[redacted]

Case No.

1356

[redacted]

Application, Transcript,
Small Exhibits, Etc.

[redacted]

CASE 1356: Cities Service Oil Co. application for permission to institute a pilot water flood project, Chaves County.

EXAMINER HEARING
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
January 7, 1958

IN THE MATTER OF: Case No. 1356

TRANSCRIPT OF PROCEEDINGS

DEARNLEY - MEIER & ASSOCIATES
INCORPORATED
GENERAL LAW REPORTERS
ALBUQUERQUE, NEW MEXICO
3-6691 5-9546

NEW MEXICO OIL CONSERVATION COMMISSION

Examiner Hearing (D.S. Nutter)

Santa Fe, , NEW MEXICO

REGISTER

HEARING DATE JANUARY 7, 1958 TIME: 9 A.M.

NAME:	REPRESENTING:	LOCATION:
F. Norman Woodruff	El Paso Natural Gas Co.	El Paso Tex.
Dave Raney	"	"
Garrett Whitworth	"	"
J. W. Zaloch, Jr.	"	Jal, N.M.
E W Nestor	Shell Oil Company	Midland, Tex
Dan Curran's	Pan American	Roswell, N.M.
E A Chávez	State Engr Office	Santa Fe
Lewis [illegible]	Texas [illegible]	Santa Fe
H.N. Wade	The Texas Co.	Ft. Worth
R.V. Shoemaker	The Texas Co	Ft Worth.
J.W. Boulet, Jr.	SP NG. Co.	Jal, N.M.
G. L. Tribble	Permian Basin Pipeline	Carlsbad
Pat McCarthy	" " "	" "
W. J. Brown	" " "	Hobbs, N.M.
Wm Johnston	Northwest Production	Albuquerque —
Ray Plunkett	✓ ✓	✓
W.V. Kastler	Gulf Oil Corp	Roswell
Don Walker	"	Fort Worth
John H. Hannon	"	Roswell
John L. Sanders	Magnolia	Hobbs

NEW MEXICO OIL CONSERVATION COMMISSION

Examiner Hearing (D.S. Nutter)

Santa Fe, NEW MEXICO

REGISTER

HEARING DATE January 7, 1958 TIME: 9 a.m.

NAME:	REPRESENTING:	LOCATION:
J. H. Moore	Schermerhorn Oil Corp	Hobbs
Beaman	Self	Salt Lake City, Ut.
R.G. Hanagan	Shell Oil Co	Midland
McGuire	" "	Ft. Worth
Whitley	Harvey Dow & Hinkle	Roswell
Joe M Kanuel Jr	Cabot Carbon Co	Pampa, Texas
Perry C. Oquinn	Cabot	Midland, Tex.
A.B. Cockburn	Cabot Carbon Co	Midland, Texas
L O Thompson	Cabot Carbon Co	Midland Tex
Mac E Watkins	Gulf United Pump Co	Hobbs New Mex
Jewell Campbell	Campbell & Russell	Roswell NM

EXAMINER HEARING
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
January 7, 1958

IN THE MATTER OF:

Application of Cities Service Oil Company for permission to institute a pilot water flood project in Township 14 South, Range 31 East, Caprock-Queen Pool, Chaves County, New Mexico. Applicant, in the above-styled cause, seeks permission to institute a pilot water flood project in the Caprock-Queen Pool, Chaves County, New Mexico, by injecting water into the Queen formation through the following intake wells:

Government "B" No. 5, NW/4 NE/4 Section 10;
Government "B" No. 6, SE/4 SE/4 Section 3;
Government "B" No. 10, NE/4 SE/4 Section 3;
Government "B" No. 14, SE/4 SW/4 Section 3;

all in Township 14 South, Range 31 East.

Case 1356

BEFORE:

Mr. Daniel S. Nutter, Examiner

TRANSCRIPT OF PROCEEDINGS

MR. NUTTER: The meeting will come to order. Let the record show that due to construction work being done in Mabry Hall and the impracticability of holding the hearing here today, the meeting will be adjourned and resumed in the State Highway Building on Cerillos Road at 9:30 A.M.

(Whereupon the hearing was adjourned until 9:30 A.M. in the State Highway Building).

MR. NUTTER: The hearing will come to order, please. The

first case on the docket this morning will be Case No. 1356.

MR. COOLEY: Case 1356: Application of Cities Service Oil Company for permission to institute a pilot water flood project in Township 14 South, Range 31 East, Caprock-Queen Pool, Chaves County, New Mexico.

MR. HOLL: Appearances for the applicant, Alfred O. Holl, Bartlesville, Oklahoma. We have one witness in this case, Mr. Motter.

E. F. MOTTER,

a witness, of lawful age, having been first duly sworn on oath, testified as follows:

DIRECT EXAMINATION

By MR. HOLL:

Q Would you state your name and address, please?

A E. F. Motter, Hobbs, New Mexico.

Q By whom are you employed and in what capacity?

A Cities Service Oil Company as District Petroleum Engineer.

Q Have you previously testified before this Commission as an expert in cases such as this?

A Yes.

MR. HOLL: If there are no objections, we ask that his qualifications be waived.

MR. NUTTER: The witness is qualified.

Q Mr. Motter, are you familiar with the application filed in this matter?

A Yes, sir.

Q Is the area which is the subject of this application under your direct supervision?

A Yes, it is.

Q Our Exhibit No. 1 is a plat of the area showing all of the wells in the proposed water flood. Would you explain this exhibit please?

(Cities Service Exhibit No. 1 marked for identification.)

A This plat shows the proposed area of the water injection, all the offset operators, offset producing wells. The proposed injection wells are Government "B" No. 5, it's in the Northwest, Northeast Quarter of Section 10; Government "B" No. 6, the Southeast Southeast of Section 3; Government "B" No. 10, the Northwest Southeast of Section 3; and Government "B" No. 14 in the Southeast Southwest, Section 3. They are all in Township 14 South, Range 31 East.

Q For benefit of the Examiner, Mr. Motter, will you give a brief history of the Drickey Queen Pool?

A The Drickey Queen Pool was discovered in June of 1953 by Penrose, the discovery well was the Zimmerman No. 1, located in the Northwest of the Northwest of Section 15, Township 14 South, Range 31 East. The development proceeded in all directions from this well until it reached the old Caprock Queen Pool to the north and the wells encountered water to the east and they found a gas

cap to the west. Development to the south never did quite tie in with what they call the South Drickey Queen Pool. It appears that this pool lies in the northeast southwest trend along an old shore line. The producing formation is the Queen Sand of the Permian system, and the pay section in this area consists of from eight to ten feet of unconsolidated sand. The accumulation of oil is found along the flank of a local high extending northeast southwest; the reservoir is a stratigraphic trap with some evidence of local closure. On Cities Service acreage there were seventeen cores and sixteen Gamma Ray-Neutron logs run. Very poor recovery of the cores occurred because of the unconsolidated nature of the pay section. From all the available information, the porosity is estimated to be twenty-three percent, permeability five hundred twenty md and connate water 28.5 percent. A bottom hole fluid sample obtained from the Government "B" No. 20 shows a saturation pressure of 934 psig at a reservoir temperature of ninety degrees. The gravity to produce oil is 36.5 degrees at 60 degrees F. At present it appears that the main driving mechanism is a solution gas; however, as I stated previously, a gas cap exists to the west and water has been encountered along the eastern edge of the field, but because of low initial pressure in the field, it is anticipated that this water is essentially dormant and will not act as a water drive.

Q Now, Mr. Motter, I hand you our Exhibit No. 2. Would you, when the Examiner has a copy, explain it and identify it, please?

(Cities Service Exhibit No. 2
marked for identification.)

A Exhibit No. 2 is a structure map of the area of interest. This map is contoured on the top of the Queen Sand. Due to the completion methods used in this portion of the pool, we were unable to obtain true sand thickness so we were unable to make an isopach. The reason for this is that most wells were drilled with rotary tools to within a few feet of the pay, and after the oil string was set, the well was drilled with cable tools. It is not certain whether the sub sand section below the main pay was drilled in all the wells and for this reason, no attempt was made to prepare an isopach. However, as I stated before, we believe there is from six to eight feet of pay throughout this area.

Q Now, Mr. Motter, you have prepared what we call our Exhibits No. 3 and 4. I will ask you to identify those when the Examiner has a copy.

(Cities Service Exhibits No. 3 & 4
marked for identification.)

A Exhibit No. 3 is a radio-active log on the Government "B" No. 5, and I might say right now that this is the only log we have available on the four proposed injection wells. Exhibit No. 4 is a schematic drawing of the proposed method for completing the input wells.

Q I notice from the Exhibit 4 that there is a liner in this proposed input well. Will liners be run in all of your input wells?

A No, sir. Our plan is to log each input well and if the

five and a half inch casing is set into the anhydrite streak immediately above the pay, liners will not be run. We have roughly tried to duplicate the Gamma Ray-Neutron curve on this, and the base of the liner is the anhydrite streak which we have referred to. If we have cased down that far, we will not run liners in those wells. If you refer to Exhibit 3, the log on the Government "B" 5, you note several stringers above the anhydrite streak. We have enough cores in this area to find that this is rather unconsolidated and contains some salt.

Q Then what is the purpose of the liners?

A Well, as I have just stated, there are some core analyses. From core analysis we know that free salt exists in the formation above the anhydrite streak. Since we are going to use fresh water to kick off the flood, we feel we should protect this free salt from flushing.

Q You have mentioned fresh water for the flood. Where do you plan to obtain the water?

A We have purchased two commercial water wells in Section 24, Township 14 South, Range 31 East. It is not on the map, but it is right down there about a mile. We have both water lease and water rights assigned from the State Land Commissioner and the State Engineer. We have been authorized to use 465 acre feet of water per annum from four wells in Section 24. The file number on the change of ownership of water rights is L-2661. We have a copy of Commercial Water Lease No. W-119 assigned to Cities Service Oil

Company. These are all presented in Exhibit No. 5 and No. 5-A.

(Cities Service Exhibits No. 5 & 5-A marked for identification.)

Q What is the source of this water?

A The water will come from the Ogohalla formation at approximately three hundred foot depths.

Q Have you tested these wells for capacity?

A They have been tested for a daily capacity of 3700 barrels. These wells have not been produced at capacity for quite some time, and have not been cleaned recently, and we feel that if we cleaned out the wells, the producing capacity could be quite some better than what it is right now.

Q How much water will be used for this pilot water flood per day?

A We had planned to inject approximately four hundred barrels per day in each of the four injection wells, so that will take sixteen hundred barrels per day.

Q Have you made any effort to determine if another source of water other than the fresh water you propose to use is available?

A Yes, we have looked at logs in the area of numerous wells drilled, and talked to operators who have cable tooled wells to the producing zone in this area, and they report no evidence of water down to that depth. Water has been found in a drill stem test in the Devonian formation to the east, but inadequate information is available as to the quantity.

Q Do you know of any other operators who have been able to find another source of water other than fresh water in this area?

A It is my understanding that Grest Western has just re-entered a dry hole drilled to the Devonian and tested for water. The results of the test have been reported. I do not know how lengthy the test was, so I don't know how reliable the water source would be. We have considered picking up salt water from several other producing fields in the area, but the pipelines to transport the water would cost too much and prohibit this consideration of this water as a source for water flooding.

Q Have you performed any tests to determine if fresh water will perform successfully in this flood?

A Well, of course, we know that there are two floods to the north in the old position of the Drickey Queen Pool now operating on fresh water, and we have had laboratory tests run on cores taken from the lease and the water which we plan to use for flooding. X-ray diffraction analysis indicates that no water sensitive clays are present. Laboratory tests indicate that filtering of the water will be necessary to overcome plugging difficulties. After filtering the samples of water, there was very little change in permeability of the cores after injecting water through them for ten days.

Q What rates do you plan to inject the water into each well?

A As I stated before, approximately four hundred barrels per day per well. Since the wells will be on an eighty acre five-spot

and have approximately six to eight feet of pay, that would be nearly one barrel per day per acre foot.

Q Would you say this rate is high or low?

A I would say that is about average.

Q Do you have an estimated pressure at which the water will be injected?

A Well, while fill-up is taking place, we expect the intake wells to take water on gravity. After fill-up has occurred and as we start pushing oil, we will probably expect pressures of one thousand pounds, or perhaps in excess of a thousand pounds.

Q At this rate, you propose, how long do you predict it will be before fill-up occurs and producing wells will be affected?

A We should get some response before fill-up occurs. We estimate that it will take approximately six months before we get any effect of the water flood.

Q Do you have any information relative to the past performance and present reservoir conditions?

A Yes, we have prepared a data sheet marked, I believe it is Exhibit 6, and we have decline curves on the Government "B" lease and also several wells around this proposed pilot that are marked Exhibit 7.

(Cities Service Exhibits No. 6 & 7 marked for identification.)

Q Will you please explain this data sheet, or Exhibit No. 6, to the Commission?

A This data sheet gives information on all wells on the Government "B" lease, including date of completion, the original potential, and the most recent production tests, cumulative production to December 1st, 1957, and the most recent bottom hole pressures, and this has the bottom hole pressure in December of 1954, I believe I stated previously that was '53, it should have been corrected to '54. I might add that there is one inked-in pressure that we got after I got in yesterday. It was called up to me.

Q That was taken on the 5th day of January, 1958?

A Yes, it was taken Saturday or Sunday.

Q What do you believe the significance of the decline curve for Exhibit No. 7 to be?

A Well, the main thing, if we just look at the Government "B" lease as a whole, these curves show that the production has been falling below allowable more and more each month. The last month that the allowable was produced was January, 1956. If you will notice, we have added two small red marks there for the months of August and September. Those two months we asked for a reduced allowable, which are indicated by the two small circles; the red lines would have been what our allowable would have been, top allowable for all wells on the lease.

Q What are the reservoir conditions as they exist today?

A We estimate that we have recovered sixteen and a half percent of the oil in place, and according to our calculations, we believe that we will recover perhaps another five and a half

percent by primary means. We also estimate that we will recover an additional 25.6 percent by secondary means.

MR. NUTTER: How much was that?

A 25.6 percent.

Q Then if water flooding is not employed, there will be some loss of oil to Cities Service Oil Company and a loss of revenue to the royalty owners, who are the State of New Mexico and the Federal Government, is that correct?

A Yes, that is correct. If secondary operations are not inaugurated, we estimate that we will leave in place an estimated seventeen hundred forty barrels per acre foot.

Q Then that would result in waste if this application were not granted?

A Yes, we believe it would.

Q Now, do you have any plans relative to the increasing of the size of this pilot water flood?

A Well, naturally if this pilot is successful, we would like to increase the flood to ultimately cover our entire leases in that area. We would like to, if the Commission would approve that this be done by administrative approval rather than have to come back before this Commission each time we want to add a few more wells to our water flood.

Q Then you want the Commission to understand that we would notify all offset operators and keep them advised of any increases in this project?

A Yes, we would naturally do that on our application for administrative approval. I might add that all offset operators, of course, were notified of this application by registered mail, and as far as I'm concerned, we have had no objection. We have had several meetings in the past several months, and nearly all operators seem to be in approval of flooding for this area.

Q This proposal that we are making is the same that has been approved by the Commission in several other projects, is that correct?

A Mr. Holl, if I understand you right, this pattern agrees in line with the two pilots that are now in operation to the north of this area.

Q Were Exhibits numbered 1 through 7 prepared by you and under your supervision?

A Yes, they were.

MR. HOLL: We ask that Exhibits 1 through 7 be admitted to the record.

MR. NUTTER: Is there objection to the entrance of Cities Service Exhibits 1 through 7? If not, they will be admitted.

MR. HOLL: That's all we have.

MR. NUTTER: Does anyone have any questions of the witness?

MR. IRBY: I have a question.

MR. NUTTER: Mr. Irby.

MR. IRBY: Frank Irby from the State Engineer's office.

CROSS EXAMINATION

By MR. IRBY:

Q Did you testify that the water for this project is coming from Section 24, 14, 31, 32?

A Section 24, let me see here. I'm sure that's right. It's in the same township and range as the proposed water flood. It is about three miles south of our acreage.

Q The applications that I have on file in the State Engineer's office for this project are all in Sections 19, 29, and 30, for the withdrawal of water?

A Yes, sir, we made application in those sections; that is in the township immediately to the east of our proposed flood. After we made those applications, this commercial water well or wells became available, so we purchased those wells, and we have a transfer of ownership which I have introduced as evidence. I think that your Roswell office has all those copies, also. It was purchased from Mr. J. J. Kirby. That is what we propose to use, that water to kick off this flood, since those two wells are drilled and producing and have all the equipment in them right now.

Q Do you plan to abandon your rights under these applications L-3643 through 3649?

A Well, that's a little hard for me to say right now. If this flood would expand in the future, I'm sure that we would probably need more than this four hundred sixty-five acre feet. We might have to go over and pick up some of that water in that

other township. I believe that those leases or water rights are good for two years. We hope by that time to know whether this will be adequate or not.

Q Could you give me the numbers of these wells from which you presently propose to withdraw the water for this project, the State Engineer's file numbers? I think you gave them before.

A Well, actually I don't know whether the two wells are numbered; the transfer of ownership to us just shows four hundred sixty-five acre feet per annum to be taken from four wells, and two wells are drilled right now and producing. I can give you the location of those, they are in the northwest quarter of the northwest of Section 24.

Q Northwest, northwest, and the township and range on that?

A That is 14 South, 31 East.

MR. IRBY: Thank you. That is all.

MR. NUTTER: Anyone else have any questions?

By MR. COOLEY:

Q Mr. Motter, I believe you testified on direct that you are now seeking administrative approval, or provision in the order authorizing administrative approval for extensions to this project?

A We would like -- maybe I should explain that a little more. We would like to get something worked out so that if this flood is successful, it wouldn't be necessary to come before the Commission with a hearing to add additional wells to the flood. We thought perhaps administrative approval with offset operators' approval, or

something like that might be worked out.

Q Was this particular facet of the case mentioned in your application?

MR. HOLL: If I might interpose, Mr. Cooley, the main purpose of the application is to obtain Commission approval of the present and proposed water flood as set out in the application. Now the thought we had relative to enlarging it, if it should prove to be successful, was merely to aid, if possible, the Commission and ourselves in maybe removing the need for a hearing at a later date. If the Commission feels and the legal staff feels such is required under the New Mexico Statutes, why we'll certainly be happy to come back in on each case.

MR. COOLEY: Thank you.

Q Do you intend to continue to seek a source of salt water in this area, or do you expect to use fresh water?

A Yes, of course, we don't like to use the potable water any more than anybody else. I think we would like to see how this well of Great Western would stand up before we would attempt to test to the Devonian. I think a test to the Devonian would probably run in the neighborhood of $225,000.00 or some such matter.

Q There are no dry holes on your acreage to the Devonian?

A Yes, sir. I might add that the one commercial well we had was originally drilled to furnish fresh water to the rig on the test to the Devonian should that test be --

Q (Interrupting) You are referring to the Great Western test?

A I am referring to Great Western's test. As I understand, the well has only been tested for a short period. I don't know what the P.I. is or should that bear up, should that prove successful, we would have a dry hole drilled by the Union Water Company. We could possibly enter that hole and move our water through the pipeline up to our proposed injection wells.

Q That is in Section 14?

A No, it is in Section 24. I have a map of that.

Q Earlier in your direct examination, to clear the record, you referred to the Drickey Queen Pool, this was the original name and it is now being designated as the Caprock Queen?

A Caprock Queen.

Q It was the Drickey Queen when the wells were originally drilled?

A That's right. I have a large map of the area showing those which sections our water wells lie in. I have only one copy, so I wouldn't like to introduce it. I only brought one.

MR. COOLEY: I don't think it would be necessary to introduce it as an exhibit.

MR. HOLL: We would be happy to furnish you with a copy if you think it would be of benefit to you.

MR. NUTTER: I don't think that additional map would be necessary, Mr. Holl.

Q Mr. Motter, has your company made any study to determine

what the breakthrough pressure would be in this area? I see you intend to inject with a thousand pounds?

A We don't want to inject at such pressures until we lift the overburden, or we will fracture the formation. We probably would not want to go over a thousand pounds in this area.

Q You do not think the thousand pounds would cause a breakthrough?

A No, I don't believe it will.

Q What is the production from your four proposed injection wells?

A If you refer to Exhibit 6, those injection wells are No. 5, that was tested 7-16-57 for twenty-four barrels per day. No. 6 was tested 7-9-57 for twenty-seven barrels per day. No. 10, 7-12-57 for thirty barrels per day; and 14 was tested 7-18-57 for thirty barrels per day.

Q Would you in your opinion as an expert in these matters consider these wells listed on your Exhibit 6 as being in the stripper stage?

A No, but they are approaching that stage quite fast. I think we can bear that out by the bottom hole pressures here, which don't look like they will be with us too much longer; and also this No. 7 shows how our decline on this lease has been for the last few months.

Q Where in your opinion would the line be drawn in this area between pressure maintenance project and water flood?

A Well, that's a pretty good question. We could probably say it is either water flood or pressure maintenance right now. I

might add that one reason we would like to start this flood is that these wells are getting to the stage now that if we didn't inaugurate water flooding, we would probably go in and frack all the wells. In our opinion that is a waste of expense, if we are planning on doing any water flooding anyway.

Q You feel that you could make most of the wells top allowable by fracking them?

A Yes, sir. We fracked one well several months ago in this area and helped it considerably. I think it produced potentially eighty-some barrels per day after frack.

Q Isn't it more common to refer to water flood as the injection of water into a pool where the wells are in the stripper stage, rather than in a relatively high productive stage as are these?

A That might be true. Our experience has been if we can start injecting water at a stage more like this, we have better recovery than waiting until the wells get to a stripper stage.

Q But the earlier you commence injection of water, the more it falls in the category of pressure maintenance?

A Well, that's true, yes.

Q What area of effect do you expect -- refer to your Exhibit 1, please, and tell me what wells you expected to be affected by the injection of water in the four proposed wells.

A I would say the well in the center, the Government "B" 8. I would say, well, if you allow me, Mr. Cooley, the wells that we have on Exhibit 7, those wells listed in the back are those

wells we expect to be affected by the pilot.

Q Listed in the back?

A There are some twelve or thirteen of them there. I'll read those if you like, for the record.

Q All wells listed in 7?

A Yes, the front page is the entire lease, but the wells attached to that are the wells we expect to be affected by the four well pilot.

Q You expect seventeen wells to be affected. What is the furthermost well?

A Let me read them off.

Q I would rather see how far you expect it.

MR. NUTTER: Go ahead and read them off.

A Government "B" 2, south offset to No. 5; "B" 3; "B" 5 -- now I should take that back, we also have the producing curves on the injection wells in this list. "B" 6, which will be an injection well; Government "B" 8 will be affected; "B" 9; "B" 10, that will be an injection well; "B" 11; "B" 12; "B" 14, which will be an injection well; "B" 15; "B" 19; and the State"AN" No. 1.

MR. COOLEY: That's all. Thank you, Mr. Motter.

MR. NUTTER: Anyone have any further questions of the witness?

MR. UTZ: I have a question.

MR. NUTTER: Mr. Utz.

By MR. UTZ:

Q Mr. Motter, you spoke of primary recovery being somewhere

in the neighborhood of twenty-one and a half percent, is that right?

A That is what our reservoir department has made as an estimate on this pool.

Q Can you put that in barrels? Do you have a figure for oil in place?

A I believe that is 250 barrels per acre foot.

Q That's total oil in place, 250?

