-251	X	
		I-261	X	

EXHIBIT 2

EMPIRE ABO UNIT
INFILL WELLS APPROVED
BY NEW MEXICO OIL
CONSERVATION DIVISION

<u>Application Submittal Date</u>	<u>Phase</u>	<u>Well</u>	<u>Status, 6-1-79</u>	<u>To be Completed</u>
			<u>Completed</u>	
11/20/78	VI	D-361	X	
		E -362	X	
		E-363	X	
		E-374	X	
		E-383	X	
		E-384	X	
		E-392	X	
		E-393	X	
		E-394	Deleted	
		E-395	X	
		F-334		X
		F-335	X	
		F-342	X	
		F-343	X	
		F-354	X	
		F-363	X	
		F-373	X	
		F-374	X	
		F-375	X	
		F-376	X	
		F-382	X	
		F-383	X	
		F-391		X
		G-291	X	
		G-314	X	
		G-315	X	
		G-324	X	
		G-334	X	
		G-352	X	
		G-353		X
		G-361	X	

EMPIRE ABO UNIT
INFILL WELLS APPROVED
BY NEW MEXICO OIL
CONSERVATION DIVISION

Application Submittal Date	Phase	Well	Status, 6-1-79 Completed	To be Completed
11/20/78	VI	H-341		X
		I-292		X
		J-235		X
		K-131	X	
		K-142		X
		K-143	X	
		K-161		
		L-122		X
		L-123		X
		L-133	X	
		L-134	X	
		L-155	X	
		L-156	X	
		L-171		X
		L-191	Deleted	
		M-123		X
		M-133		X
		M-141		X
		M-153		X
		F-336		X
		F-364		X

Added Wells

dearnley, meier & mc cormick

209 SIMMS BLDG., P.O. BOX 1092, PHONE 243-8891, ALBUQUERQUE, NEW MEXICO 87103
1210 FIRST NATIONAL BANK BLDG. EAST ALBUQUERQUE, NEW MEXICO 871081
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BEFORE THE
NEW MEXICO OIL CONSERVATION COMMISSION
MORGAN HALL
STATE LAND OFFICE BUILDING
SANTA FE, NEW MEXICO
Wednesday, April 25, 1973

EXAMINER HEARING

IN THE MATTER OF:

Application of Atlantic Richfield Company
for a unit agreement, Eddy County,
New Mexico

Case No. 4952

IN THE MATTER OF:

Application of Atlantic Richfield Company
for a pressure maintenance project, Eddy
County, New Mexico

Case No. 4953

BEFORE: Richard L. Stamets

TRANSCRIPT OF HEARING

BEFORE EXAMINER HEARING
OIL CONSERVATION DIVISION
ARCO EXHIBIT NO. 3
CASE NO. 6553

1 MR. STAMETS: They are.

2 Q Now, have you prepared or has there been prepared under
3 your direction certain exhibits for introduction in this
4 case?

5 A Yes, sir. There has.

6 Q And they have been marked Exhibits 4 through 12?

7 A That's correct.

8 Q Refer to Exhibit 4 and explain what this is and what it
9 shows.

10 A Exhibit 4 happens to be a map of the Empire-Abo pool
11 contoured on the top of the Abo porous reef. The subsea
12 contours are shown. You can readily see by looking off to
13 the southwest that probably the structurally highest well
14 in the field is the Malco Federal Number 8 which happens to
15 be located in the northwest quarter of the southeast
16 quarter of 9, 18 South, 27 East, at the top of the Abo
17 reef at minus 1621 feet subsea, as you can see there.

18 From this point, the crest of the reef can be followed
19 around dipping at about 1 degree. Approximately miles east
20 of that point, the crest of the reef dips below water-oil
21 contact in the Abo formation which was determined by
22 the engineering committee to minus 2665 feet subsea. The
23 heavy dashed line is the unit area which was approved by
24 USGS as being a proper area for unitization of the Abo
25 formation.

bottom, daily water production, so labeled.

And in January that production is 25,036 barrels of water per day which amounts to about 9 per cent of the water-oil combined production. That amount of production to 2-1-73 represents 23.4 per cent of the original oil in place.

Moving up to the next curve of cumulative gas, you see that along with this oil production we have had gas production, of course. And our cumulative gas production as of the end of '73 is 118 billion cubic feet. The curve on the ^{right} white is in, well, it's again, it's in millions of barrels of oil for the cumulative. And it is in billions of cubic feet for the gas cumulative. So we have produced almost 90 million barrels in this curve of oil and the 118 billion cubic feet of gas through the year of 1972.

If we move on up to the curve that is plotted across the top, this is as indicated on the left margin, this is your reservoir pressures, ^{points} points per square inch on the vertical scale. Plotted it is the heavy line as indicated by words "Reservoir Pressure." 2355 is the point back here in November of 1957 at the beginning of production.

The last pressure survey taken in July of 1972 was 1,418 PSI, again plotted far over here to right from the middle of 1972. The other curve which we haven't yet discussed is the gas-oil ratio curve which again is shown

BEFORE EXAMINER NUTTER

OIL CONSERVATION DIVISION

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CASE NO. 6553

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And in January that production is 25,036 barrels of water per day which amounts to about 9 per cent of the water-oil combined production. That amount of production to 2-1-73 represents 23.4 per cent of the original oil in place.

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The last pressure survey taken in July of 1972 was 1,416 PSI, again plotted far over here to right from the middle of 1972. The other curve which we haven't yet discussed is the gas-oil ratio curve which again is shown

BEFORE EXAMINER NUTTER

OIL CONSERVATION DIVISION

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bottom, daily water production, so labeled.

And in January that production is 25,036 barrels of water per day which amounts to about 9 per cent of the water-oil combined production. That amount of production to 2-1-73 represents 23.4 per cent of the original oil in place.

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The last pressure survey taken in July of 1972 was 1,418 PSI, again plotted far over here to right from the middle of 1972. The other curve which we haven't yet discussed is the gas-oil ratio curve which again is shown

BEFORE EXAMINER ENTER

OIL CONSERVATION DIVISION

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CASE NO. 6533

1 on up here with the Reservoir Pressure curve. The gas-oil
2 ratio curve is read over here in the right margin. Gas-oil
3 ratio is cubic feet per barrel of oil. I think you can
4 see that in that early days it was average perhaps, 1,100
5 cubic feet per barrel. That had been a gradual increase
6 in the pool to the gas-oil ratio. However, it's been
7 holding pretty steadily in the last few years and currently
8 is averaging 1,300 cubic feet per barrel and 1,500 cubic
9 feet per barrel.

10 Q Now, have the working interest owners formed an engineering
11 committee in connection with the study of unitization in
12 this area?

13 A Yes, sir. They certainly have.

14 Q When was that formed?

15 A That was formed at a working interest owner's meeting in
16 October of 1967.

17 Q What was the purpose of the formation of this committee?

18 A The primary purpose charged to the engineering subcommittee.
19 Actually there were two primary purposes. First, to
20 determine the proper area to be unitized. And second,
21 to work up a number of parameters which would be suitable
22 as a basis for the working interest owners and to negotiate
23 possible participation in a possible future unit.

24 Q Over what period of time did the engineering committee meet?

25 A It met in work sessions virtually continuously for anyone

1 field that has had a great deal more capacity than the
2 allowables. And as you can see in the middle '60's 15 to
3 16 thousand barrels a day and the market demand began to
4 pick up.

5 The Commission upped the New Mexico Allowables. You
6 can see the Empire-Abo's rate going right up. If you
7 plot an allowable curve to the state of New Mexico, it will
8 be parallel to this thing right here. Moving on out to
9 current times, I might say that just happened at the time
10 we plotted this curve. We didn't have January's data.
11 The curve shows that we are, I'm still on the oil rate
12 curve. It shows that we are producing at the end of the
13 year 1972 approximately 25,500 barrels per day from the pool
14 as a whole.

15 Moving up one curve, you find that cumulative oil
16 curve. This is the increased oil production in the
17 original first production back in November, 1957, to
18 1-1-72. And you see that as, I mean, 1-1-73. And you see
19 as of 1-1-73 approximately 89.5 million barrels of oil had
20 been produced from the reservoir.

21 Q Do you have any later figures on that?

22 A Well, we do have January which, you might imagine, is about
23 the same as December. Allowable stayed the same. It's
24 25,625 barrels of oil per day. I might mention the water
25 at this time is plotted on the low slide line down toward

BEFORE EXAMINATION

OIL CONSERVATION DIVISION

EXHIBIT NO. 6553

CASE NO. 6553

bottom, daily water production, so labeled.

And in January that production is 25,036 barrels of water per day which amounts to about 9 per cent of the water-oil combined production. That amount of production to 2-1-73 represents 23.4 per cent of the original oil in place.

Moving up to the next curve of cumulative gas, you see that along with this oil production we have had gas production, of course. And our cumulative gas production as of the end of '73 is 118 billion cubic feet. The curve on the ^{right} white is in, well, it's again, it's in millions of barrels of oil for the cumulative. And it is in billions of cubic feet for the gas cumulative. So we have produced almost 90 million barrels in this curve of oil and the 118 billion cubic feet of gas through the year of 1972.

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The last pressure survey taken in July of 1972 was 1,418 PSI, again plotted far over here to right from the middle of 1972. The other curve which we haven't yet discussed is the gas-oil ratio curve which again is shown

by necessity. Nevertheless, the attempt was to reflect the types of wells that are in the reservoir at the present time, but I want to emphasize that these are not real tests. This is a hypothetical production, because we haven't got through March, 1974 yet. We will get there, we hope.

Okay. And then you move on over. That's the first two pages, and then you move over to the last three pages, 1, 2, 3. And some of you, I'm sorry, will not have the very last page which is a table of fluid properties versus reservoir pressure, but we will get them to. That's just a foul up on our part, but any way those last three pages are simply, they simply show how we arrived at the voidage values that are over here on pages 1 and 2.

So under this allowable plan, the project area reservoir voidage I want to emphasize will be reduced to less than half of the current primary reservoir voidages. Now, refer to Exhibit 8 and explain what this is and what it shows.

Well, Exhibit 8 would try to throw a little more color into the proceedings here. Christmas red and green. This is the same map that we looked at back over here on one of the earlier, well, I guess it was Exhibit 4, the very same structure map, the same unit outlined and so forth; but it does now have the 8 injection wells as the red triangles, the same 8 wells we looked at in

BEFORE EXAMINER NUTTER

OIL CONSERVATION DIVISION

AR 60 17XHXIT 15

CASE NO. 6553

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1 Exhibit, 1 on the plan of operation on, I believe, Exhibit
2 6 a while ago.

3 Q Why were the injection wells located as you have shown
4 them on this presentation?

5 A Well, of course, there are a number of factors you have got
6 to consider. Of course, our intent here in what we are
7 going to do is put this down in the Gas Cap. So that was
8 number 1. We want to distribute it as equally as possible
9 to maintain pressure as much as we can throughout the
10 reservoir.

11 So the attempt is to distribute the wells
12 volumetrically over the reservoir.

13 Q And the Gas Cap is toward the north border of the reservoir?

14 A Well, the Gas Cap is over the whole structure virtually
15 and along the whole ^crest of the reef and and back to the
16 back reef. And these wells are located, of course, in
17 the Gas Cap. This was a primary consideration. You
18 have got to consider permeability, injectivity, are you
19 going to be able to get gas in the wells, and then
20 naturally, and this is why the green tracts are on here.

21 These green tracts are the same tracts that Mr. Embry
22 had on his map being those tracts that we have now reason
23 to believe likely will ^{not} be in the unit. Naturally, we do not
24 want to damage in any way these tracts; and, therefore,
25 we are locating our injection wells as you can see by
looking at Exhibit A at least two locations away.

1 to be any point in repeating it. There is a little more
2 information in there. Paragraph 3 now is the basic
3 concepts. Now, I'm over on page 4. Paragraph 3 is the
4 basic concepts. "A. Field production history and Reservoir
5 Numeric Models Studies have demonstrated that reservoir
6 recovery is governed by a gravity drainage mechanism. With
7 unitization, the operator will be able to maximize beneficial
8 effects of this most efficient recovery mechanism by
9 careful observation of well performance and shutting in
or curtailing production from inefficient wells.

Paragraph B. Injection of plant residue gas will act
toward pressure maintenance and orderly control of
expansion of the secondary gas cap."

These are the concepts by which we will do our best
to operate this reservoir, this unit area. Paragraph 4
covers the special rules that we are going to request.
Go ahead and explain what the special rules are that you
are proposing.

18
19 A Paragraph 4 "Special Rules. A. Unit Allowable. Starting
20 on the effective date of the unit, the unit will receive a
21 unit allowable, calculated so that Unit Area reservoir
22 voidage will not exceed average daily reservoir voidage rate
23 for 1972." Let me see. Where am I? "This will result in
24 an increase from current 23,600 BOPD to about 30,000 BOPD
25 for the Unit Area."

BEFORE EXAMINER NUTTER

OIL CONSERVATION DIVISION

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CASE NO. 6553

BEFORE EXAMINER HEARING

OIL CONSERVATION DIVISION

ARCO EXHIBIT NO. 11

CASE NO. 6553

EXH. 11

Page 1

BEFORE THE
NEW MEXICO OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
April 10, 1974

EXAMINER HEARING

IN THE MATTER OF:

Application of Cities
Service Oil Company for
a unit agreement, Eddy
County, New Mexico.

Case No. 5212

and

IN THE MATTER OF:

Application of Cities
Service Oil Company for
a pressure maintenance
project, Eddy County,
New Mexico.

Case No. 5213

BEFORE: Richard L. Stamets, Examiner.

TRANSCRIPT OF HEARING

A P P E A R A N C E S

For the New Mexico Oil
Conservation Commission:

Thomas Derryberry, Esq.
Legal Counsel for the
Commission
State Land Office Building
Santa Fe, New Mexico

THE NYE REPORTING SERVICE
STATE-WIDE DEPOSITION NOTARIES
225 JOHNSON STREET
SANTA FE, NEW MEXICO 87501
TEL. (505) 982-0386

Now, this same factor immediately prior to unitization in September, for which I just gave you the voidage figure for the Unit, was 2.66 reservoir barrels. I don't have this in the table but, in other words, although we increased the oil rate from 23,252 to 32,891 barrels per day, we reduced the voidage-efficiency factor from 2.66 reservoir barrels per stock-tank barrel down to 1.71. So we had a sizeable reduction, and, of course, the lower you get with reservoir-voidage-efficiency factor simply means you're voiding less space per barrel of production and therefore you're holding the pressure up longer and you get this increased effect in a gravity drainage reservoir; the longer you can hold the pressure up relative to oil production the more recovery you are going to have. This is another way of stating the fact that you have a flattening in the pressure curve and the flattening is because of this improved efficiency factor.

Okay, moving to Column 7 here we simply took the total 56,319 reservoir-net-voidage rate divided by those 221 wells over there in Column 1 and got a figure of 255 reservoir barrels per day, reservoir-voidage rate, just putting it on a per well basis.

Column 8 puts the allowable production of 56,513

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BEFORE EXAMINER

OIL CONSERVATION

ARC6 EXHIBIT 12

CASE NO. 6553

EXH. 12

Page 2

BEFORE THE
NEW MEXICO OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
April 10, 1974

EXAMINER HEARING

IN THE MATTER OF:

Application of Cities
Service Oil Company for
a unit agreement, Eddy
County, New Mexico.

Case No. 5212

and

IN THE MATTER OF:

Application of Cities
Service Oil Company for
a pressure maintenance
project, Eddy County,
New Mexico.

Case No. 5213

BEFORE: Richard L. Stamets, Examiner.

TRANSCRIPT OF HEARING

A P P E A R A N C E S

For the New Mexico Oil
Conservation Commission:

Thomas Derryberry, Esq.
Legal Counsel for the
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State Land Office Building
Santa Fe, New Mexico

THE NYE REPORTING SERVICE
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comparisons I was making earlier, and the only place that gas can come from is the big unit which adjoins it and which is connected, which I certainly believe and which we've had testimony from the Citgo witness that the two unit areas are connected.

Q And that in itself, in your opinion, is a violation of correlative rights?

A Yes, sir, I would say that it is, in my opinion.

Now, we move ahead further in this summation. We feel that if the Citgo Unit is governed by the same voidage formula and controls as the Arco Unit it will give the NMOCC a means to reduce Citgo Unit reservoir voidage below present levels, admittedly somewhat inefficient as we have seen here, resulting in more efficient operations of the reservoir and tending to increase the ultimate oil recovery from the pool and I mean that the same thing that operate on them, when you set them a voidage limit like you've set us a voidage limit, then they're going to be going out there and spending money to work over wells and try to get as low in the reef as they can and produce at as low a gas-oil ratio as they can because they've got that 1559 barrel a day voidage number staring them in the face and we've got a number staring us in the

face and believe me it creates quite an incentive to go for the low-ratio wells in terms of production, and this is what you'd want to do in this reservoir if you want to maximize ultimate recovery. So setting a voidage limit is quite a carrot in front of an operator to try to get his ratio down as low as possible whereas in a gas-siphon type operation this is not as critical. About the only thing that's critical is how much gas can you get in that injection well. Now, okay, as I wanted to say again, in setting a reservoir voidage limit for the Citgo Unit Atlantic Richfield recommends the NMOCC use its best judgment after a complete review of the facts, however, we strongly recommend a voidage limit no greater than 1559 reservoir barrels per day be granted to the Citgo Unit, and just as is the Arco Unit the Citgo Unit should be required to inject back into the Abo gas cap all available plant residue gas. That completes my summation.

MR. HINKLE: We would like to offer into evidence Exhibits 1 through 5.

MR. STAMETS: Is there any objection to Exhibits 1 through 5?

MR. KELLAHIN: No objection

FIELD MANAGEMENT STUDY

ABO RESERVOIR

EMPIRE ABO POOL

Eddy County, New Mexico

October 2, 1970

CONCLUSIONS

1. Gravity segregation is the major influence on reservoir performance. However, water influx is of some importance in the extreme east portion of the reservoir.
2. Both oil and gas have migrated from the Main Reef into the Chalk Bluff Draw Unit area in significant amounts. Thus it appears the Chalk Bluff Draw area is connected to the Main Reef reservoir, though poorly.
3. Future reserve projections using the numeric reservoir simulator offer a reasonable and equitable basis for a unitization parameter.
4. The optimum future operating program is to unitize the reservoir for maximum conservation of reservoir energy by producing only from the most efficient wells ("Unitized Maximum Gas Conservation").

RECOMMENDATIONS

It is recommended that Empire Abo reservoir be unitized to increase oil recovery by producing from the most efficient wells in order to conserve reservoir gas energy.

FIELD DEVELOPMENT AND NATURAL DEPLETION HISTORY

Discovery and Development

The Empire Field is located 8 miles southeast of the town of Artesia in Eddy County, New Mexico. Empire Abo reservoir saw its initial completion in November, 1957. The well was Pan American's Malco "A" No. 1, located in NE NW-11-18S-27E. Development rapidly moved west, east, and north from the discovery which proved to be only one location removed from the fore-reef edge of productive limits. Within three years some 215 of the eventual 250 producing wells had been completed. In defining the reservoir, 29 dry holes were also drilled. At present there are 201 flowing and 38 pumping wells for a field total of 239 wells. A graph portraying field performance history is on page 7. Other current and basic data may be found in the Reservoir Data Summary, page 6.

Geology

The Abo producing zone is a Lower Leonard (Permian) carbonate reef, one of several in a trend flanking the northern margin of the Delaware Basin. Abo development is of the barrier reef type. Dolomitization of the original coralline reef material has been complete. Vugs, fractures, and fissures have been observed in examinations of cores from throughout the main reef. Anhydrite infilling has acted to restrict flow in localized areas. Reef development is long and narrow, being about $12\frac{1}{2}$ miles in length from southwest to northeast, and averaging about $1\frac{1}{2}$ miles in width from backreef (north) to forereef (south). The reef dips gradually (about 1° , or 92' per mile) from southwest to northeast on the long axis, with the highest point being -1621' at the Pan American Malco "G" No. 8 (J9-18S-27E). About $11\frac{1}{4}$ miles to the northeast the reef crest dips below the -2665' water level. Characteristically for barrier reefs, across the width of the reef there is sharp dip (10° - 20°) from the crest toward the fore-reef. This is thought to be because the fore-reef was subject to more violent wave-action from the open sea than was the quieter lagoonal area of the back-reef. Reef configuration may be seen from the Structure maps and cross-sections on pages 13 through 19. Front elevation and back to fore-reef profile views may be found on pages 21 and 22.

Productive limits to the southwest are the result largely of increasing anhydrite content, while on the back-reef north side there is a facies change to an impermeable carbonate "mud" interspersed with green shale. Limits on the south and east result as the reef dips below the water-oil contact.

ARCO geologists have made an in-depth study of main reef cores, including a large number of samples slabbed for detailed examination. A major conclusion reached was to confirm the prevalence of hydrocarbon-stained fractures and linear vugs with the major orientation

being between 0-45 degrees from the vertical plane of the core. A further conclusion was that well-to-well correlation of porosity development was not possible.

Field Performance

Original Gas-Oil Contact and Gas Cap Expansion

There was a small original gas cap located in the structurally high west portion of the field with pore volume only 0.7% of oil column pore volume. The original gas-oil contact datum at -1750' has been supported with well-test data presented on pages 2 and 3 of the Engineering Subcommittee Phase I Study of August 1968.

Initial reservoir pressure at -2264' datum was 2359 psia, while the bubble point of the composite fluid analysis used in all study calculations was 2231 psia. (See graph, page 8). The presence of a small gas cap is not incompatible with a datum pressure above the bubble-point. This is seen when it is realized that with more than 1000' of structural difference within the reservoir, a bubble-point variance of 200 psi or more is possible.

The history of gas cap expansion is best shown by study of individual well graphs illustrating gas-oil ratio variation with time. Performance of some of the wells located immediately under the original gas cap is shown by:

Pan American Windfohr Fed. No. 1 (P-4-18S-27E, graph page 29),
Windfohr Fed. No. 3 (O-4-18S-27E, graph page 31),
Malco Fed. "G" No. 11 (B-9-18S-27E, graph page 32).

Although it is an east offset to the Malco Fed. "G" No. 11, the Malco Fed. "G" No. 3 (A-9-18S-27E, graph page 33), is completed 42' lower subsea, and was not yet showing a severe increase in gas-oil ratio at the end of the history match plot shown. However, by June, 1970, the Malco "G" No. 3 had a gas-oil ratio of 2,330:1.

A significant number of wells have required workovers to lower the perforated interval due to high gas-oil ratio, caused by the expanding gas cap. Some of these are:

Pan American Malco Fed. "E" No. 1 (P-3-18S-27E, graph page 35),
Malco Fed. "E" No. 2 (O-3-18S-27E, graph page 37),
Malco Fed. "H" No. 1 (I-3-18S-27E, graph page 36),
State "AT" No. 1 (I-2-18S-27E, graph page 39),
State "AT" No. 2 (E-2-18S-27E, graph page 38),
ARCO State "AO" No. 1 (J-2-18S-27E, graph page 41).

As shown by the graphs, all these wells enjoy a considerable period of production at or near solution gas-oil ratio, with first a gradual increase as free gas begins to come into the well, followed by a sharper increase indicative that higher gas saturation has moved into the well's producing area. Recompletion to a lower subsea interval results in return to production at about the former solution gas-oil ratio.

The Pan American Malco "E" No. 1 has been the classic example of gas cap expansion, as documented first in the Engineering Subcommittee Phase I Report (Also see graph, page 35 of this report). After several years' production at gas-oil ratios of around 1100:1 or less, from perforations at -1824' to -1864', the gas-oil ratio increased to some 3000:1 and, in December, 1964, the well was recompleted to a 620' lower subsea interval at -2444' to -2474', resulting in a return to gas-oil ratios of 1000:1 or less. The "E" No. 1 was equipped to test either the old or new completion intervals separately and it was found that datum bottom-hole pressures from the two zones were virtually identical, indicating excellent formation communication. They have continued to test the upper zone, which now carries a gas-oil ratio over 220,000:1, while the lower interval has a June, 1970, gas-oil ratio of 1020:1.

Until recently there has been little field data to provide information on gas cap location in the east portion of the reservoir, particularly township 28 East. However, a number of wells which had previously been low ratio producers have shown sustained increases in gas-oil ratio in recent months. ARCo's Yates B-ARC No. 14 (B-33-17S-28E), completed in the interval -2197' to -2337', after years of production at gas-oil ratios of 1500:1 or less, has in the last year begun an increase which in June, 1970, reached 2660:1. ARCo Eddy State 32 No. 2 (F-32-17S-28E, graph page 43), completed in the interval -2146' to -2194', was originally a low ratio producer (1000:1) and has had several years of erratic increase in GOR and is now averaging a GOR of about 2000:1. These two wells are significant because they have been low-ratio oil producers in the past and the bulk of the wells in their area are completed near the reef base -- structurally too low to reveal anything as to gas cap expansion as yet.

Farther to the east, in Section 25-17S-28E, are three wells which are completed from 57' to 154' beneath the structural crest of the reef, and have shown gas-oil ratio increases in recent months. These wells are the Hondo State "A" No. 20, "A" No. 23, and "A" No. 37. These wells, all located along the reef crest, have had gas-oil ratio increases from about 1100:1 to the range of 1440:1 to 1640:1 while surrounding wells, located off the reef crest, remain at average ratios of 1100:1 or less.

Most revealing of downstructure gas cap formation have been the tests made by Pan American on their State "BU" No. 1 well, located at E-34-17S-28E. On test in January 1969, perforations in the interval -2507' to -2577', near reef base, flowed 120 BOPD with gas-oil ratio 1025:1. The lower perfs were then packed off and a section at the crest of the reef (-2125' to -2195') flowed 11 BOPD with a gas-oil ratio of 201,273:1. Separate bottom-hole pressure tests yielded pressures of 1780 psi for the upper zone and 1835 psi for the lower zone, with the interzone gradient of 0.15 psi/foot revealing a gas-oil transition zone. At the time the upper zone was testing as a gas-well, many wells located miles to the west were producing at or near solution gas-oil ratio from completion intervals as high or higher subsea than the State "BU" No. 1. This appears to be strongly indicative of gas cap "drape" along the major axis of the structure (see cross-section, page 22).

Water Production and Encroachment

The Engineering Subcommittee Phase I Report established that the level of the field water-oil contact was originally -2665'. This level is supported by drill-stem tests, completion tests and resistivity log calculations along the southeast reef flank from the Hondo-State "A" No. 30 (I-6-18S-28E) to the far east end of the reservoir. Field data appears to support some influx of water into the east end of the reservoir. Supporting evidence is:

- 1.) Wells in Section 30-17S-29E which formerly made top allowable, little water, now show increasing water cuts and decreasing oil rates. Continental State S-30 No. 1 and S-30 No. 2 are examples.
- 2.) The three easternmost sections in the reservoir had produced from 25% - 30% of their original oil in place by the time of the July, 1969, reservoir pressure survey, and yet their datum pressures as of that date were very close to the pressures in sections farther west that had produced only 15% of their original oil in place (see pressure survey map, page 20).

In addition, ARCo's reservoir simulator studies showed a calculated water influx averaging 1950 BWPD over the life of the field. Model runs at a lower rate of water influx indicated that movement of fluid from the main reef toward the east end was not sufficient to sustain east-end pressures at levels actually measured on pressure surveys.

EMPIRE ABO RESERVOIR DATA*

General

Discovery

November, 1957

Well Status - June 1970

Flowing	201
Pumping	38
Shut-in or plugged	11

Allowable Status - August, 1970

Top Allowable	183
GOR penalties	34
Capacity limit	22

Average Depth to Top Reef, Feet

5767'

Productive Acres

8993

Average Oil Price, \$/BBL

3.20

Average Gas Price, \$/MCF

0.087

Formation

Type Rock

Vuggy Dolomite

Average Net pay thickness, Feet

183'

Average Porosity, % (Log Data)

6.4

Water Saturation, Main Reef

8.6

Original Gas-Oil Contact, Feet subsea

-1750'

Original Water-Oil Contact, Feet subsea

-2665'

Reservoir mid-point, feet

-2264'

Reservoir Fluid

Original Reservoir Pressure, psia at -2264'

2359

Reservoir Pressure at Bubble Point, psia at -2264'

2231

Oil Formation Volume Factor, RVB/STB at P_{bp}

1.606

Gas Formation Volume Factor, RVB/SCF at P_{bp}

.00098

Gas in Solution at P_{bp} , SCF/STBO

1250

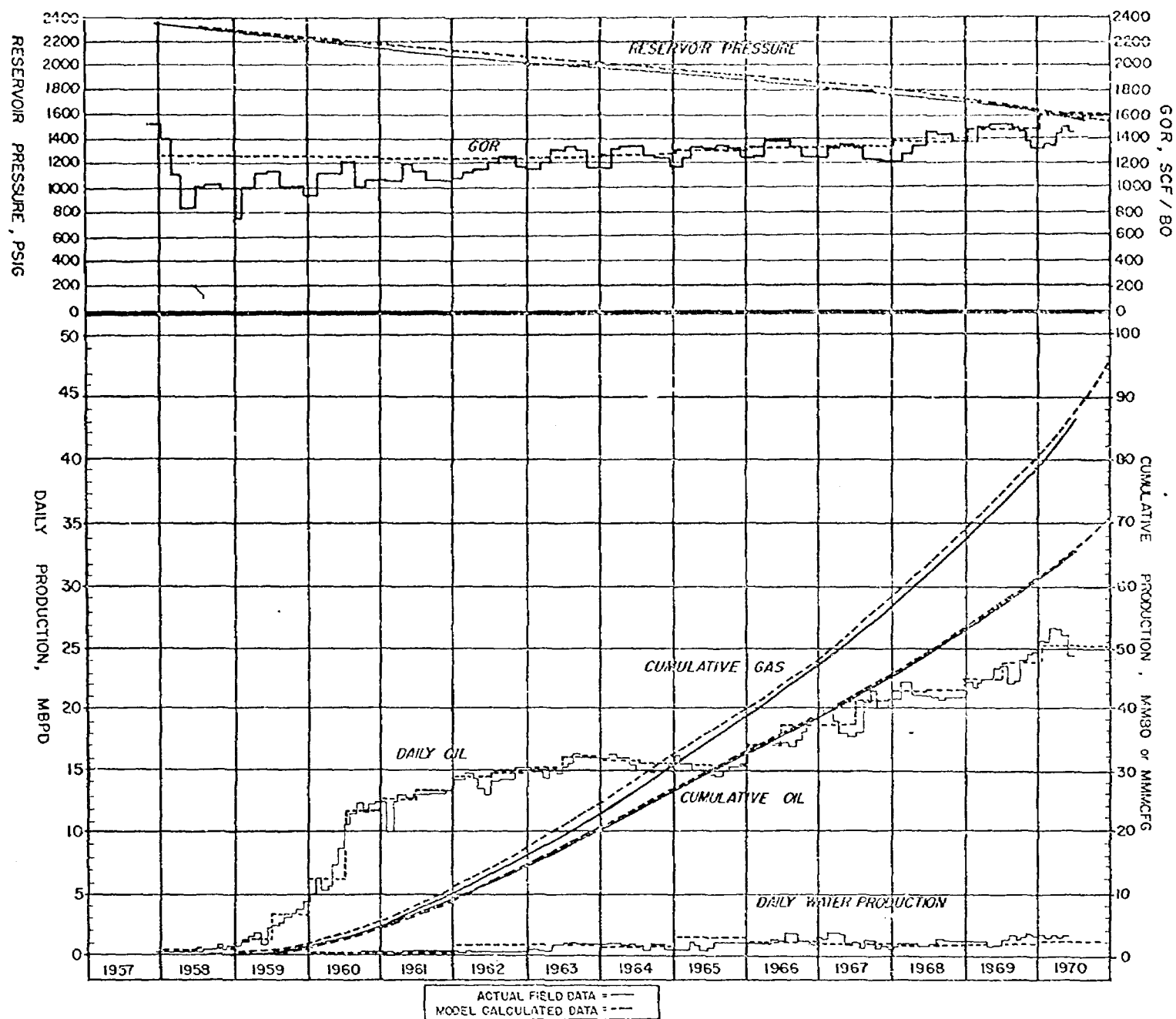
Oil Viscosity at P_{bp} , centipoise

0.387

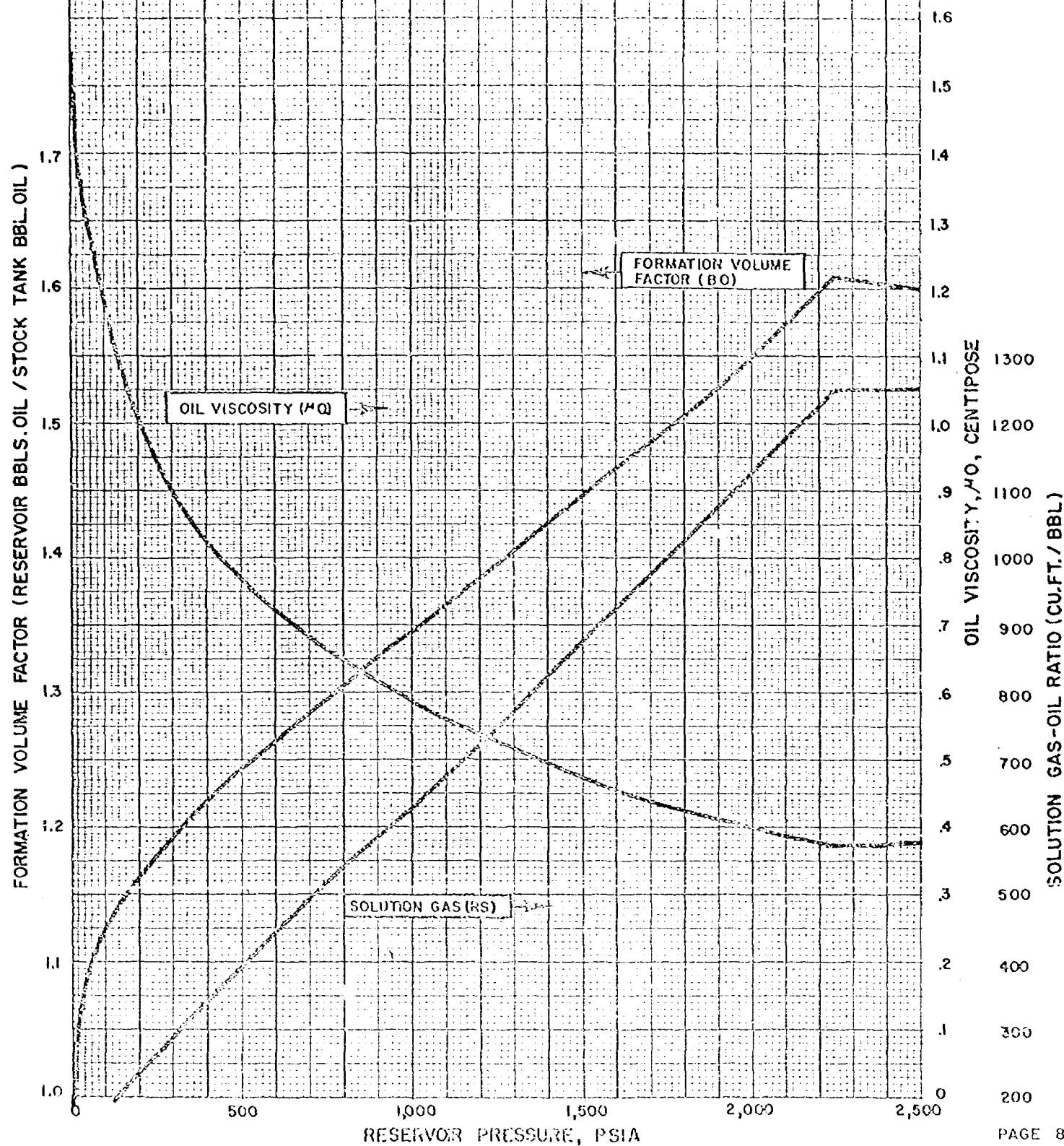
(*All except current data from Engineering Subcommittee Phase I Report)

EMPIRE ABO FIELD PERFORMANCE

COMPARISON OF ACTUAL FIELD DATA WITH NUMERIC MODEL CALCULATIONS



EMPIRE A-20 RESERVOIR EDDY COUNTY, NEW MEXICO FORMATION VOLUME FACTOR, OIL VISCOSITY AND SOLUTION GAS vs RESERVOIR PRESSURE (FIVE-WELL COMPOSITE)



RESERVOIR PERFORMANCE - HISTORY AND PREDICTIONS:

Numeric Reservoir Simulator

The model used for all reservoir history and future performance calculations was the Coats-Intercomp-Three-Dimensional, Three-Phase, Unsteady-State, Compressible Flow Model. This model solves numerically the standard partial differential equations describing simultaneous oil, gas, and water flow between reservoir segments in three dimensions. The version actually used included technical updating as of February, 1970. For Empire Abo reservoir, production history, detailed rock property data, previous model runs and trial runs using this model, all indicated that modeling in two dimensions would give excellent results. Therefore, the three-dimensional model was run in a two-dimensional format. This resulted in large reductions in both engineering and computer time required.

Volumetric Oil-In-Place

In the Engineering Committee Phase I Study, porosity values were calculated for each two-foot interval of the total 74,780 feet of gross reef logged or cored. This was based on the relationship between core porosities and open hole neutron log readings, (see example graph, page 58). A straight-line relationship between porosity and the log of permeability was also derived from analysis of 2,600 feet of core data. It was then possible to calculate permeability from porosity, (see example graph, page 59). Permeability values were calculated for each two-foot interval in each of the 250 wells in the reservoir.

This basic porosity and permeability data, digitized and computer sorted, and with log permeabilities modified in line with Field test P. I. values, was used to determine pore-volume and flow properties for each of the 211 cells into which the reservoir was divided for numeric modeling. The 211 cells were grouped into 15 blocks for model runs (see maps, pages 21 and 22). Use of a porosity cut-off of 3.4% and a permeability factor of 0.5 millidarcy (see graphs, pages 59, 60, and 61), resulted in an original oil-in-place of 452 MMBO. This compares to the Engineering Committee volumetric oil-in-place of 467 MMBO. In view of material-balance oil-in-place figures ranging from 360 MMBO to 400 MMBO, prior to any model runs, the total volume was reduced to 400 MMBO by applying the same ratio to each cell. Numeric model runs soon showed that oil-in-place would have to be reduced to the final history-match figure of 383.2 MMBO.

Numeric Model Match of Field Producing History

More than 12 years of Empire Abo production history were available for matching with model calculations. During this time about 16% of the original oil-in-place had been produced. During the history-match period only the oil production rate was input by individual wells. Using cell lengths and cross-sectional areas, pore-volumes and permeabilities, relative fluid flow properties, (see graphs, pages 25 and 26), and volumetric fluid properties (see graph, page 8), the model then calculated pressures and flow volumes between individual cells and gas and water production from each well. After

study of each trial run, adjustments were made to the various rock, fluid, and well properties, until a reasonable match was obtained with reservoir pressures and with actual gas and water production by individual wells, by areas, and for the reservoir as a whole. A total of 36 trial runs were required.

The graph on page 7 shows the total field history match on a time basis. Below is a table comparing actual field production totals with numeric model production totals at the end of the history match period (1-1-70):

	Actual Reservoir at 1-1-70	Numeric Model Calculated at 1-1-70	Ratio: $\frac{\text{Model}}{\text{Field}}$
Cumulative Oil Produced (MMB)O	61,440	61,505	1.001
Cumulative Gas Produced (MMCF)	79,224	80,865	1.021
Cumulative Water Produced (MBW)	3,632	2,727	0.751
Reservoir Pressure (psia)	1,640	1,709	1.042

Further graphical comparisons of actual field production data with numeric model calculations may be found in the Appendix under the following headings:

- a) Comparison of individual-well performance in Back-reef to Fore-reef cross-sections (page 27).
- b) Actual performance compared to numeric model calculations for each of the thirteen producing blocks in the model (pages 45 through 57).
- c) Individual Key-well comparisons, including recompletions due to encroaching gas cap (pages 28 through 44).
- d) Position of gas cap, June, 1970, as shown by numeric model, compared with actual well gas-oil ratios (page 22).
- e) Individual Block Numeric Model pressure compared with field-measured reservoir pressure (page 20).

Adjustments to laboratory relative permeability data to match actual field performance are shown graphically on pages 25 and 26.

The excellent quality of the match between actual production values and those calculated by the numeric model is graphically demonstrated by study of the above references.

FUTURE PROJECTIONS

I. Competitive Natural Depletion

All forecasts started at the end of the history-match period, 1-1-70. Rate and recovery data is plotted versus future time on page 12A.

Predicted encroachment of the gas cap and water influx with time is shown by the west-east cross-sectional graphs on pages 22, 23, and 24. Ultimate recovery of 172.6 MMBO is attained in 1998 when reservoir pressure has reached about 100 psi. As for all cases, it was assumed that allowables would escalate from present levels (124 BOPD/well) to a maximum of 177 BOPD/well by 1972. This yields a maximum field-wide rate of 31,200 BOPD in 1972.

GOR limits in line with current field testing practices were applied. When a well became a GOR-penalized well, it was limited to a maximum daily gas rate of 2.0×177 or 354 MCFPD, with the oil that came along with that amount of gas. In 1989 GOR restrictions were removed and blowdown began. Since the Coats numeric model projects future production on an individual-well basis, it was possible to handle workovers to lower GOR's or decrease water production, and pumping unit installations on a well-by-well basis as the need arose. This was true of all projections made.

II. Unitized - Maximum Gas Conservation

Rate and recovery data is plotted versus future time on page 12B.

Results:

Ultimate Recovery (MMBO) - 200.3
Increased Recovery Above Competitive Depletion (MMBO) - 27.7
Peak Oil Rate (BOPD) - 40,400
Peak Oil Rate increase above Competitive Depletion (BOPD) - 11,100
Initial Gas Injection Rate - No Injection

Assumptions:

Unitization Date - 1-1-72
Unit Allowable - Total number unit wells times 177 BOPD/well.
Allowable transfer - Top allowable fully transferable from shut-in wells.

Limitations:

Individual Well Maximum Rate: 354 BOPD, due to coning.
During excess capacity period GOR restrictions were set at 1500:1; during decline period they were increased to 3000:1, 6000:1, and 10,000:1. During blowdown, unrestricted GOR's applied.

SIMULT/ EQU/ GAS-WATER INJECTION:

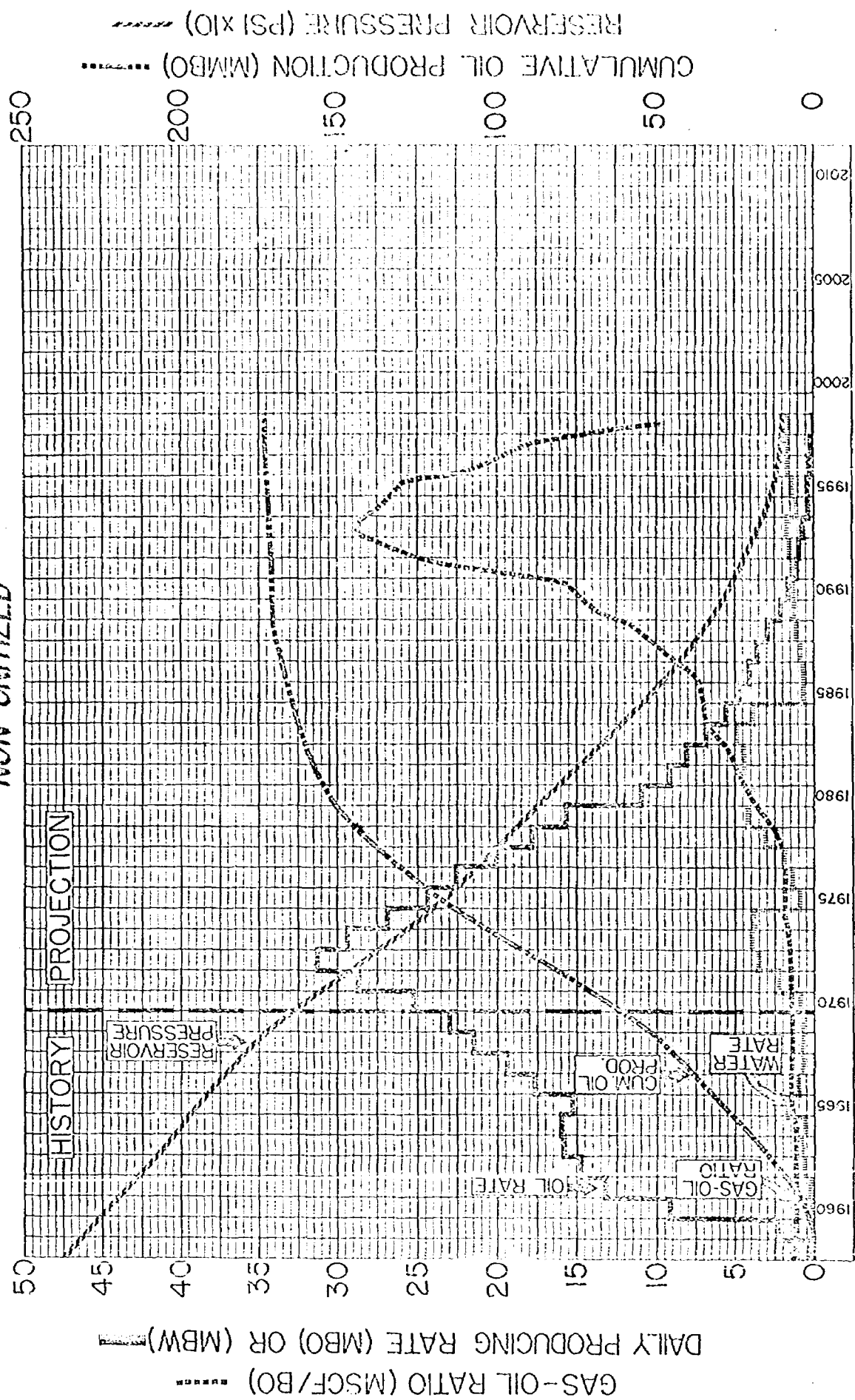
A few test runs of the numeric model were made to check reservoir response to water injection into some of the watered-out wells in the down-dip east end of the reservoir, while at the same time injecting minor volumes of gas (5 MMCFD) into the original gas cap. Preliminary results were not promising. Water injected into General American Green A-7, 8, and 9 wells at total volumes ranging from 7,500 to 15,000 BWPD caused upward movement of aquifer water into the oil zone $2\frac{1}{2}$ miles to the west (Section 35-17S-28E) within 18 months. This is an area where numeric model predictions indicate that gravity drainage recovery will be excellent. With the known poor sweep efficiency by water influx shown by wells in the east end, this early movement of water into a good gravity drainage area appears to rule out water injection at least until a more detailed study can be made.

EMPIRE ABO RESERVOIR

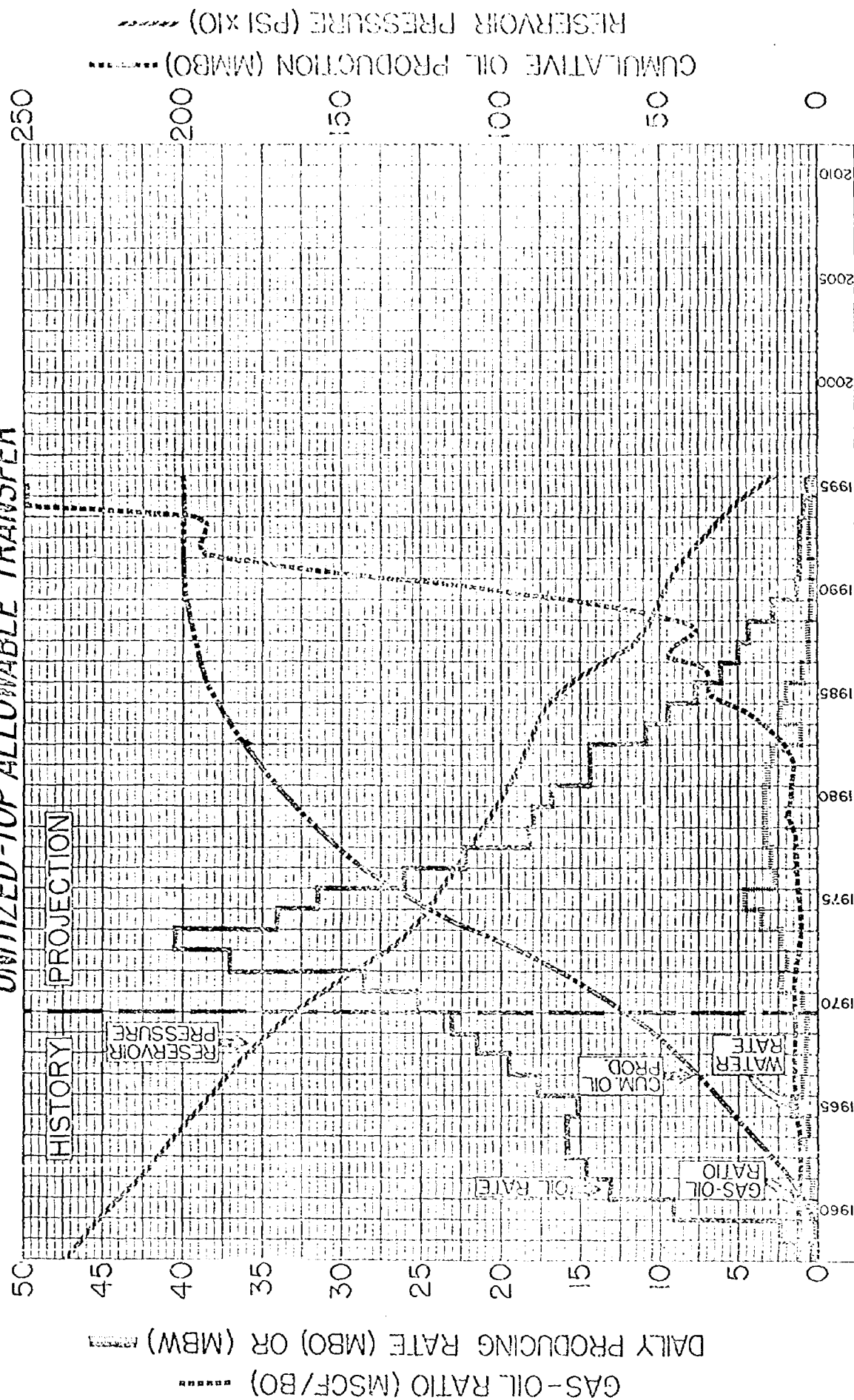
EDDY COUNTY, NEW MEXICO

PROJECTED PERFORMANCE: COMPETITIVE NATURAL DEPLETION

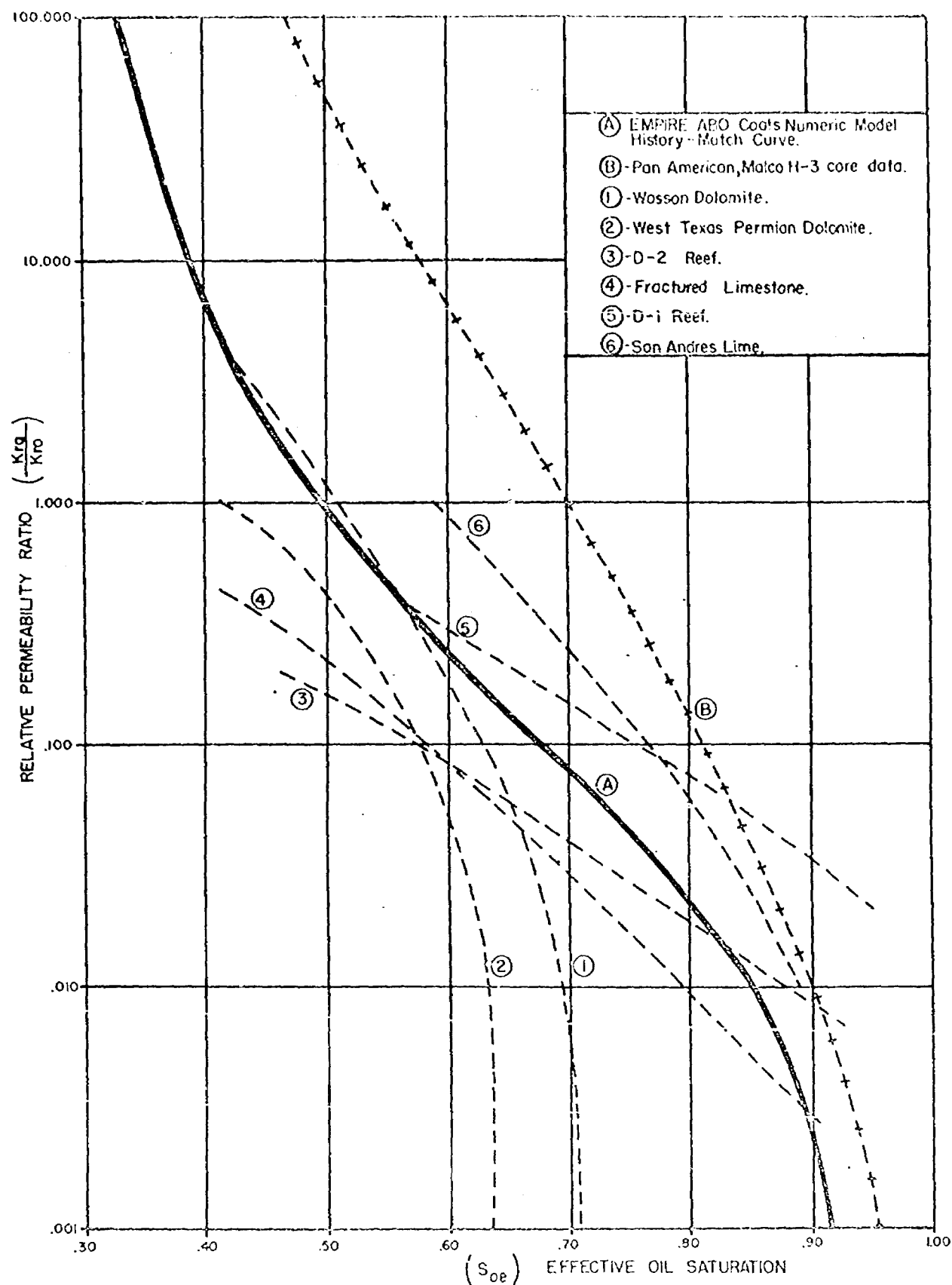
NON-UNITIZED

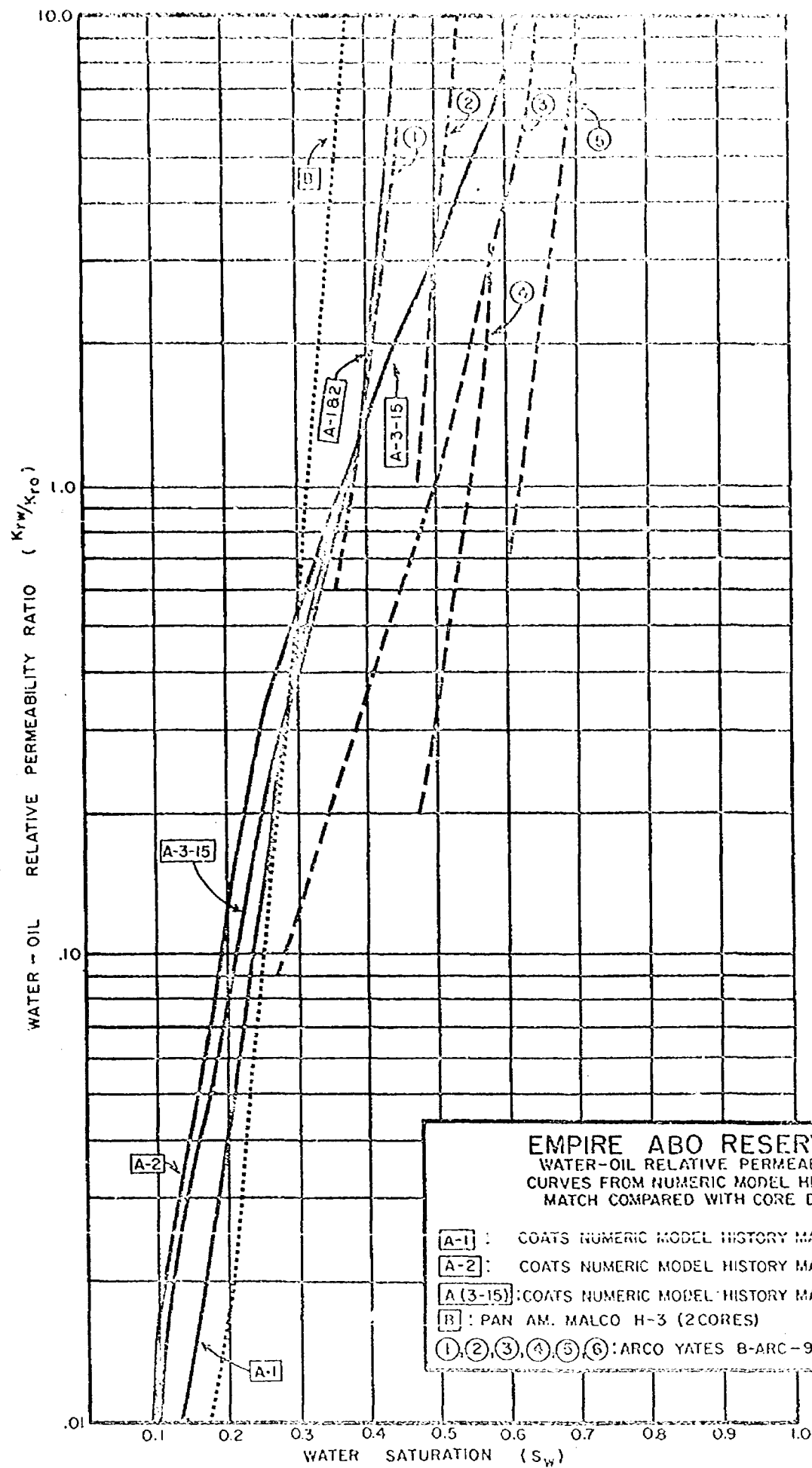


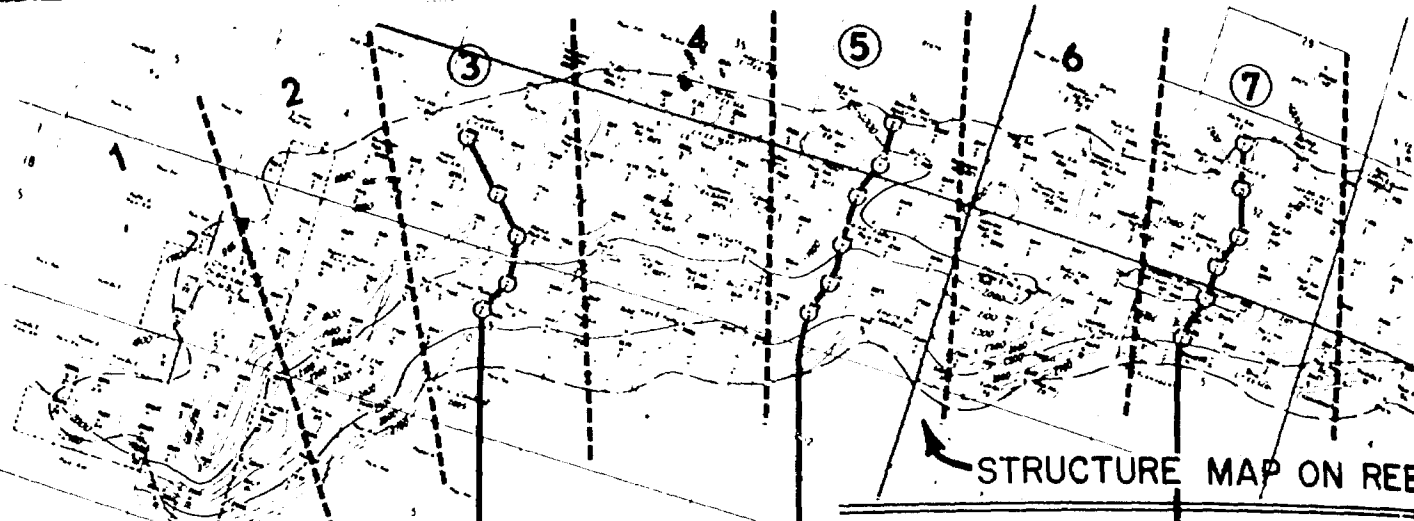
EMPIRE ABO RESERVOIR EDDY COUNTY, NEW MEXICO PROJECTED PERFORMANCE: MAXIMUM GAS CONSERVATION- UNITIZED-TOP ALLOWABLE TRANSFER



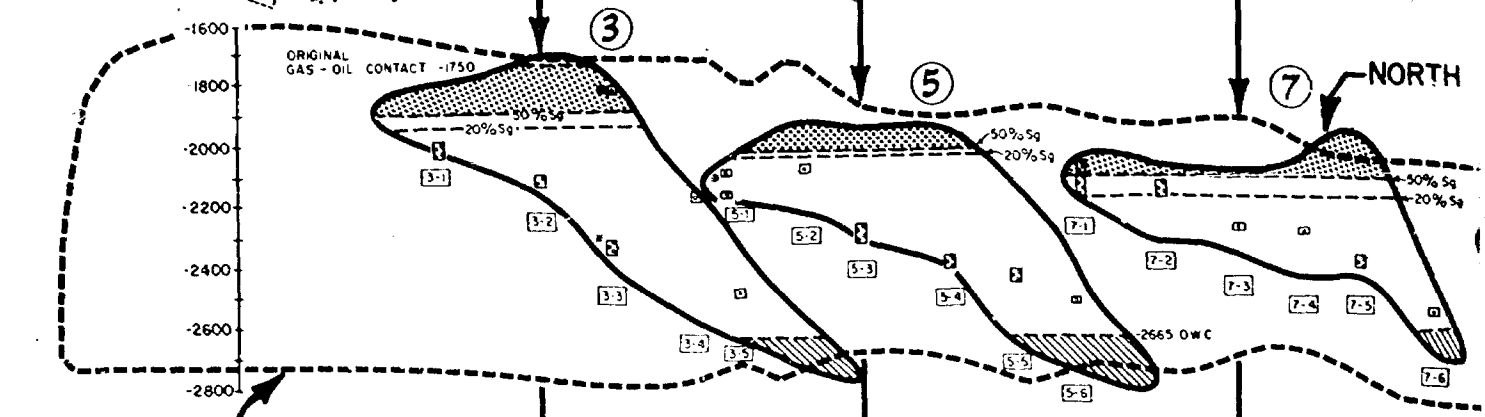
EMPIRE ABO RESERVOIR HISTORY-MATCH GAS-OIL RELATIVE PERMEABILITY CURVE COMPARED WITH CORE DATA FROM SIMILAR RESERVOIRS.







