Case No.

1433

Application, Transcript,
Small Exhibits, Etc.

[redacted]

EXAMINER HEARING
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
May 6, 1958

IN THE MATTER OF: Case No. 1433

TRANSCRIPT OF PROCEEDINGS

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EXAMINER HEARING
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
May 6, 1958

IN THE MATTER OF:

Application of Graridge Corporation to expand a pilot water flood project in the Caprock Queen Pool, Lea County, New Mexico. Applicant, in the above-styled cause, seeks an order permitting the expansion of the pilot water flood project authorized by Order No. R-972 in the North Caprock Queen Unit in the Caprock-Queen Pool, Lea County, New Mexico, to include eight additional water injection wells in Sections 30, 31, and 32 of Township 12 South, Range 32 East, Lea County, New Mexico.

Case 1433

BEFORE: Daniel S. Nutter, Examiner

TRANSCRIPT OF PROCEEDINGS

AFTERNOON SESSION

MR. NUTTER: The hearing will come to order, please. The first case on the docket this afternoon will be Case 1433.

MR. PAYNE: Application of Graridge Corporation to expand a pilot water flood project in the Caprock Queen Pool, Lea County, New Mexico.

MR. ELLIOTT: Mr. Examiner, R. A. Elliott, attorney for Graridge Corporation. At this time I would like to move to amend the application in one small respect. On page 2 under the paragraph in the middle of the page having to do with the second four wells, I would like to delete, beginning on the second line: "one

the northeast of the pilot flood area is the area that is also being affected by our present water injection system, due to an unbalanced condition of our pilot flood with subsequent loss of water injection up to this area, creating increasing oil production on the wells shown there. Under each of the producing wells in the pilot area, we have designated or indicated the present oil and water production figures in red there right underneath each producing well. As can be seen, the wells in the shaded yellow portion are up from an average of, oh, a barrel and a half to two barrels per day, up to their present indicated 15, 14, 12, 31, and 35 barrels per day with no water production.

The third exhibit is simply a tabulation of the cumulative production volume of oil that has been produced from each of the respective wells in the overall unit area. We would like to point out at this time that along the southwest border of the pilot flood area, which is outlined in pencil there, that the primary histories indicated by the low cumulative production figures there are the result of what we feel is a permeability barrier along this southwest side of the pilot flood, and it will be restricting any outward flow of water from the pilot flood area in this direction, which we don't have,on the northeast side, and therefore of our subsequent water encroachment into an outside area from our pilot flood.

Q Mr. Vick, to sort of bring the Commission up to date on the development of this pilot flood since the time that permission

explain to the Examiner exactly the reasons for these exhibits, and just what they show relative to the problem at hand.

A Well, the Sheet No. 1, or the first page, or Exhibit No. 1, designates the present unit boundary, some 2800 plus acres, and the projected water flood pattern over the whole present unit, and as you stated, the six present water injection wells, the four injection wells that we're applying for immediate conversion, and the four injection wells for which we are seeking approval to be placed on injection at the operator's discretion.

It shows also all the present producing wells and our projected injection system over the entire unit area, with the injection plants and the water supply wells and all the other pertinent data.

The Exhibit No. 2 is a projection of our theoretical calculations and also some of the actual performance data that has transpired to date on the project. The green circles around the present six injection wells indicate the relative radius of the water front, theoretical relative radius of the water front, computed from strictly a volumetric calculation, taking into consideration the amount of water injected into the specific well and the thicknesses of the sand and the porosity and oil and water saturations and so on and so forth. The area shaded in red is an indication of the theoretical pilot flood area which should be affected by our present water injection system, and which as indicated is in varying degrees so affected. The area designated in yellow to

A Breckenridge, Texas.

Q You have testified before this Commission previously, I believe?

A Yes, sir.

MR. ELLIOTT: Mr. Examiner, would you accept Mr. Vick as an expert?

MR. NUTTER: Mr. Vick's qualifications have been accepted, and he may proceed.

(Graridge's Exhibits Nos. 1, 2, & 3 marked for identification.)

Q Mr. Vick, I ask you to state whether or not you prepared these three exhibits marked Exhibits 1, 2, and 3?

A Yes, sir, I did.

MR. ELLIOTT: I would like to enter as Exhibits 1, 2, and 3, they are all three there together, he's going to be discussing them altogether, so we just left them altogether.

Before Mr. Vick starts explaining these, I would like to show that on this Exhibit 1, that the six wells in red represent injection wells which have been approved by this Commission. The four wells in yellow represent the four wells that we're asking for immediate permission to convert into injection wells, and then the four wells in green are the other four that we asked for permission at intervals to put into injection wells.

Q (By Mr. Elliott) Mr. Vick, you prepared these three exhibits which we have entered in evidence here. I ask that you

MR. ELLIOTT: Could we have a ruling on that?

MR. NUTTER: Yes, sir. Is there any objection to the amendment of the application as proposed by Mr. Elliott? If not, the amendment will be accepted and entered in the application.

MR. ELLIOTT: If it please the Examiner, I would like to point out, according to the application, that the properties which we are discussing for expansion were originally approved on April 5th of last year by this Commission for a pilot flood, setting up the six wells shown on the exhibits in red as injection wells. Then in November of last year, a capacity production allowable was given for certain wells in this area under your Order R-1073-A. Then on March the 1st of this year, after the properties in that area were unitized, the unit agreement was approved by this Commission. We are now proposing to expand this flood, in order to prevent waste.

ROBERT H. VICK

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

DIRECT EXAMINATION

By MR. ELLIOTT:

Q Mr. Vick, will you state your name, address, company you work for, and position you hold with that company?

A Robert H. Vick, water flood engineer for the Graridge Corporation.

Q Where do you live?

at a time, at intervals of approximately every two months for the remainder of the year 1958..." and insert in lieu thereof: "in accordance with the dictates of periodic performance data at operator's discretion..."

MR. NUTTER: "In accordance with the dictates of periodic performance data --

MR. ELLIOTT: " -- at operator's discretion."

MR. NUTTER: " -- at operator's discretion." Is that "operator parenthesis s"?

MR. ELLIOTT: Apostrophe s.

MR. NUTTER: I mean apostrophe s.

MR. ELLIOTT: Further down, strike the word "however", and "that each of" -- strike "each of", and put in lieu thereof "the conversion"; and then come on down to "Commission" and put a colon (:) after "Commission" and strike "prior to each conversion".

Then that should read like this: "It is further respectfully requested that this Commission authorize the orderly conversion, in accordance with the dictates of periodic performance data at operator's discretion" .. in Lea County, which I indicated in green on Exhibit "A" attached hereto .. "it being understood that the conversion of these four injection wells shall be approved upon written request without a hearing by the Commission."

MR. PAYNE: Do you have any witnesses to be sworn?

MR. ELLIOTT: Yes, sir. I would like to swear Mr. Bob Vick.

(Witness sworn.)

was given to enter into this pilot flood, would you sort of give a short history of the injection volumes and producing rates, and just a general history of how the pilot flood has been put into operation and what has resulted since that time?

A Referring back to Exhibit 2, you can obtain a relative idea of the variations in the amount of water injected into each of the six water injection wells by the difference in the radius of the, or radii of the green circled areas there which indicate that some of the wells we have had trouble with and hadn't been able to get a comparative water volume in them that we did into the others, but that is what we feel was a combination of mechanical troubles and also the point mentioned earlier of variations in permeability and porosities throughout the reservoir. The cumulative water injection into the pilot flood area to April 1st, 1958, has totalled 862,325; the cumulative production has totalled 5,245 barrels; the net cumulative water injection therefore being 857,000 barrels, approximately. The cumulative oil production from the pilot flood area prior to start of injection was 490,325 barrels of stock tank oil. The calculated cumulative voidage, or any cumulative voidage of the pilot flood area to the time of the start of water injection was 539,500 barrels, reservoir barrels. The cumulative oil production since the start of the flood has totalled 124,293 barrels of stock tank oil.

MR. NUTTER: That's since injection was commenced?

A Yes, sir. That leaves a net water injection into the pilot

area of an excess of 187,000 barrels of water above our calculated voidage in the pilot flood area.

Q Mr. Vick, has this development or the injection of water under this pilot flood arrangement resulted in any unbalanced condition or a migration of oil in any certain direction or any conditions of that sort?

A Yes, sir. In my opinion it has, as indicated by the added area to the northeast of the pilot flood being affected and with increased oil production, and we had calculated that 100 percent fill-up voidage of the pilot area oil production should have been peaked at 65 or 75 percent of our daily water injection volume, which has been averaging around 2400 barrels per day. This would have given a peak oil production of 1450 barrels to some 1800 barrels, somewhere in between there. We have also calculated that we have injected at present approximately 187,000 barrels of water in excess of 100 percent fill-up, and from study of the present production performance and primary production histories of the various producing wells, this excess 187,000 barrels of water has entered an area indicated to the north of the pilot flood area.

I might explain a little bit more there. When we initiated the pilot flood, it was on a cooperative basis and with no previous histories in the field as far as having any kind of idea as to performance of the pilot flood or the ability of the injection wells that we selected to take equal volumes of water; but under the cooperative effort we had to establish some type of a rate, and

on a round-about volumetric calculation came up with our 500 barrels of water per well per day injection rate; and since it was on a cooperative basis, we had to recommend that for each well, and attempted to put that volume into each well; and as pointed out a minute ago, you can see by the different radii of the green circles that we haven't been able to maintain that equal volume due to various reasons, and that also from the production increases to the northeast of the pilot area that we are definitely having a loss of water to that area and therefore a very unbalanced condition of the pilot flood.

Q Well, do I understand from your opinion there that there is a possibility or a probability of a loss of efficiency of the flood because of being held to this six wells, or just what is the result of this unbalanced condition, what does it mean in waste or loss?

A To me it means a loss of ultimate recoverable oil, mainly from the economic standpoint of not being able or of having a higher economic limit on the rate of production or -- that you could produce those wells in an unbalanced condition such as this, the present injection wells, water breakthrough from them would occur, definitely at an earlier date than the wells that are put on injection later. Therefore you would have to carry the increased water production in your outside producing wells there, or your present outside producing wells, throughout the performance of that individual five-spot and as a result of that increased water production

that you would have to carry your economic limit would be, as far as oil in barrels per day, would be much higher than under a normally perfectly balanced pattern flood.

Q What in your opinion needs to be done to balance up this operation and get it back?

A Well, to place the overall project back in some degree of balance, we feel that the four wells requested for immediate conversion be approved, and that the additional four wells shown be approved by the Commission at this time, these last four wells, the last four injection wells to be put in operation at the discretion of the operator and his selection of the exact time to be governed by his periodic evaluation of actual performance data.

Q Do you want to enlarge a little bit on the performance data, just exactly what it will show and how you will get it?

A Well, I might start off by saying that we would like to state concerning any projected development rate, time rate of putting these injection wells on, that in our opinion pilot flood operations cannot always be exactly ratioed to a total given area such as the North Caprock Queen Pool here. Where sufficient reservoir data is available before installation of a pilot flood or in previous or in proven water flood areas, fairly close performance predictions can be drawn. However, if this data is not available, it sometimes is about as cheap for an operator to install a pilot flood as it would be for him to obtain the necessary data by drilling new producing wells and coring, such things as

that, for such a prediction. In such cases, the main purpose of the pilot flood is to ascertain if the new area is susceptible to water flooding at economical cost; therefore, any detailed or specific projections of cumulative recovery or productive rate must be formulated along with the actual performance data from the pilot flood.

Other points that might enter into the above reasoning are such things that the operator might choose the best indicated portion of his lease to install the pilot flood on, or he might, conversely, he might pick a much poorer section of his lease in order to obtain cooperation from offset operators and such things as that.

In closing, we would like to mention that point which has been brought out many times in the past, that the recovery of oil by water displacement is not a fixed quantity but depends on the skill and the judgment of the operator in his application of developed principles to operation and control of the project.

Q Then it is your opinion that any sort of limitation on the rate of development can very seriously hinder the efficiency of your flood?

A Yes, sir, we don't believe that we can establish a definite development rate in a new area such as this where performance data is not available and where even an adjoining field, data from that, as far as water flooding, is not available; until such time as that data is available, that the operator should be free to put on additional injection wells at his discretion, as indicated by

these past points that we have discussed.

Q From this discussion then, I assume it's your opinion that the four wells shown in yellow on Exhibit 1,that you need approval for them immediately?

A Yes, sir.

Q And then on the four wells in green, there is not such an immediate need for them, that when you do get these other four wells in,that additional data may show you that the others, or one or more of the others, should be put in immediately to keep your flood in a balanced condition?

A That is true, yes, sir. As you will note on the third exhibit, the actual cumulative production figures from those outside edge producers, the very outside of the reservoir, have a slightly smaller average production than the overall field average, which would bring in that point there,that we put the four requested, presently requested wells on, it might be some time before we have indications to guide us in putting on our -- the time of our four additional wells.

Q Is it your opinion, then, that if the four wells now are not immediately granted and the other four left to where you can't work them in to keep your flood in a balanced condition, that waste will result and loss of ultimate recovery will be caused?

A That's right.

Q Do you have any other comments to make?

A No, sir.

MR. ELLIOTT: That's all.

MR. NUTTER: Are there any questions of this witness?

CROSS EXAMINATION

By MR. NUTTER:

Q Mr. Vick, I believe you stated that there would be an ultimate loss of recovery if a water flood were to get out of balance, as evidently this one may have. Would you elaborate on that, please?

A I think it would be easiest to explain, Mr. Nutter, if we took just one five-spot pattern with four injection wells and a producing well in the center. If two of the wells, two of the injection wells on one side were placed upon injection, the water started into them at such and such a date, and at a certain rate; and then two or three months later, the two opposite injection wells in the five-spot were placed on injection, your water fronts from those would progress radially outward from your injection wells and the water would break through to the center producing well on a ratio, as far as time, with the cumulative volume of water that had been injected into each well. The two first wells put on would naturally have water breakthrough into the center producer at a much earlier date than the two later wells. As a result, in an effort to try to obtain all the oil that you could out of the five-spot operation, you would have to produce the center producing well there with a high water cut as a result of water breakthrough from the first two wells. The economic limit of your producing well there would be governed by your water-oil

ratio. Say normally your economic limit would have been, with no water, four barrels of oil per day; if you had one hundred barrels of water or two hundred barrels of water, coming into that well, you couldn't naturally afford to, from an economic standpoint, produce it down to four barrels of oil per day. It would have to be stopped somewhere up the line on the decline curve with loss of that oil that would be remaining there.

Q If the oil were not recovered from the well which experienced the water breakthrough, it would be recovered from another well?

A Would you state that --

Q If the oil were not recovered from the well which experienced the water breakthrough prematurely, would the oil be recovered from another well?

A It could in some cases and very likely couldn't in others. We have found from past experience that on pilot flood operations like this, that where the back-up is brought in too late and your water front from your injection wells is driving your oil like it is here to the second and third row of producing wells, that even though you come in and place these back-up wells on injection, it's very hard to reverse the flow of your -- actually reverse the flow of the fluid in your formation,or your drive. Sometimes it happens and sometimes it doesn't.

Q Mr. Vick, you have had considerable experience with water floods, have you not?

A Yes, sir, to a degree.

Q Have you ever seen a water flood such as this in which a pilot area has been selected and is surrounded by producing wells which are not subject to water injection, which was perfectly in balance?