A No, that is not total oil in place. That is recoverable to the primary. Yes, that is 250 barrels per acre foot by primary means.

Q Do you have a figure there for total oil in place?

A Just a minute. Oil in place, barrels per acre foot, we estimate at 1,133 barrels.

Q That's per acre foot?

A Yes, sir.

MR. UTZ: That's all I have.

MR. NUTTER: Mr. Cooley.

By MR. COOLEY:

Q Mr. Motter, by this application you are not, at this time at least, seeking any allowable relief with regard to this project whatsoever, are you?

A No, sir.

Q And do you understand that if the application is granted, that the quarter sections on which the injection wells are located will not be assigned an allowable?

A Yes, we understand that.

MR. COOLEY: That's all. Thank you.

MR. NUTTER: Any further questions? Mr. Motter, I'm having a little difficulty reconciling this injection of water into four wells here of a total production of some two thousand barrels per month, and calling this a water flood. I wonder if you would elaborate on what a water flood is and what a pressure maintenance program is.

A Like I stated before, we, at this stage of the field, we could probably call it pressure maintenance; we refer to it as water flood. Our experience in other areas has been if we can start flooding along about this stage, that we will be in better position or have more ultimate recovery of water flood oil than if we wait until the field gets to a stripper stage.

MR. NUTTER: Aren't these wells here relatively high yet on a production decline curve?

A I believe if you refer to this Exhibit 7 that you could see that since about, oh, April of '57 that we're going downhill pretty fast. Right on the front page there, Mr. Nutter, the "B" lease as a whole. Then one thing we are quite concerned about is the fact that the pressures have dropped from 934 pounds when we drilled this area until right now I think we can say it is somewhere between, right here we have 213 - 319 pounds.

MR. NUTTER: Mr. Motter, isn't part of the reason for the decline the fact that the allowables have been lower since April of

'57, or has that not had any effect on the wells here?

A Those small circles are the allowables.

MR. NUTTER: They represent top allowable?

A Top allowable up until the point where the small red dashed line is in there. That is when we asked that the wells be reduced in allowable. I might add if you want more about the pressure maintenance or water flooding, we have the gentleman who is head of our secondary recovery department here.

MR. HOLL: I was going to interpose that. Mr. E. E. Funke, who has spent a great number of years on secondary recovery and water flood exclusively, is here, and we would be happy to put him on the witness stand and let him elaborate on his theories and success with those theories.

MR. NUTTER: We would be happy to hear Mr. Funke testify.

MR. HOLL: The questions you have been bringing out are for an expert secondary recovery engineer. I think you will receive more information from Mr. Funke.

MR. NUTTER: Let's excuse Mr. Motter for the time being.

MR. UTZ: I have one more question.

MR. NUTTER: Mr. Utz.

By MR. UTZ:

Q I would like to know what you calculate your average net pay in this area.

A Six feet is what we have used throughout the area.

MR. NUTTER: Mr. Motter is excused from the stand, subject

to recall.

(Witness sworn.)

E. E. FUNKE

a witness, of lawful age, having been first duly sworn on oath, testified as follows:

DIRECT EXAMINATION

By MR. HOLL:

Q Would you state your name and address, please?

A E. E. Funke, Bartlesville, Oklahoma.

Q By whom are you employed and in what capacity?

A Cities Service Oil Company, Secondary Recovery Engineer.

Q Mr. Funke, would you briefly elaborate on your educational qualifications?

A My formal education is a B.S. in Chemical Engineering from Kansas State College.

Q Now when did you obtain that degree?

A That was 1935. I have been working in the field of secondary recovery almost constantly since about 1936.

Q In such work have you studied and made recommendations with any number of secondary recovery projects?

A Yes, any number. I would hate to try to recall right off-hand how many. Currently Cities Service Oil Company is interested in some fifty, I would say, secondary recovery projects, and that oil represents roughly twenty percent of the Cities Service production.

Q And you have been primarily responsible for initiating all of these projects, is that correct?

A Well, primarily responsible; in some cases we are not the operator, other companies have taken the lead, but I would say in all those that Cities Service is the operator, I have been responsible, yes.

Q Have you served on any committees, industry committees relating to secondary recovery?

A Yes, I have served on several committees for the American Petroleum Institute.

Q For how long a period, has that been for fifteen years?

A I would say off and on for the past twelve years, anyway.

Q Have you written any papers and given any papers relative to this subject?

A I have written papers that have been published, and given papers at various A.P.I. meetings. I think the most recent one discussed the matter of proration and control of water flood projects, which was given at the Wichita District meeting of the A.P.I. in 1956.

Q Do you recall the title of that particular paper?

A "The Effect of Proration on Water Floods."

Q You have been listening to the questions propounded to Mr. Motter relative to water flood and pressure maintenance, is that correct?

A Yes, sir.

MR. HOLL: Why don't we just turn the witness over to you and you ask him the questions you are interested in? Do you feel that his qualifications are acceptable?

MR. NUTTER: The witness is qualified. Now in your summary of your background and experience, Mr. Funke, you mentioned this recent paper that you wrote?

A Yes.

MR. NUTTER: Relating to prorationing of water floods. Would you state briefly what the text of that paper was?

A You mean the conclusions?

MR. NUTTER: Abstract the thing very briefly.

A I hate to say the conclusions were rather indefinite in that, based on a number of water floods in which we had experience. We found any number of cases where interruption of production for one reason or another had caused what we considered irreparable damage or loss of oil because of that interruption. We also found some cases where interruption of production apparently caused no ultimate loss, of course, it caused an immediate loss. The conclusion was that it's risky to curtail the water flood once it is under way. There are cases where you are lucky and won't be hurt. As to why some cases won't be hurt and others would, I attempted to show that as being related to the variation in permeability within the section. There's probably many other reasons that floods might be hurt. The thing about a water flood is that usually you start your water injection with the pressure in the formation being rather

low, and incidentally, I would consider this rather low.

MR. NUTTER: This is low pressure?

A Yes. The injection of water cannot help but create a local increase in pressure, so that you have quite a difference of pressure between the input well and the producing wells. Under primary production or natural water drive, you have a rather even decline in reservoir pressure, but having this rather large differential in pressure between the input and producing well, you are inviting the water to find avenues to bypass oil and move from the input well to the oil well. Once it gets there, if the area immediately around the oil well is not uniformly increased in pressure, and I assume that it wouldn't be when you had a condition of bypass, curtailment of production will mean that water can head up in the oil well and actually reverse its flow and go back into some of the other parts of the formation.

MR. NUTTER: Now, Mr. Funke, is this bypassing of oil through the more permeable sections and the passage of water through the more permeable sections of the reservoir possible whether production is curtailed or not?

A It's possible; however, it will happen certainly, but whether it is curtailed or not, the damage in effect, though, is what we are concerned about. That is, if you are able to take out the oil and water that comes into that well, yes, damage of water backflooding into the formation should be eliminated.

MR. NUTTER: What I'm concerned with here. Now you have

stated that the bypassing of oil is possible by the injection of water and flooding out of certain sections, and leaving oil in place in other sections. Now isn't that possible whether you curtail production or not on one of these? If you inject water into a reservoir, is it not possible for the water to take off in one direction in the line of least resistance and follow the most permeable path it will find?

A I think it will always do that whether you curtail or not. Again I want to say the damage effect would be worse if you curtailed the production.

MR. NUTTER: We have got four wells here that at the present time are producing better than two thousand barrels of oil a month, and by injection of water into those wells, is it not possible for this water to bypass the oil and find its course of least resistance to well No. 8 and leave oil in the reservoir there that never will be recovered?

A I think it is possible. I'm not going to say it is going to happen. If we thought it were going to happen in a damaging amount, then we certainly wouldn't be wanting to start this water flood.

MR. NUTTER: Well, do you consider this primarily to be a water flood or pressure maintenance program here?

A I heard your question to Mr. Motter a while ago. I thought the answer to that might be determined by the situation of the reservoir fluid; that is, the pressure now is, oh, some 260 pounds,

isn't it?

MR. MOTTER: Something like that.

A Originally this reservoir was under a pressure in excess of 900 pounds, and I think the reservoir fluid analysis showed that the saturation pressure was just about the original pressure, in excess of 900 pounds. From that point on down we have had free gas occurring in the formation. Now pressure maintenance, to be strictly pressure maintenance, ought to be applied above the saturation pressure of the reservoir fluid.

MR. NUTTER: So, strictly speaking, you would not call this a pressure maintenance?

A No, this is way below the saturation pressure.

MR. NUTTER: Is this not relatively high in productivity to be water flooding?

A No, I don't think so. It's possibly higher than the average water flood, but our objective ought to be to eliminate secondary recovery as such. We ought to strive to maintain pressures on all reservoirs. There's two more points I might say there. I believe his testimony gave the most recent tests which were some six months ago. I believe that the lease production has continued to decline; therefore, the well production in the wells involved here certainly has declined also since then.

MR. NUTTER: Well, the lease production hasn't declined in an abnormal fashion, has it?

A No, but it has declined in six months' time. The two thousand

barrels per month might be a little high. Oh, I could go back and think about any number of projects that we are involved in, I know that -- well, in one case, the Langston Cliner Field in North Texas, we have commenced water flood there on a pattern basis when the individual well's production capacity was at least as much as these wells, I think a little bit greater. Another one I'm familiar with that we have an interest in is the Chitwood Simpson Sand Unit in Pratt County, Kansas. We commenced a water flood there, a number of the wells having capacities in excess of one hundred barrels per day.

MR. NUTTER: Those were water floods?

A We considered them water floods. Well, I'm getting clear off New Mexico, but in the State of Kansas they prorate until the pool average drops below twenty-five barrels per day, and this was still a prorated pool.

MR. NUTTER: Mr. Funke, you've testified ~~in~~ that your paper that you mentioned a while ago, reflected that in some cases these water floods can be curtailed and in other cases they can't be. Have you made a study of this particular reservoir here?

A Well, I've studied it, as to whether I have a conclusion as to whether this can be curtailed or not -- like I said, I would say in all cases that we would consider it risky. We have an idea on this problem which I think is somewhat straddle of the road position, I know they had a considerable hearing on the issue a month or so back.

MR. NUTTER: Where was this?

A Our position, I say.

MR. NUTTER: Where was this?

A On the Graridge application in the Caprock Queen water flood. I was not here at that hearing, but I have read about it. Our position is this, that water floods can be controlled in a fashion if the control is known and the plan is initiated -- I mean the control is initiated at the time the flood is initiated. The area to be flooded should be considered and prorated on a project basis with allowable being assigned to the project rather than to the individual wells.

MR. NUTTER: Now in this Graridge case, what was Cities Service position?

A Well, that's about what I'm stating now.

MR. NUTTER: Did they make a statement at that hearing?

A Yes, Mr. Motter made a statement at that particular hearing. In other words, if you know that you are going to be prorated, you can take your project and arrange your development so that you inject water in the area that's initially developed at the rate desired, which in this case we think should be somewhere around one barrel per day per acre foot, and have enough area involved in the project so that the allowable will be sufficient for the oil wells immediately adjacent to produce that capacity; and you expand your project then only as necessary to keep your project allowable up to the State regulation.

MR. NUTTER: Now in this case, what would you consider to be a project area?

A The entire group of leases involved there, which I think is, oh, I think --

MR. NUTTER: You mean the leases that are colored in yellow on the map?

A Yes, with the exception of the one eighty separated there.

MR. NUTTER: Do you feel that the impact of the water flood will be felt --

A (Interrupting) No, I don't mean that.

MR. NUTTER: -- up in the upper left-hand corner of the plat?

A No, I meant that the allowable should be assigned to the entire area shown in yellow, less the one isolated eighty; at present that is thirty-seven barrels. We have thirty-seven barrels per well for all the wells in that area with no individual well assignments. We can inject water in these four wells, and whatever other wells are necessary to bring our total project up to thirty-seven barrels a day. Yet the wells that are actually affected will be the only ones that, I mean will be produced to capacity, and they will be taking more than thirty-seven barrels a day at times, probably considerably more than that, but they will always be taking all their fluid out, that is, both oil and water. I don't know whether I have explained myself there or not.

MR. NUTTER: Actually this matter of allowable is beyond the scope of this hearing today. However, we are interested in

knowing the amount of water that is going to be injected and whether this water is going to affect the wells immediately adjacent to it or how far away the impact of the water will be felt. We also would like to know what will happen to well No. 8, which is directly in the center of the four injection wells. What do you think will be the future of well No. 8 after you start injecting water?

A Well, No. 8 might be produced for a short period of time at a rate as high as four hundred barrels a day oil. That, of course, is the direct relation between input and production.

MR. NUTTER: That is at the rate of four hundred barrels per day on these four offset wells?

A Yes.

MR. NUTTER: That well No. 8 could produce four hundred barrels of oil per day?

A That would be the maximum we would expect out of that well. That won't occur for very long, because water floods have a way of producing water instead of oil. There will always be some water show up.

MR. NUTTER: As I mentioned before, the matter of allowables is not a subject of this hearing. This is an application for a pilot water flood period, but you did testify a moment ago that you felt that the rate of injection could be controlled at the beginning of a water flood project, did you not?

A Yes, sir.

MR. NUTTER: And that the productivity could be thus con-

trolled by the rate of injection;if you started injecting water at four hundred barrels per day into these four injection wells, wouldn't you be a little bit presumptuous as far as expecting four hundred barrels per day out of well No. 8?

A There again I would like to make it on a project basis and that would allow us. I think the decline on the other wells would far more give us room to take up that increase.

MR. COOLEY: Mr. Funke, I'm interested in your comment about assigning allowables on the basis of a project rather than per well allowables, and your statement particularly that the allowables could be kept within what you would call a lease allowable or project allowable by adjustments in the rate of development or expansion of the flood?

A That's the point, yes.

MR. COOLEY: You said this can be done if the company or the operator of the project forsees this and proceeds on that basis. Are you aware of whether or not Cities Service anticipates development in such a manner?

A I would answer it in this fashion, that the pattern for Caprock has been somewhat established by the decision on the Graridge case. Therefore, we would assume that capacity production is to be expected all over the Caprock Pool.

MR. COOLEY: The question of rate of development has not yet come up with regard to the Graridge application, however, since there must be a hearing to expand any water flood project as it now

stands, we still have some control over the rate of development. As you pointed out, the total production can be more or less leveled off or maintained at a given level by controlling the rate of development?

A That's correct. Now each individual --

MR. COOLEY: (Interrupting) Do you feel --

A Excuse me.

MR. COOLEY: Do you feel that such a staged rate of development would be possible in this instance?

A Yes, I do. The exceptions would be the problems of what the offsets do. Now we have a fairly large area here. Graridge may be up against a different problem.

MR. COOLEY: You said, I believe, that you had read about this case. Have you read the record of the Graridge case?

A No, I haven't seen it.

MR. COOLEY: Are you aware of whether or not the pool conditions are similar in that area to those in the present area under consideration?

A About the only difference would be the Caprock area is at a more advanced state of depletion.

MR. COOLEY: That's what you might call the stripper stage?

A Yes, it is definitely stripper. I think they had an average of some one barrel or two barrels per well per day.

MR. COOLEY: That's all the questions I have.

MR. NUTTER: Mr. Funke, do you think that a water injection

program that would be classified as a pressure maintenance program can be curtailed in any manner? If so, why?

A Well, a strictly pressure maintenance where you do not allow the original reservoir pressure to decline and therefore don't bring the pressure up locally by injection could be more easily curtailed.

MR. NUTTER: Most pressure maintenance programs are instituted after the pressure has declined somewhat?

A After it has declined somewhat. Now that is the matter of degree. Had we started our injection in this field with the reservoir pressure about nine hundred pounds, I believe that we could have had less danger of loss of oil by curtailing production than we would at this time.

MR. NUTTER: Does anyone have any further questions of Mr. Funke?

MR. HOLL: I would like to ask a few more questions.

MR. NUTTER: Mr. Holl.

By MR. HOLL:

Q Mr. Funke, we have talked some here about ultimate recovery. We have also talked some about permitting a field or pool to get down to what is commonly termed the stripper stage, down to a few barrels per well per day, as opposed to, on the other hand, pressure maintenance, or beginning a water flood when your production is at a higher level. What is your feeling with regard to ultimate recovery from a field or a lease in those situations?

A I would say that if a field is going to respond to any kind

of an injection program, the ultimate recovery will be better if that injection program is initiated early in the life of the property. That is, while the pressure is still high in the reservoir.

Q In other words, the higher the pressure is, the better you consider the ultimate production to be?

A That's correct.

Q In this situation, then, you feel that ultimate production -- which is the primary concern of most operators, isn't that correct?

A That's right.

Q -- would be greater by instituting water injection now or permitting these wells in this lease to go down to smaller production?

A I think we will recover more oil by initiating it as soon as possible.

MR. HOLL: That's all.

MR. NUTTER: Now to elaborate on that a little further, Mr. Funke, the sooner water injection is instituted, the more ultimate recovery you will have, is that your testimony?

A That is my testimony.

MR. NUTTER: If you started off immediately when you drilled a well and started re-pressuring the reservoir with the first production, you would have more ultimate recovery?

A Right.

MR. NUTTER: If you started a water flood when the wells are producing twenty-five to thirty barrels a day, you'll have more

recovery than if you wait until they are producing one or two or three barrels per day?

A More ultimate oil, yes.

MR. NUTTER: Does the amount of oil produced per day have any reflection on this ultimate recovery?

A I don't know whether I understand that question.

MR. NUTTER: Well, now, you state you will have more ultimate recovery by maintaining pressure from the beginning or instituting a water flood before the pool gets to a stripper state. Does the amount of oil produced per day have any bearing on this ultimate recovery? That is, will the ultimate recovery be increased by producing the oil at a faster rate, is what I'm driving at, on a pressure maintenance or on a water flood?

A Where the bottom hole pressure is somewhere near original, I don't believe that the rate will have very much effect on the ultimate recovery. Now when you get to discussing rate of production, you always have the matter of economics to bring in. I mean by that that you can be producing at a rate that is so low that you are not making money, and, of course, that is not going to continue very long and that oil would be lost.

MR. NUTTER: Do you feel that rate sensitivity of water floods or pressure maintenance programs is proportional or related in any way to the pressure of the reservoir at the time that this flooding is instituted?

A Yes, I think so.

MR. NUTTER: In what manner?

A I think that I tend to repeat what I have said already, that if the field is in a rather advanced state of depletion, the bottom hole pressure is low, that it is more likely to be rate sensitive. I don't know, I have probably gotten clear away from your original question.

MR. NUTTER: What I'm asking you is, in other words, do you feel that the project is more rate sensitive the lower the pressure?

A Yes, sir, I do.

MR. NUTTER: In other words, sensitivity is inversely proportional to pressure at the time of the injection of water?

A I don't know the relation, what it would be, but I feel there is a relation and it would be more rate sensitive at lower pressures.

MR. NUTTER: And we have a relatively high reservoir pressure here for water floods, do we not?

A I wouldn't consider this relatively high. It's under three hundred pounds, about two hundred sixty.

MR. NUTTER: Is it at all unusual to water flood a pool that is producing at the rate that this is?

A No, not any more. The early day water flood started, oh, way back in the 1920's, they didn't think of it, but this method of recovery has certainly grown in stature through the industry, and I think everyone wants to apply it quicker.

MR. NUTTER: There is more oil being produced by water floods all the time?

A Yes, sir.

MR. NUTTER: Anyone have any questions of Mr. Funke?

MR. CAMPBELL: Jack M. Campbell, Campbell and Russell, Roswell, New Mexico. I think I had better ask a question or two on behalf of Graridge Corporation, since it has come into this case.

MR. NUTTER: Mr. Campbell.

MR. CAMPBELL: Your testimony was, as I understood you, Mr. Funke, that you felt that the basis for determining where you depart from pressure maintenance and start into water flooding or secondary recovery would be based upon the pressure situation in each area in each reservoir?

A Yes, sir.

MR. CAMPBELL: Was it your statement that at such time as the pressure is below the saturation point, that then it becomes essentially a matter of secondary recovery?

A Tryiny to find a place to distinguish between one and the other, I would say that would be a point.

MR. CAMPBELL: Be started, as a general rule of thumb, would it?

A Yes.

MR. CAMPBELL: It is your testimony that up to the time that you reach the saturation pressure, there is not too much effect with rate sensitivity in a reservoir that you are injecting water,

is that right?

A That's right.

MR. CAMPBELL: Beyond that point the risk increases with the decline in pressure in the reservoir at the time that the project is instituted?

A That is my opinion.

MR. CAMPBELL: That's all.

MR. NUTTER: Anyone have any further questions of Mr. Funke? If not, he may be excused.

(Witness excused.)

MR. NUTTER: Does anyone have any further questions of Mr. Motter? If not, he may be excused.

(Witness excused.)

MR. NUTTER: Does anyone have anything further in this case? If not, we will take Case 1356 under advisement.

* * * * *

C E R T I F I C A T E

STATE OF NEW MEXICO)
) ss
COUNTY OF BERNALILLO)

I, ADA DEARNLEY, Notary Public 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 in stenotype and reduced to typewritten transcript under my personal supervision, and that the same is a true and correct record to the best of my knowledge, skill and ability.

WITNESS my Hand and Seal this 20th day of January, 1958, in the City of Albuquerque, County of Bernalillo, State of New Mexico.

Ada Dearnley
Notary Public

My commission expires:

June 19, 1959.

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 1356 heard by me on 1-7, 1958.

Daniel S. Nutter, Examiner
New Mexico Oil Conservation Commission

EXAMINER HEARING
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
April 9, 1958

IN THE MATTER OF: Case No. 1356

TRANSCRIPT OF PROCEEDINGS

DEARNLEY - MEIER & ASSOCIATES
INCORPORATED
GENERAL LAW REPORTERS
ALBUQUERQUE, NEW MEXICO
3-6691 5-9546

EXAMINER HEARING
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
April 9, 1958

IN THE MATTER OF:

Application of Cities Service Oil Company for an order amending Order No. R-1128. Applicant, in the above-styled cause, seeks an order amending Order No. R-1128 to authorize the transfer of allowable from water injection wells to other wells on the same basic lease, to establish a lease allowable for the applicant's Government "B" Lease, and to authorize administrative approval for additions to, or deletions from the pilot area and/or injection wells. Case 1356

BEFORE: Elvis A. Utz, Examiner

TRANSCRIPT OF PROCEEDINGS

MR. UTZ: The next case on the docket will be Case 1356.

MR. PAYNE: Case 1356: Application of Cities Service Oil Company for an order amending Order No. R-1128.

MR. BRATTON: If the Examiner please, my name is Howard Bratton, Hervey, Dow and Hinkle, Roswell, New Mexico, representing Cities Service Oil Company. I would like to make a brief statement to the Examiner before presenting our case. Under date of February 12, 1958, the Commission issued its Order No. R-1128 in Case 1356, which authorized Cities Service Oil Company to inject water into four specified wells on its Government "B" Lease in the Caprock-Queen Pool. The order also carried the proviso that the injection of water shall be so regulated that the production

of wells affected by the injection project can be prorated without causing waste. In that Order, the Commission made certain findings. I won't read all of them, but I believe that I will mention a few of them for the purposes of laying the predicate for the testimony we are going to present today. The Commission found, among other things, that the production of oil from the wells on the subject area had not declined to the point where additional oil may be recovered only by water flooding or by other secondary recovery methods; and that the subject area may be said to be in the primary recovery stage.