STRUCTURE MAP ON REEF



Vertical Scale 1"=300'
Vertical Exaggeration is
5 Times Horizontal.

WEST TO EAST
REEF PROFILE

RATIOS OF CALCULATED TO FIELD-RE
PRODUCTION FROM FIRST PRODUCTION
END OF HISTORY MATCH (1-1-70)

BLOCK 3

WELL No.	OPERATOR & WELL	FIELD OIL MB	MODEL OIL MB	MODEL OIL FIELD OIL	FIELD GAS MMCF	MODEL GAS MMCF	MODEL GAS FIELD GAS	FIELD WATER M/B	MODEL WATER M/B	MODEL WATER FIELD WATER	PRODUCING INTERNAL FL SUB SEA
3-1	Ches Service Hudson B-1	26.4	26.5	1.00	4.16	3.01	0.72	0	0	0	1992-2054
3-2	Pan Am. Malco Fed. N-5	29.6	29.6	1.00	3.52	3.34	0.95	0	0	0	2024-2144
3-3	Pan Am. Malco Fed. E-2	30.6	29.5	0.93	3.28	3.60	1.10	0	0	0	2144-2166
3-4	Pan Am. Malco Fed. D-2	31.4	30.2	0.96	3.53	3.53	1.00	0	0	0	2166-2201
3-5	Pan Am. Malco Fed. D-5	27.9	27.9	1.00	2.74	3.28	1.20	3.0	0	0	2201-2488
Total For Cross Section		145.9	142.7	0.98	17.23	16.77	0.97	3.0	0	0	

* Worked over to Lower Zone 6-64

WELL No.	OPERATOR & WELL	FIELD OIL MB	MODEL OIL MB
9-1	Pan Am. State BW-1	27.4	27.4
9-2	Pan Am. State BT-3	27.3	27.3
9-3	Pan Am. State BS-1	27.3	27.3
9-4	HIY State A-10	27.8	27.8
9-5	OK De'n. Taylor St. 2	27.3	27.3
Total For Cross Section		137.1	137.1

BLOCK 5

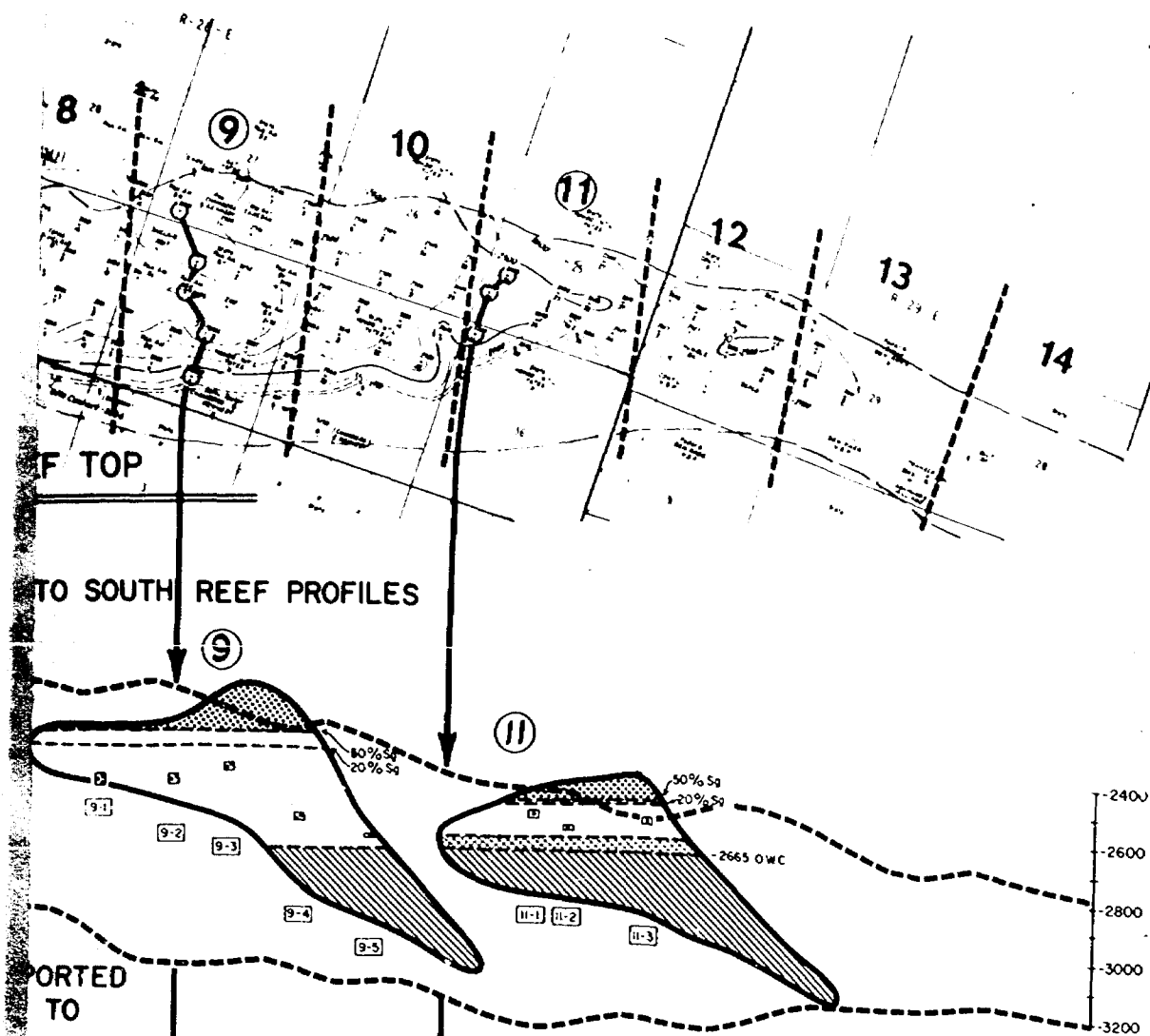
WELL No.	OPERATOR & WELL	FIELD OIL MB	MODEL OIL MB	MODEL OIL FIELD OIL	FIELD GAS MMCF	MODEL GAS MMCF	MODEL GAS FIELD GAS	FIELD WATER M/B	MODEL WATER M/B	MODEL WATER FIELD WATER	PRODUCING INTERNAL FL SUB SEA
5-1	Yates Dooley ABO ST. 3-M	110.4	104	0.93	11.23	11.22	0.99	0	0	0	2444-25
5-2	Yates Dooley ABO ST. 1	27.6	27.6	1.00	3.01	3.25	1.08	0	0	0	25-25
5-3	Pan Am. Malco Fed. F-8	29.2	29.2	1.00	3.25	3.35	1.05	0	0	0	2278-2328
5-4	Pan Am. Malco Fed. F-4	23.8	23.8	1.00	3.22	3.46	1.07	0	0	0	2382-2420
5-5	Pan Am. Malco Fed. F-5	29.9	29.5	0.99	3.42	3.43	1.00	0	0	0	2428-68
5-6	Pan Am. Malco Fed. F-12	28.6	28.6	1.00	3.13	3.28	1.08	0	0	0	2521-39
Total For Cross Section		155.5	155.1	0.98	17.21	17.93	1.04	0	0	0	

* Upper Zone Added 6-61

WELL No.	OPERATOR
11-1	HIY
11-2	HIY
11-3	HIY
Total	

BLOCK 7

WELL No.	OPERATOR & WELL	FIELD OIL MB	MODEL OIL MB	MODEL OIL FIELD OIL	FIELD GAS MMCF	MODEL GAS MMCF	MODEL GAS FIELD GAS	FIELD WATER M/B	MODEL WATER M/B	MODEL WATER FIELD WATER	PRODUCING INTERNAL FL SUB SEA
7-1	Pan Am. State AE-1	110.1	110.6	1.00	9	11.3	1.13	1.13	0	0	0
7-2	ARCO Eddy St. 32-2	26.9	26.9	1.00	3.28	3.37	1.03	0	0	0	0
7-3	HIY State A-3	27.9	27.9	1.00	3.12	3.11	0.99	0	0	0	0
7-4	HIY State A-3	28.1	27.2	0.97	3.08	3.18	1.03	0	0	0	0
7-5	Pan Am. State BK-1	27.2	27.2	1.00	3.00	3.08	1.03	0	0	0	0
7-6	Terneco State H-2	28.0	27.9	0.99	2.90	3.21	1.11	0	0	0	0
Total For Cross Section		139.0	139.1	0.99	18.27	18.27	1.03	0	0	0	0



BLOCK 9

Model Oil	Field Gas	Model Gas	Model Gas	Field Water	Model Water	Model Water	Producing
Field Oil	MMCF	MMCF	Field Gas	MB	MB	Field Water	Interval
1.00	327	308	0.94	0	0	0	2424-44
1.00	301	308	1.02	0	0	0	2420-50
1.00	296	306	1.04	0	0	0	2380-2400
1.00	316	317	1.00	0	0	0	2543-63
1.00	290	313	1.36	12	8	0.67	2611-20
1.00	1470	1552	1.06	0	0	0	

BLOCK 11

Factor & Well	Field Oil	Model Oil	Model Oil	Field Gas	Model Gas	Model Gas	Field Water	Model Water	Model Water	Producing
	MB	MB	Field Oil	MMCF	MMCF	Field Gas	MB	MB	Field Water	Interval
State A-28	2711	2711	1.00	299	315	1.05	11	0	0	2525-47
State A-20	2713	273	1.00	360	309	0.86	11	0	0	2575-89
State A-42	245	245	1.00	303	283	0.94	0	0	0	2549-63
For Cross Section	789	789	1.00	947	947	1.00	0	0	0	

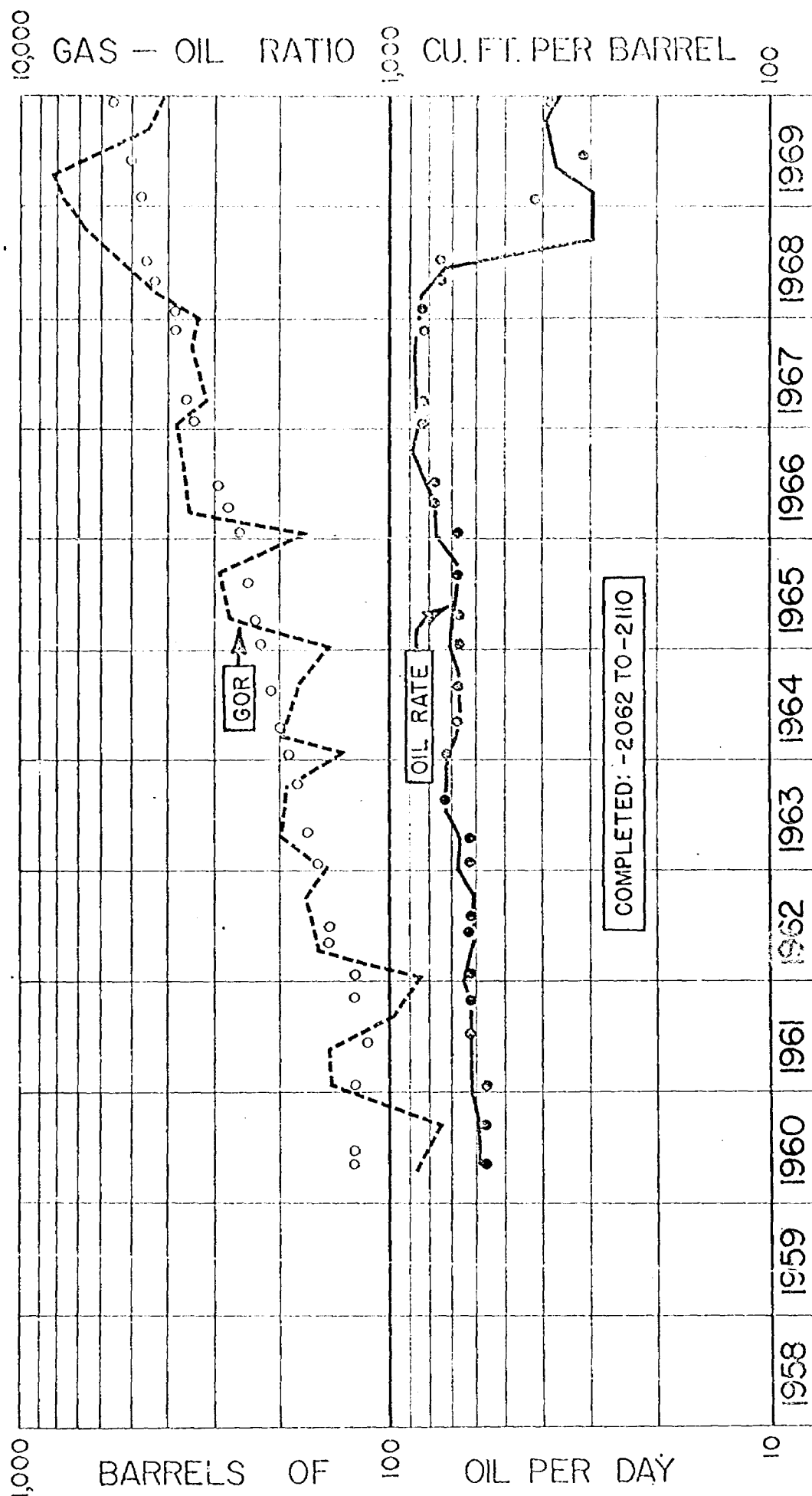
Model Water	Model Water	Producing
MB	Field Water	Interval
0	0	1075-2212
0	0	2155-94
0	0	2284-2320
0	0	2298-2316
0	0	2390-2426
0	0	2555-80

COMPARISON OF RESERVOIR SIMULATION
MODEL RESULTS TO MEASURED
FIELD PRODUCTION
BACK REEF TO FORE REEF
CROSS SECTION

EMPIRE ABO RESERVOIR

ACTUAL WELL PERFORMANCE COMPARED TO NUMERIC MODEL CALCULATIONS

HUMBLE - CBDU A NO.6
LOCATION: C-16-18S-27E
(MODEL NO.78, BLOCK I)



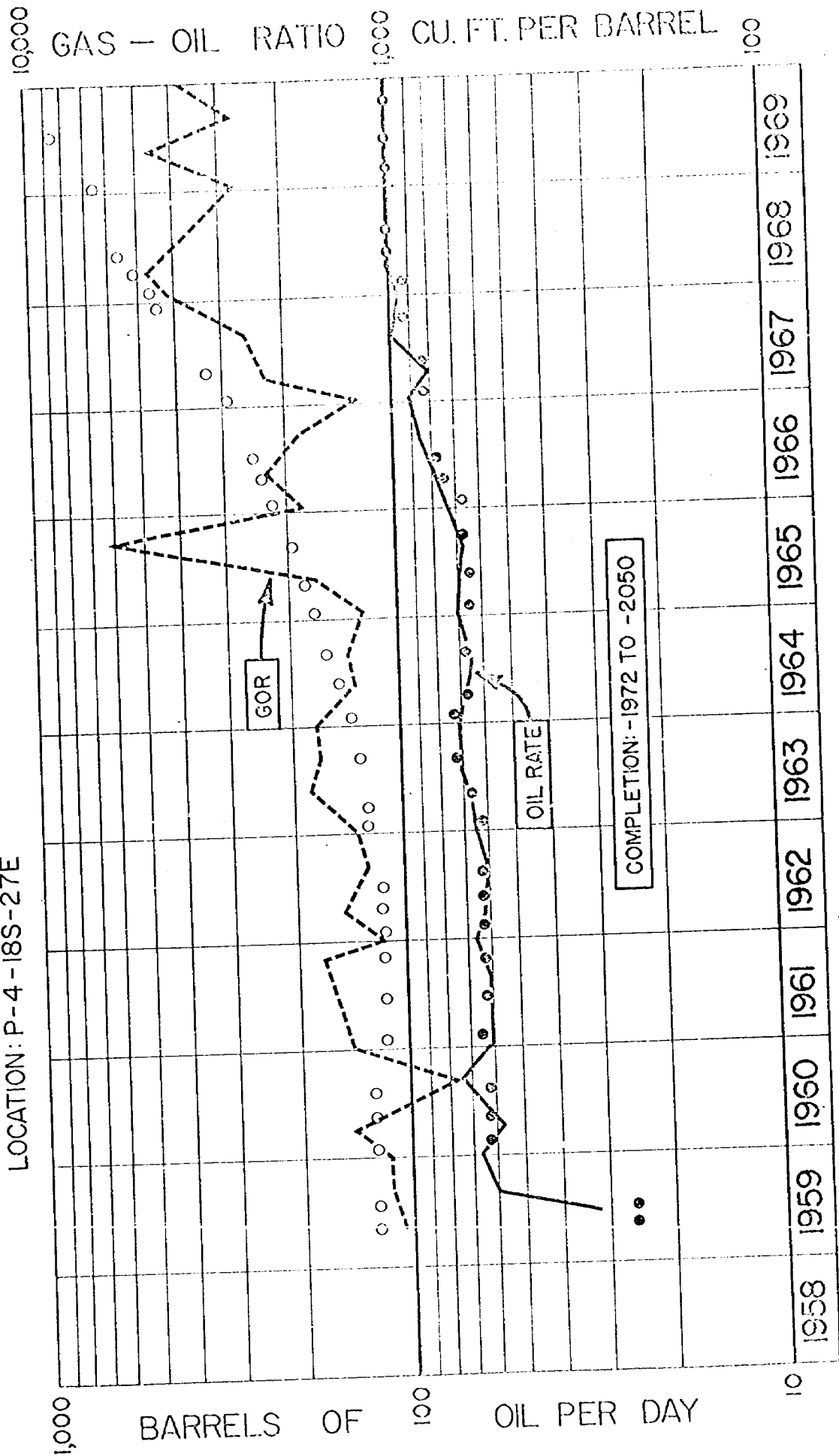
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GOR: ---

NUMERIC MODEL VALUES: INPUT OIL RATE: ●●●
CALCULATED GOR: ○○○

EMPIRE ABO RESERVOIR

ACTUAL WELL PERFORMANCE COMPARED TO NUMERIC MODEL CALCULATIONS

PAN AMERICAN - WINDFOHR FED. NO.1 (MODEL NO.13, BLOCK 2)
 LOCATION: P-4-18S-27E



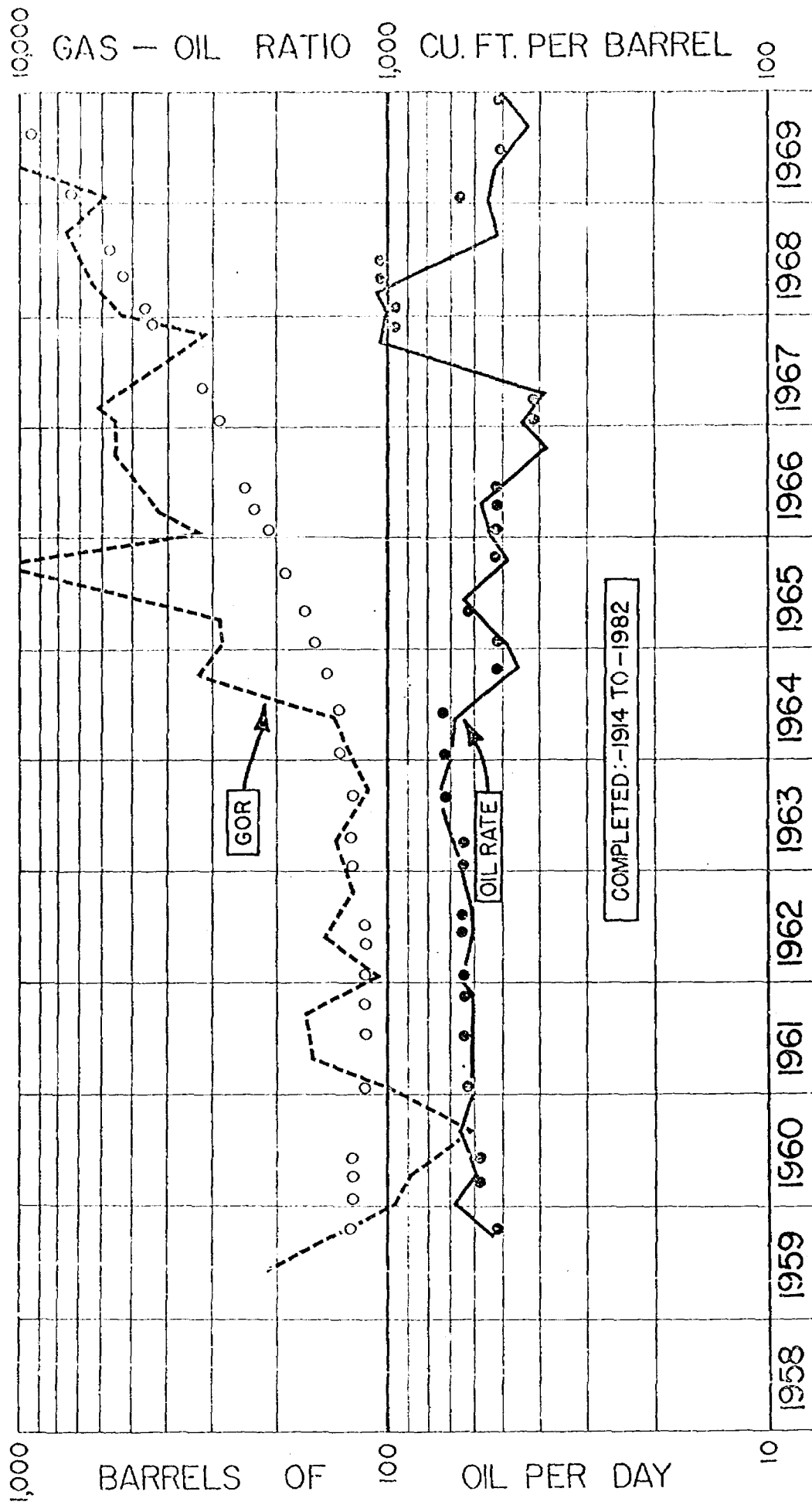
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 GOR: ---
 NUMERIC MODEL VALUES: INPUT OIL RATE: ●●●
 CALCULATED GOR: ○○○

EMPIRE ABO RESERVOIR

ACTUAL WELL PERFORMANCE COMPARED TO NUMERIC MODEL CALCULATIONS

PAN AMERICAN - WINDFOHR FED. NO. 4 (MODEL NO. 34, BLOCK 2)

LOCATION: J-4-18S-27E



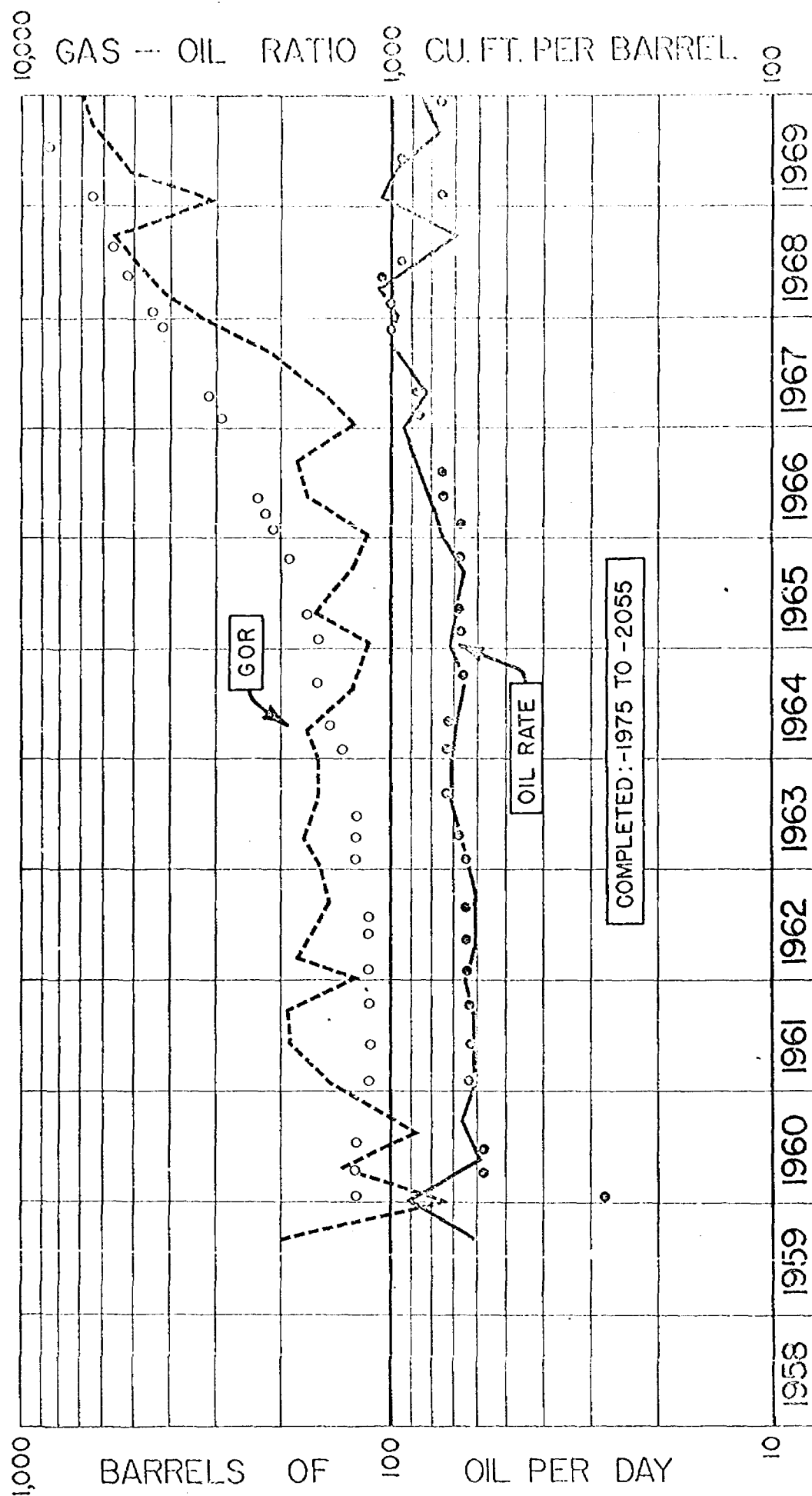
ACTUAL VALUE: OIL RATE: ●●●
GOR: ---

NUMERIC MODEL VALUES: INPUT OIL RATE: ●●●
CALCULATED GOR: ○○○

EMPIRE ABO RESERVOIR

ACTUAL WELL PERFORMANCE COMPARED TO NUMERIC MODEL CALCULATIONS

PAN AMERICAN-WINDFOHR FED. NO.3 (MODEL NO.35, BLOCK 2)
LOCATION: O-4-18S-27E



ACTUAL VALUE: OIL RATE: —
GOR: ---

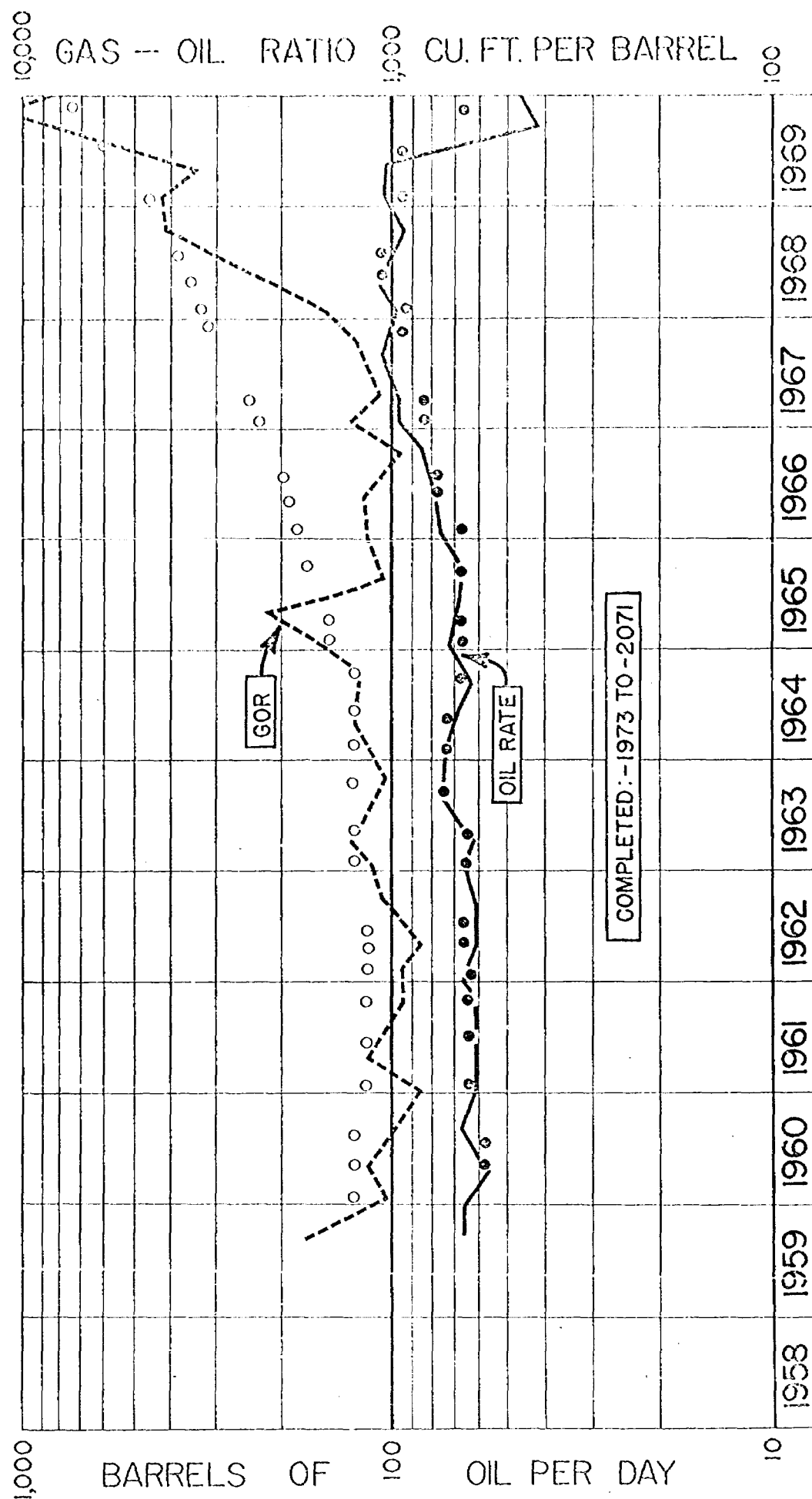
NUMERIC MODEL VALUES: INPUT OIL RATE: ●●●
CALCULATED GOR: ○○○

EMPIRE ABO RESERVOIR

ACTUAL WELL PERFORMANCE COMPARED TO NUMERIC MODEL CALCULATIONS

PAN AMERICAN-MALCO FED.G NO.II (MODEL NO.36, BLOCK 2)

LOCATION: B-9-18S-27E



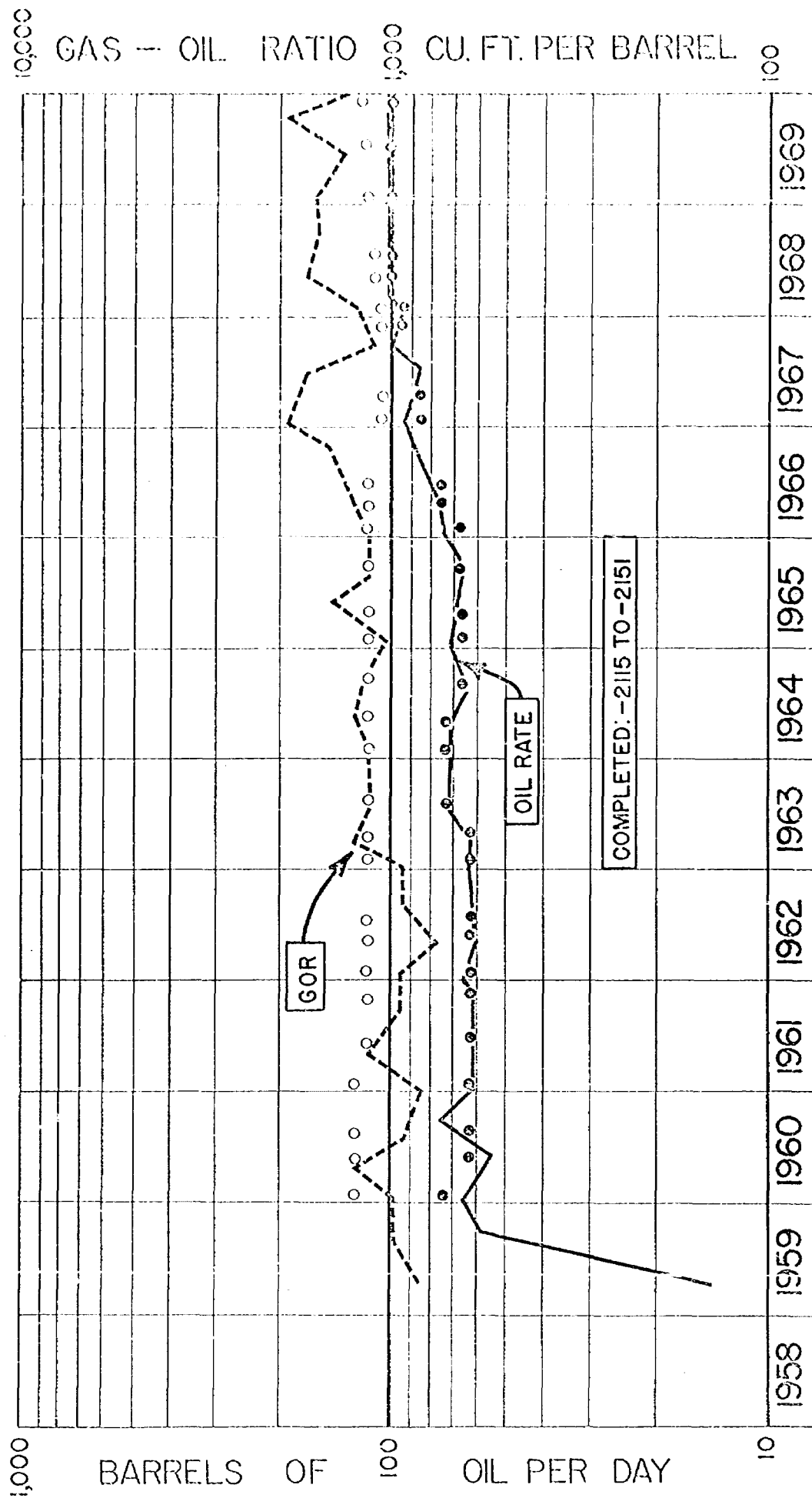
ACTUAL VALUE: OIL RATE: —
GOR: ---

NUMERIC MODEL VALUES: INPUT OIL RATE: ●●●
CALCULATED GOR: ○○○

EMPIRE ABO RESERVOIR

ACTUAL WELL PERFORMANCE COMPARED TO NUMERIC MODEL CALCULATIONS

PAN AMERICAN-MALCO FED. G NO.3 (MODEL NO. 37, BLOCK 2)
 LOCATION: A-9-18S-27E



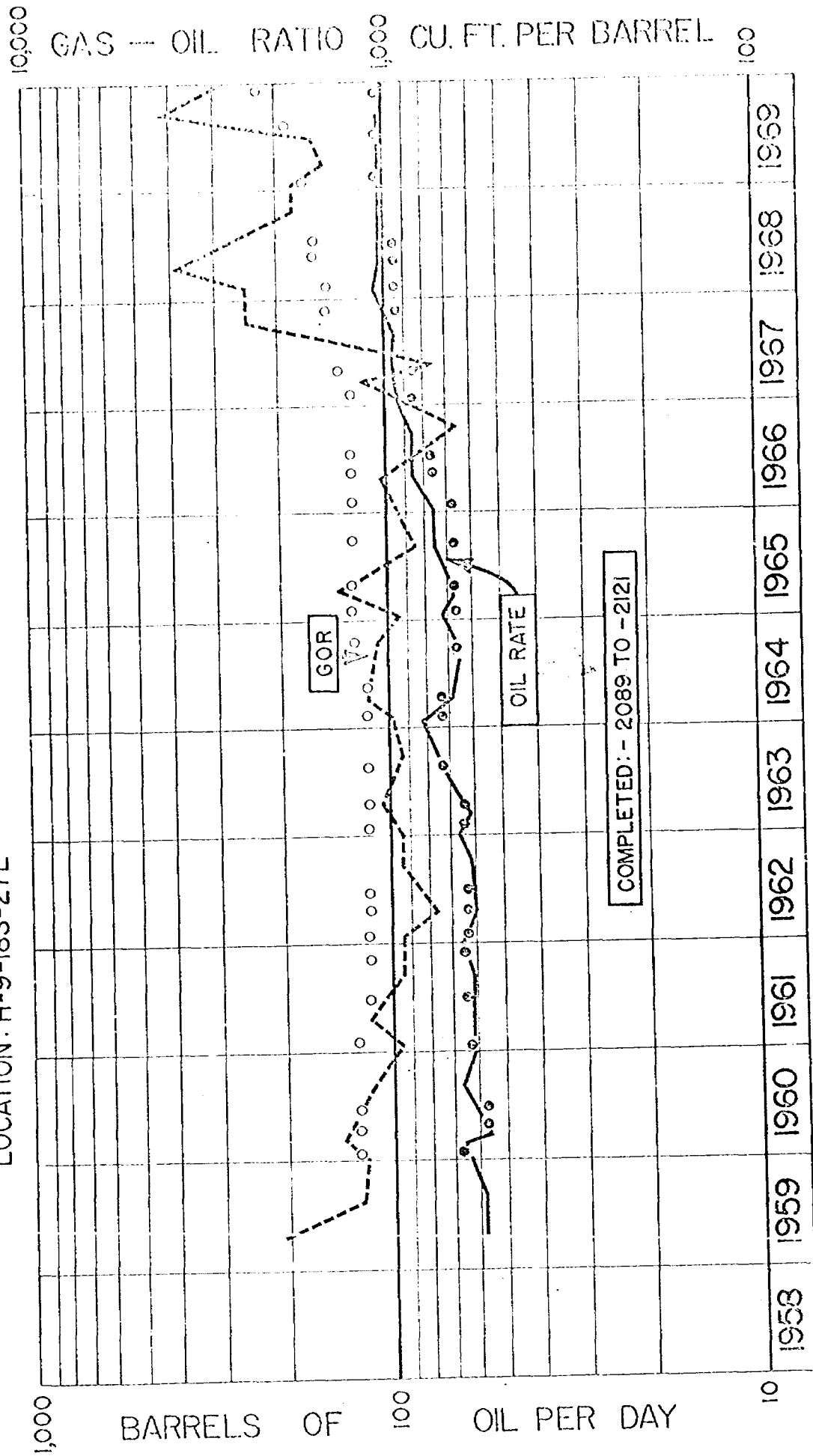
ACTUAL VALUE: OIL RATE: —●●●
 GOR: ---

NUMERIC MODEL VALUES: INPUT OIL RATE: ●●●
 CALCULATED GOR: ○○○

EMPIRE ABO RESERVOIR ACTUAL WELL PERFORMANCE COMPARED TO NUMERIC MODEL CALCULATIONS

PAN AMERICAN - MALCO FED. G NO.5 (MODEL NO. 39, BLOCK 2)

LOCATION: H-9-18S-27E



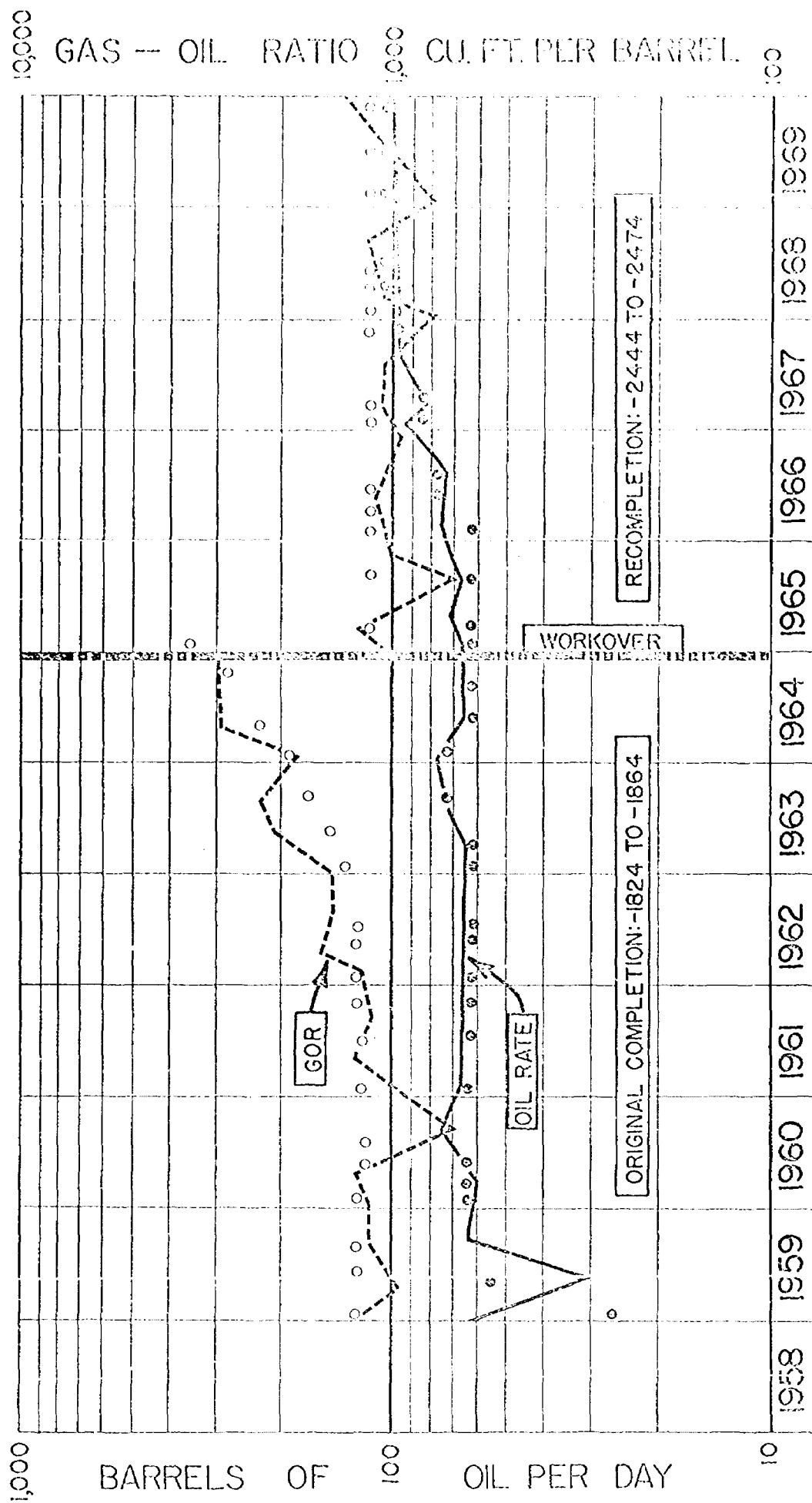
ACTUAL VALUE: OIL RATE: — GOR: ---

NUMERIC MODEL VALUES: INPUT OIL RATE: ●●● CALCULATED GOR: ○○○

EMPIRE ABO RESERVOIR

ACTUAL WELL PERFORMANCE COMPARED TO NUMERIC MODEL CALCULATIONS

PAN AMERICAN-MALCO FED.E NO.1 (MODEL NO.6, BLOCK 3)
LOCATION: P-3-18S-27E

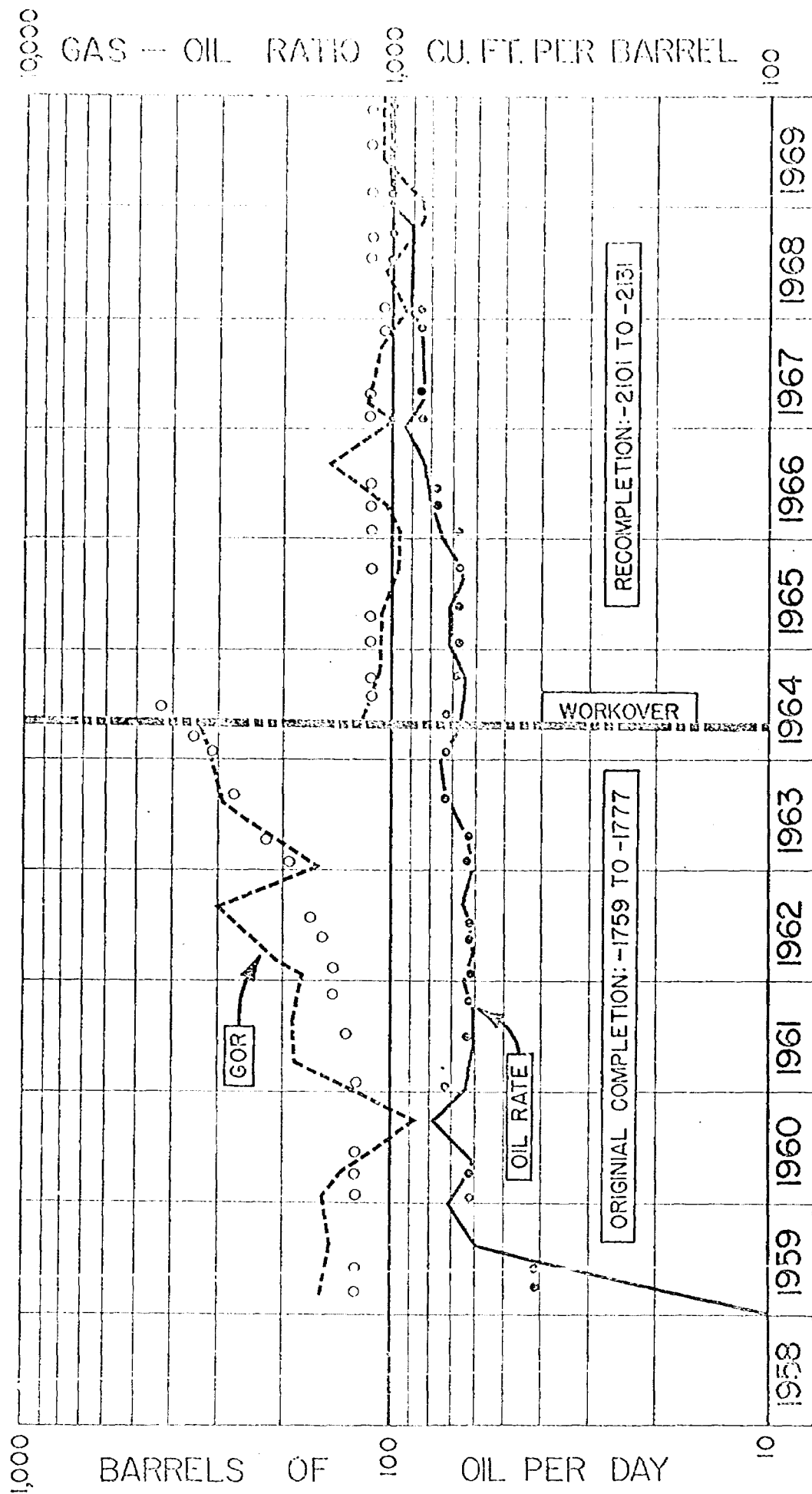


ACTUAL VALUE: OIL RATE: —
GOR: ---
NUMERIC MODEL VALUES: INPUT OIL RATE: ●●●
CALCULATED GOR: ○○○

EMPIRE ABO RESERVOIR

ACTUAL WELL PERFORMANCE COMPARED TO NUMERIC MODEL CALCULATIONS

PAN AMERICAN-MALCO FED. H NO.1 (MODEL NO.17, BLOCK 3)
LOCATION: 1-3-18S-27E



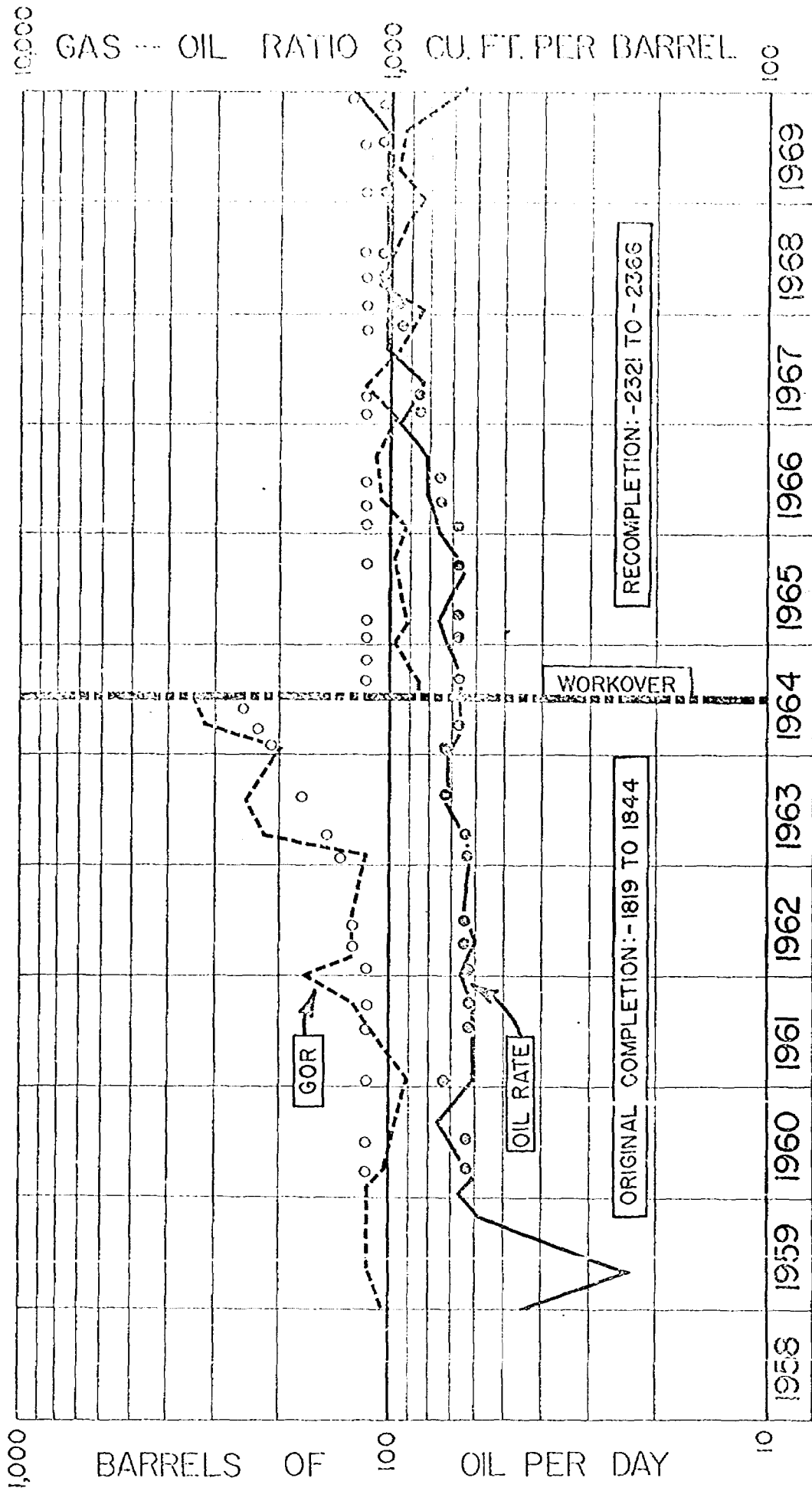
ACTUAL VALUE: OIL RATE: —
GOR: ---
NUMERIC MODEL VALUES: INPUT OIL RATE: ●●●
CALCULATED GOR: ○○○

EMPIRE ABO RESERVOIR

ACTUAL WELL PERFORMANCE COMPARED TO NUMERIC MODEL CALCULATIONS

PAN AMERICAN-MALCO FED. E NO.2 (MODEL NO. 79, BLOCK 3)

LOCATION: 0-3-18S-27E

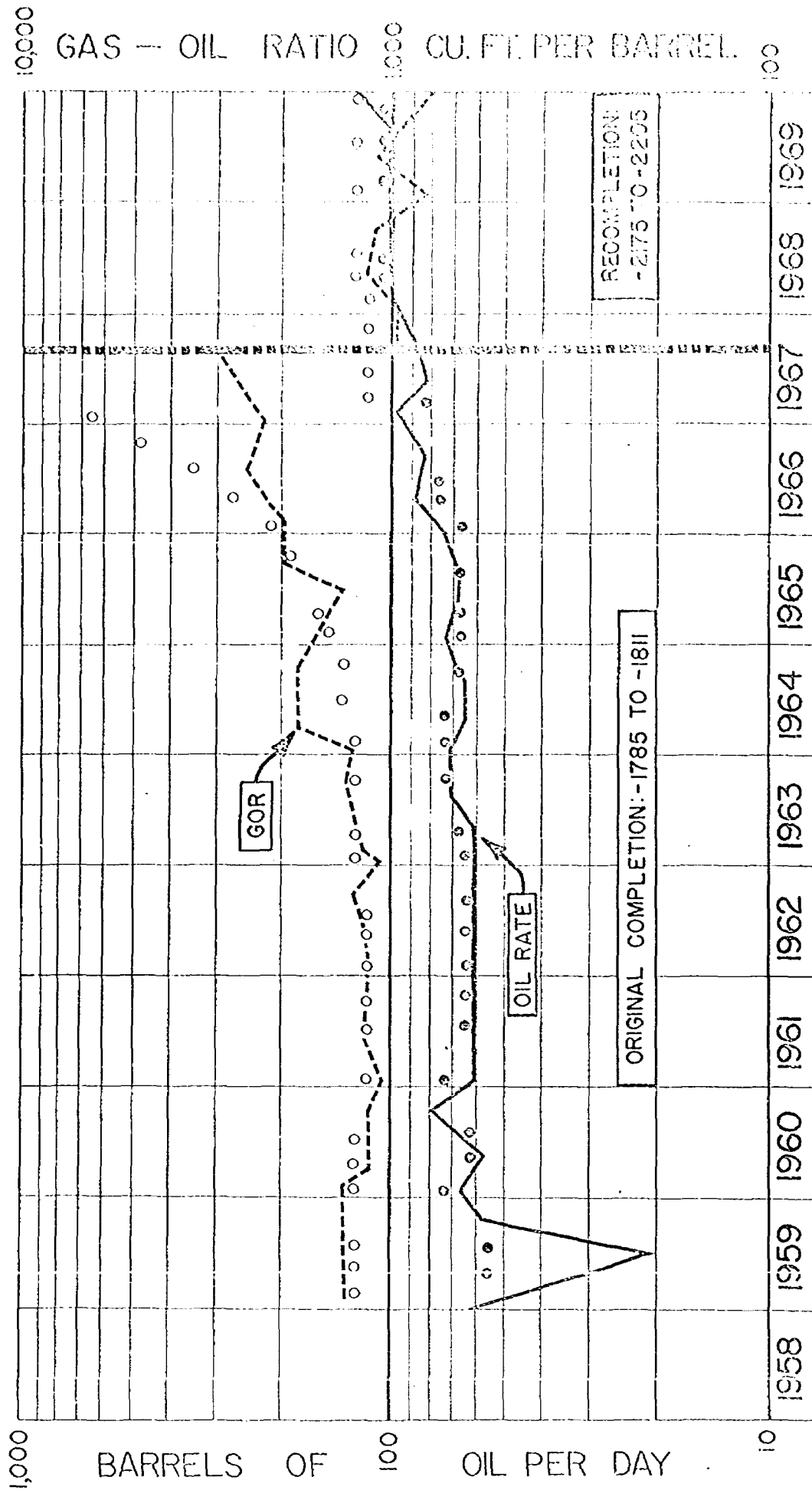


ACTUAL VALUE: OIL RATE: — GOR: ---
 NUMERIC MODEL VALUES: INPUT OIL RATE:
 CALCULATED GOR:
 RECOMPLETION: -2321 TO -2366

EMPIRE ABO RESERVOIR

ACTUAL WELL PERFORMANCE COMPARED TO NUMERIC MODEL CALCULATIONS

PAN AMERICAN-STATE AT NO.2 (MODEL NO.8, BLOCK NO.4)
LOCATION: E-2-18S-27E



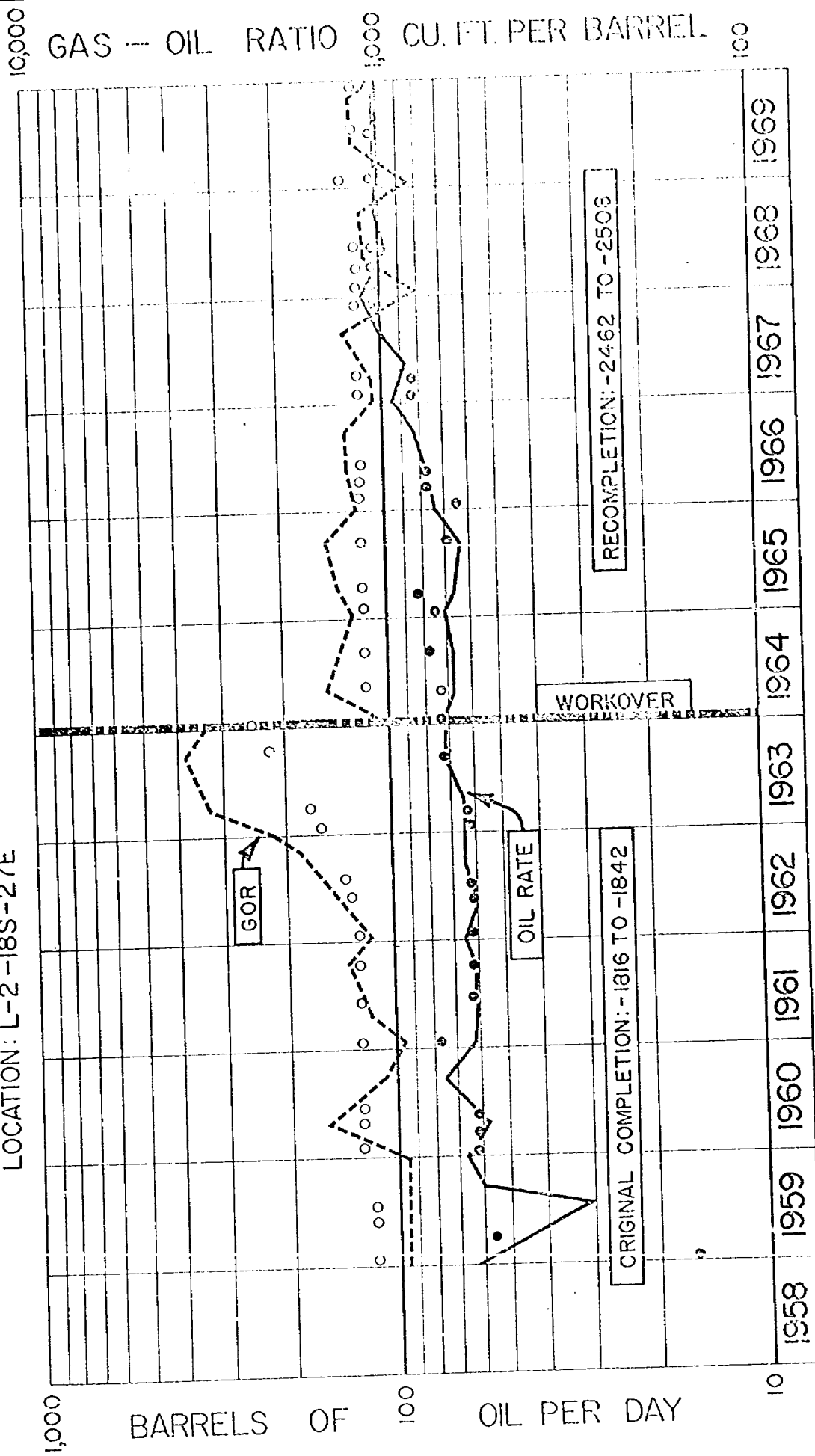
EMPIRE ABO RESERVOIR

ACTUAL WELL PERFORMANCE COMPARED TO NUMERIC MODEL CALCULATIONS

PAN AMERICAN-STATE AT NO.1

LOCATION: L-2 -18S-27E

(MODEL NO.9, BLOCK 4)