A To varying degrees, I believe, Mr. Nutter. I think we have one example in the M. R. Y. pilot that we have presently in the Artesia Pool. The producing wells, all of the inside and outside producing wells, are kicking about at the same time as far as increased oil production, and it appears to be very balanced, so we don't expect nearly as much trouble there as we are encountering right here.

Q So if you were to draw a comparable plat of that water flood, you wouldn't have an area which would be colored in yellow as you have here?

A No, sir. The area colored in yellow there is actual performance data, the wells are being affected with increased oil production and we definitely do not have that in the Artesia pilot with the second and third row of producing wells being affected at present.

Q This is one time when increased oil production is not desirable?

A Not from an engineering standpoint, no, sir.

Q Has this Well No. 32-5 in the Southwest of the Northwest of 32 been affected by the water flood?

A 32-5?

Q Yes, sir.

A Yes, sir, the production there is up to the indicated ten barrels of oil and no water, and that's just been in the last two weeks, it was on the last series of well tests.

Q Is that ten barrels or twelve barrels? My exhibit says twelve.

A It's twelve years.

Q What water injection wells, in your opinion, would be affecting that No. 32-5 well?

A Well, the 31-10 and the 31-16 and possibly some help from the 5-4.

Q If you were to put the No. 31-8 and the 32-12 on injection immediately, wouldn't the effect that the water injection in No. 31-10 and 31-16 has had just be multiplied or increased by the injection of additional water, through 31-8 and 32-12?

A Yes, sir, we would have a faster response there, I'm sure.

Q If this is a permeable area up to the northeast which is susceptible to an inbalanced condition, wouldn't that also require that 32-4 and 32-6 go on injection almost immediately?

A It might possibly, yes, sir. That is our reasoning, part of our reasoning behind our present application.

Q Mr. Vick, I think it was Mr. Elliott in his introductory statement mentioned in November of 1957, the Commission authorized capacity allowables by Order No. 1073-A for this area. Were you present at the hearing which was the cause of that Order 1073-A

being issued?

A Yes, sir, I was here on approximately the first two-thirds of the hearing.

Q Do you recall that at that hearing there was some testimony that the only way that water flood allowables should be curtailed would be by the control of the number of projects and the expansion of the project?

A Yes, sir.

Q If a condition like this exists, how are you going to control the expansion of water flood projects?

A Well, Mr. Nutter, it isn't our intention in applying for such a measure as this to come in and request all of our outlined injection wells in the overall area, we definitely intend to stay with that general idea of not exceeding or of trying to maintain some stabilized development rate, or keeping that at a minimum actually governed by this evaluation of performance data and such. We definitely realize the problems concerning the overall situation, but this we don't feel would let anything get out of hand as far as our company's development rate on the overall unit area.

Q How many wells have been affected by the injection of water into these six injection wells in the pilot project?

A Well, all twelve of the wells, producing wells in the pilot area proper, and the 32-14, 32-12 -- 31-8 actually isn't producing. We went in and cleaned it out and ran a liner in it, but it did have an oil show in it, that possibly would have had some oil increase.

Q Which well is that?

A 31-8.

Q That would be approximately seventeen wells?

A Plus 32-5 and 32-11.

Q Would that be approximately seventeen wells?

A It would be sixteen, wouldn't it?

Q How many of those sixteen wells have reached their peak rate of production and either stabilized or declined?

A Well, at present, with the present injection pattern and system, the No. 6-1 well, we feel, has peaked out and is on a decline; also the outside, presently outside producing well, No. 31-9, and the No. 32-13.

Q Let's see, the 31-9 --

A Well, from its present drive, there is 115 barrels and 42 of water. Were we to put on the outside injection wells, well, naturally it would get an additional peak above that.

Q Would the amount of water that is being produced decline?

A No, sir.

Q That water is there to stay?

A Yes.

Q If the rate of injection in 31-10 and 31-16 were decreased, and the rate of injection in 31-8 and 32-12 were -- well, you would have to establish a rate of injection, you don't have any, but you started injecting in 31-8 and 32-12 at the maximum rate -- would not the water production in 31-9 go down?

A No, sir, I don't believe so. In my opinion it wouldn't. As I stated a minute ago, in a lot of cases it is very hard to reverse your direction of flow of fluid in the reservoir and maintain any type of sweep efficiencies on the water flooding program.

Q Have the green circles on this Exhibit No. 2 been drawn taking into consideration variations in porosity or pay thickness?

A No, sir. They were, as I stated, on a theoretical basis. Our actual reservoir data at the beginning of this project was very limited as far as porosity and permeability and the regular information you get from core analysis was very limited, and we had to use average figures on our volumetric calculations and all our work on the overall area.

Q Are any of the wells located within the pilot project itself still increasing in their productive capacity?

A Yes, sir, the No. 31-11 and 31-13 are presently increasing slightly. The slight increase that we have there indicated had just been in the last several weeks, they had come up. The increase or the indicated increase on 6-3, 6-7, and 6-9 have all remained about constant for quite some time. Also the increase in 5-5, the 134 barrels of oil per day has remained constant for quite some time.

Q How about 5-3, what is it doing?

A 34 barrels of oil and no water.

Q Is that stable, going up, or coming down, or what?

A It has been in that range for approximately the last month.

Q How about 32-13, is it coming up, going down, or stable?

A It's stable at 150 barrels.

Q You anticipate it will remain stable until water is injected in 32-12 and 32-14?

A Yes, sir, except that actually the water production will continue to increase and the oil production will go down.

Q Then you already stated that 31-9, the oil production was declining slightly?

A Yes, sir.

Q How about 31-7?

A That is the new producing well that we drilled to replace the old air injection well which we couldn't recomplete. That well potentialed for approximately one hundred, I believe, seven barrels of oil per day, and made that for approximately two weeks, and then the water cut started increasing, and it's presently at its indicated rate there, 31 oil and 102 water.

Q That is a newly drilled well, then?

A Yes, sir.

MR. NUTTER: Are there any other questions of the witness?

MR. COOLEY: Yes, please.

MR. NUTTER: Mr. Cooley.

By MR. COOLEY:

Q Mr. Vick, can you tell me what you anticipate the inclusion or addition of the eight more injection wells in the northern portion of the North Caprock Unit will do to the production in that area?

To what extent do you believe that will increase the production, and to what amounts, if you can make a rough estimate?

A Well, offhand, Mr. Cooley, we feel like it will bring it up to somewhere over a period of, within a period of the next three months; if all eight injection wells were put on immediately, that within three months that we would be approaching approximately 2500 barrels. There again is a, that's just a prediction.

Q How many developed 40-acre tracts are in the North Caprock Unit, Mr. Vick?

A Seventy-two, I believe.

Q My calculations are correct, 33 barrel allowable, 72 units, you would have 2,376 barrel unit allowable, if the North Caprock Unit were to be assigned a unit allowable?

A Yes, sir, that would be correct, 2316, yes, sir.

Q 2376?

A Yes, sir, that's right.

Q Do you feel that the addition of the proposed eight injection wells in the North Caprock Unit could be operated at a total unit allowable with 2,373 barrels of oil per day?

A I couldn't state definitely, Mr. Cooley. Offhand, I believe that it possibly could. There again, the evaluation or periodic evaluation of the overall project would have to, I feel, have to enter into the picture concerning this or future expansion on the south and west sides of the present pilot area. If we, or when that time comes, our development rate there is naturally going to

be much slower, due to the tightness of the formation and the restrictive, or the restriction caused by this permeability variation there, and also another point, these high wells or high capacity wells in the present pilot are going to be decreasing and evaluation of their performance would tie in with that overall allowable that you are speaking of.

Q Mr. Vick, you stated that you cannot say positively that you can operate it within 2376 barrel allowable on the proposed plan. Let's assume for the moment that in no event would the North Caprock Unit be permitted to produce in excess of 2,376 barrels of oil per day, that that is the absolute top on it. How would you then proceed with the development of the present flood?

A It would be my recommendation to proceed just as we have outlined in our discussion here, Mr. Cooley, as far as placing on additional injection wells when we feel that they are warranted, but the moment that production increases are noticed in the outside producing wells, I feel like that the next row of injection wells should be put on at that time, to prevent this ultimate loss of oil.

Q You would recommend proceeding as you now propose, even though it might, I believe as you stated, result in the necessity of curtailing production, still assuming the maximum limit on production from the unit?

A Yes, sir, it would be my recommendation to go ahead, based on those concepts, and with the thought in mind that possibly

something might happen down the line that our decline might be faster in the original pilot area, or something else might transpire to alleviate the end point situation and -- but that would definitely be my recommendation to proceed, as it's indicated to me.

Q Do you concur in the extensive testimony offered in what is commonly referred to as the "Graridge case", which resulted in Order 1073-A, wherein it was stated repeatedly that, in the opinion of many of the witnesses, that to curtail the production from water flood producers would cause waste?

A Yes, sir, I do.

Q You would proceed with the expansion of this flood, even though it might be necessary to curtail them to stay within a unit allowable?

A Yes, sir, I would recommend going ahead as though you weren't looking at any ceiling or anything like that. As I stated a minute ago, it wasn't our intention to try to put the whole project under at any given time or immediately; that would be, my recommendation would be directed by the overall performance of the project, my evaluation of it.

Q Mr. Vick, you have testified several times in this hearing today that in your opinion it's dangerous to try to reverse the liquid flows in the reservoir once you have established a trend of flow in a water project?

A Yes, sir.

Q Go ahead and explain your answer.

A I was going to state that I have seen cases whereby when the next row of injection wells were put on in an unbalanced condition like this, that instead of having something similar, your water flood front similar to the circles here, it would actually elongate out and just continue to be exaggerated in the direction that it was going, as far as your water traveling in that direction. I mean by that that, say we were to put on 32-12 there on injection right now, and we came along and within a month's time 32-6, which is the next outside producer there, which hasn't been affected right now, might possibly kick up and with a very big increase, which would indicate that the major portion of your drive from 32-12 were going still in the same direction, instead of radiating out, radially.

Q Once this trend has been established, and assuming that you do move north and easterly with your conversion of producing wells to injection wells, isn't it more likely that the result will be something in the order of what is referred to as a "line drive", rather than a five-spot type of flood that you started with?

A Well, if the unbalanced condition were maintained, it definitely would develop into that, just as I pointed out, you would be increasing, going that way, and the minute you put your injection on the biggest portion of your drive would be in one direction, or linear, and that was one of the points behind our reasoning in stating that we feel like that as the operator, we

should be able to put these outside injection wells at our discretion, if we come in and put the four present wells on and, say 32-6 were to kick up immediately in oil production, we would come in and recommend at that time that it definitely be put on injection.

Q Is there any performance data that you now have showing any necessity for conversion immediately, or even in the near future, of the 31-2 in the Northwest of the Northeast of 31, and the 30-16 in the Southeast Southeast of 30? It is the two northwesterly wells. Are those wells required immediately to balance this flood?

A No, sir, not immediately. We would be --

Q (Interrupting) But 31-2 is one that you propose for immediate conversion, isn't it?

A Well, that's our reasoning behind that, Mr. Cooley, was the fact that if you connect up this abandoned location or abandoned producing well just outside of the unit area in 31-10 and 37-8 and 31-2, and formulate this five-spot pattern with those four wells.

Q Will you repeat those a little slower? I didn't find them.

A 31-2.

Q I don't find it.

A It is the injection well you questioned. 31-8, 31-10, and then going northwesterly to that location outside the unit which actually had sand, and we're in the process of recompleting the well so that it can be completed in the unit as soon as we can

get it in, but to be included into the unit.

MR. NUTTER: What is the location of that well, Mr. Vick?

A Well, it would be the Southeast of the Northwest Quarter of Section 31.

MR. NUTTER: This is proposed to be an injection well, eventually?

A Yes, sir, as soon as we can make arrangements for it. Getting back to the overall five-spot pattern that that would formulate, you can see the location of the old No. 2 Well, the abandoned producer in the center, and then the new well that was drilled, the No. 31-7, the relatively off-balanced location, relative to the five-spot.

Q (By Mr. Cooley) Yes.

A It is our opinion that unless we can get 31-2 on injection immediately and get considerable volume of water into it, that we're going to leave a lot of oil in the northern half, say, of that subject five-spot; that since we do have water breakthrough already on No. 31-7, that it's going to be a condition as we described a minute ago as far as the economic limit on it, so we feel that 31-2 should be definitely put on injection at this time.

MR. NUTTER: In other words, the water has to travel further?

A Yes.

MR. NUTTER: So it ought to be put in sooner?

A Yes, sir.

Q (By Mr. Cooley) You anticipate producing this well for

the northern part of the five-spot?

A Yes.

MR. NUTTER: Why was that well drilled so close to the water injection there, the Northeast of the Southeast of 31?

A There had been some water injection into the old No. 2 Well during the air injection program back in '51, '52. We didn't have any exact volumes on that, and we felt like that it possibly had decreased the saturation some in that area, the air injection sweeping through and the water injection that was put into No. 2. That is the reason that No. 31-7 was pulled down off location, off the center of the five-spot.

Q (By Mr. Cooley) You do not feel that injection rates in 31-10 could be reduced and alleviate the situation somewhat?

A No, sir.

Q You feel that once water breakthrough has occurred, it can never be remedied?

A That's right, unless you had enough zone that you felt like, or enough permeability variation that you felt it was a breakthrough actually in one streak and you could go in with selective plugging material or something on that order and isolate your water transfer zone.

Q Can you take a copy of Exhibit 2 -- do you have an extra copy there, Exhibit 2?

A Yes, sir.

Q As prepared here?

A Well, it's a little bit different.

Q Take one of these like the ones that you have presented in evidence. Draw, if you can, what you believe is the actual water front there, rather than this theoretical display that you show by the green circles around the injection wells. What type of water flood would you have to have to get the results that you have in the yellow area?

A Well, it would simply be an elongation toward your high producing rates, Mr. Cooley, as far as actually, and with the green surface broken into the wells that are actually producing water and a subsequent decrease of the radius of the green zone on the other side of the well, just more or less in an elongated situation.

MR. NUTTER: Are there any further questions of the witness? Mr. Utz.

By MR. UTZ:

Q Mr. Vick, I don't believe you mentioned whether or not the 6-1 was increasing or not.

A At present it is making 480 barrels of oil and 10 barrels of water. The water production is just recent, within the last week or week and a half. It doesn't appear to be increasing too fast, the water cut on it, but we feel like that under the present conditions, it definitely has peaked and will be declining.

Q Mr. Vick, how long after you started injecting water in the six wells did you get response on the 6-1?

A Approximately five and a half months.

Q Five and a half months. How much longer was it before you reached the peak?

A I don't have any individual curves on the respective producer in the -- well, it was approximately either in November or December that the well peaked out in oil production.

Q Is that November or December?

A Yes, sir.

Q What was it producing per day?

A Approximately 480 to 500 barrels.

Q It's producing 480 now?

A Yes, sir.

Q When did you start injecting?

A April the 15th, 1957.

Q About nine or nine and a half months?

A Yes. The cumulative water flood production from that well has been approximately 55,000 some odd barrels.

Q What is your anticipation as to how these wells will hold up, particularly the 6-1, do you think it will level off a while or fall off rapidly?

A It will just have to be indicated, as far as I'm concerned, just have to be indicated from future evaluation, I mean future performance, that we actually have no way of knowing whether the well, the respective injection wells around the well were receiving enough injection water to create a natural peak and then a sharp

decline, or whether they were at a lesser rate and that your peak production would be actually flattened out a little bit on top. I would say that it's our future planning in recommendations for the overall project to definitely, to come in with variations in injection volumes as regulated by partially a pressure balance method of ascertaining your injection volumes, and also a volumetric balance indicated by both of them, giving weight in the overall operation of the project, and taking in your performance data as you get it along, and also what we know about the cumulative primary production histories of the wells, whether they indicated they were tight wells or prolific wells or average wells.

