

BEFORE THE
NEW MEXICO OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
October 25, 1967

IN THE MATTER OF:

Application of Gulf Oil
Corporation for a Unit Agreement,
Eddy County, New Mexico

Application of Gulf Oil
Corporation for a waterflood
project, Eddy County,
New Mexico.

Case No. 3675

Case No. 3676

BEFORE: Elvis A. Utz, Examiner

TRANSCRIPT OF HEARING

MR. UTZ: Case 3675.

MR. HATCH: Case 3675, Application of Gulf Oil Corporation for a unit agreement, Eddy County, New Mexico.

MR. KASTLER: If the Examiner please, I am Bill Kastler, from Roswell, representing Gulf. I would like to have Case 3675 and Case 3676 consolidated for the purpose of the hearing.

MR. UTZ: Case 3675 is for the north Hackberry Yates Unit area and 3676 is for a water injection approval from that same area, is that true?

MR. KASTLER: That's correct.

MR. UTZ: Cases 3675 and 3676 will be consolidated.

MR. KASTLER: We have three copies of a brochure and it has been appropriately marked and it contains all of our exhibits. Would you like copies of the Unit and Unit Operating Agreement to be submitted as Exhibits 2 and 3

MR. UTZ: We'll let the attorney make that decision.

MR. HATCH: Let's have them, please.

(Whereupon, Applicant's Exhibits 1 through 1-A and 1-G and Exhibits 2 and 3 were marked for identification.)

MR. KASTLER: Our only witness this morning will be Mr. Don G. Bilbrey.

(Witness sworn.)

D O N G. B I L B R E Y, called as a witness,
having been first duly sworn, was examined and testified as
follows:

DIRECT EXAMINATION

BY MR. KASTLER:

Q Mr. Bilbrey, will you please state your name and
your address and for whom you work?

A My name is Don G. Bilbrey. I reside at 1201 West
McGaffey in Roswell, New Mexico, and I work for Gulf Oil
Corporation in Roswell.

MR. UTZ: Would you spell your name?

THE WITNESS: Don G. B-i-l-b-r-e-y.

Q (By Mr. Kastler) Have you previously testified
before the Oil Conservation Commission?

A Yes, I have, on several occasions.

Q Will you briefly outline the purpose of this
hearing?

A Yes. Gulf, in cooperation with Union Oil Company of
California, proposes to unitize and waterflood a portion of
the North Hackberry-Yates Pool in Eddy County, New Mexico.
We would like to do this in order to inject water into the
Yates formation to recover additional oil reserves which
might be otherwise left in the ground.

Q Would you describe the location of the proposed

unit in the project and give the number of wells and the total number of acres involved?

A Yes. I would like to refer to Exhibit No. 1 now, No. 1-A more specifically, which is an area plat. The Unit area covers portions of Section 23 and 24 of Township 19 South, Range 30 East, in Eddy County, New Mexico, and the area lies approximately 24 miles from, northeast of Carlsbad, New Mexico. The area includes 720 acres and 16 producing wells. There's one dry hole within the proposed boundary and this is in the southwest quarter of the northeast quarter of Section 23, and there's one vacant location. This is in the southeast of the southeast of Section 24, on Gulf's Federal-Holder Tract.

Q Are there currently any waterflood projects in this pool?

A No, there are not; to my knowledge, the nearest waterflood is Hondo Oil and Gas Culwin Queen Unit flood about three miles north of the Shugart Yates Pool.

Q You previously stated that the purpose of the North Hackberry-Yates Unit Waterflood would be to inject water into the Yates Formation. Would you tell us more about the Yates in this area?

A Yes; I would like to refer now to Exhibit No. 1-B

which is a typical well log in the area showing a portion of the Yates formation. You will see from this exhibit the productive zones are in a 50 to 100 foot gross interval in the upper part of the formation. The depth of these producing horizons ranges from 1750 to 2050 feet below the surface in this area. The net pay in the two zones ranges from 3 to 24 feet in the upper zone and from 0 to 8 feet in the lower zone in the 16 producing wells involved. As shown on Exhibit 1-D and 1-E, which is the net pay isopachs for the upper zone, you will see that the upper zone covers essentially the entire unit area. This is the main producing zone or horizon in this part of the North Hackberry-Yates pool and we figure it has contributed probably 90% of the oil production to date. The figure on Exhibit No. 1-E - the lower zone - is a net pay isopach of the lower zone and from it you can see that it covers approximately half of the unit area. It is much thinner than the upper zone and it has probably contributed no more than 10% of the oil production that has come from this interval to date.