NUMERIC MODEL VALUES: INPUT OIL RATE: 1000
CALCULATED GOR: 1000

ACTUAL VALUE: OIL RATE: 1000
GOR: 1000

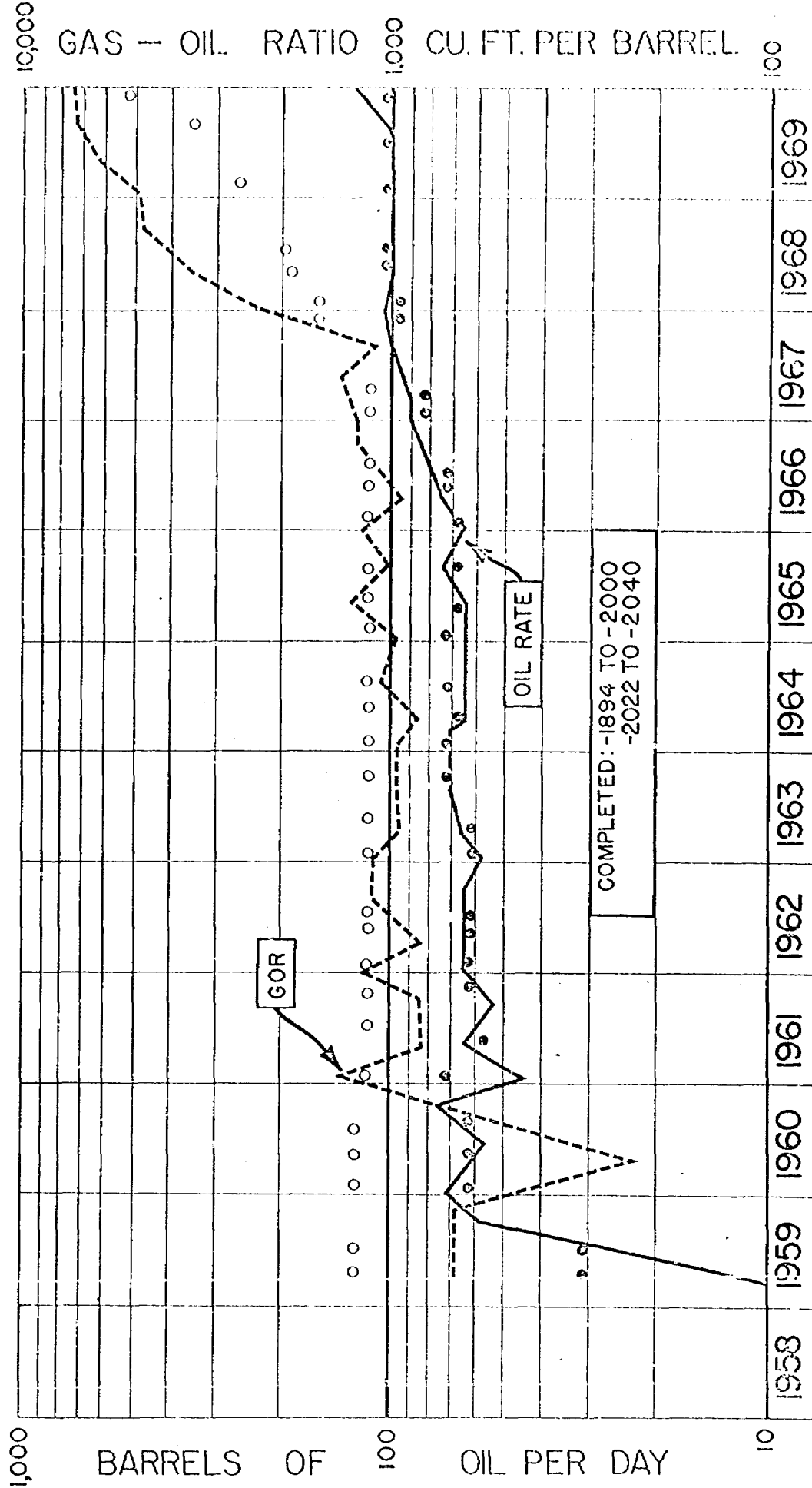
EMPIRE ABO RESERVOIR

ACTUAL WELL PERFORMANCE COMPARED TO NUMERIC MODEL CALCULATIONS

TURNER - STATE B 939I NO.1

(MODEL NO. 23, BLOCK 4)

LOCATION: H-2-18S-27E

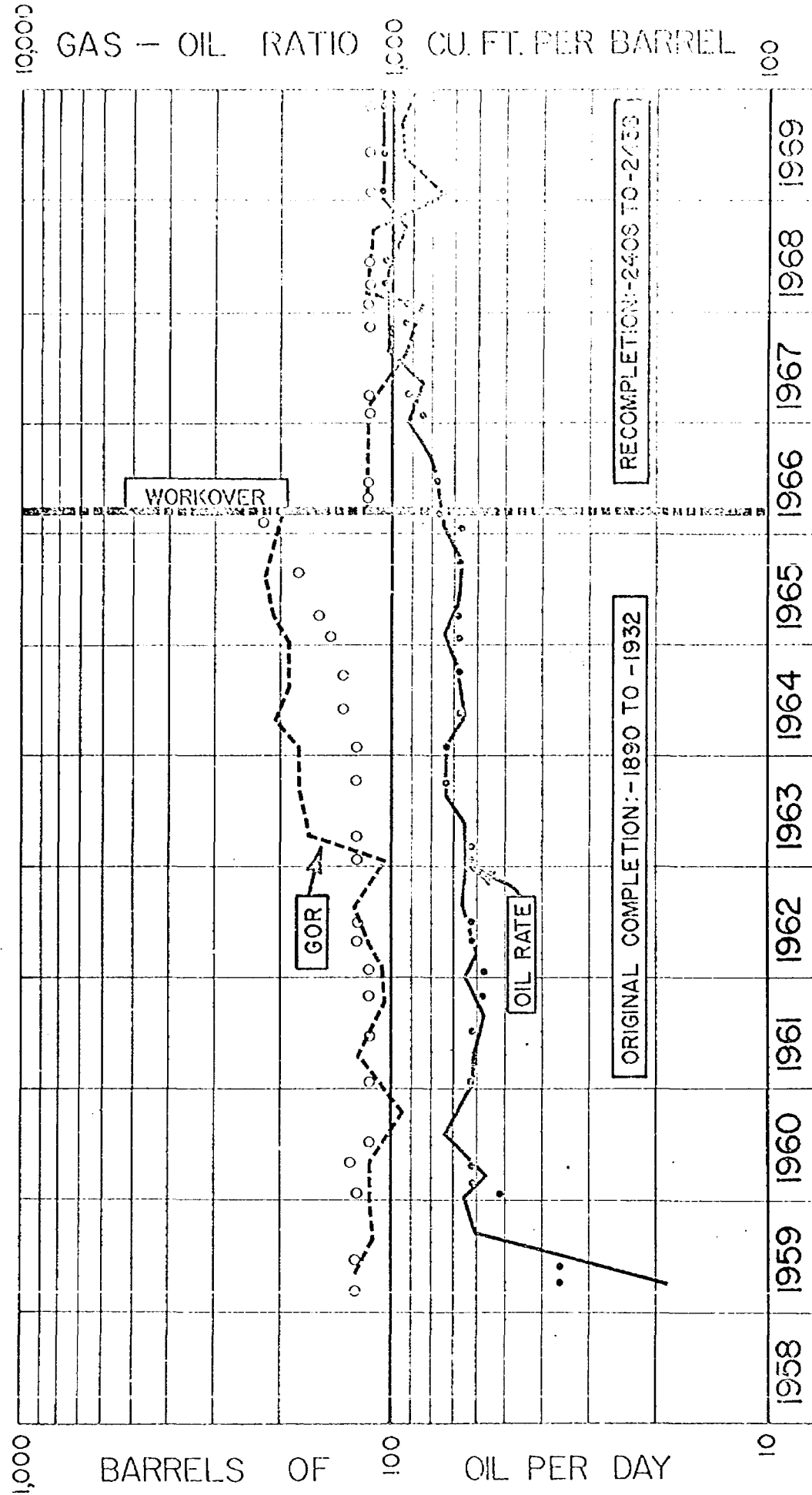


ACTUAL VALUE: OIL RATE: —●●●
GOR: ---●●●

EMPIRE ABO RESERVOIR

ACTUAL WELL PERFORMANCE COMPARED TO NUMERIC MODEL CALCULATIONS

ARCO - STATE AO NO.1
LOCATION: J-2-18S-27E
(MODEL NO. 24, BLOCK 4)

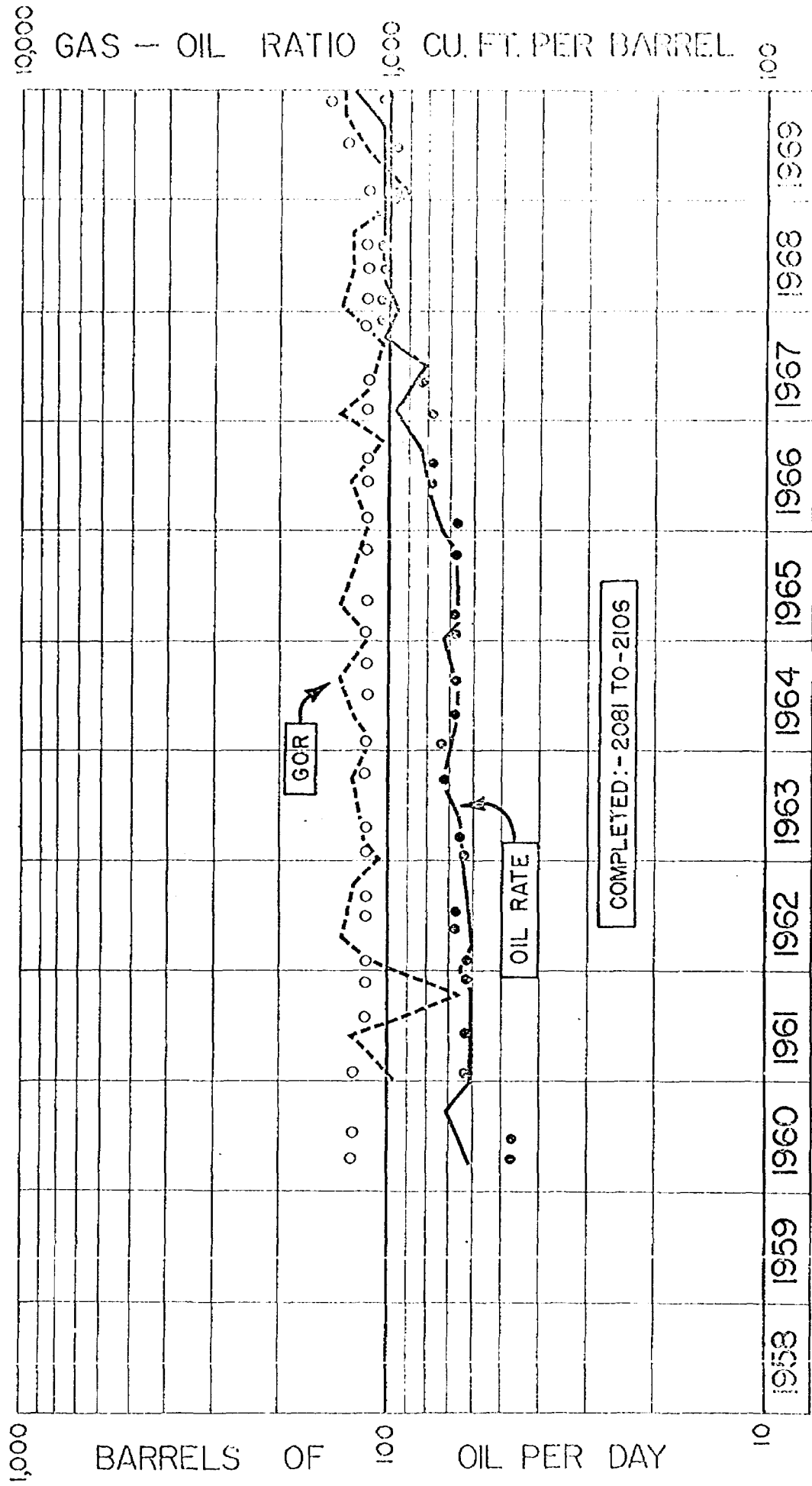


ACTUAL VALUE: OIL RATE: —
GOR: ---
NUMERIC MODEL VALUES: INPUT OIL RATE: 000
CALCULATED GOR: 000

EMPIRE ABO RESERVOIR

ACTUAL WELL PERFORMANCE COMPARED TO NUMERIC MODEL CALCULATIONS

M. YATES - DOOLEY ABO STATE NO. 1 (MODEL NO. 85, BLOCK 5)
 LOCATION: N-36-17S-27E



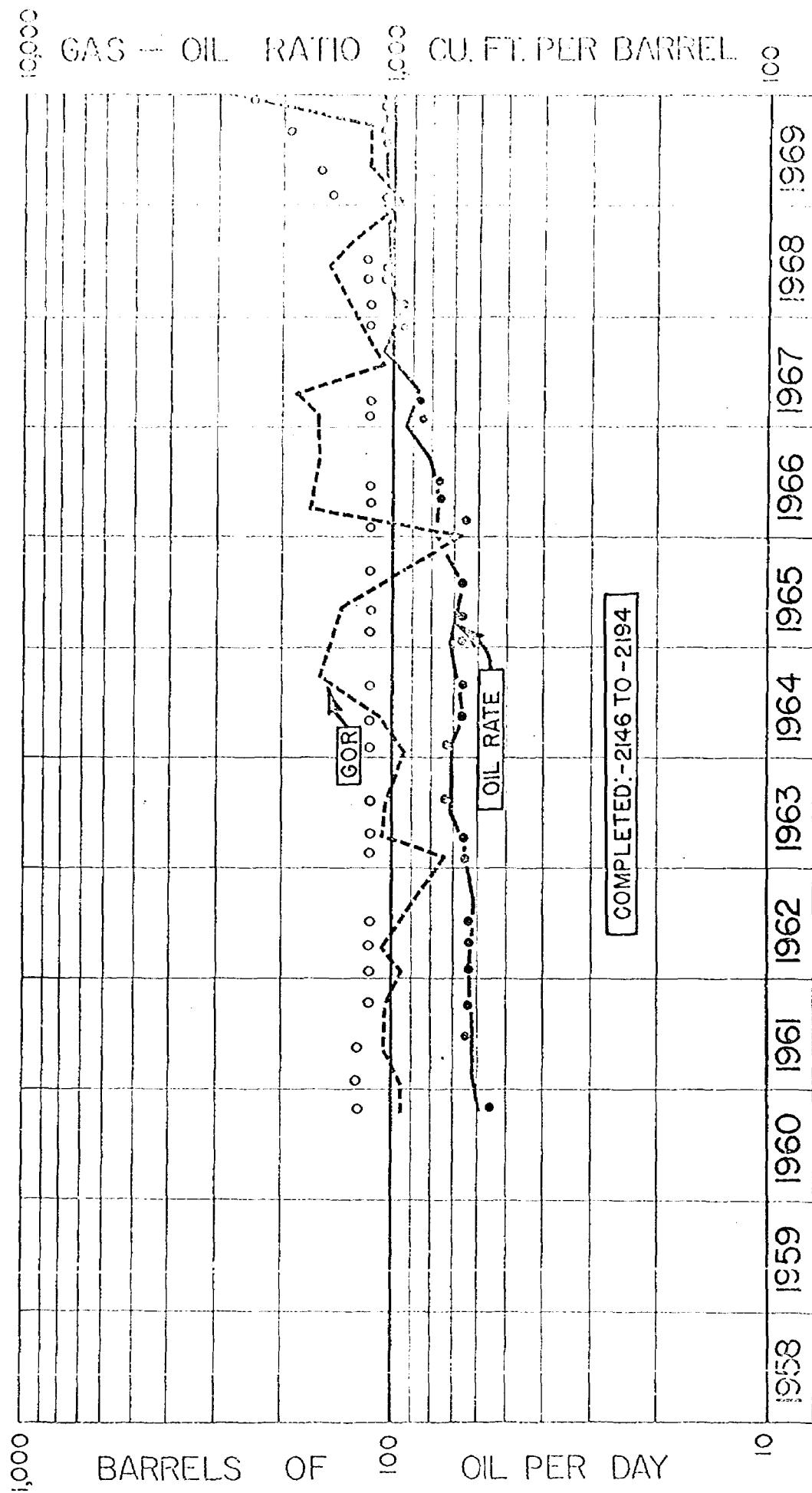
EMPIRE ABO RESERVOIR

ACTUAL WELL PERFORMANCE COMPARED TO NUMERIC MODEL CALCULATIONS

ARCO-EDDY STATE 32 NO.2

(MODEL NO. 168, BLOCK 7)

LOCATION: F-32-17S-28E



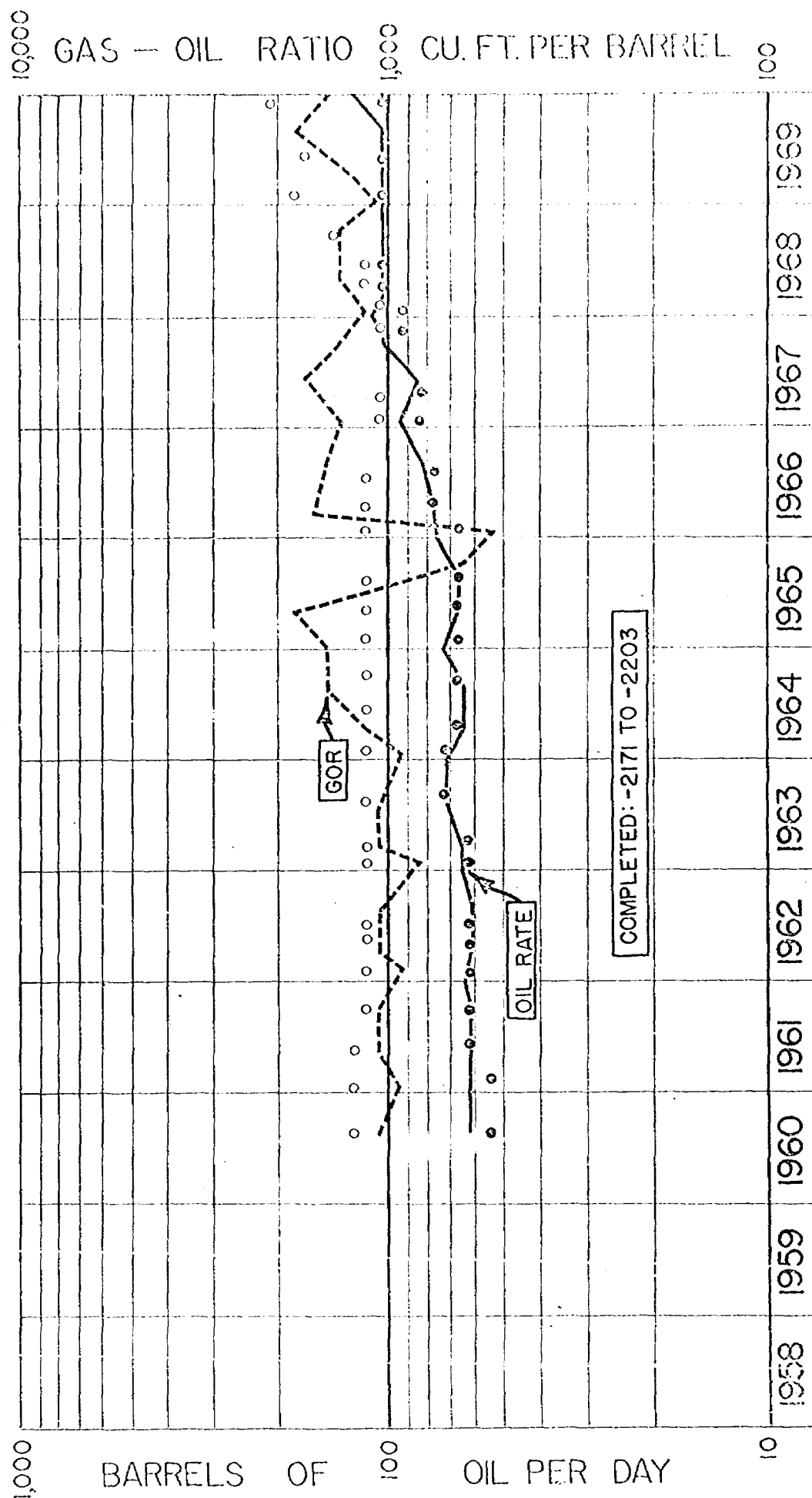
ACTUAL VALUE: OIL RATE: —
GOR: ---

NUMERIC MODEL VALUES: INPUT OIL RATE: •••
CALCULATED GOR: ○○○

EMPIRE ABO RESERVOIR

ACTUAL WELL PERFORMANCE COMPARED TO NUMERIC MODEL CALCULATIONS

ARCO - M. YATES B ARC NO.13 (MODEL NO.173, BLOCK 8)
LOCATION: C-33-17S-28E

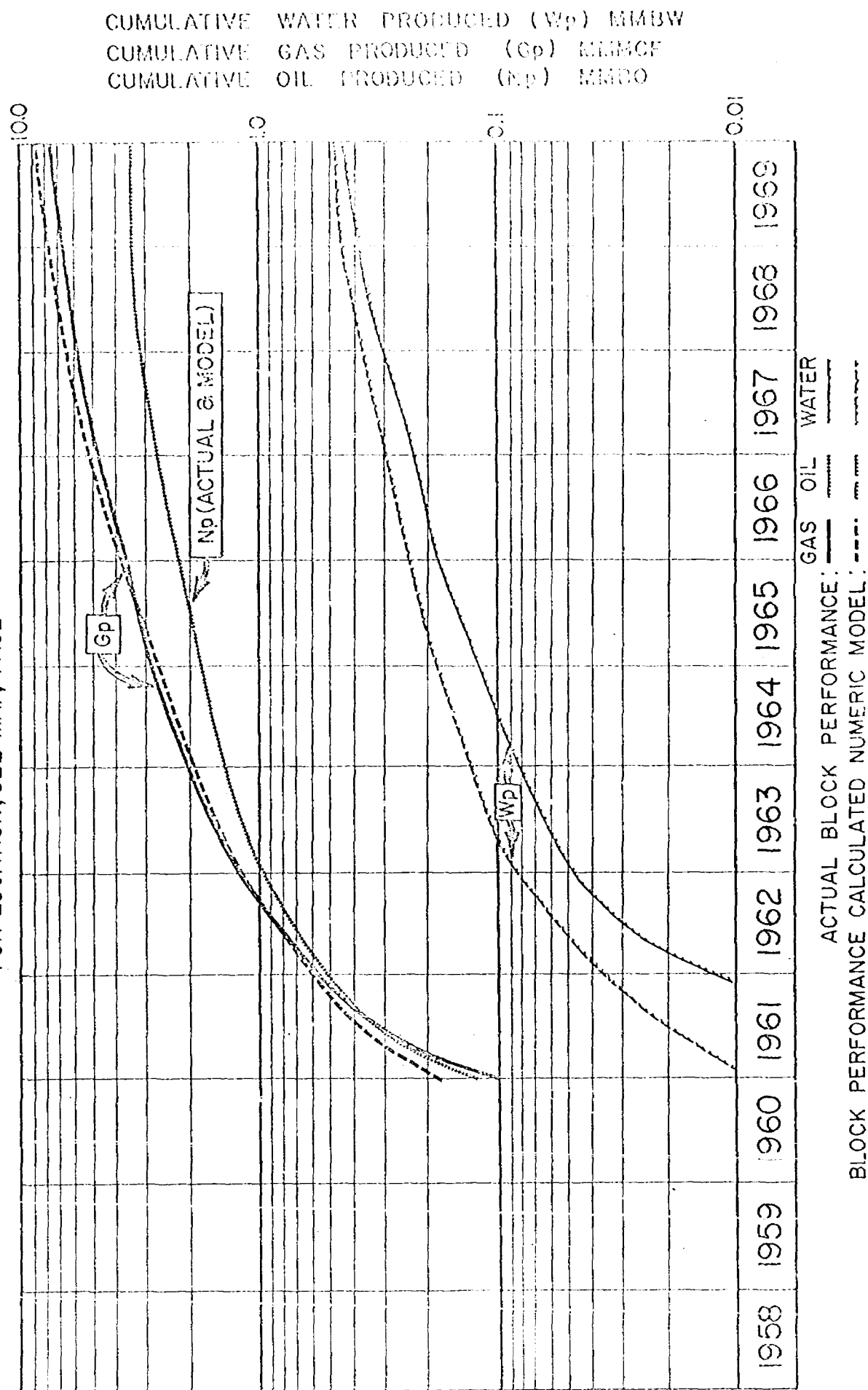


ACTUAL VALUE: OIL RATE: —
GOR: ---

NUMERIC MODEL VALUES: INPUT OIL RATE: •••
CALCULATED GOR: ○○○

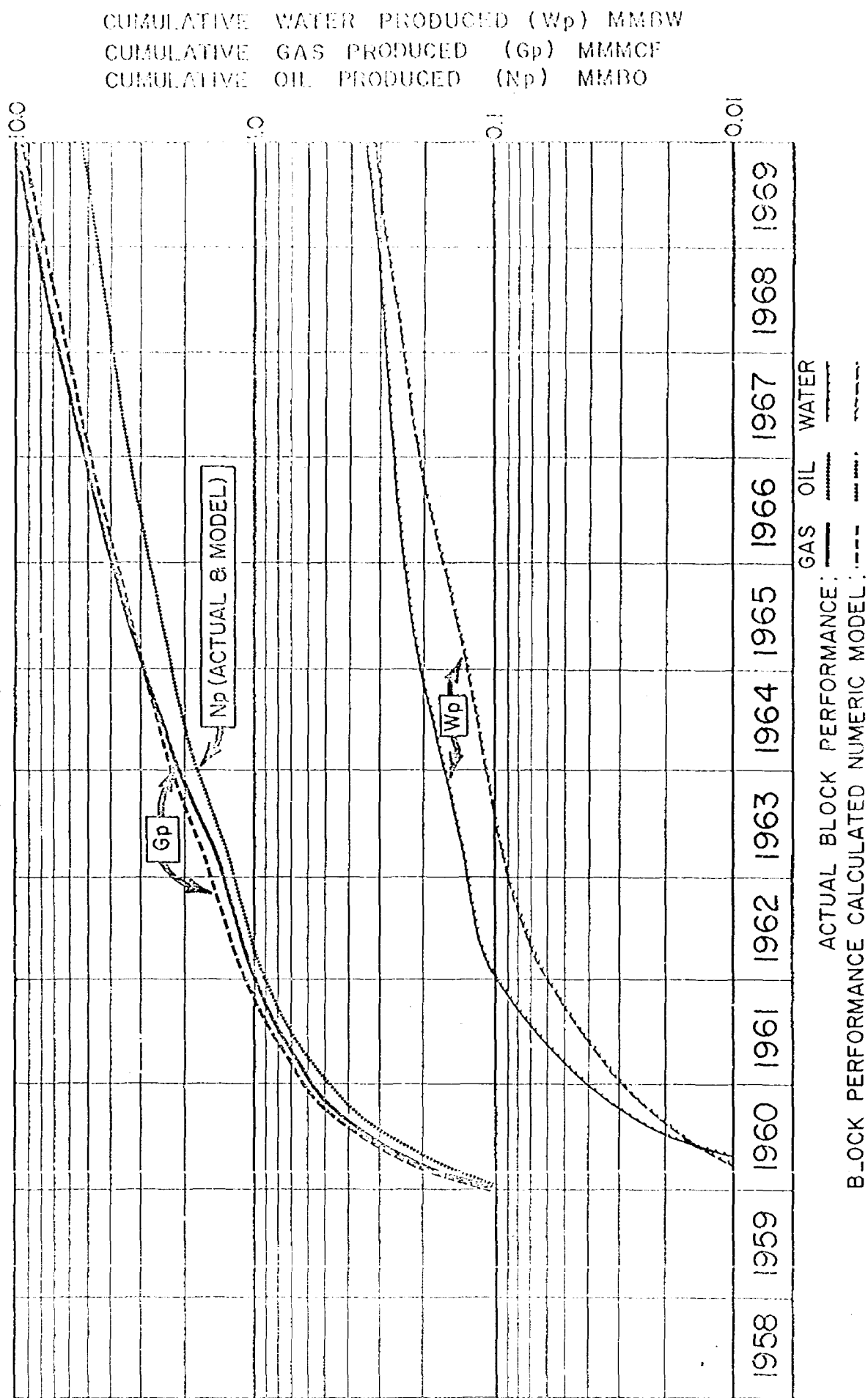
BLOCK - I (25 WELLS) EMPIRE ABO RESERVOIR ACTUAL BLOCK PERFORMANCE COMPARED TO NUMERIC MODEL CALCULATIONS

FOR LOCATION, SEE MAP, PAGE



BLOCK - 2 (21 WELLS) EMPIRE ABO RESERVOIR ACTUAL BLOCK PERFORMANCE COMPARED TO NUMERIC MODEL CALCULATIONS

FOR LOCATION, SEE MAP, PAGE

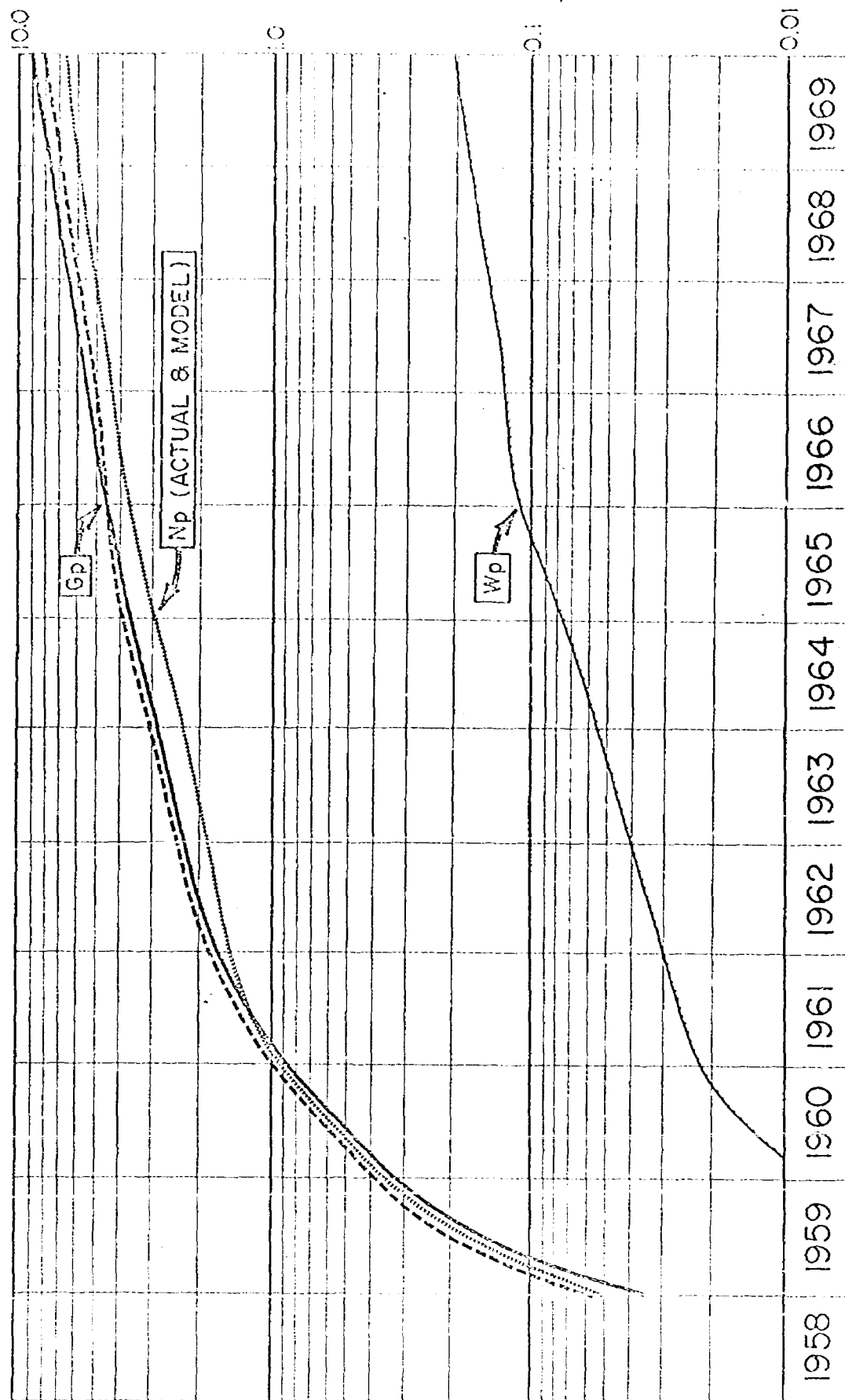


BLOCK - 3 (23 WELLS)

EMPIRE ABO RESERVOIR

ACTUAL BLOCK PERFORMANCE COMPARED TO NUMERIC MODEL CALCULATIONS

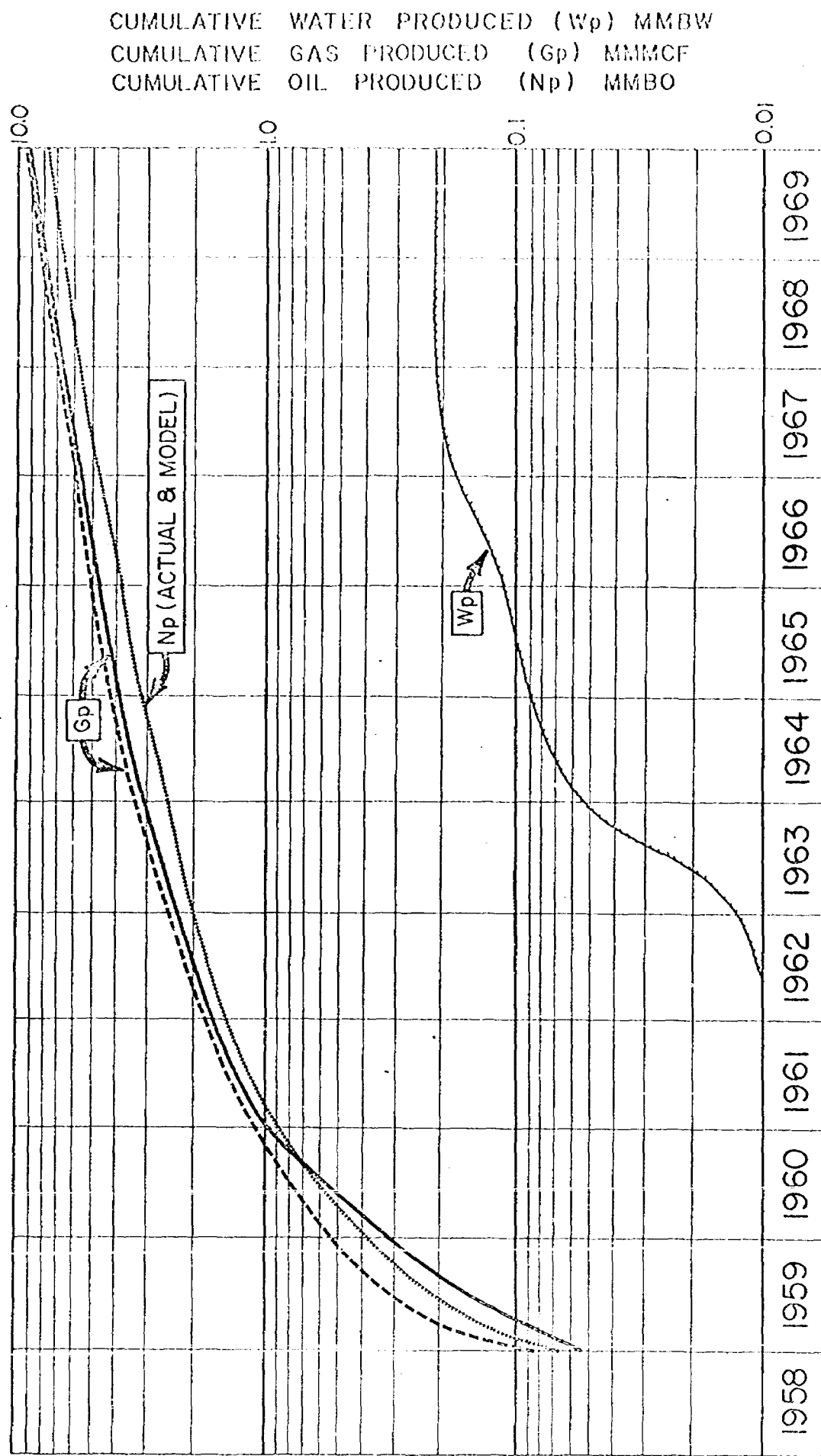
FOR LOCATION, SEE MAP, PAGE



ACTUAL BLOCK PERFORMANCE: —
BLOCK PERFORMANCE CALCULATED NUMERIC MODEL: ---
GAS OIL WATER

BLOCK - 4 (27 WELLS) EMPIRE ABO RESERVOIR ACTUAL BLOCK PERFORMANCE COMPARED TO NUMERIC MODEL CALCULATIONS

FOR LOCATION, SEE MAP, PAGE



ACTUAL BLOCK PERFORMANCE: ———
 BLOCK PERFORMANCE CALCULATED NUMERIC MODEL: - - - -

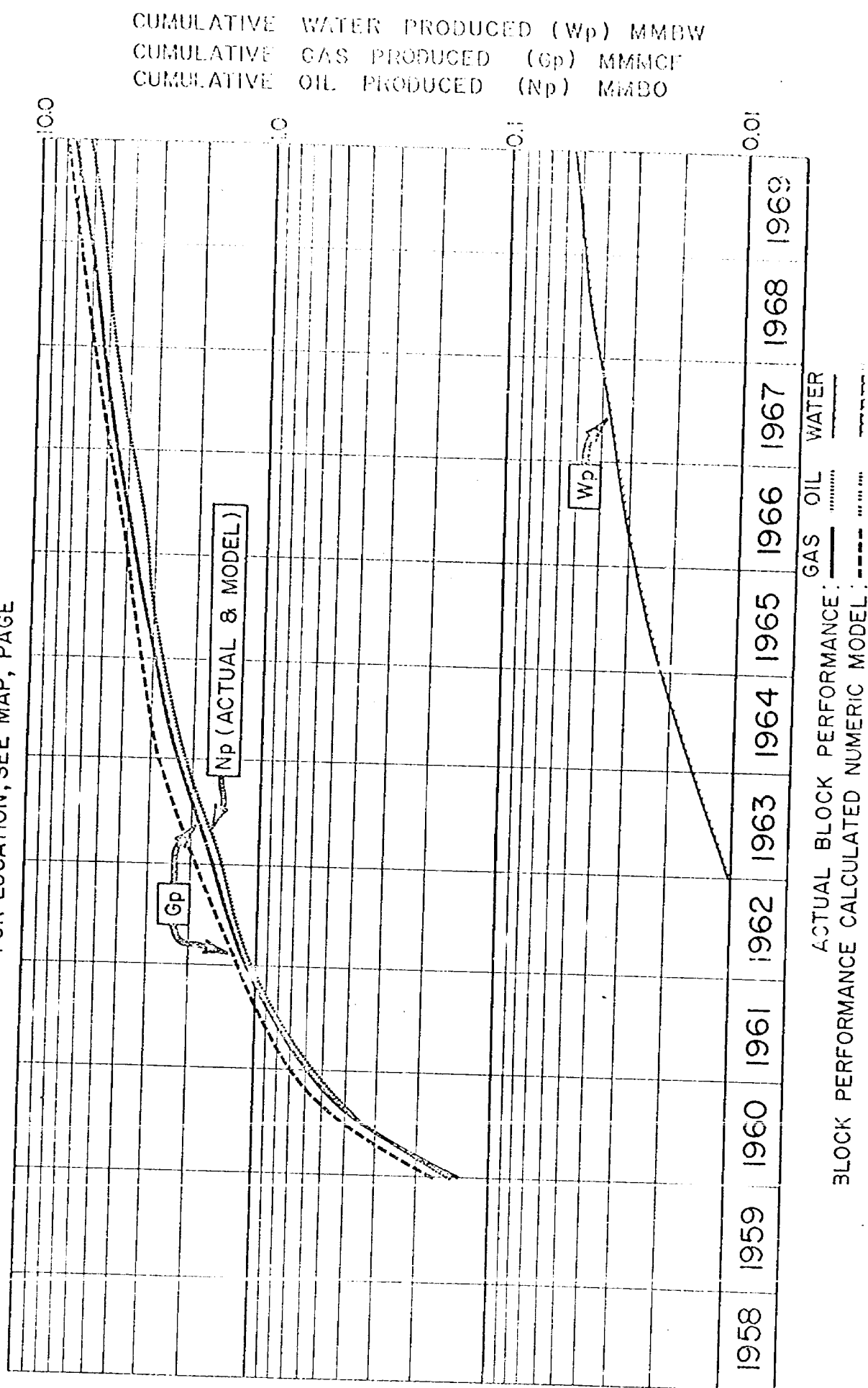
GAS OIL WATER

BLOCK -5 (24 WELLS)

EMPIRE ABO RESERVOIR

ACTUAL BLOCK PERFORMANCE COMPARED TO NUMERIC MODEL CALCULATIONS

FOR LOCATION, SEE MAP, PAGE

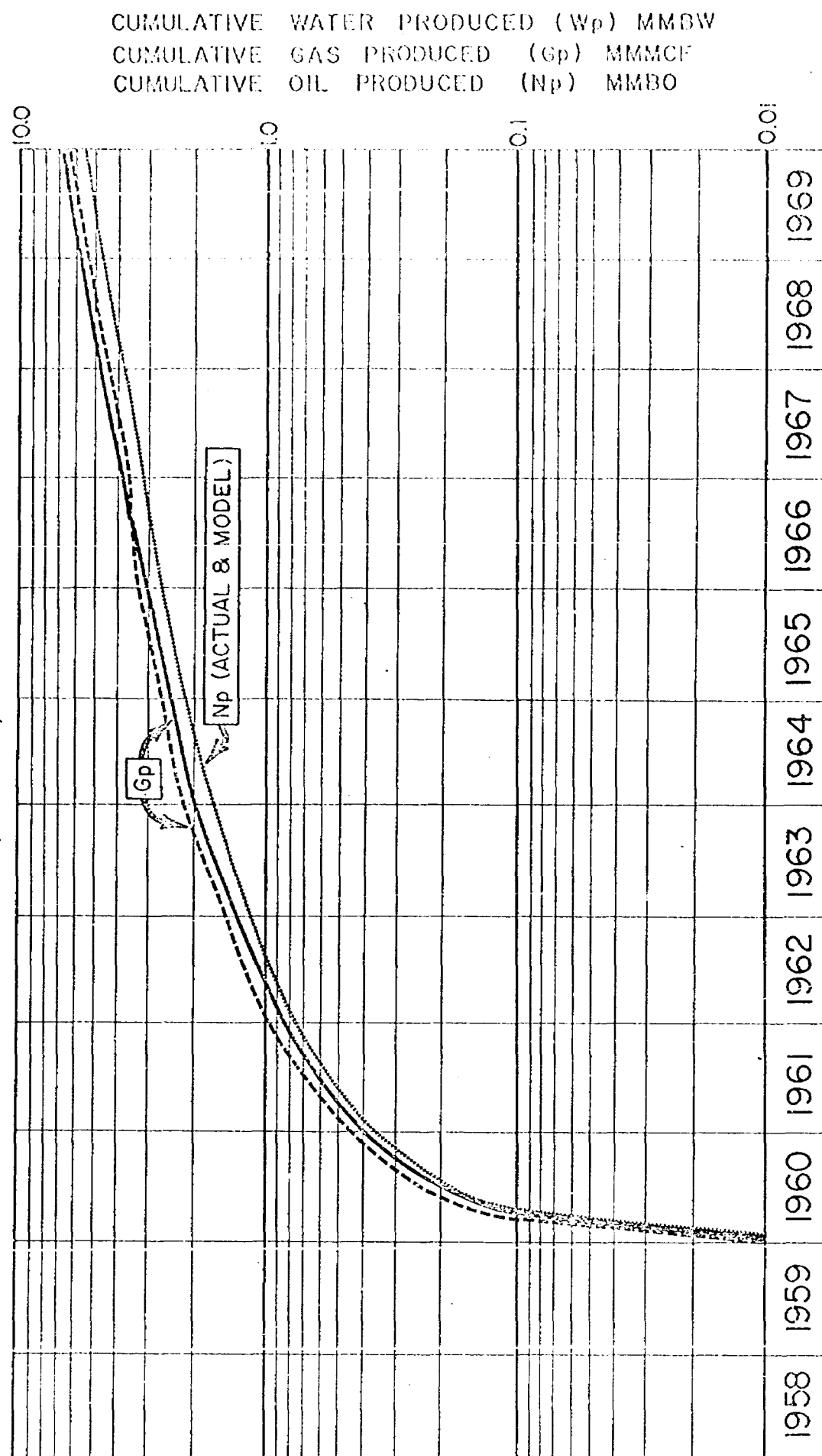


BLOCK - 6 (23 WELLS)

EMPIRE ABO RESERVOIR

ACTUAL BLOCK PERFORMANCE COMPARED TO NUMERIC MODEL CALCULATIONS

FOR LOCATION, SEE MAP, PAGE

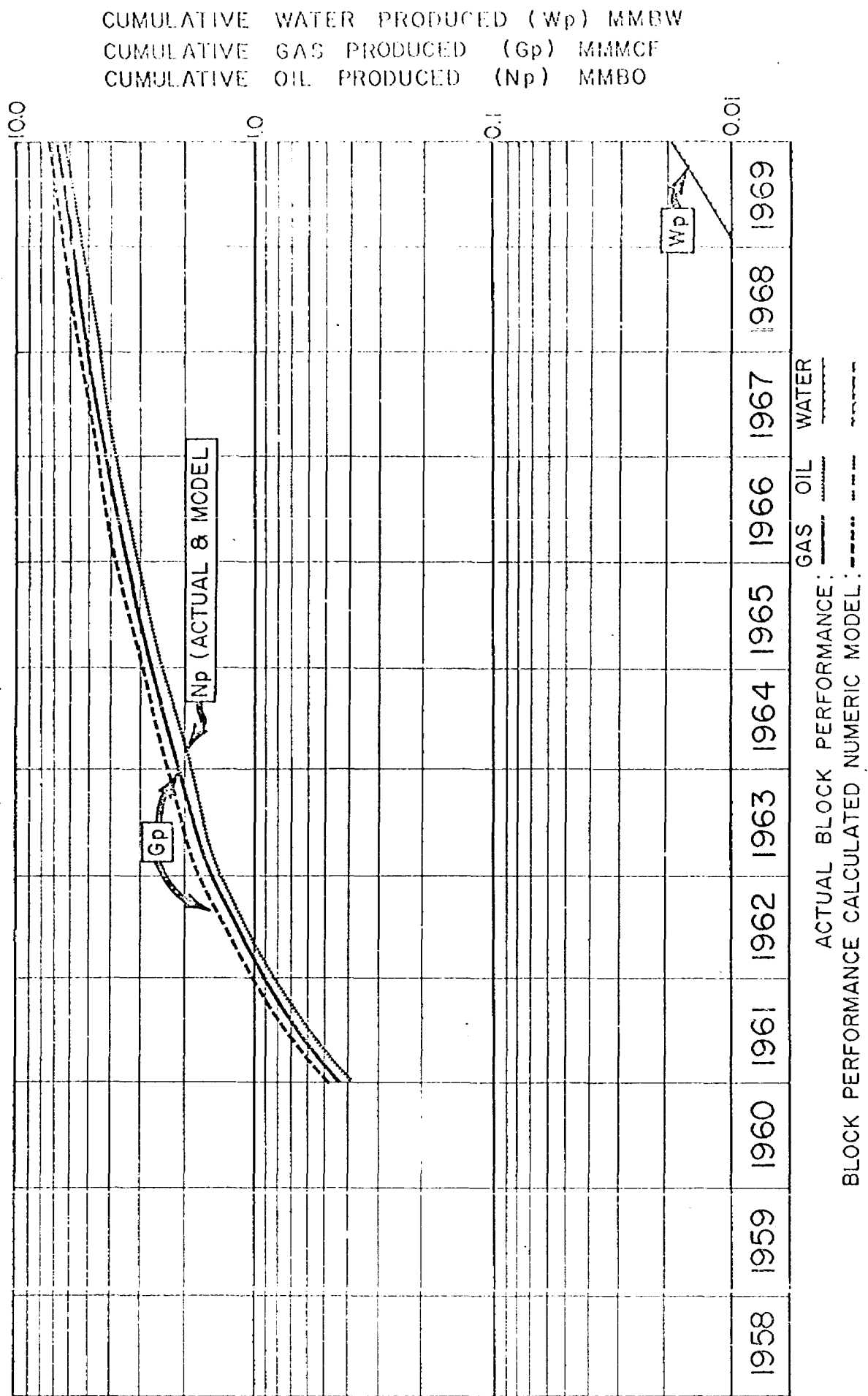


ACTUAL BLOCK PERFORMANCE: ———
 BLOCK PERFORMANCE CALCULATED NUMERIC MODEL: - - -

BLOCK -7 (24 WELLS) EMPIRE ABO RESERVOIR

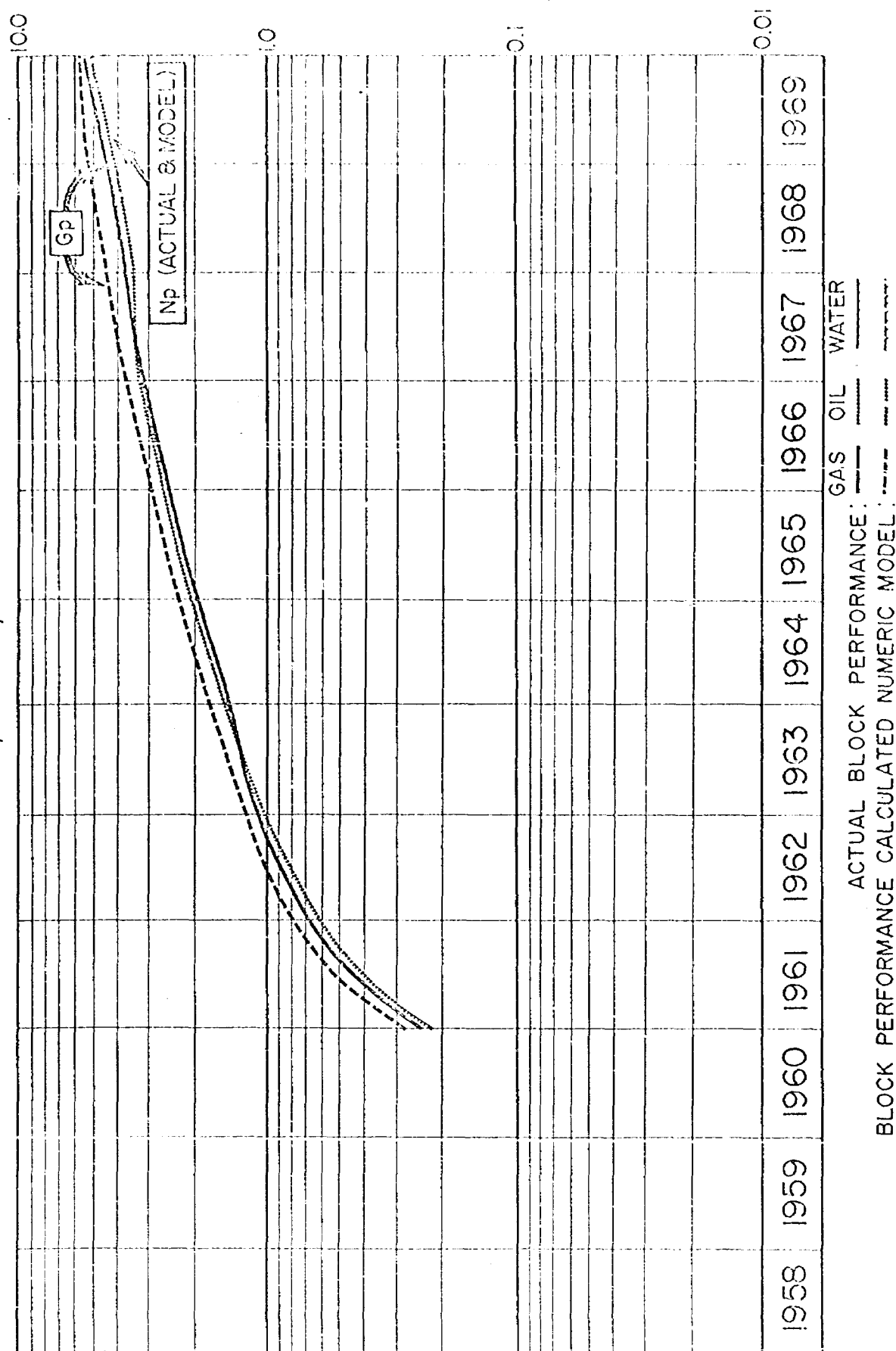
ACTUAL BLOCK PERFORMANCE COMPARED TO NUMERIC MODEL CALCULATIONS

FOR LOCATION, SEE MAP, PAGE



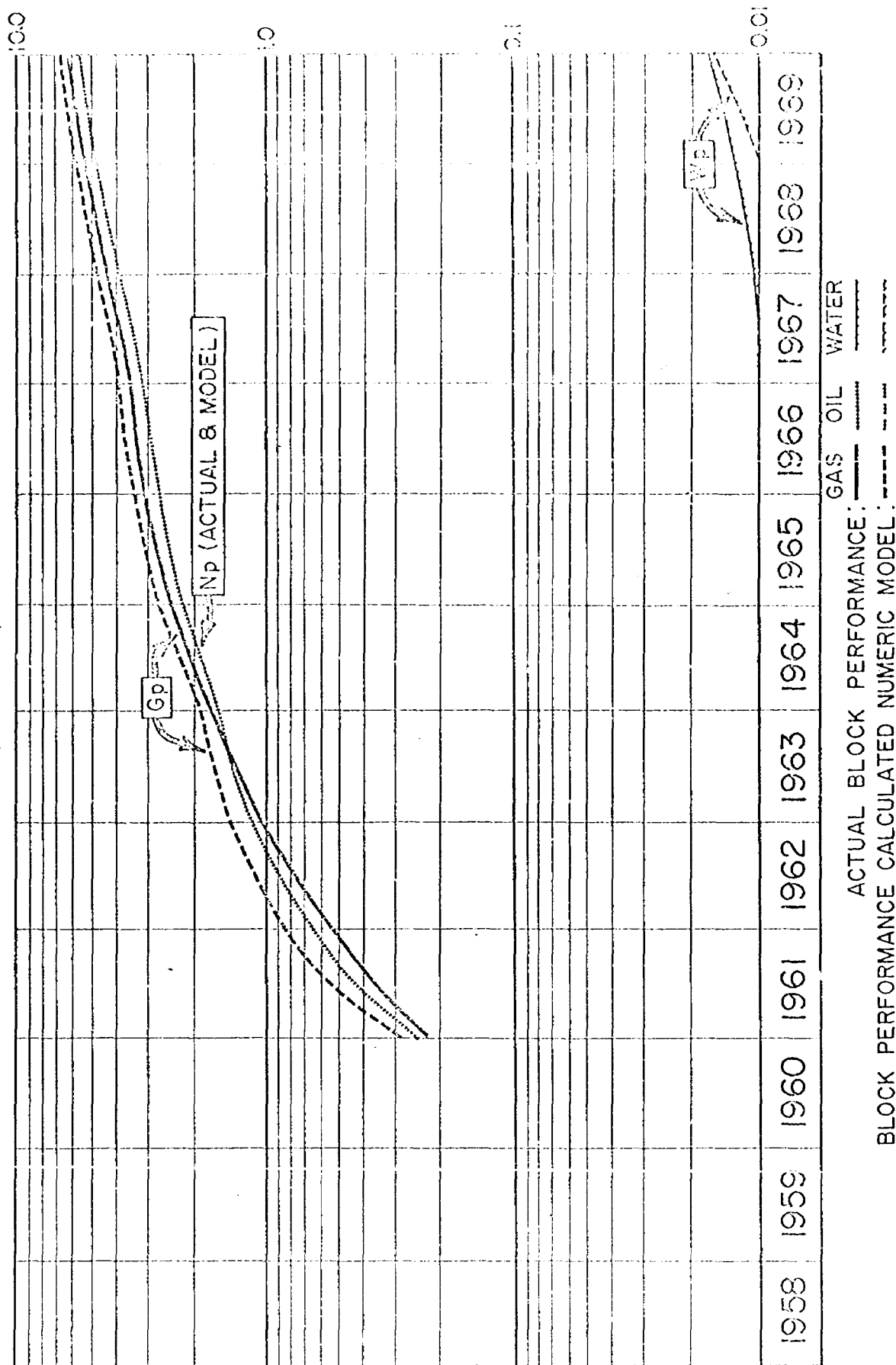
BLOCK - 8 (19 WELLS) EMPIRE ABO RESERVOIR ACTUAL BLOCK PERFORMANCE COMPARED TO NUMERIC MODEL CALCULATIONS