Q Mr. Vick, it is my understanding that the way you are going to determine how to expand this unit is on the basis of when you get an effect or response from an offset producing well?

A Well, that would be one factor that would enter into it. Actually it would be a combination of everything that we would have at hand to look at and evaluate as far as calculated voidage in that area and the character of the primary history of the well, and just everything at our disposal.

Q Do you give any consideration as to whether the well had peaked or not, or whether it was on a decline?

A Yes, sir, I would definitely say that as far as water breakthrough into the well --

Q Yes.

A -- that putting on back-up wells, we feel like that we will

be able to time our expansion to such a degree that actually our water breakthrough, we will have our injection wells on before water breakthrough occurs, because that is what we are trying to alleviate.

Q It wouldn't make any difference to you in your analysis as to how much oil the well was producing, it wouldn't matter whether or not it had peaked?

A No, sir, if the well -- are you referring to possibility of a water breakthrough into a well without any increase in oil production?

Q I could be referring to that, or oil production either. In other words, the volume of fluids that it is producing, are you going to use that in your determination of when to increase your water flood?

A Yes, sir, that would be a factor, if it indicated to us that, say we had a perfect or an equal condition in the reservoir throughout this five-spot pattern and the outside producing well peaked at roughly fifty percent of the injected volume going into the -- total injected volume going into the two injection wells inside, then it would definitely be timed to put those outside injection wells on because usually in the operation of a flood, the moment of peak is the moment that actual water breakthrough occurs, theoretically.

Q Then you put more emphasis on water breakthrough than you do volume of fluid, is that right?

A Yes, sir.

MR. UTZ: I believe that's all I have.

MR. ELLIOTT: Could I ask another question?

MR. NUTTER: Yes, sir, Mr. Elliott.

MR. ELLIOTT: There are two questions I would like to ask Mr. Vick.

REDIRECT EXAMINATION

By MR. ELLIOTT:

Q One thing I would like to know, we are making a request for these four injection wells now. Do you think that the delay which has necessarily been caused by getting approval for these four injection wells, rather than having the order to go ahead and put them in two weeks or a month ago, might have caused waste in some respect?

A Yes, I do, I feel that.

Q In other words, if we hadn't had to wait for the approval you would already have had these four wells on some time ago?

A Yes, definitely.

Q Let me ask you this now. There's some indication from the Examiner that it's possible that you could get by with less injection wells than these four that you have asked for, and certainly less than the eight that you have asked for. Do you feel that if you are allowed less than the four required immediately, and would have to come back for another hearing and delay of a month or two on the next two or four, that you would need, that it

would result in additional waste and inefficiency of your flooding?

A Yes, sir.

MR. ELLIOTT: That's all I have.

RECROSS EXAMINATION

By MR. NUTTER:

Q Do you happen to have prepared a tabulation of the total production from the pilot water flood area since, monthly production figures since injection was commenced?

A Yes, sir, I can give them to you. They will be approximate off of the curve, Mr. Nutter. I don't have all of the monthly statements that we prepare on it.

Q Well, do you have a curve that you could present as an exhibit in this hearing showing the monthly production for the pilot water flood area?

A Yes, sir, it's not very presentable, but it's had some work done on it. We could offer it as an exhibit. I believe actually you all have copies of the same curve with your previous applications concerning the formation of the unit. Wasn't that exhibit on the formation of the unit?

M MR. ELLIOTT: I don't believe I recall.

MR. NUTTER: Let's take a recess and we will see if we have the exhibit. If we have that exhibit, we can get along without one here.

(Recess.)

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

Vick, an investigation of the case file in the North Caprock Queen Unit case did not reveal that we have a graph showing the production of the pilot area, so if you can furnish us with an exhibit, it would be appreciated. If you could furnish us with a tabulation of the monthly production.

MR. ELLIOTT: Which would you rather have?

MR. NUTTER: It's immaterial, tabulation if you want to.

A All right.

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

MR. ELLIOTT: Did we ever have the exhibits approved?

MR. NUTTER: I don't believe so.

MR. UTZ: I have one.

MR. NUTTER: Mr. Utz.

By MR. UTZ:

Q Mr. Vick, as I understand it, you are the consultant who recommends when to develop and put into operation more injection wells for this project?

A Yes, sir.

Q They pretty well follow your recommendations?

A Yes, sir, to a fairly good degree.

Q Pardon?

A To a fairly good degree, yes, sir.

Q What you are asking for for the immediate future is four injection wells, which are colored in yellow on Exhibit 1, is that

right?

A Yes, sir.

Q And you want to put into operation four more injection wells that are colored in green?

A Yes, sir.

Q At your pleasure?

A Yes, sir.

Q Can you tell me on what basis and when you are going to recommend that the four green injection wells be put into operation?

A Well, we will, if approved, immediately put on the four yellow wells, and as we discussed a little bit earlier, watch the performance of the surrounding offset producers and take all that, evaluate all that information as it transpires week by week, and if after fifteen days or a month's injection into 32-12 and 32-14 and 31-8, if the producing wells 32-5 and 32-11 and also the eventual injection wells, 32-6 and 32-10 and 32-4, should start increasing soon, my recommendation would follow that to put them on.

Q Increasing in total fluids now, or what?

A Well, it would be oil, I'm at least hoping.

Q As soon as you have response from 32-5 and 32-11, then you would start getting ready to inject water in the four green injection wells?

A Yes, sir.

Q You would be injecting water in the wells 32-5 and 32-11 and possibly 31-1 had a chance to peak?

A Yes, sir.

MR. UTZ: That's all.

MR. NUTTER: Any further questions?

MR. LAMB: Mr. Nutter, I have a question. Raymond Lamb with Wilson Oil Company.

By MR. LAMB:

Q Do you have any indication, Mr. Vick, that the area southeast of your original pilot project is out of balance, or do you have any prediction that it will be out of balance?

A Do you mean southwest?

Q Southwest, yes.

A Well, from the production performance of 31-13 and 6-3 and 6-7, the outside producers to the present pilot area, their limited production indicates to us that we definitely are losing water drive in that direction outside of the pilot area, and that as a result it wouldn't be out of balance.

Q You have no indication of when it will be out of balance in that direction?

A No, sir. Now there is a point, we feel like that when we get our new pump set in and our plant and have a little more injection pressure, that we will be able to kick up the injection rate in 31-14 and 6-8, which have been, have had very low cumulative injection figures. We feel like that our oil increase will come up according to that rise in injection volume.

Q I notice that you didn't have any new input wells in that

area?

A No, sir.

Q That they are all --

A (Interrupting) We feel like that, as we explained from this Exhibit 3, that the primary production histories of actually those four outside producing wells have been very low, and from that we derive that the area has some sort of permeability variation or restriction or porosity condition that is more or less forming a barrier in this one area right along here.

Q Well, then, in establishing the entire unit area, you will have a barrier across the middle of your unitized area currently?

A Currently, yes, sir.

Q On this entire area, did I understand you correctly that the top unit allowable times the number of producing proration units would be a limit under which you could produce and operate your water flood?

A I definitely feel like we could produce for a time. We have no way of definitely stating right now that it would be adequate or that it might be in excess, actually we don't know.

Q You would have, then, some control over the maximum capacity wells by the rate at which you put on new input wells?

A Well, I believe I stated earlier that it would be my recommendation to continue evaluating our current performance data and that if no restriction were up there as far as the top allowable and that if we approached that to take it into consideration at the

time that the problem came up; otherwise, to go about our normal engineering procedures just like we normally would.

Q Under the cases that I have read, has this project been converted from a pilot project into a full-fledged water flood, or are we still in the state of a pilot project, even though it is unitized to seventy-two 40-acre units?

A I would consider it is in the pilot stage. Actually we are injecting into the six wells which were the original pilot wells, but considering the performance data of the northwest producing wells that have increased, it's definitely progressed beyond pilot stage, I mean we should have had injection wells on prior to this.

Q So it's beyond the stage of the pilot project?

A In that sense, yes, sir.

MR. LAMB: That's all.

MR. NUTTER: Any further questions of Mr. Vick?

By MR. NUTTER:

Q To what do you attribute the low cumulative injection into the No. 31-14?

A We have had a series of mechanical problems there. To begin with, we set a liner in the well, and the liner collapsed and we had to go in and re-work that; and then we lost that job and we had to re-work it a second time, and that actually has been the big factor during the progress of these re-work jobs in these liner failures. We had a lot of sloughing of the red bed section

or shale section immediately above the pay, down into the pay, and with its subsequent plugging, and we have fractured a well with a small fracture and tried everything that we know, with the exception of going up on pressure, that we have run some pressure tests that indicate that with the increase of approximately 100 or 150 pounds that we can get in a normal injection rate into it; but with the present facilities in the plant, we don't have that 100 to 150 pounds right now so we had to be satisfied with the present injection rate until we could get the additional pressure.

Q Well, this well had a relatively high primary production history, however, did it not?

A Yes, sir.

Q Which would indicate that the thing must be permeable?

A Yes, sir. Well, these injectivity tests with the higher pressure indicates that it actually is porous and permeable, but the subsequent workover jobs have allowed foreign material and such to get into the pay zone, and actually it's a mechanical restriction other than a formation restriction.

Q So you feel that perhaps the formation in the vicinity of the well bore is not permeable now, but it's on account of having been plugged by extraneous material?

A Yes, sir, mechanical, yes, sir.

Q To what do you attribute the fact that No. 31-15 has never yielded any startling results as a result of this water flood?

A Well, there again we don't know. We have cut off a small

fracture in the well, and we are contemplating a larger fracture job;after the first fracturing job on the well, it appeared that the well was going to come around and start increasing, but we got up to our 25 or so barrels a day, and it's just remained at that. It was definitely evaluated along with all the rest of the data concerning the possibility that it might be trouble from our injection wells, as far as the water going away from this producing well instead of centering on it, but it appears now, as in 31-14, there is some type of mechanical restriction around the well bore that we haven't relieved, and possibly the larger fracture job will,sand frac job, will fix that up.

Q The eight proposed injection wells that are the subject of this hearing being the yellow wells and the green wells on these exhibits, are the only wells that you contemplate converting to water injection at the present time?

A Well, yes, sir, at the present time.

Q What will be the next wells that will be put on injection?

A Well, it possibly will be some wells on a back-up arrangement to the Ambassador pilot flood which is in the northeast corner of their unit there, Mr. Nutter, or it could be.

Q Where would those be?

A Well, it would be in this vicinity of Section 6 here, the western half of Section 6, along in there; but there again we have that permeability and porosity condition that might alleviate any present back-up, we don't know yet, or we could have need for an

injection well or so along the northwest side of the area here now.

Q What would be the result of a state of inbalance occurring on the northwest side of the pilot flood?

A As we increased our pressure, I stated earlier, then 31-11 and 31-13 had just begun to respond with increased production, if those come up materially, well, we would be looking at the same condition offsetting those four injection wells for back-up that we have discussed over on the other side.

Q Do you think that what has happened here in the area colored in yellow on your Exhibit 2 is in essence a line water drive that's resulting from this pilot project?

A It could be to a degree called so, yes.

Q Is there anything particularly objectionable about a line drive type of water flood?

A Well, one point here is the fact that it's going down-dip instead of normally up-dip like a natural water drive goes, and you have problems centered around that, but mainly the point that we discussed earlier, as far as the economic limit of the producing wells.

Q Is the payout normally about the same or a little slower or a little faster on a line drive than on a five-spot type of water flood?

A It would be normally slower.

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

(Witness excused.)

MR. ELLIOTT: At this time I would like to ask the three exhibits presented and prepared by Mr. Vick be entered into the record, if there is no objection?

MR. NUTTER: Is there objection to the introduction of Graridge Exhibits 1 through 3 in this case? If not, they will be received. Do you have anything further, Mr. Elliott?

MR. ELLIOTT: I believe not.

MR. NUTTER: Does anyone have anything they wish to offer in Case 1433?

MR. ROSS: John Ross, representing the Gulf Oil Corporation. The Gulf Oil Corporation being a working interest owner with a participation factor of approximately five percent in this unit, concurs in the recommendation of the Graridge Corporation and requests that the application be approved.

MR. COOLEY: Mr. Ross, where are your offices?

MR. ROSS: Fort Worth, Texas.

MR. McCRACKEN: McCracken with Ambassador Oil. I would like to concur in the application of Graridge.

MR. HAMPTON: John Hampton, Great Western Drilling Company. Great Western Drilling Company being a working interest owner in this unit would like to concur in Ambassador's recommendation.

MR. NUTTER: If there are no further statements in Case 1433, we will take the case 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 10th day of May, 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. 1433 heard by me on 5-6, 1958.

..... Examiner
New Mexico Oil Conservation Commission

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. 1433
Order No. R-972-A

APPLICATION OF GRARIDGE CORPORATION
FOR AN ORDER AMENDING ORDER NO. R-972
TO PERMIT THE EXPANSION OF THE PILOT
WATER FLOOD PROJECT AUTHORIZED THEREBY
IN THE CAPROCK-QUEEN POOL, LEA COUNTY,
NEW MEXICO.

ORDER OF THE COMMISSION

BY THE COMMISSION:

This cause came on for hearing at 9 o'clock a.m. on May 6, 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 28th day of May, 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 Commission by its Order No. R-972 authorized Graridge Corporation, Gulf Oil Corporation, and Great Western Drilling Company to institute a pilot water flood project with six water injection wells in Section 31, Township 12 South, Range 32 East, and Sections 5 and 6 of Township 13 South, Range 32 East, Caprock-Queen Pool, Lea County, New Mexico.

(3) That the above-described pilot water flood project was subsequently included in the North Caprock-Queen Unit, which agreement designated Graridge Corporation as the unit operator and that the said North Caprock Queen Unit was approved by the Commission by its Order No. R-1145.

(4) That the applicant, Graridge Corporation, now seeks permission to expand the above-referenced pilot water flood project by immediate conversion of the following described wells to water injection wells:

Cap-Unit #31-2, situated in NW/4 NE/4 of Section 31-12S-32E, NMPM.

Cap-Unit #31-8, situated in SE/4 NE/4 of Section 31-12S-32E, NMPM.

Cap-Unit #32-12, situated in NW/4 SW/4 of Section 32-12S-32E, NMPM.

Cap-Unit #32-14, situated in SE/4 SW/4 of Section 32-12S-32E, NMPM.

(5) That the applicant further requests that it be authorized to convert the following described wells to water injection wells in accordance with the dictates of periodic performance data at the operator's discretion, without notice and hearing but subject to administrative approval by the Commission, to-wit:

Cap-Unit #30-16, situated in SE/4 SE/4 of Section 30-12S-32E, NMPM.

Cap-Unit #32-4, situated in NW/4 NW/4 of Section 32-12S-32E, NMPM.

Cap-Unit #32-6, situated in SE/4 NW/4 of Section 32-12S-32E, NMPM.

Cap-Unit #32-10, situated in NW/4 SE/4 of Section 32-12S-32E, NMPM.

(6) That the above-referenced water flood is in a state of imbalance and that the immediate injection of water into the above-described Cap-Unit Wells #31-2, #31-8, #32-12, and #32-14 is necessary to restore the balance in the said water flood project.