It further found that the injection of water at the present time into the Queen Formation of the Caprock-Queen Pool through the four wells described above may stimulate the primary recovery of oil in the immediate area of the injection wells, but that the proposed program is not, however, a water flood project for purposes of secondary recovery as that term is generally understood. It is further found that the production from the wells which might be affected by the proposed injection program could be curtailed without causing waste, provided the rate of injection is regulated. Further, that the applicant should so regulate the injection of water.

Based upon that, the Commission ordered that water could be injected into the wells, provided that the applicant should regulate the injection of water into the wells so that the production from the wells affected by the injection project can be prorated

without causing waste. At the time the application was filed, it did not include a request for a consideration of the allowable to be granted to the injection wells or the affected wells; and therefore, that question was outside the scope of the prior hearing. We have now raised that question in our application in this hearing. We realize that the Commission has problems in connection with the allowable production from water flood projects, and I am sure that the Commission realizes that we have serious problems. I am sure the Commission realizes that if the present order were to remain in effect throughout the life of the flood, the flood could just never come into being. I'm sure that the Commission realizes that at some time there would have to be a consideration of the allowable to be granted to this flood, this pilot flood project.

Now, we believe we will be able to introduce evidence to show that the time is ripe for the consideration of the allowable to be granted to this pilot project. We believe further that we'll be able to go into a matter which caused the Commission some concern and which was reflected in its order. That was the matter that the Commission apparently was concerned about, its feeling that the area was not in a marginal or stripper state of production. We believe that we will be able to show that by the time the flood is effective and stimulation is achieved, that the area will be in a marginal or stripper state of production.

We believe further that regardless of whether you consider the area to be in this stripper stage of production or whether it

is somewhat above the stripper stage of production, that the plan for an allowable which we have requested in our application is reasonable and practical and fair under the circumstances.

We believe further that we can show that there will be greater ultimate recovery of oil under this area, or from this area if we are permitted to proceed with our project now, our pilot project.

For that reason, we have requested the following: The transfer of the full unit allowable from water injection wells to other wells on the Government "B" Lease. We further requested the establishment of a lease allowable to be the multiple of the top unit allowable and the total number of wells on the lease, such allowable to be produced in any proportion from the wells on the lease; and we further requested the authorization by administrative approval without notice and hearing for additions to or deletions from the pilot area and/or injection wells.

We have two witnesses, Mr. Motter and Mr. Funk, and I ask that they be sworn, now, please.

MR. UTZ: Are there any other appearances to be made in this case? If not, we will proceed.

(Witnesses sworn.)

MR. BRATTON: Before we begin, I would like to ask that the transcript of the first proceedings in Case 1356 be made a part of this record. I presume they would be, since it is still under the case number.

MR. UTZ: It will be made a part of this record.

E. F. MOTTER

called as a witness, having been first duly sworn on oath, testified as follows:

DIRECT EXAMINATION

By MR. BRATTON:

Q State your name, please.

A E. F. Motter.

Q By whom are you employed?

A Cities Service Oil Company, Hobbs, New Mexico.

Q In what capacity?

A Division Engineer.

Q Have you previously testified before this Commission?

A Yes, I have, on numerous times and also in the previous case.

Q The Caprock-Queen Pool is still directly under your supervision?

A Yes, it is.

Q You are familiar with Order No. R-1128 and with the application which has been filed in this case?

A Yes, I certainly am.

Q Mr. Motter, you have on the board what has been marked Applicant's Exhibit 1-A. Will you identify that and explain to the Commission what it shows?

A This is an area plat involving the Government "B" Lease;

actually it is one of the same exhibits we used previously. This shows the four injection wells, Government "B"-5, "B"-6, "B"-10, and "B"-14. The injection wells are all circled in red. These injection wells correspond to the injection program set up by Graridge, it follows the same pattern as their injection wells.

Q Mr. Motter, in your opinion under the provisions of Order R-1128, would it be feasible and practical for your company to now commence its authorized water injection project?

A No, sir, it would not.

Q Why?

A Well, the first place, it provides that the rate of water injection shall be so regulated that stimulated wells can be produced and prorated without causing waste. I believe in order to prevent waste, the stimulated wells should be produced at capacity. The amount they are stimulated, however, depends on the amount of water injected, and so their productivity can be controlled within certain limits. It's my opinion that there is rare cases, or exceptions that producing wells in a flood will not be damaged by curtailment of oil production after stimulation. Water flooding increases formation pressures locally, so that oil will very likely be bypassed if not removed at the producing well as it's being swept toward that well.

Q Does the present order state to what extent a well should be prorated in this area?

A No, sir. There is a finding in the order which states that

no well shall receive a disproportionate share of the market demand for oil when production of oil from such well can be curtailed without waste.

Q The order as written restricts every stimulated well to the top per well allowable fixed for the pool?

A That is my understanding of the order.

Q Turning to your plat, Exhibit 1-A there, the five-spot well in the middle, I believe that's Well No. 8?

A That is our Government B-8, yes.

Q That is the well that would receive the most stimulation from the project?

A In all normal aspects, it would.

Q What is the current daily allowable of that well?

A Right now thirty-one barrels a day is the current daily allowable.

Q The allowable for the Caprock Pool is 33 barrels?

A Yes, that is the normal unit allowable for April for wells of this depth.

Q So that as the order is now written, if that well was now being stimulated, its daily allowable would be increased by two barrels?

A That is correct.

Q What is the current combined daily allowable of the four injection wells which you have marked in red?

A Their current allowable is 67 barrels per day.

Q So that allowable would be lost if these wells were converted to injection wells?

A Yes, it would, under this order.

Q Do you think that the injection rate could be controlled to the extent that a producing well would only be stimulated by one barrel or ten barrels or fifty barrels?

A No, sir, I don't believe it can be controlled that close.

Q Could your company justify the initiation of the water flood project under these conditions, even if it were to result in some additional recovery of oil?

A No, to start this flood we estimate it's going to cost approximately $160,000.00, the money that was budgeted for this project was the same as if it came out to drill new wells, so the expenditure would not have been authorized unless we could show that it would pay out.

Q In order to alleviate this situation, would you recommend that each injection well be created with a full unit allowable, which in turn would be assigned to other wells on the lease?

A Yes, I would. The transfer of allowables is an established and sound practice in the industry. It has been done in New Mexico, as well as other states having a market demand to control production. They are operational wells, all capable of producing, and only if taken off production in the interest of greater ultimate recovery.

Q Why would you recommend the transfer of the top unit allowable rather than the current allowable of these wells?

A Well, currently they are in the same category as other producing wells on the lease. When stimulation begins, the other wells will have increased allowables, and the wells causing that stimulation, we feel, should have the same consideration. Under a different flooding pattern, for instance, if we shifted this over one row of wells, those particular wells would become producing wells and would be stimulated. In our mind there should be no differentiation between the wells.

Q Mr. Motter, the second amendment that you have recommended is the request for the establishment of a lease allowable to be the multiple of the top unit allowable and the total number of wells on the lease, that allowable to be produced in any proportion from the wells on the lease. Now, do you recommend that amendment to the Commission?

A Yes, I do.

Q What are your reasons for that recommendation?

A This in effect puts the top lease allowable on the controlled water flood; on the Government "B" we have twenty-four wells, the current normal unit allowable for April is 33 barrels, so this would establish an allowable of 792 barrels for the entire lease. This serves a dual purpose, in the first place, assuming the flood is successful, it can be justified from economic standpoint and secondly, it prevents waste.

Q You said that it would prevent waste. Will you amplify that statement, please?

A Well, as I previously testified, in my opinion a well stimulated in production by water injection could not be curtailed in production without a resultant waste. It would be a bypassing of oil, if we could not take the oil out as it is being swept to the producing well. Under our proposed amendment this well would produce at capacity under the controlled injection program.

Q I believe in the previous hearing you testified that the injection rate would be 400 barrels per injection well per day?

A Yes.

Q Now, is there a possibility that there would be insufficient allowable under your proposal to produce the stimulated wells to capacity?

A Well, of course, there is always that possibility, but right now this is the most feasible plan, in our opinion, that can be started at this time. By controlled expansion we believe that we can avoid this difficulty.

Q Now, if there is some possibility of that, why not start your flood at an injection rate of less than 400 barrels a day?

A Well, as I testified previously, we believe that there is between eight and ten feet of sand in this area, and since this is an 80-acre pattern, that gives us approximately the 400 barrels, gives us approximately one-half barrel per acre foot injection. We consider this is a minimum for efficient flooding. This has been based on experience on numerous floods that the company operates throughout different areas of the country. Normally we try to

operate our floods somewhere between a half a barrel and one barrel per acre foot per day. The best results are possibly with the higher injection rates, but frequently the rate is not possible because of mechanical difficulties and other unforseen items that occur.

Q This would be a half a barrel per day per acre foot?

A That is correct.

Q What would happen if you used a lower rate than the half barrel?

A Of course, there are some cases that apparently a low rate is just as effective as a high rate, but there is still more cases where the higher rates are more effective. At low rates water seems to separate vertically in the formation, and might possibly flow through a depleted vein in the formation, so that there is absolutely no stimulation to a producing well. I believe that the exhibits presented by Sinclair in the Graridge hearing last October on their Browning Unit up in Kansas more or less bore this fact out.

Q Mr. Motter, in your opinion would the adoption of these two amendments which you are proposing result in giving these wells a disproportionate share of the market?

A No, sir, because we are asking to produce from the lease its proportionate share of the pool's reserves. Most certainly there are certain wells on the lease that will produce somewhat greater, some wells will produce somewhat lower, but on an average we feel that this is justified because an overall basis, this will

not be a disproportionate share.

Q So that you believe as a producer of this lease you would be producing your reasonable share?

A That is correct.

Q Do you believe that these proposed amendments would have any adverse effect on the other operators in the pool?

A No, I do not.

Q I believe you stated that both of the proposals which have been made in the application are in useage in New Mexico and elsewhere?

A Yes, that is correct.

Q Now I believe you stated that the reason we're requesting the adoption of these proposed amendments is in order to immediately begin flooding operations?

A That is correct.

Q Would one of these reasons for immediate commencement be the current status of our property?

A Yes, it would.

Q I believe you have an Exhibit 2-A. Would you distribute that and explain it?

A Exhibit 2-A is a data sheet on the Government "B" lease and also one well on the State "AN" Lease, this No. 1 well right over here.

MR. COOLEY: Where is that?

A That is the No. 1 well on the State "AN" Lease.

Q Describe that by subdivision.

A Yes. That is located in the southwest southwest of Section 2, Township 14 South, Range 31 East.

This data sheet shows the completion date of the well; the original potential, whether it was potential by flowing or pumping means; the date of the latest test, twenty-four hour test, which is all oil, we produced, no water on the lease; the current allowable assigned by the Commission; the cumulative production to April 1st, 1958; and most recent bottom-hole pressures we have obtained. I might point out that during this month of April we have tested all wells which will either be injection wells or which we believe will be affected by this flood, and of course some of the other tests were run at the last GOR test period as set up by the Commission.

Q But you do have tests on all injection wells and all wells that you believe will be affected by the flood, the current tests in April?

A Yes, they have all been taken since April 1st.

Q Will you refer to Exhibit 3-A?

A Well, Exhibit 3-A is a production curve on the Government "B" Lease. It is average daily oil production since we started drilling there in 1954, and I would like to point out that we have a very well established decline curve on this lease now. We have extrapolated that curve for some, oh, possibly two years. I think it is very definite by this trend that this lease is rapidly approaching what you might consider stripper stage. In other words,

we have made two assumptions on this curve, that if everything goes as we think it will in our construction, we hope to begin to put water in sometime in June, and basing evidence on the results of the Graridge flood, we expect stimulation four months later. You will notice at that time when stimulation occurs the lease production will probably be slightly below 220 barrels per day for the 24 wells which will be somewhere in the neighborhood of eight or nine barrels per well per day. Further extrapolation of the curve indicates that sometime late in 1959, this will probably be clear down to as low as four or five barrels per day.

One thing I would like to point out, based upon our results of these curves and some more data which we have had since the last hearing. I testified previously that we estimated 22.2 percent of the oil in the reservoir would be produced by primary means. That was taken from a material balance equation, and as everybody knows that is all that we usually have to work with until we do have decline curve. This decline curve, by extrapolating it on down to where we believe there will be no more primary recovery, indicates that there will be 18.1 percent of primary oil recovered, rather than the 22.2 as I stated previously.

Q Those two exhibits show that the lease is certainly beyond the flush stage of production right now?

A In my mind, they certainly do.

Q The earliest possible date that you could ancipate stimulation, it would be considerably further reduced and would probably

be below ten barrels per day average?

A Yes, I testified eight to nine barrels.

Q What's the current picture on recovery, and what do you anticipate?

A Well, as of April 1st, 1958, we estimate that we have recovered fifteen and a half percent of the oil in place. According to our calculations, we believe we can recover another 2.6 percent by primary means. At the end of this extrapolated eight-month period where we expect to get response from the flood, there will remain 1.7 percent of recoverable primary oil in place. Our estimate on additional water flood is 25.6 percent.

Q You said that you had made certain assumptions, actually those are very realistic assumptions, aren't they, Mr. Motter?

A To be honest with you, this is one of the best decline curves I have ever worked with on a field of this type. I think this is a very good picture of what is going to happen up there.

Q Mr. Motter, is there any other method, other than water flooding, by which the productivity of these wells could be stimulated?

A Yes, they can be fracked. We have fracked one well with very good results.

Q Would you recommend fracking the remaining wells on the lease?

A No, I have recommended against it, because in my opinion it is a needless expense if the person is expecting to water flood

the field. There could be special cases where fracking would actually be detrimental to the flood, by causing premature water breakthrough.

Q Which would result in lost oil and waste?

A That is correct.

Q If water flood operations are commenced now rather than delayed until such time as the lease has reached a truly marginal or abandonment status, do you believe that the ultimate recovery of oil from the property would be greater?

A Yes, I certainly do, formation volume factor would be one thing, the water-oil viscosity relationship is another. There are certain other factors that indicate that by starting now when the pressure is somewhat higher than if the field were entirely depleted, or the particular lease, we would actually recover more oil than by depleting down to an absolute stripper stage.

Q Any other reasons which would make the immediate commencement of flood operations desirable?

A Yes. If we can get the recoverable oil out of the ground faster, we will naturally reduce our cost by maintenance, lifting costs, and other such costs that may not be foreseen right now.

Q Mr. Motter, I believe you have already testified concerning your water supply?

A Yes, I've testified at the previous hearing that we have purchased a commercial water lease. We have two wells available on there which will give us more than adequate amount to start this

flood.

Q Mr. Motter, are you familiar with the definition of secondary recovery as found in the definitions of the Rules of the Oil Conservation Commission?

A Yes, I am. I would like to read that. It's on page 5, item 56. "Secondary Recovery shall mean a method of recovering quantities of oil or gas from a reservoir which quantities would not be recoverable by ordinary primary depletion methods."

Q Now in your opinion does the flood which you are proposing come within the bounds of that definition?

A Yes, it certainly does.

Q Mr. Motter, are you familiar with the definition of pressure maintenance which is definition 48, which states that: "Pressure Maintenance shall mean the injection of gas or other fluid into a reservoir, either to maintain the existing pressure in such reservoir or to retard the natural decline in the reservoir pressure."?

A Yes.

Q In your opinion does the flood proposal which you are making come within the bounds of that definition?

A No, sir, because we hope to actually increase the pressure in the formation when we start injecting water.

Q Mr. Motter, have you investigated other water floods in the Caprock-Queen Pool?

A Yes, I have.

Q What information have you used for that study?

A Well, principally, most of the data that I used in preparing this next curve came from forms filed with the Commission. This is on a Graridge Unit water flood that is --

Q (Interrupting) You are referring to Applicant's Exhibit 4-A?

A Yes, that is correct.

Q Will you explain what that exhibit shows?

A This is a graphic exhibit on Graridge Unit water flood in the north portion of this Caprock-Queen Pool. We have a small insert down here in the right-hand portion of the exhibit that indicates the injection wells are encircled or in squares in green. The wells which are being affected are circled with red, the bottom curve is the production history of that--I should say of those particular wells that I have either circled or in green. Actually up to the time of the water injection, this included production of the injection wells. The water injection was started in April, 1957, which we show, and the first response was in August of 1957. Currently their average daily production is about 920 barrels per day, and their current average injection of water is 200 -- excuse me, 2,000 and about 50 barrels per day, or slightly over 350 barrels per injection well.

Q Now, what is the purpose of that exhibit with relation to this application?

A Well, one thing I wanted to show, referring back to Exhibit 3-A, that's where we arrived at the four months period for the

response to the flood. Another thing, this is the same reservoir that we anticipate flooding, and we think that it has all the chances of operating quite satisfactorily.

Q At approximately a similar experience as far as injection and producing relationship or ratios?

A Yes, I believe that is about what we can expect.

Q Mr. Motter, in connection, I forgot to ask you, in connection with the definition of secondary recovery and pressure maintenance, would you anticipate that as soon as you have received stimulation in these wells that you would actually be recovering what would be considered to be secondary recovery oil?

A Yes, I believe it would be, because it certainly would have to be thrust over there by the water. Any increase of the production would have to come from the natural response to that water injection.

Q Do you have anything further in connection with that exhibit, Mr. Motter?

A No, I believe not. I think it's pretty self-explanatory. It's merely a compilation of data that's available in the Commission records.

Q The third amendment to Order R-1128 is for authorization by administrative approval without notice or hearing for additions to or deletions from the pilot area and/or injection wells. Will you explain to the Commission your reasons for this request?

A Well, I think I testified previously there is a uniform flooding pattern that has already been established by other operators,

and this pilot that we propose falls in line with that established pattern. Referring again to Exhibit 4-A, the feasibility of flooding is, certainly it looks like it is going to work in the Caprock-Queen Pool. We feel that as water flood progresses, any offsetting wells that might be stimulated should immediately have the benefit of an increased allowable. The time element involved from the time the application is filed with the Commission to the time of the order could only result in the loss of some production. This affects other owners and royalty owners that might be involved. The restriction imposed on the Government "B" could be carried over into other leases. As far as the Government "B" is concerned, it would be better to operate it smoothly rather than spasmodically, than having to wait for an order to come out when we could increase the flood.

Q Mr. Motter, you have testified that it would be at least eight months before you expect to receive stimulation. Now you don't recommend that you be granted full lease allowables now or a full lease allowable now, do you?

A No, sir. If we could start water in the ground in, say four months, I feel that we could keep the Commission informed possibly by letter as to what our expectations are for any increased oil which we might receive, and in turn they could possibly give us an allowable up to the time that we reach whatever this allowable is that we are asking for.

Q In other words, you recommend that the allowable be authorized

now, but that it not be granted except upon this periodic advice which you would furnish to the Commission?

A Yes. As the oil increases, there will be no need for them to actually give us the full unit allowables we have asked for, it could be done whenever we would so predict.

Q But if granted now, you would be in a position to plan and put into effect a planned and controlled flood?

A Oh, we most certainly could. Right now, we actually have no idea what we could put in the ground. It is something we must know before we start actually injecting water.

Q Do you have anything further that you would like to state at this time, Mr. Motter?

A No, I believe not. I think possibly Mr. Funk will cover some other aspects of the case.

Q The Exhibits 1-A through 4-A which have been introduced have been prepared under your supervision or by you?

A Yes, they have been.

MR. BRATTON: We ask that the exhibits be introduced in evidence, Exhibits 1-A through 4-A.

MR. UTZ: Any objection to the introduction of Exhibits 1-A through 4-A? They will be accepted.

MR. BRATTON: We have no further direct at this time.

MR. UTZ: Are there questions of the witness? Mr. Nutter.

CROSS EXAMINATION

By MR. NUTTER:

Q Mr. Motter, your Exhibit 4-A reflects the history of the Graridge Unit water flood since injection began. I wonder if you can tell me if water is being injected into those six wells equally?

A I think there is some slight variation factor, I know there is, I have studied the case, the difference being pressure. They are having a little trouble getting the water right up there in some of the wells.

Q The red-colored wells are the producing wells?

A Those are the producing wells and the ones being reported to the Commission as being affected by the results of the injection of the water.

Q Are they all producing oil at more or less uniform rate?

A No, there is one well down there -- these are new number designations since this has been formed into a unit -- it would be, I believe, the northeast northeast of Section 6, that well has been tested for as much as 550 barrels per day. In fact, in February it produced, I think, over 15,000 barrels.

Q So that one well is producing a good part of the total production that you show here?

A Yes, I think the production runs two, two, and over five hundred barrels per day.

Q Do you think that this pilot water flood that you have depicted on this exhibit has reached its peak as far as productivity

is concerned?

A No, but I think you can tell by the curve it will not be too much longer until the peak will be reached. Actually, in my understanding, they have not produced any water yet, so once they get water production the peak will start right back down.

Q What is the rate of production on the second highest well in this area?

A Well, the second highest well, No. 15, which is another inside location, that has not responded quite as good as some of the others. I think that, let me see, about 300 barrels per day is what one of the other wells has responded, I think in the month of February it was a little over 9,000 barrels.

Q That is the No. 15 well?

A No, that is not. When I made my study I had the old well numbers. I don't know which one corresponds right now, I only --

Q (Interrupting) Do you think there is a possibility that some of the other wells that you have shown as red dots on this exhibit might show a very sharp increase if they should suddenly become affected by the water flood?

A It can always happen, certainly.

Q This rate of production that you have shown here may continue to go up at a steep rate?

A No, I do not think that will occur. I think by the time that any of the outside wells will be stimulated that we are probably getting water at the inside, and the curve will more or less flatten

out. In fact, it will probably start back down sooner or later. I don't mean sooner or later, I mean in some short period of time, maybe next six or eight months.

Q You are depending on the wells that have responded to go down at about the same time that new wells show a response?

A Normally we expect water to break through, and of course, these wells can only produce at such a capacity and there will be that much less oil can come in if the water starts coming in.

Q How much oil, Mr. Motter -- first of all, the third requests of your application called for administrative approval of the pilot project and/or -- let me see, for additions to or deletions from the pilot area and/or injection wells. What do you mean "pilot area and/or injection wells"?

A Well, if we start injecting water in these four wells and water starts being produced in our producing wells to where we start falling below the established allowable, then we would like to come before you to add possibly one or two more injection wells from time to time.

Q What is the pilot area?

A The pilot area as we propose would be the four injection wells and there are nine wells which we expect to be affected by the flood sooner or later. I will point those out and read them off, if you would like.

Q I think that would be a good idea. These are the wells in the pilot area?

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Q What is the pilot area?

A The pilot area as we propose would be the four injection wells and there are nine wells which we expect to be affected by the flood sooner or later. I will point those out and read them off, if you would like.

Q I think that would be a good idea. These are the wells in the pilot area?

A Yes, and this was in the case before. I brought this out before. I'll start, Government B-19, B-15, B-12, B-8, B-11, B-2, B-3, and the State "AN" No. 1.

Those are also shown on Exhibit 2 with two asterisks indicating the wells which we expect to be affected by the flood and the single asterisks are the injection wells.

Q How much oil do you think that you will recover as a result of the pilot project from the nine wells in the pilot area within a reasonable length of time?

A Do I understand you, Mr. Nutter, to mean that what we consider as recoverable oil by secondary means per acre, or do you mean as a total from the nine?

Q As a total from the nine-well pilot area.

A Well, I have got that figure. We estimate 25.6 percent will be recovered by secondary means. I would have to work out on acreage basis, let me see, that would be thirteen times forty, five hundred twenty acres. I don't know how good my arithmetic is about 914,800.