FOR LOCATION, SEE MAP, PAGE



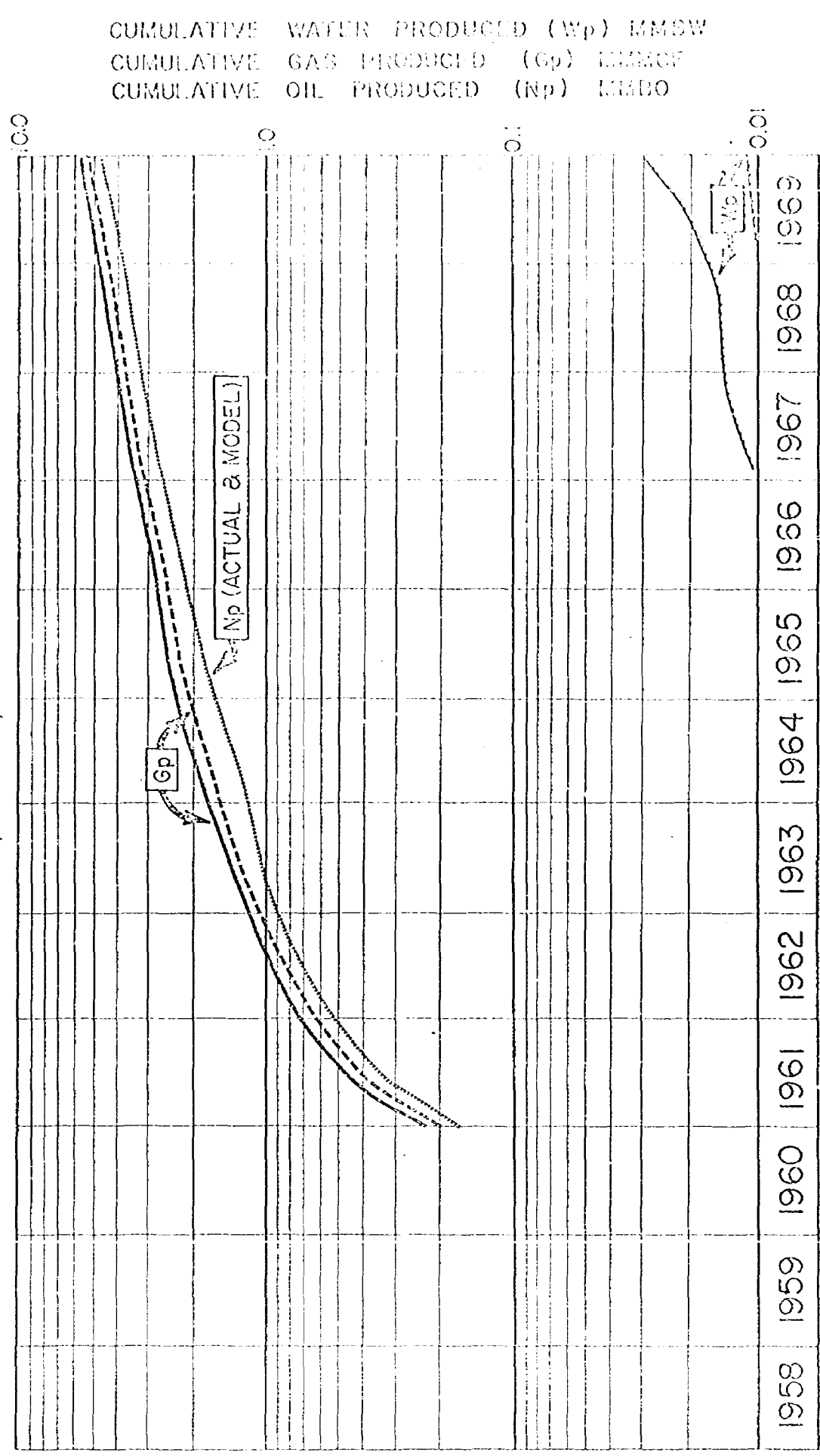
BLOCK - 9 (23 WELLS) EMPIRE ABO RESERVOIR ACTUAL BLOCK PERFORMANCE COMPARED TO NUMERIC MODEL CALCULATIONS

FOR LOCATION, SEE MAP, PAGE



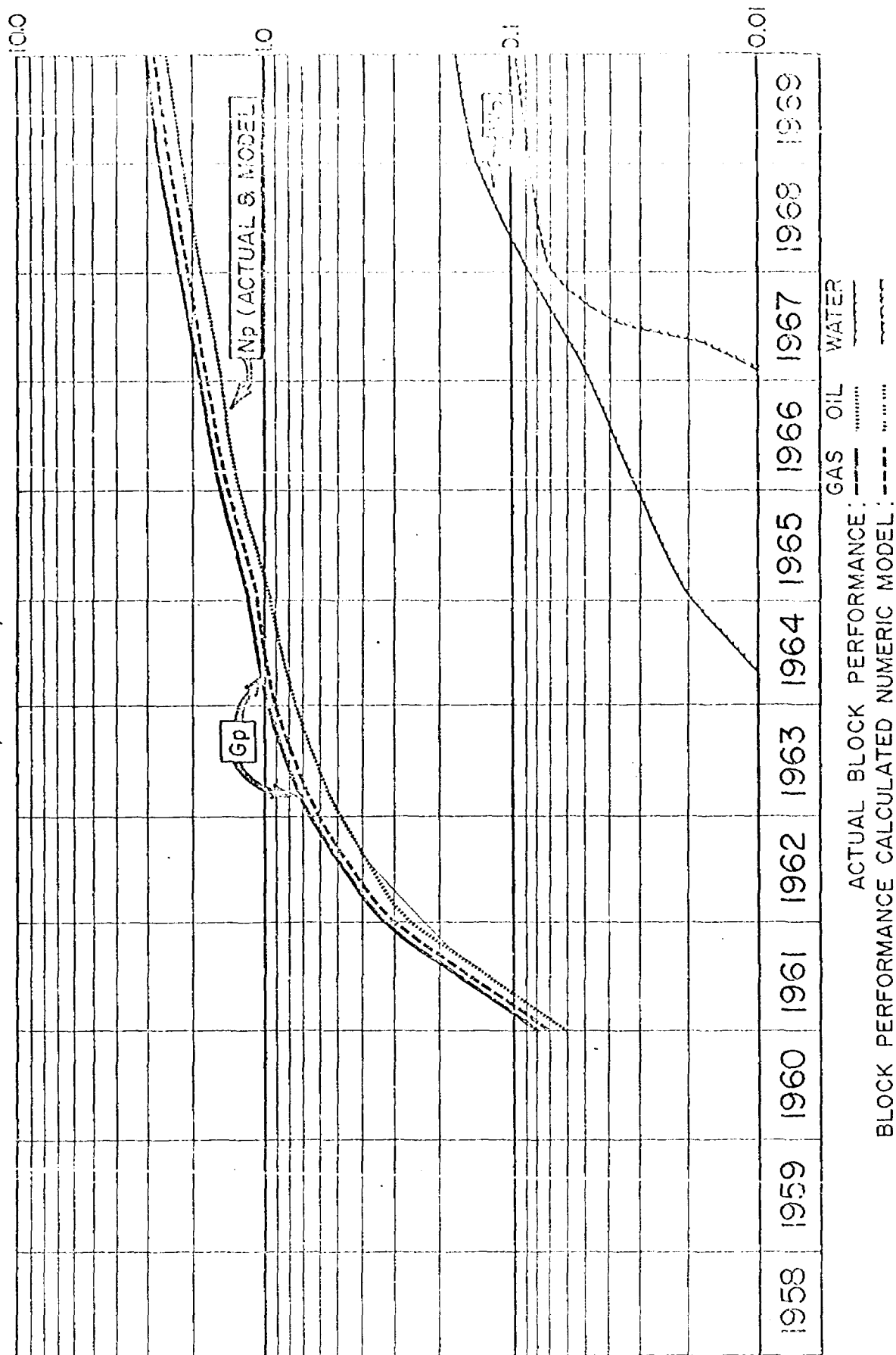
BLOCK -10 (18 WELLS) EMPIRE ABO RESERVOIR ACTUAL BLOCK PERFORMANCE COMPARED TO NUMERIC MODEL CALCULATIONS

FOR LOCATION, SEE MAP, PAGE



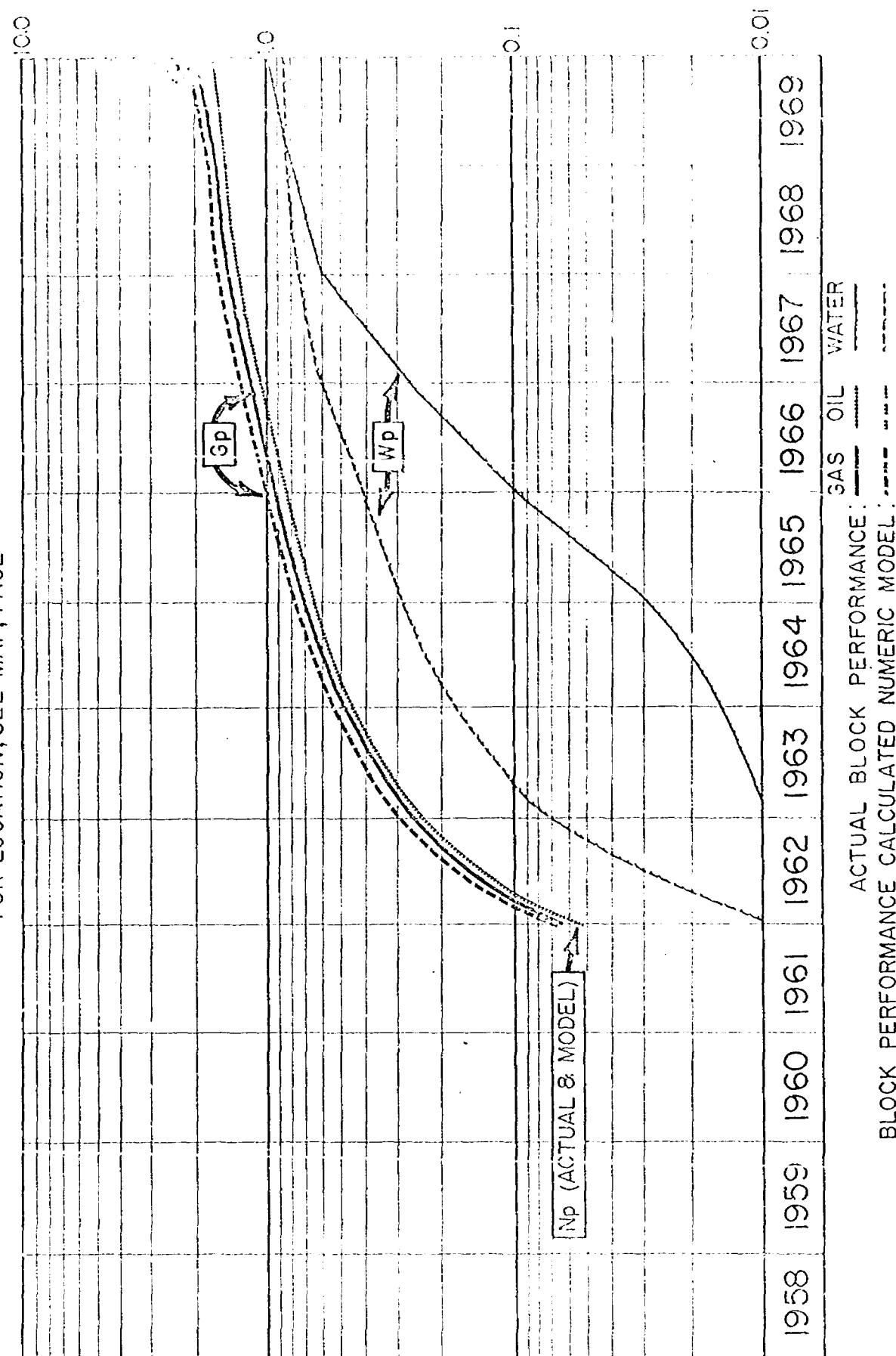
BLOCK-II (11 WELLS) EMPIRE ABO RESERVOIR ACTUAL BLOCK PERFORMANCE COMPARED TO NUMERIC MODEL CALCULATIONS

FOR LOCATION, SEE MAP, PAGE



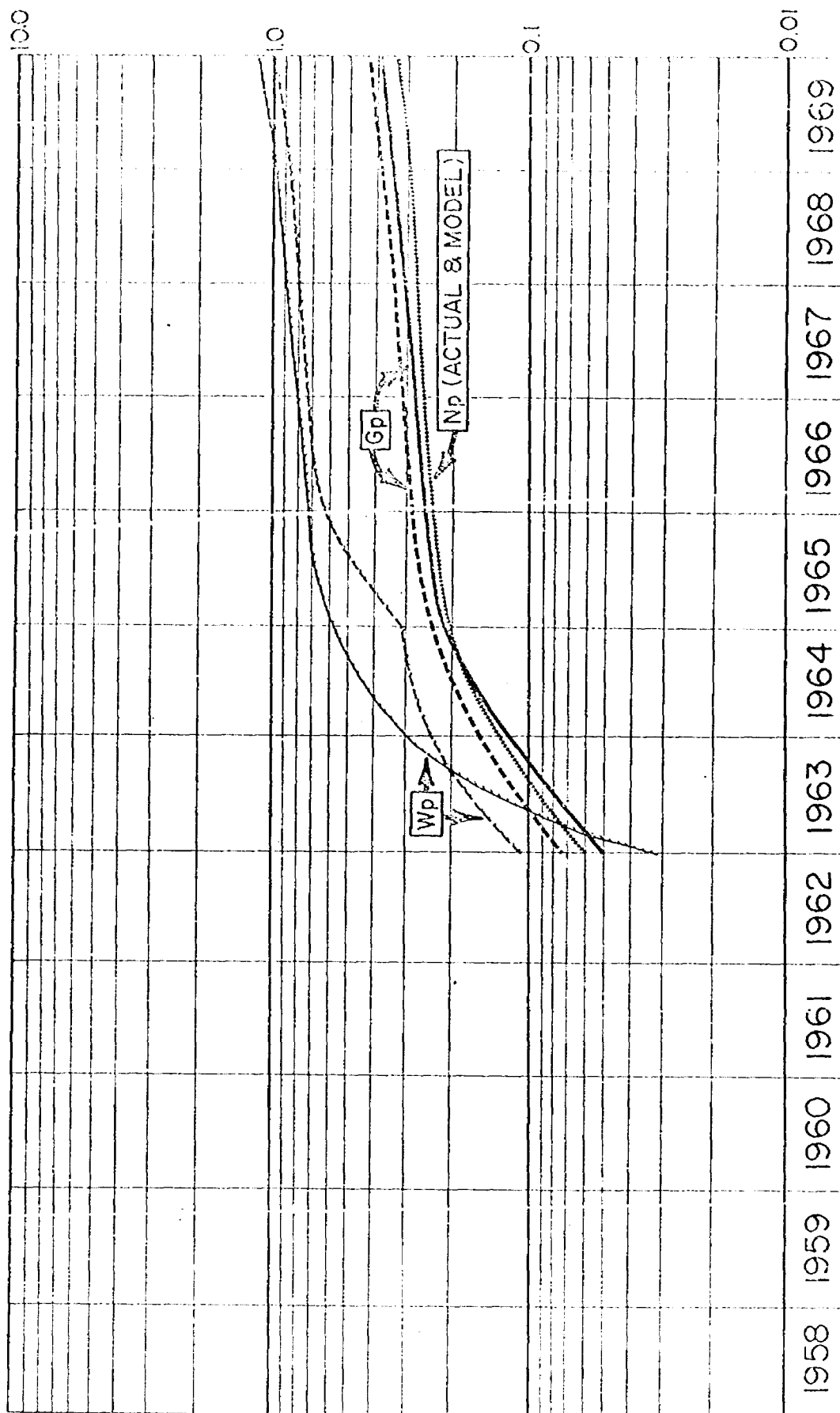
BLOCK -12 (8 WELLS) EMPIRE ABO RESERVOIR ACTUAL BLOCK PERFORMANCE COMPARED TO NUMERIC MODEL CALCULATIONS

FOR LOCATION, SEE MAP, PAGE



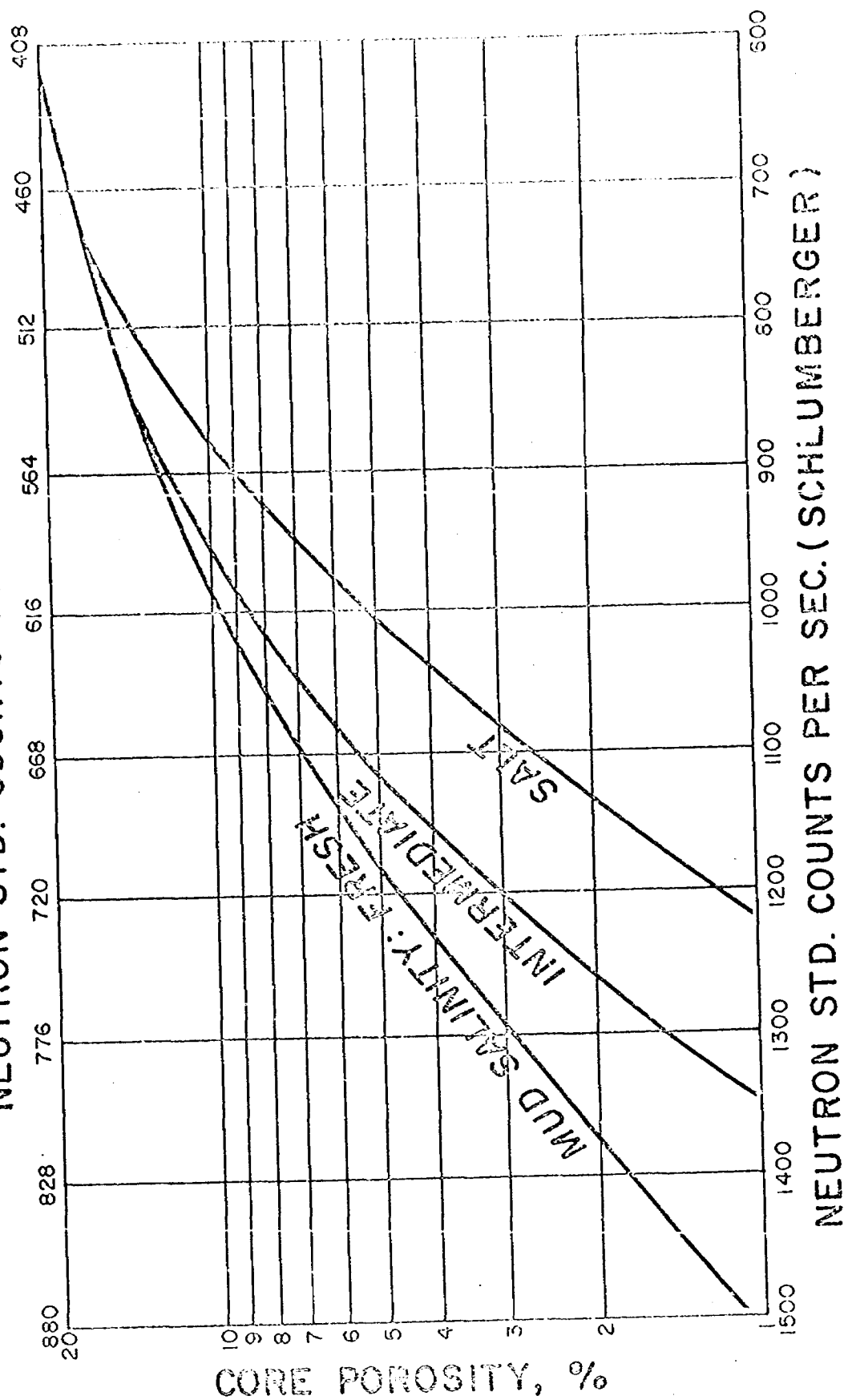
BLOCK - 13 (4 WELLS) EMPIRE ABO RESERVOIR ACTUAL BLOCK PERFORMANCE COMPARED TO NUMERIC MODEL CALCULATIONS

FOR LOCATION, SEE MAP, PAGE

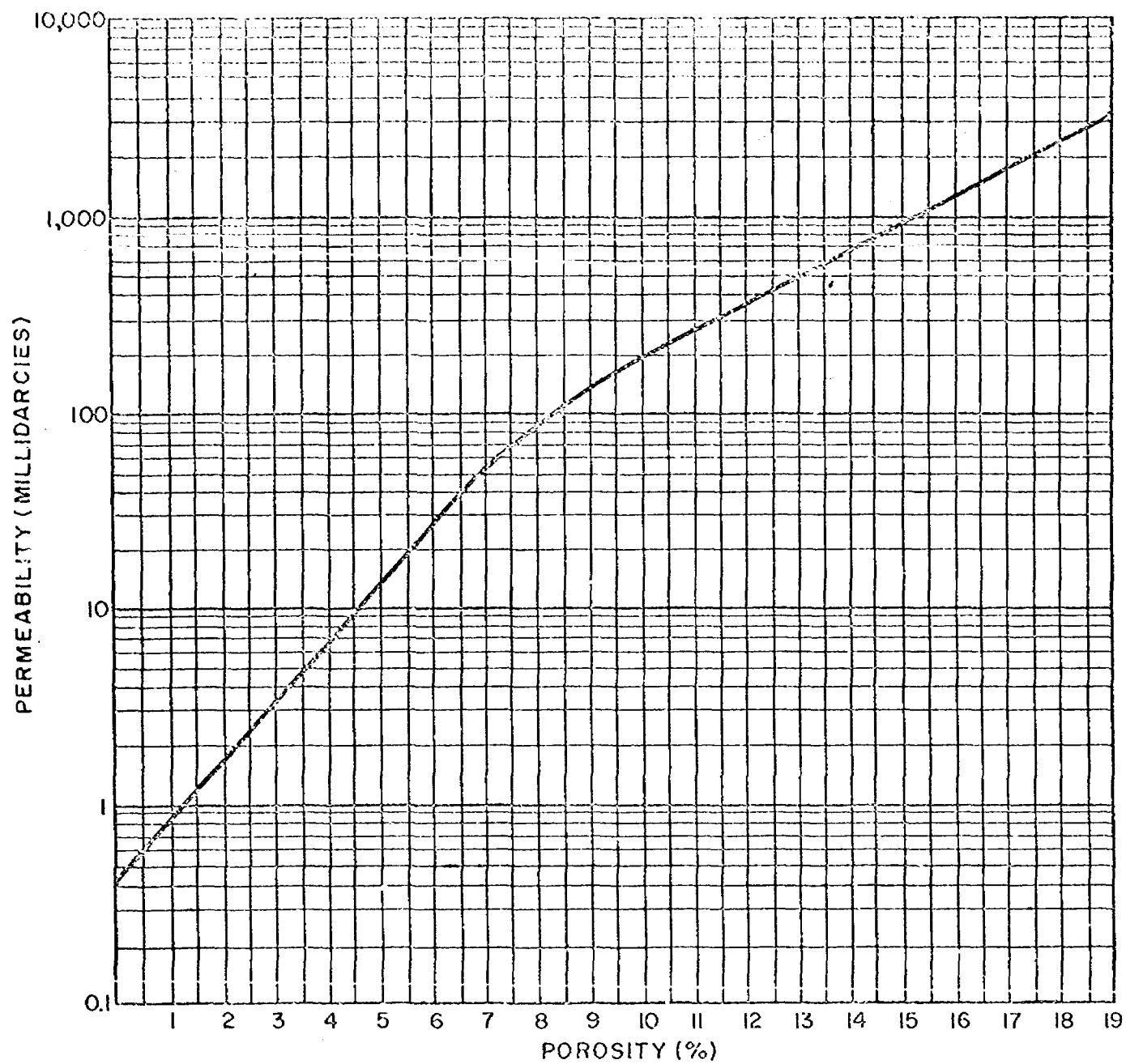


ENGINEERING COMMITTEE
 EMPIRE ABO RESERVOIR-MAIN REEF AREA
 CORE POROSITY VS. NEUTRON STD. COUNTS PER SEC. FOR SCHLUMBERGER
 AND WELEX LOGS
 CONDITIONS: OPEN HOLE 7 7/8" DIAMETER

NEUTRON STD. COUNTS PER SEC.(WELEX)

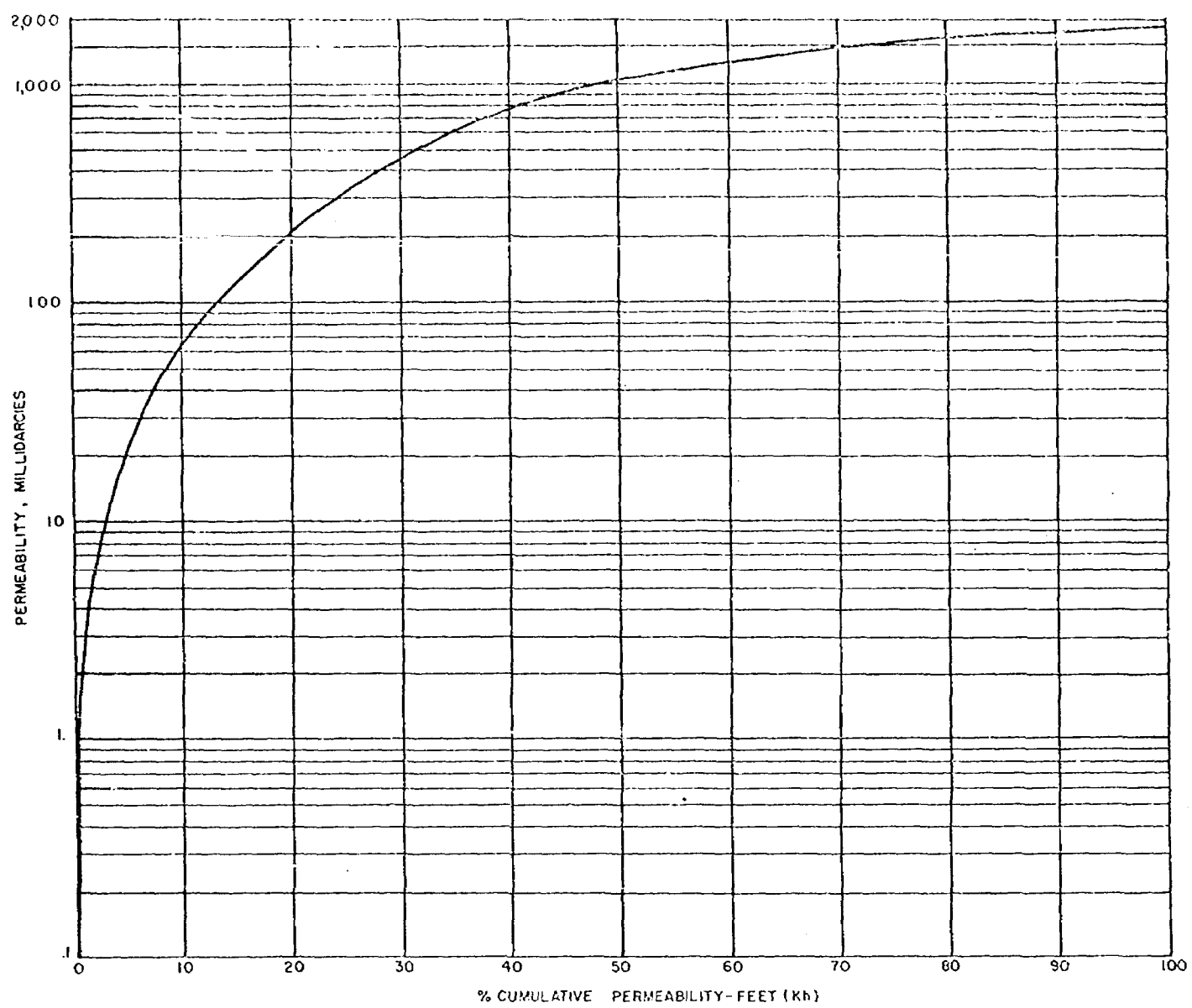


CORE PERMEABILITY V.S. POROSITY
USING SORT BY POROSITY RANGES

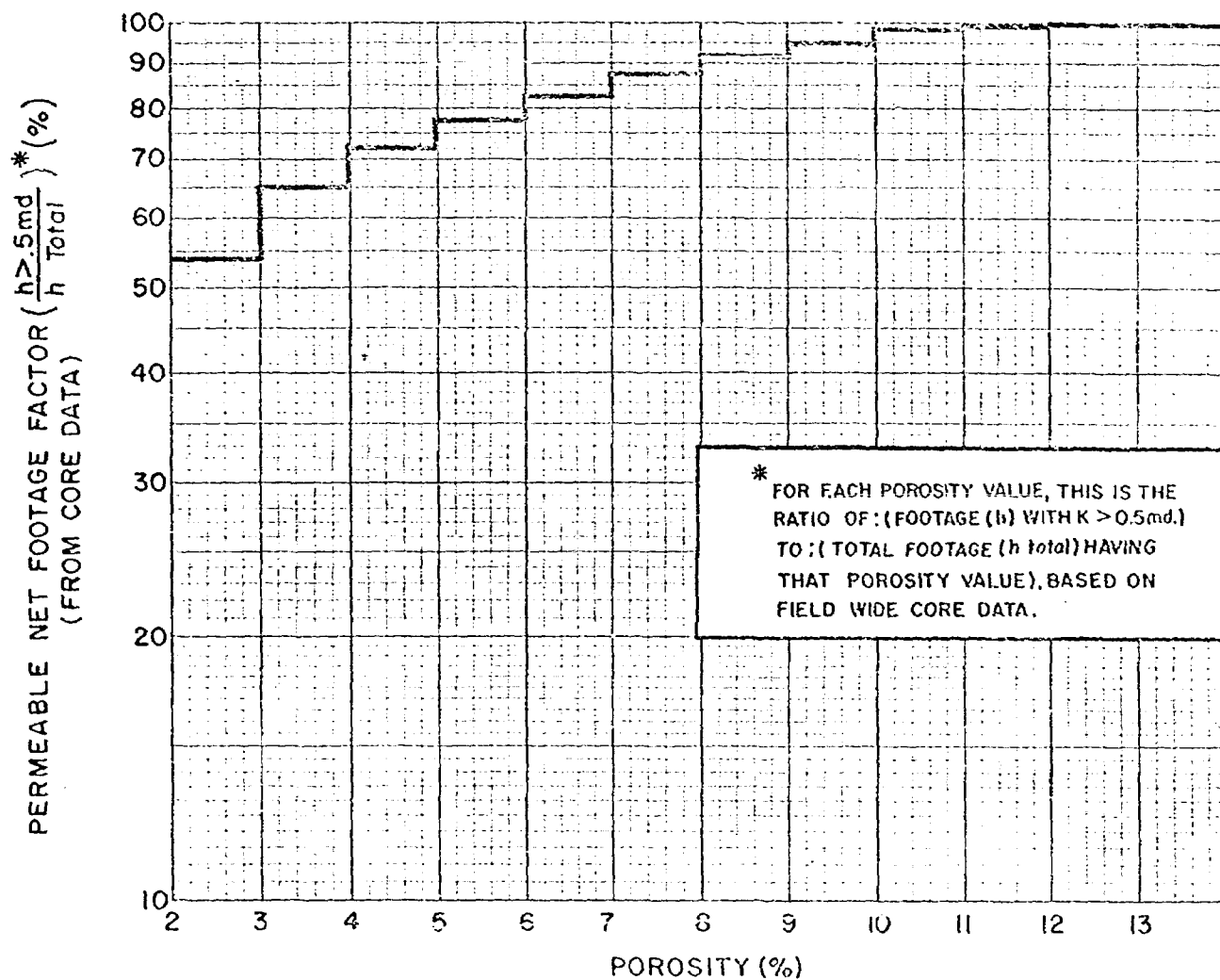


(PAN AM CURVE FROM ENGINEERING COMMITTEE DATA)

EMPIRE ABO RESERVOIR
FLOW CAPACITY CURVE
PERMEABILITY vs CUM. PERMEABILITY-FT.
BASED ON ENGINEERING COMMITTEE CORE DATA SORTING



EMPIRE ABO RESERVOIR PERMEABLE NET FOOTAGE FACTOR*



SINGLE WELL MULTIPHASE CONING SIMULATOR

57

(3-PHASE COMPRESSIBLE CONING)

Introduction

This program is designed to predict the ability of an individual oil or gas well to cone fluids into the wellbore. The model is extremely flexible in that a large variety of conditions may be simulated with only a minimum amount of data input.

The program is particularly useful for determining the effect of coning gas downward and/or water upward into the wellbore perforations as producing rates vary. Descriptive output is generated to show the cone growth and the changes that occur in saturations within the cone area. As gas and/or water is coned into the wellbore, production rates reflect the change to multiphase flow. The program numerically solves the partial differential equations which describe three-phase compressible transient flow in cylindrical coordinates. That is, an R-Z (radial-vertical) coordinate system is employed so that the reservoir under consideration assumes symmetry in the angular direction. The geometry is shown in Figure 1.

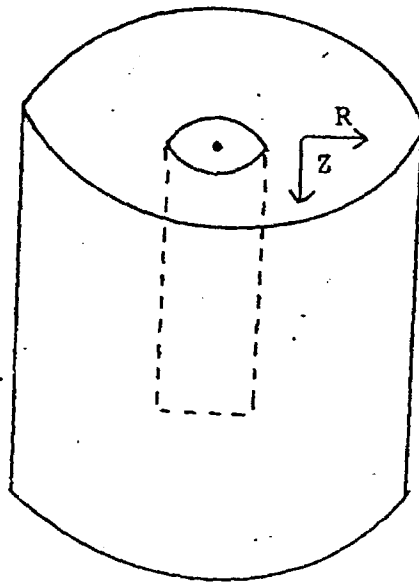


FIGURE 1

The reservoir has the shape of a right circular cylinder with a radius (R) and a thickness (Z). The wellbore with a radius (R_W) is located at the center of the cylinder from which production and/or injection of fluids occur. Areal reservoir heterogeneities are accounted for by variable permeabilities, porosities, and saturations which are read as input data.

BEFORE EXAMINER MUTTER
OIL CONSERVATION DIVISION
ARCO EXHIBIT NO. 14
CASE NO. 6553

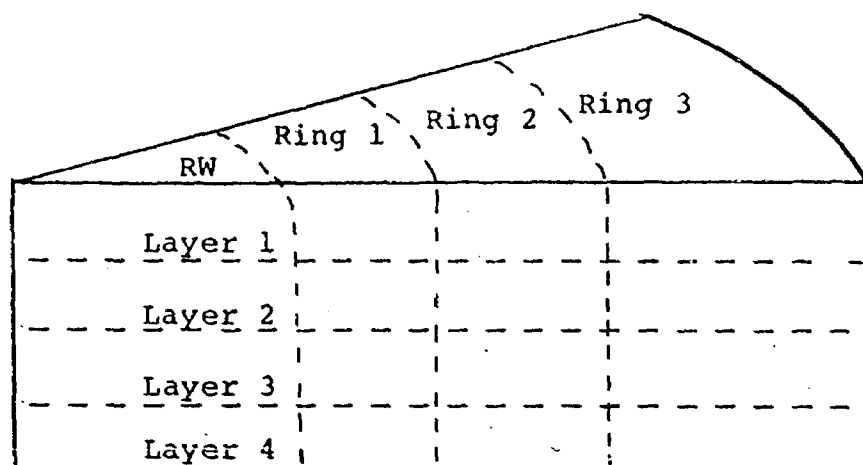


FIGURE 2

The areal reservoir description is described by concentric rings as indicated in Figure 2. Vertical heterogeneities are accounted for in a similar fashion with various reservoir layers, again shown in Figure 2.

The solution technique employed in this model is unconditionally stable which means that the time step size is limited only by the desired accuracy and not the pore volume of the smallest cell. This model typically employs time steps where 1000 times a block's pore volume can flow through it in a single time step.

The final result is a coning model which simulates years of real time in seconds and solves problems for a few dollars which a few months ago cost thousands.

Special Features

- By simply manipulating the input data the program can handle a domal reservoir geometry rather than cylindrical shape.
- Gas-oil ratios and water-oil ratios are monitored each time step to reflect the growth of the unwanted phases. When one or both of these indications increase to a

pre-set limiting value, the computer run is ended to prevent additional unneeded calculations.

- The program allows different fluid properties and relative permeability and capillary pressure data for different layers.
- The unconditional stability allows very large time steps resulting in a model which will simulate years of real time in a few minutes.
- Time steps can be specified by the user or can be automatically selected by the program. The automatic selection process is designed to choose time steps which minimize the running time while keeping the numerical errors within a specified bounds.
- A restart feature is included in the program so that the user can study alternatives which differ only in the late stages of the flood without repeating the entire run each time.
- The program checks for a variety of types of data input errors and in the event of their occurrence, terminates the run and prints the error which occurred.
- Predicted results are monitored at each time step through a cumulative material balance (for each phase) for the entire reservoir and by an incremental material balance for each time step.
- A minimum amount of input data are required, as options are available ranging from a homogeneous reservoir option with very little input data requirements, up to a full heterogeneous reservoir option where properties can be varied at each grid block.
- A horizontal fraction can be simulated by varying only the input data.
- The user has control over the time and amount of output so that detailed information can be obtained for matching field data at any specified times.

Uses

- Determine optimum producing rates by simulating many different producing rate conditions

- Determine optimum location of perforations
- Improve reservoir description or obtain information about aquifer activity by history matching
- Select optimum well density within a field by comparing results which use various external drainage radii
- Achieve the twofold objective of determining a producing rate which inhibits serious coning and at the same time effectively drains the reservoir
- Perform depletion and pressure maintenance studies of single well reef pools (a single study predicts field performance while determining ultimate sandwich losses)

Examples

A recent application of this model was a depletion study of a number of single well reef pools under various operating strategies. These results were presented to a regulatory body and the result of the hearing increased allowables for these pools 40%. At the same hearing 90% of the pools in the same area had allowables cut over 20%.

Another recent application of this model was a coning study of a large gas field in Canada. Early in the life of this field, a number of the wells began producing water and the operator became concerned about the future performance of this field. An extensive study was undertaken to determine:

- 1) the water influx into the pool
- 2) the individual well performance at various production rates

The study was completed and future rate schedules were determined which minimized water production. Coning was found not to be as serious as originally expected since reasonably large rates were permissible without serious water production. The field has been producing as predicted for five months.

Basic Equations

The equations used in this model to describe compressible multi-phase fluid flow in a porous media are a combination of the continuity equation plus Darcy's Law and are as follows:

$$\nabla \cdot \frac{kk_{ro}}{B_o \mu_o} \nabla (p_o - \rho_o gh) + q_{ov} = \phi \frac{\partial}{\partial t} \left(\frac{S_o}{B_o} \right) \quad \text{oil} \quad (1)$$

$$\nabla \cdot \frac{kk_{rw}}{B_w \mu_o} \nabla (p_w - \rho_w gh) - q_{wv} = \phi \frac{\partial}{\partial t} \left(\frac{S_w}{B_w} \right) \quad \text{water} \quad (2)$$

$$\nabla \cdot \frac{kk_{rg}}{B_g \mu_g} \nabla (p_g - \rho_g hg) + \nabla \cdot R_s \frac{kk_{ro}}{B_o \mu_o} (p_o - \rho_o gh) - q_{gv} = \phi \frac{\partial}{\partial t} \left(\frac{S_o}{B_o} R_s + \frac{S_g}{B_g} \right) \quad \text{gas} \quad (3)$$

$$S_o + S_w + S_g = 1.0 \quad (4)$$

$$p_o = p_w + p_{cwo} \quad (5)$$

$$p_g = p_o + p_{cgo} \quad (6)$$

These equations are expanded using a cylindrical coordinate system (R-Z). The resulting equations are approximated by a fully implicit difference scheme which is unconditionally stable. This means that large volumes of fluid can pass through the small reservoir blocks near the wellbore in a single time step. In addition, large saturation changes may occur in these blocks without causing any numerical difficulties. A fast, stable, and accurate numerical scheme is used to solve the resulting non-linear system of difference equations.

Nomenclature

Variables:

B = formation volume factor, RB/STB or RB/MCF

g = gravitational constant

h = elevation

k = absolute permeability

k_r = relative permeability

p = pressure

P_c = capillary pressure

R_s = solution gas-oil ratio

S = saturation

t = time

μ = viscosity

ϕ = porosity

ρ = density

Subscripts:

g = gas phase

go = gas-oil system

o = oil phase

w = water phase

wo = water-oil system

Input Data Requirements

The reservoir description includes:

- a) Geometry such as thickness, drainage radius, well-bore, size and outline of reservoir
- b) Porosity and absolute permeability distributions, i.e., stratification
- c) Location of initial gas-oil and water-oil contacts or initial fluid and pressure distributions

The fluid properties needed are:

- a) Formation volume factors, solution gas-oil ratio and viscosities as functions of pressure
- b) Relative permeability and capillary pressure data as functions of saturation

The required operating information is:

- a) Well locations and rates
- b) Production strategy for workovers, limiting GOR and WOR information, etc.

In many cases, much of the above input data, required by the model, is uncertain or even unavailable. This, however, is not a serious drawback if reservoir performance data is available. The performance data is used in what is called the history matching phase. This is where the uncertain or unknown data is adjusted until the model simulates the actual reservoir performance. A very accurate reservoir description can often be obtained by history matching.

Typical performance data which are useful for history matching purposes include individual well pressure as a function of time and production and producing gas-oil or water-oil ratios.

EXH. NO. 15

April 25, 1973

United States Department
of the Interior
Geological Survey
P. O. Drawer 1857
Roswell, New Mexico 88201

Attention: Mr. N. O. Frederick (6)
Oil and Gas Supervisor

State of New Mexico
Mr. Alex J. Armijo
Commissioner of Public Lands
P. O. Box 1148
Santa Fe, New Mexico

Attention: Mr. Ray D. Graham, Director (3)
Oil and Gas Department

State of New Mexico
Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico

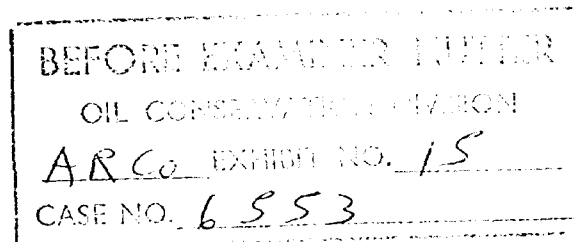
Attention: Mr. A. L. Porter, Jr. (3)
Secretary Director

Working Interest Owners
Empire Abo Unit
(see attached address list)

Re: Initial Plan of Operation
Empire Abo Unit
Eddy County, New Mexico

Gentlemen:

In compliance with Section 11 of the Unit
Agreement, Empire Abo Unit, Eddy County,
New Mexico, Atlantic Richfield Company, as



United States Department
of the Interior
Page 2
April 25, 1973

Unit Operator on behalf of itself and the
other participating working interest owners,
hereby submits for your approval a Plan of
Operation to cover the period beginning with
the effective date of the Unit Agreement and
extending through the remainder of calendar
year 1973.

Yours very truly,

ATLANTIC RICHFIELD COMPANY
OPERATOR

A handwritten signature in dark ink, appearing to read "P. E. Fletcher", is written over the typed name.

P. E. Fletcher
Operations Manager

PEF/SHC/jrb

INITIAL PLAN OF OPERATION
EMPIRE ABO UNIT

Page 3

1. Project Area

History and Background

The Empire Abo Unit area consists of some 11,339.15 acres in Eddy County, New Mexico (see attached plat, Exhibit 1). The area is located in portions of sections 34, 35, 36 Township 17 South, Range 27 East; sections 1, 2, 3, 4, 8, 9, 10, 11, 12, 15, 16, 17 Township 18 South, Range 27 East; sections 25, 26, 27, 28, 31, 32, 33, 34, 35, 36 Township 17 South, Range 28 East; sections 4, 5, 6 Township 18 South, Range 28 East; sections 29, 30 Township 17 South, Range 29 East. Within the Unit Area, owners of the following tracts have chosen not to participate in the unit: 2,6,42,46,49,55,56,69,73C,77,79,84,91. These non-participating tracts total 684.84 acres. The remaining 10,654.31 acres is to be developed as a project area for pressure maintenance by injection of plant residue gas from Abo production back into the Abo formation.

The Abo producing zone is found at an average depth of about 5800 feet (see attached type log, Exhibit 2). The Abo is a lower Leonard (Permian) carbonate reef which has undergone complete dolomitization. Vugs, fractures and fissures have been observed in cores throughout the main reef, with local anhydrite infilling sometimes restricting flow. Reef development is long (12 1/2 miles) and narrow (1 1/2 miles). The reef crest dips about 1° from southwest to northeast. Average gross reef thickness is about 300 feet, ranging to the maximum of 732 feet on the Amoco State AT No. 1. (L2-18S-27E).

On the up-dip west and southwest end of the reservoir productive limits are the result of anhydrite deposition, while on the back-reef north side there is a facies change to an impermeable carbonate "mud" interspersed with green shale. Limits to the south, east and northeast result as the top of the reef dips below the oil-water contact.

2. Current Production, Future Recovery

The original discovery well was the Amoco Malco Federal A No. 1, located in the NE NW Section 11, T-18-S - R-27-E, completed in November 1957.

At the present time the Pool has 235 producing wells. Of these, 153 are capable of producing more than the current top allowable of 142 BOPD/well. There are 183 flowing wells. Field performance and detailed study of cores indicate excellent vertical permeability. The principal producing mechanism is gravity drainage with an expanding secondary gas cap. There are 22 operators in the field and 112 separate working interest owners.

In January 1973, Abo Pool total oil production averaged 25,625 BOPD with 9% water production and gas oil ratio 1,366 cu. ft./BO. Cumulative oil production from the pool is 90 MMBO to February 1, 1973. Remaining primary after February 1, 1973, based on ARCO numeric model studies, is estimated to be 83 MMBO. Unitized residue gas injection for pressure maintenance is calculated to increase future recovery by about 30 MMBO compared to continued primary operations.

3. Basic Concepts Governing Future Unit Operations

- a) Field production history and reservoir numeric model studies have demonstrated that reservoir recovery is governed by a gravity drainage mechanism. With unitization, the operator will be able to maximize beneficial effects of this most efficient recovery mechanism by careful observation of well performance and shutting in or curtailing production from inefficient wells.
- b) Injection of plant residue gas will act toward pressure maintenance and orderly control of expansion of the secondary gas cap.

4. Special Rules

a) Unit Allowable

1st Step - Starting on the effective date of the unit, the unit will receive a unit allowable, calculated so that Unit Area reservoir voidage will not exceed average daily reservoir voidage rate for 1972. This will result in an increase from current 23,600 BOPD to about 30,000 BOPD for the Unit Area.

2nd Step - to be effective with the start of gas injection. Unit Area allowable to be 40,192 BOPD. Reservoir numeric model studies demonstrate added recovery and no reservoir waste at this rate.

- b) Provision to produce the unit allowable from the most efficient wells without restriction. The only exception will be where a Unit producing well offsets a non-unit well.
- c) Provision that if any unit well is located within 660' of a non-participating tract on which is located an Empire Abo producing well, such unit well will be allowed to produce no more than two times normal unit allowable for the Empire Abo Pool.
- d) Provision for administrative approval of additional injection wells, or changes in injection well locations.

5. Operating Plans for 1973

Initially gas injection will be into the Abo gas cap in the following eight wells (see plat Exhibit 1):

<u>Current Operator</u>	<u>Lease & Well</u>	<u>Location</u>
Exxon	Chalk Bluff Draw Unit "A" No. 4	NE/4 NW/4 Sec.9-T18S-R27E
Amoco	Windfohr Federal No. 4	NW/4 SE/4 Sec.4-T18S-R27E
Amoco	Malco "H" Federal No. 2	SE/4 NE/4 Sec.3-T18S-R27E
M.YatesIII	Dooley Abo State No. 2	NW/4 SE/4 Sec.36-T17S-R27E
Amoco	State "BM" No. 1	NE/4 SW/4 Sec.31-T17S-R28E
Amoco	State "BV" No. 1	SW/4 NW/4 Sec.32-T17S-R28E
Arco	M. Yates B (ARC) No. 8	SW/4 NE/4 Sec.33-T17S-R28E
Hondo	State "A" No. 21	NE/4 SW/4 Sec.26-T17S-R28E

Attached Exhibit 3 is an example of an injection well log, while Exhibit 4 is a schematic diagram of a typical mechanical setup for an injection well.

Maximum gas injection volume into all wells is estimated at 37,000 MCF/Day. In terms of reservoir space fill-up, this is equivalent to over 60,000 barrels of water injection per day. Plans are to pick up residue gas at about 700 psi and compress it to 2000 psi for injection. The gas will contain hydrogen sulfide. Superdehydration facilities are planned in order to minimize possible corrosion.

A rigorous corrosion checking procedure will be maintained.

A regular and comprehensive well-testing program will be followed to maintain reservoir control and aid in determining optimum operating conditions.

Workovers: Wherever well production data and reservoir conditions so indicate, workovers will be performed to lower gas-oil or water-oil ratios and maximize producing well efficiencies.

Facilities for produced water gathering and reinjection will be constructed. .

Atlantic Richfield Company, as unit operator, will act prudently to preserve all rights of the mineral owners and to effectively and efficiently recover the unit area reserves. This Company will meet all economical offset obligations and act to prevent undue waste.

Modifications - It is understood that to meet changing conditions, this Plan of Operation may be modified from time to time, with the approval of the Supervisor, the Commissioner of Public Lands of the State of New Mexico and the New Mexico Oil Conservation Commission.

Effective Date:

This Plan of Operation shall be effective July 1, 1973.

If this Plan of Operation meets with your approval, please indicate in the space below and return one copy for our files.

Yours very truly,

ATLANTIC RICHFIELD COMPANY
OPERATOR



P. E. Fletcher
Operations Manager

PEF/SHC/jrb

APPROVED BY: _____ Date: _____
Supervisor of United
States Geological Survey

APPROVED BY: _____ Date: _____
Commissioner of Public
Lands, State of New Mexico

APPROVED BY: _____ Date: _____
Secretary-Director
New Mexico Oil Conservation
Commission

EXHIBIT 16

EMPIRE ABO UNIT
INFILL WELL STUDY RESULTS,
LISTED BY DATE OF STUDY

Date of Added Recovery Study (Month-Year)	Cumulative Number of Infill Wells in Study	Spacing (Acres/well)	Reserves Added By Infill Drilling	
			Average Added Reserves (MBO/well)	Total Added Reserves (MBO)
8-74	2	20	80	160
1-75	58*	20	100	5,800
11-77	158*	20 & 10	92	14,510

(* includes wells in earlier studies)

With 129 infill wells on production

Actual Cumulative Production to 5-1-79 from all infill wells = 16,292 MBO.

To 5-1-79, actual average production per well = $\frac{16,292 \text{ MBO}}{129 \text{ Wells}} = 126 \frac{\text{MBO}}{\text{well}}$

<u>Study Date</u>	<u>Study Type</u>
8-74	Calculation using original coning simulator, 1970 study
1-75	Updated coning simulators considered well interference
11-77	Back-to-front reef 3-dimensional slice model, combined coning effects and fluid movements in all directions. More production history available.

BEFORE EXAMINER PUTTER
OIL CONSERVATION DIVISION
ARCO EXHIBIT NO. 16
CASE NO. 6553



September 10, 1974

EXH. 2

New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico

Attn: Mr. A. L. Porter, Jr.

Re: Proposed Locations for Infill
Drilling of Empire Abo Unit
G-3301 and J-2101
ARCO-Empire Abo Unit Pressure
Maintenance Project
Eddy County, New Mexico

Gentlemen:

Atlantic Richfield, as operator of the Empire Abo Unit Pressure Maintenance Project, acting on behalf of itself and the other participating working interest owners, requests administrative approval under the provisions of Order No. R-4549-B, Rule 14, under "Special Rules and Regulations for the Empire Abo Pressure Maintenance Project," for the drilling of Unit Wells G-3301 and J-2101 (locations shown on the attached exhibits).

The proposed drilling of Unit Wells G-3301 and J-2101, meets all requirements of Order R-4549-B, Rule 14, said wells being located "no closer than 660 feet to the outer boundary of said unit, nor closer than 10 feet to any quarter-quarter section or subdivision inner boundary."

The proposed drilling of Unit Wells G-3301 and J-2101 will be necessary to complete a more efficient producing pattern, promote the greatest ultimate recovery of reserves, prevent waste, and protect correlative rights.

Very truly yours,

Jerry L. Tweed
Jerry L. Tweed

JMB/agp

Attachments

BEFORE EXAMINER	
OIL CONSERVATION DIVISION	
ARCO	EXHIBIT NO. 2
CASE NO.	6553



September 27, 1974

New Mexico Oil and Gas Conservation Commission
P. O. Box 2068
Santa Fe, New Mexico

Attn: Mr. A. L. Porter, Jr.

Re: Amended Unorthodox Well Locations
Empire Abo Unit
Eddy County, New Mexico

Gentlemen:

Atlantic Richfield Company, as operator of the ARCO-Empire Abo Unit Pressure Maintenance Project, requested administrative approval of two unorthodox well locations within the project area by letter dated September 10, 1974. Due to the recent period of inclement weather we were not able to survey the locations prior to submitting the application. We have recently completed the surveying of the two locations and submit for your approval the amendments as shown below. Our intent in submitting the original application was to place the locations approximately in the center of F-33, F-34, G-33, G-34, and J-21, J-22, K-21 K-22. The sections these wells are located in are irregular in size, and shape, and due to surface conditions and existing pipelines and rights-of-way, we request our original application be amended as shown.

Locations

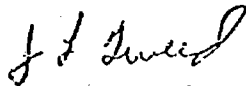
<u>As shown in original application</u>	<u>Amended to</u>
1) Empire Abo Unit Lease G Well No. 3301 1310' FWL & 2610' FSL Sec. 34, T-17S, R-28E Eddy County, New Mexico	Empire Abo Unit Lease F Well No. 331 1250' FWL & 2576' FNL Sec. 34, T-17S, R-28E Eddy County, New Mexico
2) Empire Abo Unit Lease J Well No. 2101 1310' FWL & 2610' FNL Sec. 6, T-18S, R-28E Eddy County, New Mexico	Empire Abo Unit Lease J Well No. 211 1300' FWL & 2630' FNL Sec. 6, T-18S, R-28E Eddy County, New Mexico

New Mexico Oil & Gas Conservation Commission
September 27, 1974
Page 2

These amended locations still meet all requirements of Commission Order R-4549 as amended by R-4549-B, Rule 14, said amended locations are "no closer than 660' to the outer boundary of said Unit, nor closer than 10' to any quarter-quarter section or subdivision inner boundary."

Your consideration in this matter will be greatly appreciated.

Very truly yours,


J. L. Tweed

GES/agp

cc: Mr. J. E. Kapteina

OIL CONSERVATION COMMISSION

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

I. R. TRUJILLO
CHAIRMAN
LAND COMMISSIONER
ALEX J. ARMJO
MEMBER
STATE GEOLOGIST
A. L. PORTER, JR.
SECRETARY - DIRECTOR

October 1, 1974

Atlantic Richfield Company
P.O. Box 1610
Midland, Texas 79701

Attention: Mr. Jerry L. Tweed.

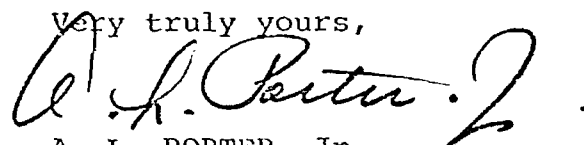
Administrative Order NSL-687

Gentlemen:

Reference is made to your application for approval of a non-standard location for your Empire Abo Unit Lease C Well No. 331 to be located 1310 feet from the West line and 2610 feet from the South line of Section 34, Township 17 South, Range 28 East, and your Empire Abo Unit Lease J Well No. 211 to be located 1310 feet from the West line and 2610 feet from the North line of Section 6, Township 18 South, Range 28 East, both in Eddy County, New Mexico.

By authority granted me under the provisions of Rule 14 of Order No. R-4549-B, of the Commission Rules and Regulations, the above-described unorthodox locations are hereby approved.

Very truly yours,



A. L. PORTER, Jr.
Secretary-Director

ALP/JEK/jr

cc: Oil Conservation Commission - Artesia
Oil & Gas Engineering Committee - Hobbs
State Land Office - Santa Fe

OIL CONSERVATION COMMISSION

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

October 10, 1974

I. R. TRUJILLO
CHAIRMAN

LAND COMMISSIONER
ALEX J. ARMJO
MEMBER

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

Atlantic Richfield Company
P. O. Box 1610
Midland, Texas 79701

Attention: Mr. Jerry L. Tweed

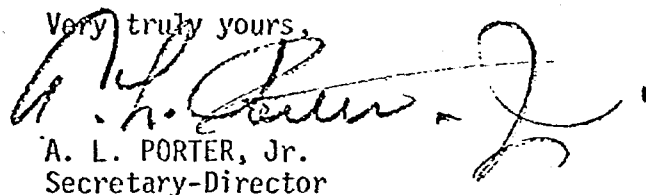
Amendment
Administrative Order NSL-687

Gentlemen:

Reference is made to your application for approval of a non-standard location for your Empire Abo Unit Lease G Well No. 331 to be located 2576 feet from the North line and 1250 feet from the West line of Section 34, Township 17 South, Range 28 East, and your Empire Abo Unit Lease J Well No. 211 to be located 2630 feet from the North line and 1300 feet from the West line of Section 6, Township 18 South, Range 28 East, both in Eddy County, New Mexico.

By authority granted me under the provisions of Rule 14 of Order No. R-4549-B, of the Commission Rules and Regulations, the above-described unorthodox locations are hereby approved.

Very truly yours,


A. L. PORTER, Jr.
Secretary-Director

ALP/JEK/dr

cc: Oil Conservation Commission - Artesia
Oil & Gas Engineering Committee - Hobbs
State Land Office - Santa Fe

Atlantic Richfield Company North American Producing Division
Permian District
Post Office Box 1610
Midland, Texas 79701
Telephone 915 682 6631



March 6, 1975

New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico 87501

Attn: Mr. A. J. Porter, Jr.

Re: Request for Non-Standard Drilling Locations
Within the Project Area of the
ARCO-Empire Abo Unit Pressure Maintenance Project
Eddy County, New Mexico

Gentlemen:

Atlantic Richfield Company, as operator of the Empire Abo Unit Pressure Maintenance Project, acting on behalf of itself and the other participating working interest owners, requests administrative approval under the provisions of Order No. R-4549-B, Rule 14, under "Special Rules and Regulations for the Empire Abo Pressure Maintenance Project," for the drilling of 15 unit wells at non-standard locations (locations shown on attached exhibits).

The proposed drilling of the subject wells at the non-standard locations meets all requirements of Order R-4549-B, Rule 14, said wells being located "no closer than 660 feet to the outer boundary of said unit, nor closer than 10 feet to any quarter-quarter section or subdivision inner boundary."

The proposed drilling of the wells will be necessary to complete a more efficient producing pattern to conserve reservoir energy, promote the greatest ultimate recovery of unit reserves, prevent waste, and protect correlative rights.