(7) That the applicant should be authorized to convert the above-described Cap-Unit Wells #30-16, #32-4, #32-6, and #32-10 to water injection wells, without notice and hearing, provided administrative approval is first obtained from the Commission.

(8) That the Commission should not grant administrative approval for conversion to water injection of any of the wells mentioned in finding No. 7 above unless it is shown that the proposed water injection well has experienced a substantial response to the water flood project or is directly offset by a producing well which has experienced such response.

(9) That the subject application should be approved in the interests of conservation.

IT IS THEREFORE ORDERED:

(1) That Graridge Corporation be and the same is hereby authorized to immediately convert the following-described wells to water injection wells:

Cap-Unit #31-2, situated in NW/4 NE/4 of Section 31-12S-32E, NMPM.

Cap-Unit #31-8, situated in SE/4 NE/4 of Section 31-12S-32E, NMPM.

Cap-Unit #32-12, situated in NW/4 SW/4 of Section 32-12S-32E, NMPM.

Cap-Unit #32-14, situated in SE/4 SW/4 of Section 32-12S-32E, NMPM.

(2) That Graridge Corporation be and the same is hereby authorized to convert the following-described wells to water injection wells subject to administrative approval by the Commission, to-wit:

Cap-Unit #30-16, situated in SE/4 SE/4 of Section 30-12S-32E, NMPM.

Cap-Unit #32-4, situated in NW/4 NW/4 of Section 32-12S-32E, NMPM.

Cap-Unit #32-6, situated in SE/4 NW/4 of Section 32-12S-32E, NMPM.

Cap-Unit #32-10, situated in NW/4 SE/4 of Section 32-12S-32E, NMPM.

PROVIDED HOWEVER, That none of the above-described wells shall be eligible for administrative approval for conversion to water injection unless it is shown that the proposed water injection well has experienced a substantial response to the water flood project or is directly offset by a producing well which has experienced such response.

PROVIDED FURTHER, That to obtain administrative approval for the conversion of any well to water injection, applicant shall submit to the Commission in triplicate a request for such administrative approval, setting forth therein all the facts pertinent to the need for expansion of the water flood, and attaching thereto Commission Form C-116, showing production tests of the affected well or wells both before and after stimulation by water flood. Applicant shall also attach plats of the water flood project area and immediate surrounding area, indicating thereon the owner of each lease and the location of all water injection wells and producing wells, and shall submit evidence that a copy of the application to expand the water flood project area has been sent to each operator offsetting the proposed expansion.

The Secretary-Director of the Commission may, if in his opinion there is need for the expansion of the water flood project area, authorize said expansion without notice and hearing, provided no offset operator objects to said expansion within fifteen (15) days. The Secretary-Director may grant immediate approval of the expansion upon receipt of waivers of objection from all operators offsetting the proposed expansion.

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/

OIL CONSERVATION COMMISSION
P. O. BOX 871
SANTA FE, NEW MEXICO

June 2, 1958

COPY

Mr. R. L. Elliott
Graridge Corporation
P.O. Box 752
Breckenridge, Texas

Dear Mr. Elliott:

We enclose two copies of Order R-972-A issued May 28, 1958, by the Oil Conservation Commission in Case 1433, which was heard on May 6th at Santa Fe before an examiner.

Very truly yours,

A. L. Porter, Jr.
Secretary - Director

bp
Encls.

OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO

Date 5-19-58

CASE NO. 1433 HEARING DATE BSN SF 9am 5-6

My recommendations for an order in the above numbered case(s) are as follows:

Enter an order approving the immediate conversion of the following wells to water injection:

Cap Unit 31-2
Cap Unit 31-8
Cap Unit 32-12
Cap Unit 32-14
~~Cap Unit 32-4~~
~~Cap Unit 32-6~~
~~Cap Unit 32-10~~

the grounds therefor being that the water flood is in a state of imbalance and that injection into certain wells (these 4) is necessary to restore the balance to prevent waste (premature breakthru etc)

authorize the ~~Secretary~~ administrative approval of conversion to water injection of applicants Cap Unit 32-4, 32-6, and 32-10. 30-16 upon submission of proof to the commission ~~to be filed with said~~ substantially ~~in writing~~ that action affecting directly ~~proposed~~ to the effects of water flood and that a need exists for its conversion.

Staff Member

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. 1195
Order No. R-972

APPLICATION OF GRARIDGE CORPORATION:
GULF OIL CORPORATION, AND GREAT WESTERN
DRILLING COMPANY FOR AN ORDER AUTHORIZING
A PILOT WATER FLOOD PROJECT IN THE QUEEN
FORMATION OF THE CAPROCK-QUEEN POOL, LEA
COUNTY, NEW MEXICO.

ORDER OF THE COMMISSION

BY THE COMMISSION:

This cause came on for hearing at 9 O'clock a. m. on January 9, 1957, at Santa Fe, New Mexico, before Warren W. Mankin, 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 April 1957, the Commission, a quorum being present, having considered the application, the evidence adduced, and the recommendations of the Examiner, Warren W. Mankin, 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 case and the subject matter thereof.

(2) That the applicants, Graridge Corporation, Gulf Oil Corporation, and Great Western Drilling Company, propose to institute a pilot water flood operation in the Queen formation underlying certain of their leases in all or part of Section 31, Township 12 South, Range 32 East, and Sections 5 and 6, Township 13 South, Range 32 East, Caprock-Queen Pool, Lea County, New Mexico.

(3) That the applicants propose to accomplish the said flooding operation by means of water injection through six of their wells located in the S/2 of Section 31, Township 12 South, Range 32 East, the NE/4 of Section 6 and the NW/4 of Section 5, Township 13 South, Range 32 East, NMPM, Lea County, New Mexico.

(4) That the applicants have obtained authority from the State Engineer for the State of New Mexico to use fresh water in limited quantities until June 30, 1958, for the operation of the subject pilot water flood project.

(5) That the proposed program for secondary recovery will promote conservation and tend to prevent waste through the production of oil which might not otherwise be recovered.

(6) That the progress of the secondary recovery program should be reported periodically to the Commission.

IT IS THEREFORE ORDERED:

1. That the application of Graridge Corporation, Gulf Oil Corporation, and Great Western Drilling Company for permission to institute a pilot water flood in the Queen formation of the Caprock-Queen Pool underlying all or portions of Section 31, Township 12 South, Range 32 East, Sections 5 and 6 of Township 13 South, Range 32 East, NMPM, Lea County, New Mexico, be and the same is hereby granted.

2. That the following wells be and the same are hereby approved as water injection wells in the above Pilot Water Flood Project:

1 Graridge - Malco State "A" Well No. 5	660 feet from the South line and 1980 feet from the West line of Section 31, Township 12 South, Range 32 East, NMPM.
2 Graridge-Livermore Maxwell State "G" Well No. 5	1980 feet from the South line and 1980 feet from the East line of Section 31, Township 12 South, Range 32 East, NMPM.
3 Graridge-Livermore Maxwell State "G" Well No. 7	660 feet from the South line and 660 feet from the East line of Section 31, Township 12 South, Range 32 East, NMPM.
4 Graridge-Manry State "A" No. 2	654 feet from the North line and 1982 feet from the East line of Section 6, Township 13 South, Range 32 East, NMPM.
5 Gulf-Lea State "B" Well No. 2	1980 feet from the North line and 660 feet from the East line of Section 6, Township 13 South, Range 32 East, NMPM.
6 Great Western-State "R" Well No. 1	660 feet from the North line and 660 feet from the West line of Section 5, Township 13 South, Range 32 East, NMPM.

all in Lea County, New Mexico.

3. That monthly progress reports on the subject water flood project shall be submitted to the Commission in accordance with Rule 1119 of the Commission Rules and Regulations.

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

S E A L

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Case 1433, Rec'd
to expand Cap Unit No. 1

APPLICATION FOR AUTHORITY TO EXPAND THE WATERFLOOD
IN NORTH CAPROCK QUEEN UNIT,
LEA AND CHAVES COUNTIES, NEW MEXICO

OIL CONSERVATION COMMISSION OF STATE OF NEW MEXICO
SANTA FE, NEW MEXICO

WHEREAS, on April 5, 1957, the Oil Conservation Commission of the State of New Mexico, by its Order No. R-972, authorized Graridge Corporation, Gulf Oil Corporation and Great Western Drilling Company to institute a pilot flood in Queen formation underlying certain of their leases in all or part of Section 31 - 12 S - 32 E and Sections 5 and 6 - 13 S - 32 E, Caprock-Queen Pool, Lea County, New Mexico. That in such order six (6) water injection wells were authorized, which are more particularly set out on the plat attached hereto and marked Exhibit "A" as well as Nos. 5-4, 6-2, 6-8, 31-10, 31-14 and 31.16 marked in red.

WHEREAS, the operation of said pilot flood over a period of months resulted in a successful increase in production and on November 13, 1957, the Oil Conservation Commission of the State of New Mexico, by its Order R-1073-A, authorized capacity production allowable for certain wells in the pilot waterflood project above referred to for the purpose of handling the increased production.

WHEREAS, effective as of March 1, 1958, certain oil and gas leases were unitized by that certain unit agreement approved by the owners of those leases shown on Exhibit "A" within the shaded area, creating the North Caprock Queen Unit, and designating Graridge Corporation as Unit Operator. This Unit Agreement was approved by the Commissioner of Public Lands of the State of New Mexico on February 27, 1958. The Unit Agreement was approved by the Oil Conservation Commission of the State of New Mexico, after due public notice had been given as required by law, on April 3, 1958, by its Order No. R-1145.

WHEREAS, after a duly called meeting of the Operator's Committee under the terms and provisions of the above referred to Unit Agreement, it was determined by such committee, that in order to prevent waste and obtain full ultimate recovery of oil from the waterflood area, such

unit must be expanded by converting additional wells into water injection wells. The unit operator was therefore authorized and requested to obtain authority from the Oil Conservation Commission of the State of New Mexico to so expand the unit as per this application.

It is, therefore, respectfully requested by the undersigned unit operator, Graridge Corporation, that this Commission immediately authorize the following wells situated in the North Queen Caprock Unit in Lea County, New Mexico, which are indicated in yellow on Exhibit "A" attached hereto, be converted to water injection wells:

(1) Cap-Unit #31-2, situated in NW/4 NE/4 of Section 31 -12 S - 32 E, N.M.P.M.

(2) Cap-Unit #31-8, situated in SE/4 NE/4 of Section 31 - 12 S - 32 E, N.M.P.M.

(3) Cap-Unit #32-12, situated in NW/4 SW/4 of Section 32 - 12 S - 32 E, N.M.P.M.

(4) Cap-Unit #32-14, situated in SE/4 SW/4 of Section 32 - 12 S - 32 E, N.M.P.M.

It is further respectfully requested that this Commission authorize orderly conversion, one at a time, at intervals of approximately every two months for the remainder of the year 1958, the following wells situated in the North Queen Caprock Unit in Lea County, New Mexico, which are indicated in green on Exhibit "A" attached hereto; it being understood, however, that each of these four injection wells shall be approved upon written request without a hearing by the Commission prior to each conversion:

(1) Cap-Unit #30-16, situated in SE/4 SE/4 of Section 30 - 12 S - 32 E, N.M.P.M.

(2) Cap-Unit #32-4, situated in NW/4 NW/4 of Section 32 - 12 S - 32 E, N.M.P.M.

(3) Cap-Unit #32-6, situated in SE/4 NW/4 of Section 32 - 12 S - 32 E, N.M.P.M.

(4) Cap-Unit #32-10, situated in NW/4 SE/4 of Section 32 - 12 S - 32 E, N.M.P.M.

It is, therefore, respectfully requested that this Commission set a date for a hearing on this application so that the undersigned may

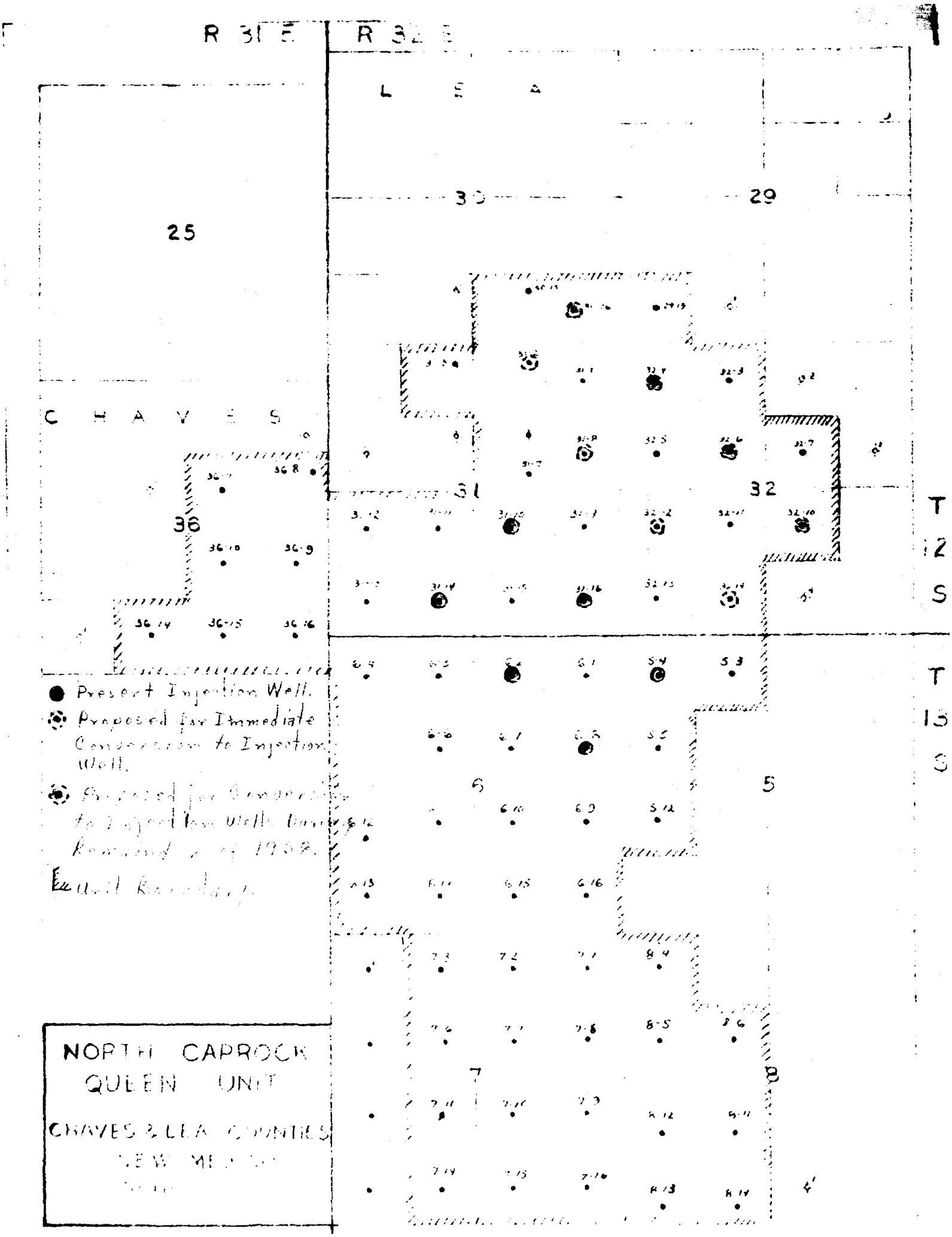
establish the facts necessary to authorize this unit expansion in the interest of conservation and prevention of waste as above set out.