Q You would get a 914,800 increase as a result of a capital outlay of some $160,000?

A No, that would not be right. I probably couldn't say it was 914,000 if we had the pattern extended on around, we would recover the secondary oil. It will cost additional money to increase the injection wells, so I couldn't say that the 914,000 will be recovered, but not a $160,000 outlay. It is going to cost

somewhere in the neighborhood of fifteen to twenty thousand dollars per well to prepare the well or work it over for injection purposes.

Q How much oil will you recover from the pilot project then, if that is all that you put in, just the pilot project and didn't expand it?

A We would almost have to contribute ten acres to some of the outside wells, is about all we could contribute to those wells, so that would cut that down immensely. I think perhaps Mr. Funk has more experience, he would be glad to answer that question. I'll be glad to elaborate more on it if you would like.

Q Let's leave that for now. You would transfer the full unit allowable from the four injection wells, is that correct?

A Yes.

Q Which would be four times thirty-three?

A Well, yes, that in effect. We believe that the injection well should be treated the same as the producing well, because if the pattern were shifted over one line of wells, they in turn would be in a producing well themselves.

Q Yet the four injection wells have a total productivity of sixty-seven barrels?

A Yes, that is correct.

MR. NUTTER: I believe that is all.

MR. UTZ: Are there other questions of the witness?

MR. COOLEY: Yes, sir.

MR. UTZ: Mr. Cooley.

By MR. COOLEY:

Q Mr. Motter, it is your Exhibit 1-A on the board?

A Yes.

Q There is considerable area covered in yellow which represents Cities Service ownership, I presume?

A Yes, that's right.

Q But all that area is not contained within the Government "B" Lease, is it?

A No.

Q Would you please give the legal description of the Government "B"?

A All of Sections 3, Range 31 East, Township 14 South; the North Half of Section 10 in the same township and range.

Q In your application for this hearing, you request consideration only for the Government "B" Lease, is that correct?

A Yes, that is correct.

Q However, from your testimony and from the plat itself, Exhibit 1-A, it seems quite reasonable to assume that the No. 1 Well in the State "AN" Lease would also be affected?

A Yes, Mr. Cooley. Maybe I can elaborate that. Mr. Funk has testimony to show that we are working on a unit for this area. We hope possibly to get the unit established before stimulation on that well would occur. At that time we can take care of that in that unit.

Q Will he testify as to what the probable area of that unit

will be?

A He will. In fact, he will have exhibits to outline the area.

Q But by the present application, all you seek is a lease allowable for the Government "B" Lease?

A Yes. If for some reason this unit could not go through by the time we could get stimulation, I presume we would have the prerogative to come back and ask for possibly the same consideration for just the State "AN" Lease, which would take care of any increased production over there.

MR. NUTTER: If Mr. Penrose's well in Section 11 showed a response to water flood, should he have a right to come in and ask for an increase?

A I don't see why he couldn't. That would be money that we would be helping him out or pushing some oil over to him. It probably might be some of his oil or probably some of ours.

Q (By Mr. Cooley) You stated in answer to a question by Mr. Bratton that you did not feel that this project, injection project qualified as a pressure maintenance project for some reason. I didn't gather what that reason was. Would you repeat it?

A My reason was because I think as the Commission themselves defined pressure maintenance, it's either the maintaining of pressure, well, I'll have to look here again, it's on page 4. It is either to maintain existing pressure or to retard the natural decline. We expect to increase the present bottom-hole pressure by injection of water.

Q I'm going to put you on the spot. Do you think that is a reasonable interpretation of pressure maintenance? Is it not a known fact that the institution of a pressure maintenance program any time after the decline from the original pressure, reservoir pressure, will result in some increase in pressure?

A That is true. This problem has been argued, I guess, ever since there has been secondary recovery. I think there is one state actually had a secondary recovery group working and also a pressure maintenance group working, and neither one of them could decide who was working on whose project, and so on and so forth.

Q Certainly it is a nebulous line between the two, you will agree?

A Yes, we will certainly agree.

Q Again in answer to Mr. Bratton's question, you stated that any increase over and above the present production rates would in your opinion be secondary oil. Would you again repeat what reason you ascribe to that conclusion?

A Well, naturally if we get any increase in a well after water injection started, there can only be one reason, in my mind, why that increase would occur, and that would be because we are injecting water to force the oil toward that well.

Q I concur in that conclusion, but would it not also be possible that this oil is just being recovered sooner than it would have been under primary recovery and would nevertheless have been recovered in the economic life of the well, a portion of it?

A I brought out here that, I will grant you I believe I testified there would be 1.7 percent. We estimated the primary oil left to be recovered by the time we get response from the flood. I think I testified that I have extrapolated those curves out to show that we would recover some one million one hundred eighty thousand barrels of oil by primary means from this lease, but I did not take into consideration the economics at any time. I would say that the economic limit for wells in that area would probably be three to five barrels per day, which would naturally cut off or cut some of the ultimate recovery of primary oil that we would expect.

Q Economic limit on wells depends to some degree at least, does it not, upon the practices of the particular operator?

A It most certainly does.

Q Were there not a great number of wells in the area around what is known as the Graridge water project producing at the two-barrel level?

A Yes, they certainly were.

Q Would you give me the potential producing capacities of each of the four injection wells at the time of conversion?

A We have not converted any of the wells. We have not done any construction, physically.

Q They are still producing wells?

A Yes, they certainly are.

Q When do you anticipate converting them?

A We would like to convert the wells if and when we get water to the wells. In other words, we would like to use water for conversion. We will need it in our workover procedure, so they will probably be the last thing to be done in the construction.

Q When do you anticipate?

A Well, like I say here, if everything goes well, we expect to be putting water in in June of 1958.

Q Could you predict the potentials of these four wells, extrapolate them to June of '58?

A I think I possibly could by using this decline curve that is already established.

Q This is not the allowables?

A No, sir.

Q You referred a while ago to allowables. As you know, the allowables assigned to wells in many cases in marginal wells certainly do not represent their actual potential.

A That's right. In these recent tests we are going to ask for reduced allowables because we did not produce our 412 barrels.

Q Let's preface your extrapolation with a little of your most recent potentials on the four wells.

A If you will give me just a minute here, I'll see about what they will be. This will be at the time we start injecting water. From this curve it looks like we will be producing roughly about 280 barrels per day. This is, I tell you how I arrived at this; in March our average well, average daily production per well was

15 barrels per day, and in June it should be 12 barrels per day, so if we take three barrels off each one of the injection wells, No. 5 should have about 12 barrels; 6 should have 17; 14 should have about 11 barrels per day; and I guess it's 10, should be about 19 barrels per day. That's rather a rough extrapolation, but it's the best I can do right now.

Q That's quite satisfactory for the purpose of my question. Would you again give your reasons why you feel these wells should receive top allowable for the purposes of transfer, rather than their potential at the time of conversion?

A Well, Mr. Cooley, like I believe I stated to Mr. Nutter, if this pilot injection program, if it were shifted one line of wells, these four injection wells would actually be producing wells, which could possibly be stimulated by another row of wells, so therefore we feel they should be treated no different than a producing well.

Q I can't follow that reasoning, Mr. Motter.

A Let me point this out. Here is the four wells which we intend to inject water. Say that we changed our flood pattern and made these the injection wells. Then this well would in turn become a producer, this well also; in fact, all four of them would be producers, and they would be stimulated by the four injection wells. Therefore, we feel that it's just a matter of which way you space your pattern, they should all be treated the same. I hope I'm making it clear.

Q Well, the fact that under a different type of injection program you could obtain additional production from these wells is the premise upon which you base your conclusion?

A Yes, that's right. Actually we could go in and drill injection wells on a five-spot pattern, and then these wells would all be treated as producing wells.

Q Then that $160,000 cost would be substantially increased?

A Most certainly.

Q You stated in your direct testimony that you felt that the production from a water flood project could be controlled within some limits by the injection rate. Then I believe you used three figures, not this and not this and not fifty. What are the limits that you think they can be kept within?

A Well, that again is a pretty choice question. If we have a goal to arrive at, for instance, if we are given this 33 barrels times the 24 40-acre units, 792 barrels; it looks possible on this Graridge flood that the ratio is going to be, from injection water to produced oil, is going to be somewhere in the neighborhood of two to one.

Q Two barrels of injected water to one barrel of recovered oil?

A Yes. So by quick mathematics, we want to put in 400 barrels per injection well, or 1600 barrels, we hope that we could arrive at approximately 800 barrels per day.

Q Now back to that two to one ratio, you said two to one?

A Yes.

Q Two barrels of injected water to one barrel of recovered oil or recovered liquids?

A No, recovered oil.

Q Do you have any estimate on what it would be of injected liquid, as compared to recovered liquid?

A Of course, there could probably be one barrel for one barrel, barrel of injected water for a barrel of fluid taken out.

Q It certainly wouldn't exceed it?

A No, it wouldn't exceed it, and I don't think it will ever happen, but it could.

Q The reason for that question, on the recent trip to Oklahoma, I find that out there they have four or five times the amount of liquid withdrawn as that injected. I didn't expect that to happen in this case.

A That would be pretty good.

Q Pretty phenomenal?

A They must have an atomic project.

Q Two injection wells and seventy-five producing wells. By controlled expansion, Mr. Motter, do you mean that you would try to keep the production on the Government "B" Lease, once you do get water flood results, at approximately the 800 barrel level?

A Yes. I would like to expand on that a little. For instance, say we can control it up to 800 barrels, say we can control it in 50 barrels, if the stimulated wells start to drop off we would like

to come before the Commission for administrative approval to insert one or two more injection wells, because we know it will take an additional four months to stimulate any other wells, and possibly in four months the production from the producing wells will drop to some point. We would like to predict ahead all the time so we can keep the 800 barrels or so per day coming in at all times.

Q Might this very question of expansion and the time limits of expansion be one on which reasonable men could differ?

A Would you state that question again?

Q Might this question of expansion, the time limits on the point at which you should expand the flood to make up for any decline in existing wells' production be a controversial issue?

A It could be, that would be something we would have to predict. Of course, if we see a water breakthrough on a well, it has occurred in the Graridge, got up to 550 barrels, we know the production is going to start down pretty rapidly. We would have to start injecting in some other well to make up some place else.

Q The purpose of the question was the advisability of the administrative approval of any expansions of projects which were set up to be controlled projects, on the basis of controlled expansion.

A Well, well, as I have said, where Mr. Funk is going to testify on a proposed unit that we have for this area, and I think that any expansion will naturally come in this unit and lease lines at that time will make no difference, or -- if I assume what you are leading up to.

Q Well, that you are going to keep a water flood within a positive limit, a time which expansion would be necessitated to keep it at that level could be a very controversial issue?

A There would have to be a prediction based probably upon experience. I think possibly we will be able to tell by the results of the Graridge flood possibly when something like that can occur, and base some of our predictions on that when we have to add additional injection wells.

Q That brings up a point I would like to ask. You do not feel, I assume, that the discrepancies in the degree to which the two areas have been depleted, the Graridge Area being very marginal, down to five-barrel level, and the subject area being, I think, twenty-five barrels?

A No, fifteen.

Q You do not feel that this discrepancy will cause any discrepancy in results?

A Well, as I testified before, there are certain factors which we believe will actually increase our recovery by inaugurating a flood at this time rather than waiting until we get to a stripper stage.

Q That has been the impression left with the Commission from previous hearings. Consequently, I question whether the performance of the two floods would be substantially the same.

A I think they would be. I don't think that there would be too much difference in the two. Along that same line, if you refer

to Exhibit 3-A again, this extrapolation looks like possibly late in 1960 we would be clear down to what you would call a stripper stage, no doubt in my mind about it.

Q One last question, you did testify in connection with what you have just said that you feel that the ultimate amount of oil recovered would be greater if the Cities Service had been permitted to institute its flood at the present time rather than waiting until it is depleted, did you not?

A Yes, sir. Mr. Funk plans to elaborate on that. As I said before, formation volume factor, the viscosity of oil to water relationship, and certain other factors, gas in solution, those are all contributing factors which we can show that it would be better for us to inaugurate the flood at the present pressure, rather than waiting until it got down to 75 pounds.

Q Since it is your opinion that additional oil will be recovered, is it also your opinion that the production under your proposed plan will be greater than it would be if you waited until the stripper stage?

A No, sir, because I think I testified there is only about 1.7 percent oil to be recovered between absolute primary means and when we expect to be injecting water, and that although it is a lot, it is only 1.7 percent and it is not a big amount of oil, excuse me.

Q Where is the additional amount of oil going to come from, if it isn't going to come from what would be termed unrecoverable

oil, if you waited until the stripper stage?

A I think Mr. Funk is going to elaborate on that.

Q I will be glad to defer the question.

A Some of the oil left as residual oil, let me put it this way, as the pressure decreases the gas in solution decreases, so that means the formation volume factor decreases; thus you leave more residual oil in place, which probably there is 25 percent that there is no means that we can ever get out of the formation.

Q I vaguely understand these things.

A I think Mr. Funk will explain that.

Q It seems reasonable to assume if you are going to recover more oil under your proposed plan, that your peaks would also be higher?

A They might be higher to some extent, but like I said previously, there's only one or two percent more, should not affect the peaks to just one percent in seven or eight hundred barrels we expect for allowable is not very much oil. This additional oil will come from, I think it's like Mr. Funk will testify, we actually think we will bring part of the oil that would naturally be left in the formation out with this flood by starting earlier.

Q One last question. You testified that you feel that there will only be nine wells which can reasonably be expected to be affected by this injection program. That is the nine wells you enumerated a few moments ago?

A Yes.

Q They occupy nine units, nine 40-acre proration units?

A Yes.

Q Then there are four additional proration units occupied--

A That is correct.

Q -- making a total of thirteen?

A Right, 520 acres.

Q And you request, however, a lease allowable for all of the rest of the wells on the Government "B" Lease. Why do you feel this is justified, that they are not going to be affected by the flood?

A They are not going to be affected, not right now. They will be affected as we expand the flood.

Q Then to treat the thing as a project and to have sufficient allowable at the end of the flood --

A (Interrupting) Yes, sir. We would like for it to be treated as one big unit, assigned one allowable, and we can take the oil out as we expand the flood. Certainly in time it will, possibly in ten years, cover the full area.

Q Would a program permitting only the nine wells which you mentioned to produce in excess of the normal unit allowable up to a limit of the twenty-four wells times the top unit allowable be a reasonable approach to this thing?

A Perhaps it would.

Q Then only the nine wells would be permitted to exceed their allowable; however, I don't think there is much danger, all

the rest of the wells are marginal?

A Oh, yes, they certainly are. I don't know any well -- no, there are no wells right now on the Government "B" Lease that approach the normal unit allowable.

Q All the wells on the Government "B" Lease are now producing at capacity?

A Yes.

MR. COOLEY: That's all the questions I have.

By MR. UTZ:

Q What does the twenty-four hour test production in barrels indicate on your Exhibit 2-A?

A Well, that is the production test that we have run. As you will notice, there are some wells there that produce 40, 44 barrels; here is one 37, 40. As you realize, the facilities on lease, we cannot test or cannot produce all wells while we are testing some, so possibly some of these wells that are shown as high as 40 or 44 barrels might have been shut in for four or five days while we were producing other wells into that same battery.

Q That is not an average producing --

A (Interrupting) No, on some of these wells, especially some of the wells which I have indicated as being affected, we tried to produce some of those two or three days to try and establish an average. I think the No. 8 well was the only one that produced at 44 barrels, and if I remember correctly, that well has just been reworked. I think it was hot oil or had some work

done to increase the producing capacity. We have a terrific paraffine problem up there, it has been testified before this Commission previously.

Q Mr. Motter, do you believe that the radius of influence on your injection wells is any greater than 1320 feet?

A There could always be freak conditions that could stimulate a well, maybe a half or three-quarters of a mile away. Normally we think by pumping these wells just directly offsetting our injection wells, we will keep the pressure differential low enough that those will probably be the only wells affected. In other words, in flooding, actually what you do is try to create a pressure differential to cause the flow to flow to your low pressure areas caused by your producing wells.

Q Now, the premise on which you are asking the transfer of allowables on the Government "B" Lease is due to the fact that you are injecting water in four wells, is that correct?

A Well, that we want to inject the water in four wells. We are not doing it as yet.

Q You propose to?

A We propose to, yes.

Q If you did not inject water in these wells, then you wouldn't be in here asking for transfer of allowables on the lease?

A No, most certainly not.

Q You don't feel you would be entitled to it?

A No.

Q Then why are you asking for a transfer of allowables from wells which are not affected and that will not be affected by the injection of water?

A Well, that brings us back to the same thing I showed here, Mr. Utz, on my program. If this pilot was shifted over another row, we might approach this as if we would establish a five-spot water program, and actually drill injection wells in here, and then all these wells we currently have would be treated as producing wells. We feel they should be treated as producing wells, as the wells being affected by the flood. We have put out money to drill the wells, and what we are doing is driving it from the wells that is actually under the 40-acre tract that the injection well lies on, we are driving it over to producing wells, and it is being produced at these wells, as I have indicated.

Q Then the real reason for it is so you can produce the affected wells unrestrictedly, is that right?

A Well, no. I think I stated that the affected wells, we think, should be produced at capacity. We think we have a small enough pilot we can operate on this unit allowable.

Q What do you think the producing,maximum producing capacity of the affected wells will be?

A Well, like I say, if we inject 1600 barrels per day, which is a minimum of a half a barrel per day per acre foot that we feel that can be used to actually stimulate the wells, I think that somewhere in the neighborhood of around 800 barrels per day is

what we should expect from this flood.

Q You don't believe you could get along on any less than 800 barrels per day?

A No. Experience has shown that half a barrel per acre foot is the minimum we can operate under. I think you will find floods that have operated at less than that. It was probably due to the operator not wanting to put in more, but case of necessity where pressure was too high, he could not put in more water than half a barrel per acre foot.

Q One clarifying question on your Exhibit No. 4-A.

A Yes.

Q Since your vertical scale is a logarithmic scale, is not that second thousand that you have written there ten thousand?

A No, it should be -- well, let me think a minute.

Q This is daily?

A No, that should be, that's correct, Mr. Utz, 920 some barrels per day is what they are producing.

Q Nine hundred --

A (Interrupting) They're injecting slightly over 2,000 barrels per day.

Q Your lower scale is your production?

A Yes, that is correct.

Q Oil production?

A Oil production.

Q The maximum, or your last point, February point, is 920?

A 920 barrels per day, that is from 12 wells.

Q Shouldn't this be a hundred down here, the first circle?

A Maybe I have, no, the cycle on the bottom should be ten, then the next one should be one hundred, two hundred, three hundred, four hundred, five hundred, seven hundred, then on up to a thousand.

Q That straightens it out.

MR. UTZ: Any other questions of the witness? Mr. Nutter.

By MR. NUTTER:

Q Mr. Motter, in response to a question by Mr. Cooley, you said that if you started injecting water that all of the additiona oil that would be recovered could be construed water flood oil, is that correct?

A Well, I would say any increase you are going to get from any producing well has to be affected by the injection of water.

Q Could you call it secondary recovery oil?

A Well, like I explained to Mr. Cooley, we still have the 1.7 percent that we think we could recover by primary means. That would be the only additional oil that I could see, except that we think we could recover some of the oil that would normally be left in place by starting at a higher pressure rather than letting the reservoir pressure get to somewhere in the neighborhood of 75 to 100 pounds.

Q But in the face of the testimony that you gave that these wells respond well to fracking treatment --

A Yes, they do.

Q -- would you say that the additional oil would be secondary recovery oil except for this 1.7 percent?

A Well, I could show you a well here that has been fracked, it's a Government "B"-18, was fracked about, oh, some six months ago, it potentialed after the frac for 87, it's back down to 27 right now. We have not gained a tremendous amount. We have probably paid for the frac job, but that's about all.

Q Now, Mr. Motter, you stated that you felt that no well in this project would receive a disproportionate share of the market for New Mexico oil, because all you would be recovering would be your share of the reserves in place in the Caprock-Queen Pool, is that correct?

A That's right.

Q Have you taken into consideration whether the wells would be receiving their proportionate share of the daily allowable of New Mexico oil, or the daily market demand?

A Well, they would not be receiving any more, Mr. Nutter, than if we went in there and fracked every well and establishing it back to 33 barrels a day, we probably couldn't keep them up there, but certainly if we do that we would be entitled, I'm sure, to the 33 barrels, and all we have done in effect is, rather than do that, we would like to spend our money down here to put it in a water flood and work through the entire lease, like I explained before, might take some period of six to ten years, but we feel

we would like to do it that way rather than spend our money in the fracture process, which fracking will not increase the ultimate recovery.

Q You answered "No" to a question by Mr. Utz that you didn't want unrestricted allowables here, but you wanted to produce the wells within a unit allowable, is that correct?

A If I answered his question in that manner, I misunderstood Mr. Utz. I meant to explain that we would like to produce the affected wells at capacity, but we feel by regulating the amount of water we put in, we can stay within the unit allowable we have asked for.

Q Because you have asked for a large enough unit allowable, is that it?

A Yes, that is correct.

Q If your unit allowable were any smaller, would you be able to stay within that?

A That is something we will be faced with. We think we can operate under any normal change. We haven't seen too many drastic changes. I'll admit it has come from 45 barrels down to 33 barrels in the last few years. It has only happened a barrel at a time. If we were cut, say, after this started, down to 20 barrels, then I think we would have to come back before the Commission and try to freeze our production or allowable at some rate, because we cannot curtail the flood without doing damage.

Q I might make the remark here at this point that that was

probably the reason the Commission entered those findings they did in that order that appeared in the last case, although it may not have been within the scope of the hearing.

A We feel we can operate with any normal change, a barrel per two per month, I think we can live with it. I won't say we can go out there if you cut it 15 barrels a month, that is entirely different.

Q What was the original oil in place?

A 6,798 barrels per acre foot.

Q What do you calculate will be recovered per acre foot in this area by secondary recovery means?

A 290 barrels per acre foot, 6,790 barrels per acre, and our recovery on 1740 barrels per acre by secondary recovery.

Q 1740 per acre. So assuming that this nine-well pilot project has 320 acres enclosed in it,you would recover the result of 320 times 1740, is that correct?

A Would you tell me what 320 you are referring to?

Q The nine-well pilot project has approximately 320 acres under it?

A Yes, something like that.

Q You would recover 1740 barrels per acre?

A Right.

Q So you would recover somewhere in the neighborhood of 557,000 barrels of oil by secondary recovery means?

A I'll accept your figures, I think that is probably about right.

Q As a result of a capital outlay of $160,000?

A No. We're going to have some more wells, we hope some day to put in for injection wells, we will have to pay for that, too.

Q They will recover more oil from additional acres, besides the 320 acres?

A They certainly should.

MR. UTZ: Any other questions?

MR. BRATTON: I have one or two questions.

MR. UTZ: You may proceed.

REDIRECT EXAMINATION

By MR. BRATTON:

Q Mr. Motter, I don't want to belabor this point, but I believe in discussing this question of when stimulation is achieved as to whether you are going to get primary or secondary oil, did you not actually testify that you would probably be getting both primary and secondary oil?

A Well, yes, I think we have some primary oil that we would possibly recover, like I stated before, I think it is 1.7 percent of the oil in place that would probably come with this secondary oil.

Q But it would actually not all be primary oil for some time it would be secondary oil, some secondary oil?

A Certainly there would be secondary oil with it.

Q If you were allowed anything less than what has been requested in the application, the net result would be that you would have to inject less than 400 barrels per well per day?