The reservoir rock is similar in both the pay zones. It's a tan to brown, fine medium grain sandstone which is slightly dolomitic and argillaceous. The rock is extremely friable in some parts of the reservoir as evidenced by loss of core in several wells.

As far as structure is concerned, I would like now to refer to Exhibit 1-C and from this you can see that the reservoir is located on the northeastern flank of an anticlinal nose which plunges to the east at approximately 100 feet per mile. On this same exhibit we have shown an oil-water contact at approximately 1395 feet above sea level. This oil-water contact probably limits production on the northeast flank of this structure. Production on other directions is probably limited by loss of porosity and permeability.

Q What about porosity and permeability of the reservoir rock?

A Thirteen of the sixteen wells in the unit area producing wells were cored and analyzed, and based on these analyses, the average porosity in the upper zone is 21.05 percent and 18 1/2 percent in the lower zone. The average permeability is approximately the same for both zones, being 14.3 millidarcies in the upper and 13.3 millidarcies in the lower. The permeability in these pays ranges from 5 millidarcies cutoff which was used to determine net pay, to a maximum of 467 millidarcies.

Q Is that the same number of millidarcies, same average, or largest permeability range, is that true as to both

upper and lower zones?

A No, the upper zone, this porosity is better, its permeability is slightly better, too. The maximum permeability of 467 is in the upper zone. The lower zone maximum is 364, from the 13 cores that we have.

Q What can you tell the Commission concerning primary operations in this area?

A The initial production from the Unit area was in December, 1960. I would like now to refer to Exhibit 1-F which is the production history for the unit area. The upper curve, you can see the twelve wells were completed the first year or so, by January of 1962, when drilling came to a temporary halt there for two, two and a half years. In the latter part of 1964, and in the first part of '65, Gulf Oil drilled four additional wells in the Northeast portion of the pool on their Federal-Holder lease. These four wells were, you can go back to Exhibit 1-C, were completed much closer to the oil-water contact than the previous wells. On the production history curve, then, you will see that at the completion of these wells and by the very close proximity of the wells to the water-oil contact, that the water production increased markedly due to these wells, especially Well No. 10.

The cumulative production from the 16 wells was

710,585 barrels through July, 1967, which is an average of 44,400 barrels per well. The oil is being produced by solution-gas-drive and the reservoir is approximately 75% depleted of its primary oil at this time. Average daily production from the wells is approximately 10 barrels per well now. A total of probably 939,000 barrels of oil will be produced through primary operations. This represents 1.44% of the estimated original oil-in-place.

Q In order to recover additional oil, you say you plan to install a waterflood. Will you tell the Commission what your plans involve?

A Yes, we propose to install a 16-well project using an 80-acre, 5-spot pattern as shown on Exhibits 1-A, D and E. There will be 8 input wells into which we plan to put up to 500 barrels of water per day per well. Our plans call for the initial injection pressure at the wellhead not to exceed 1000 psi. However, the plant will be designed for 2000 psi so that higher injection pressures can be utilized if necessary, later on in the project.

Q How, specifically, do you plan to inject water into the 8 input wells?

A I would like to refer now to Exhibit 1-G which is a schematic diagram showing the schematic diagram for all

eight of the proposed injection wells.

Q Is 1-G continued on two pages?

A Yes, there are two pages to 1-G, in each of them water will be injected down 2-3/8ths inch O. D. plastic-coated tubing, below a packer into the Yates formation through casing perforations. The casing tubing annulus will be filled with corrosion-resistant inhibited water.

Q Now, this diagram, the schematic diagram, Exhibit 1-G, shows all of these injection wells and identifies each one of them?

A It does, yes.

Q And in each one are your injections going to be into both the upper and the lower pay zones?

A Where they're found in the particular injection well involved, yes. There are several injection wells which only the one zone, the main upper zone is found.

Q How have you delineated that on your schematic diagram?

A I have not. I've given the gross interval in which we plan to inject. Realizing that the zones will be selectively perforated where they're found. In fact, I think all of these are perforated exactly where they're indicated right now.

Q They are presently perforated?

A As shown, right.

MR. UTZ: In other words, you are currently perforated in each of the zones from which they have been producing?