Respectfully yours,

GRARIDGE CORPORATION

By R. L. Elliott, Attorney.

EXHIBIT "A"


R 31 E
R 32 E
L E A
30
29
25
C H A V E S
31
32
36
T 12 S
T 13 S
6
5
7
8
4'
● Present Injection Well.
Proposed for Immediate Conversion to Injection Well.
Proposed for Conversion to Injection Well During Remainder of 1958.
Unit Boundary
NORTH CAPROCK QUEEN UNIT
CHAVES & LEA COUNTIES NEW MEXICO

Case 1433

NEW MEXICO
OIL CONSERVATION COMMISSION
P. O. Box 871
Santa Fe, New Mexico

Date April 18, 1958

Mr. R. L. Elliott, Attorney
Graridge Corporation
Ibex Building
Breckenridge, Texas

Gentlemen:

Your application for expansion of the pilot water flood project authorised by Order No. R-972 dated April 8, 1958 has been received, and has been tentatively scheduled for hearing before an examiner on May 6, 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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GRARIDGE CORPORATION

GRAREDGE TEXAS

April 8, 1958

5x Hearing

Oil Conservation Commission
State of New Mexico
State Capitol
Santa Fe, New Mexico

Re: North Caprock Queen Unit
Lea and Chaves Counties, New Mexico

Gentlemen:

Attached hereto you will find an original and two copies of an application for authority to expand ~~the~~ a waterflood in the North Caprock Queen Unit, Lea and Chaves Counties, New Mexico.

It would be appreciated very much if you would set this matter up for hearing at your first Examiners' Hearing. Mr. Cooley informs me that you tentatively have one set up for the first part of May. If you could perfect your notice on this application prior to this date so as to include same on that hearing date, it would certainly be appreciated.

I shall also appreciate your notifying me of the date which has been set for the hearing of this application.

Thank you very much for giving this matter your usual prompt attention.

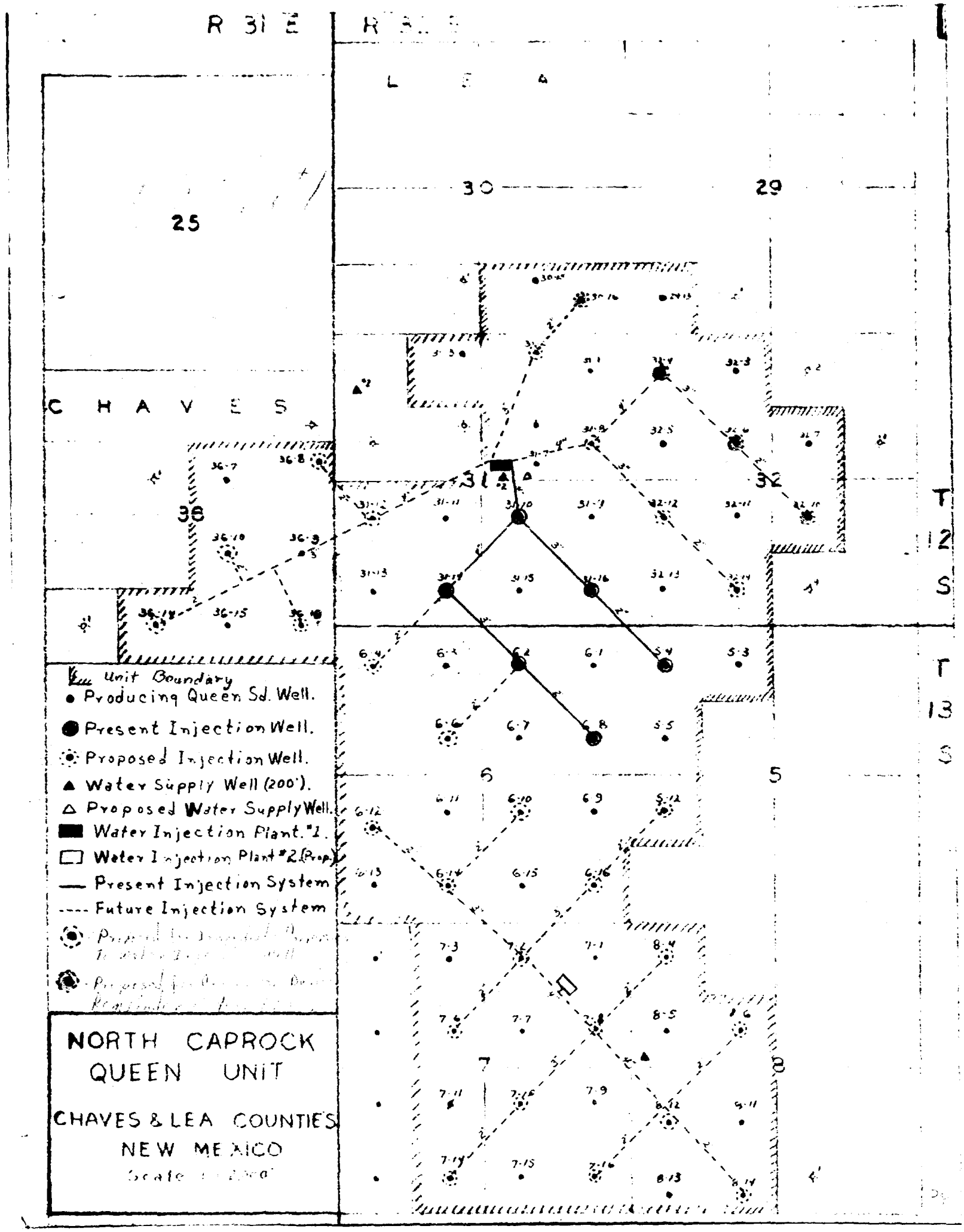
Yours very truly,

GRARIDGE CORPORATION

By R. L. Elliott, Attorney

RLE:ea
enc

cc-Graham Office


R 31 E
R 32 E
L E A
30
29
25
C H A V E S
31
32
36
T 12 S
T 13 S
6
5
7
8
Unit Boundary
Producing Queen Sd. Well.
Present Injection Well.
Proposed Injection Well.
Water Supply Well (200').
Proposed Water Supply Well.
Water Injection Plant "1.
Water Injection Plant "2 (Prop.)
Present Injection System
Future Injection System
NORTH CAPROCK
QUEEN UNIT
CHAVES & LEA COUNTIES
NEW MEXICO

R 31 E

R 32 E

BEFORE EXAMINER NUTTER
OIL CONSERVATION COMMISSION
Appl No. 20
CASE NO. 1433

25

C H A V E S

36

31

32

T 12 S

T 13 S

5

7

8

Stable

Peak + Seal

NORTH CAPROCK
QUEEN UNIT

CHAVES & LEA COUNTIES
NEW MEXICO
Scale 1" = 2000'

R 31 E

R 32 E

T 12 S

T 13 S

25

30

29

Appl 1433

3

31

32

36

5

6

7

8

4

1

C H A V E S

41000

27000

113

78000

54000

95000

33000

42000

58000

57000

36000

77000

72000

55000

10500

47000

66000

70000

56500

96500

19000

61500

16000

14500

35000

54000

5000

53600

62200

97300

22500

21000

19700

115000

77000

72000

84000

10000 - Cumulative Primary Production Volume (Bbls. S.T.O.) From The Respective Wells.

NORTH CAPROCK QUEEN UNIT

CHAVES & LEA COUNTIES NEW MEXICO

CASE RECORD FILE

1195 + 1433 A

[redacted] Monday 11/12/58

BEFORE THE
OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO

IN THE MATTER OF:

CASES 1195 & 1433

TRANSCRIPT OF HEARING

November 12, 1958

DEARNLEY - MEIER & ASSOCIATES
GENERAL LAW REPORTERS
ALBUQUERQUE NEW MEXICO
Phone CHapel 3-5691

NEW MEXICO OIL CONSERVATION COMMISSION

Mabry Hall

Santa Fe, NEW MEXICO

REGISTER

HEARING DATE Examiner November 12, 1958 TIME: 1:00 p.m.

NAME:	REPRESENTING:	LOCATION:
[illegible]	Brinkley Corp.	Breckenridge, Texas
B. R. Kaiser	Brinkley Corp.	Breckenridge, Texas
J. A. Hoover	Gulf Oil Corp.	Roswell, N. M.
[illegible]	[illegible]	[illegible]

BEFORE THE
OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO
NOVEMBER 12, 1958

IN THE MATTER OF:

CASES 1195 & 1433:

Application of Graridge Corporation for capacity allowables for certain wells in a water flood project. Applicant, in the above-styled cause, seeks an order authorizing capacity allowables for the following described wells which are situated in the project area of its water flood project in the Caprock-Queen Pool in Lea and Chaves Counties, New Mexico:

Cap Unit Well No.32-5, SW/4 NW/4 Section 32
Cap Unit Well No.32-11, NE/4 SW/4 Section 32

both in Township 12 South, Range 32 East, Lea County, New Mexico.

BEFORE:

Mr. Daniel S. Nutter, Examiner

TRANSCRIPT OF PROCEEDINGS

MR. NUTTER: The hearing will come to order, please. The first case on the docket this afternoon will be consolidated Cases 1195 and 1433.

MR. PAYNE: Cases 1195 and 1433. Application of Graridge Corporation for capacity allowables for certain wells in a water flood project.

MR. CAMPBELL: Mr. Examiner, I would like to enter an

appearance for Mr. Russell Elliott, Breckenridge, Texas, and Jack M. Campbell of Campbell & Russell, Roswell, New Mexico, on behalf of the applicant.

MR. NUTTER: Are there any further appearances to be made in this case today? Would you state your name, please, sir?

MR. LAMB: Raymond Lamb of the Wilson Oil Company.

MR. NUTTER: Any further appearances? If not, will you proceed, Mr. Campbell?

MR. CAMPBELL: Mr. Examiner, I would like first to request the Examiner to incorporate by reference the transcript of testimony and Exhibits in prior hearings in Cases No. 1195 and 1433, insofar as this case is concerned.

MR. NUTTER: I believe there is one other case in this series, Mr. Campbell. 1324.

MR. CAMPBELL: And Case 1324.

MR. NUTTER: Is there objection of consolidation into the record in this case the transcript and testimony and the Exhibits in Cases 1195, 1324 and 1433? If not, these records will be incorporated in the record of this case.

MR. CAMPBELL: Mr. Examiner, this application is before you on the show cause provision of an emergency order entered by the Commission approving capacity allowables for two wells in the North Caprock-Queen Unit No. 1 in Chaves and Lea Counties, New Mexico. We have one witness to testify in connection with this case, Mr.

Harrison.

(Witness sworn)

B. G. HARRISON,

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

DIRECT EXAMINATION

BY MR. CAMPBELL:

Q Will you state your name, please?

A B. G. Harrison.

Q Where do you live, Mr. Harrison?

A Breckenridge, Texas.

Q By whom are you employed?

A I am employed by the Graridge Corporation.

Q In what capacity?

A As manager of secondary recovery.

Q Have you previously testified before this Commission or an Examiner for this Commission, Mr. Harrison, in a professional capacity?

A Yes, sir, I have, Mr. Campbell.

MR. CAMPBELL: Are the witness' qualifications acceptable?

MR. NUTTER: Yes, sir, they are.

Q Mr. Harrison, you are acquainted, are you not, with the North Caprock-Queen Unit No. 1 water flood project being operated by Graridge Corporation? A Yes, sir.

Q Do you have some current information as to oil and water production from producing wells in the North Caprock-Queen Unit No. 1?

A Yes, I do, Mr. Campbell.

Q I hand you, Mr. Harrison, what has been identified as Graridge's Exhibit No. 1, --

MR. CAMPBELL: How would you like these Exhibits identified?

MR. NUTTER: Call it Exhibit No. 1 with a suffix on it, 11-12 or -11/12. That will indicate the date on this.

Q (By Mr. Campbell) -- what has been identified as Graridge's Exhibit No. 1, -11/12 in Case No. 1195, is that correct?

MR. NUTTER: And 1433.

Q -- and 1433, and ask you to state what that is, please.

A This is a plat showing the outline of Caprock-Queen Unit No. 1 operated by Graridge Corporation, on which are identified the present injection wells, the proposed injection wells, the present producing wells, and three wells Nos. 32-4, 32-6, 32-10, indicated in red, which are proposed injection wells which have had a letter of administrative approval submitted to the Commission for conversion of these wells to water injection wells.

Q Mr. Harrison, have all the wells indicated by the symbols on the plat received administrative approval as injection wells?

A All of the wells identified as injection wells with the solid circled wells have been approved by the Commission.

Q Mr. Harrison, in your application to the Commission for an emergency order, you requested that you be permitted to produce your Well No. 32-5 in the SW/4 NW/4 of Section 32, and your Well No. 32-11 in the NE/4 SW/4 of Section 32, both in Township 12 South, Range 32 East, at capacity. Will you refer to Exhibit No. 1 and point out to the Examiner what the most recent tests show with regard to the producing capacity of each of those wells, please?

A These wells were tested on the 4th and 5th of November, and as indicated by the red figure beside each well location, the upper figure is oil production, the lower figure indicates water production on twenty-four hour test that was made on these wells. Currently, the No. 32-5 is producing 52 barrels of oil and no water, and the No. 32-11 is producing 39 barrels of oil and no water; both of these in excess of present unit allowable.

Q Now, immediately to the northeast of these two wells, Exhibit No. 1 indicates three wells in red. I believe you stated generally what that indicated. Will you please tell the Examiner what the status of those three wells is at the present time?

A These wells Nos. 32-6 and 32-10 are currently producing. The No. 32-4 is a plugged and abandoned well. These will be made ready for water injection wells upon approval of the Commission.

Q And do you consider that, in view of the relation of Wells 32-5 and 32-11, that these three wells to which you referred should be converted to injection wells to back up the increase in the producing wells?

A Yes, sir, I do.

Q Now, Mr. Harrison, in your opinion, is it necessary for you to obtain authority to produce Wells 32-5 and 32-11 at capacity in order to avoid waste by obtaining the greatest ultimate recovery of oil?

A Yes, Mr. Campbell, that would be my opinion.

MR. CAMPBELL: I would like to offer Applicant's Exhibit No. 1-11/12 in evidence.

MR. NUTTER: Is there objection to the introduction of Graridge Corporation's Exhibit 1-11/12 in evidence in this case? If not, the Exhibit will be received.

MR. CAMPBELL: I believe that's all the questions I have at the present, Mr. Examiner.

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

CROSS EXAMINATION

BY MR. NUTTER:

Q I didn't understand you correctly, sir. Now, the wells that you have circled in red and filled in the circles, you have requested administrative approval for the conversion of these two water injections, but has the approval been granted as yet?

A No, it has not.

Q Is it on a waiting period?

A Yes. The letter was mailed from our office on November 3, and we have not had sufficient time to receive any word from the Commission on those particular wells.

Q Do you anticipate the conversion of these wells to water injection soon after receiving authority to do so?

A Yes, we do. The No. 32-10 apparently is ready with the exception of pulling rods and tubing. The No. 32-6 will require a very small workover. No. 32-4 will have to be entered to be plugged effectively, and if upon such entrance we can effectively convert this well to an injection well, we will use it. If not, it will require the drilling of a new hole.

Q Do you have authority for the conversion of any well to water injection wells which has not been so converted as yet?

A The No. 6-12, which is an offset to the Ambassador Unit, has not yet been converted. The well should be converted within the next few days.