Very truly yours,

C. R. Leggott, Jr.
C. R. Leggott, Jr.

GES/agg

Attachments

ATLANTIC RICHFIELD COMPANY
EMPIRE ABO UNIT
Proposed Non-Standard Locations

Well Name and No.	Location
Empire Abo Unit "E" 371	1195' FNL & 10' FWL, Sec. 35, T-17S, R-28E, Eddy County, New Mexico
Empire Abo Unit "E" 381	2475' FWL & 1155' FNL, Sec. 35, T-17S, R-28E, Eddy County, New Mexico
Empire Abo Unit "F" 351	2550' FNL & 1650' FEL, Sec. 34, T-17S, R-28E, Eddy County, New Mexico
Empire Abo Unit "G" 291	1320' FSL & 1230' FWL, Sec. 33, T-17S, R-28E, Eddy County, New Mexico
Empire Abo Unit "G" 311	1430' FEL & 1350' FSL, Sec. 33, T-17S, R-28E, Eddy County, New Mexico
Empire Abo Unit "H" 261	1400' FWL & 150' FSL, Sec. 32, T-17S, R-28E, Eddy County, New Mexico
Empire Abo Unit "H" 271	1450' FEL & 330' FSL, Sec. 32, T-17S, R-28E, Eddy County, New Mexico
Empire Abo Unit "H" 291	200' FSL & 50' FWL, Sec. 33, T-17S, R-28E, Eddy County, New Mexico
Empire Abo Unit "I" 231	1260' FNL & 1580' FEL, Sec. 6, T-18S, R-28E, Eddy County, New Mexico
Empire Abo Unit "J" 191	2500' FEL & 2500' FNL, Sec. 1, T-18S, R-27E, Eddy County, New Mexico
Empire Abo Unit "J" 201	2501' FNL & 20' FEL, Sec. 1, T-18S, R-27E, Eddy County, New Mexico
Empire Abo Unit "K" 181	1440' FWL & 2050' FSL, Sec. 1, T-18S, R-27E, Eddy County, New Mexico
Empire Abo Unit "L" 141	1360' FWL & 1050' FSL, Sec. 2, T-18S, R-27E, Eddy County, New Mexico
Empire Abo Unit "L" 151	1110' FSL & 1322' FEL, Sec. 2, T-18S, R-27E, Eddy County, New Mexico
Empire Abo Unit "M" 121	900' FEL & 10' FNL, Sec. 10, T-18S, R-27E, Eddy County, New Mexico

OIL CONSERVATION COMMISSION

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

March 27, 1975

I. R. TRUJILLO
CHAIRMAN

LAND COMMISSIONER
PHIL R. LUCERO
MEMBER

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

Atlantic Richfield Company
P. O. Box 1610
Midland, Texas 79701

Attention: C. R. Leggott, Jr.

Administrative Order NSL-706

Gentlemen:

Reference is made to your application for approval of non-standard locations for the following fifteen wells in Eddy County, New Mexico:

<u>WELL NAME AND NO.</u>	<u>LOCATION</u>
Empire Abo Unit "E" 371	1195' FNL & 10' FWL, Section 35, T-17-S, R-28-E
Empire Abo Unit "E" 381	2475' FWL & 1155' FNL, Section 35, T-17-S, R-28-E
Empire Abo Unit "F" 351	2550' FNL & 1650' FEL, Section 34, T-17-S, R-28-E
Empire Abo Unit "G" 291	1320' FSL & 1280' FWL, Section 33, T-17-S, R-28-E
Empire Abo Unit "G" 311	1430' FEL & 1350' FSL, Section 33, T-17-S, R-28-E
Empire Abo Unit "H" 261	1400' FWL & 150' FSL, Section 32, T-17-S, R-28-E
Empire Abo Unit "H" 271	1450' FEL & 330' FSL, Section 32, T-17-S, R-28-E
Empire Abo Unit "H" 291	200' FSL & 50' FWL, Section 33, T-17-S, R-28-E
Empire Abo Unit "I" 231	1260' FNL & 1580' FEL, Section 6, T-18-S, R-28-E
Empire Abo Unit "J" 191	2500' FEL & 2500' FNL, Section 1, T-18-S, R-27-E
Empire Abo Unit "J" 201	2501' FNL & 20' FEL, Section 1, T-18-S, R-27-E
Empire Abo Unit "K" 181	1440' FWL & 2050' FSL, Section 1, T-18-S, R-27-E
Empire Abo Unit "L" 141	1360' FWL & 1050' FSL, Section 2, T-18-S, R-27-E

Atlantic Richfield Co.

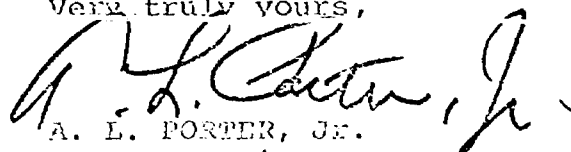
-2-

Administrative Order
NSL-706

<u>WELL NAME AND NO.</u>	<u>LOCATION</u>
Empire Abo Unit "L" 151	1110' FSL & 1322' FEL, Section 2, T-18-S, R-27-E
Empire Abo Unit "M" 121	900' FEL & 10' FNL, Section 10, T-18-S, R-27-E

By authority granted me under the provisions of Rule 14 of Order No. R-4549-B, the above-described unorthodox locations are hereby approved.

Very truly yours,


A. L. PORTER, JR.
Secretary-Director

ALP/JEK/dr

cc: Oil Conservation Commission - Artesia
Oil & Gas Engineering Committee - Hobbs

Atlantic Richfield Company

North American Producing Division
Permian District
Post Office Box 1610
Midland, Texas 79701
Telephone 915 632 8631



December 8, 1975

New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico 87501

Attn: Mr. Joe Ramey

Re: Request for Non-Standard Drilling Locations
Within the Project Area of the
ARCO-Empire Abo Unit Pressure Maintenance Project
Eddy County, New Mexico

Gentlemen:

Atlantic Richfield Company, as operator of the Empire Abo Unit Pressure Maintenance Project, acting on behalf of itself and the other participating working interest owners, requests administrative approval under the Provisions of Order No. R-4549-B, Rule 14, under "Special Rules and Regulations for the Empire Abo Pressure Maintenance Project," for the drilling of 17 Unit wells at non-standard locations (locations shown on attached exhibit).

The proposed drilling of the subject wells at the non-standard locations meet all requirements of Order R-4549-B, Rule 14, said wells being located "no closer than 660 feet to the outer boundary of said unit, nor closer than 10 feet to any quarter-quarter section or subdivision inner boundary."

The proposed drilling of the wells will be necessary to complete a more efficient producing pattern to conserve reservoir energy, promote the greatest ultimate recovery of Unit reserves, prevent waste, and protect correlative rights.

Very truly yours,

ATLANTIC RICHFIELD COMPANY

J. L. Tweed
District Engineer

PMB/agp

ATLANTIC RICHFIELD COMPANY
Empire Abo Unit
Proposed Non-Standard Locations
Eddy County, New Mexico

<u>Well Name and Number</u>	<u>Location</u>
Empire Abo Unit "E" 382	1175' FNL & 1316' FWL, Section 35, T-17S, R-28E
Empire Abo Unit "E" 391	135' FNL & 2567' FEL, Section 35, T-17S, R-28E
Empire Abo Unit "E" 401	90' FNL & 1296' FEL, Section 35, T-17S, R-28E
Empire Abo Unit "F" 371	2220' FNL & 25' FWL, Section 35, T-17S, R-28E
Empire Abo Unit "G" 312	1550' FSL & 2511' FEL, Section 33, T-17S, R-28E
Empire Abo Unit "G" 321	1520' FSL & 230' FEL, Section 33, T-17S, R-28E
Empire Abo Unit "G" 331	1580' FSL & 1140' FWL, Section 34, T-17S, R-28E
Empire Abo Unit "G" 341	1850' FSL & 2591' FWL, Section 34, T-17S, R-28E
Empire Abo Unit "I" 271	670' FNL & 1700' FEL, Section 5, T-18S, R-28E
Empire Abo Unit "J" 202	2490' FNL & 1299' FEL, Section 1, T-18S, R-28E
Empire Abo Unit "J" 221	2610' FNL & 2713' FWL, Section 6, T-18S, R-28E
Empire Abo Unit "J" 232	2253' FNL & 1576' FEL, Section 6, T-18S, R-28E
Empire Abo Unit "K" 182	1533' FSL & 2370' FWL, Section 1, T-18S, R-27E
Empire Abo Unit "L" 111	20' FSL & 2485' FEL, Section 3, T-18S, R-27E
Empire Abo Unit "L" 131	100' FSL & 100' FWL, Section 2, T-18S, R-27E
Empire Abo Unit "L" 132	275' FSL & 1243' FWL, Section 2, T-18S, R-27E
Empire Abo Unit "L" 152	320' FSL & 2602' FEL, Section 2, T-18S, R-27E



OIL CONSERVATION COMMISSION

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



DIRECTOR
JOE D. RAMEY

LAND COMMISSIONER
PHIL R. LUCERO

STATE GEOLOGIST
EMERY C. ARNOLD

December 31, 1975

Atlantic Richfield Company
Post Office Box 1610
Midland, Texas 79701

Attention: Mr. J. L. Tweed


Administrative Order NSL-743

Gentlemen:

Reference is made to your application for approval of non-standard locations for the seventeen wells listed on the attached page. All seventeen wells are located within the project area of the Arco-Empire Abo Unit Pressure Maintenance Project, Eddy County, New Mexico.

By the authority granted me by the provisions of Rule 14 of Order No. R-4549-B, the described unorthodox locations are hereby approved.

Very truly yours,


JOE D. RAMEY
Secretary-Director

JDR/JEK/jr

cc: Oil Conservation Commission - Artesia
Oil & Gas Engineering Committee - Hobbs
U. S. Geological Survey - Artesia
State Land Office - Santa Fe

ATLANTIC RICHFIELD COMPANY
Empire Abo Unit
Proposed Non-Standard Locations
Eddy County, New Mexico

<u>Well Name and Number</u>	<u>Location</u>
Empire Abo Unit "E" 382	1175' FNL & 1316' FWL, Section 35, T-17S, R-28E
Empire Abo Unit "E" 391	135' FNL & 2567' FEL, Section 35, T-17S, R-28E
Empire Abo Unit "E" 401	90' FNL & 1296' FEL, Section 35, T-17S, R-28E
Empire Abo Unit "F" 371	2220' FNL & 25' FWL, Section 35, T-17S, R-28E
Empire Abo Unit "G" 312	1550' FSL & 2511' FEL, Section 33, T-17S, R-28E
Empire Abo Unit "G" 321	1520' FSL & 230' FEL, Section 33, T-17S, R-28E
Empire Abo Unit "G" 331	1530' FSL & 1140' FWL, Section 34, T-17S, R-28E
Empire Abo Unit "G" 341	1850' FSL & 2591' FWL, Section 34, T-17S, R-28E
Empire Abo Unit "I" 271	670' FNL & 1700' FEL, Section 5, T-18S, R-28E
Empire Abo Unit "J" 202	2490' FNL & 1299' FEL, Section 1, T-18S, R-28E
Empire Abo Unit "J" 221	2610' FNL & 2713' FWL, Section 6, T-18S, R-28E
Empire Abo Unit "J" 232	2253' FNL & 1576' FEL, Section 6, T-18S, R-28E
Empire Abo Unit "K" 182	1533' FSL & 2370' FWL, Section 1, T-18S, R-27E
Empire Abo Unit "L" 111	20' FSL & 2485' FEL, Section 3, T-18S, R-27E
Empire Abo Unit "L" 131	100' FSL & 100' FWL, Section 2, T-18S, R-27E
Empire Abo Unit "L" 132	275' FSL & 1243' FWL, Section 2, T-18S, R-27E
Empire Abo Unit "L" 152	320' FSL & 2602' FEL, Section 2, T-18S, R-27E

Atlantic Richfield Company

North American Producing Division
Permian Division
Post Office Box 1610
Midland, Texas 79701
Telephone 915 682 8631



October 22, 1976

New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico 87501

Attn: Mr. Joe Ramey

Re: Request for Non-Standard Drilling Locations
Within the Project Area of the
ARCO-Empire Abo Unit Pressure Maintenance Project
Eddy County, New Mexico

Gentlemen:

Atlantic Richfield Company, as operator of the Empire Abo Unit Pressure Maintenance Project, acting on behalf of itself and the other participating working interest owners, requests administrative approval under the Provisions of Order No. R-4549-B, Rule 14, under "Special Rules and Regulations for the Empire Abo Pressure Maintenance Project," for the drilling of 3 Unit wells at non-standard locations (locations shown on attached exhibit).

The proposed drilling of the subject wells at the non-standard locations meet all requirements of Order R-4549-B, Rule 14, said wells being located "no closer than 660 feet to the outer boundary of said unit, nor closer than 10 feet to any quarter-quarter section or subdivision inner boundary."

The proposed drilling of the wells will be necessary to complete a more efficient producing pattern to conserve reservoir energy, promote the greatest ultimate recovery of Unit reserves, prevent waste, and protect correlative rights.

Very truly yours,

ATLANTIC RICHFIELD COMPANY

J. L. Tweed
J. L. Tweed
District Engineer

REH/agp

ATLANTIC RICHFIELD COMPANY
Empire Abo Unit
Proposed Non-Standard Locations
Eddy County, New Mexico

<u>WELL NAME AND NUMBER</u>	<u>LOCATION</u>
Empire Abo Unit F-332	2581.95' FNL & 150' FWL, Sec. 34, T-17S, R-28E
Empire Abo Unit F-361	1765' FNL & 1270' FEL, Sec. 34, T-17S, R-28E
Empire Abo Unit G-342	2400' FSL & 2080' FWL, Sec. 34, T-17S, R-28E

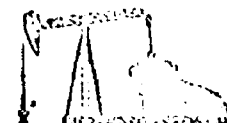


DIRECTOR
JOE D. RAMEY

OIL CONSERVATION COMMISSION

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

LAND COMMISSIONER
PHIL R. LUCERO



STATE GEOLOGIST
EMERY C. ARNOLD

November 5, 1976

Atlantic Richfield Company
P. O. Box 1610
Midland, Texas 79701

Attention: Mr. J. L. Tweed

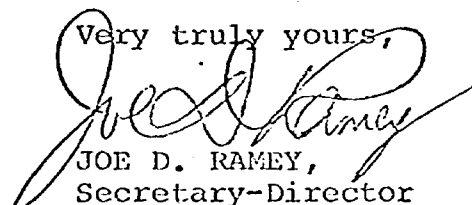
Administrative Order NSL-802

Gentlemen:

Reference is made to your application for approval of non-standard locations for your Empire Abo Unit Well No. F-332 to be located 2581.95 feet from the North line and 150 feet from the West line, Empire Abo Unit Well No. F-361 to be located 1765 feet from the North line and 1270 feet from the East line and your Empire Abo Unit Well No. G-342 to be located 2400 feet from the South line and 2080 feet from the West line, all in Section 34, Township 17 South, Range 28 East, NMPM, Empire Abo Pool, Eddy County, New Mexico.

By authority granted me under the provisions of Rule 14 of Order No. R-4549-B, the above-described unorthodox locations are hereby approved.

Very truly yours,

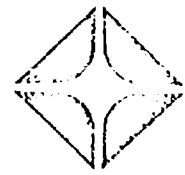

JOE D. RAMEY,
Secretary-Director

JDR/JEK/dr

cc: Oil Conservation Commission - Artesia
Oil & Gas Engineering Committee - Hobbs
Central Leasing, State Land Office - Santa Fe

Atlantic Richfield Company

North American Producing Division
Permian Basin Unit
Post Office Box 1610
Midland, Texas 79701
Telephone 915 632 8631



November 3, 1976

New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico 87501

Attn: Mr. Joe Ramey

Re: Request for Non-Standard Drilling Locations
Within the Project Area of the ARCO-Empire
Abo Unit Pressure Maintenance Project
Eddy County, New Mexico

Gentlemen:

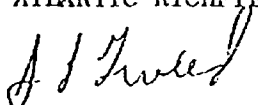
Atlantic Richfield Company, as operator of the Empire Abo Unit Pressure Maintenance Project, acting on behalf of itself and the other participating working interest owners, requests administrative approval under the Provisions of Order No. R-4549-B, Rule 14, under "Special Rules and Regulations for the Empire Abo Pressure Maintenance Project," for the drilling of 20 Unit wells at non-standard locations (locations shown on attached exhibit).

The proposed drilling of the subject wells at the non-standard locations meet all requirements of Order R-4549-B, Rule 14, said wells being located "no closer than 660 feet to the outer boundary of said unit, nor closer than 10 feet to any quarter-quarter section or subdivision inner boundary."

The proposed drilling of the wells will be necessary to complete a more efficient producing pattern to conserve reservoir energy, promote the greatest ultimate recovery of Unit reserves, prevent waste, and protect correlative rights.

Very truly yours,

ATLANTIC RICHFIELD COMPANY


J. L. Tweed
District Engineer

REH/agp

ATLANTIC RICHFIELD COMPANY
EMPIRE AIO UNIT
Proposed Non-Standard Locations
Eddy County, New Mexico

Phase III, Part B

Well Name & Number	Location	G.L. Elev.
Empire Abo Unit		
E-372	100' FNL & 1291.14' FWL	Sec. 35, T-17S, R-28E 3681.1'
E-401	90' FNL & 1296' FEL	Sec. 35, T-17S, R-28E 3669.1'
F-372	2490' FNL & 1100' FWL	Sec. 35, T-17S, R-28E 3676.8'
F-381	1900' FNL & 2260' FWL	Sec. 35, T-17S, R-28E 3679.0'
G-351	1850' FSL & 1650' FEL	Sec. 34, T-17S, R-28E 3663.2'
H-272	2481' FEL & 330' FSL	Sec. 32, T-17S, R-28E 3661.4'
H-292	1225' FWL & 180' FSL	Sec. 33, T-17S, R-28E 3665.7'
H-293	1248.88' FSL & 50' FWL	Sec. 33, T-17S, R-28E 3671.4'
H-311	2490' FEL & 313' FSL	Sec. 33, T-17S, R-28E 3661.4'
I-281	450' FEL & 700' FNL	Sec. 5, T-18S, R-28E 3659.8'
J-222	1350' FNL & 1572' FWL	Sec. 6, T-18S, R-28E 3656.7'
K-141	1370' FSL & 2445' FWL	Sec. 2, T-18S, R-27E 3521.0'
K-183	2370' FSL & 1510' FWL	Sec. 1, T-18S, R-27E 3694.0'
L-112	1186' FSL & 1372' FEL	Sec. 3, T-18S, R-27E 3516.7'
L-121	1186' FSL & 200' FEL	Sec. 3, T-18S, R-27E 3509.3'
L-153	90' FSL & 1456' FEL	Sec. 2, T-18S, R-27E 3585.0'
M-91	1300' FNL & 1220' FWL	Sec. 10, T-18S, R-27E 3507.7'
M-101	1100' FNL & 2170' FWL	Sec. 10, T-18S, R-27E 3506.8'
M-122	990' FNL & 1300' FEL	Sec. 10, T-18S, R-27E 3499.9'
N-91	2390' FNL & 940' FWL	Sec. 10, T-18S, R-27E 3596.3'



DIRECTOR
JOE D. RAMEY

OIL CONSERVATION COMMISSION

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

LAND COMMISSIONER
PHIL R. LUCERO

November 12, 1976



STATE GEOLOGIST
EMERY C. ARNOLD

Atlantic Richfield Company
P. O. Box 1610
Midland, Texas 79701

Attention: Mr. J. L. Tweed

Administrative Order NSL-809

Gentlemen:

Reference is made to your application for approval of the following non-standard locations in the Empire Abo Pool, Eddy County, New Mexico:

<u>Well Name and Number</u>	<u>Location</u>
Empire Abo Unit Wells	
Nos.	
E-372	100' FNL & 1291' FWL of Sec. 35, T-17-S, R-28-E
E-401	90' FNL & 1296' FEL of Sec. 35, T-17-S, R-28-E
F-372	2490' FNL & 1100' FWL of Sec. 35, T-17-S, R-28-E
F-381	1900' FNL & 2260' FWL of Sec. 35, T-17-S, R-28-E
G-351	1850' FSL & 1650' FEL of Sec. 34, T-17-S, R-28-E
H-272	2481' FEL & 330' FSL of Sec. 32, T-17-S, R-28-E
H-292	1225' FWL & 180' FSL of Sec. 33, T-17-S, R-28-E
H-293	1249' FSL & 50' FWL of Sec. 33, T-17-S, R-28-E
H-311	2490' FEL & 313' FSL of Sec. 33, T-17-S, R-28-E
I-281	450' FEL & 700' FNL of Sec. 5, T-18-S, R-28-E
J-222	1350' FNL & 1572' FWL of Sec. 6, T-18-S, R-28-E
K-141	1370' FSL & 2445' FWL of Sec. 2, T-18-S, R-27-E
K-183	2370' FSL & 1510' FWL of Sec. 1, T-18-S, R-27-E
L-112	1186' FSL & 1372' FEL of Sec. 3, T-18-S, R-27-E
L-121	1186' FSL & 200' FEL of Sec. 3, T-18-S, R-27-E
L-153	90' FSL & 1456' FEL of Sec. 2, T-18-S, R-27-E
M-91	1300' FNL & 1220' FWL of Sec. 10, T-18-S, R-27-E
M-101	1100' FNL & 2170' FWL of Sec. 10, T-18-S, R-27-E
M-122	990' FNL & 1300' FEL of Sec. 10, T-18-S, R-27-E
N-91	2390' FNL & 940' FWL of Sec. 10, T-18-S, R-27-E

Atlantic Richfield Company

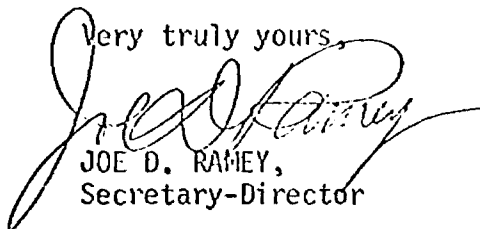
-2-

November 12, 1976

Administrative Order HSL-809

By authority granted me under the provisions of Rule 14 of Order No. R-4549-B, the above-described unorthodox locations are hereby approved.

Very truly yours,

A handwritten signature in dark ink, appearing to read "Joe D. Ramey", is written over the typed name and title.

JOE D. RAMEY,
Secretary-Director

JDR/JEK/dr

cc: Oil Conservation Commission - Artesia
Oil & Gas Engineering Committee - Hobbs

Atlantic Richfield Company

North American Producing Division
Permian District
Post Office Box 1610
Midland, Texas 79701
Telephone 915 682 8631



December 29, 1977

New Mexico Oil and Gas Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico 87501

Attn: Mr. J. D. Ramey

Re: Request for Non-Standard Drilling Locations
Within the Project Area of the ARCO-Empire
Abo Unit Pressure Maintenance Project
Eddy County, New Mexico

Gentlemen:

Atlantic Richfield Company, operator of the Empire Abo Unit Pressure Maintenance Project, acting on behalf of itself and the other participating working interest owners, requests administrative approval under the provisions of Order No. R-4549-B, Rule 14, under "Special Rules and Regulations for the Empire Abo Pressure Maintenance Project," for the drilling of 25 Unit wells at non-standard locations shown on the attached Exhibit 1.

The proposed non-standard locations meet all requirements of Order R-4549-B, Rule 14, said wells being located "no closer than 660 feet to the outer boundary of said Unit, nor closer than 10 feet to any quarter-quarter section or subdivision inner boundary."

The proposed drilling of these wells is necessary to complete a more efficient producing pattern to conserve reservoir energy, promote the greatest ultimate recovery of Unit reserves, prevent waste, and protect correlative rights.

Very truly yours,

ATLANTIC RICHFIELD COMPANY

J. L. Tweed
District Engineer

IJN/agp

cc: Mr. Bill Gressett
NMOCC
Artesia, New Mexico

EXHIBIT 1

ATLANTIC RICHFIELD COMPANY
EMPIRE ABO UNIT
PROPOSED NON-STANDARD LOCATIONS
Eddy County, New Mexico

PHASE IV

WELL NAME & NUMBER	LOCATION	G. L. ELEVATION
Empire Abo Unit		
E-373	150' FNL & 15' FWL Section 35 T-17S R-28E	3670.4'
E-361	620' FNL & 1200' FEL Section 34 T-17S R-28E	3671.6'
E-351	610' FNL & 2601' FEL Section 34 T-17S R-28E	3673.9'
E-341	660' FNL & 1560' FWL Section 34 T-17S R-28E	3675.7'
F-321	1610' FNL & 250' FEL Section 33 T-17S R-28E	3674.3'
G-322	2350' FSL & 1100' FEL Section 33 T-17S R-28E	3665.6'
I-272	1300' FNL & 2345' FEL Section 5 T-18S R-28E	3651.9'
K-231	1700' FSL & 2350' FEL Section 6 T-18S R-28E	3649.3'
M-152	560' FNL & 2588' FEL Section 11 T-18S R-27E	3589.8'
M-131	1100' FNL & 1200' FWL Section 11 T-18S R-27E	3568.3'
G-343	1500' FSL & 1820' FWL Section 34 T-17S R-28E	3659.5'
G-332	1575' FSL & 660' FWL Section 34 T-17S R-28E	3658.4'
G-323	1500' FSL & 700' FEL Section 33 T-17S R-28E	3663.9'
H-331	1000' FSL & 1200' FWL Section 34 T-17S R-28E	3658.4'
H-321	1050' FSL & 250' FEL Section 33 T-17S R-28E	3662.4'
H-322	750' FSL & 1150' FEL Section 33 T-17S R-28E	3662.4'
H-301	150' FSL & 1650' FWL Section 33 T-17S R-28E	3659.8'
I-282	1150' FNL & 1270' FEL Section 5 T-18S R-28E	3655.1'
J-233	2550' FNL & 2050' FEL Section 6 T-18S R-28E	3668.9'
K-232	2300' FSL & 1570' FEL Section 6 T-18S R-28E	3653.1'
K-184	2120' FSL & 2465' FWL Section 1 T-18S R-27E	3623.8'
J-223	2630' FNL & 1930' FWL Section 6 T-18S R-28E	3644.3'
K-192	2020' FSL & 1390' FEL Section 1 T-18S R-27E	3636.7'
M-151	400' FNL & 1450' FEL Section 11 T-18S R-27E	3604.1'
I-273	1300' FNL & 1595' FEL Section 5 T-18S R-28E	3651.3'

OIL CONSERVATION COMMISSION

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



DIRECTOR
JOE D. RAMEY

LAND COMMISSIONER
PHIL R. LUCERO

STATE GEOLOGIST
EMERY C. ARNOLD

January 16, 1978

Atlantic Richfield Company
P. O. Box 1610
Midland, Texas 79701

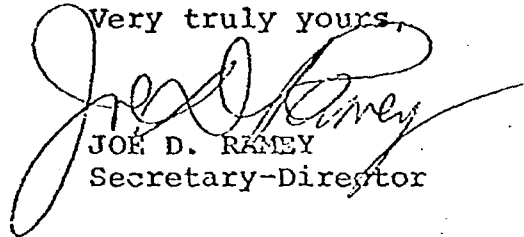
Administrative Order NSL-915

Gentlemen:

The Secretary-Director hereby approves the non-standard location for 25 Atlantic Richfield Company Empire Abo Unit Wells, Empire Abo Pool, Eddy County, New Mexico, as shown on Exhibit 1 of their application dated 12-29-1977 and attached hereto.

These producing wells are approved under the provisions of Rule 14 of Order No. R-4549 as amended, in order to permit the operator to complete a more efficient production pattern within said unit in said pool.

Very truly yours,



JOE D. RAMEY
Secretary-Director

JDR/RLS/jr

cc: Oil & Gas Engineering Committee - Hobbs
Oil Conservation Commission - Artesia

EXHIBIT 1
ATLANTIC RICHFIELD COMPANY
EMPIRE ABO UNIT
PROPOSED NON-STANDARD LOCATIONS
Eddy County, New Mexico

PHASE IV

WELL NAME & NUMBER	LOCATION	G. L. ELEVATION
Empire Abo Unit		
E-373	150' FNL & 15' FWL Section 35 T-17S R-28E	3670.4'
E-361	620' FNL & 1200' FEL Section 34 T-17S R-28E	3671.6'
E-351	610' FNL & 2601' FEL Section 34 T-17S R-28E	3673.9'
E-341	660' FNL & 1560' FWL Section 34 T-17S R-28E	3675.7'
F-321	1610' FNL & 250' FEL Section 33 T-17S R-28E	3674.3'
G-322	2350' FSL & 1100' FEL Section 33 T-17S R-28E	3665.6'
I-272	1300' FNL & 2345' FEL Section 5 T-18S R-28E	3651.9'
K-231	1700' FSL & 2350' FEL Section 6 T-18S R-28E	3649.3'
M-152	560' FNL & 2588' FEL Section 11 T-18S R-27E	3589.8'
M-131	1100' FNL & 1200' FWL Section 11 T-18S R-27E	3568.3'
G-343	1500' FSL & 1820' FWL Section 34 T-17S R-28E	3659.5'
G-332	1575' FSL & 660' FWL Section 34 T-17S R-28E	3658.4'
G-323	1500' FSL & 700' FEL Section 33 T-17S R-28E	3663.9'
H-331	1000' FSL & 1200' FWL Section 34 T-17S R-28E	3658.4'
H-321	1050' FSL & 250' FEL Section 33 T-17S R-28E	3662.4'
H-322	750' FSL & 1150' FEL Section 33 T-17S R-28E	3662.4'
H-301	150' FSL & 1650' FWL Section 33 T-17S R-28E	3659.8'
I-282	1150' FNL & 1270' FEL Section 5 T-18S R-28E	3655.1'
J-233	2550' FNL & 2050' FEL Section 6 T-18S R-28E	3668.9'
K-232	2300' FSL & 1570' FEL Section 6 T-18S R-28E	3653.1'
K-184	2120' FSL & 2465' FWL Section 1 T-18S R-27E	3623.8'
J-223	2630' FNL & 1930' FWL Section 6 T-18S R-28E	3644.3'
K-192	2020' FSL & 1390' FEL Section 1 T-18S R-27E	3636.7'
M-151	400' FNL & 1450' FEL Section 11 T-18S R-27E	3604.1'
I-273	1300' FNL & 1595' FEL Section 5 T-18S R-28E	3651.3'

Atlantic Richfield Company

North American Producing Division
Permian District
Post Office Box 1610
Midland, Texas 79701
Telephone 915 682 8631



April 4, 1978

New Mexico Oil and Gas Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico 87501

Attn: Mr. J. D. Ramey

Re: Request for Non-Standard Drilling Locations
Within the Project Area of the ARCO-Empire
Abo Unit Pressure Maintenance Project
Eddy County, New Mexico

Gentlemen:

Atlantic Richfield Company, operator of the Empire Abo Unit Pressure Maintenance Project, acting on behalf of itself and the other participating working interest owners, requests administrative approval under the provisions of Order No. R-4549-B, Rule 14, under "Special Rules and Regulations for the Empire Abo Pressure Maintenance Project," for the drilling of 25 Unit wells at non-standard locations shown on the attached Exhibit 1.

The proposed non-standard locations meet all requirements of Order R-4549-B, Rule 14, said wells being located "no closer than 660 feet to the outer boundary of said Unit, nor closer than 10 feet to any quarter-quarter section or subdivision inner boundary."

The proposed drilling of these wells is necessary to complete a more efficient producing pattern to conserve reservoir energy, promote the greatest ultimate recovery of Unit reserves, prevent waste, and protect correlative rights.

Very truly yours,

ATLANTIC RICHFIELD COMPANY

J. L. Tweed
J. L. Tweed
District Engineer

IJN/agp

cc: Mr. Bill Gressett
New Mexico Oil Conservation Commission
Artesia, New Mexico

EXHIBIT 1

ATLANTIC RICHFIELD COMPANY
EMPIRE ADO UNIT
PHASE V

UNIT WELL	LOCATION	ELEV. - G.L.
F-362	1850' FNL & 350' FEL Sec. 34, T-17S, R-28E	3074.6'
F-352	1330' FNL & 1980' FEL Sec. 34, T-17S, R-28E	3070.3'
F-353	2400' FNL & 2350' FEL Sec. 34, T-17S, R-28E	3061.4'
F-322	2480' FNL & 500' FEL Sec. 33, T-17S, R-28E	3065.2'
G-333	2100' FSL & 1100' FWL Sec. 34, T-17S, R-28E	3060.2'
G-313	2000' FSL & 2450' FEL Sec. 33, T-17S, R-28E	3062.5'
H-312	815' FSL & 2525' FEL Sec. 33, T-17S, R-28E	3064.9'
H-302	1250' FSL & 1925' FWL Sec. 33, T-17S, R-28E	3070.9'
H-303	800' FSL & 1340' FWL Sec. 33, T-17S, R-28E	3065.6'
H-294	1200' FSL & 700' FWL Sec. 33, T-17S, R-28E	3066.2'
H-295	700' FSL & 10' FWL Sec. 33, T-17S, R-28E	3066.4'
H-281	200' FSL & 660' FEL Sec. 32, T-17S, R-28E	3063.4'
I-291	200' FNL & 350' FWL Sec. 4, T-18S, R-28E	3062.7'
I-283	175' FNL & 300' FEL Sec. 5, T-18S, R-28E	3061.0'
J-234	1900' FNL & 2441' FEL Sec. 6, T-18S, R-28E	3077.6'
J-212	1900' FNL & 100' FWL Sec. 6, T-18S, R-28E	3049.7'
J-213	1950' FNL & 1300' FWL Sec. 6, T-18S, R-28E	3047.8'
J-214	2450' FNL & 400' FWL Sec. 6, T-18S, R-28E	3050.1'
J-203	2400' FNL & 700' FEL Sec. 1, T-18S, R-27E	3050.9'
K-193	2150' FSL & 2450' FEL Sec. 1, T-18S, R-27E	3035.4'
K-194	1500' FSL & 2130' FEL Sec. 1, T-18S, R-27E	3018.3'
L-154	750' FSL & 2550' FEL Sec. 2, T-18S, R-27E	3553.4'
L-142	100' FSL & 1950' FWL Sec. 2, T-18S, R-27E	3555.6'
L-143	1200' FSL & 1900' FWL Sec. 2, T-18S, R-27E	3528.0'
M-132	625' FNL & 175' FWL Sec. 11, T-18S, R-27E	3540.6'



JERRY APODACA
GOVERNOR

NICK FRANKLIN
SECRETARY

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION

April 26, 1978

POST OFFICE BOX 2000
STATE LAND OFFICE BUILDING
SANTA FE, NEW MEXICO 87501
(505) 827-2434

Atlantic Richfield Company
P. O. Box 1610
Midland, Texas 79701

Attention: J. L. Tweed

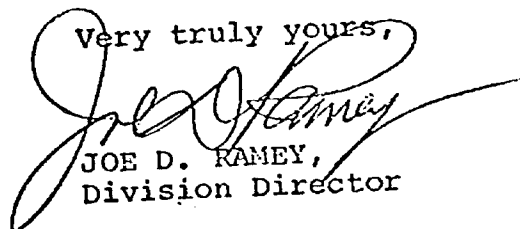
Administrative Order NSL-937

Gentlemen:

The Division Director hereby approves the non-standard location for 25 Atlantic Richfield Company Empire Abo Unit Wells, Empire Abo Pool, Eddy County, New Mexico, as shown on Exhibit 1 of their application dated April 4, 1978 and attached hereto.

These producing wells are approved under the provisions of Rule 14 of Order No. R-4549-B, in order to permit the operator to complete a more efficient production pattern within said unit in said pool.

Very truly yours,


JOE D. RAMEY,
Division Director

JDR/RLS/dr

cc: Oil & Gas Engineering Committee - Hobbs
Oil Conservation Division - Artesia
Central Leasing - State Land Office - Santa Fe

EXHIBIT 1

ATLANTIC RICHFIELD COMPANY
EMPIRE ABO UNIT
PHASE V

UNIT WELL	LOCATION	ELEV. - G.L.
F-362	1850' FNL & 350' FEL Sec. 34, T-17S, R-28E	3674.6'
F-352	1330' FNL & 1980' FEL Sec. 31, T-17S, R-28E	3670.3'
F-353	2400' FNL & 2350' FEL Sec. 34, T-17S, R-28E	3661.4'
F-322	2480' FNL & 500' FEL Sec. 33, T-17S, R-28E	3665.2'
G-333	2100' FSL & 1100' FWL Sec. 34, T-17S, R-28E	3660.2'
G-313	2000' FSL & 2450' FEL Sec. 33, T-17S, R-28E	3662.5'
H-312	815' FSL & 2525' FEL Sec. 33, T-17S, R-28E	3664.9'
H-302	1250' FSL & 1925' FWL Sec. 33, T-17S, R-28E	3670.9'
H-303	800' FSL & 1340' FWL Sec. 33, T-17S, R-28E	3665.6'
H-294	1200' FSL & 700' FWL Sec. 33, T-17S, R-28E	3666.2'
H-295	700' FSL & 10' FWL Sec. 33, T-17S, R-28E	3666.4'
H-281	200' FSL & 660' FEL Sec. 32 T-17S, R-28E	3663.4'
I-291	200' FNL & 350' FWL Sec. 4, T-18S, R-28E	3662.7'
I-283	175' FNL & 300' FEL Sec. 5, T-18S, R-28E	3661.0'
J-234	1900' FNL & 2441' FEL Sec. 6, T-18S, R-28E	3677.6'
J-212	1900' FNL & 100' FWL Sec. 6, T-18S, R-28E	3649.7'
J-213	1950' FNL & 1300' FWL Sec. 6, T-18S, R-28E	3647.8'
J-214	2450' FNL & 400' FWL Sec. 6, T-18S, R-28E	3650.1'
J-203	2400' FNL & 700' FEL Sec. 1, T-18S, R-27E	3650.9'
K-193	2150' FSL & 2450' FEL Sec. 1, T-18S, R-27E	3635.4'
K-194	1500' FSL & 2130' FEL Sec. 1, T-18S, R-27E	3618.3'
L-154	750' FSL & 2550' FEL Sec. 2, T-18S, R-27E	3553.4'
L-142	100' FSL & 1950' FWL Sec. 2, T-18S, R-27E	3555.6'
L-143	1200' FSL & 1900' FWL Sec. 2, T-18S, R-27E	3528.0'
M-132	625' FNL & 175' FWL Sec. 11, T-18S, R-27E	3540.6'

AtlanticR

Company

North American Producing Division
Permian District
Post Office Box 1610
Midland, Texas 79702
Telephone 915 684 0100



November 20, 1978

Energy & Minerals Department
Oil Conservation Division
P. O. Box 2088
Santa Fe, New Mexico 87501

Attn: Mr. J. D. Ramey

Re: Request for Non-Standard Drilling Locations
Within the Project Area of the ARCO-Empire
Abo Unit Pressure Maintenance Project
Eddy County, New Mexico

Gentlemen:

Atlantic Richfield Company, as operator of the Empire Abo Unit Pressure Maintenance Project, acting on behalf of itself and the other participating working interest owners, requests administrative approval under the provisions of Order No. R-4549-B, Rule 14 under "Special Rules and Regulations for the Empire Abo Pressure Maintenance Project," for the drilling of 50 Unit wells at non-standard locations shown on the attached Exhibit 1.

The proposed non-standard locations meet all requirements of Order R-4549-B, Rule 14, said wells being located "no closer than 660 feet to the outer boundary of said Unit, nor closer than 10 feet to any quarter-quarter section of subdivision inner boundary.

The proposed drilling of these wells is necessary to complete a more efficient producing pattern to conserve reservoir energy, promote the greatest ultimate recovery of Unit reserves, prevent waste, and protect correlative rights.

Very truly yours,

ATLANTIC RICHFIELD COMPANY

J. L. Tweed
District Engineer

IJN/agp

cc: Mr. Bill Gressett
Energy & Minerals Dept.,
Oil Conservation Div.,
Artesia, New Mexico

EXHIBIT 1
EMPIRE ABO UNIT

PHASE VI

ELEV. GL	WELL NAME	LOCATION	SEC.	TWP-S	RANGE-E
3675.9	E-362	1200' FNL & 1200' FEL	34	17	28
3665.5	D-361	136' FSL & 800' FEL	27	17	28
3673.5	E-363	650' FNL & 120' FEL	34	17	28
3680.7	E-374	220' FNL & 700' FWL	35	17	28
3679.3	E-383	1190' FNL & 1910' FWL	35	17	28
3681.0	E-384	600' FNL & 1400' FWL	35	17	28
3685.5	E-392	959' FNL & 2400' FEL	35	17	28
3686.1	E-393	1100' FNL & 2250' FEL	35	17	28
3677.9	E-394	1000' FNL & 1600' FEL	35	17	28
3676.2	E-395	75' FNL & 1820' FEL	35	17	28
3674.8	F-334	1700' FNL & 620' FWL	34	17	28
3664.3	F-335	2250' FNL & 570' FWL	34	17	28
3672.1	F-342	1450' FNL & 1900' FWL	34	17	28
3662.2	F-343	2300' FNL & 1675' FWL	34	17	28
3666.9	F-354	1850' FNL & 2550' FEL	34	17	28
3663.3	F-363	2250' FNL & 1250' FEL	34	17	28
3679.3	F-373	1820' FNL & 150' FWL	35	17	28
3674.8	F-374	2525' FNL & 520' FWL	35	17	28
3681.2	F-375	1780' FNL & 1175' FWL	35	17	28
3685.3	F-376	1335' FNL & 700' FWL	35	17	28
3675.6	F-382	2400' FNL & 1600' FWL	35	17	28
3678.4	F-383	1600' FNL & 2350' FWL	35	17	28
3680.6	F-391	1545' FNL & 1625' FEL	35	17	28
3665.7	G-291	2000' FSL & 1200' FWL	33	17	28
3661.7	G-314	1450' FSL & 2000' FEL	33	17	28
3662.6	G-315	1900' FSL & 1450' FEL	33	17	28
3662.3	G-324	2250' FSL & 235' FEL	33	17	28
3661.4	G-334	2400' FSL & 500' FWL	34	17	28
3662.2	G-352	2200' FSL & 1450' FEL	34	17	28
3663.8	G-353	1420' FSL & 2050' FEL	34	17	28
3670.5	G-361	2400' FSL & 300' FEL	34	17	28

Exhibit 1
 Empire Abo Unit
 Phase VI
 (cont'd.)

<u>ELEV.</u> <u>GL</u>	<u>WELL</u> <u>NAME</u>	<u>LOCATION</u>	<u>SEC.</u>	<u>TWP-S</u>	<u>RANGE-E</u>
3660.9	H-341	1200' FSL & 2500' FWL	34	17	28
3663.6	I-292	485' FNL & 1070' FWL	4	18	28
3672.9	J-235	1750' FNL & 1600' FEL	6	18	28
3517.0	K-131	1500' FSL & 600' FWL	2	18	27
3523.4	K-142	1700' FSL & 1400' FWL	2	18	27
3533.0	K-143	1820' FSL & 2550' FWL	2	18	27
3558.7	K-161	1310' FSL & 590' FEL	2	18	27
3521.4	L-122	100' FSL & 430' FEL	3	18	27
3501.4	L-123	660' FSL & 250' FEL	3	18	27
3518.5	L-133	800' FSL & 950' FWL	2	18	27
3535.3	L-134	10' FSL & 640' FWL	2	18	27
3552.7	L-155	1040' FSL & 2025' FEL	2	18	27
3574.8	L-156	600' FSL & 1330' FEL	2	18	27
3588.6	L-171	670' FSL & 300' FWL	1	18	27
3630.3	L-191	1120' FSL & 1440' FEL	1	18	27
3533.2	M-123	1050' FNL & 100' FEL	10	18	27
3557.0	M-133	450' FNL & 1175' FWL	11	18	27
3574.8	M-141	225' FNL & 2280' FWL	11	18	27
3593.0	M-153	200' FNL & 1925' FEL	11	18	27

Due to surface conditions, the following wells will be drilled directionally at the surface location mentioned above, and bottomed within a circle of 150' radius with its center being the bottom hole location specified below.

D-361	Surface location 136' FSL & 800' FEL, Sec. 27, T-17S, R-28E Bottom hole location 300' FNL & 500' FEL, Sec. 34, T-17S, R-28E
E-392	Surface location 959' FNL & 2400' FEL, Sec. 35, T-17S, R-28E Bottom hole location 600' FNL & 2500' FEL, Sec. 35, T-17S, R-28E
K-131	Surface location 1500' FSL & 600' FWL, Sec. 2, T-18S, R-27E Bottom hole location 1600' FSL & 250' FWL, Sec. 2, T-18S, R-27E
L-133	Surface location 800' FSL & 950' FWL, Sec. 2, T-18S, R-27E Bottom hole location 1250' FSL & 700' FWL, Sec. 2, T-18S, R-27E



STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION

JERRY APODACA
GOVERNOR

NICK FRANKLIN
SECRETARY

December 12, 1978

POST OFFICE BOX 2005
STATE LAND OFFICE BUILDING
SANTA FE, NEW MEXICO 87501
(505) 827-2434

Atlantic Richfield Company
P. O. Box 1610
Midland, Texas 79702

Attention: J. L. Tweed

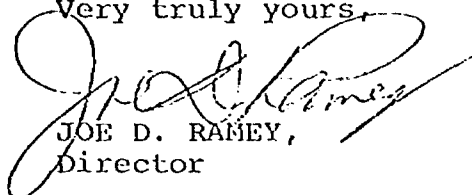
Administrative Order NSL-999

Gentlemen:

Reference is made to your application for 46 non-standard locations for your ARCO-Empire Abo Unit Wells as per the attached list, Eddy County, New Mexico.

By authority granted me under the provisions of Rule 14 of Order No. R-4549-B, the 46 listed non-standard locations are hereby approved.

Very truly yours,


JOE D. RAMEY,
Director

JDR/RLS/dr

cc: Oil Conservation Division - Artesia
Oil & Gas Engineering Committee - Hobbs
U. S. Geological Survey - Artesia
Oil & Gas Division - State Land Office - Santa Fe

EMPIRE ABO UNIT WELLS

WELL NAME	LOCATION	SEC.	TWP--S	RANGE--E
E-362	1200' FNL and 1200' FEL	34	17	28
E-363	650' FNL and 120' FEL	34	17	28
E-374	220' FNL and 700' FWL	35	17	28
E-383	1190' FNL and 1910' FWL	35	17	28
E-384	600' FNL and 1400' FWL	35	17	28
E-393	1100' FNL and 2250' FEL	35	17	28
E-394	1000' FNL and 1600' FEL	35	17	28
E-395	75' FNL and 1820' FEL	35	17	28
F-334	1700' FNL and 620' FWL	34	17	28
F-335	2250' FNL and 570' FWL	34	17	28
F-342	1450' FNL and 1900' FWL	34	17	28
F-343	2300' FNL and 1675' FWL	34	17	28
F-354	1850' FNL and 2550' FEL	34	17	28
F-363	2250' FNL and 1250' FEL	34	17	28
F-373	1820' FNL and 150' FWL	35	17	28
F-374	2525' FNL and 520' FWL	35	17	28
F-375	1780' FNL and 1175' FWL	35	17	28
F-376	1335' FNL and 700' FWL	35	17	28
F-382	2400' FNL and 1600' FWL	35	17	28
F-383	1600' FNL and 2350' FWL	35	17	28
F-391	1545' FNL and 1625' FEL	35	17	28
G-291	2000' FSL and 1200' FWL	33	17	28
G-314	1450' FSL and 2000' FEL	33	17	28
G-315	1900' FSL and 1450' FEL	33	17	28
G-324	2250' FSL and 235' FEL	33	17	28
G-334	2400' FSL and 500' FWL	34	17	28
G-352	2200' FSL and 1450' FEL	34	17	28
G-353	1420' FSL and 2050' FEL	34	17	28
G-361	2400' FSL and 300' FEL	34	17	28
H-341	1200' FSL and 2500' FWL	34	17	28
I-292	485' FNL and 1070' FWL	4	18	28
J-235	1750' FNL and 1600' FEL	6	18	28
K-142	1700' FSL and 1400' FWL	2	18	27
K-143	1820' FSL and 2550' FWL	2	18	27
K-161	1310' FSL and 590' FEL	2	18	27
L-122	100' FSL and 430' FEL	3	18	27
L-123	660' FSL and 250' FEL	3	18	27
L-134	10' FSL and 640' FWL	2	18	27
L-155	1040' FSL and 2025' FEL	2	18	27
L-156	600' FSL and 1330' FEL	2	18	27
L-171	670' FSL and 300' FWL	1	18	27
L-191	1120' FSL and 1440' FEL	1	18	27
M-123	1050' FNL and 190' FEL	10	18	27
M-133	450' FNL and 1175' FWL	11	18	27
M-141	225' FNL and 2280' FWL	11	18	27
M-153	200' FNL and 1925' FEL	11	18	27

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION

IN THE MATTER OF THE HEARING
CALLED BY THE OIL CONSERVATION
DIVISION FOR THE PURPOSE OF
CONSIDERING:

CASE NO. 6409
Order No. R-5906

APPLICATION OF ATLANTIC RICHFIELD
COMPANY FOR DIRECTIONAL DRILLING,
EDDY COUNTY, NEW MEXICO.

ORDER OF THE DIVISION

BY THE DIVISION:

This cause came on for hearing at 9 a.m. on December 20,
1978, at Santa Fe, New Mexico, before Examiner Daniel S. Nutter.

NOW, on this 16th day of January, 1979, the Division
Director, 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 Division has jurisdiction of this cause and the
subject matter thereof.

(2) That the applicant, Atlantic Richfield Company, seeks
approval for the directional drilling of four wells on its
Empire Abo Unit Area, Empire-Abo Pool, Eddy County, New Mexico,
as follows:

In Township 17 South, Range 28 East:

Well No. D-361, surface location 136 feet from the South
line and 800 feet from the East line of Section 27,
bottom-hole location 300 feet from the North line and
500 feet from the East line of Section 34; this well
would be designated as being in Unit A of Section 34.

Well No. E-392, surface location 959 feet from the North
line and 2400 feet from the East line, bottom-hole
location 600 feet from the North line and 2500 feet
from the East line, in Unit C of Section 35.

In Township 18 South, Range 27 East:

Well No. K-131, surface location 1500 feet from the South line and 600 feet from the West line, bottom-hole location 1600 feet from the South line and 250 feet from the West line, in Unit L of Section 2; and

Well No. L-133, surface location 800 feet from the South line and 950 feet from the West line, bottom-hole location 1250 feet from the South line and 700 feet from the West line, in Unit M of Section 2.

(3) That all of the above wells would be bottomed at unorthodox locations within 150 feet of the described bottom-hole locations.

(4) That the applicant should be required to determine the subsurface locations of the bottom of the holes of each of the wells by means of a continuous multi-shot directional drilling, if said well is to be completed as a producing well.

(5) That approval of the subject application will prevent the drilling of unnecessary wells, avoid the augmentation of risk arising from the drilling of an excessive number of wells, and otherwise prevent waste and protect correlative rights.

IT IS THEREFORE ORDERED:

(1) That the applicant, Atlantic Richfield Company, is hereby authorized to directional drill four wells on its Empire Abo Unit Area, Empire-Abo Pool, Eddy County, New Mexico, bottoming them at unorthodox locations as follows:

In Township 17 South, Range 28 East:

Well No. D-361, surface location 136 feet from the South line and 800 feet from the East line of Section 27, bottom-hole location 300 feet from the North line and 500 feet from the East line of Section 34 in Unit A;

Well No. E-392, surface location 959 feet from the North line and 2400 feet from the East line, bottom-hole location 600 feet from the North line and 2500 feet from the East line, Section 35 in Unit C.

In Township 18 South, Range 27 East:

Well No. K-131, surface location 1500 feet from the South line and 600 feet from the West line, bottom-hole location 1600 feet from the South line and 250 feet from the West line, Section 2 in Unit L; and

Well No. L-133, surface location 800 feet from the South line and 950 feet from the West line, bottom-hole location 1250 feet from the South line and 700 feet from the West line, Section 2, in Unit M.

(2) That all of the above wells would be bottomed at unorthodox locations within 150 feet of the described bottom-hole locations.

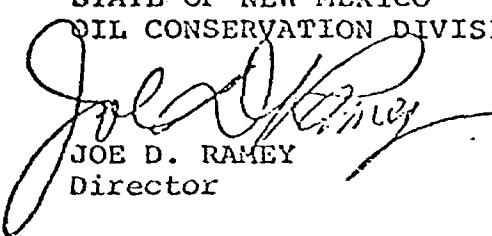
PROVIDED HOWEVER, that subsequent to the above-described directional drilling, should any of said wells be a producer, a continuous multi-shot directional survey shall be made of the wellbore from total depth to the surface with shot points not more than 100 feet apart; that the operator shall cause the surveying company to forward a copy of the survey report directly to the Santa Fe office of the Division, Box 2088, Santa Fe, New Mexico, and that the operator shall notify the Division's Artesia District Office of the date and time said survey is to be commenced.

(3) That Form C-105 shall be filed in accordance with Division Rule 1105 and the operator shall indicate thereon true vertical depths in addition to measured depths.

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

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

STATE OF NEW MEXICO
OIL CONSERVATION DIVISION


JOE D. RAMEY
Director

S E A L

fd/

Empire Abo Unit
Infill Wells Approved
By New Mexico Oil
Conservation Division

<u>Application Submittal Date</u>	<u>Phase</u>	<u>Well</u>	<u>Status 6-1-79</u>	
			<u>Completed</u>	<u>To Be Completed</u>
9/10/74	I-A	F-331	X	
		J-211	X	

Empire Abo Unit
 Infill Wells Approved
 By New Mexico Oil
 Conservation Division

Exhibit 2

Application Submittal Date	Phase	Well	Status 6-1-79	
			Completed	To Be Completed
3/6/75	I	E-371	X	
		E-381	X	
		F-351	X	
		G-291	Deleted	
		G-311	X	
		H-261	X	
		H-271	X	
		H-291	X	
		I-231	X	
		J-191	X	
		J-201	X	
		K-181	X	
		L-141	X	
		L-151	X	
		M-121	X	
Added Well		J-231	X	

Empire Abo Unit
 Infill Wells Approved
 By New Mexico Oil
 Conservation Division

Application Submittal Date	Phase	Well	Status 6-1-79	
			Completed	To Be Completed
12/8/75	II	E-382	X	
		E-391	X	
		E-401	Deleted	
		F-371	X	
		G-312	X	
		G-321	X	
		G-331	X	
		G-341	X	
		I-271	X	
		J-202	X	
		J-221	X	
		J-232	X	
		K-182	X	
		L-111	X	
		L-131	X	
		L-132	X	
		L-152	X	
Added Wells		K-191	X	
		G-301	X	

Empire Abo Unit
Infill Wells Approved
By New Mexico Oil
Conservation Division

<u>Application Submittal Date</u>	<u>Phase</u>	<u>Well</u>	<u>Status 6-1-79</u>	
			<u>Completed</u>	<u>To Be Completed</u>
10/22/76	III-A	F-332	X	
		F-361	X	
		G-342	X	

Empire Abo Unit
 Infill Wells Approved
 By New Mexico Oil
 Conservation Division

Application Submittal Date	Phase	Well	Status 6-1-79	
			Completed	To Be Completed
11/3/76	III-B	E-372	X	
		E-401	Deleted	
		F-372	X	
		F-381	X	
		G-351	X	
		H-272	X	
		H-292	X	
		H-293	X	
		H-311	X	
		I-281	X	
		J-222	X	
		K-141	X	
		K-183	X	
		L-112	Deleted	
		L-121	X	
		L-153	X	
		M-91	X Changed Number to M-901	
		M-101	X	
		M-122		X
		N-91	X Changed Number to N-901	
Added Wells		F-341	X	
		F-372	X	
		F-333	X	

Empire Abo Unit
 Infill Wells Approved
 By New Mexico Oil
 Conservation Division

Application Submittal Date	Phase	Well	Status 6-1-79	
			Completed	To Be Completed
12/29/77	IV	E-373	X	
		E-361	X	
		E-351	X	
		E-341	X	
		F-321	X	
		G-322	X	
		I-272	X	
		K-231	X	
		M-152	X	
		M-131		X
		G-343	X	
		G-332	X	
		G-323	X	
		H-331	X	
		H-321	X	
		H-322	X	
		H-301	X	
		I-282	X	
		J-233	X	
		K-232		X
		K-184	X	
		J-223	X	
		K-192	X	
		M-151	X	
		I-273	X	

Empire Abo Unit
 Infill Wells Approved
 By New Mexico Oil
 Conservation Division

Application Submittal Date	Phase	Well	Status 6-1-79	
			Completed	To Be Completed
4/4/78	V	F-362	X	
		F-352	X	
		F-353	X	
		F-322	X	
		G-333	X	
		G-313	X	
		H-312	X	
		H-302	X	
		H-303	X	
		H-294	X	
		H-295	X	
		H-281	X	
		I-291	X	
		I-283	X	
		J-234	X	
		J-212	Deleted	
		J-213	Deleted	
		J-214	Completed as J-212	
		J-203	X	
		K-193	X	
		K-194	X	
		L-154	X	
		L-142	X	
		L-143	X	
		M-132		X
Added Wells		I-251	X	
		I-261	X	

EXHIBIT 2

EMPIRE ABO UNIT
INFILL WELLS APPROVED
BY NEW MEXICO OIL
CONSERVATION DIVISION

<u>Application Submittal Date</u>	<u>Phase</u>	<u>Well</u>	<u>Status, 6-1-79</u>	<u>To be Completed</u>
11/20/78	VI	D-361	X	
		E-362	X	
		E-363	X	
		E-374	X	
		E-383	X	
		E-384	X	
		E-392	X	
		E-393	X	
		E-394	Deleted	
		E-395	X	
		F-334		X
		F-335	X	
		F-342	X	
		F-343	X	
		F-354	X	
		F-363	X	
		F-373	X	
		F-374	X	
		F-375	X	
		F-376	X	
		F-382	X	
		F-383	X	
		F-391		X
		G-291	X	
		G-314	X	
		G-315	X	
		G-324	X	
		G-334	X	
		G-352	X	
		G-353		X
		G-361	X	

EMPIRE ABO UNIT
INFILL WELLS APPROVED
BY NEW MEXICO OIL
CONSERVATION DIVISION

<u>Application Submittal Date</u>	<u>Phase</u>	<u>Well</u>	<u>Status, 6-1-79</u>	<u>To be Completed</u>
11/20/78	VI	H-341		X
		I-292		X
		J-235		X
		K-131	X	
		K-142		X
		K-143	X	
		K-161		
		L-122		X
		L-123		X
		L-133	X	
		L-134	X	
		L-155	X	
		L-156	X	
		L-171		X
		L-191	Deleted	
		M-123		X
		M-133		X
		M-141		X
		M-153		X
Added Wells		F-336		X
		F-364		X

dearnley, meier & mc cormick

209 SIMMS BLDG., P.O. BOX 1092, PHONE 243-6691, ALBUQUERQUE, NEW MEXICO 87103
1216 FIRST NATIONAL BANK BLDG. EAST, ALBUQUERQUE, NEW MEXICO 87108

BEFORE THE
NEW MEXICO OIL CONSERVATION COMMISSION
MORGAN HALL
STATE LAND OFFICE BUILDING
SANTA FE, NEW MEXICO
Wednesday, April 25, 1973

EXAMINER HEARING

IN THE MATTER OF:

Application of Atlantic Richfield Company
for a unit agreement, Eddy County,
New Mexico

Case No. 4952

IN THE MATTER OF:

Application of Atlantic Richfield Company
for a pressure maintenance project, Eddy
County, New Mexico

Case No. 4953

BEFORE: Richard L. Stamets

TRANSCRIPT OF HEARING

BEFORE EXAMINER
OIL CONSERVATION COMMISSION
ARCO EXHIBIT NO. 3
CASE NO. 6553

1 MR. STABETS: They are.

2 Q Now, have you prepared or has there been prepared under
3 your direction certain exhibits for introduction in this
4 case?

5 A Yes, sir. There has.

6 Q And they have been marked Exhibits 4 through 12?

7 A That's correct.

8 Q Refer to Exhibit 4 and explain what this is and what it
9 shows.

10 A Exhibit 4 happens to be a map of the Empire-Abo pool
11 contoured on the top of the Abo porous reef. The subsea
12 contours are shown. You can readily see by looking off to
13 the southwest that probably the structurally highest well
14 in the field is the Malco Federal Number 8 which happens to
15 be located in the northwest quarter of the southeast
16 quarter of 9, 18 South, 27 East, at the top of the Abo
17 reef at minus 1621 feet subsea, as you can see there.

18 From this point, the crest of the reef can be followed
19 around dipping at about 1 degree. Approximately miles east
20 of that point, the crest of the reef dips below water-oil
21 contact in the Abo formation which was determined by
22 the engineering committee to minus 2665 feet subsea. The
23 heavy dashed line is the unit area which was approved by
24 USGS as being a proper area for unitization of the Abo
25 formation.

bottom, daily water production, so labeled.