A Yes. That would put us down below the half-barrel per acre foot which we strive to stay above.

Q In your opinion, if you get below the half-barrel per acre foot per day, is waste apt to occur?

A In most cases, I think it possibly has. There are certainly some floods that have operated less than that, but I think that most generally you'll find that floods are operated from half a barrel an acre foot on up. I think most people even strive to inject water around one barrel per acre foot.

Q You believe actually that you will be planning or programming this pilot at the minimum injection which you could make and still not result in waste?

A That is correct.

Q Mr. Motter, you were asked as to whether you believed any well would receive more than its proportionate part of the daily allowable. I would like to ask,if your two amendments were granted by the Commission,would the lease receive more than its fair share of the daily allowable?

A Not in my opinion, I don't think it would.

Q Mr. Motter, if the Commission should feel that there could be controversies as to expansion of the flood, do you believe you could institute and inaugurate the pilot flood without the granting of your request number three, as to administrative exception?

A Oh, certainly we could.

MR. BRATTON: I believe that's all.

MR. UTZ: Any further questions? The witness may be excused.

(Witness excused.)

MR. UTZ: We will take ten minutes recess.

(Recess.)

MR. UTZ: The hearing will come to order, please. Proceed, Mr. Bratton.

E. E. FUNK

called as a witness, having been first duly sworn on oath, testified as follows:

DIRECT EXAMINATION

By MR. BRATTON:

Q Will you state your name, please.

A E. E. Funk.

Q By whom are you employed?

A Cities Service Oil Company.

Q Where and in what capacity, Mr. Funk?

A In Bartlesville, Oklahoma, Secondary Recovery Engineer is the title that I use.

Q As such, does the area covered by this hearing come within your jurisdiction?

A Yes, it does.

Q You testified in the previous hearing on this matter?

A I did.

Q Since that time you have continued your work in secondary

recovery matters?

A I have.

Q Are you the Chairman of the Engineering Committee of the Caprock-Queen secondary recovery project?

A Cities Service Oil Company as a company is designated as Chairman, and I have conducted the meetings that we have had so far.

Q I would like for you to refer to Applicant's Exhibit 5-A, Mr. Funk, and explain to the Commission what that is and what it shows.

A This map in general covers all of the Caprock-Queen Pool except the south portion. The area outlined in red represents what is now the Ambassador operated unit, and encircled in red are the six input wells.

Q Is that the Ambassador or Graridge in red?

A I'm sorry, it is the Graridge. The six wells there represent their pilot area. Now they started a pilot on a cooperative basis and subsequently worked out the unit which I think went into effect the first of March of this year. Outlined in blue is an area which Ambassador is endeavoring to work into a unit. They also have a pilot area going on a cooperative basis at this time.

Below that we have outlined here in orange, I guess you would call it, a tentative unit that Great Western has taken the lead to form. Now, I understand Great Western has changed the boundaries of that thing a time or two, and currently may be planning to include quite a bit more of this area to the south.

Between the area shown for Great Western and this green line down here is somewhat of an area that plans have not been crystalized on, but I feel certain that that area will ultimately be put into some form of a unit for purposes of water flood, either by inclusion in the Great Western project, or the creation of a separate unit operated by Great Western or Gulf.

Below that, outlined in green, is an area covering eleven Sections, not all of which is productive, which encompasses nearly all of the Cities Service holdings and includes the four input well pilot test which is the subject of our current hearing. This area, Cities Service has taken the lead to form into an operating unit.

Below that is an area of about two Sections wide which again no plans have been laid on, but I feel certain that there again it will before too long be a subject for a unit. Not shown on the map, but starting at the bottom edge of the map, is the north boundary of the area Union Oil Company is trying to organize into a unit, includes all the remainder of the Caprock Pool.

In total, you can see it's falling into a very definite pattern. It looks like there will be some six or seven operating units in the Caprock Field.

Q Why is the Pool being divided as you outlined?

A Well, it's, for two reasons. One, I think,because the operators have outlined the amount that the one operator would like to operate, and, secondly, it's pretty generally the amount

of area that they have a water supply source available for.

Q Now, the general input pattern is constant throughout this area, is it not, Mr. Funk?

A Yes, it is. I think this organization, which we've called the Caprock-Queen's Engineering Committee, represents quite a step in putting this whole area into a very systematic pattern. I think by our action I think we are all going to be working together and as such are not competing for water sources, and I think we will be in much better shape to get along on this allowable question and we certainly will establish a pattern that everybody is using. The patterns, of course, are kind of, for the pilots are separated now, but when they do come to the edge of the various units, they will fit in without any difficulty and the various units then can have cooperative line agreements between themselves.

Q Now, referring to the portion shown on the map there, Mr. Funk, as the proposed Cities Service unit, is that area larger than what you mentioned in your testimony in the hearing in this case on January 6th?

A Yes, it is. In our hearing previously we indicated only the Cities Service leases which are shown here in yellow. We had in mind a royalty unit covering those tracts. The tracts are leases attained from either the State of New Mexico or the Federal Government. The United States Geological Survey office over at Roswell raised the question as to why we would want to unitize such an odd-shaped tract when there were other operations right around it.

Well, that was a logical question. That, plus the fact that some of these other sections have 40-acre leases with only one well in it, it just seemed imperative that we should go ahead and take the lead to make that into an operating unit.

Q In your opinion, Mr. Funk, will the granting of this application, the amendments which we have asked, will that serve to expedite the formation of a unit in this area and an orderly development of the area?

A Yes, I believe it definitely will. The desires we have are that before this pilot test has become very old, that the unit will be formed and we won't have any difficulties extending our flood pattern, and also we hope our allowable arrangement throughout the entire unit.

Q With reference to that, Mr. Funk, I refer you to Applicant's Exhibit 6-A, and ask you if you will explain to the Commission what that is and what that shows.

A This is a production record for the area outlined in green on the map on the wall there. This shows production rate in barrels per month. It is, I think, pertinent because you can see the total area has long since passed the stage where it produces top allowable. It's declining rapidly in much the same fashion as the Government "B" Lease of Cities Service, which is also shown on the same curve here. In other words, what we are proposing for this pilot area is what the whole proposed unit would like to have and would need for a water flood program.

Q That exhibit shows that the unit area is in approximately the same stage of decline as the pilot area?

A Yes, it does.

Q How will the construction work which you are starting fit in with the need of this proposed unit?

A Well, the main water lines which we are installing for the pilot area are sized to meet the needs of the entire proposed unit. At the proposed water plant, the layout is being designed for easy additions of filters and pressure pumps, although initially we will install only such filters and pressure pumps as we need for the pilot area.

Q And your water supply is sufficient, Mr. Funk?

A Yes, we believe our water supply is sufficient for that area. As I stated earlier, that was one of the reasons that most of these units were outlined with the size they have. It might be that that area to the south of us could be brought into the unit Cities Service proposes by later amendment, but we right now aren't sure we would have enough water for that.

Q Mr. Motter has stated that your plan is to inject 400 barrels per well per day, and that is still your proposed plan, for the pilot area?

A Yes. That's essentially the reason for this hearing. If we inject water at that rate and are allowed to transfer allowable from input wells and are permitted to produce the normal per unit New Mexico allowable on a lease-wide basis, we should be able to.

Q If the proposed Cities Service Unit is organized, you would expect it to develop substantially along the same lines?

A Yes, the anticipated allowable should, and, of course, will be used as a guide to the rate of water flood development. I think the normal per well allowable assigned to this unit that we have outlined here will permit us to develop at such a rate that all the stimulated wells will be operated at capacity and prevent any waste.

Q Mr. Funk, I believe Mr. Motter has discussed the increased ultimate recovery which could be obtained if water flooding were initiated now in accordance with your proposed amendments. In your opinion, if water flood operations are commenced now, rather than delayed until such time as the lease has reached a marginal or stripper status, do you believe that the ultimate recovery of oil from the property would be greater?

A Yes, I do. Now in operating a reservoir so as to gain the greatest recovery, we have to recognize that the character of the reservoir fluid is about the only factor over which we have any measure of control. We can do very little concerning the size and the shape of the pores of the rock. This oil under the original 946 pounds bottom-hole pressure, I believe it was, had a gas saturation of 215 cubic feet per barrel. Each barrel of reservoir oil occupied 1.126 times as much pore space as a barrel of gas-free oil would occupy. Now at the time we start our flood we expect the reservoir pressure will be down to about 200 pounds. At this

pressure each barrel of reservoir oil will contain approximately 140 cubic feet of gas per barrel. The formation volume factor, that term I used up above, will drop to about 1.105. If we deplete by primary means before starting our flood, the gas in solution will amount to -- I'm guessing -- about 75 cubic feet per barrel, and the reservoir volume factor will be about 1.07. Now we are estimating that after water flooding 27.8 percent of this por space will stil be occupied by oil. That oil will have the characteristics existing at the time we start the flood, which will be the point of lowest pressure.

On a straight volume basis, the inclusion of the present solution gas in the residual oil will mean a recovery of about 80 barrels per acre more secondary oil, or 80 barrels per acre more oil. This means our secondary recovery will be about 4.6 percent higher than if we were to deplete. Now that's not a very big figure, but it certainly is some oil. I am talking about 4.6 percent of the estimated total recovery if we were to deplete completely by primary means. Our total oil recovered would be about 2.7 percent more.

Now, this gas that we would be leaving in the formation is chiefly nitrogen and has no other value. That's one consideration. Another consideration is the viscosity. Originally the reservoir oil had 2.27 centipoise viscosity at the saturation pressure. We estimate the viscosity is now at 3.8 and will be four and a half centipoises at the end of primary depletion. The water viscosity

under reservoir temperature should be about .8 of a centipoise.

Now flooding efficiency is partially a function of the viscosity relationship between the driving fluid and the driven fluid. The more nearly alike the two fluids are, the water and the oil, the better the efficiency. I would say roughly that the better efficiency gained by closer relation between the two viscosities could yield some 100 to 130 barrels per acre more oil than if we let the viscosities continue to get farther apart.

Now there's other possible benefits by earlier commencement of flooding, one that has been advanced, I don't know that it has ever been proved in any field test, and that is that free gas that is trapped in the formation will replace residual oil; therefore, more of your oil will be recovered. I don't know how to put any figure on that, so I just say in summary that I would guess about 200 barrels per acre more oil will be recovered from this Government "B" Lease if we are able to start our flood as quickly as possible, rather than waiting until it is completely depleted.

The surrounding leases, of course, will continue to decline in pressure until they have their flood started and the gains that they have will be somewhat less, but I think in every case the sooner it is started the higher the ultimate recovery.

Q I believe you said that you estimated 200 barrels per acre more would be recovered if the flood were started now, than if it were allowed to go on primary production to the state of depletion?

A Yes.

Q What does that total in terms of total barrels of oil that would be recovered if this flood is started now as proposed?

A Well, on the Government "B" Lease, that would amount to about 190,000 barrels.

Q Of more ultimate recovery?

A Yes.

Q Were Exhibits 5-A and 6-A prepared by you or under your direction?

A Under my direction, yes.

MR. BRATTON: I would like to move that they be introduced in evidence.

MR. UTZ: Is there objection to the introduction of Exhibits 5-A and 6-A? If not, they will be accepted.

Q Do you have anything else that you would care to say about this application, Mr. Funk?

A Oh, I believe not.

MR. BRATTON: I believe that's all the direct.

MR. UTZ: Any questions of the witness? Mr. Nutter.

CROSS EXAMINATION

By MR. NUTTER:

Q Mr. Funk, you state that by commencing the injection of water at this time while the formation volume factor is comparatively high, you will have an additional 4.6 percent increase in secondary recovery than if you wait until the field is depleted by primary means?

A I think we have a problem here of knowing what percent we're referring to. Now I meant by that that the estimated ultimate recovery of 25.6 percent of the oil in place is 4.6 percent higher than if we were to allow it to go to primary depletion. In other words, 4.6 percent of that 25.6.

Q Four percent of twenty-five percent?

A Yes.

Q Not 4 percent or 4.6 of the total oil in the reservoir?

A No, I do not mean that.

Q Mr. Funk, at the hearing of this case originally in January, you made a statement that I would like to have you elaborate on a little bit now, in which you said what Cities Service's position was in the Graridge case. You said on the Graridge application in the Caprock-Queen water flood," I was not here at that hearing, I have read about it. Our position is this, that water floods can be controlled in a fashion if the control is known and the plan is initiated, I mean the control is initiated at the time the flood is initiated. The area to be flooded should be considered and prorated on a project basis with allowable being assigned to the project rather than to the individual wells." I was asking you in reference to the Graridge. Mr. Motter stated that the pilot project that we're considering here today is a nine-well area surrounding the four proposed injection wells. That would be the project, in your opinion?

A No, I don't believe so. I think what I had in mind there,

that a project sufficiently large could be assigned an allowable, and then the operator could start his pilot within that project and use the entire number of wells in his project to calculate his allowable, which is, of course, what we have asked for in the case of the Government "B" Lease.

Q In other words, if the project is to be considered a very large area, even an area that is not affected by the water injection wells, the question of allowable actually doesn't enter into the thing, the per well allowables, if you make the project big enough?

A What I intended to convey at that time, and that was more or less an ad lib statement that I made, was that we recognize that the States, not only New Mexico but other States have a problem facing them because water flooding in particular, or other means of secondary recovery in general, are becoming more and more a part of the total daily production. Their position pretty much exclusive from proration, of course, has not only been challenged, but it has created a problem for the State Regulatory bodies. Now if the project is sufficiently large, and an operator can know where he is going and produce at capacity and still stay within the allowable, that would be assigned to that project, I mean he would produce his wells within that area at capacity but stay within the overall project allowable and not have any well that would have to be curtailed after it had received a stimulation. Looking at the Caprock Pool as a whole, I think the per well top allowable, if it were applied to all the wells in the field, would mean maybe a

fifty percent increase over what is now being produced. Now, I think that the State could live with something like that. Now they might have trouble if every individual lease started in and wanted to produce at capacity, and all tried to do it at one time. I think they would find the allowable so great, I mean the request for capacity so great that they just wouldn't have any place to send the oil, wouldn't have purchasers or pipe lines to handle it. It would be a very temporary situation, it wouldn't last long.

Q What did you mean in your statement that water floods could be controlled if the control was known at the time the flood was initiated? What control is there, if you have a sufficiently large project that you can produce at capacity?

A I mean control on the rate of development. Now if you have an area that has a hundred wells in it and you want to inject water into an area that would stimulate only nine wells, why, you wouldn't increase that hundred-well area very much; and if you knew that you had to stay within a certain limit, why, you could develop that pilot area and expand it at such a rate that you would never bring your allowable any higher than this top that you were looking at at the time that you made your first injection program, or started your first pilot.

Q What's the answer to the problem, if the number of units in a project is stabilized but the allowable per unit goes down?

A Well, I think that same question Mr. Motter asked, or answered. It's a case of degree. Now right now it's 33 barrels,

and that is one of the lowest in the history of the State, I think, but even at that they have changed only a barrel or two at a time. If it were a drastic drop, say we were to suddenly have it cut from 33 down to, say 15 or something like that, why, we would just be caught. We would come in and ask for relief. I just hope that doesn't occur. I think you do, too, it would be a problem.

Q Mr. Funk, the Commission in Case No. 1381 entered Order No. R - SS 27, in which they provided that the total allowable assigned to the wells in the Red Lake-Premier Sand Unit would not be greater than an amount to be determined by multiplying the number of 40-acre tracts on which there is located an authorized injection well, plus the number of developed 40-acre proration units, either directly or diagonally offsetting the 40-acre tracts on which the 40-acre units are located, times the top unit allowable. Would it be possible to operate this unit in accordance with a plan like that?

A I don't believe it would. I think we would have to have a larger allowable than that would grant.

Q How many wells are directly and diagonally offsetting these injection wells?

A In this particular case we have nine wells.

Q I think those are direct offsets, Mr. Funk.

A Let me see. I don't know what you mean by diagonal, then. I believe Mr. Motter spelled out a group of nine oil wells plus the four input wells there.

Q If there were a total of 21 wells directly and diagonally offsetting your injection project, would you have sufficient allowable?

A Well, that's getting very near the total number on the lease.

Q We are taking a couple that aren't on the lease by doing that, two wells on the State "AN" Lease, and one we'll belonging to Penrose in Section 11.

A Frankly, I don't think that would be quite enough. We are figuring on putting in about 400 barrels a day, and it looks like the peak rate of production is going to be somewhere in the neighborhood of one barrel of oil for each two barrels of water injected, so by multiplication you will come out around 800, and that is just about what the 24 wells on the lease times 33 will give.

Q Will these wells directly offsetting this pilot project be producing the 800 barrels at one time? You expect a peak of 800 barrels from these wells?

A 800.

Q In this four-well project that you are talking about now?

A Oh, I think we would come close to that, yes. The few wells outside of the area there would be making, oh, I would guess only maybe fifty barrels of it.

Q How much do you anticipate your No. 8 well, which is in the center of the injection pattern, will make at its peak?

A Well, I've watched a lot of water floods, and I don't believe anyone can predict any single well. That's been one of

the mysteries to me, as to why in a water flood you will have a few of your oil wells far superior to all the others. Now just on a straight barrel basis, I would think it would be possible to say that that well might make 400 barrels a day.

Q Although the total number of units offsetting directly and diagonally the four well injection project is 21, that approximates what you have requested here today, a total of 24 40-acre units to be assigned to the project, you don't think you could get along with that sort of an allowable?

A No, I don't. Particularly because part of those 21 are not on the Government "B" Lease. I think at least one of them is over on the State "AN", and I believe there is another one that is off the Cities Service property, it would be the Penrose Lease.

MR. NUTTER: That's all.

By MR. UTZ:

Q Mr. Funk, do you intend to try to communitize the State "AN" Lease with the Government "B" Lease?

A We intend to try to form a unit for both operations and royalty covering all this eleven Section area as shown on this Exhibit 6-A, I believe it is.

Q Which would also include the Penrose-Alston Lease?

A It would include any number of leases, and one of the difficulties is that part of the land is Government land, part of it is State land, and part of it is private land.

Q Are you now in the process of trying to communitize that area?

A We are. The work that's being done is all being done by Cities Service at that, which is a matter of compiling data to make a recommendation on participation. We figure that we have to make a recommendation on that matter before we should approach any of the other parties involved.

MR. UTZ: Any other questions of the witness?

MR. BRATTON: I have one or two questions, Mr. Utz.

REDIRECT EXAMINATION

By MR. BRATTON:

Q Mr. Funk, when you were discussing the ultimate recovery and how much it would be better if the project were started now, I think you said that, in response to a question by Mr. Nutter, that it would be 4.6 percent of 25 percent. Don't you mean that it would be 4.6 percent from 25 percent; in other words, that the primary would be, or the secondary recovery would be somewhere around 21 percent if the project were started later?

A No, I don't think so. Let me do a little checking here to make sure. I'm confusing myself now. What I meant, put it this way, that our secondary recovery would amount to roughly 80 barrels per acre more. Now 80 barrels per acre in reference to an estimated ultimate recovery of 1740, I believe it is, yes, would be 4.6 percent of that 1740 barrels per acre that were estimated recoverable by water flood.

Q The net result is that you would anticipate an ultimate recovery of approximately 190,000 barrels if the project were started

now?

A Yes.

Q Now, Mr. Funk, you've heard Mr. Motter testify that the approximate half-barrel per acre foot per day is a desirable level or is a minimum desirable level for injection. Is that your opinion, too?

A Yes, sir, it is.

Q Do you believe if you inject less than that, that waste might result?

A I think it's very likely to result. I will have to admit, there are some rare cases where it wouldn't, but I wouldn't want to take the chance.

MR. BRATTON: I believe that's all.

MR. UTZ: Mr. Cooley.

MR. COOLEY: With your permission, Mr. Bratton, I would like to inject one more question.

MR. BRATTON: Thank you.

RECROSS EXAMINATION

By MR. COOLEY:

Q Mr. Funk, have you had considerable experience in Texas in the operation of water floods in that State?

A Yes.

Q Are you familiar with the manner in which the Texas Railroad Commission handles such matters?

A Yes, I know from experience on the various projects that

Cities Service is interested in or operates, their practice is somewhat variable.

Q They don't treat all water injection or water flood projects the same, from the standpoint of allowable, do they?

A That is correct.

Q Is one of the basic determining factors in that regard the degree to which the particular area has been depleted?

A Yes.

Q On primary depletion?

A I would say that's right.

Q How do they range those degrees, according to your knowledge?

A I wouldn't know what their plan is. In fact, we have some of the same issues to take up with them from time to time. It seems that in the North Texas area that most anything in that area is considered stripper, and they will allow capacity production. I would say that might be true in some other areas, but the West Texas area, pretty generally they have been much more critical of capacity production. Now, in West Texas they granted capacity production in the older South Ward, I think other Yates Sands Pools down there, I don't know. It would just be a matter of opinion, but I think their position is one of trying to institute a regulation in line with their market demand situation prevailing at the time.

Q Well, of course, we have to face the market demand problem in this State, too, since we are prorated in market demand, and the particular question I wanted to ask you with regard to the

policy there,in the event they find that a particular area is not in the stripper stage, is somewhere in between the initial flush stage and the stripper stage, isn't it their practice to put it on an MER basis?

A Yes, I would say it is.

Q Then they are prorated?

A They will put it on a project basis very similar to what we have asked for here.

Q They are prorated on a project basis?

A That's right.

Q Which would be contrasted with the capacity type of allowable that was authorized in the Graridge case?

A Yes. Now, one thing I might bring up, that the South Ward Pool was a place where the State of Texas gained an awful lot of experience in how enormous the problem might become. In that Pool they have granted capacity production, and I think if one had a lease in that area where he was starting to flood today and go to the State for capacity production, he would still be allowed it. In other words, once they started it in the Pool, they stayed with it. If it's an entirely new area, they might use a different rule on it.

MR. COOLEY: Thank you very much.

MR. BRATTON: Could I ask one further question.

REDIRECT EXAMINATION

By MR. BRATTON:

Q In the State of Texas, in cases where the production has declined below the flush production and is not quite down to the stripper production, if it is put on a project basis as you discussed, it is on a lease allowable and transfer of allowables such as we have requested here?

A Yes, sir, it is.

MR. BRATTON: Thank you.

MR. UTZ: Mr. Funk, is your 400 barrels a day injection rate predicated on 80-acre injection pattern per injection well, or ten foot pay?

A Yes, sir, well, we said eight to ten feet.

MR. UTZ: Are there any other questions of the witness? If not, the witness may be excused.

(Witness excused.)

MR. UTZ: Any other statements to be made in this case? If there are not, the case will be taken under advisement.

* * * * * * * *

C E R T I F I C A T E

STATE OF NEW MEXICO)
) ss
COUNTY OF BERNALILLO)

I, ADA DEARNLEY, Notary Public 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 in stenotype and reduced to typewritten transcript under my personal supervision, and that the same is a true and correct record to the best of my knowledge, skill and ability.

WITNESS my Hand and Seal this 14th day of April, 1958, in the City of Albuquerque, County of Bernalillo, State of New Mexico.

Ada Dearnley
NOTARY PUBLIC

My commission expires:

June 19, 1959.

I do hereby certify that the foregoing is a complete record of the proceedings in the examiner hearing of Case No. 1356, heard by me on Apr. 9, 1958.