Q Do you have authority to convert it?

A Yes.

Q Is that the only one that hasn't been converted?

A Yes, sir, that's correct.

Q What is the primary reason for requesting allowables in excess of the top unit allowable of these two wells, please?

A We feel that we will lose ultimate oil if we are unable to produce these wells at their capacity.

Q Have you read the transcript of the previous cases --

A Yes, sir, I have.

Q -- in the previous hearings of these cases?

A Yes, sir.

Q Do you agree in substance with the testimony which was presented in those cases substantiating this theoretical loss in ultimate recovery?

A Yes, sir, I agree with the supporting evidence.

Q And you would apply that same evidence to these two particular wells in question today?

A Yes, surely would.

MR. NUTTER: Are there any further questions of the witness? If not, he may be excused. Do you have anything further, Mr. Campbell?

MR. CAMPBELL: No, nothing further, Mr. Examiner.

MR. NUTTER: Does anyone have anything they wish to offer in this case?

MR. HOOVER: Mr. Examiner, I would like to make a statement. My name is John Hoover from Roswell, New Mexico, representing Gulf Oil Corporation. Gulf believes that the curtailment of production from water flood wells will result in ultimate oil,and being a working interest owner in the North Caprock-Queen Unit No. 1, concurs with the Graridge Corporation in their application in Cases 1195 and 1433, and urges approval by the Commission.

MR. NUTTER: Does anyone else have anything they wish to offer in the case?

MR. LAMB: I am Raymond Lamb with Wilson Oil Company. We have appeared in this Case 1195 and 1433, and in the amended numbers as they appear. The latest date, I believe, was May,

1958, and have submitted testimony. Since this testimony is part of this case we wish to limit our remarks to a statement.

We would like to bring to the attention of the Commission, and in this case in particular, a report recently released on research on curtailment of production in water flood projects. This research was carried out by the Interstate Oil Compact Commission under the direction of Paul D. Torrey and his committee. This report entitled "Effects of Curtailment of Oil Production from Water Injection Projects" was released in September, 1958.

Since this paper and its conclusions are parallel in many respects to the Wilson Oil Company, and since this report is an important unbiased report, we request that this paper be considered a part of the record of this case and be identified as to its source. In the interest of time we will read into the record only the conclusion of the paper. (Quote)

"In reviewing what has already become a rather voluminous quantity of literature relating to the problem of curtailment, it is impressively apparent that the economic conditions have influenced many of the opinions that have been expressed on this subject. It is evident that if most of the projects cited as examples had not been curtailed in one way or another they would have been more profitable. Thus, as was recognized near the beginning of this paper, the profit motive is just as important in the

Albuquerque, New Mexico
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development of secondary oil reserves as it is in the development of primary oil reserves. If the economic factor of time did not reduce income there probably would be little complaint about the damage resulting from prorated secondary oil production. Furthermore, if it should be possible to produce curtailed secondary water floods profitably over extended periods of time it is likely that the same amount of oil, or even more oil could be produced as would have been the case if production from them had not been curtailed. The difference in the thinking of the operators, of course, is that the uncurtailed projects are usually more profitable than the curtailed ones."

The Wilson Oil Company wishes to refer to Order 1244 which sets out the allowable for the Magnolia Vacuum water flood. This allowable is determined by multiplying the top unit allowable times the number of developed 40 acre tracts.

We urge the Commission to deny the applicant capacity allowable for additional wells in the Caprock-Queen water flood project in favor of allowable plan set out in Order 1244.

This request is based on these basic factors:

1. Capacity allowable in Caprock will not protect correlative rights. It will deprive operators of their fair share of the demand for New Mexico crude oil production.

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Phone CHapel 3-6691

2. Prorated allowable is in the best interest of conservation in the Caprock water flood project as has been the case of all primary production in New Mexico.

MR. NUTTER: Mr. Lamb, do you happen to have a copy of the Interstate Committee Report that you wish to offer in this case?

MR. LAMB: I have a copy, yes.

MR. CAMPBELL: Mr. Examiner, I am going to have to object to this being offered as an Exhibit in this case. Certainly, the Commission and its staff will have the opportunity, if they haven't already, I assume, to read this publication. I am not acquainted with it. However, the parties who wrote it or contributed to it are not here to testify; they are not here subject to cross examination, and I believe it is not proper to offer it in evidence in this case. I don't believe it is admissible because it is not competent evidence, in my judgment.

MR. NUTTER: You have objection to the introduction of the statement?

MR. CAMPBELL: No, not the statement. The statement will be a part of the record, but offering this publication which is not -- which we haven't seen, and prepared by people who are not here to testify, is the objection I have to that portion of the statement and its offer into evidence, as such, in the case.

MR. NUTTER: I believe Mr. Campbell's objection to the introduction of the document will have to be sustained. The statement will stay in the record, and that is all.

MR. CAMPBELL: Now, Mr. Examiner, I would just like to make one or two observations by way of statement and to some extent by way of answer to Mr. Lamb's comments. Toward the end of his statement, he indicated he did not object to an Order similar to one the Commission entered in the Magnolia case on a unit basis. I might observe that insofar as this particular project is concerned, should the Commission enter its Order on a unit basis and set that as the allowable, that that allowable would be in excess of capacity allowables under the present operation of this particular project. It seems to me that once the Commission has adopted the policy, which at least to this time is the firm policy of the Commission, the principle of capacity allowables, that it is better and more realistic to recognize that principle without establishing an artificial ceiling or an artificial allowable which would, in fact, be greater than the allowable now permitted under straight capacity. For straight capacity purposes, I do not believe that there has been any evidence offered here to contradict the voluminous testimony and Exhibits heretofore taken in connection with capacity allowables in water flood projects, and I believe that until there is some evidence to the contrary, we certainly are prepared to stand on the evidence that has heretofore been presented, and on that basis we seek the capacity allowable for these two wells.

MR. NUTTER: Thank you.

MR. LAMB: Would the applicant, since the unit allowable number 40 acre units multiplied by the top unit allowable,

since it will be in excess of the allowable you expect, would you have any objection to having a greater allowable than you have so requested?

MR. CAMPBELL: Yes, we would, for the reason that we think it is an unrealistic approach to the matter. We think that the way it is set out now, where the capacity allowable has been approved by the Commission, as a matter of principle in water flood projects, that to create a situation where a unit allowable must be used, even though it is greater than the capacity allowable for the project, seems to us to be unrealistic and to be a wasted step. There are undoubtedly projects where the unit allowable will not permit capacity. This isn't one of them, but there probably are some, and in those cases, based on the Commission's previous findings, they would have to go ahead in the absence of some showing or a change of the attitude on the part of the Commission and give the capacity anyway, so we can't see that setting the unit allowable up does a great deal to change the situation except create a rather artifical ceiling on the allowable for the project. I have never been able to see the advantage of the unit allowable approach from the point of view of control of allowable.

MR. NUTTER: I wonder if I could ask your witness a question. How many 40-acre tracts are in this unit?

THE WITNESS: There are seventy-two total 40-acre tracts.

MR. NUTTER: And do you know what the current allowable for the entire unit is at the present time?

THE WITNESS: No, sir, I couldn't state what the allowable is for the entire unit.

MR. LAMB: As I recall the case, we have operated on a pilot project for a number of months, and then the project was extended as far as the area and operation was concerned, and that the pilot allowable has been carried over, and this is the first extension of that pilot allowable, as I understand it, and we are asking for two additional wells to be put under the capacity. Of course, as Mr. Campbell says, in some cases the top unit allowable is unrealistic for us to have marginal wells, but we reduce the production on our well to meet the marginal allowable. Even though the State grants us a greater amount we reduce our production to the amount of oil that the well will produce. We are not particularly interested in this case solely on its own condition, but as a matter of absorbing the large part of the demand for New Mexico crude, which will affect all operators in the State. We do feel that each water flood project is entitled to its fair share and in our opinion that fair share is the top unit allowable times the acre units in the project. I think they are entitled to it, and I think they should have it and since Case 1214 has been set out on a permanent basis for allowable, we suggest that that be carried over into this case too.

MR. NUTTER: Do you have anything further, Mr. Campbell?

MR. CAMPBELL: No, sir.

MR. NUTTER: If there is nothing further on Cases 1195 and 1433, we will take the case under advisement and the hearing is adjourned.

C E R T I F I C A T E

STATE OF NEW MEXICO)
: ss
COUNTY OF BERNALILLO)

I, J. A. TRUJILLO, 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 by me and/or 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, the 14th day of November 1958, in the City of Albuquerque, County of Bernalillo, State of New Mexico.

Joseph G. Trujillo
Notary Public

My Commission Expires:

October 5, 1960.

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 1195 & 1435 heard by me on 11-12, 1958.

..... Examiner
New Mexico Oil Conservation Commission

DEARNLEY - MEIER & ASSOCIATES
GENERAL LAW REPORTERS
ALBUQUERQUE, NEW MEXICO
Phone CHapel 3-6691

BEFORE THE OIL CONSERVATION COMMISSION

STATE OF NEW MEXICO

IN THE MATTER OF THE APPLICATION OF GRARIDGE CORPORATION FOR AN EMERGENCY ORDER AUTHORIZING PRODUCTION OF TWO WELLS AT CAPACITY IN THE WATER FLOOD PROJECT HERETOFORE AUTHORIZED IN THE CAPROCK-QUEEN POOL IN LEA AND CHAVES COUNTIES, NEW MEXICO	Case No. 1324

APPLICATION

Comes now Applicant, Graridge Corporation, by its attorneys, and states:

1. The Commission, by its Order No. R-972, and amendments thereto, has heretofore approved a water flood project operated by the Applicant in the Caprock-Queen Pool in Lea and Chaves Counties, New Mexico.

2. Applicant's Well No. 32-5 in the SW¼NW¼ of Section 32, Township 12 South, Range 32 East, upon being tested on October 22, 1958, tested a producing capacity of 41 barrels of oil per day, and Applicant's Well No. 32-11 in the NE¼SW¼ of Section 32, Township 12 South, Range 32 East, upon being tested on the same date, showed a producing capacity of 27 barrels of oil per day, having risen from a producing capacity of 3 barrels of oil per day within a thirty-day period. The increase of production in the aforesaid two wells is due to a response to additional injection wells added to the project upon approval as required by the Commission.

3. The Commission is requested to issue its emergency order authorizing Applicant to operate its two wells at capacity inasmuch as production cannot be curtailed without causing reduction in the ultimate recovery of oil.

WHEREFORE, Applicant requests that an emergency order be issued granting to each of the above described wells an allowable equal to their capacity to produce.

Respectfully submitted,

GRARIDGE CORPORATION

By: Jack M. Campbell
Jack M. Campbell

FOR: CAMPBELL & RUSSELL

BEFORE THE OIL CONSERVATION COMMISSION
OF THE STATE OF NEW MEXICO

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

CASES 1195 & 1433
Order No. R-972-C

APPLICATION OF GRARIDGE CORPORATION
FOR AN ORDER AUTHORIZING CAPACITY
ALLOWABLES FOR TWO WELLS IN THE PROJECT
AREA OF ITS WATER FLOOD PROJECT IN THE
CAPROCK-QUEEN POOL IN LEA AND CHAVES
COUNTIES, NEW MEXICO.

ORDER OF THE COMMISSION

BY THE COMMISSION:

This cause came on for hearing at 1 o'clock p.m. on November 12, 1958, at Santa Fe, New Mexico, before Daniel S. Nutter, Examiner duly appointed by the Oil Conservation Commission of New Mexico, hereinafter referred to as the "Commission," in accordance with Rule 1214 of the Commission Rules and Regulations.

NOW, on this 12th day of November, 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, Graridge Corporation, is the operator of a water flood project in the Caprock-Queen Pool, Lea and Chaves Counties, New Mexico, a portion of which project is in Township 12 South, Range 32 East, NMPM, Lea County, New Mexico.

(3) That the said water flood project has caused an increase in the producing capacity of two wells in the project area to the extent that they are now capable of producing in excess of the top unit allowable for the Caprock-Queen Pool.

(4) That permission is sought to produce the following-described wells at capacity, on the ground that the production from a water flood project cannot be curtailed without causing a reduction in the ultimate recovery of oil:

Cap Unit Well No. 32-5, SW/4 NW/4 of Section 32
Cap Unit Well No. 32-11, NE/4 SW/4 of Section 32

both in Township 12 South, Range 32 East, NMPM, Lea County, New Mexico.

(5) That the entire record in Case Nos. 1195, 1324 and 1433 was incorporated by reference in the subject hearing.

(6) That the preponderance of the evidence presented in these cases indicates that waste might occur if the production from the above-described wells were restricted.

(7) That said wells should be permitted to produce at capacity.

IT IS THEREFORE ORDERED:

(1) That the following-described wells be granted an allowable equal to their capacity to produce:

Cap Unit Well No. 32-5, SW/4 NW/4 of Section 32
Cap Unit Well No. 32-11, NE/4 SW/4 of Section 32

both in Township 12 South, Range 32 East, NMPM, Lea County, New Mexico.

(2) That this order shall become effective at 7 o'clock a.m., Mountain Standard Time, November 13, 1958.

(3) That the Commission hereby retains jurisdiction of this cause to amend or revoke all or any part of this order, and further, to enter any additional order or orders deemed necessary.

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/

OIL CONSERVATION COMMISSION
P. O. BOX 871
SANTA FE, NEW MEXICO

October 29, 1958

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 Emergency Order No. E-12 issued October 28, 1958, by the Oil Conservation Commission.

Very truly yours,

A. L. Porter, Jr.
Secretary - Director

bp
Encls.

COPY

BEFORE THE OIL CONSERVATION COMMISSION
OF THE STATE OF NEW MEXICO

IN THE MATTER OF THE APPLICATION OF GRARIDGE CORPORATION FOR AN EMERGENCY ORDER GRANTING CAPACITY ALLOWABLES FOR TWO WELLS IN THE CAPROCK-QUEEN POOL, LEA AND CHAVES COUNTIES, NEW MEXICO.

EMERGENCY ORDER NO. E-12

NOW, on this 28th day of October, 1958, the Oil Conservation Commission of New Mexico, a quorum being present, having considered the application of Graridge Corporation for an Emergency Order and being fully advised in the premises,

FINDS:

(1) That Graridge Corporation was authorized by Order No. R-972 and amendments thereto, to institute a water flood project in the Caprock-Queen Pool, Lea and Chaves Counties, New Mexico.

(2) That Graridge Corporation is the operator of the following described wells which are situated in the aforementioned water flood project area:

Cap-Unit Well No. 32-5, SW/4 NW/4 of Section 32;
Cap-Unit Well No. 32-11, NE/4 SW/4 of Section 32;

both in Township 12 South, Range 32 East, NMPM, Caprock-Queen Pool, Lea County, New Mexico.

(3) That said water flood project has caused an increase in the producing capacity of the above-described wells to the extent that they are now or soon may be capable of producing in excess of the top unit allowable for the Caprock-Queen Pool.

(4) That there is a possibility that waste will occur if the production from the above-described wells is curtailed.

(5) That an emergency exists which requires the promulgation of an order, without notice and hearing, to eliminate the possibility of waste occurring as a result of a curtailment of the production from said wells.

(6) That a hearing should be held on November 12, 1958, to determine whether waste will actually result if the production from the said wells is curtailed.

(7) That in the event the applicant fails to prove that waste will be caused if the production from the above-described wells is curtailed, then any oil produced from said wells in excess of the normal unit allowable shall be charged against future allowables for said wells.