And in January that production is 25,036 barrels of water per day which amounts to about 9 per cent of the water-oil combined production. That amount of production to 2-1-73 represents 23.4 per cent of the original oil in place.

Moving up to the next curve of cumulative gas, you see that along with this oil production we have had gas production, of course. And our cumulative gas production as of the end of '73 is 118 billion cubic feet. The curve on the white is in, well, it's again, it's in millions of barrels of oil for the cumulative. And it is in billions of cubic feet for the gas cumulative. So we have produced almost 90 million barrels in this curve of oil and the 118 billion cubic feet of gas through the year of 1972.

If we move on up to the curve that is plotted across the top, this is as indicated on the left margin, this is your reservoir pressures, points per square inch on the vertical scale. Plotted it is the heavy line as indicated by words "Reservoir Pressure." 2355 is the point back here in November of 1957 at the beginning of production.

The last pressure survey taken in July of 1972 was 1,418 PSI, again plotted far over here to right from the middle of 1972. The other curve which we haven't yet discussed is the gas-oil ratio curve which again is shown

BEFORE EXAMINER NUTTER
OIL CONSERVATION DIVISION

EXHIBIT 15
16
17

CASE NO. 6553

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OIL CONSERVATION DIVISION

CASE NO. 6553

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BEFORE EXAMINED BY THE

OIL CONSERVATION DIVISION

APCO EXHIBIT NO. 7

CASE NO. 6553

on up here with the Reservoir Pressure curve. The gas-oil ratio curve is read over here in the right margin. Gas-oil ratio is cubic feet per barrel of oil. I think you can see that in that early days it was average perhaps, 1,100 cubic feet per barrel. That had been a gradual increase in the pool to the gas-oil ratio. However, it's been holding pretty steadily in the last few years and currently is averaging 1,300 cubic feet per barrel and 1,500 cubic feet per barrel.

Q Now, have the working interest owners formed an engineering committee in connection with the study of unitization in this area?

A Yes, sir. They certainly have.

Q When was that formed?

A That was formed at a working interest owner's meeting in October of 1967.

Q What was the purpose of the formation of this committee?

A The primary purpose charged to the engineering subcommittee. Actually there were two primary purposes. First, to determine the proper area to be unitized. And second, to work up a number of parameters which would be suitable as a basis for the working interest owners and to negotiate possible participation in a possible future unit.

Q Over what period of time did the engineering committee meet?

A It met in work sessions virtually continuously for anyone

1 field that has had a great deal more capacity than the
2 allowables. And as you can see in the middle '60's 15 to
3 16 thousand barrels a day and the market demand began to
4 pick up.

5 The Commission upped the New Mexico Allowables. You
6 can see the Empire-Abo's rate going right up. If you
7 plot an allowable curve to the state of New Mexico, it will
8 be parallel to this thing right here. Moving on out to
9 current times, I might say that just happened at the time
10 we plotted this curve. We didn't have January's data.
11 The curve shows that we are, I'm still on the oil rate
12 curve. It shows that we are producing at the end of the
13 year 1972 approximately 25,500 barrels per day from the pool
14 as a whole.

15 Moving up one curve, you find that cumulative oil
16 curve. This is the increased oil production in the
17 original first production back in November, 1957, to
18 1-1-72. And you see that as, I mean, 1-1-73. And you see
19 as of 1-1-73 approximately 89.5 million barrels of oil had
20 been produced from the reservoir.

21 Q Do you have any later figures on that?

22 A Well, we do have January which, you might imagine, is about
23 the same as December. Allowable stayed the same. It's
24 25,625 barrels of oil per day. I might mention the water
25 at this time is plotted on the low slide line down toward

BEFORE EXAMINER NUMBER

OIL CONSERVATION DIVISION

EXHIBIT NO.

CASE NO. 6553

bottom, daily water production, so labeled.

And in January that production is 25,036 barrels of ^{should have been 2536 barrels/day} water per day which amounts to about 9 per cent of the water-oil combined production. That amount of production to 2-1-73 represents 23.4 per cent of the original oil in place.

Moving up to the next curve of cumulative gas, you see that along with this oil production we have had gas production, of course. And our cumulative gas production as of the end of '73 is 118 billion cubic feet. The curve on the ^{right} white is in, well, it's again, it's in millions of barrels of oil for the cumulative. And it is in billions of cubic feet for the gas cumulative. So we have produced almost 90 million barrels in this curve of oil and the 118 billion cubic feet of gas through the year of 1972.

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The last pressure survey taken in July of 1972 was 1,418 PSI, again plotted far over here to right from the middle of 1972. The other curve which we haven't yet discussed is the gas-oil ratio curve which again is shown

1 by necessity. Nevertheless, the attempt was to reflect
2 the types of wells that are in the reservoir at the present
3 time, but I want to emphasize that these are not real
4 tests. This is a hypothetical production, because we
5 haven't got through March, 1974 yet. We will get there, we
6 hope.

7 Okay. And then you move on over. That's the first
8 two pages, and then you move over to the last three pages,
9 1, 2, 3. And some of you, I'm sorry, will not have the
10 very last page which is a table of fluid properties versus
11 reservoir pressure, but we will get them to. That's just
12 a foul up on our part, but any way those last three pages
13 are simply, they simply show how we arrived at the voidage
14 values that are over here on pages 1 and 2.

15 So under this allowable plan, the project area
16 reservoir voidage I want to emphasize will be reduced to
17 less than half of the current primary reservoir voidages.
18 Q Now, refer to Exhibit 8 and explain what this is and what
19 it shows.

20 A Well, Exhibit 8 would try to throw a little more color
21 into the proceedings here. Christmas red and green.
22 This is the same map that we looked at back over here
23 on one of the earlier, well, I guess it was Exhibit 4,
24 the very same structure map, the same unit outlined and so
25 forth; but it does now have the 8 injection wells as the
red triangles, the same 8 wells we looked at in

BEFORE EXAMINER

OIL CONSERVATION DIVISION

ALGO EXHIBIT NO. 8553

CASE NO.

Exhibit 1 on the plan of operation on, I believe, Exhibit 6 a while ago.

Q Why were the injection wells located as you have shown them on this presentation?

A Well, of course, there are a number of factors you have got to consider. Of course, our intent here in what we are going to do is put this down in the Gas Cap. So that was number 1. We want to distribute it as equally as possible to maintain pressure as much as we can throughout the reservoir.

So the attempt is to distribute the wells volumetrically over the reservoir.

Q And the Gas Cap is toward the north border of the reservoir?

A Well, the Gas Cap is over the whole structure virtually and along the whole rest of the reef and and back to the back reef. And these wells are located, of course, in the Gas Cap. This was a primary consideration. You

have got to consider permeability, injectivity, are you going to be able to get gas in the wells, and then naturally, and this is why the green tracts are on here.

These green tracts are the same tracts that Mr. Embry had on his map being those tracts that we have now reason to believe likely will be in the unit. Naturally, we do not want to damage in any way these tracts; and, therefore, we are locating our injection wells as you can see by looking at Exhibit A at least two locations away.

1 to be any point in repeating it. There is a little more
2 information in there. Paragraph 3 now is the basic
3 concepts. Now, I'm over on page 4. Paragraph 3 is the
4 basic concepts. "A. Field production history and Reservoir
5 Numeric Models Studies have demonstrated that reservoir
6 recovery is governed by a gravity drainage mechanism. With
7 unitization, the operator will be able to maximize beneficial
8 effects of this most efficient recovery mechanism by
9 careful observation of well performance and shutting in
10 or curtailing production from inefficient wells.

11 Paragraph B. Injection of plant residue gas will act
12 toward pressure maintenance and orderly control of
13 expansion of the secondary gas cap."

14 These are the concepts by which we will do our best
15 to operate this reservoir, this unit area. Paragraph 4
16 covers the special rules that we are going to request.

17 Q Go ahead and explain what the special rules are that you
18 are proposing.

19 A Paragraph 4 "Special Rules. A. Unit Allowable. Starting
20 on the effective date of the unit, the unit will receive a
21 unit allowable, calculated so that Unit Area reservoir
22 voidage will not exceed average daily reservoir voidage rate
23 for 1972." Let me see. Where am I? "This will result in
24 an increase from current 23,600 BOPD to about 30,000 BOPD
25 for the Unit Area."

BEFORE EXAMINATION

OIL CONSERVATION DIVISION

10/10

11

12

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14

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CASE NO. 6553

EXH. 11

Page 1

BEFORE THE
NEW MEXICO OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
April 10, 1974

EXAMINER HEARING

IN THE MATTER OF:

Application of Cities
Service Oil Company for
a unit agreement, Eddy
County, New Mexico.

Case No. 5212

and

IN THE MATTER OF:

Application of Cities
Service Oil Company for
a pressure maintenance
project, Eddy County,
New Mexico.

Case No. 5213

BEFORE: Richard L. Stamets, Examiner.

TRANSCRIPT OF HEARING

A P P E A R A N C E S

For the New Mexico Oil
Conservation Commission:

Thomas Derryberry, Esq.
Legal Counsel for the
Commission
State Land Office Building
Santa Fe, New Mexico

THE NYE REPORTING SERVICE
STATE-WIDE DEPOSITION NOTARIES
225 JOHNSON STREET
SANTA FE, NEW MEXICO 87501
TEL. (505) 982-0395

BEFORE EXAMINER KUTTER

OIL CONSERVATION DIVISION

ALCO EXHIBIT NO. 11

CASE NO. 6353

Now, this same factor immediately prior to unitization in September, for which I just gave you the voidage figure for the Unit, was 2.66 reservoir barrels. I don't have this in the table but, in other words, although we increased the oil rate from 23,252 to 32,891 barrels per day, we reduced the voidage-efficiency factor from 2.66 reservoir barrels per stock-tank barrel down to 1.71. So we had a sizeable reduction, and, of course, the lower you get with reservoir-voidage-efficiency factor simply means you're voiding less space per barrel of production and therefore you're holding the pressure up longer and you get this increased effect in a gravity drainage reservoir; the longer you can hold the pressure up relative to oil production the more recovery you are going to have. This is another way of stating the fact that you have a flattening in the pressure curve and the flattening is because of this improved efficiency factor.

Okay, moving to Column 7 here we simply took the total 56,319 reservoir-net-voidage rate divided by those 221 wells over there in Column 1 and got a figure of 255 reservoir barrels per day, reservoir-voidage rate, just putting it on a per well basis.

Column 8 puts the allowable production of 56,513

BEFORE THE

OIL CONSERVATION

ARCO

EXHIBIT 12

CASE NO.

6553

EXH. 12

Page 1

BEFORE THE
NEW MEXICO OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
April 10, 1974

EXAMINER HEARING

IN THE MATTER OF:

Application of Cities
Service Oil Company for
a unit agreement, Eddy
County, New Mexico.

Case No. 5212

and

IN THE MATTER OF:

Application of Cities
Service Oil Company for
a pressure maintenance
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TRANSCRIPT OF HEARING

A P P E A R A N C E S

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comparisons I was making earlier, and the only place that gas can come from is the big unit which adjoins it and which is connected, which I certainly believe and which we've had testimony from the Citgo witness that the two unit areas are connected.

Q And that in itself, in your opinion, is a violation of correlative rights?

A Yes, sir, I would say that it is, in my opinion.

Now, we move ahead further in this summation. We feel that if the Citgo Unit is governed by the same voidage formula and controls as the Arco Unit it will give the NMOCC a means to reduce Citgo Unit reservoir voidage below present levels, admittedly somewhat inefficient as we have seen here, resulting in more efficient operations of the reservoir and tending to increase the ultimate oil recovery from the pool and I mean that the same thing that operate on them, when you set them a voidage limit like you've set us a voidage limit, then they're going to be going out there and spending money to work over wells and try to get as low in the reef as they can and produce at as low a gas-oil ratio as they can because they've got that 1559 barrel a day voidage number staring them in the face and we've got a number staring us in the

face and believe me it creates quite an incentive to go for the low-ratio wells in terms of production, and this is what you'd want to do in this reservoir if you want to maximize ultimate recovery. So setting a voidage limit is quite a carrot in front of an operator to try to get his ratio down as low as possible whereas in a gas-siphon type operation this is not as critical. About the only thing that's critical is how much gas can you get in that injection well. Now, okay, as I wanted to say again, in setting a reservoir voidage limit for the Citgo Unit Atlantic Richfield recommends the NMOCC use its best judgment after a complete review of the facts, however, we strongly recommend a voidage limit no greater than 1559 reservoir barrels per day be granted to the Citgo Unit, and just as is the Arco Unit the Citgo Unit should be required to inject back into the Abo gas cap all available plant residue gas. That completes my summation.

MR. HINKLE: We would like to offer into evidence Exhibits 1 through 5.

MR. STAMETS: Is there any objection to Exhibits 1 through 5?

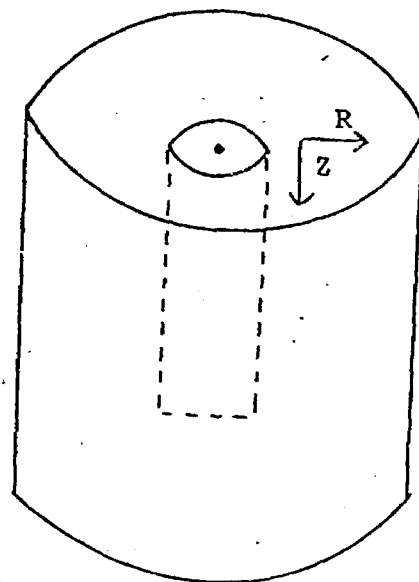
MR. KELLAHIN: No objection

(3-PHASE COMPRESSIBLE CONING)

Introduction

This program is designed to predict the ability of an individual oil or gas well to cone fluids into the wellbore. The model is extremely flexible in that a large variety of conditions may be simulated with only a minimum amount of data input.

The program is particularly useful for determining the effect of coning gas downward and/or water upward into the wellbore perforations as producing rates vary. Descriptive output is generated to show the cone growth and the changes that occur in saturations within the cone area. As gas and/or water is coned into the wellbore, production rates reflect the change to multiphase flow. The program numerically solves the partial differential equations which describe three-phase compressible transient flow in cylindrical coordinates. That is, an R-Z (radial-vertical) coordinate system is employed so that the reservoir under consideration assumes symmetry in the angular direction. The geometry is shown in Figure 1.



BEFORE 5-2-66	
OIL CONING SIMULATOR	
ARCO	EXHIBIT NO. 14
CASE NO. 6553	

FIGURE 1

The reservoir has the shape of a right circular cylinder with a radius (R) and a thickness (Z). The wellbore with a radius (R_W) is located at the center of the cylinder from which production and/or injection of fluids occur. Areal reservoir heterogeneities are accounted for by variable permeabilities, porosities, and saturations which are read as input data.

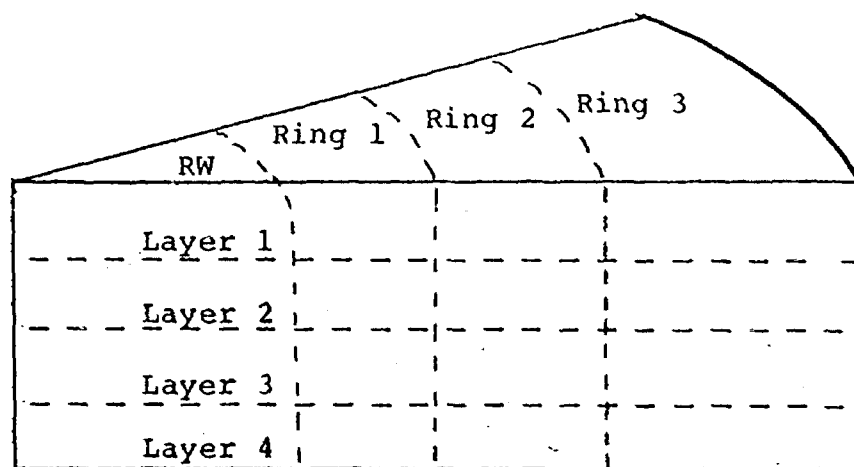


FIGURE 2

The areal reservoir description is described by concentric rings as indicated in Figure 2. Vertical heterogeneities are accounted for in a similar fashion with various reservoir layers, again shown in Figure 2.

The solution technique employed in this model is unconditionally stable which means that the time step size is limited only by the desired accuracy and not the pore volume of the smallest cell. This model typically employs time steps where 1000 times a block's pore volume can flow through it in a single time step.

The final result is a coning model which simulates years of real time in seconds and solves problems for a few dollars which a few months ago cost thousands.

Special Features

- By simply manipulating the input data the program can handle a domal reservoir geometry rather than cylindrical shape.
- Gas-oil ratios and water-oil ratios are monitored each time step to reflect the growth of the unwanted phases. When one or both of these indications increase to a

pre-set limiting value, the computer run is ended to prevent additional unneeded calculations.

- The program allows different fluid properties and relative permeability and capillary pressure data for different layers.
- The unconditional stability allows very large time steps resulting in a model which will simulate years of real time in a few minutes.
- Time steps can be specified by the user or can be automatically selected by the program. The automatic selection process is designed to choose time steps which minimize the running time while keeping the numerical errors within a specified bounds.
- A restart feature is included in the program so that the user can study alternatives which differ only in the late stages of the flood without repeating the entire run each time.
- The program checks for a variety of types of data input errors and in the event of their occurrence, terminates the run and prints the error which occurred.
- Predicted results are monitored at each time step through a cumulative material balance (for each phase) for the entire reservoir and by an incremental material balance for each time step.
- A minimum amount of input data are required, as options are available ranging from a homogeneous reservoir option with very little input data requirements, up to a full heterogeneous reservoir option where properties can be varied at each grid block.
- A horizontal fraction can be simulated by varying only the input data.
- The user has control over the time and amount of output so that detailed information can be obtained for matching field data at any specified times.

Uses

- Determine optimum producing rates by simulating many different producing rate conditions

- Determine optimum location of perforations
- Improve reservoir description or obtain information about aquifer activity by history matching
- Select optimum well density within a field by comparing results which use various external drainage radii
- Achieve the twofold objective of determining a producing rate which inhibits serious coning and at the same time effectively drains the reservoir
- Perform depletion and pressure maintenance studies of single well reef pools (a single study predicts field performance while determining ultimate sandwich losses)

Examples

A recent application of this model was a depletion study of a number of single well reef pools under various operating strategies. These results were presented to a regulatory body and the result of the hearing increased allowables for these pools 40%. At the same hearing 90% of the pools in the same area had allowables cut over 20%.

Another recent application of this model was a coning study of a large gas field in Canada. Early in the life of this field, a number of the wells began producing water and the operator became concerned about the future performance of this field. An extensive study was undertaken to determine:

- 1) the water influx into the pool
- 2) the individual well performance at various production rates

The study was completed and future rate schedules were determined which minimized water production. Coning was found not to be as serious as originally expected since reasonably large rates were permissible without serious water production. The field has been producing as predicted for five months.

Basic Equations

The equations used in this model to describe compressible multi-phase fluid flow in a porous media are a combination of the continuity equation plus Darcy's Law and are as follows:

$$\nabla \cdot \frac{kk_{ro}}{B_o \mu_o} \nabla (p_o - \rho_o gh) + q_{ov} = \phi \frac{\partial}{\partial t} \left(\frac{S_o}{B_o} \right) \quad \text{oil} \quad (1)$$

$$\nabla \cdot \frac{kk_{rw}}{B_w \mu_o} \nabla (p_w - \rho_w gh) - q_{wv} = \phi \frac{\partial}{\partial t} \left(\frac{S_w}{B_w} \right) \quad \text{water} \quad (2)$$

$$\nabla \cdot \frac{kk_{rg}}{B_g \mu_g} \nabla (p_g - \rho_g hg) + \nabla \cdot R_s \frac{kk_{ro}}{B_o \mu_o} (p_o - \rho_o gh) - q_{gv} = \phi \frac{\partial}{\partial t} \left(\frac{S_o}{B_o} R_s + \frac{S_g}{B_g} \right) \quad \text{gas} \quad (3)$$

$$S_o + S_w + S_g = 1.0 \quad (4)$$

$$p_o = p_w + p_{cwo} \quad (5)$$

$$p_g = p_o + p_{cgo} \quad (6)$$

These equations are expanded using a cylindrical coordinate system (R-Z). The resulting equations are approximated by a fully implicit difference scheme which is unconditionally stable. This means that large volumes of fluid can pass through the small reservoir blocks near the wellbore in a single time step. In addition, large saturation changes may occur in these blocks without causing any numerical difficulties. A fast, stable, and accurate numerical scheme is used to solve the resulting non-linear system of difference equations.

Nomenclature

Variables:

B = formation volume factor, RB/STB or RB/MCF

g = gravitational constant

h = elevation

k = absolute permeability

k_r = relative permeability

p = pressure

P_c = capillary pressure

R_s = solution gas-oil ratio

S = saturation

t = time

μ = viscosity

ϕ = porosity

ρ = density

Subscripts:

g = gas phase

go = gas-oil system

o = oil phase

w = water phase

wo = water-oil system

Input Data Requirements

The reservoir description includes:

- a) Geometry such as thickness, drainage radius, well-bore, size and outline of reservoir
- b) Porosity and absolute permeability distributions, i.e., stratification
- c) Location of initial gas-oil and water-oil contacts or initial fluid and pressure distributions

The fluid properties needed are:

- a) Formation volume factors, solution gas-oil ratio and viscosities as functions of pressure
- b) Relative permeability and capillary pressure data as functions of saturation

The required operating information is:

- a) Well locations and rates
- b) Production strategy for workovers, limiting GOR and WOR information, etc.

In many cases, much of the above input data, required by the model, is uncertain or even unavailable. This, however, is not a serious drawback if reservoir performance data is available. The performance data is used in what is called the history matching phase. This is where the uncertain or unknown data is adjusted until the model simulates the actual reservoir performance. A very accurate reservoir description can often be obtained by history matching.

Typical performance data which are useful for history matching purposes include individual well pressure as a function of time and production and producing gas-oil or water-oil ratios.

EXH. NO. 15

April 25, 1973

United States Department
of the Interior
Geological Survey
P. O. Drawer 1857
Roswell, New Mexico 88201

Attention: Mr. N. O. Frederick (6)
Oil and Gas Supervisor

State of New Mexico
Mr. Alex J. Armijo
Commissioner of Public Lands
P. O. Box 1148
Santa Fe, New Mexico

Attention: Mr. Ray D. Graham, Director (3)
Oil and Gas Department

State of New Mexico
Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico

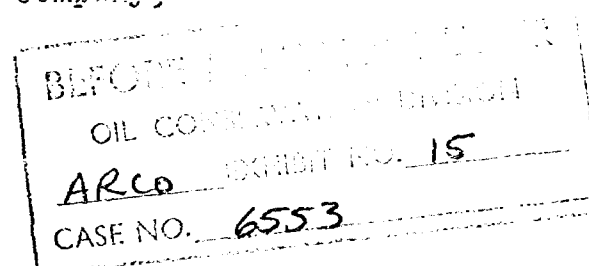
Attention: Mr. A. L. Porter, Jr. (3)
Secretary Director

Working Interest Owners
Empire Abo Unit
(see attached address list)

Re: Initial Plan of Operation
Empire Abo Unit
Eddy County, New Mexico

Gentlemen:

In compliance with Section 11 of the Unit
Agreement, Empire Abo Unit, Eddy County,
New Mexico, Atlantic Richfield Company, as

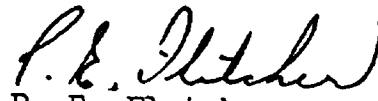


United States Department
of the Interior
Page 2
April 25, 1973

Unit Operator on behalf of itself and the other participating working interest owners, hereby submits for your approval a Plan of Operation to cover the period beginning with the effective date of the Unit Agreement and extending through the remainder of calendar year 1973.

Yours very truly,

ATLANTIC RICHFIELD COMPANY
OPERATOR



P. E. Fletcher
Operations Manager

PEF/SHC/jrb

INITIAL PLAN OF OPERATION
EMPIRE ABO UNIT1. Project AreaHistory and Background

The Empire Abo Unit area consists of some 11,339.15 acres in Eddy County, New Mexico (see attached plat, Exhibit 1). The area is located in portions of sections 34, 35, 36 Township 17 South, Range 27 East; sections 1, 2, 3, 4, 8, 9, 10, 11, 12, 15, 16, 17 Township 18 South, Range 27 East; sections 25, 26, 27, 28, 31, 32, 33, 34, 35, 36 Township 17 South, Range 28 East; sections 4, 5, 6 Township 18 South, Range 28 East; sections 29, 30 Township 17 South, Range 29 East. Within the Unit Area, owners of the following tracts have chosen not to participate in the unit: 2,6,42,46,49,55,56,69,73C,77,79,84,91. These non-participating tracts total 684.84 acres. The remaining 10,654.31 acres is to be developed as a project area for pressure maintenance by injection of plant residue gas from Abo production back into the Abo formation.

The Abo producing zone is found at an average depth of about 5800 feet (see attached type log, Exhibit 2). The Abo is a lower Leonard (Permian) carbonate reef which has undergone complete dolomitization. Vugs, fractures and fissures have been observed in cores throughout the main reef, with local anhydrite infilling sometimes restricting flow. Reef development is long (12 1/2 miles) and narrow (1 1/2 miles). The reef crest dips about 1° from southwest to northeast. Average gross reef thickness is about 300 feet, ranging to the maximum of 732 feet on the Amoco State AT No. 1 (L2-18S-27E).

On the up-dip west and southwest end of the reservoir productive limits are the result of anhydrite deposition, while on the back-reef north side there is a facies change to an impermeable carbonate "mud" interspersed with green shale. Limits to the south, east and northeast result as the top of the reef dips below the oil-water contact.

2. Current Production, Future Recovery

The original discovery well was the Amoco Malco Federal A No. 1, located in the NE NW Section 11, T-18-S - R-27-E, completed in November 1957.

At the present time the Pool has 235 producing wells. Of these, 153 are capable of producing more than the current top allowable of 142 BOPD/well. There are 183 flowing wells. Field performance and detailed study of cores indicate excellent vertical permeability. The principal producing mechanism is gravity drainage with an expanding secondary gas cap. There are 22 operators in the field and 112 separate working interest owners.

In January 1973, Abo Pool total oil production averaged 25,625 BOPD with 9% water production and gas oil ratio 1,366 cu. ft./BO. Cumulative oil production from the pool is 90 MMBO to February 1, 1973. Remaining primary after February 1, 1973, based on ARCO numeric model studies, is estimated to be 83 MMBO. Unitized residue gas injection for pressure maintenance is calculated to increase future recovery by about 30 MMBO compared to continued primary operations.

3. Basic Concepts Governing Future Unit Operations

- a) Field production history and reservoir numeric model studies have demonstrated that reservoir recovery is governed by a gravity drainage mechanism. With unitization, the operator will be able to maximize beneficial effects of this most efficient recovery mechanism by careful observation of well performance and shutting in or curtailing production from inefficient wells.
- b) Injection of plant residue gas will act toward pressure maintenance and orderly control of expansion of the secondary gas cap.

4. Special Rules

a) Unit Allowable

1st Step - Starting on the effective date of the unit, the unit will receive a unit allowable, calculated so that Unit Area reservoir voidage will not exceed average daily reservoir voidage rate for 1972. This will result in an increase from current 23,600 BOPD to about 30,000 BOPD for the Unit Area.

2nd Step - to be effective with the start of gas injection. Unit Area allowable to be 40,192 BOPD. Reservoir numeric model studies demonstrate added recovery and no reservoir waste at this rate.

- b) Provision to produce the unit allowable from the most efficient wells without restriction. The only exception will be where a Unit producing well offsets a non-unit well.
- c) Provision that if any unit well is located within 660' of a non-participating tract on which is located an Empire Abo producing well, such unit well will be allowed to produce no more than two times normal unit allowable for the Empire Abo Pool.
- d) Provision for administrative approval of additional injection wells, or changes in injection well locations.

5. Operating Plans for 1973

Initially gas injection will be into the Abo gas cap in the following eight wells (see plat Exhibit 1):

<u>Current Operator</u>	<u>Lease & Well</u>	<u>Location</u>
Exxon	Chalk Bluff Draw Unit "A" No. 4	NE/4 NW/4 Sec.9-T18S-R27E
Amoco	Windfohr Federal No. 4	NW/4 SE/4 Sec.4-T18S-R27E
Amoco	Malco "H" Federal No. 2	SE/4 NE/4 Sec.3-T18S-R27E
M.YatesIII	Dooley Abo State No. 2	NW/4 SE/4 Sec.36-T17S-R27E
Amoco	State "BM" No. 1	NE/4 SW/4 Sec.31-T17S-R28E
Amoco	State "BV" No. 1	SW/4 NW/4 Sec.32-T17S-R28E
Arco	M. Yates B (ARC) No. 8	SW/4 NE/4 Sec.33-T17S-R28E
Hondo	State "A" No. 21	NE/4 SW/4 Sec.26-T17S-R28E

Attached Exhibit 3 is an example of an injection well log, while Exhibit 4 is a schematic diagram of a typical mechanical setup for an injection well.

Maximum gas injection volume into all wells is estimated at 37,000 MCF/Day. In terms of reservoir space fill-up, this is equivalent to over 60,000 barrels of water injection per day. Plans are to pick up residue gas at about 700 psi and compress it to 2000 psi for injection. The gas will contain hydrogen sulfide. Superdehydration facilities are planned in order to minimize possible corrosion.

A rigorous corrosion checking procedure will be maintained.

A regular and comprehensive well-testing program will be followed to maintain reservoir control and aid in determining optimum operating conditions.

Workovers: Wherever well production data and reservoir conditions so indicate, workovers will be performed to lower gas-oil or water-oil ratios and maximize producing well efficiencies.

Facilities for produced water gathering and reinjection will be constructed.

Atlantic Richfield Company, as unit operator, will act prudently to preserve all rights of the mineral owners and to effectively and efficiently recover the unit area reserves. This Company will meet all economical offset obligations and act to prevent undue waste.

Modifications - It is understood that to meet changing conditions, this Plan of Operation may be modified from time to time, with the approval of the Supervisor, the Commissioner of Public Lands of the State of New Mexico and the New Mexico Oil Conservation Commission.

Effective Date:

This Plan of Operation shall be effective July 1, 1973.

If this Plan of Operation meets with your approval, please indicate in the space below and return one copy for our files.

Yours very truly,

ATLANTIC RICHFIELD COMPANY
OPERATOR



P. E. Fletcher
Operations Manager

PEF/SHC/jrb

Initial Plan of Operation
Empire Abo Unit
Page 7

APPROVED BY: _____ Date: _____
Supervisor of United
States Geological Survey

APPROVED BY: _____ Date: _____
Commissioner of Public
Lands, State of New Mexico

APPROVED BY: _____ Date: _____
Secretary-Director
New Mexico Oil Conservation
Commission

EMPIRE ABO UNIT
INFILL WELL STUDY RESULTS,
LISTED BY DATE OF STUDY

Date of Added Recovery Study (Month-Year)	Cumulative Number of Infill Wells in Study	Spacing (Acres/well)	Reserves Added By Infill Drilling	
			Average Added Reserves (MBO/well)	Total Added Reserves (MBO)
8-74	2	20	80	160
1-75	58*	20	100	5,800
11-77	158*	20 & 10	92	14,510

(* includes wells in earlier studies)

With 129 infill wells on production

Actual Cumulative Production to 5-1-79 from all infill wells = 16,292 MBO.

To 5-1-79, actual average production per well = $\frac{16,292 \text{ MBO}}{129 \text{ Wells}} = 126 \frac{\text{MBO}}{\text{well}}$

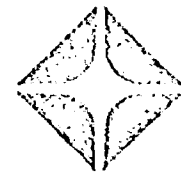
<u>Study Date</u>	<u>Study Type</u>
8-74	Calculation using original coning simulator, 1970 study
1-75	Updated coning simulators considered well interference
11-77	Back-to-front reef 3-dimensional slice model, combined coning effects and fluid movements in all directions. More production history available.

BEFORE EXAMINER MUTTER
OIL CONSERVATION DIVISION
ARCO EXHIBIT NO. 16
CASE NO. 6553

North American Producing Division
Permian Division
Post Office Box 1610
Midland, Texas 79701
Telephone 915 682 8631

September 10, 1974

EXH. 2



New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico

Attn: Mr. A. L. Porter, Jr.

Re: Proposed Locations for Infill
Drilling of Empire Abo Unit
G-3301 and J-2101
ARCO-Empire Abo Unit Pressure
Maintenance Project
Eddy County, New Mexico

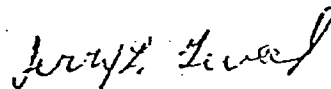
Gentlemen:

Atlantic Richfield, as operator of the Empire Abo Unit Pressure Maintenance Project, acting on behalf of itself and the other participating working interest owners, requests administrative approval under the provisions of Order No. R-4549-B, Rule 14, under "Special Rules and Regulations for the Empire Abo Pressure Maintenance Project," for the drilling of Unit Wells G-3301 and J-2101 (locations shown on the attached exhibits).

The proposed drilling of Unit Wells G-3301 and J-2101, meets all requirements of Order R-4549-B, Rule 14, said wells being located "no closer than 660 feet to the outer boundary of said unit, nor closer than 10 feet to any quarter-quarter section or subdivision inner boundary."

The proposed drilling of Unit Wells G-3301 and J-2101 will be necessary to complete a more efficient producing pattern, promote the greatest ultimate recovery of reserves, prevent waste, and protect correlative rights.

Very truly yours,


Jerry L. Tweed

JMB/agp

Attachments

BEFORE NEAL J. PORTER
OIL CONSERVATION DIVISION
Abo EXHIBIT NO. 2
CASE NO. 6553



September 27, 1974

New Mexico Oil and Gas Conservation Commission
P. O. Box 2068
Santa Fe, New Mexico

Attn: Mr. A. L. Porter, Jr.

Re: Amended Unorthodox Well Locations
Empire Abo Unit
Eddy County, New Mexico

Gentlemen:

Atlantic Richfield Company, as operator of the ARCO-Empire Abo Unit Pressure Maintenance Project, requested administrative approval of two unorthodox well locations within the project area by letter dated September 10, 1974. Due to the recent period of inclement weather we were not able to survey the locations prior to submitting the application. We have recently completed the surveying of the two locations and submit for your approval the amendments as shown below. Our intent in submitting the original application was to place the locations approximately in the center of F-33, F-34, G-33, G-34, and J-21, J-22, K-21 K-22. The sections these wells are located in are irregular in size, and shape, and due to surface conditions and existing pipelines and rights-of-way, we request our original application be amended as shown.

Locations

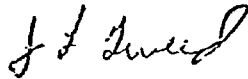
<u>As shown in original application</u>	<u>Amended to</u>
1) Empire Abo Unit Lease G Well No. 3301 1310' FWL & 2610' FSL Sec. 34, T-17S, R-28E Eddy County, New Mexico	Empire Abo Unit Lease F Well No. 331 1250' FWL & 2576' FNL Sec. 34, T-17S, R-28E Eddy County, New Mexico
2) Empire Abo Unit Lease J Well No. 2101 1310' FWL & 2610' FNL Sec. 6, T-18S, R-28E Eddy County, New Mexico	Empire Abo Unit Lease J Well No. 211 1300' FWL & 2630' FNL Sec. 6, T-18S, R-28E Eddy County, New Mexico

New Mexico Oil & Gas Conservation Commission
September 27, 1974
Page 2

These amended locations still meet all requirements of Commission Order R-4549 as amended by R-4549-B, Rule 14, said amended locations are "no closer than 660' to the outer boundary of said Unit, nor closer than 10' to any quarter-quarter section or subdivision inner boundary."

Your consideration in this matter will be greatly appreciated.

Very truly yours,



J. L. Tweed

GES/agp

cc: Mr. J. E. Kapteina

OIL CONSERVATION COMMISSION

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

I. R. TRUJILLO
CHAIRMAN

LAND COMMISSIONER
ALEX J. ARMJO
MEMBER

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

October 1, 1974

Atlantic Richfield Company
P.O. Box 1610
Midland, Texas 79701

Attention: Mr. Jerry L. Tweed.

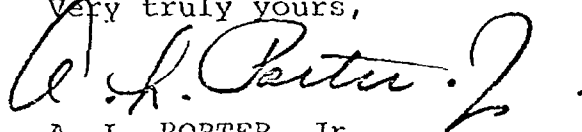
Administrative Order NSL-687

Gentlemen:

Reference is made to your application for approval of a non-standard location for your Empire Abo Unit Lease C Well No. 331 to be located 1310 feet from the West line and 2610 feet from the South line of Section 34, Township 17 South, Range 28 East, and your Empire Abo Unit Lease J Well No. 211 to be located 1310 feet from the West line and 2610 feet from the North line of Section 6, Township 18 South, Range 28 East, both in Eddy County, New Mexico.

By authority granted me under the provisions of Rule 14 of Order No. R-4549-B, of the Commission Rules and Regulations, the above-described unorthodox locations are hereby approved.

Very truly yours,



A. L. PORTER, Jr.
Secretary-Director

ALP/JEK/jr

cc: Oil Conservation Commission - Artesia
Oil & Gas Engineering Committee - Hobbs
State Land Office - Santa Fe

OIL CONSERVATION COMMISSION

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

October 10, 1974

I. R. TRUJILLO
CHAIRMAN

LAND COMMISSIONER
ALEX J. ARMUJO
MEMBER

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

Atlantic Richfield Company
P. O. Box 1610
Midland, Texas 79701

Attention: Mr. Jerry L. Tweed

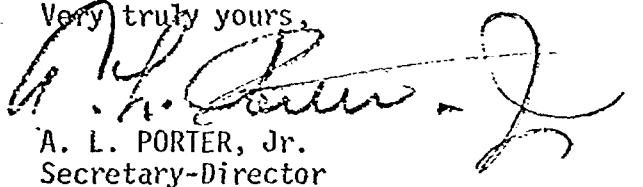
Amendment
Administrative Order NSL-687

Gentlemen:

Reference is made to your application for approval of a non-standard location for your Empire Abo Unit Lease G Well No. 331 to be located 2576 feet from the North line and 1250 feet from the West line of Section 34, Township 17 South, Range 28 East, and your Empire Abo Unit Lease J Well No. 211 to be located 2630 feet from the North line and 1300 feet from the West line of Section 6, Township 18 South, Range 28 East, both in Eddy County, New Mexico.

By authority granted me under the provisions of Rule 14 of Order No. R-4549-B, of the Commission Rules and Regulations, the above-described unorthodox locations are hereby approved.

Very truly yours,


A. L. PORTER, Jr.
Secretary-Director

ALP/JEK/dr

cc: Oil Conservation Commission - Artesia
Oil & Gas Engineering Committee - Hobbs
State Land Office - Santa Fe



March 6, 1975

New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico 87501

Attn: Mr. A. L. Porter, Jr.

Re: Request for Non-Standard Drilling Locations
Within the Project Area of the
ARCO-Empire Abo Unit Pressure Maintenance Project
Eddy County, New Mexico

Gentlemen:

Atlantic Richfield Company, as operator of the Empire Abo Unit Pressure Maintenance Project, acting on behalf of itself and the other participating working interest owners, requests administrative approval under the provisions of Order No. R-4549-B, Rule 14, under "Special Rules and Regulations for the Empire Abo Pressure Maintenance Project," for the drilling of 15 unit wells at non-standard locations (locations shown on attached exhibits).

The proposed drilling of the subject wells at the non-standard locations meets all requirements of Order R-4549-B, Rule 14, said wells being located "no closer than 660 feet to the outer boundary of said unit, nor closer than 10 feet to any quarter-quarter section or subdivision inner boundary."

The proposed drilling of the wells will be necessary to complete a more efficient producing pattern to conserve reservoir energy, promote the greatest ultimate recovery of unit reserves, prevent waste, and protect correlative rights.

Very truly yours,

C. R. Leggott, Jr.
C. R. Leggott, Jr.

GES/agp

Attachments

ATLANTIC RICHFIELD COMPANY
EMPIRE ABO UNIT
Proposed Non-Standard Locations

Well Name and No.	Location
Empire Abo Unit "E" 371	1195' FNL & 10' FWL, Sec. 35, T-17S, R-28E, Eddy County, New Mexico
Empire Abo Unit "E" 381	2475' FWL & 1155' FNL, Sec. 35, T-17S, R-28E, Eddy County, New Mexico
Empire Abo Unit "F" 351	2550' FNL & 1650' FEL, Sec. 34, T-17S, R-28E, Eddy County, New Mexico
Empire Abo Unit "G" 291	1320' FSL & 1280' FWL, Sec. 33, T-17S, R-28E, Eddy County, New Mexico
Empire Abo Unit "G" 311	1430' FEL & 1350' FSL, Sec. 33, T-17S, R-28E, Eddy County, New Mexico
Empire Abo Unit "H" 261	1400' FWL & 150' FSL, Sec. 32, T-17S, R-28E, Eddy County, New Mexico
Empire Abo Unit "H" 271	1450' FEL & 330' FSL, Sec. 32, T-17S, R-28E, Eddy County, New Mexico
Empire Abo Unit "H" 291	200' FSL & 50' FWL, Sec. 33, T-17S, R-28E, Eddy County, New Mexico
Empire Abo Unit "I" 231	1260' FNL & 1580' FEL, Sec. 6, T-18S, R-28E, Eddy County, New Mexico
Empire Abo Unit "J" 191	2500' FEL & 2500' FNL, Sec. 1, T-18S, R-27E, Eddy County, New Mexico
Empire Abo Unit "J" 201	2501' FNL & 20' FEL, Sec. 1, T-18S, R-27E, Eddy County, New Mexico
Empire Abo Unit "K" 181	1440' FWL & 2050' FSL, Sec. 1, T-18S, R-27E, Eddy County, New Mexico
Empire Abo Unit "L" 141	1360' FWL & 1050' FSL, Sec. 2, T-18S, R-27E, Eddy County, New Mexico
Empire Abo Unit "L" 151	1110' FSL & 1322' FEL, Sec. 2, T-18S, R-27E, Eddy County, New Mexico
Empire Abo Unit "M" 121	900' FEL & 10' FNL, Sec. 10, T-18S, R-27E, Eddy County, New Mexico

OIL CONSERVATION COMMISSION

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

March 27, 1975

I. R. TRUJILLO
CHAIRMAN

LAND COMMISSIONER
PHIL R. LUCERO
MEMBER

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

Atlantic Richfield Company
P. O. Box 1610
Midland, Texas 79701

Attention: C. R. Leggott, Jr.

Administrative Order NSL-706

Gentlemen:

Reference is made to your application for approval of non-standard locations for the following fifteen wells in Eddy County, New Mexico:

<u>WELL NAME AND NO.</u>	<u>LOCATION</u>
Empire Abo Unit "E" 371	1195' FNL & 10' FWL, Section 35, T-17-S, R-28-E
Empire Abo Unit "E" 381	2475' FWL & 1155' FNL, Section 35, T-17-S, R-28-E
Empire Abo Unit "F" 351	2550' FNL & 1650' FEL, Section 34, T-17-S, R-28-E
Empire Abo Unit "G" 291	1320' FSL & 1280' FWL, Section 33, T-17-S, R-28-E
Empire Abo Unit "G" 311	1430' FEL & 1350' FSL, Section 33, T-17-S, R-28-E
Empire Abo Unit "H" 261	1400' FWL & 150' FSL, Section 32, T-17-S, R-28-E
Empire Abo Unit "H" 271	1450' FEL & 330' FSL, Section 32, T-17-S, R-28-E
Empire Abo Unit "H" 291	200' FSL & 50' FWL, Section 33, T-17-S, R-28-E
Empire Abo Unit "I" 231	1260' FNL & 1580' FEL, Section 6, T-18-S, R-28-E
Empire Abo Unit "J" 191	2500' FEL & 2500' FNL, Section 1, T-18-S, R-27-E
Empire Abo Unit "J" 201	2501' FNL & 20' FEL, Section 1, T-18-S, R-27-E
Empire Abo Unit "K" 181	1440' FWL & 2050' FSL, Section 1, T-18-S, R-27-E
Empire Abo Unit "L" 141	1360' FWL & 1050' FSL, Section 2, T-18-S, R-27-E

Atlantic Richfield Co.

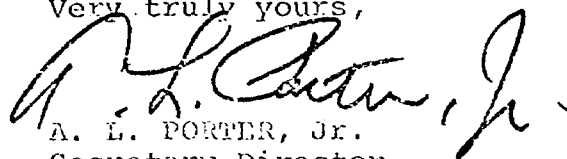
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Administrative Order
NSL-706

<u>WELL NAME AND NO.</u>	<u>LOCATION</u>
Empire Abo Unit "L" 151	1110' FSL & 1322' FSL, Section 2, T-18-S, R-27-E
Empire Abo Unit "M" 121	900' FSL & 10' FSL, Section 10, T-18-S, R-27-E

By authority granted me under the provisions of Rule
14 of Order No. R-4549-B, the above-described unorthodox
locations are hereby approved.

Very truly yours,


A. L. PORTER, Jr.
Secretary-Director

ALP/JEK/dr

cc: Oil Conservation Commission - Artesia
Oil & Gas Engineering Committee - Hobbs

Atlantic Richfield Company

North American Producing Division
Permian District
Post Office Box 1610
Midland, Texas 79701
Telephone 915 682 8631



December 8, 1975

New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico 87501

Attn: Mr. Joe Ramey

Re: Request for Non-Standard Drilling Locations
Within the Project Area of the
ARCO-Empire Abo Unit Pressure Maintenance Project
Eddy County, New Mexico

Gentlemen:

Atlantic Richfield Company, as operator of the Empire Abo Unit Pressure Maintenance Project, acting on behalf of itself and the other participating working interest owners, requests administrative approval under the Provisions of Order No. R-4549-B, Rule 14, under "Special Rules and Regulations for the Empire Abo Pressure Maintenance Project," for the drilling of 17 Unit wells at non-standard locations (locations shown on attached exhibit).

The proposed drilling of the subject wells at the non-standard locations meet all requirements of Order R-4549-B, Rule 14, said wells being located "no closer than 660 feet to the outer boundary of said unit, nor closer than 10 feet to any quarter-quarter section or subdivision inner boundary."

The proposed drilling of the wells will be necessary to complete a more efficient producing pattern to conserve reservoir energy, promote the greatest ultimate recovery of Unit reserves, prevent waste, and protect correlative rights.

Very truly yours,

ATLANTIC RICHFIELD COMPANY

J. L. Tweed
District Engineer

PMB/agp

ATLANTIC RICHFIELD COMPANY
Empire Abo Unit
Proposed Non-Standard Locations
Eddy County, New Mexico

<u>Well Name and Number</u>	<u>Location</u>
Empire Abo Unit "E" 382	1175' FNL & 1316' FWL, Section 35, T-17S, R-28E
Empire Abo Unit "E" 391	135' FNL & 2567' FEL, Section 35, T-17S, R-28E
Empire Abo Unit "E" 401	90' FNL & 1296' FEL, Section 35, T-17S, R-28E
Empire Abo Unit "F" 371	2220' FNL & 25' FWL, Section 35, T-17S, R-28E
Empire Abo Unit "G" 312	1550' FSL & 2511' FEL, Section 33, T-17S, R-28E
Empire Abo Unit "G" 321	1520' FSL & 230' FEL, Section 33, T-17S, R-28E
Empire Abo Unit "G" 331	1580' FSL & 1140' FWL, Section 34, T-17S, R-28E
Empire Abo Unit "G" 341	1850' FSL & 2591' FWL, Section 34, T-17S, R-28E
Empire Abo Unit "I" 271	670' FNL & 1700' FEL, Section 5, T-18S, R-28E
Empire Abo Unit "J" 202	2490' FNL & 1299' FEL, Section 1, T-18S, R-28E
Empire Abo Unit "J" 221	2610' FNL & 2713' FWL, Section 6, T-18S, R-28E
Empire Abo Unit "J" 232	2253' FNL & 1576' FEL, Section 6, T-18S, R-28E
Empire Abo Unit "K" 182	1533' FSL & 2370' FWL, Section 1, T-18S, R-27E
Empire Abo Unit "L" 111	20' FSL & 2485' FEL, Section 3, T-18S, R-27E
Empire Abo Unit "L" 131	100' FSL & 100' FWL, Section 2, T-18S, R-27E
Empire Abo Unit "L" 132	275' FSL & 1243' FWL, Section 2, T-18S, R-27E
Empire Abo Unit "L" 152	320' FSL & 2602' FEL, Section 2, T-18S, R-27E

ATLANTIC RICHFIELD COMPANY
Empire Abo Unit
Proposed Non-Standard Locations
Eddy County, New Mexico

<u>Well Name and Number</u>	<u>Location</u>
Empire Abo Unit "E" 382	1175' FNL & 1316' FWL, Section 35, T-17S, R-28E
Empire Abo Unit "E" 391	135' FNL & 2567' FEL, Section 35, T-17S, R-28E
Empire Abo Unit "E" 401	90' FNL & 1296' FEL, Section 35, T-17S, R-28E
Empire Abo Unit "F" 371	2220' FNL & 25' FWL, Section 35, T-17S, R-28E
Empire Abo Unit "G" 312	1550' FSL & 2311' FEL, Section 33, T-17S, R-28E
Empire Abo Unit "G" 321	1520' FSL & 230' FEL, Section 33, T-17S, R-28E
Empire Abo Unit "G" 331	1580' FSL & 1140' FWL, Section 34, T-17S, R-28E
Empire Abo Unit "G" 341	1850' FSL & 2591' FWL, Section 34, T-17S, R-28E
Empire Abo Unit "I" 271	670' FNL & 1700' FEL, Section 5, T-18S, R-28E
Empire Abo Unit "J" 202	2490' FNL & 1299' FEL, Section 1, T-18S, R-28E
Empire Abo Unit "J" 221	2610' FNL & 2713' FWL, Section 6, T-18S, R-28E
Empire Abo Unit "J" 232	2253' FNL & 1576' FEL, Section 6, T-18S, R-28E
Empire Abo Unit "K" 182	1533' FSL & 2370' FWL, Section 1, T-18S, R-27E
Empire Abo Unit "L" 111	20' FSL & 2485' FEL, Section 3, T-18S, R-27E
Empire Abo Unit "L" 131	100' FSL & 100' FWL, Section 2, T-18S, R-27E
Empire Abo Unit "L" 132	275' FSL & 1243' FWL, Section 2, T-18S, R-27E
Empire Abo Unit "L" 152	320' FSL & 2602' FEL, Section 2, T-18S, R-27E



OIL CONSERVATION COMMISSION

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

LAND COMMISSIONER
PHIL R. LUCERO



STATE GEOLOGIST
EMERY C. ARNOLD

DIRECTOR
JOE D. RAMEY

December 31, 1975

Atlantic Richfield Company
Post Office Box 1610
Midland, Texas 79701

Attention: Mr. J. L. Tweed

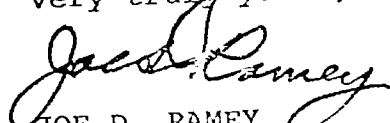
Administrative Order NSL-743

Gentlemen:

Reference is made to your application for approval of non-standard locations for the seventeen wells listed on the attached page. All seventeen wells are located within the project area of the Arco-Empire Abo Unit Pressure Maintenance Project, Eddy County, New Mexico.

By the authority granted me by the provisions of Rule 14 of Order No. R-4549-B, the described unorthodox locations are hereby approved.

Very truly yours,


JOE D. RAMEY
Secretary-Director

JDR/JEK/jr

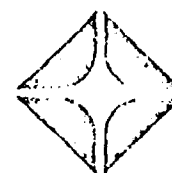
cc: Oil Conservation Commission - Artesia
Oil & Gas Engineering Committee - Hobbs
U. S. Geological Survey - Artesia
State Land Office - Santa Fe

ATLANTIC RICHFIELD COMPANY
 Empire Abo Unit
 Proposed Non-Standard Locations
 Eddy County, New Mexico

<u>Well Name and Number</u>	<u>Location</u>
Empire Abo Unit "E" 382	1175' FNL & 1316' FWL, Section 35, T-17S, R-28E
Empire Abo Unit "E" 391	135' FNL & 2567' FEL, Section 35, T-17S, R-28E
Empire Abo Unit "E" 401	90' FNL & 1296' FEL, Section 35, T-17S, R-28E
Empire Abo Unit "F" 371	2220' FNL & 25' FWL, Section 35, T-17S, R-28E
Empire Abo Unit "G" 312	1550' FSL & 2511' FEL, Section 33, T-17S, R-28E
Empire Abo Unit "G" 321	1520' FSL & 230' FEL, Section 33, T-17S, R-28E
Empire Abo Unit "G" 331	1580' FSL & 1140' FWL, Section 34, T-17S, R-28E
Empire Abo Unit "G" 341	1850' FSL & 2591' FWL, Section 34, T-17S, R-28E
Empire Abo Unit "I" 271	670' FNL & 1700' FEL, Section 5, T-18S, R-28E
Empire Abo Unit "J" 202	2490' FNL & 1299' FEL, Section 1, T-18S, R-28E
Empire Abo Unit "J" 221	2610' FNL & 2713' FWL, Section 6, T-18S, R-28E
Empire Abo Unit "J" 232	2253' FNL & 1576' FEL, Section 6, T-18S, R-28E
Empire Abo Unit "K" 182	1533' FSL & 2370' FWL, Section 1, T-18S, R-27E
Empire Abo Unit "L" 111	20' FSL & 2485' FEL, Section 3, T-18S, R-27E
Empire Abo Unit "L" 131	100' FSL & 100' FWL, Section 2, T-18S, R-27E
Empire Abo Unit "L" 132	275' FSL & 1243' FWL, Section 2, T-18S, R-27E
Empire Abo Unit "L" 152	320' FSL & 2602' FEL, Section 2, T-18S, R-27E

Atlantic Richfield Company

North American Producing Division
Permian Division
Post Office Box 1610
Midland, Texas 79701
Telephone 915 632 8631



October 22, 1976

New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico 87501

Attn: Mr. Joe Ramey

Re: Request for Non-Standard Drilling Locations
Within the Project Area of the
ARCO-Empire Abo Unit Pressure Maintenance Project
Eddy County, New Mexico

Gentlemen:

Atlantic Richfield Company, as operator of the Empire Abo Unit Pressure Maintenance Project, acting on behalf of itself and the other participating working interest owners, requests administrative approval under the Provisions of Order No. R-4549-B, Rule 14, under "Special Rules and Regulations for the Empire Abo Pressure Maintenance Project," for the drilling of 3 Unit wells at non-standard locations (locations shown on attached exhibit).

The proposed drilling of the subject wells at the non-standard locations meet all requirements of Order R-4549-B, Rule 14, said wells being located "no closer than 660 feet to the outer boundary of said unit, nor closer than 10 feet to any quarter-quarter section or subdivision inner boundary."

The proposed drilling of the wells will be necessary to complete a more efficient producing pattern to conserve reservoir energy, promote the greatest ultimate recovery of Unit reserves, prevent waste, and protect correlative rights.

Very truly yours,

ATLANTIC RICHFIELD COMPANY

J. L. Tweed
J. L. Tweed
District Engineer

REH/agp

316
47

ATLANTIC RICHFIELD COMPANY
Empire Abo Unit
Proposed Non-Standard Locations
Eddy County, New Mexico

WELL NAME AND NUMBER

LOCATION

Empire Abo Unit F-332

2581.95' FNL & 150' FWL, Sec. 34, T-17S, R-28E

Empire Abo Unit F-361

1765' FNL & 1270' FEL, Sec. 34, T-17S, R-28E

Empire Abo Unit G-342

2400' FSL & 2080' FWL, Sec. 34, T-17S, R-28E



DIRECTOR
JOE D. RAMEY

OIL CONSERVATION COMMISSION

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

LAND COMMISSIONER
PHIL R. LUCERO



STATE GEOLOGIST
EMERY C. ARNOLD

November 5, 1976

Atlantic Richfield Company
P. O. Box 1610
Midland, Texas 79701

Attention: Mr. J. L. Tweed

Administrative Order NSL-802

Gentlemen:

Reference is made to your application for approval of non-standard locations for your Empire Abo Unit Well No. F-332 to be located 2581.95 feet from the North line and 150 feet from the West line, Empire Abo Unit Well No. F-361 to be located 1765 feet from the North line and 1270 feet from the East line and your Empire Abo Unit Well No. G-342 to be located 2400 feet from the South line and 2080 feet from the West line, all in Section 34, Township 17 South, Range 28 East, NMPM, Empire Abo Pool, Eddy County, New Mexico.

By authority granted me under the provisions of Rule 14 of Order No. R-4549-B, the above-described unorthodox locations are hereby approved.

Very truly yours,

JOE D. RAMEY,
Secretary-Director

JDR/JEK/dr

cc: Oil Conservation Commission - Artesia
Oil & Gas Engineering Committee - Hobbs
Central Leasing, State Land Office - Santa Fe

Atlantic Richfield Company

North American Producing Division
Permian District
Post Office Box 1610
Midland, Texas 79701
Telephone 915 682 8631



November 3, 1976

New Mexico Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico 87501

Attn: Mr. Joe Ramey

Re: Request for Non-Standard Drilling Locations
Within the Project Area of the ARCO-Empire
Abo Unit Pressure Maintenance Project
Eddy County, New Mexico

Gentlemen:

Atlantic Richfield Company, as operator of the Empire Abo Unit Pressure Maintenance Project, acting on behalf of itself and the other participating working interest owners, requests administrative approval under the Provisions of Order No. R-4549-B, Rule 14, under "Special Rules and Regulations for the Empire Abo Pressure Maintenance Project," for the drilling of 20 Unit wells at non-standard locations (locations shown on attached exhibit).

The proposed drilling of the subject wells at the non-standard locations meet all requirements of Order R-4549-B, Rule 14, said wells being located "no closer than 660 feet to the outer boundary of said unit, nor closer than 10 feet to any quarter-quarter section or subdivision inner boundary."

The proposed drilling of the wells will be necessary to complete a more efficient producing pattern to conserve reservoir energy, promote the greatest ultimate recovery of Unit reserves, prevent waste, and protect correlative rights.