Elvis A. Utz, Examiner
New Mexico Oil Conservation Commission

DEARNLEY - MEIER & ASSOCIATES
INCORPORATED
GENERAL LAW REPORTERS
ALBUQUERQUE, NEW MEXICO
3-6691 5-9546

CITIES SERVICE OIL COMPANY
CAPROCK QUEEN POOL
GOVERNMENT "B" LEASE
Secs. 3 and 10, T-11-S, R-31-E, Chaves County, New Mexico

Well No.	Comp. Date	Orig. Potential		Date of 24 Hr. Test - Oil Bbls.		Acc. Prod. to 12-1-57	Date	BHP
1	3-26-54	F	96 B/D	7-17-57	24	47893		
2	5-19-54	P	256	7-18-57	25	47144		
3	6-23-54	F	920	7-12-57	11	44115		
4	6-24-54	F	412	8-29-57	18	44658		
5	7-30-54	P	101	7-16-57	24	43643		
6	8-19-54	P	138	7-9-57	27	43318		
7	10-28-54	P	134	7-30-57	40	37997		
8	8-27-54	P	121	7-10-57	40	42926		
9	9-27-54	P	160	7-16-57	22	42111		
10	9-3-54	P	226	7-12-57	30	42195		
11	9-7-54	F	164	7-27-57	20	36871		
12	9-27-54	P	126	7-3-57	28	41557		
13	10-15-54	P	112	7-5-57	37	41026		
14	10-8-54	P	128	7-18-57	30	39942	1-5-58	292
15	10-20-54	P	292	7-19-57	22	39847	12-17-57	319
16	10-30-54	P	133	8-24-57	40	40444		
17	11-11-54	P	66	7-26-57	18	35066		
18	11-10-54	P	347	7-21-57	40	39968		
19	12-2-54	P	94	7-29-57	20	34414		
20	11-23-54	F	528	9-11-57	36	39166		
21	12-13-54	P	166	7-29-57	13	37231	12-15-57	213
22	12-24-54	P	45	6-29-57	40	36745		
23	12-23-54	P	92	8-6-57	38	38475		
24	1-6-55	P	107	8-8-57	26	37457		

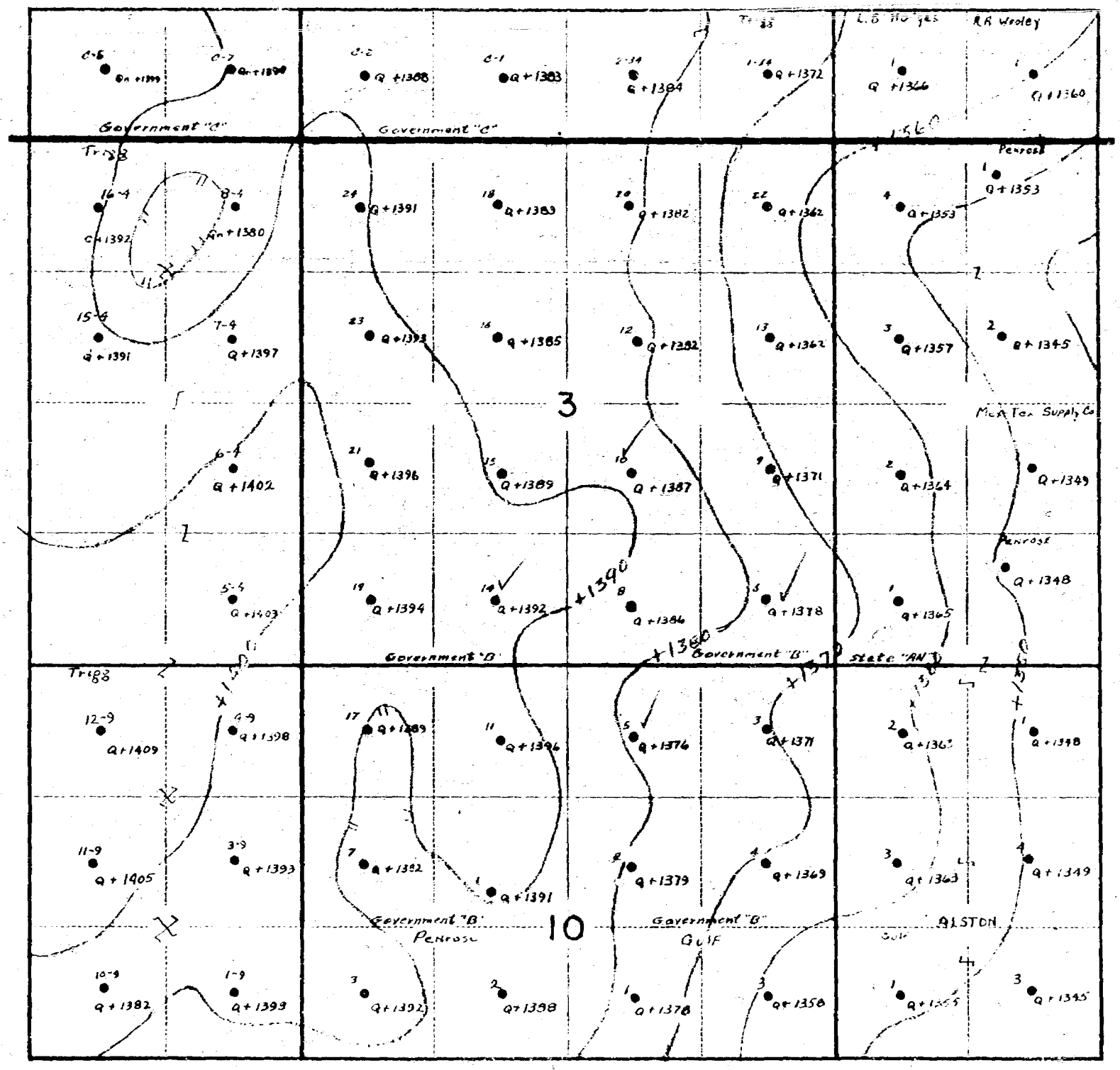
Bottom Hole Pressure December, 1954, 946#
Saturation Pressure December, 1954, 934# @ 90°

BEFORE THE
OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO
CASE 1756 EXHIBIT NO. 6

EXHIBIT 6

STATE

COUNTY



FORM GEOL. 46

EXHIBIT 2

SCALE: 4 INCHES EQUAL 1 MILE

CITIES SERVICE OIL COMPANY
CAPROCK QUEEN POOL

Lease	Well No.	Comp. Date	Orig. Potential B/D		Date of Latest Test	24 Hr. Test Prod.-Bbls.	Current Allow.	Acc. Prod. to 4-1-58	BHP	Date
Government	1	3-26-54	F	96	7-17-57	24	16	49250		
	2**	5-19-54	P	256	4-6-58	20	18	48576		
	3**	6-23-54	F	920	3-31-58	8	11	44887		
	4	6-24-54	F	412	8-29-57	18	12	45639		
	5*	7-30-54	P	101	4-1-58	15	13	44947		
	6*	8-19-54	P	139	4-1-58	20	18	45220		
	7	10-28-54	P	134	7-30-57	40	18	39517		
	8**	8-27-54	P	121	3-31-58	44	31	45177		
	9**	9-27-54	P	160	4-2-58	21	21	42641		
	10*	9-3-54	P	226	4-3-58	22	21	43692		
	11**	9-7-54	F	164	4-4-58	11	12	37711		
	12**	9-27-54	P	126	4-2-58	12	10	42836		
	13	10-15-54	P	112	7-5-57	37	21	42732		
	14*	10-8-54	P	138	4-4-58	14	15	40994	292	1-5-58
	15**	10-20-54	P	202	4-3-58	6	10	41036	319	12-17-57
	16	10-30-54	P	133	8-24-57	40	24	42689		
	17	11-11-54	P	66	7-26-57	18	10	35762		
	18	11-10-54	P	317	7-21-57	40	27	42285		
	19**	12-2-54	P	74	4-5-58	13	12	35241		
	20	11-23-54	F	543	9-11-57	36	21	40870		
	21	12-13-54	P	146	7-29-57	33	11	38140	213	12-15-57
	22	12-24-54	P	45	6-29-57	40	20	40518		
	23	12-23-54	P	92	8-6-57	38	22	40374		
	24	1-6-55	P	107	8-8-57	26	18	38791		
							412	1009408		
State AN	1**	7-19-54	F	402	4-5-58	22	15	43563		

Bottom Hole Pressure December, 1954 - 946#
Saturation Pressure December, 1954, 934# @ 90°

* Injection Well
** Well Expected to be Effected by Flood

BEFORE THE
OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO
Cities Svc. EXHIBIT No. 2-A
CASE 1356

EXHIBIT .....

WR-8

CHANGE OF OWNERSHIP OF WATER RIGHT

File No. L-2661

Date Received _____

State of New Mexico, }
County of Lea } ss.

This is to certify that J. J. Kerby & Sons, Inc.

of Lovington, County of Lea

State of New Mexico, the owner and holder of a water right set forth in

file number L-2661 of record in the office of the State Engineer

at Santa Fe, New Mexico, has transferred all (all or part) of said water right

to Cities Service Oil Company, of Box 968, Roswell

County of Chaves, State of New Mexico.

The transferred water right is appurtenant to lands described as follows (describe only lands with actual water right):

SUBDIVISION	SECTION	TOWNSHIP	RANGE	ACREAGE
466 acre feet per annum from 4 wells				
private utility company	24	14S	31E	

OIL CONSERVATION COMMISSION
EXHIBIT NO. 5
CASE NO. 1365

Total _____

The undersigned, being first duly sworn upon oath, deposes and says that he has read the foregoing statements and that the same are true to the best of his knowledge and belief.

E. L. Kerby President
Attest: Secretary

Subscribed and sworn to before me this 28 day of October, 19 57

My commission expires:

Sept. 15, 1958

Notary Public

INSTRUCTIONS

Change of ownership shall be filed in
duplicate—for surface water rights.
triplicate—for underground water rights.

This form shall be executed either by transferor (seller) or by the transferee (buyer) and shall be accompanied by a filing fee of $1.00. If executed by the transferee it shall be accompanied by a certified copy of the deed or other instrument of conveyance.

IMPORTANT: Any filing, permit or license to appropriate water may be assigned, but no such assignment shall be binding, except on the parties thereto, unless filed for record in the office of the State Engineer. Such filing shall be made out on Change of Ownership forms or may consist of certified copies of the actual assignment. In either case a filing fee of $1.00 is required.

No irrigation right which is appurtenant to the land shall be assigned or transferred apart from the land excepting in the manner specifically provided by law. Neither may title to land be transferred apart from any water right which is appurtenant thereto unless such right has been previously alienated from the land in the manner provided by law.

FILED
OCT 28 1957
4 OFFICE
GROUND WATER SUPERVISOR
ROSWELL, NEW MEXICO

EXHIBIT 5

LEASE NO. W-119

COMMERCIAL WATER LEASE

THIS INDENTURE, made and entered into this 31st day of October, 19 57 by and between the STATE OF NEW MEXICO, acting by and through its Commissioner of Public Lands, party of the first part, hereinafter called the Lessor, and Cities Service Oil Company, Box 969, Roswell, New Mexico, Bartlesville, Oklahoma, hereinafter called the Lessee.

WITNESSETH

The Lessor, in consideration of the covenants and agreements of the Lessee hereinafter set forth, has this day leased to the Lessee the hereinafter described tract of land for the sole and only purpose of the commercial development, storage, transportation and sale of water, nothing herein contained, however, shall be construed as depriving the lawful holder, for the time being, of any grazing, oil and/or gas, or other mineral or business lease on the tract hereinbelow described, when any such leases exist on the tract embraced in the present commercial water lease, of the right to develop and use water thereon for any purpose which such lease holders may have as incidental to purposes of such lease or leases. It is understood that no other commercial water lease is to be issued upon this tract so long as the present lease remains in effect.

Right of ingress and egress and rights of way for wells, reservoirs, pipe lines and telephone lines as incidental and necessary for the purposes of this lease are hereby granted.

The tract of land in this lease is as follows:

SUBDIVISION	SEC.	TWP.	RGE.	ACRES	FUND
All	24	14 S	31 E	640.00	C. S.

BEFORE THE
OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO
EXHIBIT No. 5a
CASE 135

TO HAVE AND TO HOLD the same for a term of five (5) years, beginning at the date of this lease and ending on October 31st, 1962, for which lessee agrees to pay rental as follows:

For the first year of the lease the lessee agrees to pay the sum of $ 100.00. The rental for each of the following years will be based on the amount of water produced, but in no event shall the annual rental be at an unreasonable rate nor shall it be less than the rental for the first year of the lease.

IT IS HEREBY COVENANTED AND AGREED That any water well, together with all casing therein which the Lessee may own or cause to be developed for the purposes herein on the tract embraced in the lease shall, upon the cancellation of this lease by default, become the property of the State, but the Lessee at all times shall have the right to remove all other property placed thereon by said Lessee.

IT IS HEREBY FURTHER COVENANTED AND AGREED That the Lessee shall under the terms and agreements of this lease be required to submit annually a comprehensive report of water produced under this lease and the price per unit of the disposal thereof.

IT IS HEREBY FURTHER COVENANTED AND AGREED That the Lessee shall have preference right for the renewal of this lease for another five (5) year period, provided said Lessee complies with all terms of this lease, the laws of New Mexico and the rules and regulations of the State Land Office, if application for such renewal is made prior to the expiration of this lease.

IT IS HEREBY FURTHER COVENANTED AND AGREED That before renewal thereof the Commissioner of Public Lands shall review the annual report hereinabove provided of the water produced or produced and sold, and based upon such report, have the right to adjust upward or downward the rentals of any such renewal lease.

IT IS HEREBY FURTHER COVENANTED AND AGREED That this lease is made for the sole purpose and benefit named hereinabove; that no sublease or underlease (either written or verbal) shall be made by the Lessee without the written consent of the Commissioner of Public Lands; any violation of this agreement and understanding will subject this lease to cancellation.

IT IS HEREBY FURTHER COVENANTED AND AGREED That this lease shall terminate upon default of any payments due upon thirty (30) days' notice by registered mail to Lessee, evidenced by return receipt, unless such default be cured within such thirty (30) day period.

IT IS HEREBY FURTHER COVENANTED AND AGREED That the Lessee may at any time surrender and be relieved of any obligations under this lease by the payment of Ten Dollars ($10.00) to the Lessor, provided however, that all rentals then due have been fully paid and the terms of this lease have been fully complied with. However, upon such surrender, no portion of the rentals paid by the Lessee shall be refunded.

All the terms of this agreement shall extend to and bind the successors and assigns of the parties hereto.

WITNESS the hands and the seals of the parties aforesaid, the day and year first above written.

THE STATE OF NEW MEXICO

By: _____
Its Commissioner of Public Lands

CITIES SERVICE OIL COMPANY

By: Emmett Williams
Emmett Williams, District Landman
Lessee

EXHIBIT 5A

SCHEMATIC DIAGRAM
PROPOSED INPUT WELL

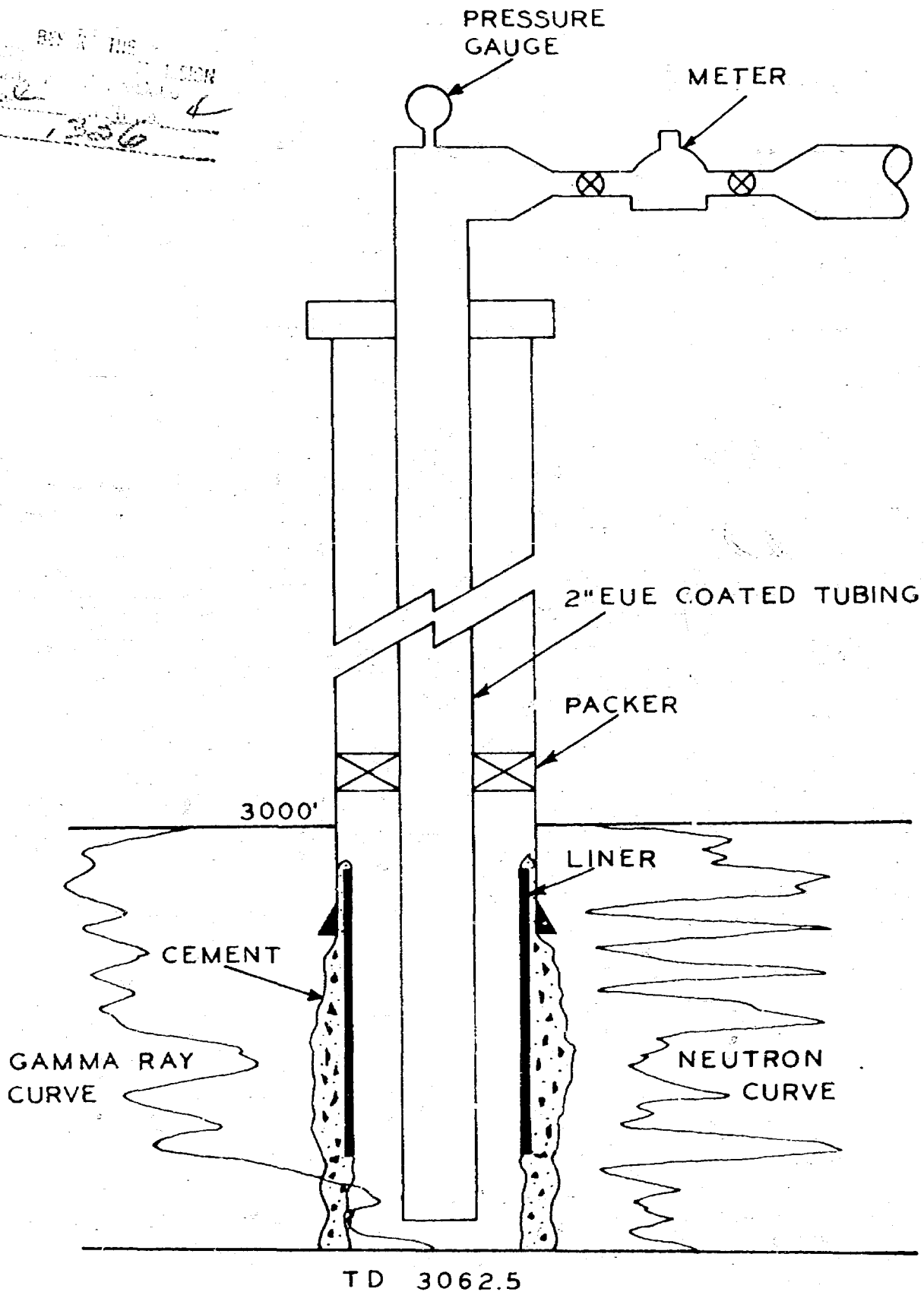


EXHIBIT NO 4

Rockwell Mfg. Co
Pittsburgh 8, Penn -
Midland, Texas

CITIES SERVICE OIL COMPANY

BOX 97
HOBBS, NEW MEXICO

Case 1356

January 16, 1958

State Engineer
State of New Mexico
Box 1079
Santa Fe, New Mexico

Attn: Mr. Frank E. Irby, Chief, Water Rights Division

Dear Sir:

Your letter of January 13, 1958, concerning the measurement of water from permit wells numbered L-2661, L-2662, L-3451 and L-3452 has been received by this office.

Water from these wells is to be gathered at a central battery, located in the SW/4 of the NW/4, Section 24, T-14-S, R-31-E, Chaves County, New Mexico. From this point the water will be pumped to the filter plant site, which will be located in the NE/4 of the SE/4, Section 3, T-14-S, R-31-E, Chaves County, New Mexico (see attached plat). It is planned to install a meter in the discharge line of the pump which will be located at the central battery. This meter will be a Rockwell "Nute Cycle" or equivalent. Measurement of fluid in this type meter is accomplished as a continuous rotating cycle by true positive displacement. Injected water will be measured at each well head with a Rockwell "Five Pointer" disc type or equivalent meter. The meters herein described are both subject to your approval.

It is proposed to use water from the four permit wells numbered L-2661, L-2662, L-3451 and L-3452 in the following manner: (1) waterflood; (2) dissolve salt in well bore of producing wells; (3) domestic use for company employees; (4) general oil production, drilling and well workover operations.

You will be notified prior to installation of meters for your approval of both equipment and method of installation. Should there be further questions in this matter, please call on me.

Very truly yours,

E. F. Hutter
District Engineer

EFH/gb

STATE OF NEW MEXICO

OFFICE OF STATE ENGINEER

IN THE MATTER OF THE PERMITS

OF CITIES SERVICE OIL COMPANY

FILES L-2661, L-2662, L-3451 and L-3452

ORDER REQUIRING THE INSTALLATION OF TOTALIZING METERS ON WELLS USED IN WATER FLOODING PROGRAM.

WHEREAS, the State Engineer approved Applications No. L-2661 and L-2662 on June 9, 1955 and January 17, 1955, respectively, for Kerby & Sons, Inc. of Lovington, County of Lea, State of New Mexico for an annual use of 3.0 acre feet from each well for supplying oil wells for drilling purposes and road contractors within Lea and Chaves Counties.

WHEREAS, the State Engineer approved Applications No. L-3451 and L-3452 on May 9, 1957 for J. J. Kerby and Sons, Inc. for a combined annual use of 465 acre feet per annum to be appropriated from the four wells, L-2661, L-2662, L-3451 and L-3452 for deliveries by this privately owned public utility water company to oil companies and others for domestic use, oil well drilling, oil production operations and various municipal and commercial uses as need arises.

WHEREAS, on the 28th day of October, 1957 Cities Service Oil Company of Roswell, County of Chaves filed changes of ownership stating that they had acquired all of said water rights set forth in file numbers L-2661, L-2662, L-3451 and L-3452.

NOW, THEREFORE, I, S. E. Reynolds, State Engineer of the State of New Mexico, by virtue of the authority vested in me by the laws of said State, do hereby order that prior to any withdrawals from described wells the Cities Service Oil Company shall:

1. Install totalizing water meters on the discharge line of each pump or one meter at the gathering point of discharge from all wells so that the withdrawal for the prescribed purposes from the four wells will be fully and accurately measured.

2. The totalizing meter shall be of a design approved by the State Engineer and installed at the most practical point or points for measuring the water.

3. The discharge line of each pump must be visible from the pump to the meter and the meter or meters must be accessible for reading.

4. Cities Service Oil Company shall notify the State Engineer before said meters are installed.

5. Cities Service Oil Company shall submit records of withdrawal for each calendar year, on or before the 30th day of January of the following year, to the Groundwater Supervisor, District II, Roswell, New Mexico.

WITNESS, my hand and the official seal of my office this 13th day of January, 1958.

S. E. Reynolds
State Engineer

/s/ By: Frank E. Irby

Frank E. Irby
Chief
Water Rights Division

SEAL:

OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO

February 6, 1958

Case No. 1356

Hearing Date: January 7, 1958
Daniel S. Nutter
Santa Fe, New Mexico
9:00 a.m.

My recommendations for an order in the above numbered cases are as follows:

I hesitate to accept the definition of this proposed program as a water-flood, at least in the usual sense of the word. It is true that water is to be injected into certain wells with the aim of flushing oil from the reservoir and producing it from adjoining wells. However, the same basic principle exists in a pressure maintenance program, in that one of the aims is to flush oil from the reservoir and produce it from adjoining wells while another aim is to build up or maintain the reservoir pressure at a level similar to the original pressure of the reservoir or the saturation pressure of the oil.

Water flooding is generally construed to be a secondary recovery process whereby oil is recovered from a reservoir which would not otherwise be recovered, if the producing medium were confined to one of those accepted as primary recovery methods.