THE WITNESS: That's correct.

MR. UTZ: You are going to inject into the same zone?

THE WITNESS: Into the same zone. I think all zones have been perforated where they're found in the wellbore.

Q (By Mr. Kastler) What will be the source of your injection water?

A Most of it initially will come from the shallow wells to be drilled to the Rustler formation, about 300 to 500 feet below the surface in the Unit area. Produced water will be used also, but this will not be a significant part of the total until the latter stage of the project.

Q That's your produced water?

A That's produced water, yes.

Q Do you have any produced water now that you are disposing of?

A Yes, we have two to three thousand barrels per month, currently, that will be injected initially.

Q Has Gulf made an application and received the approval of the State Engineer to use Rustler water for this project?

A Yes, our application to appropriate ground water

were approved by the State Engineer August 22, 1966, entitling us to use 200 acre feet of Rustler water annually for water-flooding purposes.

Q Has Gulf also sent a copy of this application to the State Engineer's Office?

A Yes, it has.

Q What is the quality of the Rustler water in this area?

A It is saline. Water samples from the Rustler underlying Gulf's Federal-Holder lease show the water contains approximately 60,000 ppm chloride.

Q Do you plan to treat this water prior to injection?

A No, not initially since all of our injection equipment will be coated for protection against corrosion. However, if tests and flood performance later indicate treatment of the water to be necessary, then appropriate action will be taken.

MR. UTZ: This is produced water you are talking about now?

THE WITNESS: This is produced and/or the initial water from our Rustler wells.

MR. UTZ: The Rustler water also?

THE WITNESS: Both; initially, nothing is planned

in the way of treatment.

Q (By Mr. Kastler) And the Rustler water is quite saline, 60,000 parts per million?

A Right.

Q How much additional oil do you think will be recovered from the project area due to the waterflood?

A Our estimate is that we will get at least 939,000 barrels of additional oil will be recovered, or 100% of primary. Recovery of this additional oil will increase the productive life of the unit area 4 to 5 years, over their primary lives.

Q Is it your opinion that unitization and waterflooding of these properties is in the best interest of conservation and in the prevention of waste?

A Yes, I do, under the primary operations alone, less than 15% of the original oil-in-place will be recovered. We feel we can double this through secondary recovery operations, with the waterflood project, and at the same time increase the effective producing life of this area.

Q Now, my next questions will concern the instruments in the unit and unit operating agreement. Are you familiar with the Unit Agreement and the exhibits to that?

A Yes, sir, I am.

Q Does Gulf have 100% working interest owners

commitment?

A Yes, verbally, at least; there are, of course, in this unit, only two working interest owners, Gulf and Union Oil of California. Union has not exactly signed the ratification, but they have assured us they will do so. Gulf, of course, has signed.

Q Do you know what the respective percentages of Gulf and Union are in acreage holding, in percentage of participation?

A Under both phases?

Q Yes.

A Under the primary phase, Gulf Oil will have 88.369%. Under the secondary phase 81.3789% in the unit. Union Oil of California, under the primary phase will have 11.6302% and that will increase to 18.6211% under the secondary phase of operations.

Q And these two operators are the only two involved?

A The only two working interest owners involved in the unit.

Q Are all of the lands within this Unit Federal-owned lands?

A Yes, they are. The Federal Government is the sole basic royalty owner here.

Q Has the Federal Government, through the U. S.

Geological Survey, examined this, and approved the unit designated as a Unit Area?

A Yes, they have given us preliminary approval in the Roswell Office, and Washington, D. C. Office.

Q Have they approved the form of Unit Agreement which we propose to use?

A Yes, they have.

Q Does the Unit Agreement provide for the expansion of the Unit Area under certain circumstances?

A Yes, Section 4, Page 5 of the agreement outlines the procedure for expansion of the Unit.

Q These are the normal provisions for expansion of the Unit?

A Yes.

Q Does this Unit Agreement provide for selection of a successor unit operator in the event of resignation or removal so as to insure continuous responsible operations?

A Yes, this is covered under Section 8, Page 7 of the Unit Agreement.

Q Under the Unit Agreement, what is the basis for allocation of the remaining primary and secondary oil reserves?

A The Unit Agreement, Section 13, Page 10 provides for a split participation formula which resulted from negotiations

between Union of California and Gulf.