Very truly yours,

ATLANTIC RICHFIELD COMPANY

J. L. Tweed
District Engineer

REH/agp

ATLANTIC RICHFIELD COMPANY
EMPIRE ADO UNIT
Proposed Non-Standard Locations
Eddy County, New Mexico

Phase III, Part B

Well Name & Number		Location	G.L. Elev.
Empire Abo Unit			
E-372	100' FNL & 1291.14' FWL	Sec. 35, T-17S, R-28E	3681.1'
E-401	90' FNL & 1296' FEL	Sec. 35, T-17S, R-28E	3669.1'
F-372	2490' FNL & 1100' FWL	Sec. 35, T-17S, R-28E	3676.8'
F-381	1900' FNL & 2260' FWL	Sec. 35, T-17S, R-28E	3679.0'
G-351	1850' FSL & 1650' FEL	Sec. 34, T-17S, R-28E	3663.2'
H-272	2481' FEL & 330' FSL	Sec. 32, T-17S, R-28E	3661.4'
H-292	1225' FWL & 180' FSL	Sec. 33, T-17S, R-28E	3665.7'
H-293	1248.88' FSL & 50' FWL	Sec. 33, T-17S, R-28E	3671.4'
H-311	2490' FEL & 313' FSL	Sec. 33, T-17S, R-28E	3661.4'
I-281	450' FEL & 700' FNL	Sec. 5, T-18S, R-28E	3659.8'
J-222	1350' FNL & 1572' FWL	Sec. 6, T-18S, R-28E	3656.7'
K-141	1370' FSL & 2445' FWL	Sec. 2, T-18S, R-27E	3521.0'
K-183	2370' FSL & 1510' FWL	Sec. 1, T-18S, R-27E	3694.0'
L-112	1186' FSL & 1372' FEL	Sec. 3, T-18S, R-27E	3516.7'
L-121	1186' FSL & 200' FEL	Sec. 3, T-18S, R-27E	3509.3'
L-153	90' FSL & 1456' FEL	Sec. 2, T-18S, R-27E	3585.0'
M-91	1300' FNL & 1220' FWL	Sec. 10, T-18S, R-27E	3507.7'
M-101	1100' FNL & 2170' FWL	Sec. 10, T-18S, R-27E	3506.8'
M-122	990' FNL & 1300' FEL	Sec. 10, T-18S, R-27E	3499.9'
N-91	2390' FNL & 940' FWL	Sec. 10, T-18S, R-27E	3596.3'



DIRECTOR
JOE D. RAMEY

OIL CONSERVATION COMMISSION

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

LAND COMMISSIONER
PHIL R. LUCERO

November 12, 1976



STATE GEOLOGIST
EMERY C. ARNOLD

Atlantic Richfield Company
P. O. Box 1610
Midland, Texas 79701

Attention: Mr. J. L. Tweed

Administrative Order NSL-809

Gentlemen:

Reference is made to your application for approval of the following non-standard locations in the Empire Abo Pool, Eddy County, New Mexico:

<u>Well Name and Number</u>	<u>Location</u>
<u>Empire Abo Unit Wells</u>	
Nos.	
E-372	100' FNL & 1291' FWL of Sec. 35, T-17-S, R-28-E
E-401	90' FNL & 1296' FEL of Sec. 35, T-17-S, R-28-E
F-372	2490' FNL & 1100' FWL of Sec. 35, T-17-S, R-28-E
F-381	1900' FNL & 2260' FWL of Sec. 35, T-17-S, R-28-E
G-351	1850' FSL & 1650' FEL of Sec. 34, T-17-S, R-28-E
H-272	2481' FEL & 330' FSL of Sec. 32, T-17-S, R-28-E
H-292	1225' FWL & 180' FSL of Sec. 33, T-17-S, R-28-E
H-293	1249' FSL & 50' FWL of Sec. 33, T-17-S, R-28-E
H-311	2490' FEL & 313' FSL of Sec. 33, T-17-S, R-28-E
I-281	450' FEL & 700' FNL of Sec. 5, T-18-S, R-28-E
J-222	1350' FNL & 1572' FWL of Sec. 6, T-18-S, R-28-E
K-141	1370' FSL & 2445' FWL of Sec. 2, T-18-S, R-27-E
K-183	2370' FSL & 1510' FWL of Sec. 1, T-18-S, R-27-E
L-112	1186' FSL & 1372' FEL of Sec. 3, T-18-S, R-27-E
L-121	1186' FSL & 200' FEL of Sec. 3, T-18-S, R-27-E
L-153	90' FSL & 1456' FEL of Sec. 2, T-18-S, R-27-E
M-91	1300' FNL & 1220' FWL of Sec. 10, T-18-S, R-27-E
M-101	1100' FNL & 2170' FWL of Sec. 10, T-18-S, R-27-E
M-122	990' FNL & 1300' FEL of Sec. 10, T-18-S, R-27-E
N-91	2390' FNL & 940' FWL of Sec. 10, T-18-S, R-27-E

Atlantic Richfield Company

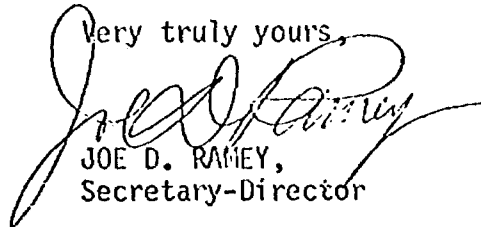
-2-

November 12, 1976

Administrative Order HSL-809

By authority granted me under the provisions of Rule 14 of Order No. R-4549-B, the above-described unorthodox locations are hereby approved.

Very truly yours,



JOE D. RAMEY,
Secretary-Director

JDR/JEK/dr

cc: Oil Conservation Commission - Artesia
Oil & Gas Engineering Committee - Hobbs

Atlantic Richfield Company

North American Producing Division
Permian District
Post Office Box 1610
Midland, Texas 79701
Telephone 915 682 8631



December 29, 1977

New Mexico Oil and Gas Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico 87501

Attn: Mr. J. D. Ramey

Re: Request for Non-Standard Drilling Locations
Within the Project Area of the ARCO-Empire
Abo Unit Pressure Maintenance Project
Eddy County, New Mexico

Gentlemen:

Atlantic Richfield Company, operator of the Empire Abo Unit Pressure Maintenance Project, acting on behalf of itself and the other participating working interest owners, requests administrative approval under the provisions of Order No. R-4549-B, Rule 14, under "Special Rules and Regulations for the Empire Abo Pressure Maintenance Project," for the drilling of 25 Unit wells at non-standard locations shown on the attached Exhibit 1.

The proposed non-standard locations meet all requirements of Order R-4549-B, Rule 14, said wells being located "no closer than 660 feet to the outer boundary of said Unit, nor closer than 10 feet to any quarter-quarter section or subdivision inner boundary."

The proposed drilling of these wells is necessary to complete a more efficient producing pattern to conserve reservoir energy, promote the greatest ultimate recovery of Unit reserves, prevent waste, and protect correlative rights.

Very truly yours,

ATLANTIC RICHFIELD COMPANY

J. L. Tweed
District Engineer

IJN/agp

cc: Mr. Bill Gressett
NMOCC
Artesia, New Mexico

EXHIBIT 1

ATLANTIC RICHFIELD COMPANY
 EMPIRE ABO UNIT
 PROPOSED NON-STANDARD LOCATIONS
 Eddy County, New Mexico

PHASE IV

WELL NAME & NUMBER	LOCATION					G. L. ELEVATION
Empire Abo Unit						
E-373	150' FNL & 15' FWL	Section 35	T-17S	R-28E	3670.4'	
E-361	620' FNL & 1200' FEL	Section 34	T-17S	R-28E	3671.6'	
E-351	810' FNL & 2801' FEL	Section 34	T-17S	R-28E	3673.9'	
E-341	660' FNL & 1560' FWL	Section 34	T-17S	R-28E	3675.7'	
F-321	1610' FNL & 250' FEL	Section 33	T-17S	R-28E	3674.3'	
G-322	2350' FSL & 1100' FEL	Section 33	T-17S	R-28E	3665.6'	
I-272	1300' FNL & 2345' FEL	Section 5	T-18S	R-28E	3651.9'	
K-231	1700' FSL & 2350' FEL	Section 6	T-18S	R-28E	3649.3'	
M-152	560' FNL & 2588' FEL	Section 11	T-18S	R-27E	3589.8'	
M-131	1100' FNL & 1200' FWL	Section 11	T-18S	R-27E	3568.3'	
G-343	1500' FSL & 1820' FWL	Section 34	T-17S	R-28E	3659.5'	
G-332	1575' FSL & 660' FWL	Section 34	T-17S	R-28E	3658.4'	
G-323	1500' FSL & 700' FEL	Section 33	T-17S	R-28E	3663.9'	
H-331	1000' FSL & 1200' FWL	Section 34	T-17S	R-28E	3658.4'	
H-321	1050' FSL & 250' FEL	Section 33	T-17S	R-28E	3662.4'	
H-322	750' FSL & 1150' FEL	Section 33	T-17S	R-28E	3662.4'	
H-301	150' FSL & 1650' FWL	Section 33	T-17S	R-28E	3659.8'	
I-282	1150' FNL & 1270' FEL	Section 5	T-18S	R-28E	3655.1'	
J-233	2550' FNL & 2050' FEL	Section 6	T-18S	R-28E	3668.9'	
K-232	2300' FSL & 1570' FEL	Section 6	T-18S	R-28E	3653.1'	
K-184	2120' FSL & 2465' FWL	Section 1	T-18S	R-27E	3623.8'	
J-223	2630' FNL & 1930' FWL	Section 6	T-18S	R-28E	3644.3'	
K-192	2020' FSL & 1390' FEL	Section 1	T-18S	R-27E	3636.7'	
M-151	400' FNL & 1450' FEL	Section 11	T-18S	R-27E	3604.1'	
I-273	1300' FNL & 1595' FEL	Section 5	T-18S	R-28E	3651.3'	

OIL CONSERVATION COMMISSION

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



DIRECTOR
JOE D. RAMEY

LAND COMMISSIONER
PHIL R. LUCERO

STATE GEOLOGIST
EMERY C. ARNOLD

January 16, 1978

Atlantic Richfield Company
P. O. Box 1610
Midland, Texas 79701

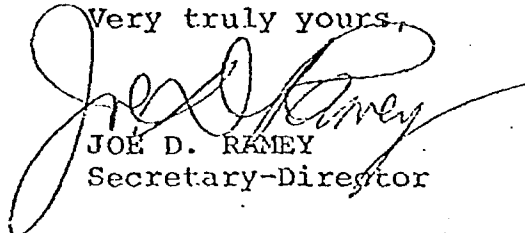
Administrative Order NSL-915

Gentlemen:

The Secretary-Director hereby approves the non-standard location for 25 Atlantic Richfield Company Empire Abo Unit Wells, Empire Abo Pool, Eddy County, New Mexico, as shown on Exhibit 1 of their application dated 12-29-1977 and attached hereto.

These producing wells are approved under the provisions of Rule 14 of Order No. R-4549 as amended, in order to permit the operator to complete a more efficient production pattern within said unit in said pool.

Very truly yours,


JOE D. RAMEY
Secretary-Director

JDR/RLS/jr

cc: Oil & Gas Engineering Committee - Hobbs
Oil Conservation Commission - Artesia

EXHIBIT 1
ATLANTIC RICHFIELD COMPANY
EMPIRE ABO UNIT
PROPOSED NON-STANDARD LOCATIONS
Eddy County, New Mexico

PHASE IV

WELL NAME & NUMBER	LOCATION	G. L. ELEVATION
Empire Abo Unit		
E-373	150' FNL & 15' FWL Section 35	T-17S R-28E 3670.4'
E-361	620' FNL & 1200' FEL Section 34	T-17S R-28E 3671.6'
E-351	610' FNL & 2601' FEL Section 34	T-17S R-28E 3673.9'
E-341	660' FNL & 1560' FWL Section 34	T-17S R-28E 3675.7'
F-321	1610' FNL & 250' FEL Section 33	T-17S R-28E 3674.3'
G-322	2350' FSL & 1100' FEL Section 33	T-17S R-28E 3665.6'
I-272	1300' FNL & 2345' FEL Section 5	T-18S R-28E 3651.9'
K-231	1700' FSL & 2350' FEL Section 6	T-18S R-28E 3649.3'
M-152	560' FNL & 2588' FEL Section 11	T-18S R-27E 3589.8'
M-131	1100' FNL & 1200' FWL Section 11	T-18S R-27E 3568.3'
G-343	1500' FSL & 1820' FWL Section 34	T-17S R-28E 3659.5'
G-332	1575' FSL & 660' FWL Section 34	T-17S R-28E 3658.4'
G-323	1500' FSL & 700' FEL Section 33	T-17S R-28E 3663.9'
H-331	1000' FSL & 1200' FWL Section 34	T-17S R-28E 3658.4'
H-321	1050' FSL & 250' FEL Section 33	T-17S R-28E 3662.4'
H-322	750' FSL & 1150' FEL Section 33	T-17S R-28E 3662.4'
H-301	150' FSL & 1650' FWL Section 33	T-17S R-28E 3659.8'
I-282	1150' FNL & 1270' FEL Section 5	T-18S R-28E 3655.1'
J-233	2550' FNL & 2050' FEL Section 6	T-18S R-28E 3668.9'
K-232	2300' FSL & 1570' FEL Section 6	T-18S R-28E 3653.1'
K-184	2120' FSL & 2465' FWL Section 1	T-18S R-27E 3623.8'
J-223	2630' FNL & 1930' FWL Section 6	T-18S R-28E 3644.3'
K-192	2020' FSL & 1390' FEL Section 1	T-18S R-27E 3636.7'
M-151	400' FNL & 1450' FEL Section 11	T-18S R-27E 3604.1'
I-273	1300' FNL & 1595' FEL Section 5	T-18S R-28E 3651.3'

Atlantic Richfield Company

North American Producing Division
Permian District
Post Office Box 1610
Midland, Texas 79701
Telephone 915 682 8631



April 4, 1978

New Mexico Oil and Gas Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico 87501

Attn: Mr. J. D. Ramey

Re: Request for Non-Standard Drilling Locations
Within the Project Area of the ARCO-Empire
Abo Unit Pressure Maintenance Project
Eddy County, New Mexico

Gentlemen:

Atlantic Richfield Company, operator of the Empire Abo Unit Pressure Maintenance Project, acting on behalf of itself and the other participating working interest owners, requests administrative approval under the provisions of Order No. R-4549-B, Rule 14, under "Special Rules and Regulations for the Empire Abo Pressure Maintenance Project," for the drilling of 25 Unit wells at non-standard locations shown on the attached Exhibit 1.

The proposed non-standard locations meet all requirements of Order R-4549-B, Rule 14, said wells being located "no closer than 660 feet to the outer boundary of said Unit, nor closer than 10 feet to any quarter-quarter section or subdivision inner boundary."

The proposed drilling of these wells is necessary to complete a more efficient producing pattern to conserve reservoir energy, promote the greatest ultimate recovery of Unit reserves, prevent waste, and protect correlative rights.

Very truly yours,

ATLANTIC RICHFIELD COMPANY

J. L. Tweed
J. L. Tweed
District Engineer

IJN/agp

cc: Mr. Bill Gressett
New Mexico Oil Conservation Commission
Artesia, New Mexico

EXHIBIT 1

ATLANTIC RICHFIELD COMPANY
EMPIRE ABO UNIT
PHASE V

UNIT WELL	LOCATION	ELEV. - G.L.
F-362	1850' FNL & 350' FEL Sec. 34, T-17S, R-28E	3674.6'
F-352	1330' FNL & 1980' FEL Sec. 34, T-17S, R-28E	3670.3'
F-353	2400' FNL & 2350' FEL Sec. 34, T-17S, R-28E	3661.4'
F-322	2480' FNL & 500' FEL Sec. 33, T-17S, R-28E	3665.2'
G-333	2100' FSL & 1100' FWL Sec. 34, T-17S, R-28E	3660.2'
G-313	2000' FSL & 2450' FEL Sec. 33, T-17S, R-28E	3662.6'
H-312	815' FSL & 2525' FEL Sec. 33, T-17S, R-28E	3664.9'
H-302	1250' FSL & 1925' FWL Sec. 33, T-17S, R-28E	3670.9'
H-303	800' FSL & 1340' FWL Sec. 33, T-17S, R-28E	3665.6'
H-294	1200' FSL & 700' FWL Sec. 33, T-17S, R-28E	3666.2'
H-295	700' FSL & 10' FWL Sec. 33, T-17S, R-28E	3666.4'
H-281	200' FSL & 660' FEL Sec. 32, T-17S, R-28E	3663.4'
I-291	200' FNL & 350' FWL Sec. 4, T-18S, R-28E	3662.7'
I-283	175' FNL & 300' FEL Sec. 5, T-18S, R-28E	3661.0'
J-234	1900' FNL & 2441' FEL Sec. 6, T-18S, R-28E	3677.6'
J-212	1900' FNL & 100' FWL Sec. 6, T-18S, R-28E	3649.7'
J-213	1950' FNL & 1300' FWL Sec. 6, T-18S, R-28E	3647.8'
J-214	2450' FNL & 400' FWL Sec. 6, T-18S, R-28E	3650.1'
J-203	2400' FNL & 700' FEL Sec. 1, T-18S, R-27E	3650.9'
K-193	2150' FSL & 2450' FEL Sec. 1, T-18S, R-27E	3635.4'
K-194	1500' FSL & 2130' FEL Sec. 1, T-18S, R-27E	3618.3'
L-154	750' FSL & 2550' FEL Sec. 2, T-18S, R-27E	3553.4'
L-142	100' FSL & 1950' FWL Sec. 2, T-18S, R-27E	3555.6'
L-143	1200' FSL & 1900' FWL Sec. 2, T-18S, R-27E	3528.0'
M-132	625' FNL & 175' FWL Sec. 11, T-18S, R-27E	3540.6'



STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION

April 26, 1978

JERRY APODACA
GOVERNOR

NICK FRANKLIN
SECRETARY

POST OFFICE BOX 2000
STATE LAND OFFICE BUILDING
SANTA FE, NEW MEXICO 87501
(505) 827-2434

Atlantic Richfield Company
P. O. Box 1610
Midland, Texas 79701

Attention: J. L. Tweed

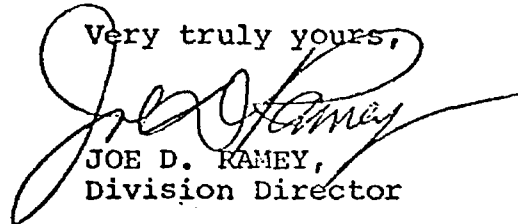
Administrative Order NSL-937

Gentlemen:

The Division Director hereby approves the non-standard location for 25 Atlantic Richfield Company Empire Abo Unit Wells, Empire Abo Pool, Eddy County, New Mexico, as shown on Exhibit 1 of their application dated April 4, 1978 and attached hereto.

These producing wells are approved under the provisions of Rule 14 of Order No. R-4549-B, in order to permit the operator to complete a more efficient production pattern within said unit in said pool.

Very truly yours,



JOE D. RAMEY,
Division Director

JDR/RLS/dr

cc: Oil & Gas Engineering Committee - Hobbs
Oil Conservation Division - Artesia
Central Leasing - State Land Office - Santa Fe

EXHIBIT 1

ATLANTIC RICHFIELD COMPANY
EMPIRE ABO UNIT
PHASE V

UNIT WELL	LOCATION	ELEV. - G.L.
F-362	1850' FNL & 350' FEL Sec. 34, T-17S, R-28E	3674.6'
F-352	1330' FNL & 1980' FEL Sec. 34, T-17S, R-28E	3670.3'
F-353	2400' FNL & 2350' FEL Sec. 34, T-17S, R-28E	3661.4'
F-322	2480' FNL & 500' FEL Sec. 33, T-17S, R-28E	3665.2'
G-333	2100' FSL & 1100' FWL Sec. 34, T-17S, R-28E	3660.2'
G-313	2000' FSL & 2450' FEL Sec. 33, T-17S, R-28E	3662.5'
H-312	815' FSL & 2525' FEL Sec. 33, T-17S, R-28E	3664.9'
H-302	1250' FSL & 1925' FWL Sec. 33, T-17S, R-28E	3670.9'
H-303	800' FSL & 1340' FWL Sec. 33, T-17S, R-28E	3665.6'
H-294	1200' FSL & 700' FWL Sec. 33, T-17S, R-28E	3666.2'
H-295	700' FSL & 10' FWL Sec. 33, T-17S, R-28E	3666.4'
H-281	200' FSL & 660' FEL Sec. 32 T-17S, R-28E	3663.4'
I-291	200' FNL & 350' FWL Sec. 4, T-18S, R-28E	3662.7'
I-283	175' FNL & 300' FEL Sec. 5, T-18S, R-28E	3661.0'
J-234	1900' FNL & 2441' FEL Sec. 6, T-18S, R-28E	3677.6'
J-212	1900' FNL & 100' FWL Sec. 6, T-18S, R-28E	3649.7'
J-213	1950' FNL & 1300' FWL Sec. 6, T-18S, R-28E	3647.8'
J-214	2450' FNL & 400' FWL Sec. 6, T-18S, R-28E	3650.1'
J-203	2400' FNL & 700' FEL Sec. 1, T-18S, R-27E	3650.9'
K-193	2150' FSL & 2450' FEL Sec. 1, T-18S, R-27E	3635.4'
K-194	1500' FSL & 2130' FEL Sec. 1, T-18S, R-27E	3618.3'
L-154	750' FSL & 2550' FEL Sec. 2, T-18S, R-27E	3553.4'
L-142	100' FSL & 1950' FWL Sec. 2, T-18S, R-27E	3555.6'
L-143	1200' FSL & 1900' FWL Sec. 2, T-18S, R-27E	3528.0'
M-132	625' FNL & 175' FWL Sec. 11, T-18S, R-27E	3540.6'



November 20, 1978

Energy & Minerals Department
Oil Conservation Division
P. O. Box 2088
Santa Fe, New Mexico 87501

Attn: Mr. J. D. Ramey

Re: Request for Non-Standard Drilling Locations
Within the Project Area of the ARCO-Empire
Abo Unit Pressure Maintenance Project
Eddy County, New Mexico

Gentlemen:

Atlantic Richfield Company, as operator of the Empire Abo Unit Pressure Maintenance Project, acting on behalf of itself and the other participating working interest owners, requests administrative approval under the provisions of Order No. R-4549-B, Rule 14 under "Special Rules and Regulations for the Empire Abo Pressure Maintenance Project," for the drilling of 50 Unit wells at non-standard locations shown on the attached Exhibit 1.

The proposed non-standard locations meet all requirements of Order R-4549-B, Rule 14, said wells being located "no closer than 660 feet to the outer boundary of said Unit, nor closer than 10 feet to any quarter-quarter section of subdivision inner boundary.

The proposed drilling of these wells is necessary to complete a more efficient producing pattern to conserve reservoir energy, promote the greatest ultimate recovery of Unit reserves, prevent waste, and protect correlative rights.

Very truly yours,

ATLANTIC RICHFIELD COMPANY

J. L. Tweed
District Engineer

IJN/agp

cc: Mr. Bill Gressett
Energy & Minerals Dept.,
Oil Conservation Div.,
Artesia, New Mexico

EXHIBIT 1
EMPIRE ABO UNIT

PHASE VI

ELEV. GL	WELL NAME	LOCATION	SEC.	TWP-S	RANGE-E
3675.9	E-362	1200' FNL & 1200' FEL	34	17	28
3665.5	D-361	136' FSL & 800' FEL	27	17	28
3673.5	E-363	650' FNL & 120' FEL	34	17	28
3680.7	E-374	220' FNL & 700' FWL	35	17	28
3679.3	E-383	1190' FNL & 1910' FWL	35	17	28
3681.0	E-384	600' FNL & 1400' FWL	35	17	28
3685.5	E-392	959' FNL & 2400' FEL	35	17	28
3686.1	E-393	1100' FNL & 2250' FEL	35	17	28
3677.9	E-394	1000' FNL & 1600' FEL	35	17	28
3676.2	E-395	75' FNL & 1820' FEL	34	17	28
3674.8	F-334	1700' FNL & 620' FWL	34	17	28
3664.3	F-335	2250' FNL & 570' FWL	34	17	28
3672.1	F-342	1450' FNL & 1900' FWL	34	17	28
3662.2	F-343	2300' FNL & 1675' FWL	34	17	28
3666.9	F-354	1850' FNL & 2550' FEL	34	17	28
3663.3	F-363	2250' FNL & 1250' FEL	35	17	28
3679.3	F-373	1820' FNL & 150' FWL	35	17	28
3674.8	F-374	2525' FNL & 520' FWL	35	17	28
3681.2	F-375	1780' FNL & 1175' FWL	35	17	28
3685.3	F-376	1335' FNL & 700' FWL	35	17	28
3675.6	F-382	2400' FNL & 1600' FWL	35	17	28
3678.4	F-383	1600' FNL & 2350' FWL	35	17	28
3680.6	F-391	1545' FNL & 1625' FEL	33	17	28
3665.7	G-291	2000' FSL & 1200' FWL	33	17	28
3661.7	G-314	1450' FSL & 2000' FEL	33	17	28
3662.6	G-315	1900' FSL & 1450' FEL	33	17	28
3662.3	G-324	2250' FSL & 235' FEL	34	17	28
3661.4	G-334	2400' FSL & 500' FWL	34	17	28
3662.2	G-352	2200' FSL & 1450' FEL	34	17	28
3663.8	G-353	1420' FSL & 2050' FEL	34	17	28
3670.5	G-361	2400' FSL & 300' FEL	34	17	28

Exhibit 1
 Empire Abo Unit
 Phase VI
 (cont'd.)

<u>ELEV.</u> <u>GL</u>	<u>WELL</u> <u>NAME</u>	<u>LOCATION</u>	<u>SEC.</u>	<u>TWP-S</u>	<u>RANGE-E</u>
3660.9	H-341	1200' FSL & 2500' FWL	34	17	28
3663.6	I-292	485' FNL & 1070' FWL	4	18	28
3672.9	J-235	1750' FNL & 1600' FEL	6	18	28
3517.0	K-131	1500' FSL & 600' FWL	2	18	27
3523.4	K-142	1700' FSL & 1400' FWL	2	18	27
3533.0	K-143	1820' FSL & 2550' FWL	2	18	27
3558.7	K-161	1310' FSL & 590' FEL	2	18	27
3521.4	L-122	100' FSL & 430' FEL	3	18	27
3501.4	L-123	660' FSL & 250' FEL	3	18	27
3518.5	L-133	800' FSL & 950' FWL	2	18	27
3535.3	L-134	10' FSL & 640' FWL	2	18	27
3552.7	L-155	1040' FSL & 2025' FEL	2	18	27
3574.8	L-156	600' FSL & 1330' FEL	2	18	27
3588.6	L-171	670' FSL & 300' FWL	1	18	27
3630.3	L-191	1120' FSL & 1440' FEL	1	18	27
3533.2	M-123	1050' FNL & 100' FEL	10	18	27
3557.0	M-133	450' FNL & 1175' FWL	11	18	27
3574.8	M-141	225' FNL & 2280' FWL	11	18	27
3593.0	M-153	200' FNL & 1925' FEL	11	18	27

Due to surface conditions, the following wells will be drilled directionally at the surface location mentioned above, and bottomed within a circle of 150' radius with its center being the bottom hole location specified below.

D-361	Surface location 136' FSL & 800' FEL, Sec. 27, T-17S, R-28E Bottom hole location 300' FNL & 500' FEL, Sec. 34, T-17S, R-28E
E-392	Surface location 959' FNL & 2400' FEL, Sec. 35, T-17S, R-28E Bottom hole location 600' FNL & 2500' FEL, Sec. 35, T-17S, R-28E
K-131	Surface location 1500' FSL & 600' FWL, Sec. 2, T-18S, R-27E Bottom hole location 1600' FSL & 250' FWL, Sec. 2, T-18S, R-27E
L-133	Surface location 800' FSL & 950' FWL, Sec. 2, T-18S, R-27E Bottom hole location 1250' FSL & 700' FWL, Sec. 2, T-18S, R-27E



STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION

JERRY APODACA
GOVERNOR

NICK FRANKLIN
SECRETARY

December 12, 1978

POST OFFICE BOX 2085
STATE LAND OFFICE BUILDING
SANTA FE, NEW MEXICO 87501
(505) 827-2434

Atlantic Richfield Company
P. O. Box 1610
Midland, Texas 79702

Attention: J. L. Tweed

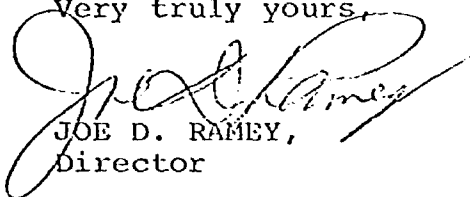
Administrative Order NSL-999

Gentlemen:

Reference is made to your application for 46 non-standard locations for your ARCO-Empire Abo Unit Wells as per the attached list, Eddy County, New Mexico.

By authority granted me under the provisions of Rule 14 of Order No. R-4549-B, the 46 listed non-standard locations are hereby approved.

Very truly yours,


JOE D. RAMEY,
Director

JDR/RLS/dr

cc: Oil Conservation Division - Artesia
Oil & Gas Engineering Committee - Hobbs
U. S. Geological Survey - Artesia
Oil & Gas Division - State Land Office - Santa Fe

EMPIRE ABO UNIT WELLS

WELL NAME	LOCATION	SEC.	TWP-S	RANGE-E
E-362	1200' FNL and 1200' FEL	34	17	28
E-363	650' FNL and 120' FEL	34	17	28
E-374	220' FNL and 700' FWL	35	17	28
E-383	1190' FNL and 1910' FWL	35	17	28
E-384	600' FNL and 1400' FWL	35	17	28
E-393	1100' FNL and 2250' FEL	35	17	28
E-394	1000' FNL and 1600' FEL	35	17	28
E-395	75' FNL and 1820' FEL	35	17	28
F-334	1700' FNL and 620' FWL	34	17	28
F-335	2250' FNL and 570' FWL	34	17	28
F-342	1450' FNL and 1900' FWL	34	17	28
F-343	2300' FNL and 1675' FWL	34	17	28
F-354	1850' FNL and 2550' FEL	34	17	28
F-363	2250' FNL and 1250' FEL	34	17	28
F-373	1820' FNL and 150' FWL	35	17	28
F-374	2525' FNL and 520' FWL	35	17	28
F-375	1780' FNL and 1175' FWL	35	17	28
F-376	1335' FNL and 700' FWL	35	17	28
F-382	2400' FNL and 1600' FWL	35	17	28
F-383	1600' FNL and 2350' FWL	35	17	28
F-391	1545' FNL and 1625' FEL	35	17	28
G-291	2000' FSL and 1200' FWL	33	17	28
G-314	1450' FSL and 2000' FEL	33	17	28
G-315	1900' FSL and 1450' FEL	33	17	28
G-324	2250' FSL and 235' FEL	33	17	28
G-334	2400' FSL and 500' FWL	34	17	28
G-352	2200' FSL and 1450' FEL	34	17	28
G-353	1420' FSL and 2050' FEL	34	17	28
G-361	2400' FSL and 300' FEL	34	17	28
H-341	1200' FSL and 2500' FWL	34	17	28
I-292	485' FNL and 1070' FWL	4	18	28
J-235	1750' FNL and 1600' FEL	6	18	28
K-142	1700' FSL and 1400' FWL	2	18	27
K-143	1820' FSL and 2550' FWL	2	18	27
K-161	1310' FSL and 590' FEL	2	18	27
L-122	100' FSL and 430' FEL	3	18	27
L-123	660' FSL and 250' FEL	3	18	27
L-134	10' FSL and 640' FWL	2	18	27
L-155	1040' FSL and 2025' FEL	2	18	27
L-156	600' FSL and 1330' FEL	2	18	27
L-171	670' FSL and 300' FWL	1	18	27
L-191	1120' FSL and 1440' FEL	1	18	27
M-123	1050' FNL and 100' FEL	10	18	27
M-133	450' FNL and 1175' FWL	11	18	27
M-141	225' FNL and 2280' FWL	11	18	27
M-153	200' FNL and 1925' FEL	11	18	27

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION

IN THE MATTER OF THE HEARING
CALLED BY THE OIL CONSERVATION
DIVISION FOR THE PURPOSE OF
CONSIDERING:

CASE NO. 6409
Order No. R-5906

APPLICATION OF ATLANTIC RICHFIELD
COMPANY FOR DIRECTIONAL DRILLING,
EDDY COUNTY, NEW MEXICO.

ORDER OF THE DIVISION

BY THE DIVISION:

This cause came on for hearing at 9 a.m. on December 20, 1978, at Santa Fe, New Mexico, before Examiner Daniel S. Nutter.

NOW, on this 16th day of January, 1979, the Division Director, 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 Division has jurisdiction of this cause and the subject matter thereof.

(2) That the applicant, Atlantic Richfield Company, seeks approval for the directional drilling of four wells on its Empire Abo Unit Area, Empire-Abo Pool, Eddy County, New Mexico, as follows:

In Township 17 South, Range 28 East:

Well No. D-361, surface location 136 feet from the South line and 800 feet from the East line of Section 27, bottom-hole location 300 feet from the North line and 500 feet from the East line of Section 34; this well would be designated as being in Unit A of Section 34.

Well No. E-392, surface location 959 feet from the North line and 2400 feet from the East line, bottom-hole location 600 feet from the North line and 2500 feet from the East line, in Unit C of Section 35.

In Township 18 South, Range 27 East:

Well No. K-131, surface location 1500 feet from the South line and 600 feet from the West line, bottom-hole location 1600 feet from the South line and 250 feet from the West line, in Unit L of Section 2; and

Well No. L-133, surface location 800 feet from the South line and 950 feet from the West line, bottom-hole location 1250 feet from the South line and 700 feet from the West line, in Unit M of Section 2.

(3) That all of the above wells would be bottomed at unorthodox locations within 150 feet of the described bottom-hole locations.

(4) That the applicant should be required to determine the subsurface locations of the bottom of the holes of each of the wells by means of a continuous multi-shot directional drilling, if said well is to be completed as a producing well.

(5) That approval of the subject application will prevent the drilling of unnecessary wells, avoid the augmentation of risk arising from the drilling of an excessive number of wells, and otherwise prevent waste and protect correlative rights.

IT IS THEREFORE ORDERED:

(1) That the applicant, Atlantic Richfield Company, is hereby authorized to directional drill four wells on its Empire Abo Unit Area, Empire-Abo Pool, Eddy County, New Mexico, bottoming them at unorthodox locations as follows:

In Township 17 South, Range 28 East:

Well No. D-361, surface location 136 feet from the South line and 800 feet from the East line of Section 27, bottom-hole location 300 feet from the North line and 500 feet from the East line of Section 34 in Unit A;

Well No. E-392, surface location 959 feet from the North line and 2400 feet from the East line, bottom-hole location 600 feet from the North line and 2500 feet from the East line, Section 35 in Unit C.

In Township 18 South, Range 27 East:

Well No. K-131, surface location 1500 feet from the South line and 600 feet from the West line, bottom-hole location 1600 feet from the South line and 250 feet from the West line, Section 2 in Unit L; and

-3-

Case No. 6409
Order No. R-5906

Well No. L-133, surface location 800 feet from the South line and 950 feet from the West line, bottom-hole location 1250 feet from the South line and 700 feet from the West line, Section 2 in Unit M.

(2) That all of the above wells would be bottomed at unorthodox locations within 150 feet of the described bottom-hole locations.

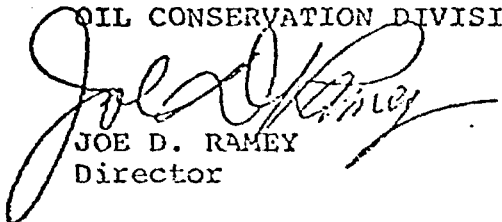
PROVIDED HOWEVER, that subsequent to the above-described directional drilling, should any of said wells be a producer, a continuous multi-shot directional survey shall be made of the wellbore from total depth to the surface with shot points not more than 100 feet apart; that the operator shall cause the surveying company to forward a copy of the survey report directly to the Santa Fe office of the Division, Box 2088, Santa Fe, New Mexico, and that the operator shall notify the Division's Artesia District Office of the date and time said survey is to be commenced.

(3) That Form C-105 shall be filed in accordance with Division Rule 1105 and the operator shall indicate thereon true vertical depths in addition to measured depths.

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

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

STATE OF NEW MEXICO
OIL CONSERVATION DIVISION


JOE D. RAMEY
Director

S E A L

fd/

Empire Abo Unit
Infill Wells Approved
By New Mexico Oil
Conservation Division

<u>Application Submittal Date</u>	<u>Phase</u>	<u>Well</u>	<u>Status 6-1-79</u>	
			<u>Completed</u>	<u>To Be Completed</u>
9/10/74	I-A	F-331	X	
		J-211	X	

Empire Abo Unit
 Infill Wells Approved
 By New Mexico Oil
 Conservation Division

Exhibit 2

Application Submittal Date	Phase	Well	Status 6-J-79	
			Completed	To Be Completed
3/6/75	I	E-371	X	
		E-381	X	
		F-351	X	
		G-291	Deleted	
		G-311	X	
		H-261	X	
		H-271	X	
		H-291	X	
		I-231	X	
		J-191	X	
		J-201	X	
		K-181	X	
		L-141	X	
		L-151	X	
		M-121	X	
Added Well		J-231	X	

Empire Abo Unit
 Infill Wells Approved
 By New Mexico Oil
 Conservation Division

Application Submittal Date	Phase	Well	Status 6-1-79	
			Completed	To Be Completed
12/8/75	II	E-382	X	
		E-391	X	
		E-401	Deleted	
		F-371	X	
		G-312	X	
		G-321	X	
		G-331	X	
		G-341	X	
		I-271	X	
		J-202	X	
		J-221	X	
		J-232	X	
		K-182	X	
		L-111	X	
		L-131	X	
		L-132	X	
		L-152	X	
Added Wells		K-191	X	
		G-301	X	

Empire Abo Unit
Infill Wells Approved
By New Mexico Oil
Conservation Division

Application Submittal Date	Phase	Well	Status 6-1-79	
			Completed	To Be Completed
10/22/76	III-A	F-332	X	
		F-361	X	
		G-342	X	

Empire Abo Unit
 Infill Wells Approved
 By New Mexico Oil
 Conservation Division

Application Submittal Date	Phase	Well	Status 6-1-79	
			Completed	To Be Completed
11/3/76	III-B	E-372	X	
		E-401	Deleted	
		F-372	X	
		F-381	X	
		G-351	X	
		H-272	X	
		H-292	X	
		H-293	X	
		H-311	X	
		I-281	X	
		J-222	X	
		K-141	X	
		K-183	X	
		L-112	Deleted	
		L-121	X	
		L-153	X	
		M-91	X	X Changed Number to M-901
		M-101		X
		M-122		X Changed Number to N-901
		N-91		
Added Wells		F-341	X	
		F-372	X	
		F-333	X	

Empire Abo Unit
 Infill Wells Approved
 By New Mexico Oil
 Conservation Division

Application Submittal Date	Phase	Well	Status 6-1-79	
			Completed	To Be Completed
12/29/77	IV	E-373	X	
		E-361	X	
		E-351	X	
		E-341	X	
		F-321	X	
		G-322	X	
		I-272	X	
		K-231	X	
		M-152	X	
		M-131		X
		G-343	X	
		G-332	X	
		G-323	X	
		H-331	X	
		H-321	X	
		H-322	X	
		H-301	X	
		I-282	X	
		J-233	X	
		K-232		X
		K-184	X	
		J-223	X	
		K-192	X	
		M-151	X	
		I-273	X	

Empire Abo Unit
 Infill Wells Approved
 By New Mexico Oil
 Conservation Division

Application Submittal Date	Phase	Well	Status 6-1-79	
			Completed	To Be Completed
4/4/78	V	F-362	X	
		F-352	X	
		F-353	X	
		F-322	X	
		G-333	X	
		G-313	X	
		H-312	X	
		H-302	X	
		H-303	X	
		H-294	X	
		H-295	X	
		H-281	X	
		I-291	X	
		I-283	X	
		J-234	X	
		J-212	Deleted	
		J-213	Deleted	
		J-214	Completed as J-212	
		J-203	X	
		K-193	X	
		K-194	X	
		L-154	X	
		L-142	X	
		L-143	X	
		M-132		X
Added Wells		I-251	X	
		I-261	X	

EXHIBIT 2

EMPIRE ABO UNIT
INFILL WELLS APPROVED
BY NEW MEXICO OIL
CONSERVATION DIVISION

<u>Application Submittal Date</u>	<u>Phase</u>	<u>Well</u>	<u>Status, 6-1-79</u> <u>Completed</u>	<u>To be Completed</u>
11/20/78	VI	D-361	X	
		E-362	X	
		E-363	X	
		E-374	X	
		E-383	X	
		E-384	X	
		E-392	X	
		E-393	X	
		E-394	Deleted	
		E-395	X	
		F-334		X
		F-335	X	
		F-342	X	
		F-343	X	
		F-354	X	
		F-363	X	
		F-373	X	
		F-374	X	
		F-375	X	
		F-376	X	
		F-382	X	
		F-383	X	
		F-391		X
		G-291	X	
		G-314	X	
		G-315	X	
		G-324	X	
		G-334	X	
		G-352	X	
		G-353		X
		G-361	X	

EMPIRE ABO UNIT
INFILL WELLS APPROVED
BY NEW MEXICO OIL
CONSERVATION DIVISION

<u>Application Submittal Date</u>	<u>Phase</u>	<u>Well</u>	<u>Status, 6-1-79</u> <u>Completed</u>	<u>To be Completed</u>		
11/20/78	VI	H-341		X		
		I-292		X		
		J-235		X		
		K-131	X			
		K-142		X		
		K-143	X			
		K-161				
		L-122		X		
		L-123		X		
		L-133	X			
		L-134	X			
		L-155	X			
		L-156	X			
		L-171		X		
		L-191	Deleted			
		M-123		X		
		M-133		X		
		M-141		X		
		M-153		X		
		Added Wells		F-336		X
				F-364		X

dearnley, meier & mc cormick

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1216 FIRST NATIONAL BANK BLDG., EAST ALBUQUERQUE, NEW MEXICO 87106

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BEFORE THE
NEW MEXICO OIL CONSERVATION COMMISSION
MORGAN HALL
STATE LAND OFFICE BUILDING
SANTA FE, NEW MEXICO
Wednesday, April 25, 1973

EXAMINER HEARING

IN THE MATTER OF:

Application of Atlantic Richfield Company
for a unit agreement, Eddy County,
New Mexico

Case No. 4952

IN THE MATTER OF:

Application of Atlantic Richfield Company
for a pressure maintenance project, Eddy
County, New Mexico

Case No. 4953

BEFORE: Richard L. Stamets

TRANSCRIPT OF HEARING

REPORT OF EXAMINER	
OIL CONSERVATION DIVISION	
Arco	EXHIBIT NO. <u>3</u>
CASE NO.	<u>6553</u>

1 MR. STAMETS: They are.

2 Q Now, have you prepared or has there been prepared under
3 your direction certain exhibits for introduction in this
4 case?

5 A Yes, sir. There has.

6 Q And they have been marked Exhibits 4 through 12?

7 A That's correct.

8 Q Refer to Exhibit 4 and explain what this is and what it
9 shows.

10 A Exhibit 4 happens to be a map of the Empire-Abo pool
11 contoured on the top of the Abo porous reef. The subsea
12 contours are shown. You can readily see by looking off to
13 the southwest that probably the structurally highest well
14 in the field is the Malco Federal Number 8 which happens to
15 be located in the northwest quarter of the southeast
16 quarter of 9, 18 South, 27 East, at the top of the Abo
17 reef at minus 1621 feet subsea, as you can see there.

18 From this point, the crest of the reef can be followed
19 around dipping at about 1 degree. Approximately miles east
20 of that point, the crest of the reef dips below water-oil
21 contact in the Abo formation which was determined by
22 the engineering committee to minus 2665 feet subsea. The
23 heavy dashed line is the unit area which was approved by
24 USGS as being a proper area for unitization of the Abo
25 formation.

bottom, daily water production, so labeled.

And in January that production is ²⁵³⁶25,036 barrels of water per day which amounts to about 9 per cent of the water-oil combined production. That amount of production to 2-1-73 represents 23.4 per cent of the original oil in place.

Moving up to the next curve of cumulative gas, you see that along with this oil production we have had gas production, of course. And our cumulative gas production as of the end of '73 is 118 billion cubic feet. The curve on the ^{right} white is in, well, it's again, it's in millions of barrels of oil for the cumulative. And it is in billions of cubic feet for the gas cumulative. So we have produced almost 90 million barrels in this curve of oil and the 118 billion cubic feet of gas through the year of 1972.

If we move on up to the curve that is plotted across the top, this is as indicated on the left margin, this is your reservoir pressures, ^{points} points per square inch on the vertical scale. Plotted it is the heavy line as indicated by words "Reservoir Pressure." 2355 is the point back here in November of 1957 at the beginning of production.

The last pressure survey taken in July of 1972 was 1,418 PSI, again plotted far over here to right from the middle of 1972. The other curve which we haven't yet discussed is the gas-oil ratio curve which again is shown

BEFORE EXAMINER KUTTER

OIL CONSERVATION DIVISION

EXHIBIT NO.

CASE NO. 6553

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And in January that production is 25,036 barrels of water per day which amounts to about 9 per cent of the water-oil combined production. That amount of production to 2-1-73 represents 23.4 per cent of the original oil in place.

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BEFORE EXAMINER: NUTTER

OIL CONSERVATION DIVISION

EXHIBIT NO.

CASE NO. 6553

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BEFORE EXAMINER BUTTER

OIL CONSERVATION DIVISION
EXHIBIT NO. 2

CASE NO. 6553

on up here with the Reservoir Pressure curve. The gas-oil ratio curve is read over here in the right margin. Gas-oil ratio is cubic feet per barrel of oil. I think you can see that in that early days it was average perhaps, 1,100 cubic feet per barrel. That had been a gradual increase in the pool to the gas-oil ratio. However, it's been holding pretty steadily in the last few years and currently is averaging 1,300 cubic feet per barrel and 1,500 cubic feet per barrel.

Q Now, have the working interest owners formed an engineering committee in connection with the study of unitization in this area?

A Yes, sir. They certainly have.

Q When was that formed?

A That was formed at a working interest owner's meeting in October of 1967.

Q What was the purpose of the formation of this committee?

A The primary purpose charged to the engineering subcommittee. Actually there were two primary purposes. First, to determine the proper area to be unitized. And second, to work up a number of parameters which would be suitable as a basis for the working interest owners and to negotiate possible participation in a possible future unit.

Q Over what period of time did the engineering committee meet?

A It met in work sessions virtually continuously for anyone

1 field that has had a great deal more capacity than the
2 allowables. And as you can see in the middle '60's 15 to
3 16 thousand barrels a day and the market demand began to
4 pick up.

5 The Commission upped the New Mexico Allowables. You
6 can see the Empire-Abo's rate going right up. If you
7 plot an allowable curve to the state of New Mexico, it will
8 be parallel to this thing right here. Moving on out to
9 current times, I might say that just happened at the time
10 we plotted this curve. We didn't have January's data.
11 The curve shows that we are, I'm still on the oil rate
12 curve. It shows that we are producing at the end of the
13 year 1972 approximately 25,500 barrels per day from the pool
14 as a whole.

15 Moving up one curve, you find that cumulative oil
16 curve. This is the increased oil production in the
17 original first production back in November, 1957, to
18 1-1-72. And you see that as, I mean, 1-1-73. And you see
19 as of 1-1-73 approximately 89.5 million barrels of oil had
20 been produced from the reservoir.

21 Q Do you have any later figures on that?

22 A Well, we do have January which, you might imagine, is about
23 the same as December. Allowable stayed the same. It's
24 25,625 barrels of oil per day. I might mention the water
25 at this time is plotted on the low slide line down toward

BEFORE EXAMINER HUYER

OIL CONSERVATION DIVISION

EXHIBIT NO. 6553

CASE NO. 6553

bottom, daily water production, so labeled.

And in January that production is 25,036 barrels of water per day which amounts to about 9 per cent of the water-oil combined production. That amount of production to 2-1-73 represents 23.4 per cent of the original oil in place.

Moving up to the next curve of cumulative gas, you see that along with this oil production we have had gas production, of course. And our cumulative gas production as of the end of '73 is 118 billion cubic feet. The curve on the white is in, well, it's again, it's in millions of barrels of oil for the cumulative. And it is in billions of cubic feet for the gas cumulative. So we have produced almost 90 million barrels in this curve of oil and the 118 billion cubic feet of gas through the year of 1972.

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The last pressure survey taken in July of 1972 was 1,418 PSI, again plotted far over here to right from the middle of 1972. The other curve which we haven't yet discussed is the gas-oil ratio curve which again is shown

1 by necessity. Nevertheless, the attempt was to reflect
2 the types of wells that are in the reservoir at the present
3 time, but I want to emphasize that these are not real
4 tests. This is a hypothetical production, because we
5 haven't got through March, 1974 yet. We will get there, we
6 hope.

7 Okay. And then you move on over. That's the first
8 two pages, and then you move over to the last three pages,
9 1, 2, 3. And some of you, I'm sorry, will not have the
very last page which is a table of fluid properties versus
reservoir pressure, but we will get them to. That's just
a foul up on our part, but any way those last three pages
are simply, they simply show how we arrived at the voidage
values that are over here on pages 1 and 2.

So under this allowable plan, the project area
reservoir voidage I want to emphasize will be reduced to
less than half of the current primary reservoir voidages.
Now, refer to Exhibit 8 and explain what this is and what
it shows.

A Well, Exhibit 8 would try to throw a little more color
into the proceedings here. Christmas red and green.
This is the same map that we looked at back over here
on one of the earlier, well, I guess it was Exhibit 4,
the very same structure map, the same unit outlined and so
forth; but it does now have the 8 injection wells as the
red triangles, the same 8 wells we looked at in

BEFORE EXAMINER

OIL CONSERVATION DIVISION

EXHIBIT NO. 1

CASE NO. 1

1 Exhibit 1 on the plan of operation on, I believe, Exhibit
2 6 a while ago.

3 Q Why were the injection wells located as you have shown
4 them on this presentation?

5 A Well, of course, there are a number of factors you have got
6 to consider. Of course, our intent here in what we are
7 going to do is put this down in the Gas Cap. So that was
8 number 1. We want to distribute it as equally as possible
9 to maintain pressure as much as we can throughout the
10 reservoir.

11 So the attempt is to distribute the wells
12 volumetrically over the reservoir.

13 Q And the Gas Cap is toward the north border of the reservoir?

14 A Well, the Gas Cap is over the whole structure virtually
15 and along the whole rest of the reef and and back to the
16 back reef. And these wells are located, of course, in
17 the Gas Cap. This was a primary consideration. You
18 have got to consider permeability, injectivity, are you
19 going to be able to get gas in the wells, and then
20 naturally, and this is why the green tracts are on here.

21 These green tracts are the same tracts that Mr. Embry
22 had on his map being those tracts that we have now reason
23 to believe likely will be in the unit. Naturally, we do not
24 want to damage in any way these tracts; and, therefore,
25 we are locating our injection wells as you can see by
looking at Exhibit A at least two locations away.

1 to be any point in repeating it. There is a little more
2 information in there. Paragraph 3 now is the basic
3 concepts. Now, I'm over on page 4. Paragraph 3 is the
4 basic concepts. "A. Field production history and Reservoir
5 Numeric Models Studies have demonstrated that reservoir
6 recovery is governed by a gravity drainage mechanism. With
7 unitization, the operator will be able to maximize beneficial
8 effects of this most efficient recovery mechanism by
9 careful observation of well performance and shutting in
10 or curtailing production from inefficient wells.

Paragraph B. Injection of plant residue gas will act
toward pressure maintenance and orderly control of
expansion of the secondary gas cap."

These are the concepts by which we will do our best
to operate this reservoir, this unit area. Paragraph 4
covers the special rules that we are going to request.

Q Go ahead and explain what the special rules are that you
are proposing.

A Paragraph 4 "Special Rules. A. Unit Allowable. Starting
on the effective date of the unit, the unit will receive a
unit allowable, calculated so that Unit Area reservoir
voidage will not exceed average daily reservoir voidage rate
for 1972." Let me see. Where am I? "This will result in
an increase from current 23,600 BOPD to about 30,000 BOPD
for the Unit Area."

BEFORE EXAMINER NUTTER

OIL CONSERVATION DIVISION

EXHIBIT NO. 10

CASE NO. 6553

BEFORE EXAMINER

OIL CONSERVATION COMMISSION

EXHIBIT NO. 11

CASE NO. 6553

EXH. 11

Page 1

BEFORE THE
NEW MEXICO OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
April 10, 1974

EXAMINER HEARING

IN THE MATTER OF:

Application of Cities
Service Oil Company for
a unit agreement, Eddy
County, New Mexico.

Case No. 5212

and

IN THE MATTER OF:

Application of Cities
Service Oil Company for
a pressure maintenance
project, Eddy County,
New Mexico.

Case No. 5213

BEFORE: Richard L. Stamets, Examiner.

TRANSCRIPT OF HEARING

A P P E A R A N C E S

For the New Mexico Oil
Conservation Commission:

Thomas Derryberry, Esq.
Legal Counsel for the
Commission
State Land Office Building
Santa Fe, New Mexico

THE NYE REPORTING SERVICE
STATE-WIDE DEPOSITION NOTARIES
225 JOHNSON STREET
SANTA FE, NEW MEXICO 87501
TEL. (505) 982-0386

Now, this same factor immediately prior to unitization in September, for which I just gave you the voidage figure for the Unit, was 2.66 reservoir barrels. I don't have this in the table but, in other words, although we increased the oil rate from 23,252 to 32,891 barrels per day, we reduced the voidage-efficiency factor from 2.66 reservoir barrels per stock-tank barrel down to 1.71. So we had a sizeable reduction, and, of course, the lower you get with reservoir-voidage-efficiency factor simply means you're voiding less space per barrel of production and therefore you're holding the pressure up longer and you get this increased effect in a gravity drainage reservoir; the longer you can hold the pressure up relative to oil production the more recovery you are going to have. This is another way of stating the fact that you have a flattening in the pressure curve and the flattening is because of this improved efficiency factor.

17 Okay, moving to Column 7 here we simply took the total 56,319 reservoir-net-voidage rate divided by those 221 wells over there in Column 1 and got a figure of 255 reservoir barrels per day, reservoir-voidage rate, just putting it on a per well basis.

Column 8 puts the allowable production of 56,513

BEFORE THE
OIL CONSERVATION COMMISSION
EXHIBIT NO. 12
CASE NO. 6553

EXH. 12

Page 1

BEFORE THE
NEW MEXICO OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
April 10, 1974

EXAMINER HEARING

IN THE MATTER OF:

Application of Cities
Service Oil Company for
a unit agreement, Eddy
County, New Mexico.

Case No. 5212

and

IN THE MATTER OF:

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Service Oil Company for
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project, Eddy County,
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BEFORE: Richard L. Stamets, Examiner.

TRANSCRIPT OF HEARING

A P P E A R A N C E S

For the New Mexico Oil
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comparisons I was making earlier, and the only place that gas can come from is the big unit which adjoins it and which is connected, which I certainly believe and which we've had testimony from the Citgo witness that the two unit areas are connected.

Q And that in itself, in your opinion, is a violation of correlative rights?

A Yes, sir, I would say that it is, in my opinion.

Now, we move ahead further in this summation. We feel that if the Citgo Unit is governed by the same voidage formula and controls as the Arco Unit it will give the NMOCC a means to reduce Citgo Unit reservoir voidage below present levels, admittedly somewhat inefficient as we have seen here, resulting in more efficient operations of the reservoir and tending to increase the ultimate oil recovery from the pool and I mean that the same thing that operate on them, when you set them a voidage limit like you've set us a voidage limit, then they're going to be going out there and spending money to work over wells and try to get as low in the reef as they can and produce at as low a gas-oil ratio as they can because they've got that 1559 barrel a day voidage number staring them in the face and we've got a number staring us in the

face and believe me it creates quite an incentive to go for the low-ratio wells in terms of production, and this is what you'd want to do in this reservoir if you want to maximize ultimate recovery. So setting a voidage limit is quite a carrot in front of an operator to try to get his ratio down as low as possible whereas in a gas-siphon type operation this is not as critical. About the only thing that's critical is how much gas can you get in that injection well. Now, okay, as I wanted to say again, in setting a reservoir voidage limit for the Citgo Unit Atlantic Richfield recommends the NMOCC use its best judgment after a complete review of the facts, however, we strongly recommend a voidage limit no greater than 1559 reservoir barrels per day be granted to the Citgo Unit, and just as is the Arco Unit the Citgo Unit should be required to inject back into the Abo gas cap all available plant residue gas. That completes my summation.

MR. HINKLE: We would like to offer into evidence Exhibits 1 through 5.

MR. STAMETS: Is there any objection to Exhibits 1 through 5?

MR. KELLAHIN: No objection

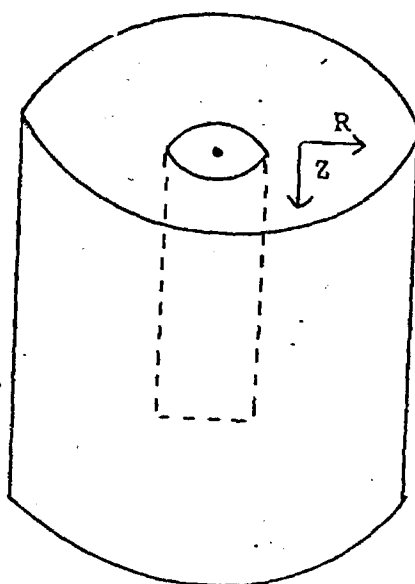
SINGLE WELL MULTIPHASE CONING SIMULATOR

(3-PHASE COMPRESSIBLE CONING)

Introduction

This program is designed to predict the ability of an individual oil or gas well to cone fluids into the wellbore. The model is extremely flexible in that a large variety of conditions may be simulated with only a minimum amount of data input.

The program is particularly useful for determining the effect of coning gas downward and/or water upward into the wellbore perforations as producing rates vary. Descriptive output is generated to show the cone growth and the changes that occur in saturations within the cone area. As gas and/or water is coned into the wellbore, production rates reflect the change to multiphase flow. The program numerically solves the partial differential equations which describe three-phase compressible transient flow in cylindrical coordinates. That is, an R-Z (radial-vertical) coordinate system is employed so that the reservoir under consideration assumes symmetry in the angular direction. The geometry is shown in Figure 1.



BEFORE EXAMINATION	
OIL CONSERVATION DIVISION	
Also	EXHIBIT NO. 14
CASE NO.	6553

FIGURE 1

The reservoir has the shape of a right circular cylinder with a radius (R) and a thickness (Z). The wellbore with a radius (R_W) is located at the center of the cylinder from which production and/or injection of fluids occur. Areal reservoir heterogeneities are accounted for by variable permeabilities, porosities, and saturations which are read as input data.

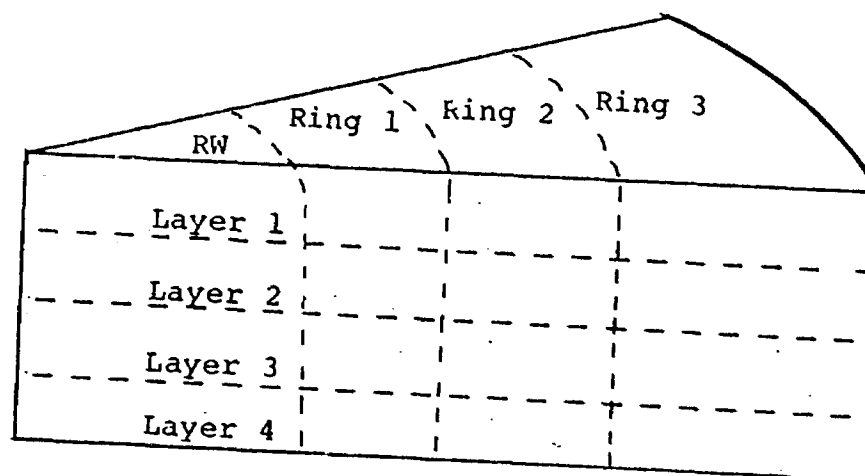


FIGURE 2

The areal reservoir description is described by concentric rings as indicated in Figure 2. Vertical heterogeneties are accounted for in a similar fashion with various reservoir layers, again shown in Figure 2.

The solution technique employed in this model is unconditionally stable which means that the time step size is limited only by the desired accuracy and not the pore volume of the smallest cell. This model typically employs time steps where 1000 times a block's pore volume can flow through it in a single time step.

The final result is a coning model which simulates years of real time in seconds and solves problems for a few dollars which a few months ago cost thousands.

Special Features

- By simply manipulating the input data the program can handle a domal reservoir geometry rather than cylindrical shape.
- Gas-oil ratios and water-oil ratios are monitored each time step to reflect the growth of the unwanted phases. When one or both of these indications increase to a

pre-set limiting value, the computer run is ended to prevent additional unneeded calculations.

- The program allows different fluid properties and relative permeability and capillary pressure data for different layers.
- The unconditional stability allows very large time steps resulting in a model which will simulate years of real time in a few minutes.
- Time steps can be specified by the user or can be automatically selected by the program. The automatic selection process is designed to choose time steps which minimize the running time while keeping the numerical errors within a specified bounds.
- A restart feature is included in the program so that the user can study alternatives which differ only in the late stages of the flood without repeating the entire run each time.
- The program checks for a variety of types of data input errors and in the event of their occurrence, terminates the run and prints the error which occurred.
- Predicted results are monitored at each time step through a cumulative material balance (for each phase) for the entire reservoir and by an incremental material balance for each time step.
- A minimum amount of input data are required, as options are available ranging from a homogeneous reservoir option with very little input data requirements, up to a full heterogeneous reservoir option where properties can be varied at each grid block.
- A horizontal fraction can be simulated by varying only the input data.
- The user has control over the time and amount of output so that detailed information can be obtained for matching field data at any specified times.