IT IS THEREFORE ORDERED:

(1) That the following described wells be granted an allowable equal to their capacity to produce, effective October 29, 1958, to-wit:

Cap-Unit Well No. 32-5, SW/4 NW/4 of Section 32;
Cap-Unit Well No. 32-11, NE/4 SW/4 of Section 32;

both in Township 12 South, Range 32 East, NMPM, Caprock-Queen Pool, Lea County, New Mexico.

(2) That this order shall become effective at 7 o'clock a.m. Mountain Standard Time on October 29, 1958.

(3) That a hearing be held at 1 o'clock p.m. on November 12, 1958, to permit the applicant to appear and show cause why the above-referenced wells should be granted capacity allowables.

(4) That in the event the applicant fails to prove that waste will be caused if the production from the above-described wells is curtailed, then any oil produced from said wells in excess of the normal unit allowable shall be charged against future allowables for said wells.

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. 30-58

DOCKET: EXAMINER HEARING NOVEMBER 12, 1958

Oil Conservation Commission 1 p. m. Mabry Hall, State Capitol, Santa Fe, New Mexico

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

CASES 1195 & 1433:

Application of Graridge Corporation for capacity allowables for certain wells in a water flood project. Applicant, in the above-styled cause, seeks an order authorizing capacity allowables for the following described wells which are situated in the project area of its water flood project in the Caprock-Queen Pool in Lea and Chaves Counties, New Mexico:

Cap Unit Well No. 32-5, SW/4 NW/4 Section 32
Cap Unit Well No. 32-11, NE/4 SW/4 Section 32

both in Township 12 South, Range 32 East, Lea County, New Mexico.

R 31 E

R 32 E

Grayridge
EXT NO 1 11/12

L E A

25

30

29

C H A V E S

31

32

38

T 12 S

T 13 S

6

5

7

8

- Producing Queen Sd. Well.
- Present Injection Well.
- Proposed Injection Well.
- Water Supply Well (200').
- Proposed Water Supply Well.
- Water Injection Plant "1".
- Water Injection Plant "2" (Prop.)
- Present Injection System
- Future Injection System
- Proposed Injection Well — Requested Administrative Approval
- (11/Water) Daily Production

NORTH CAPROCK QUEEN UNIT
No. 1
CHAVES & LEA COUNTIES NEW MEXICO

Scale 1" = 2000'

CASE RECORD FILE

1195 + 1433 B

CASES 1195 & 1433: Hearing 1/20/59

BEFORE THE
OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO

IN THE MATTER OF:

Cases 1195 and 1433

TRANSCRIPT OF HEARING

JANUARY 20, 1959

DEARNLEY - MEIER & ASSOCIATES
GENERAL LAW REPORTERS
ALBUQUERQUE NEW MEXICO
Phone CHapel 3-6691

NEW MEXICO OIL CONSERVATION COMMISSION

Mabry Hall

Santa Fe, NEW MEXICO

REGISTER

HEARING DATE Examiner January 20, 1959 **TIME:** 1:30 p.m.

NAME:	REPRESENTING:	LOCATION:
Jack M Campbell	Campbell & Russell	Roswell NM
John Kemp	Gen'l Western	Midland
B. H. Lawrence	Grandge Corp	Buckingridge, Ind.
T. L. Porter, Jr	O.C.C.	Santa Fe
Oliver E. Payne	O.C.C.	Santa Fe, N.M.

BEFORE THE
OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO

IN THE MATTER OF:	
Cases 1195 and 1433	Application of Graridge Corporation for capacity allowable for one well in a water flood project. Applicant, in the above-styled cause, seeks an order authorizing capacity allowable for the following-described well situated in the project area of its water flood project in the Caprock-Queen Pool in Lea and Chaves Counties, New Mexico:
	Cap Unit Well No. 31-1, NE/4 NE/4 of Section 31, Township 12 South, Range 32 East, Lea County, New Mexico.

Mr. A. L. Porter's Office
Santa Fe, New Mexico
January 20, 1959

BEFORE:

Daniel S. Nutter, Examiner.

TRANSCRIPT OF HEARING

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

The one and only case on the docket this afternoon will be Cases 1195 and 1433.

MR. PAYNE: Cases 1195 and 1433, "Application of Graridge Corporation for capacity allowable for one well in a water flood project."

MR. CAMPBELL: Jack M. Campbell, Campbell and Russell, Roswell, New Mexico, appearing for the applicant.

I have one witness, Mr. Harrison, to be sworn.

(Witness sworn in).

B. G. HARRISON

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

DIRECT EXAMINATION

BY MR. CAMPBELL:

Q Will you state your name, please?

A B. G. Harrison.

Q Where do you live, Mr. Harrison?

A Breckenridge, Texas.

Q By whom are you employed and in what capacity?

A I am employed by the Graridge Corporation as Manager of Secondary Recovery.

Q What is your profession?

A Engineer.

Q Have you testified previously before this Commission or its examiners?

A Yes, I have, Mr. Campbell.

MR. CAMPBELL: Are the witness' qualifications acceptable?

MR. NUTTER: Yes, they are. Please proceed.

Q (By Mr. Campbell) Mr. Harrison, are you acquainted with the North Caprock-Queen Unit Number 1 Water Flood Project?

A Yes, sir.

Q Is Graridge the operator of that project?

A Yes, sir.

(Whereupon, the document was marked as Applicant's Exhibit Number One for identification.)

Q (By Mr. Campbell) I am going to hand you what has been identified as Applicant's Exhibit Number One and ask you to state what that is, please?

A This is a plat showing the North Caprock-Queen Unit Number 1 operated by the Graridge Corporation, and reflects the present injection wells as indicated by the red, the wells, injection wells, that have received administrative approval but are not presently under injection indicated in blue, and the wells as indicated in green, which are to be injection wells and which administrative approval has been requested but has not been granted.

Q Will you state also what the figures are that appear adjacent to certain producing well locations?

A The figures adjacent to the well numbers are figures indicating the oil and water production from each of these wells during the latest test that we have from each well.

Q Now, with reference to the wells in blue, would you state for the Examiner what the status of those is with regard to their being used as water injection wells?

A Wells Number 32-6 and 32-10 have been prepared for injection and we expect to have water going in those within the next few days. Well Number 32-4 is the location to be drilled as replacement well for a plugged and abandoned well.

Q Now, referring to Exhibit Number One, will you identify on the exhibit the well covered by this application for which you seek capacity allowable, please?

A The well is Unit Well Number 31-1 and it is located in the northeast of the northeast of Section 31.

Q Are you sure of that location? Yes, yes, and what is it you now are seeking in connection with that well?

A We are seeking a capacity-type allowable in order that we may prevent waste by being able to produce this well at its top capacity.

Q What is the date of this test of 43 barrels?

A This 43-barrel test was on January 12.

Q In your opinion, if you are not permitted to produce this well at capacity, would it result in loss of ultimate recovery of oil?

A Yes sir, it would, Mr. Campbell.

(Whereupon, the document was marked as Applicant's Exhibit Number Two for identification.)

Q (By Mr. Campbell) Now, I am going to hand you what has been identified as Applicant's Exhibit Number Two and ask you to state what that is, please?

A This is a set of composite curves that reflect the production and injection from the entire Caprock-Queen Unit Number 1, and it indicates that we produced some 45,000 barrels of oil during the month of December while injecting some 160,000

barrels of water.

Q Are some of the wells in the project and in the pilot area of the project now declining in production?

A Yes, they are, Mr. Campbell. We have had three wells, I believe, in the area that are showing decline. One of the major producers has declined to some 150 barrels per day now.

Q And what was it at its peak?

A At its peak, it was somewhere in the order of 570 barrels per day.

Q And about how long did that peak production stay there?

A In the order of two months.

Q I notice also on Exhibit Number One that there are some wells, principally 31-7 and 31-9, showing sizeable water production. Could you explain what your situation is with regard to those wells?

A Through an interference test, we shut in Well Number 31-10, this being an injection well. We have discovered that we have had apparently a water break-through from this well. We believe this to have been caused by the air injection program which was conducted in this area. At present, we feel like the water cuts to a point now that we should shut Number 31-10 in for a short period of time and determine if other wells offsetting this injection well, such as Number 31-11 and Number 31-15, are being affected by this well. If not, then we feel like that some remedial work should be done to Number 31-10, something

in the order of a selective plugging.

Q Do you have anything further you would like to tell the Examiner in regard to either of these two exhibits, Mr. Harrison?

A I think I might explain one thing, Mr. Campbell, that the reason for the delay in placing 32-6 and 32-10 on injection after receiving administrative approval was a result of inadequate water supply. We received permission to drill a water well in Section 6 in the latter part of November, I believe November 28, and we started a water well shortly thereafter and we have had considerable trouble in completing this well, but the well is complete now and it will supply sufficient water now that we'll be able to place these wells on injection.

MR. CAMPBELL: I believe that's all, Mr. Examiner.

CROSS EXAMINATION

BY MR. NUTTER:

Q Mr. Harrison, your Exhibit Number--I am having a little bit of difficulty tracking some of these lines here.

A All right, sir.

Q Now, on this upper area on this line that starts where it is labeled, "Primary life of the total unit area,"where does that line go, does it get over into 1957?

A That primary life of the unit area extends on up and eventually becomes the total unit production curve. The primary life curve would be only until we received our first increase

from the water flood production.

Q Does it intersect one of these vertical lines that passes by it there or --

A No, it's a continuous line.

Q Mr. Harrison, if I hand you some colored pencils, would you indicate the courses that those several lines follow on the exhibit, please?

A Yes.

MR. CAMPBELL: After you finish, identify each of those lines by color, will you, after you finish them?

A All right.

MR. CAMPBELL: What colors have you marked those lines?

A I have indicated the primary life of the total unit area in red, and I projected it into the curve as we received our first increase from the water flood and from that point on, it reflects water flood oil rather than secondary--rather, primary oil.

Q (By Mr. Nutter) So the primary life production after the injection of water has commenced becomes the secondary recovery as well, is that correct?

A Yes, that is right. We do not have a break-down here showing the primary oil that was--would have been produced had not the water flood been instituted; however, we do have a line that is shown as a dashed red line that indicated the cumulative oil above the normal primary decline, which indicates that we have

produced some--almost 300,000 barrels of secondary oil.

MR. NUTTER: Off the record here a minute.

(Discussion off the record.)

Q (By Mr. Nutter) Mr. Harrison, is it your opinion that the injection of water in this area has caused an increase in the ultimate amount of oil that will be recovered?

A Yes, sir.

Q Are you acquainted with the previous record in this case in which certain experts testified that it would be necessary to produce these wells at a rate in excess of the normal unit allowable for the Caprock-Queen Pool?

A Yes, Mr. Nutter, I have read those transcripts of the hearing.

Q Is it your belief as an engineer in the field of water flooding that the expert opinion expressed in those hearings does reflect the condition that exists in this area?

A Yes sir, I agree with the experts that testified that capacity-type allowables were necessary to prevent waste in water floods.

Q And you feel that this well Number 31-1, will, in order to increase the ultimate recovery of oil, have to be produced at a rate in excess of the normal unit allowable?

A Yes, sir.

Q Are there any other wells at the present time in the Caprock-Queen unit area which are capable of producing in excess

of the top unit allowable for which authorization of such excessive production has not been received?

A No, sir.

Q The well that you mentioned that had had a peak production rate of some 590 barrels a day and has now declined to the neighborhood of 150 barrels per day is identified as which well, Mr. Harrison?

A Number 61.

Q In the northeast northeast of Section 6, correct?

A Yes, sir.

Q How long has 32-13 been producing in the neighborhood of 576 barrels?

A It's in the neighborhood of two months now and we don't have a test on that well during the last few days, but we do know that it is making some water now.

Q It has started to make water?

A Yes, sir.

Q Do you expect the productive capacity of the well to decline in the near future?

A Yes, we believe that it has reached its peak and will decline.

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

If not, he may be excused. (Witness excused).

MR. CAMPBELL: I would like to offer Applicant's

Exhibits One and Two in evidence.

MR. NUTTER: Is there objection to the introduction of Applicant's Exhibits One and Two in the case?

If not, they will be received.

MR. PAYNE: Mr. Campbell, do you want to introduce the entire record in Cases Number 1195 and 1433?

MR. CAMPBELL: We ask that the prior record in Cases Number 1195 and 1433 be considered to be a part of the record in this hearing.

MR. NUTTER: Is there objection to this motion?

If not, the record will be considered a part of this case.

Does anyone have anything further they wish to offer in this case?

MR. PAYNE: Mr. Campbell, when does this emergency order of yours expire?

MR. CAMPBELL: The emergency order--I'm sorry, I do not have a copy of the emergency order, so I don't know its date.

MR. NUTTER: Here is the one effective at seven o'clock on January 5.

MR. CAMPBELL: January 5, so --

MR. PAYNE: It would expire tomorrow morning at seven o'clock?

MR. CAMPBELL: Yes.

MR. PORTER: Right.

MR. CAMPBELL: That's correct.

MR. PAYNE: Mr. Examiner, we received one statement here from Gulf Oil Corporation.

MR. NUTTER: Would you read it into the record?

MR. PAYNE: "Gulf Oil Corporation, being a working interest owner in the North Caprock-Queen Unit Number 1, concurs with the Graridge Corporation in their application in Cases 1195 and 1433 scheduled for examiner hearing January 20, 1959, and urges approval by the Commission."

MR. NUTTER: Is there anything further in this case?

If not, we will take the consolidated cases, 1195 and 1433, under advisement, and the hearing is adjourned.

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 1195 & 1433 heard by me on 1-20, 19 59.

..... Examiner
New Mexico Oil Conservation Commission

STATE OF NEW MEXICO)
: ss
COUNTY OF BERNALILLO)

I, JERRY MARTINEZ, Notary Public in and for the County of Bernalillo, State of New Mexico, do hereby certify that the foregoing and attached Transcript of Hearing was reported by me in Stenotype and that the same was reduced to typewritten transcript by me and contains a true and correct record of said hearing, to the best of my knowledge, skill and ability.

DATED this 21st day of January, 1959, in the City of Albuquerque, County of Bernalillo, State of New Mexico.

Jerry Martinez
Notary Public

My Commission Expires:
January 24, 1962

DEARNLEY-MEIER & ASSOCIATES
General Law Reporters
ALBUQUERQUE, NEW MEXICO
Phone CHapel 3-6691

CLASS OF SERVICE
This is a fast message unless its deferred character is indicated by the proper symbol.

WESTERN UNION
TELEGRAM

W. P. MARSHALL, PRESIDENT

(13)•= 1201

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DL=Day Letter
NL=Night Letter
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NEW MEXICO OIL CONSERVATION COMMISSION=

STATE CAPITOL BLDG SANTA FE NMEX=

GULF OIL CORPORATION, BEING A WORKING INTEREST OWNER IN THE NORTH CAPROCK QUEEN UNIT NO 1, CONCURS WITH THE GRARIDGE CORPORATION IN THEIR APPLICATION IN CASES 1195 AND 1433 SCHEDULED FOR EXAMINER HEARING JANUARY 20, 1959, AND URGES APPROVAL BY THE COMMISSION=

GULF OIL CORPORATION==

1 1195 1433 20 1959=

THE COMPANY WILL APPRECIATE SUGGESTIONS FROM ITS PATRONS CONCERNING ITS SERVICE

OIL CONSERVATION COMMISSION
P. O. BOX 871
SANTA FE, NEW MEXICO

P.O. Box 871
Santa Fe, New Mexico
January 5, 1959

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 Emergency Order E-13 issued January 5, 1959, by the Oil Conservation Commission.