We therefore see that water flooding cannot be said to recover any additional oil until the volume of oil which would have been produced without the water flooding has been produced.

It follows that pressure maintenance programs in their early lives are that: pressure maintenance programs, also that in the later stages of depletion when secondary recovery oil volume only is being recovered, that they should be considered as water floods. The question then arises as to the determination of the point at which a pressure maintenance program ceases to be a maintenance program and becomes a secondary recovery program.

Another question to be decided is whether a project at its inception should be classified as a pressure maintenance project or as a secondary recovery project.

This latter determination is important in view of the previous determinations by the Commission with regard to allowables for these two types of projects.

The Commission has on previous occasions:

1. Authorized water flood projects with allowables and production restricted to the total allowable of all developed tracts with the privilege of producing said allowable from any well or wells.
2. Authorized water flood projects to produce any amount of oil from any well or wells without restriction, providing the operator requested authority to so produce the well.
3. Authorized pressure maintenance projects to produce the top allowable from each well with allowable credit given for injection wells, said injection well allowable eligible for production from any well or wells in the project.

It is apparent that more allowable advantages, to date at least, have been granted to the water flood type of project. The advocates of the capacity allowables referred to in 2 above admitted the possibility of water flood oil obtaining a non-proportional share of the total market for New Mexico oil if certain curtailments were not made. The recommended curtailments would be achieved by limiting the number of water flood projects or by limiting the expansion of existing projects.

Another obvious way of limiting the amount of capacity allowable, to not glut the market with such oil to the detriment of primary recovery fields and exploration, is to prevent any but bonafide water floods from being operated at capacity allowables. It is apparent that if pressure maintenance projects should ever be granted capacity allowables, that by the mere expediency of injecting some water into a few wells an entire pool in its early stage of depletion could be produced at capacity.

The applicant in this case has maintained that "pressure maintenance to be strictly pressure maintenance, ought to be applied above the saturation pressure of the fluid". It is agreed that the reservoir pressure in the subject area is considerably below the saturation pressure of some 900 / pounds, being in the neighborhood of some 260 pounds.

However the production of oil in this area has not declined to a stripper stage at which it may be said that water flooding is the only means of producing additional oil, the four proposed injection wells having a total productive capacity in excess of 2,000 barrels of oil, per month. In view of the serious considerations involved in permitting any but the most unquestionable projects to be classified as water floods and eligible for consideration of capacity allowables, I recommend that the application of Cities Service for a pilot water flood be denied, but that the applicant be permitted to inject water into this reservoir through the proposed wells in an effort to stimulate the primary recovery.

Further, that the applicant be required to limit the amound of water injected into the four injection wells to an amount that will permit limiting the production without waste to only that amount of oil obtained by assigning top allowable to those wells on the lease which, by bottom hole pressure data and productivity data, indicate that the injection project is having a marked effect upon them, plus the top allowable for injection wells. The allowable for the injection wells should be permitted to be produced from any such affected adjoining well or wells.

No. 38-57

DOCKET: EXAMINER HEARING JANUARY 7, 1958

Oil Conservation Commission 9 a.m. Mabry Hall, State Capitol, Santa Fe, NM

The following cases will be heard before Daniel S. Nutter, Examiner:

CASE 1356: Application of Cities Service Oil Company for permission to institute a pilot water flood project in Township 14 South, Range 31 East, Caprock-Queen Pool, Chaves County, New Mexico. Applicant, in the above-styled cause, seeks permission to institute a pilot water flood project in the Caprock-Queen Pool, Chaves County, New Mexico, by injecting water into the Queen formation through the following intake wells:

Government "B" No. 5, NW/4 NE/4 Section 10;
Government "B" No. 6, SE/4 SE/4 Section 3;
Government "B" No. 10, NE/4 SE/4 Section 3;
Government "B" No. 14, SE/4 SW/4 Section 3,

all in Township 14 South, Range 31 East.

CASE 1357: Application of Standard Oil Company of Texas for an order authorizing the production into a common tank battery of all oil produced from five leases in the Atoka Pool, Eddy County, New Mexico. Applicant, in the above-styled cause, seeks an order authorizing the production into a common tank battery of all oil produced from the Atoka Pool from the following described leases: SW/4 SE/4, NW/4 NW/4, NW/4 SE/4, SE/4 NW/4, and SW/4 NE/4 of Section 12, Township 18 South, Range 26 East, Eddy County, New Mexico.

CASE 1358: Application of Magnolia Petroleum Company for an order cancelling Order R-984, and granting authority to commingle the liquid hydrocarbons produced from the Pictured Cliffs and Mesaverde formations into central tank batteries located on certain leases in the Blanco Mesaverde Gas Pool, Tapacito-Pictured Cliffs Gas Pool and certain undesignated Pictured Cliffs and Mesaverde gas pools in Rio Arriba County, New Mexico. Applicant, in the above-styled cause, seeks an order cancelling Order No. R-984, and granting authority to commingle the liquid hydrocarbon production from the Pictured Cliffs and Mesaverde formations into central tank batteries located on certain of the applicant's leases in Township 26 North, Range 2 West; Township 26 North, Range 3 West; Township 27 North, Range 2 West, and Township 27 North, Range 3 West, in Rio Arriba County, New Mexico.

CASE 1359: Application of El Paso Natural Gas Company for an order extending the time allowed for making annual deliverability and shut-in pressure tests, and requesting allowables for 237 gas wells in certain prorated, non-prorated, and undesignated gas pools in San Juan and Rio Arriba Counties, New Mexico. Applicant, in the above-styled cause, seeks an

CASE 1359 continued

order extending the time allowed for making annual deliverability and shut-in pressure tests, and requesting allowables for 237 gas wells in the Blanco Mesaverde, Fulcher Kutz-Pictured Cliffs, West Kutz-Pictured Cliffs, Aztec-Pictured Cliffs, South Blanco-Pictured Cliffs, Ballard-Pictured Cliffs, Otero, Canyon Largo, East Companero Dakota, Tapacito, West Kutz-Fruitland, North Los Pinos-Fruitland, and South Los Pinos-Fruitland Gas Pools and in undesignated Fruitland, Pictured Cliffs, and La Ventana gas pools in San Juan and Rio Arriba Counties, New Mexico.

CASE 1360: Application of Gulf Oil Corporation for an order suspending the cancellation of underage accrued to eight gas wells in the Eumont, Jalmat, Tubb, and Blinebry Gas Pools, Lea County, New Mexico. Applicant, in the above-styled cause, seeks an order suspending the cancellation on January 1, 1958, of the underage accrued to the following gas wells in the Eumont, Jalmat, Tubb, and Blinebry Gas Pools:

Eumont Pool

Bell-Ramsay St. "C" No. 1, NW/4 SE/4 Section 34, Township 20 South, Range 37 East

Jalmat Pool

Arnott-Ramsay "E" No. 2, SW/4 SE/4 Section 16, Township 25 South, Range 37 East

Arnott-Ramsay "E" No. 5, SW/4 NW/4 Section 16, Township 25 South, Range 37 East

J. R. Holt "A" No. 2, SE/4 SW/4 Section 16, Township 24 South, Range 37 East

Tubb Pool

Hugh No. 7, NE/4 NW/4 Section 14, Township 22 South, Range 37 East

Harry Leonard "E" No. 4, NE/4 NE/4 Section 16, Township 21 South, Range 37 East

Blinebry Pool

J. N. Carson "A" No. 4, SW/4 SE/4 Section 28, Township 21 South, Range 37 East

H. Leonard "E" No. 4, NE/4 NE/4 Section 16, Township 21 South, Range 37 East

all in Lea County, New Mexico.

CASE 1361: Application of The Texas Company for an order suspending the cancellation of underage accrued to two gas wells in the Eumont Gas Pool and Jalmat Gas Pool, Lea County, New Mexico. Applicant, in the above-styled cause, seeks an order suspending the cancellation on January 1, 1958, of the underage accrued to the following gas wells in the Eumont and Jalmat Gas Pools:

Texas Company Riddel Well No. 2, NE/4 NE/4 Section 12, Township 21 South, Range 36 East;

Texas Company State of New Mexico "B" (NCT-2) Well No. 3, NW/4 NW/4 Section 16, Township 23 South, Range 36 East;

all in Lea County, New Mexico.

CASE 1362: Application of Schermerhorn Oil Corporation for an order suspending the cancellation of underage accrued to one well in the Eumont Gas Pool, Lea County, New Mexico. Applicant, in the above-styled cause, seeks an order suspending the cancellation on January 1, 1958, of the underage accrued to the following named gas well in the Eumont Gas Pool:

Schermerhorn Oil Corporation Gulf-State No. 1 Well, SE/4 SW/4 Section 31, Township 18 South, Range 37 East,

Lea County, New Mexico.

CASE 1363: Application of J. C. Watson Drilling Company for an order authorizing the use of vacuum pumps on certain wells in the Roberts Pool in Lea County, New Mexico. Applicant, in the above-styled cause, seeks an order authorizing the use of vacuum pumps on its Trimble No. 1 Well located in the NE/4 NE/4 Section 11, Township 17 South, Range 32 East, and its Trimble No. 2 Well located in the SE/4 NE/4 of said Section 11, in the Roberts Pool, Lea County, New Mexico.

CASE 1364: Application of Cities Service Oil Company for an oil-oil dual completion in the Vacuum Pool and Vacuum-Seven Rivers Pool in Lea County, New Mexico. Applicant, in the above-styled cause, seeks an order authorizing the dual completion of its State "K" No. 2 Well located 1980 feet from the North line and 660 feet from the East line of Section 27, Township 17 South, Range 35 East, Lea County, New Mexico, in such a manner as to permit the production of oil from the Vacuum Pool through one inch tubing and oil from the Vacuum-Seven Rivers Pool through two inch tubing.

CASE 1365: Application of Cabot Carbon Company for an oil-oil dual completion in the King-Devonian Pool and King-Wolfcamp Pool in Lea County, New Mexico. Applicant, in the above-styled cause, seeks an order authorizing the dual completion of its H. L. Lowe "B" Well No. 1, located 467 feet from the South line and 850 feet from the East line of Section 26, Township 13 South, Range 37 East, Lea County, New Mexico, in such a manner as to permit the production of oil from both the King-Devonian Pool and King-Wolfcamp Pool through parallel strings of 1½ inch tubing.

CASE 1366: Application of Signal Oil and Gas Company for an oil-gas dual completion in the Skaggs Pool and an undesignated Drinkard gas pool in Lea County, New Mexico. Applicant, in the above-styled cause, seeks an order authorizing the dual completion of its Fred Turner No. 1 Well located 660 feet from the South line and 560 feet from the East line of Section 6, Township 20 South, Range 38 East, Lea County, New Mexico, in such a manner as to permit the production of oil from the Skaggs Pool and gas from an undesignated Drinkard gas pool through parallel strings of tubing.

CASE 1367: Application of Felmont Oil Corporation for approval of its Etcheverry Unit Agreement in Lea County, New Mexico. Applicant, in the above-styled cause, seeks an order approving its Etcheverry Unit Agreement embracing 1,920 acres, more or less, of State of New Mexico lands consisting of S/2 Section 32, S/2 Section 33, Township 14 South, Range 34 East, and all of Sections 4 and 5, Township 15 South, Range 34 East, Lea County, New Mexico.

CASE 1368: Application of Ambassador Oil Corporation for an order granting approval of applicant's proposed pilot water flood project in the Square Lake Pool in Eddy County, New Mexico. Applicant, in the above-styled cause, seeks approval of its proposed pilot water flood project for the purpose of secondary recovery in which water will be injected into the Grayburg and San Andres formations through six injection wells located in the SW/4 NW/4, SW/4 SW/4, NE/4 SW/4, and SW/4 SE/4 of Section 29, and NE/4 SE/4 of Section 30, and the NE/4 NW/4 of Section 32, Township 16 South, Range 31 East, Square Lake Pool, Eddy County, New Mexico.

ir/

OIL CONSERVATION COMMISSION
P. O. BOX 871
SANTA FE, NEW MEXICO

February 14, 1958

COPY

Mr. Alfred O. Holl
Cities Service Oil Co.
Bartlesville, Oklahoma

Dear Mr. Holl:

We enclose two copies of Order R-1128 issued February 12, 1958, by the Oil Conservation Commission in Case 1356, which was heard on January 7th at Santa Fe.

Very truly yours,

A. L. Porter, Jr.
Secretary - Director

bp
Encls.

OIL CONSERVATION COMMISSION
P. O. BOX 871
SANTA FE, NEW MEXICO

February 14, 1958

COPY

Mr. Jack Campbell
Campbell & Russell
P.O. Box 721
Roswell, New Mexico

Dear Mr. Campbell:

On behalf of your client, Graridge Corporation, we enclose two copies of Order R-1128 issued February 12, 1958, by the Oil Conservation Commission in Case 1356, which was heard on January 7th at Santa Fe.

Very truly yours,

A. L. Porter, Jr.
Secretary - Director

bp
Encls.

CITIES SERVICE OIL COMPANY

BOX 97

HOBBS, NEW MEXICO

November 12, 1957

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

Attn: Mr. A. L. Porter

Re: Application for Permit under Rule 701 to Inject Water, Caprock Queen Pool, Chaves County, New Mexico

Gentlemen:

Cities Service Oil Company hereby makes application to the Oil Conservation Commission for an order authorizing the injection of water into the Queen Sand formation in the Caprock Queen Pool, Chaves County, New Mexico. In support of this application, Cities Service Oil Company respectfully submits the following:

1. Attached hereto is a plat marked Exhibit "A" of the Caprock Queen Pool area showing the location of the proposed water intake wells, the location of all oil wells, the names of Lessees within one-half mile of all proposed water intake wells and the names of all offset operators.
2. All wells within one-half mile of the proposed water intake wells are now producing from the Queen Sand, Permian Age. The Queen Sand is the only known producing formation in the immediate area involved with this application.
3. Injection of water is to be made into the Queen Sand encountered at an approximate depth of 3050'. The net pay section of the Queen Sand in the area of the proposed water intake wells is from 4 to 8'. Attached hereto and marked Exhibit "B" is a schematic drawing showing the casing program, top of pay and total depth of the four proposed water intake wells. A copy of the Gamma Ray Neutron Log of the Government "B" No. 5 is attached marked Exhibit "C" and is the only log now available on the four proposed water intake wells. The names and locations of the proposed water intake wells are as follows:

Government "B" No. 5, NW/4 NE/4, Section 10, T-14-S, R-31-E;

Government "B" No. 6, SE/4 SE/4, Section 3, T-14-S, R-31-E;

Government "B" No. 10, NE/4 SE/4, Section 3, T-14-S, R-31-E;

Government "B" No. 14, SE/4 SW/4, Section 3, T-14-S, R-31-E.

4. The casing program followed during development for wells in the vicinity of the proposed intake wells was to set sufficient surface casing to protect the fresh water sands and to set the oil string from the surface to the top of the pay. Casing Leakage tests will be performed and casing will be repaired if found unsatisfactory. Injection of water will be made down tubing with a packer set near the bottom of the casing as shown in the schematic diagram, Exhibit "B".
5. Water will be injected into the Queen Sand and will be obtained from the Ogallaha formation in Section 24, T-14-S, R-31-E. Approval for the use of fresh water for waterflooding purposes has been granted by the State Engineer of the State of New Mexico. It is estimated that the water injection rate will be approximately 400 barrels per day per intake well.
6. All intake wells are located on leases owned by the applicant and will be operated by the applicant, Cities Service Oil Company.

It is respectfully requested that the Oil Conservation Commission schedule a hearing at an early date at Santa Fe, New Mexico, to consider Cities Service Oil Company's application for a permit under Rule 701 to inject water into wells described heretofore. A copy of this application has been sent by registered mail to each operator named on the attached mailing list.

Very truly yours,

CITIES SERVICE OIL COMPANY

D. D. Bodie

D. D. Bodie
Division Superintendent

EFM/gb
Attachs.

M A I L I N G L I S T

Oil Conservation Commission (3)
State of New Mexico
P. O. Box 871
Santa Fe, New Mexico

Oil Conservation Commission (1)
P. O. Box 2045
Hobbs, New Mexico

Gulf Oil Corporation (1)
P. O. Box 962
Roswell, New Mexico

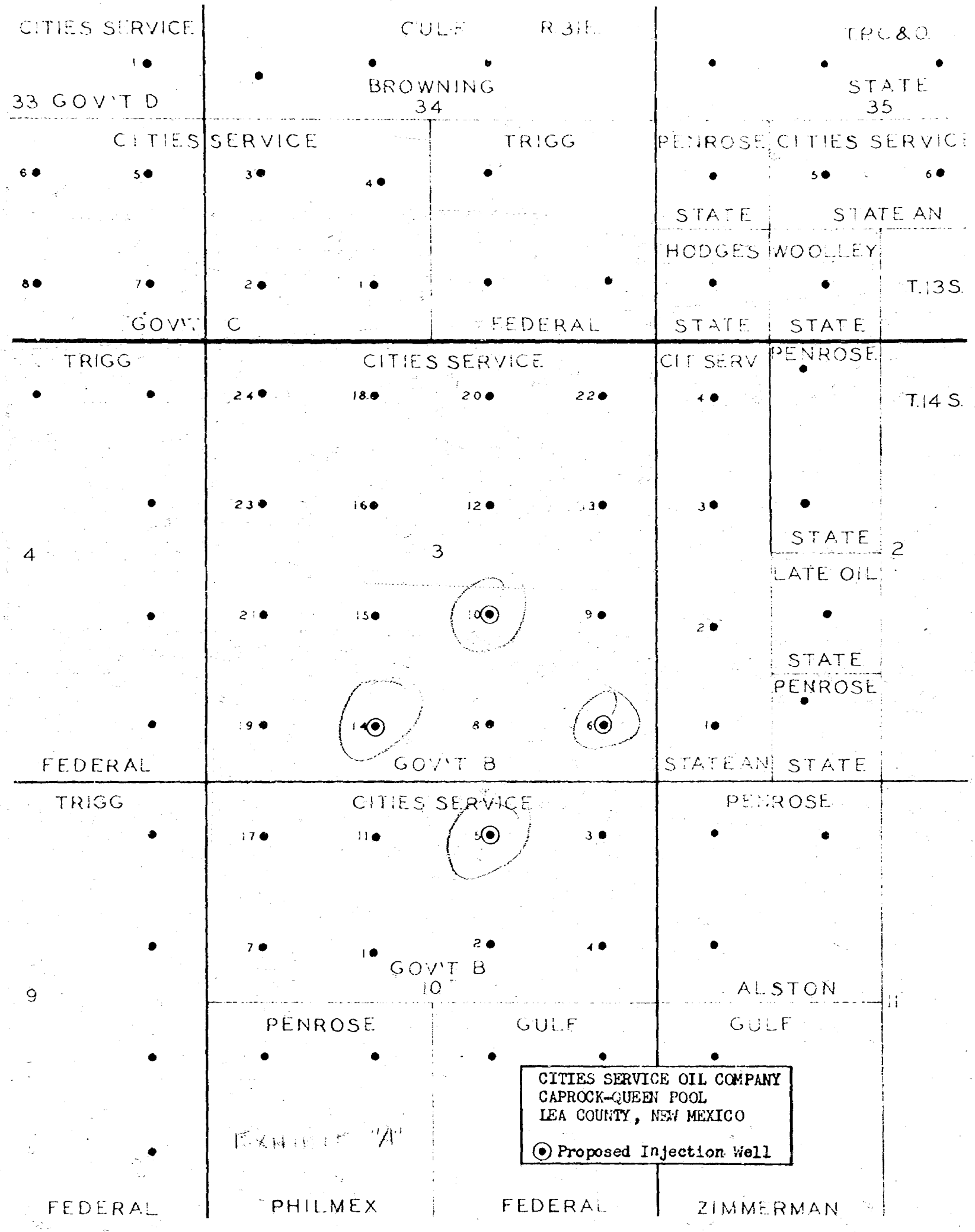
L. B. Hodges (1)
P. O. Box 671
Roswell, New Mexico

Late Oil Company (1)
P. O. Box 670
San Angelo, Texas

Neville G. Penrose, Inc. (1)
1813 Fair Building
Fort Worth, Texas

John H. Trigg Company (1)
Box 5629
Roswell, New Mexico

R.R. Wooley (1)
P. O. Box 398
Loco Hills, New Mexico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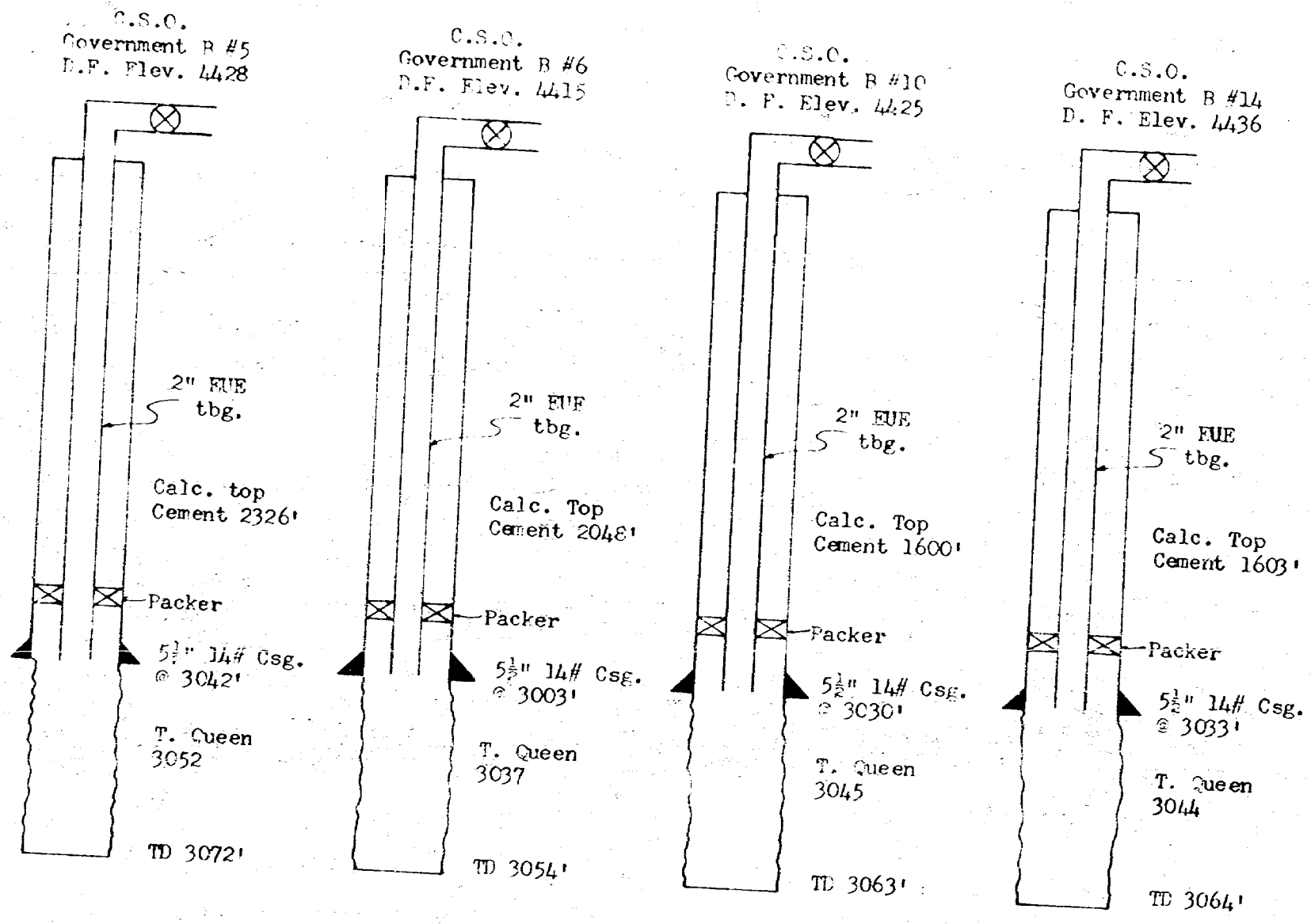
ZIMMERMAN
CITIES SERVICE OIL COMPANY
CAPROCK-QUEEN POOL
LEA COUNTY, NEW MEXICO
Proposed Injection Well



CAPROCK QUEEN POOL, LEA COUNTY, NEW MEXICO

SCHEMATIC OF PROPOSED WATER INJECTION WELLS

EXHIBIT "B"

CITIES SERVICE OIL COMPANY

CITIES SERVICE BUILDING
BARTLESVILLE, OKLAHOMA

March 11, 1958

Oil Conservation Commission
State of New Mexico
P.O. Box 871
Santa Fe, New Mexico

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

Re: Case No. 1356, Order No. R-1128, Authorizing Cities Service Oil Company to Institute a Pilot Waterflood Project in the Caprock-Queen Pool, Chaves County, New Mexico.