Uses

- Determine optimum producing rates by simulating many different producing rate conditions

- Determine optimum location of perforations
- Improve reservoir description or obtain information about aquifer activity by history matching
- Select optimum well density within a field by comparing results which use various external drainage radii
- Achieve the twofold objective of determining a producing rate which inhibits serious coning and at the same time effectively drains the reservoir
- Perform depletion and pressure maintenance studies of single well reef pools (a single study predicts field performance while determining ultimate sandwich losses)

Examples

A recent application of this model was a depletion study of a number of single well reef pools under various operating strategies. These results were presented to a regulatory body and the result of the hearing increased allowables for these pools 40%. At the same hearing 90% of the pools in the same area had allowables cut over 20%.

Another recent application of this model was a coning study of a large gas field in Canada. Early in the life of this field, a number of the wells began producing water and the operator became concerned about the future performance of this field. An extensive study was undertaken to determine:

- 1) the water influx into the pool
- 2) the individual well performance at various production rates

The study was completed and future rate schedules were determined which minimized water production. Coning was found not to be as serious as originally expected since reasonably large rates were permissible without serious water production. The field has been producing as predicted for five months.

Basic Equations

The equations used in this model to describe compressible multi-phase fluid flow in a porous media are a combination of the continuity equation plus Darcy's Law and are as follows:

$$\nabla \cdot \frac{kk_{ro}}{B_o \mu_o} \nabla (p_o - \rho_o gh) + q_{ov} = \phi \frac{\partial}{\partial t} \left(\frac{S_o}{B_o} \right) \quad \text{oil} \quad (1)$$

$$\nabla \cdot \frac{kk_{rw}}{B_w \mu_o} \nabla (p_w - \rho_w gh) - q_{wv} = \phi \frac{\partial}{\partial t} \left(\frac{S_w}{B_w} \right) \quad \text{water} \quad (2)$$

$$\nabla \cdot \frac{kk_{rg}}{B_g \mu_g} \nabla (p_g - \rho_g hg) + \nabla \cdot R_s \frac{kk_{ro}}{B_o \mu_o} (p_o - \rho_o gh) - q_{gv} = \phi \frac{\partial}{\partial t} \left(\frac{S_o}{B_o} R_s + \frac{S_g}{B_g} \right) \quad \text{gas} \quad (3)$$

$$S_o + S_w + S_g = 1.0 \quad (4)$$

$$p_o = p_w + p_{cwo} \quad (5)$$

$$p_g = p_o + p_{cgo} \quad (6)$$

These equations are expanded using a cylindrical coordinate system (R-Z). The resulting equations are approximated by a fully implicit difference scheme which is unconditionally stable. This means that large volumes of fluid can pass through the small reservoir blocks near the wellbore in a single time step. In addition, large saturation changes may occur in these blocks without causing any numerical difficulties. A fast, stable, and accurate numerical scheme is used to solve the resulting non-linear system of difference equations.

Nomenclature

Variables:

B = formation volume factor, RB/STB or RB/MCF

g = gravitational constant

h = elevation

k = absolute permeability

k_r = relative permeability

p = pressure

P_c = capillary pressure

R_s = solution gas-oil ratio

S = saturation

t = time

μ = viscosity

ϕ = porosity

ρ = density

Subscripts:

g = gas phase

go = gas-oil system

o = oil phase

w = water phase

wo = water-oil system

Input Data Requirements

The reservoir description includes:

- a) Geometry such as thickness, drainage radius, well-bore, size and outline of reservoir
- b) Porosity and absolute permeability distributions, i.e., stratification
- c) Location of initial gas-oil and water-oil contacts or initial fluid and pressure distributions

The fluid properties needed are:

- a) Formation volume factors, solution gas-oil ratio and viscosities as functions of pressure
- b) Relative permeability and capillary pressure data as functions of saturation

The required operating information is:

- a) Well locations and rates
- b) Production strategy for workovers, limiting GOR and WOR information, etc.

In many cases, much of the above input data, required by the model, is uncertain or even unavailable. This, however, is not a serious drawback if reservoir performance data is available. The performance data is used in what is called the history matching phase. This is where the uncertain or unknown data is adjusted until the model simulates the actual reservoir performance. A very accurate reservoir description can often be obtained by history matching.

Typical performance data which are useful for history matching purposes include individual well pressure as a function of time and production and producing gas-oil or water-oil ratios.

Atlantic Richfield Company North American Producing Division
Permian District
Post Office Box 1610
Midland, Texas 79701
Telephone 915 682 8631



EXH. NO. 15

April 25, 1973

United States Department
of the Interior
Geological Survey
P. O. Drawer 1857
Roswell, New Mexico 88201

Attention: Mr. N. O. Frederick (6)
Oil and Gas Supervisor

State of New Mexico
Mr. Alex J. Armijo
Commissioner of Public Lands
P. O. Box 1148
Santa Fe, New Mexico

Attention: Mr. Ray D. Graham, Director (3)
Oil and Gas Department

State of New Mexico
Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico

Attention: Mr. A. L. Porter, Jr. (3)
Secretary Director

Working Interest Owners
Empire Abo Unit
(see attached address list)

Re: Initial Plan of Operation
Empire Abo Unit
Eddy County, New Mexico

Gentlemen:

In compliance with Section 11 of the Unit
Agreement, Empire Abo Unit, Eddy County,
New Mexico, Atlantic Richfield Company, as

OIL CONSERVATION COMMISSION	
Arco	EXHIBIT NO. 15
CASE NO.	6553

United States Department
of the Interior
Page 2
April 25, 1973

Unit Operator on behalf of itself and the other participating working interest owners, hereby submits for your approval a Plan of Operation to cover the period beginning with the effective date of the Unit Agreement and extending through the remainder of calendar year 1973.

Yours very truly,

ATLANTIC RICHFIELD COMPANY
OPERATOR



P. E. Fletcher
Operations Manager

PEF/SHC/jrb

INITIAL PLAN OF OPERATION
EMPIRE ABO UNIT

Page 3

1. Project Area

History and Background

The Empire Abo Unit area consists of some 11,339.15 acres in Eddy County, New Mexico (see attached plat, Exhibit 1). The area is located in portions of sections 34, 35, 36 Township 17 South, Range 27 East; sections 1, 2, 3, 4, 8, 9, 10, 11, 12, 15, 16, 17 Township 18 South, Range 27 East; sections 25, 26, 27, 28, 31, 32, 33, 34, 35, 36 Township 17 South, Range 28 East; sections 4, 5, 6 Township 18 South, Range 28 East; sections 29, 30 Township 17 South, Range 29 East. Within the Unit Area, owners of the following tracts have chosen not to participate in the unit: 2, 6, 42, 46, 49, 55, 56, 69, 73C, 77, 79, 84, 91. These non-participating tracts total 684.84 acres. The remaining 10,654.31 acres is to be developed as a project area for pressure maintenance by injection of plant residue gas from Abo production back into the Abo formation.

The Abo producing zone is found at an average depth of about 5800 feet (see attached type log, Exhibit 2). The Abo is a lower Leonard (Permian) carbonate reef which has undergone complete dolomitization. Vugs, fractures and fissures have been observed in cores throughout the main reef, with local anhydrite infilling sometimes restricting flow. Reef development is long (12 1/2 miles) and narrow (1 1/2 miles). The reef crest dips about 1° from southwest to northeast. Average gross reef thickness is about 300 feet, ranging to the maximum of 732 feet on the Amoco State AT No. 1 (L2-18S-27E).

On the up-dip west and southwest end of the reservoir productive limits are the result of anhydrite deposition, while on the back-reef north side there is a facies change to an impermeable carbonate "mud" interspersed with green shale. Limits to the south, east and northeast result as the top of the reef dips below the oil-water contact.

2. Current Production, Future Recovery

The original discovery well was the Amoco Malco Federal A No. 1, located in the NE NW Section 11, T-18-S - R-27-E, completed in November 1957.

At the present time the Pool has 235 producing wells. Of these, 153 are capable of producing more than the current top allowable of 142 BOPD/well. There are 183 flowing wells. Field performance and detailed study of cores indicate excellent vertical permeability. The principal producing mechanism is gravity drainage with an expanding secondary gas cap. There are 22 operators in the field and 112 separate working interest owners.

In January 1973, Abo Pool total oil production averaged 25,625 BOPD with 9% water production and gas oil ratio 1,366 cu. ft./BO. Cumulative oil production from the pool is 90 MMBO to February 1, 1973. Remaining primary after February 1, 1973, based on ARCO numeric model studies, is estimated to be 83 MMBO. Unitized residue gas injection for pressure maintenance is calculated to increase future recovery by about 30 MMBO compared to continued primary operations.

3. Basic Concepts Governing Future Unit Operations

- a) Field production history and reservoir numeric model studies have demonstrated that reservoir recovery is governed by a gravity drainage mechanism. With unitization, the operator will be able to maximize beneficial effects of this most efficient recovery mechanism by careful observation of well performance and shutting in or curtailing production from inefficient wells.
- b) Injection of plant residue gas will act toward pressure maintenance and orderly control of expansion of the secondary gas cap.

4. Special Rules

a) Unit Allowable

1st Step - Starting on the effective date of the unit, the unit will receive a unit allowable, calculated so that Unit Area reservoir voidage will not exceed average daily reservoir voidage rate for 1972. This will result in an increase from current 23,600 BOPD to about 30,000 BOPD for the Unit Area.

2nd Step - to be effective with the start of gas injection. Unit Area allowable to be 40,192 BOPD. Reservoir numeric model studies demonstrate added recovery and no reservoir waste at this rate.

- b) Provision to produce the unit allowable from the most efficient wells without restriction. The only exception will be where a Unit producing well offsets a non-unit well.
- c) Provision that if any unit well is located within 660' of a non-participating tract on which is located an Empire Abo producing well, such unit well will be allowed to produce no more than two times normal unit allowable for the Empire Abo Pool.
- d) Provision for administrative approval of additional injection wells, or changes in injection well locations.

5. Operating Plans for 1973

Initially gas injection will be into the Abo gas cap in the following eight wells (see plat Exhibit 1):

<u>Current Operator</u>	<u>Lease & Well</u>	<u>Location</u>
Exxon	Chalk Bluff Draw Unit "A" No. 4	NE/4 NW/4 Sec.9-T18S-R27E
Amoco	Windfohr Federal No. 4	NW/4 SE/4 Sec.4-T18S-R27E
Amoco	Malco "H" Federal No. 2	SE/4 NE/4 Sec.3-T18S-R27E
M.YatesIII	Dooley Abo State No. 2	NW/4 SE/4 Sec.36-T17S-R27E
Amoco	State "BM" No. 1	NE/4 SW/4 Sec.31-T17S-R28E
Amoco	State "BV" No. 1	SW/4 NW/4 Sec.32-T17S-R28E
Arco	M. Yates B (ARC) No. 8	SW/4 NE/4 Sec.33-T17S-R28E
Hondo	State "A" No. 21	NE/4 SW/4 Sec.26-T17S-R28E

Attached Exhibit 3 is an example of an injection well log, while Exhibit 4 is a schematic diagram of a typical mechanical setup for an injection well.

Maximum gas injection volume into all wells is estimated at 37,000 MCF/Day. In terms of reservoir space fill-up, this is equivalent to over 60,000 barrels of water injection per day. Plans are to pick up residue gas at about 700 psi and compress it to 2000 psi for injection. The gas will contain hydrogen sulfide. Superdehydration facilities are planned in order to minimize possible corrosion.

A rigorous corrosion checking procedure will be maintained.

A regular and comprehensive well-testing program will be followed to maintain reservoir control and aid in determining optimum operating conditions.

Workovers: Wherever well production data and reservoir conditions so indicate, workovers will be performed to lower gas-oil or water-oil ratios and maximize producing well efficiencies.

Facilities for produced water gathering and reinjection will be constructed.

Atlantic Richfield Company, as unit operator, will act prudently to preserve all rights of the mineral owners and to effectively and efficiently recover the unit area reserves. This Company will meet all economical offset obligations and act to prevent undue waste.

Modifications - It is understood that to meet changing conditions, this Plan of Operation may be modified from time to time, with the approval of the Supervisor, the Commissioner of Public Lands of the State of New Mexico and the New Mexico Oil Conservation Commission.

Effective Date:

This Plan of Operation shall be effective July 1, 1973.

If this Plan of Operation meets with your approval, please indicate in the space below and return one copy for our files.

Yours very truly,

ATLANTIC RICHFIELD COMPANY
OPERATOR



P. E. Fletcher
Operations Manager

PEF/SHC/jrb

Initial Plan of Operation
Empire Abo Unit
Page 7

APPROVED BY: _____ Date: _____
Supervisor of United
States Geological Survey

APPROVED BY: _____ Date: _____
Commissioner of Public
Lands, State of New Mexico

APPROVED BY: _____ Date: _____
Secretary-Director
New Mexico Oil Conservation
Commission

EXHIBIT 16

EMPIRE ABO UNIT
INFILL WELL STUDY RESULTS,
LISTED BY DATE OF STUDY

<u>Date of Added Recovery Study (Month-Year)</u>	<u>Cumulative Number of Infill Wells in Study</u>	<u>Spacing (Acres/well)</u>	<u>Reserves Added By Infill Drilling</u>	
			<u>Average Added Reserves (MBO/well)</u>	<u>Total Added Reserves (MBO)</u>
8-74	2	20	80	160
1-75	58*	20	100	5,800
11-77	158*	20 & 10	92	14,510

(* includes wells in earlier studies)

With 129 infill wells on production

Actual Cumulative Production to 5-1-79 from all infill wells = 16,292 MBO.

To 5-1-79, actual average production per well = $\frac{16,292 \text{ MBO}}{129 \text{ Wells}} = 126 \frac{\text{MBO}}{\text{well}}$

<u>Study Date</u>	<u>Study Type</u>
8-74	Calculation using original coning simulator, 1970 study
1-75	Updated coning simulators considered well interference
11-77	Back-to-front reef 3-dimensional slice model, combined coning effects and fluid movements in all directions. More production history available.

BEFORE OIL CONSERVATION DIVISION
OIL CONSERVATION DIVISION
<u>Area</u> EXHIBIT NO. <u>16</u>
CASE NO. <u>6553</u>

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION
State Land Office Building
Santa Fe, New Mexico
23 May 1979

EXAMINER HEARING

IN THE MATTER OF:

Application of The Atalntic Richfield) CASE
Company for approval of infill drilling,) 6553
Eddy County, New Mexico.)

BEFORE: Richard L. Stamets

TRANSCRIPT OF HEARING

A P P E A R A N C E S

For the Oil Conservation Division: Ernest L. Padilla, Esq.
Legal Counsel for the Division
State Land Office Bldg.
Santa Fe, New Mexico 87503

SALLY WALTON BOYD
CERTIFIED SHORTHAND REPORTER
2020 Plaza Blanca (SSE) 411-2462
Santa Fe, New Mexico 87501

1 MR. STAMETS: Call next case 6553.

2 MR. PADILLA: Application of The Atlantic
3 Richfield Company for approval of the infill drilling,
4 Eddy County, New Mexico.

5 MR. STAMETS: The Division has received and will
6 approve the request that this case be continued to the
7 June 13th Examiner Hearing.

8 (Hearing concluded.)
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SALLY WALTON BOYD
CERTIFIED SHORTHAND REPORTER
3020 Plaza Blanca (606) 471-2462
Santa Fe, New Mexico 87501

REPORTER'S CERTIFICATE

I, SALLY WALTON BOYD, a Court Reporter, DO HEREBY
CERTIFY that the foregoing and attached Transcript of
Hearing before the Oil Conservation Division was reported
by me; that said transcript is a full, true, and correct
record of the hearing, prepared by me to the best of my
ability, knowledge, and skill, from my notes taken at the
time of the hearing.

SALLY WALTON BOYD
CERTIFIED SHORTHAND REPORTER
3020 Plaza Blanca (SOS) 471-2462
Santa Fe, New Mexico 87501

Sally W. Boyd CSR
Sally W. Boyd, C.S.R.

I do hereby certify that the foregoing is
a complete record of the proceedings in
the Examiner hearing of Case No. 6553
heard by me on 5-23 1979.

Richard L. Ham Examiner
Oil Conservation Division

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION
State Land Office Building
Santa Fe, New Mexico
23 May 1979

EXAMINER HEARING

IN THE MATTER OF:

Application of The Atalntic Richfield) CASE
Company for approval of infill drilling,) 6553
Eddy County, New Mexico.)

BEFORE: Richard L. Stamets

TRANSCRIPT OF HEARING

A P P E A R A N C E S

For the Oil Conservation	Ernest L. Padilla, Esq.
Division:	Legal Counsel for the Division
	State Land Office Bldg.
	Santa Fe, New Mexico 87503

SALLY WALTON BOYD
CERTIFIED SHORTHAND REPORTER
3020 Plaza Blanca (SOS) 471-2463
Santa Fe, New Mexico 87501

1 MR. STAMETS: Call next case 6553.

2 MR. PADILLA: Application of The Atlantic
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4 Eddy County, New Mexico.

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SALLY WALTON BOYD
CERTIFIED SHORTHAND REPORTER
3020 Plaza Blanca (995) 471-4462
Santa Fe, New Mexico 87501

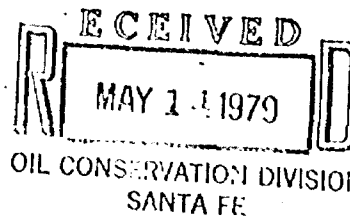
REPORTER'S CERTIFICATE

I, SALLY WALTON BOYD, a Court Reporter, DO HEREBY
CERTIFY that the foregoing and attached Transcript of
Hearing before the Oil Conservation Division was reported
by me; that said transcript is a full, true, and correct
record of the hearing, prepared by me to the best of my
ability, knowledge, and skill, from my notes taken at the
time of the hearing.

Sally W. Boyd, C.S.R.

I do hereby certify that the foregoing is
a complete record of the proceedings in
the Examiner hearing of Case No. _____
heard by me on _____ 19____.
_____, Examiner
Oil Conservation Division

SALLY WALTON BOYD
CERTIFIED SHORTHAND REPORTER
3020 Plaza Blanca (S.S.) 471-2462
Santa Fe, New Mexico 87501



TO: THE NEW MEXICO OIL CONSERVATION DIVISION

FROM: THE ATLANTIC RICHFIELD COMPANY

RE: APPLICATION FOR APPROVAL OF INFILL DRILLING, EDDY COUNTY, NEW MEXICO


COMES NOW THE UNDERSIGNED ATTORNEY, ON BEHALF OF THE ATLANTIC RICHFIELD
COMPANY AND STATES:

The Atlantic Richfield Company hereby formally makes application for approval of infill drilling, Eddy County, New Mexico. Applicant seeks a finding that the Division waived existing well-spacing requirements and found that the drilling of additional wells was necessary to effectively and efficiently drain those portions of the proration units in the Empire Abo Unit located in Townships 17 and 18 South, Ranges 27, 28 and 29 East, which could not be so drained by the existing wells.

Applicant respectfully requests that this matter be set on the docket for an Examiner's hearing on May 23, 1979.

THE ATLANTIC RICHFIELD COMPANY

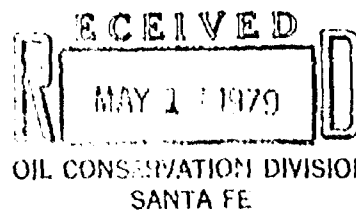
BY


Conrad E. Coffield

Attorney for Applicant

Box 3580

Midland, Texas 79702



TO: THE NEW MEXICO OIL CONSERVATION DIVISION

FROM: THE ATLANTIC RICHFIELD COMPANY

RE: APPLICATION FOR APPROVAL OF INFILL DRILLING, EDDY COUNTY, NEW MEXICO


COMES NOW THE UNDERSIGNED ATTORNEY, ON BEHALF OF THE ATLANTIC RICHFIELD
COMPANY AND STATES:

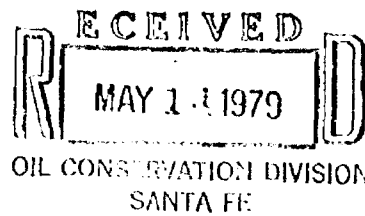
The Atlantic Richfield Company hereby formally makes application for approval of infill drilling, Eddy County, New Mexico. Applicant seeks a finding that the Division waived existing well-spacing requirements and found that the drilling of additional wells was necessary to effectively and efficiently drain those portions of the proration units in the Empire Abo Unit located in Townships 17 and 18 South, Ranges 27, 28 and 29 East, which could not be so drained by the existing wells.

Applicant respectfully requests that this matter be set on the docket for an Examiner's hearing on May 23, 1979.

THE ATLANTIC RICHFIELD COMPANY

BY


Conrad E. Coffield
Attorney for Applicant
Box 3580
Midland, Texas 79702




TO: THE NEW MEXICO OIL CONSERVATION DIVISION
FROM: THE ATLANTIC RICHFIELD COMPANY
RE: APPLICATION FOR APPROVAL OF INFILL DRILLING, EDDY COUNTY, NEW MEXICO

COMES NOW THE UNDERSIGNED ATTORNEY, ON BEHALF OF THE ATLANTIC RICHFIELD COMPANY AND STATES:

The Atlantic Richfield Company hereby formally makes application for approval of infill drilling, Eddy County, New Mexico. Applicant seeks a finding that the Division waived existing well-spacing requirements and found that the drilling of additional wells was necessary to effectively and efficiently drain those portions of the proration units in the Empire Abo Unit located in Townships 17 and 18 South, Ranges 27, 28 and 29 East, which could not be so drained by the existing wells.

Applicant respectfully requests that this matter be set on the docket for an Examiner's hearing on May 23, 1979.

THE ATLANTIC RICHFIELD COMPANY

BY 
Conrad E. Coffield
Attorney for Applicant
Box 3580
Midland, Texas 79702

Set in May 33

Arco Oil & Gas Co., Division of
Application of Atlantic Richfield Company
for approval of infill drilling, Eddy
County, NM.

Applicant in the above-styled
cause seeks a finding that the
Division waived existing well-
spacing requirements and found
that the drilling of additional wells
was necessary to effectively and
efficiently drain those portions of
the proration units in the Empire
Lbo Unit located in Townships 17
and 18 South, Ranges 27, 28 and
29 East, Eddy County, NM,
which could not be so drained
by the existing wells.

Send copy of docket to:

~~Contact~~ Andy Anderson

Mr.
(R. M. Anderson)
Atlantic Richfield Co.
P.O. Box 2819
Dallas 75221

LAW OFFICES

HINKLE, COX, EATON, COFFIELD & HENSLEY

1000 FIRST NATIONAL BANK TOWER

POST OFFICE BOX 3580

MIDLAND, TEXAS 79702

(915) 683-4891

OF COUNSEL

CLARENCE E. HINKLE

W.E. CONCURANT, JR. (914-1973)

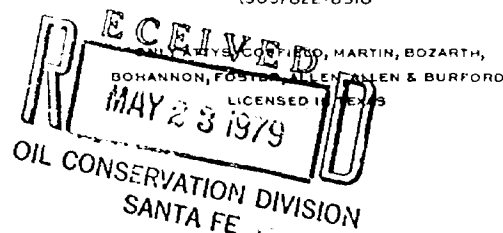
ROSWELL, NEW MEXICO OFFICE

800 HINKLE BUILDING

(505) 622-8510

LEWIS C. COX, JR.
PAUL W. EATON, JR.
CONRAD E. COFFIELD
HAROLD L. HENSLEY, JR.
STUART D. SHANOR
C.D. MARTIN
PAUL J. KELLY, JR.
JAMES H. BOZARTH

DOUGLAS L. LUNSFORD
PAUL M. BOHANNON
J. DOUGLAS FOSTER
K. DOUGLAS PERRIN
C. RAY ALLEN
JACQUELINE W. ALLEN
T. CALDER EZZELL, JR.
WILLIAM B. BURFORD
JOHN S. NELSON
RICHARD E. OLSON



May 21, 1979

Handwritten signature/initials

Mr. Ernest Padilla
Oil Conservation Division
Post Office Box 2088
Santa Fe, New Mexico 87501

Re: Oil Conservation Division
Case No. 6553

Dear Ernie:

This will confirm our telephone conversation today. On behalf of the Atlantic Richfield Company, I have requested a continuance of the above referenced case so that instead of its being heard at the Examiner's Hearing on May 23, it will be scheduled on Docket 23-79 for hearing on June 13, 1979.

Please advise if there is any problem in granting this continuance.

With best personal regards.

Very truly yours,

HINKLE, COX, EATON,
COFFIELD & HENSLEY

Handwritten signature of Conrad E. Coffield
Conrad E. Coffield

CEC:rf

xc: Mr. Andy Anderson
xc: Mr. Jerry Tweed
xc: Mr. Hugh Christianson

CASE 6535: (Continued from May 23, 1979, Examiner Hearing)

Application of Torreon Oil Company for a waterflood project, Sandoval County, New Mexico. Applicant, in the above-styled cause, seeks authority to institute a waterflood project in the San Luis-Mesaverde Pool by the injection of water into the Menefee formation through two wells located in Section 21, Township 18 North, Range 3 West, Sandoval County, New Mexico.

CASE 6575: In the matter of the hearing called by the Oil Conservation Division on its own motion for an order creating, contracting the vertical limits, and extending the horizontal limits of certain pools in Eddy, Lea, and Roosevelt Counties, New Mexico:

(a) CREATE a new pool in Eddy County, New Mexico, classified as a gas pool for Wolfcamp production and designated as the Cass Draw-Wolfcamp Gas Pool. The discovery well is Black River Corporation Miller Com Well No. 1 located in Unit C of Section 10, Township 23 South, Range 27 East, NMPM. Said pool would comprise:

TOWNSHIP 23 SOUTH, RANGE 27 EAST, NMPM
Section 10: N/2

(b) CREATE a new pool in Eddy County, New Mexico, classified as a gas pool for Abo production and designated as the Runyan Ranch-Abo Gas Pool. The discovery well is Mesa Petroleum Company Runyan Federal Com Well No. 1 located in Unit F of Section 17, Township 19 South, Range 23 East, NMPM. Said pool would comprise:

TOWNSHIP 19 SOUTH, RANGE 23 EAST, NMPM
Section 17: NW/4

(c) CREATE a new pool in Eddy County, New Mexico, classified as a gas pool for Morrow production and designated as the Runyan Ranch-Morrow Gas Pool. The discovery well is Mesa Petroleum Company Gardner State Well No. 1 located in Unit K of Section 8, Township 19 South, Range 23 East, NMPM. Said pool would comprise:

TOWNSHIP 19 SOUTH, RANGE 23 EAST, NMPM
Section 8: W/2

(d) EXTEND the Austin-Mississippian Gas Pool in Lea County, New Mexico, to include therein:

TOWNSHIP 14 SOUTH, RANGE 36 EAST, NMPM
Section 16: SE/4
Section 17: NE/4

(e) EXTEND the Avalon-Morrow Gas Pool in Eddy County, New Mexico, to include therein:

TOWNSHIP 21 SOUTH, RANGE 26 EAST, NMPM
Section 28: N/2

(f) EXTEND the Avalon-Wolfcamp Gas Pool in Eddy County, New Mexico, to include therein:

TOWNSHIP 21 SOUTH, RANGE 26 EAST, NMPM
Section 21: SW/4
Section 28: N/2

(g) EXTEND the Buffalo-Pennsylvanian Gas Pool in Lea County, New Mexico, to include therein:

TOWNSHIP 19 SOUTH, RANGE 33 EAST, NMPM
Section 6: N/2

(h) EXTEND the Burton Flat-Morrow Gas Pool in Eddy County, New Mexico, to include therein:

TOWNSHIP 20 SOUTH, RANGE 27 EAST, NMPM
Section 12: S/2
Section 13: N/2

(i) EXTEND the Chaveroo-San Andres Pool in Roosevelt County, New Mexico, to include therein:

TOWNSHIP 7 SOUTH, RANGE 32 EAST, NMPM
Section 34: SW/4

(j) EXTEND the South Culebra Bluff-Atoka Gas Pool in Eddy County, New Mexico, to include therein:

TOWNSHIP 23 SOUTH, RANGE 28 EAST, NMPM
Section 22: N/2
Section 35: N/2

- (k) EXTEND the Diamond Mound-Atoka Gas Pool in Eddy County, New Mexico, to include therein:

TOWNSHIP 16 SOUTH, RANGE 27 EAST, NMPM
Section 12: N/2

- (l) EXTEND the Dublin Ranch-Morrow Gas Pool in Eddy County, New Mexico, to include therein:

TOWNSHIP 22 SOUTH, RANGE 28 EAST, NMPM
Section 21: E/2

- (m) EXTEND the East Eagle Creek Atoka-Morrow Gas Pool in Eddy County, New Mexico, to include therein:

TOWNSHIP 17 SOUTH, RANGE 25 EAST, NMPM
Section 13: S/2

- (n) EXTEND the South Empire-Morrow Gas Pool in Eddy County, New Mexico, to include therein:

TOWNSHIP 17 SOUTH, RANGE 29 EAST, NMPM
Section 19: S/2

- (o) EXTEND the Eumont Gas Pool in Lea County, New Mexico, to include therein:

TOWNSHIP 20 SOUTH, RANGE 36 EAST, NMPM
Section 32: W/2

- (p) EXTEND the Hardy-Blinbry Pool in Lea County, New Mexico, to include therein:

TOWNSHIP 21 SOUTH, RANGE 36 EAST, NMPM
Section 2: E/2 SE/4 and SW/4 SE/4

- (q) EXTEND the Herradura Bend-Delaware Pool in Eddy County, New Mexico, to include therein:

TOWNSHIP 23 SOUTH, RANGE 28 EAST, NMPM
Section 5: E/2 NW/4

- (r) EXTEND the Indian Flats-Morrow Gas Pool in Eddy County, New Mexico, to include therein:

TOWNSHIP 21 SOUTH, RANGE 28 EAST, NMPM
Section 25: S/2
Section 36: W/2

- (s) EXTEND the Kennedy Farms-Morrow Gas Pool in Eddy County, New Mexico, to include therein:

TOWNSHIP 17 SOUTH, RANGE 26 EAST, NMPM
Section 10: S/2
Section 11: S/2
Section 16: E/2

- (t) EXTEND the East Lake-Morrow Gas Pool in Eddy County, New Mexico, to include therein:

TOWNSHIP 18 SOUTH, RANGE 27 EAST, NMPM
Section 32: W/2

- (u) EXTEND the Logan Draw-Cisco Canyon Gas Pool in Eddy County, New Mexico, to include therein:

TOWNSHIP 17 SOUTH, RANGE 27 EAST, NMPM
Section 28: W/2

- (v) EXTEND the West Malaga-Morrow Gas Pool in Eddy County, New Mexico, to include therein:

TOWNSHIP 24 SOUTH, RANGE 26 EAST, NMPM
Section 16: N/2

- (w) EXTEND the Penasco Draw-Morrow Gas Pool in Eddy County, New Mexico, to include therein:

TOWNSHIP 18 SOUTH, RANGE 24 EAST, NMPM
Section 25: N/2

- (x) EXTEND the South Peterson-Fusselman Pool in Roosevelt County, New Mexico, to include therein:

TOWNSHIP 5 SOUTH, RANGE 33 EAST, NMPM
Section 31: NW/4

(y) CONTRACT the vertical limits of the Shoe Bar-Pennsylvanian Gas Pool in Lea County, New Mexico, to the Atoka formation only and redesignate said pool as the Shoe Bar-Atoka Gas Pool, and extend the horizontal limits of said pool to include therein:

TOWNSHIP 16 SOUTH, RANGE 35 EAST, NMPM
Section 34: SW/4

TOWNSHIP 17 SOUTH, RANGE 35 EAST, NMPM
Section 3: N/2

(z) EXTEND the Teague-Abo Gas Pool in Lea County, New Mexico, to include therein:

TOWNSHIP 23 SOUTH, RANGE 37 EAST, NMPM
Section 22: S/2
Section 27: NE/4

(aa) EXTEND the Todd-Wolfcamp Pool in Roosevelt County, New Mexico, to include therein:

TOWNSHIP 7 SOUTH, RANGE 35 EAST, NMPM
Section 22: NE/4

(bb) EXTEND the Tomahawk-San Andres Pool in Roosevelt County, New Mexico, to include therein:

TOWNSHIP 7 SOUTH, RANGE 32 EAST, NMPM
Section 30: W/2

(cc) EXTEND the West Tonto-Pennsylvanian Gas Pool in Lea County, New Mexico, to include therein:

TOWNSHIP 19 SOUTH, RANGE 33 EAST, NMPM
Section 7: NW/4

(dd) EXTEND the Turkey Track-Morrow Gas Pool in Eddy County, New Mexico, to include therein:

TOWNSHIP 19 SOUTH, RANGE 29 EAST, NMPM
Section 14: W/2
Section 15: E/2
Section 23: All
Section 24: W/2

(ee) EXTEND the Wantz-Granite Wash Pool in Lea County, New Mexico, to include therein:

TOWNSHIP 22 SOUTH, RANGE 37 EAST, NMPM
Section 3: SE/4
Section 10: NE/4

Dockets Nos. 24-79 and 25-79 are tentatively set for hearing on June 27 and July 11, 1979. Applications for hearing must be filed at least 22 days in advance of hearing date.

DOCKET: COMMISSION HEARING - WEDNESDAY - JUNE 6, 1979

OIL CONSERVATION COMMISSION - 9 A.M. - ROOM 205
STATE LAND OFFICE BUILDING, SANTA FE, NEW MEXICO

CASE 6495: (DE NOVO)

Application of Amax Chemical Corporation for the amendment of Order No. R-111-A, Eddy County, New Mexico. Applicant, in the above-styled cause, seeks the amendment of Order No. R-111-A to extend the boundaries of the Potash-Oil Area by the inclusion of certain lands in Sections 23 and 24, Township 19 South, Range 29 East, Sections 1, 4, 5, 6, 7, 11, 12, 13, 14, 19, 20, 23, 24, and 29, Township 19 South, Range 30 East, and Sections 7, 8, 17, 18, and 19, Township 19 South, Range 31 East, all in Eddy County, New Mexico.

Upon application of Amax Chemical Corporation this case will be heard De Novo pursuant to the provisions of Rule 1220.

DOCKET: EXAMINER HEARING - WEDNESDAY - JUNE 13, 1979

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

The following cases will be heard before Daniel S. Nutter, Examiner, or Richard L. Stamets, Alternate Examiner:

- ALLOWABLE: (1) Consideration of the allowable production of gas for July, 1979, from fifteen prorated pools in Lea, Eddy, and Chaves Counties, New Mexico.
- (2) Consideration of the allowable production of gas for July, 1979, from four prorated pools in San Juan, Rio Arriba, and Sandoval Counties, New Mexico.

CASE 6560: Application of Exxon Corporation for a dual completion, Lea County, New Mexico. Applicant, in the above-styled cause, seeks approval for the dual completion (combination) of its "AB" State Well No. 4 located in Unit A of Section 16, Township 24 South, Range 37 East, to produce gas from the Langlie Mattix Pool and oil from the Fowler-Upper Yeso Pool, through parallel strings of casing cemented in a common well bore.

CASE 6561: Application of Amoco Production Company for directional drilling, Lea County, New Mexico. Applicant, in the above-styled cause, proposes to directionally drill its State "HC" Well No. 1 located 1980 feet from the South and West lines of Section 21, Township 16 South, Range 35 East, Townsend Field, to a bottom hole location within 100 feet of a point 990 feet from the South line and 2310 feet from the East line of said Section 21, the S/2 of said Section 21 to be dedicated to the well.

CASE 6562: Application of Orla Petco, Inc. for salt water disposal, Eddy County, New Mexico. Applicant, in the above-styled cause, seeks authority to dispose of produced salt water into the Ramsey Sand of the Bell Canyon formation through the open hole interval from 2498 feet to 2508 feet in its Courley-Federal Well No. 4 located in Unit J of Section 31, Township 22 South, Range 28 East, Herradura Bend-Delaware Pool.

CASE 6563: Application of Roy L. McKay for a unit agreement, Lea County, New Mexico. Applicant, in the above-styled cause, seeks approval for his North Woolworth Ranch Unit Area, comprising 1,280 acres, more or less, of State lands in Township 23 South, Range 35 East.

CASE 6564: Application of Herndon Oil & Gas Co. for an unorthodox oil well location, Lea County, New Mexico. Applicant, in the above-styled cause, seeks approval for the unorthodox location of its O. A. Woody Well No. 1 in the center of Unit E, Section 35, Township 16 South, Range 38 East, Knowles-Devonian Pool.

CASE 6565: Application of Lewis B. Burleson, Inc. for compulsory pooling, a non-standard gas proration unit, and an unorthodox well location, Lea County, New Mexico. Applicant, in the above-styled cause, seeks an order pooling all mineral interests in the Jalmat Gas Pool underlying the W/2 SE/4 of Section 20, Township 25 South, Range 37 East, to form an 80-acre non-standard gas proration unit to be dedicated to a well to be drilled at an unorthodox location 1650 feet from the South and East lines of said Section 20. Also to be considered will be the cost of drilling and completing said well and the allocation of the cost thereof as well as actual operating costs and charges for supervision. Also to be considered will be the designation of applicant as operator of the well and a charge for risk involved in drilling said well.

- CASE 6566: Application of Lewis B. Burleson, Inc. for an unorthodox well location and a non-standard proration unit, Lea County, New Mexico. Applicant, in the above-styled cause, seeks approval of a 160-acre non-standard gas proration unit comprising the SW/4 of Section 10, Township 24 South, Range 36 East, Jalmat Gas Pool, to be dedicated to a well to be drilled 2310 feet from the South and West lines of said Section 10.
- CASE 6567: Application of Newbourne Oil Company for an unorthodox well location, Chaves County, New Mexico. Applicant, in the above-styled cause, seeks approval for the unorthodox location of its State 25 Com Well No. 1 660 feet from the South line and 1650 feet from the West line of Section 25, Township 14 South, Range 27 East, Buffalo Valley-Pennsylvanian Gas Pool, the S/2 of said Section 25 to be dedicated to the well.
- CASE 6568: Application of Dallas McCasland for approval of infill drilling, Lea County, New Mexico. Applicant, in the above-styled cause, seeks a waiver of existing well spacing requirements and a finding that the drilling of his Woolworth Well No. 5 located in Unit P of Section 28, Township 24 South, Range 37 East, Jalmat Gas Pool, is necessary to effectively and efficiently drain that portion of the proration unit which cannot be so drained by the existing well.
- CASE 6569: Application of Continental Oil Company for a dual completion, Lea County, New Mexico. Applicant, in the above-styled cause, seeks approval for the dual completion of its Lockhart A-17 Well No. 2 located in Unit I of Section 17, Township 21 South, Range 37 East, to produce gas from the Eumont Gas Pool through the casing-tubing annulus and oil from the Blinbry Oil and Gas Pool through tubing.
- CASE 6570: Application of Continental Oil Company for a non-standard gas proration unit and simultaneous dedication, Lea County, New Mexico. Applicant, in the above-styled cause, seeks approval of a 228-acre non-standard gas proration unit comprising the SW/4 and S/2 SE/4 of Section 18, Township 21 South, Range 36 East, Eumont Gas Pool, to be simultaneously dedicated to applicant's Lockhart A-18 Wells Nos. 2, 3, and 4, located in Units O, K, and M, respectively, of said Section 18.
- CASE 6571: Application of Continental Oil Company for vertical pool limit redefinition, Lea County, New Mexico. Applicant, in the above-styled cause, seeks an order extending the vertical limits of the Langlie Mattix Pool to include the lowermost 165 feet of the Seven Rivers formation and the concomitant contraction of the vertical limits of the Jalmat Gas Pool underlying the following described lands: SW/4 W/2 SE/4 and SE/4 SE/4 of Section 35, Township 23 South, Range 36 East; and NW/4, W/2 NE/4, and SE/4 NE/4 of Section 1, Township 24 South, Range 36 East.
- CASE 6537: (Continued from May 9, 1979, Examiner Hearing)
- Application of Harper Oil Company for a unit agreement, Lea County, New Mexico. Applicant, in the above-styled cause, seeks approval for its West Ranger Lake Unit Area, comprising 1,120 acres, more or less, of State lands in Township 12 South, Range 34 East, Lea County, New Mexico.
- CASE 6553: (Continued from May 23, 1979, Examiner Hearing)
- Application of The Atlantic Richfield Company for approval of infill drilling, Eddy County, New Mexico. Applicant, in the above-styled cause, seeks a finding that the Division waived existing well-spacing requirements and found that the drilling of additional wells was necessary to effectively and efficiently drain those portions of the proration units in the Empire Abo Unit located in Townships 17 and 18 South, Ranges 27, 28 and 29 East, which could not be so drained by the existing wells.
- CASE 6572: Application of ARCO Oil and Gas Company to drill a horizontal drainhole, Eddy County, New Mexico. Applicant, in the above-styled cause, seeks approval to drill and complete its Empire Abo Unit Well No. K-142, located in Unit K of Section 2, Township 18 South, Range 27 East, Empire-Abo Pool, with a single horizontal drainhole of about 200 feet in length in the Abo formation.
- CASE 6573: Application of Mesa Petroleum Company for directional drilling, Eddy County, New Mexico. Applicant, in the above-styled cause, seeks approval for the directional drilling of its Well No. 7 in the Nash Unit, the surface location of which would be 685 feet from the North line and 1295 feet from the West line of Section 18, to be vertically drilled to approximately 7,000 feet, and then directionally drilled to a bottom hole location in the Morrow formation within 400 feet of a point 1315 feet from the South line and 1320 feet from the West line of Section 7, all in Township 23 South, Range 30 East.
- CASE 6574: Application of Texas Oil & Gas Corp. for an unorthodox gas well location and compulsory pooling, Lea County, New Mexico. Applicant, in the above-styled cause, seeks an order pooling all mineral interests in the Wolfcamp through Morrow formations underlying the E/2 of Section 6, Township 17 South, Range 35 East, to be dedicated to a well to be drilled at an unorthodox location 660 feet from the South and East lines of said Section 6. Also to be considered will be the cost of drilling and completing said well and the allocation of the cost thereof as well as actual operating costs and charges for supervision. Also to be considered will be the designation of applicant as operator of the well and a charge for risk involved in drilling said well.

Dockets Nos. 23-79 and 24-79 are tentatively set for hearing on June 13 and 27, 1979. Applications for hearing must be filed at least 22 days in advance of hearing date.

DOCKET: EXAMINER HEARING - WEDNESDAY - MAY 23, 1979

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

The following cases will be heard before Richard L. Stamets, Examiner, or Daniel S. Nutter, Alternate Examiner:

- CASE 6545: In the matter of the hearing called by the Oil Conservation Division on its own motion to permit Corinne Grace, Travelers Indemnity Company, and all other interested parties to appear and show cause why the Kuklah Baby Well No. 1 located in Unit G of Section 24, Township 22 South, Range 26 East, Eddy County, New Mexico, should not be plugged and abandoned in accordance with a Division-approved plugging program.
- CASE 6422: (Continued from February 28, 1979, Examiner Hearing)
- In the matter of the hearing called by the Oil Conservation Division on its own motion to permit Helton Engineering & Geological Services, Inc., Travelers Indemnity Company, and all other interested parties to appear and show cause why the Brent Well No. 1 located in Unit M of Section 29 and the Brent Well No. 3 located in Unit G of Section 19, both in Township 13 North, Range 6 East, Sandoval County, New Mexico, should not be plugged and abandoned in accordance with a Division-approved plugging program.
- CASE 6546: Application of Black River Corporation for compulsory pooling and non-standard gas proration unit, Lea County, New Mexico. Applicant, in the above-styled cause, seeks an order pooling all mineral interests in the Jalmat Gas Pool underlying the SW/4 of Section 32, Township 23 South, Range 37 East, to form a 160-acre non-standard gas proration unit to be dedicated to a well to be drilled at a standard location thereon. Also to be considered will be the cost of drilling and completing said well and the allocation of the cost thereof as well as actual operating costs and charges for supervision. Also to be considered will be the designation of applicant as operator of the well and a charge for risk involved in drilling said well.
- CASE 6536: (Continued from May 9, 1979, Examiner Hearing)
- Application of Black River Corporation for two non-standard gas proration units, Lea County, New Mexico. Applicant, in the above-styled cause, seeks approval for two 80-acre non-standard gas proration units in the Jalmat Gas Pool as follows: the N/2 SE/4 of Section 22, Township 23 South, Range 36 East, to be dedicated to applicant's well to be drilled in Unit J of said Section 22; and the S/2 SE/4 of said Section 22 to be dedicated to El Paso Natural Gas Company's Shell State Well No. 3 located in Unit P.
- CASE 6535: (Continued from May 9, 1979, Examiner Hearing)
- Application of Torreon Oil Company for a waterflood project, Sandoval County, New Mexico. Applicant, in the above-styled cause, seeks authority to institute a waterflood project in the San Luis-Mesaverde Pool by the injection of water into the Menefee formation through two wells located in Section 21, Township 18 North, Range 3 West, Sandoval County, New Mexico.
- CASE 6547: Application of American Petrofina Company of Texas for the creation of a waterflood buffer zone, Lea County, New Mexico. Applicant, in the above-styled cause, seeks the creation of a waterflood buffer zone comprising the NE/4 SE/4 of Section 26, Township 17 South, Range 32 East, Maljamar Grayburg-San Andres Pool, to enable applicant to produce its Johns B Well No. 4 located thereon at an unrestricted rate.
- CASE 6548: Application of John F. Staver for salt water disposal, San Juan County, New Mexico. Applicant, in the above-styled cause, seeks authority to dispose of produced salt water into the Dakota formation through the open hole interval from 1408 feet to 1412 feet in his Table Mesa Well No. 22 located in Unit N and from 1394 feet to 1400 feet in his Table Mesa Well No. 23 located in Unit O, both in Section 34, Township 28 North, Range 17 West, Table Mesa-Dakota Oil Pool.
- CASE 6549: Application of Gulf Oil Corporation for pool creation, discovery allowable, and special pool rules, Lea County, New Mexico. Applicant, in the above-styled cause, seeks an order creating a new Bone Springs oil pool for its Lea "YH" State Well No. 1 located in Unit O of Section 25, Township 18 South, Range 34 East. Applicant also seeks a discovery allowable and promulgation of special pool rules, including a provision for 80-acre spacing.

- CASE 6550: Application of Yates Petroleum Corporation for an unorthodox gas well location and compulsory pooling, Eddy County, New Mexico. Applicant, in the above-styled cause, seeks an order pooling all mineral interests in the Wolfcamp through Mississippian formations underlying the S/2 of Section 12, Township 19 South, Range 24 East, to be dedicated to its Allison Federal "CQ" Well No. 2 to be drilled at an unorthodox location 1980 feet from the South line and 660 feet from the West line of said Section 12. Also to be considered will be the cost of drilling and completing said well and the allocation of the cost thereof as well as actual operating costs and charges for supervision. Also to be considered will be the designation of applicant as operator of the well and a charge for risk involved in drilling said well.
- CASE 6492: (Continued from May 9, 1979, Examiner Hearing)
- Application of Yates Petroleum Corporation for compulsory pooling, Eddy County, New Mexico. Applicant, in the above-styled cause, seeks an order pooling all mineral interests in the San Andres formation underlying the NE/4 NW/4 of Section 13, Township 17 South, Range 25 East, Eddy County, New Mexico, to be dedicated to a well to be drilled at a standard location thereon. Also to be considered will be the cost of drilling and completing said well and the allocation of the cost thereof as well as actual operating costs and charges for supervision. Also to be considered will be the designation of applicant as operator of the well and a charge for risk involved in drilling said well.
- CASE 6551: Application of Bass Enterprises Production Company for an unorthodox gas well location, Eddy County, New Mexico. Applicant, in the above-styled cause, seeks approval for an unorthodox Lower Morrow gas well location 1980 feet from the North line and 660 feet from the East line of Section 1, Township 19 South, Range 28 East, the N/2 of said Section 1 to be dedicated to the well.
- CASE 6528: (Continued from April 25, 1979, Examiner Hearing)
- Application of Bass Enterprises Production Co. for an unorthodox gas well location, Lea County, New Mexico. Applicant, in the above-styled cause, seeks approval for an unorthodox Morrow test well location to be drilled 660 feet from the North and West lines of Section 10, Township 21 South, Range 32 East, Lea County, New Mexico, the W/2 of said Section 10 to be dedicated to the well.
- CASE 6552: Application of Maddox Energy Corporation for compulsory pooling, Eddy County, New Mexico. Applicant, in the above-styled cause, seeks an order pooling all mineral interests in the Pennsylvanian formation underlying the E/2 of Section 3, Township 24 South, Range 28 East, to be dedicated to a well to be drilled at a standard location thereon. Also to be considered will be the cost of drilling and completing said well and the allocation of the cost thereof as well as actual operating costs and charges for supervision. Also to be considered will be the designation of applicant as operator of the well and a charge for risk involved in drilling said well.
- CASE 6553: Application of The Atlantic Richfield Company for approval of infill drilling, Eddy County, New Mexico. Applicant, in the above-styled cause, seeks a finding that the Division waived existing well-spacing requirements and found that the drilling of additional wells was necessary to effectively and efficiently drain those portions of the proration units in the Empire Abo Unit located in Townships 17 and 18 South, Ranges 27, 28 and 29 East, which could not be so drained by the existing wells.
- CASE 6554: Application of The Atlantic Richfield Company for compulsory pooling, Lea County, New Mexico. Applicant, in the above-styled cause, seeks an order pooling all royalty interests in the Devonian, McKee, and Ellenburger formations underlying the E/2 of Section 20, Township 22 South, Range 36 East, Langlie Field, to be dedicated to a well to be drilled at a standard location thereon.
- CASE 6555: Application of Jake L. Haron for an unorthodox gas well location, Lea County, New Mexico. Applicant, in the above-styled cause, seeks approval for an unorthodox location 660 feet from the North line and 560 feet from the East line of Section 30, Township 20 South, Range 36 East, North Osudo-Morrow Gas Pool, all of said Section 30 to be dedicated to the well.
- CASE 6556: Application of Curtis Little for the amendment of Order No. R-5962, San Juan County, New Mexico. Applicant, in the above-styled cause, seeks the amendment of Order No. R-5962 to provide for the unorthodox location of a well to be drilled 1000 feet from the South line and 50 feet from the East line of Section 11, Township 28 North, Range 12 West, Basin-Dakota Pool, and for the extension of the date to commence drilling.
- CASE 6435: (Continued from February 28, 1979, Examiner Hearing)
- Application of Amerada Hess Corporation for approval of infill drilling, Lea County, New Mexico. Applicant, in the above-styled cause, seeks a finding that the drilling of its W. A. Weir "B" Well No. 3 located in Unit B of Section 26, Township 19 South, Range 36 East, Eumont Gas Pool, Lea County, New Mexico, is necessary to effectively and efficiently drain that portion of the proration unit which cannot be so drained by the existing well, and further seeks approval of a waiver of existing well-spacing requirements.

CASE 6559: Application of Roy L. McEay for a unit agreement, Lea County, New Mexico. Applicant, in the above-styled cause, seeks approval for his Norton Solid State Unit Area, comprising 1,480 acres, more or less, of State lands in Township 15 South, Range 34 East.

CASE 6467: (Continued from February 28, 1979, Examiner Hearing)

Application of El Paso Natural Gas Company for approval of infill drilling, Lea County, New Mexico. Applicant, in the above-styled cause, seeks a waiver of existing well-spacing requirements and a finding that the drilling of its Shell E State Coa Well No. 2 located in Unit N of Section 6, Township 21 South, Range 36 East, Emont Gas Pool, Lea County, New Mexico, is necessary to effectively and efficiently drain that portion of the proration unit which cannot be so drained by the existing well.

CASE 6471: (Continued from February 28, 1979, Examiner Hearing)

Application of Consolidated Oil & Gas, Inc. for approval of infill drilling, San Juan County, New Mexico. Applicant, in the above-styled cause, seeks a waiver of existing well-spacing requirements and a finding that the drilling of its Freeman Well No. 1-A to be located in Unit C of Section 11, Township 31 North, Range 13 West, Basin-Dakota Pool, San Juan County, New Mexico, is necessary to effectively and efficiently drain that portion of the proration unit which cannot be so drained by the existing well.

CASE 6472: (Continued from February 28, 1979, Examiner Hearing)

Application of Consolidated Oil & Gas, Inc. for approval of infill drilling, Rio Arriba County, New Mexico. Applicant, in the above-styled cause, seeks a waiver of existing well-spacing requirements and a finding that the drilling of its Jenny Well No. 1-A to be located in Unit P of Section 13, Township 26 North, Range 4 West, Basin-Dakota Pool, Rio Arriba County, New Mexico, is necessary to effectively and efficiently drain that portion of the proration unit which cannot be so drained by the existing well.

CASE 6473: (Continued from February 28, 1979, Examiner Hearing)

Application of Consolidated Oil & Gas, Inc. for approval of infill drilling, Rio Arriba County, New Mexico. Applicant, in the above-styled cause, seeks a waiver of existing well-spacing requirements and a finding that the drilling of its McIntyre Well No. 1-A to be located in Unit K of Section 11, Township 26 North, Range 4 West, Basin-Dakota Pool, Rio Arriba County, New Mexico, is necessary to effectively and efficiently drain that portion of the proration unit which cannot be so drained by the existing well.

CASE 6474: (Continued from February 28, 1979, Examiner Hearing)

Application of Consolidated Oil & Gas, Inc. for approval of infill drilling, San Juan County, New Mexico. Applicant, in the above-styled cause, seeks a waiver of existing well-spacing requirements and a finding that the drilling of its Williams Well No. 1-A to be located in Unit C of Section 24, Township 31 North, Range 13 West, Basin-Dakota Pool, San Juan County, New Mexico, is necessary to effectively and efficiently drain that portion of the proration unit which cannot be so drained by the existing well.

CASE 6475: (Continued from February 28, 1979, Examiner Hearing)

Application of Consolidated Oil & Gas, Inc. for approval of infill drilling, San Juan County, New Mexico. Applicant, in the above-styled cause, seeks a waiver of existing well-spacing requirements and a finding that the drilling of its Montoya Well No. 1-A to be located in Unit I of Section 35, Township 32 North, Range 13 West, Basin-Dakota Pool, San Juan County, New Mexico, is necessary to effectively and efficiently drain that portion of the proration unit which cannot be so drained by the existing well.

DOCKET: COMMISSION HEARING - TUESDAY - MAY 29, 1979

OIL CONSERVATION COMMISSION - 9 A.M. - ROOM 205
STATE LAND OFFICE BUILDING, SANTA FE, NEW MEXICO

CASE 6557: Application of Getty Oil Company for pool creation and special pool rules, Lea County, New Mexico. Applicant, in the above-styled cause, seeks an order creating a new Morrow gas pool for its State 35 Well No. 1 located in Unit K of Section 35, Township 21 South, Range 34 East, and its Getty Two State Well No. 1 located in Unit F of Section 2, Township 22 South, Range 34 East, and for promulgation of special pool rules, including provision for 640-acre gas well spacing.

CASE 6497: (DE NOVO)

Application of Llano, Inc. for an unorthodox gas well location, Lea County, New Mexico. Applicant, in the above-styled cause, seeks approval for the unorthodox location of a well to be located 1650 feet from the South line and 660 feet from the East line of Section 34, Township 21 South, Range 34 East, Grama Ridge-Morrow Gas Pool, the E/2 of said Section 34 to be dedicated to the well.

Upon application of Getty Oil Company this case will be heard De Novo pursuant to the provisions of Rule 1220.

CASE 6558: Application of Llano, Inc. for a non-standard gas proration unit, Lea County, New Mexico. Applicant, in the above-styled cause, seeks approval for a 320-acre non-standard gas proration unit comprising the E/2 of Section 34, Township 21 South, Range 34 East, to be dedicated to its Llano 34 State Com Well No. 1 located in Unit 1 of said Section 34.

ROUGH

dr/

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION

IN THE MATTER OF THE HEARING
CALLED BY THE OIL CONSERVATION
DIVISION FOR THE PURPOSE OF
CONSIDERING:

CASE NO. 6553

Order No. R-6054

APPLICATION OF THE ATLANTIC
RICHFIELD COMPANY FOR APPROVAL
OF INFILL DRILLING, EDDY COUNTY,
NEW MEXICO.

ORDER OF THE DIVISION

BY THE DIVISION:

This cause came on for hearing at 9 a.m. on June 13,
19 79, at Santa Fe, New Mexico, before Examiner Daniel S. Nutter.

NOW, on this _____ day of June, 19 79, the
Division Director, 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 Division has jurisdiction of this cause and the
subject matter thereof.

(2) That the applicant, The Atlantic Richfield Company,
is the operator of the Empire Abo Unit Area, Empire-Abo Pool,
Eddy County, New Mexico.

(3) That said unit area covers most of the Empire-Abo Pool, and includes all or portions of Sections 34 through 36, Township 17 South, Range 27 East, Sections 25 through 27 and 31 through 36, Township 17 South, Range 28 East, Sections 29 and 30, Township 17 South, Range 29 East, Sections 1 through 4, 8 through 11, and 15 through 17, Township 18 South, Range 27 East, and Sections 4 through 6, Township 18 South, Range 28 East, NMPM.

(4) That the applicant is conducting a pressure maintenance project in the aforesaid Empire Abo Unit Area, and as project operator has drilled and is drilling additional wells on various 40-acre proration units within said unit area as infill wells to further enhance production from the pool and increase recovery.

(5) That the applicant herein, The Atlantic Richfield Company, seeks a finding that the drilling of each of the aforesaid additional wells on various 40-acre proration units in its Empire Abo Unit Area was, and is, necessary to effectively and efficiently drain the portions of the proration units which could not be so drained by the existing well(s) on the unit.

(6) That the applicant further seeks approval of a waiver of existing well spacing requirements for the aforesaid infill wells.

(7) That the Empire-Abo ^{reservoir rock of the Pool} ~~reservoir~~ is the Abo reef, a long narrow barrier type reef approximately 12.5 miles in length from Southwest to Northeast and 1.5 miles in width from backreef (north) to forereef (south); ^{that} the reef dips gradually from Southwest to Northeast ^{as is} ~~and~~ characteristically ~~for~~ barrier reefs, ~~that~~ ^{sharply} there is a sharp dip from the crest toward the forereef.

(8) That the gas injection pressure maintenance program which the applicant is conducting requires the injection of gas in wells high on the structure along the North flank of the reef, and depends largely on the expanding gas cap and gravity drainage through the reef to achieve maximum ultimate recovery.

(9) That there is good horizontal permeability through the reef with respect to oil, but the relative vertical permeability with respect to gas is even more pronounced.

(10) That said pronounced vertical permeability with respect to gas causes gas to cone into the producing wells as the gas cap expands, ^{resulting in the} ~~and the resultant~~ premature abandonment of the oil wells ^{and a decrease in the ultimate recovery under} ~~causes waste.~~
individual proration units in the pool and under the pool as a whole

(11) That the most effective manner in which to reduce the coning of gas into the producing wells and yet maintain production of oil at a reasonable level is to increase the number of withdrawal points within the reef.

(12) That the only way in which to so increase the number of withdrawal points within the reef is to drill additional wells.

(13) That the Division has recognized the necessity for the drilling of such additional wells in order to more effectively and efficiently drain the portion of the proration units upon which said wells are located which could not be so drained by the existing well(s) thereon, and, ^{has} approved their being drilled as infill wells in exception to the applicable well spacing requirements for the Empire-Abo Pool. *by its Orders*

No. R-4549-B and R-5906.
IT IS THEREFORE ORDERED:

(1) That the establishment of a procedure for administrative approval for unorthodox producing well locations in the Empire-Abo Unit Area, Empire-Abo Pool, Eddy County, New Mexico, by Division Order No. R-4549-B, and the unorthodox locations which have been approved pursuant to such procedure, as well as by Division Order No. R-5906, be and the same are hereby ratified and confirmed.

(2) That such unorthodox producing well locations as have been approved pursuant to said Order No. R-4549-B or Order No. R-5906 as infill producing wells were, and are hereby found, to be necessary to effectively and efficiently drain the portion of the reservoir covered by ~~the~~ ^{their respective} existing proration units which could not be so drained by the existing wells on the units, and that the existing well spacing requirements were waived to permit their approval.

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

DONE at Santa Fe, New Mexico, on the day and year herein-
above designated.