The remaining primary oil for the unit will be allocated based on 50% oil rate for the six month period, December, 1966 through May, 1967, and 50% remaining primary reserves from June 1st, 1967. The secondary reserves will be allocated 50% on ultimate primary recovery and 50% on total net acre feet.

Q What were the primary or the estimated remaining primary reserves as of June 1, 1967?

A 314,692 barrels. That plus the cumulative will give the primary ultimate recovery of 939,000, or approximately 939,000 barrels of oil.

Q Has the U. S. Geological Survey representing the only royalty owner, approved this formula?

A Yes, they have.

Q As being equitable?

A Yes, they have.

MR. KASTLER: Those are all the questions I have on direct.

CROSS EXAMINATION

BY MR. UTZ:

Q Mr. Bilbrey, in regard to your produced water, how saline is your produced water now?

A I don't think I have access to an analysis of a water sample of the produced water.

Q Do you know whether it's more or less saline than the Rustler water?

A I think it's less saline than the Rustler water, how much, I don't know. The Rustler in this area, sits right on top of your salt section and the water is artesian, it's circulating and it's probably picking up a great deal of salt. The produced water, I don't believe is quite as saline.

Q You don't anticipate any problem using the salt water?

A We don't anticipate any. We'll keep a close eye on it, and if anything happens as far as affecting the flood or our equipment, we'll make a judgment then, as to what to do.

Q If necessary, you will treat it?

A Right, of course.

Q This is in view of the fact that your produced water in the formation that you are going to flood has less salt in it than your proposed injection water?

A And I can't say definitely what the difference is; it's just in my opinion that it's probably a little less saline. The formation water is a little less saline.

Q In regard to Exhibit 1-G, do I interpret this as

well, no, I am sure I have interpreted it wrong. You have surface casing on each of the injection wells?

A Yes.

Q Is that all circulated to the surface?

A Yes, that is correct.

Q Is all the fresh water in this area beside the surface casing?

A Yes, what fresh water is, I think, is protected by the surface casing. You only have to go through to 500 feet to get this highly saline Rustler water and most of this surface casing just looking at Exhibit 1-G, is around four to five hundred feet deep. It looks like it's all set through the Rustler. The fresh water would be shallower than that in this area.

Q On your producing strings which is four and a half and five and a half in all cases --

A I believe that's correct. In fact, only two of the eight have five and a half, the rest of them have four and a half.

Q Is it your testimony that you have sufficient cement behind the producing strings to retain the injection pressure you propose?

A Yes, I believe so.

Q And where the cement does not come back up into the surface casing which I don't think it does in any of these, there's no danger of contaminating any oil or fresh water formation?

A No, in this area immediately above the Yates, well just within a few feet of the top of the Yates, you have your salt anydrite section which goes up to your Rustler.

Q Did you list all of your injection wells in your application?

A Yes.

Q Are all of those locations correct?

A To the best of my knowledge. I prepared it and checked it and I think they're correct.

MR. UTZ: Are there any other questions of the witness? The witness may be excused.

(Witness excused)

MR. UTZ: Do we have any statements in this case.

MR. KASTLER: Did I move, or will the record show that we move for admission of Exhibits 1-A through 1-G and 2 and 3 to be included in the record.

MR. UTZ: Exhibit 1, 2 and 3, that would be in Case 3675, correct?

MR. KASTLER: Yes

MR. UTZ: And Exhibits 1, parts A through G will
be entered into the record in this case.

(Whereupon, Applicant's Exhibits
1-A through 1-G and 2 and 3 were
admitted into evidence.)

MR. UTZ: The case will be taken under advisement.

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STATE OF NEW MEXICO)
) ss
 COUNTY OF BERNALILLO)

I, ADA DEARNLEY, Court Reporter in and for the County of Bernalillo, State of New Mexico, do hereby certify that the foregoing and attached Transcript of Proceedings before the New Mexico Oil Conservation Commission was reported by me, and that the same is a true and correct record to the best of my knowledge, skill and ability.

WITNESS my hand this 28th day of November, 1867.

Ada Dearnley
 Court Reporter

I do hereby certify that the foregoing is
 a complete record of the proceedings in
 the Bernalillo District of Case No. 3675
 heard by the Hon. the Supreme Court of New Mexico
 on the 12th day of November, 1867.
Wm. C. Dearnley, Bernalillo
 New Mexico Oil Conservation Commission