Gentlemen:

Cities Service Oil Company herewith makes application to amend Order No. R-1128, dated February 12, 1958, and issued in Case No. 1356, authorizing the institution of a pilot waterflood project on its Government "B" lease in the Caprock-Queen Pool Chaves County, New Mexico, to include the following provisions:

1. The transfer of the full unit allowable from water injection wells to other wells on the Government "B" lease.

2. The establishment of a lease allowable to be the multiple of the top unit allowable, and the total number of wells on the lease, said allowable to be produced in any proportion from the wells on the lease.

3. The authorization by administrative approval, without notice and hearing, for additions to or deletions from the pilot area and/or injection wells.

It is respectfully requested that this matter be docketed and set for hearing. A copy of the application has been sent to each operator named on the attached mailing list.

Yours very truly,

CITIES SERVICE OIL COMPANY

By _____
R. E. Adams
Proration Engineer

REA:pg
Attach.

M A I L I N G L I S T

Oil Conservation Commission (3)
State of New Mexico
P.O. Box 871
Santa Fe, New Mexico

Oil Conservation Commission (1)
P.O. Box 2045
Hobbs, New Mexico

Gulf Oil Corporation (1)
P.O. Box 962
Roswell, New Mexico

L. B. Hodges (1)
P.O. Box 671
Roswell, New Mexico

Late Oil Company (1)
P.O. Box 670
San Angelo, Texas

Neville G. Penro , Inc. (1)
1813 Fair Building
Fort Worth, Texas

John H. Trigg Company (1)
P.O. Box 5629
Roswell, New Mexico

R. R. Wooley (1)
P.O. Box 398
Loco Hills, New Mexico

BEFORE THE OIL CONSERVATION COMMISSION
OF THE STATE OF NEW MEXICO

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

CASE NO. 1356
Order No. R-1128

APPLICATION OF CITIES SERVICE OIL
COMPANY FOR PERMISSION TO INSTITUTE
A PILOT WATER FLOOD PROJECT IN THE
CAPROCK-QUEEN POOL, CHAVES COUNTY,
NEW MEXICO.

ORDER OF THE COMMISSION

BY THE COMMISSION:

This cause came on for hearing at 9 o'clock a.m. on January 7, 1958, at Santa Fe, New Mexico, before Daniel S. Nutter, Examiner duly appointed by the New Mexico Oil Conservation Commission, hereinafter referred to as the "Commission," in accordance with Rule 1214 of the Commission Rules and Regulations.

NOW, on this 12th day of February, 1958, the Commission, a quorum being present, having considered the application, the evidence adduced, and the recommendations of the Examiner, Daniel S. Nutter, and being fully advised in the premises,

FINDS:

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

(2) That the applicant, Cities Service Oil Company, is the owner and operator of the following named oil wells in the Caprock-Queen Pool, Chaves County, New Mexico, to-wit:

Government "B"	No. 5,	NW/4 NE/4	Section 10;
Government "B"	No. 6,	SE/4 SE/4	Section 3;
Government "B"	No. 10,	NE/4 SE/4	Section 3;
Government "B"	No. 14,	SE/4 SW/4	Section 3;

all in Township 14 South, Range 31 East, NMPM.

(3) That the applicant proposes to institute a pilot water flood project in Township 14 South, Range 31 East, NMPM, by the injection of water into the Queen formation in the Caprock-Queen Pool through the four wells described above at an approximate rate of 400 barrels of water per day per well.

(4) That at the time this case was heard the four proposed injection wells had a total productive capacity in excess of 2000 barrels of oil per month which is more or less representative of the average productive capacities of the other wells in the area.

(5) That the production of oil from the wells in the subject area has not declined to the point where additional oil may be recovered only by water flooding or by other secondary recovery methods, and that the subject area may be said to be in the primary recovery stage.

(6) That the injection of water, at the present time, into the Queen formation of the Caprock-Queen Pool through the four wells described above may stimulate the primary recovery of oil in the immediate area of the injection wells, but that the proposed program is not, however, a water flood project for purposes of secondary recovery as that term is generally understood.

(7) That no well should be allowed to receive a disproportionate share of the market demand for oil in the State of New Mexico when the production of oil from such well can be restricted without causing waste.

(8) That the production from the wells which might be affected by the proposed injection program could be curtailed without causing waste, provided the rate of injection is regulated.

(9) That the applicant should so regulate the injection of water in the proposed project as to permit the curtailment of production from the affected wells without causing waste.

(10) That the proposed program will not adversely affect the interests of any other operator in the Caprock-Queen Pool.

(11) That the applicant should be permitted to inject water into the Queen formation in the Caprock-Queen Pool through the four proposed injection wells described above, subject to the foregoing limitations.

IT IS THEREFORE ORDERED:

That the applicant, Cities Service Oil Company, be and the same is hereby authorized to inject water into the Queen formation in the Caprock-Queen Pool, Chaves County, New Mexico, through the following described wells:

Government "B"	No. 5,	NW/4 NE/4	Section 10;
Government "B"	No. 6,	SE/4 SE/4	Section 3;
Government "B"	No. 10,	NE/4 SE/4	Section 3;
Government "B"	No. 14,	SE/4 SW/4	Section 3,

all in Township 14 South, Range 31 East, NMPM;

PROVIDED HOWEVER, That the applicant shall regulate the injection of water into the above-described wells so that the production from the wells affected by the injection project can be prorated without causing waste.

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

STATE OF NEW MEXICO
OIL CONSERVATION COMMISSION

EDWIN L. MECHEM, Chairman

MURRAY E. MORGAN, Member

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

ir/

No. 10-58

DOCKET: EXAMINER HEARING APRIL 9, 1958

OIL CONSERVATION COMMISSION 9 a.m., MABRY HALL, STATE CAPITOL, SANTA FE, NM

The following cases will be heard before Elvis A. Utz, Examiner:

- - -

CASE 1356: Application of Cities Service Oil Company for an order amending Order No. R-1128. Applicant, in the above-styled cause, seeks an order amending Order No. R-1128 to authorize the transfer of allowable from water injection wells to other wells on the same basic lease, to establish a lease allowable for the applicant's Government "B" Lease, and to authorize administrative approval for additions to, or deletions from the pilot area and/or injection wells.

CASE 1404: Application of Continental Oil Company for permission to produce more than eight oil wells into a common tank battery. Applicant, in the above-styled cause, seeks an order authorizing the production of a maximum of eleven oil wells in the Jalmat Gas Pool into a common tank battery. Said wells are located on the applicant's Eaves A-19 lease comprising the S/2, S/2 NW/4, and NW/4 NW/4 of Section 19, Township 26 South, Range 37 East, Lea County, New Mexico.

CASE 1405: Application of Continental Oil Company for an oil-oil dual completion. Applicant, in the above-styled cause, seeks an order authorizing the dual completion of its A. M. Lockhart B-14 "A" No. 1-D Well, located 1980 feet from the North line and 660 feet from the East line of Section 14, Township 21 South, Range 37 East, Lea County, New Mexico, in such a manner as to produce oil from the Terry Blinebry Oil Pool and oil from the Drinkard Oil Pool through parallel strings of tubing.

CASE 1406: Application of Continental Oil Company for a non-standard gas proration unit. Applicant, in the above-styled cause, seeks an order establishing a 200-acre non-standard gas proration unit in the Eumont Gas Pool consisting of the S/2 S/2 and the NW/4 SW/4 of Section 13, Township 20 South, Range 37 East, Lea County, New Mexico, said unit to be dedicated to the applicant's SEMU Permian Well No. 41 located 660 feet from the South and East lines of said Section 13.

CASE 1407: Application of Delhi-Taylor Oil Corporation for a non-standard gas proration unit. Applicant, in the above-styled cause, seeks an order establishing a 169.42-acre non-standard gas proration unit in the Aztec-Pictured Cliffs Gas Pool consisting of the SW/4 and S/2 NW/4 of Section 31, Township 29 North, Range 8 West, San Juan County, New Mexico, said unit to be dedicated to the applicant's Prichard Well No. 4-C, located 1450 feet from the South line and 790 feet from the West line of said Section 31.

CASE 1408: Application of Delhi-Taylor Oil Corporation for a non-standard gas proration unit. Applicant, in the above-styled cause, seeks an order establishing a 170.58-acre non-standard gas proration unit in the Aztec-Pictured Cliffs Gas Pool consisting of the SW/4 of Section 30 and the N/2 NW/4 of Section 31, all in Township 29 North, Range 8 West, San Juan County, New Mexico, said unit to be dedicated to the applicant's Jones Well No. 3, located 1750 feet from the South line and 1090 feet from the West line of said Section 30.

CASE 1409: Application of Gulf Oil Corporation for an oil-oil dual completion. Applicant, in the above-styled cause, seeks an order authorizing the dual completion of its Lea State "CL" Well No. 1, located 2651 feet from the North line and 1650 feet from the East line of Section 2, Township 16 South, Range 32 East, Lea County, New Mexico, in such a manner as to permit the production of oil from the Wolfcamp formation adjacent to the Anderson Ranch-Wolfcamp Pool and oil from the Anderson Ranch-Devonian Pool through parallel strings of tubing.

CASE 1410: Application of Gulf Oil Corporation for an oil-oil dual completion. Applicant, in the above-styled cause, seeks an order authorizing the dual completion of its Lea State "R" Well No. 1, located 990 feet from the North line and 660 feet from the East line of Section 2, Township 16 South, Range 32 East, Lea County, New Mexico, in such a manner as to permit the production of oil from the Wolfcamp formation adjacent to the Anderson Ranch-Wolfcamp Pool and oil from the Anderson Ranch-Devonian Pool through parallel strings of tubing.

CASE 1411: Application of Gulf Oil Corporation for an oil-oil dual completion. Applicant, in the above-styled cause, seeks an order authorizing the dual completion of its J. F. Janda "F" Well No. 3, located 1980 feet from the North and West lines of Section 4, Township 22 South, Range 36 East, Lea County, New Mexico, in such a manner as to permit the production of oil from the Jalmat Gas Pool and oil from the South Eunice (Oil) Pool through parallel strings of tubing.

CASE 1412: Application of John M. Kelly for a non-standard gas proration unit. Applicant, in the above-styled cause, seeks an order establishing a 240-acre non-standard gas proration unit in the Eumont Gas Pool consisting of the E/2 SW/4, W/2 SE/4, and W/2 NE/4 of Section 16, Township 19 South, Range 37 East, Lea County, New Mexico, said unit to be dedicated to the applicant's Humble State No. 1 Well located 1980 feet from the South and West lines of said Section 16.

CASE 1413: Application of Austral Oil Exploration Company for an exception to Rule 309 of the Commission Rules and Regulations. Applicant, in the above-styled cause, seeks an order authorizing it to commingle the production from all wells completed in the Townsend-Wolfcamp Pool, Lea County, New Mexico, on the following described leases:

CASE 1413
Continued: W. M. Snyder "B" Lease - Township 16 South, Range 36 East
Section 6: Lots 9, 10, 15, & 16 and SE/4

W. M. Snyder "C" Lease - Township 16 South, Range 36 East
Section 5: Lot 5
Section 6: Lots 1, 7, & 8

CASE 1414: Application of The Texas Company for an oil-oil dual completion. Applicant, in the above-styled cause, seeks an order authorizing the dual completion of its C. H. Weir "B" Well No. 1, located in the SE/4 NE/4 of Section 11, Township 20 South, Range 37 East, Lea County, New Mexico, in such a manner as to permit the production of oil from the Skaggs-Drinkard Pool and oil from an undesignated Glorieta oil pool through parallel strings of tubing.

CASE 1415: Application of Phillips Petroleum Company for authority to effect an oil-oil dual completion and to commingle the production from two separate pools. Applicant, in the above-styled cause, seeks an order authorizing the dual completion of its Santa Fe Well No. 18, located in the NW/4 NE/4 of Section 34, Township 17 South, Range 35 East, Lea County, New Mexico, in such a manner as to produce oil from the Yates formation adjacent to the Vacuum-Yates Pool and from the Vacuum (San Andres) Pool through parallel strings of tubing. Applicant further seeks authority to commingle the oil produced from the separate reservoirs in common storage after measuring the Yates oil through dump-type meters.

CASE 1416: Application of Aztec Oil and Gas Company for a non-standard location. Applicant, in the above-styled cause, seeks an order authorizing a non-standard gas well location for its Culpepper-Martin Well No. 9, to be located 1850 feet from the North line and 1950 feet from the West line of Section 30, Township 32 North, Range 12 West, Blanco Mesaverde Pool, San Juan County, New Mexico.

CASE 1417: Application of Sinclair Oil and Gas Company for an oil-oil dual completion. Applicant, in the above-styled cause, seeks an order authorizing the dual completion of its A. M. York "B" Well No. 2, located in the NE/4 NE/4 Section 20, Township 21 South, Range 37 East, Lea County, New Mexico, to produce oil from the Tubb Gas Pool and from the Drinkard Oil Pool through parallel strings of tubing.

CASE 1418: Application of Shell Oil Company for an exception to Rule 309 of the Commission Rules and Regulations. Applicant, in the above-styled cause, seeks an order authorizing the transportation, prior to measurement, of oil produced on its E. W. Mudge No. 4 Lease, comprising All of Sections 21, 28, 33, and 34, to its I. M. Phillips No. 2 Lease, comprising the S/2, NE/4, and Lots 1 and 2 of Section 4, N/2 Section 9, SW/4 and E/2 Section 10, All Section 15, N/2 and SE/4 Section 22, and W/2 Section 27,

CASE 1418
Continued: all in Township 25 North, Range 12 West, San Juan County, New Mexico. Applicant further seeks authority to commingle the production from each of said leases after separately measuring said production by means of positive displacement meters.

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NEW MEXICO OIL CONSERVATION COMMISSION

Mabry Hall

Santa Fe, NEW MEXICO

1356

REGISTER

HEARING DATE Examiner April 9, 1958 TIME: 9:00 a.m.

NAME:	REPRESENTING:	LOCATION:
Jason Kellahin	Kellahin & Fox	Santa Fe, N. M.
Kenneth McPeters	John M. Kelly	Hobbs N. Mex
John Hampton	Great Western Drlg	Midland
Leon H. Smedley	Great Western Drlg	Midland Texas
M. L. Jacobus	Stanolind Oil & Gas Co	Farmington N M
Larry O'Kampton	Shell Oil Co.	" "
C. Seth	Shell Oil Co.	Santa Fe
H. N. Wade	The Texas Co.	Ft. Worth
V. T. LYON	CONTINENTAL OIL CO	EUNICE, N. M.
Warren W. Mankin	Aztec Oil & Gas Co.	Dallas, Texas
Pierce Garlin	Aztec Oil & Gas Co.	" "
J. H. Coughman	" "	" "
R. M. Anderson	Sinclair	Midland
G. J. Savage	Gulf	Hobbs
J. H. Rowan	"	"
W. V. Hackler	"	"
Eugene H. Dobbs	Amerada Petr. Corp.	Houston Tex.
Nancy Lopez	Shell Oil Co.	Santa Fe

NEW MEXICO OIL CONSERVATION COMMISSION

Mabry Hall

Santa Fe, NEW MEXICO

REGISTER

HEARING DATE Examiner April 9, 1958 TIME: 9:00 a.m.

NAME:	REPRESENTING:	LOCATION:
Horace N. Burton	Pindair Oil & Gas Co.	Midland, Texas
W E Brunson Jr.	austin oil & gas Co	Roswell, N.M.
F. L. Morgan	Phillips Petroleum Co	Hobbs, N.M.
WELDON D. COOPER	FLUID PACKED PUMP CO	MIDLAND, TEXAS

NEW MEXICO
OIL CONSERVATION COMMISSION
P. O. Box 871
Santa Fe, New Mexico

Date November 22, 1957

Cities Service Oil Company
P.O. Box 97
Hobbs, New Mexico

Gentlemen:

Your application for water injection in the Caprock Pool

dated November 12, 1957 has been received, and has been tentatively scheduled for hearing before an Examiner on January 7, 1958.

A copy of the docket will be forwarded to you as soon as the matter is advertised.

Very truly yours,

A. L. PORTER, Jr.,
Secretary-Director

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ILLEGIBLE

OIL CONSERVATION COMMISSION
P. O. BOX 871
SANTA FE, NEW MEXICO

May 5, 1958

COPY

Mr. Howard Bratton
Hervey, Dow & Hinkle
P.O. Box 547
Roswell, New Mexico

Dear Mr. Bratton:

On behalf of your client, Cities Service Oil Company, we enclose two copies of Order R-1128-A issued May 5, 1958, by the Oil Conservation Commission in Case 1356, which was heard on April 9th before an examiner at Santa Fe.

Very truly yours,

A. L. Porter, Jr.
Secretary - Director

bp
Encls.

BEFORE THE OIL CONSERVATION COMMISSION
OF THE STATE OF NEW MEXICO

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

CASE NO. 1356
Order No. R-1128-A

APPLICATION OF CITIES SERVICE OIL
COMPANY FOR AN ORDER AMENDING ORDER
NO. R-1128 TO PROVIDE FOR A UNIT
ALLOWABLE FOR ITS WATER FLOOD PROJECT
IN THE CAPROCK-QUEEN POOL IN CHAVES
COUNTY, NEW MEXICO.

ORDER OF THE COMMISSION

BY THE COMMISSION:

This cause came on for hearing at 9 o'clock a.m. on April 9, 1958, at Santa Fe, New Mexico, before Elvis A. Utz, Examiner duly appointed by the New Mexico Oil Conservation Commission, hereinafter referred to as the "Commission," in accordance with Rule 1214 of the Commission Rules and Regulations.

NOW, on this 5th day of May, 1958, the Commission, a quorum being present, having considered the application, the evidence adduced and the recommendations of the Examiner, Elvis A. Utz, and being fully advised in the premises,

FINDS:

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

(2) That the applicant, Cities Service Oil Company, was authorized by Order No. R-1128 dated February 12, 1958, to inject water into the Queen formation in the Caprock-Queen Pool, Chaves County, New Mexico, through four wells located on the applicant's Government "B" Lease in Section 3 and Section 10, Township 14 South, Range 31 East, NMPM, with the limitation that the applicant should regulate the injection of water into the above-referenced wells so that the production from the wells affected by the injection project could be prorated without causing waste.

(3) That Cities Service Oil Company by this application, seeks the amendment of Order No. R-1128 to delete the limitation referred to above, and to authorize the transfer of allowables from injection wells to producing wells and to establish a lease allowable for its Government "B" Lease which consists of all of Section 3 and the N/2 of Section 10, Township 14 South, Range 31 East, NMPM, Chaves County, New Mexico, and further to authorize administrative approval, without notice and hearing, for additions to or deletions from the subject pilot water flood project.

(4) That according to the preponderance of the evidence presented at the April 9 hearing referred to above, the primary production from the applicant's Government "B" Lease will have declined to the "stripper" stage by the time the aforementioned water injection project has become effective.

(5) That in view of finding (4), the aforementioned water injection program should be considered as a bona fide water flood project for purposes of secondary recovery.

(6) That Order No. R-1128 should be amended to delete the production limitation referred to above and that the applicant should be authorized to transfer top allowables for each of the above-referenced injection wells to producing wells within the pilot area on the applicant's Government "B" Lease.

(7) That according to the preponderance of the evidence presented at the April 9 hearing in this case, only those producing wells which either directly or diagonally offset the water injection wells can reasonably be expected to be affected by the water injection project, and that allowable benefit as a result of water injection should therefore be limited to those wells.

(8) That three of the producing wells which either directly or diagonally offset the aforementioned water injection wells are not located on the applicant's Government "B" Lease, to-wit:

Cities Service Oil Company State "AN" Well No. 1
SW/4 SW/4 Section 2, Township 14 South, Range 31 East

Cities Service Oil Company State "AN" Well No. 2
NW/4 SW/4 Section 2, Township 14 South, Range 31 East

Neville G. Penrose Alston Well No. 2
NW/4 NW/4 Section 11, Township 14 South, Range 31 East

all in Chaves County, New Mexico.

(9) That the three wells described above should not be granted any exception to the normal allowable formula as a result of the aforementioned water injection program until such time as the tracts on which they are located are unitized with the applicant's Government "B" Lease.

(10) That within the limitations set forth above, the allowable during any given month for the producing wells which either directly or diagonally offset the authorized water injection wells should be assigned in accordance with the monthly nominations by the applicant as filed on Form C-127.

(11) That additions to or deletions from a pilot water flood project and authorization of water injection wells should be accomplished only after notice and hearing in order to more closely supervise the development of such projects.

IT IS THEREFORE ORDERED:

(1) That those wells on the applicant's Government "B" Lease which either directly or diagonally offset the 40-acre tracts on which authorized water injection wells are located be assigned an allowable equal to the nomination of the applicant for said wells as filed on Form C-127. Said Form C-127 shall be filed with the Commission not later than the 15th of each month for the next succeeding month.

PROVIDED HOWEVER, That in no event shall the total allowable assigned to the above-referenced well be greater than an amount to be determined by multiplying the number of 40-acre tracts on which there is located an authorized water injection well, plus the number of developed 40-acre proration units on the applicant's Government "B" Lease which either directly or diagonally offset the 40-acre tracts on which said injection wells are located, times the top unit allowable for the Caprock-Queen Pool.

(2) That in the event all 40-acre tracts which directly or diagonally offset the aforementioned water injection wells are unitized, then all of said wells shall be assigned an allowable equal to the monthly nominations of the unit operator for said wells as filed on Form C-127;

PROVIDED HOWEVER, That in no event shall the total allowable assigned to said wells be greater than an amount to be determined by multiplying the number of 40-acre tracts on which there is located an authorized water injection well, plus the number of developed 40-acre proration units which either directly or diagonally offset the 40-acre tracts on which said injection wells are located, times the top unit allowable for the Caprock-Queen Pool.

(3) That the application of Cities Service Oil Company to authorize administrative approval, without notice and hearing, for additions to or deletions from the subject pilot water flood project be and the same is hereby denied.

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

STATE OF NEW MEXICO
OIL CONSERVATION COMMISSION

EDWIN L. MECHEM, Chairman

MURRAY E. MORGAN, Member

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

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