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 NEW MEXICO FOR
THE PURPOSE OF CONSIDERING:

CASES 1195 and 1433
Order No. R-972-D

APPLICATION OF GRARIDGE CORPORATION
FOR AN ORDER AUTHORIZING A CAPACITY
ALLOWABLE FOR ONE WELL IN THE PROJECT
AREA OF ITS WATER FLOOD PROJECT IN
THE CAPROCK-QUEEN POOL, LEA AND CHAVES
COUNTIES, NEW MEXICO.

ORDER OF THE COMMISSION

BY THE COMMISSION:

This cause came on for hearing at 1:30 p.m. on January 20, 1959, at Santa Fe, New Mexico, before Daniel S. Nutter, Examiner duly appointed by the Oil Conservation Commission of New Mexico, hereinafter referred to as the "Commission," in accordance with Rule 1214 of the Commission Rules and Regulations.

NOW, on this 20th day of January, 1959, 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, Graridge Corporation, is the operator of a water flood project in the Caprock-Queen Pool, Lea and Chaves Counties, New Mexico, a portion of which project is in Township 12 South, Range 32 East, NMPM, Lea County, New Mexico.

(3) That the said water flood project has caused an increase in the producing capacity of one well in the project area to the extent that it is now capable of producing in excess of the top unit allowable for the Caprock-Queen Pool.

(4) That permission is sought to produce the following-described well at capacity, on the ground that the production from a water flood project cannot be curtailed without causing a reduction in the ultimate recovery of oil:

Cap Unit Well No. 31-1, NE/4 NE/4 of Section 31, Township 12 South, Range 32 East, Lea County, New Mexico.

(5) That the entire record in Case Nos. 1195 and 1433 was incorporated by reference into the record of the subject case.

(6) That the preponderance of the evidence presented in these cases indicates that waste might occur if the production from the above-described well is restricted.

(7) That said well should be permitted to produce at capacity.

IT IS THEREFORE ORDERED:

(1) That the following-described well be granted an allowable equal to its capacity to produce:

Cap Unit Well No. 31-1, NE/4 NE/4 of Section 31, Township 12 South, Range 32 East, NMPM, Lea County, New Mexico.

(2) That this order shall become effective at 7 o'clock a.m., Mountain Standard Time, January 20, 1959.

(3) That the Commission hereby retains jurisdiction of this cause to amend or revoke all or any part of this order, and further, to enter any additional order or orders deemed necessary.

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

STATE OF NEW MEXICO
OIL CONSERVATION COMMISSION

JOHN BURROUGHS, Chairman

MURRAY E. MORGAN, Member

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

ir/

BEFORE THE OIL CONSERVATION COMMISSION
OF THE STATE OF NEW MEXICO

IN THE MATTER OF THE APPLICATION
OF GRARIDGE CORPORATION FOR AN
EMERGENCY ORDER GRANTING A CAPACITY
ALLOWABLE FOR ONE WELL IN THE
CAPROCK-QUEEN POOL, LEA AND CHAVES
COUNTIES, NEW MEXICO.

EMERGENCY ORDER NO. E-13

NOW, on this 5th day of January, 1959, the Oil Conservation Commission of New Mexico, a quorum being present, having considered the application of Graridge Corporation for an Emergency Order and being fully advised in the premises,

FINDS:

(1) That Graridge Corporation was authorized by Order No. R-972 and amendments thereto, to institute a water flood project in the Caprock-Queen Pool, Lea and Chaves Counties, New Mexico.

(2) That Graridge Corporation is the operator of the following described well which is situated in the aforementioned water flood project area:

Cap-Unit Well No. 31-1, NE/4 NE/4 of Section 31, Township 12 South, Range 32 East, NMPM, Caprock-Queen Pool, Lea County, New Mexico.

(3) That said water flood project has caused an increase in the producing capacity of the above-described well to the extent that it is now or soon may be capable of producing in excess of the top unit allowable for the Caprock-Queen Pool.

(4) That there is a possibility that waste will occur if the production from the above-described well is curtailed.

(5) That an emergency exists which requires the promulgation of an order, without notice and hearing, to eliminate the possibility of waste occurring as a result of a curtailment of the production from said well.

(6) That a hearing should be held on January 20, 1959, to determine whether waste will actually result if the production from said well is curtailed.

(7) That in the event the applicant fails to prove that waste will be caused if the production from the above-described well is curtailed, then any oil produced from said well in excess of the normal unit allowable shall be charged against the future allowable for said well.

IT IS THEREFORE ORDERED:

(1) That the following described well be granted an allowable equal to its capacity to produce, effective January 5, 1959, to-wit:

Cap-Unit Well No. 31-1, NE/4 NE/4 of Section 31, Township 12 South, Range 32 East, NMPM, Caprock-Queen Pool, Lea County, New Mexico.

(2) That this order shall become effective at 7 o'clock a.m. Mountain Standard Time on January 5, 1959.

(3) That a hearing be held at 1:30 o'clock p.m. on January 20, 1959, to permit the applicant to appear and show cause why the above-referenced well should be granted a capacity allowable.

(4) That in the event the applicant fails to prove that waste will be caused if the production from the above-described well is curtailed, then any oil produced from said well in excess of the normal unit allowable shall be charged against the future allowable for said well.

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

STATE OF NEW MEXICO
OIL CONSERVATION COMMISSION

JOHN BURROUGHS, Chairman

MURRAY E. MORGAN, Member

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

ir/

BEFORE THE OIL CONSERVATION COMMISSION

STATE OF NEW MEXICO

IN THE MATTER OF THE APPLICATION OF GRARIDGE CORPORATION FOR AN EMERGENCY ORDER AUTHORIZING PRODUCTION OF ONE WELL AT CAPACITY IN THE WATER FLOOD PROJECT HERETOFORE AUTHORIZED IN THE CAPROCK-QUEEN POOL IN LEA AND CHAVES COUNTIES, NEW MEXICO.	CASES 1195 & 1433

APPLICATION

Comes now Applicant, Graridge Corporation, by its attorneys, and states:

1. The Commission, by its Order No. R-972, and amendment thereto, has heretofore approved a water flood project operated by the Applicant in the Caprock-Queen Pool in Lea and Chaves Counties, New Mexico.

2. Applicant's Well No. 31-1 in the NE¼NE¼ of Section 31, Township 12 South, Range 32 East, upon being tested on December 28, 1958, tested a producing capacity of 42 barrels of oil per day. The increase of production in the said well is due to a response to additional injection wells added to the project upon approval as required by the Commission.

3. The Commission is requested to issue its emergency order authorizing Applicant to operate its well at capacity inasmuch as production cannot be curtailed without causing reduction in the ultimate recovery of oil, the effect of which would be the waste of oil.

WHEREFORE, Applicant requests than an emergency order be issued granting to the above described well an allowable equal to its capacity to produce, and that the Commission set this matter down before an Examiner at a date prior to the expiration date of the emergency order and advertise the matter as provided by law.

Respectfully submitted,

GRARIDGE CORPORATION

Jack M. Campbell

CAMPBELL & RUSSELL, It's Attorneys

CASE RECORD

FILE

1195

CASE 1135: Cfaridge Corp., Gulf Oil & Ga[illegible]
[illegible] Co. Application for approval
of pilot water flood program.

BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico

IN THE MATTER OF:

Case No. 1195

TRANSCRIPT OF PROCEEDINGS

DEARNLEY - MEIER & ASSOCIATES
INCORPORATED
GENERAL LAW REPORTERS
ALBUQUERQUE - SANTE FE
3-6691 2-2211

January 9, 1957

BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
January 9, 1957

IN THE MATTER OF:

Application of Graridge Corporation, Gulf Oil Corporation and Great Western Drilling Company in compliance with Rule 701 (a) of the New Mexico Oil Conservation Commission Statewide Rules and Regulations for an order granting approval of applicants proposed pilot water flood program in the Queen formation in the Caprock-Queen Pool in Lea and Chaves Counties, New Mexico. Applicants in the above-styled cause seek approval of their proposed pilot water flooding program for the purpose of secondary recovery in which water injection will be made into the Queen formation through six injection wells; said wells to be located in the S/2 of Section 31, Township 12 South, Range 32 East, the NE/4 of Section 6 and NW/4 of Section 5, Township 13 South, Range 32 East, Caprock-Queen Pool, Lea and Chaves Counties New Mexico.

No. 1195

BEFORE:

Mr. Warren W. Mankin, Examiner

TRANSCRIPT OF PROCEEDINGS

MR. MANKIN: The hearing will come to order. The next case on the docket is Case No. 1195.

MR. GURLEY: Case No. 1195, the application of Graridge Corporation, Gulf Oil Corporation and Great Western Drilling Company in compliance with Rule 701 (a) of the New Mexico Oil Conservation Commission Statewide Rules and Regulations for an order granting approval of applicants proposed pilot water flood program in the Queen formation in the Caprock-Queen Pool in Lea and Chaves Counties, New Mexico.

MR. ELLIOTT: Mr. J. L. Elliott, Attorney for Graridge Corporation, and representing Gulf Oil Corporation and Great Western Drilling Company, in addition to Graridge, relative to this application, and we have one witness to be sworn.

MR. GURLEY: State your name, please.

MR. VICH: Robert H. Vich.

(Witness sworn.)

ROBERT H. VICH

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

DIRECT EXAMINATION

BY: MR. ELLIOTT:

Q Mr. Vich, you are Water Flood Engineer with Graridge Corporation in Texas?

A I am.

Q Have you been qualified before the Commission previously before this time?

A Yes, sir, on two different occasions, separate applications. On the first one, the application for the Red Lake Unit in Eddy County, New Mexico; the second time was an application for pilot water flood by the Ibex Company in Eddy County, New Mexico, on the 13th of December 19--.

MR. ELLIOTT: Is the Examiner satisfied with the qualifications of the witness?

MR. MANKIN: The qualifications are satisfied. Proceed.

MR. ELLIOTT: We would first like to present our

Exhibit No. 1, which sets up the field plat of the area, showing all the oil wells, location of the proposed pilot water flood--

MR. MANKIN: You want this marked Exhibit No. 1?

MR. ELLIOTT: Yes, sir. I believe it is already marked up there.

MR. MANKIN: All right.

Q Mr. Vich, you are familiar with this field plat and the pilot water flood project set up thereon?

A Yes, it was prepared under my direction and is true as represented.

Q Would you discuss with the Examiner the location of the wells?

MR. MANKIN: Would you speak up, please, so that everyone can hear?

MR. ELLIOTT: You want me to re-state that question?

MR. MANKIN: No, go ahead, please.

A The proposed pilot water flood is outlined in the center of Exhibit No. 1 in portion of Section 31, Township 12 South, Range 32 East, and Section -- wait a minute. We got the wrong exhibit. I am sorry. We made a mistake.

MR. MANKIN: The exhibit that you just gave out is not for Case No. 1190, but for Case No. 1190?

A That's correct, sir.

MR. MANKIN: You want that marked exhibit No. 1?

A Yes, sir.

(Generalized Exhibit No. 1 marked for identification.)

A (Cont'd) The Exhibit No. 1, as we have presented, has outlined the proposed pilot flood pattern, showing the six injection wells in portion of Section 31, Township 13 South, Range 32 East, and portion of Section 6, Township 14 South, Range 32 East of Lea County, New Mexico. And also shown on Exhibit No. 1 are the proposed water supply wells which are currently completed and which will be discussed later; and also the area that will be affected by the proposed pilot water flood program is outlined on Exhibit No. 1.

MR. ELLIOTT: May it please the Examiner, we would like to put in evidence now as Exhibit No. 2 a Data Sheet, which will be briefly discussed, relative to the production.

MR. MANKIN: You only have one copy of this?

MR. ELLIOTT: Here is another one.

(Gearldee's Exhibit No. 2 marked for identification.)

Q Mr. Vich, will you discuss this Data Sheet briefly with the Examiner as to production in the area, depth, and so forth?

A The Data Sheet contains the proposed flooding plans and outlines the reservoir conditions and the expected recoveries, and our source of water supply, with the general discussion, and the cumulative production, by a lease, and also there is an attachment on the back of the wells, producing wells to be affected by the proposed pilot, and also the cumulative production, primary production from these to be affected wells.

[illegible] what is the sand formation that you propose to

pilot flood?

A It is the Intera or Rel Sand interval of the Dean formation found at a depth of approximately three thousand feet, or plus one thousand four hundred fifty sub-sea feet.

Q Do you have any other discussion relative to the Data Sheet to make at this time?

A No, that is all.

MR. ELLIOTT: May it please the Examiner, I would like to present as Exhibit No. 3 a Structure Map of this pool.

(Gravidge's Exhibit No. 3 marked for identification.)

Q Mr. Vich, do you have any discussion relative to this Structure Map?

A The Structure Map is as shown on the exhibit and due to the well completion methods in the sub-pool, we were unable to obtain definite sand thickness. Most of the wells were completed, drilled with rotary down to approximately three thousand feet and drilled in with cable tools, and all of the sub-sand section was not drilled in all of the wells, so we were unable to complete an isopach map of the area. But the overall sand thickness averages approximately ten to twelve feet as far as we could ascertain.

Q Mr. Vich, to your knowledge has not an agreement been entered into between [illegible] relative to a cooperative flood?

A Yes, sir, the [illegible]

lease-line operating basis between Graridge, Great Western and the Gulf Oil Corporation as to method of participation and joint sharing in costs and so on, which is all outlined in the unit agreement of which we have a copy here.

MR. ELLIOTT: At this time, if it please the Examiner, I would like to introduce as Exhibit No. 4 an executed copy of this water flood agreement between the three companies. Is that all the copies you have?

MR. MANKIN: Do you desire to withdraw this and substitute another copy? Do you have another copy that could be substituted and submitted?

MR. ELLIOTT: We could make a photostatic copy of that.

A We have ample executed copies in our office. That is a spare.

(Graridge's Exhibit No. 4 marked for identification.)

MR. ELLIOTT: We can retain this?

A Yes.

MR. ELLIOTT: Would one copy suffice?

MR. MANKIN: Yes, sir.

Q Mr. Mah, at this time, would you discuss with the Examiner your well completion program for this project?

A Well, as initially intended to produce the water injection into the Queen sand formation. The present completion of all the producing wells in the area, the entire, the oil zones [illegible]

feet which is [illegible] feet above the pay interval and is designed to set in cement liners from the bottom of the casing to the top of the green sand into the top of the queen sand to confine the water injection definitely to the queen formation.

Q. What have you done about your water supply? Have you had approval to use water in that area from the state engineer?

A. Well, to begin with, in one of the old producing wells drilled earlier in the field, we had been taken down to the San Andres formation, which is at approximately 4300 feet, and from the San Andres they had an indicated show of salt water. We tried to re-enter this well, which is in Section 31, Township 17 South, Range 32 East, to obtain this salt water supply to be used for flooding purposes. Due to junk, miscellaneous material in the hole, we were unable to re-complete the well and had to abandon the endeavor, and subsequent to that Great Western Drilling Company deepened one of their Queen sand wells approximately six miles south of this proposed area and to the San Andres and obtained approximately 120 barrels per day from the San Andres after a 10,000 acid treatment and this project was abandoned as a possible source of injection water. During this interval we have been working with the Nevada Petroleum Corporation in an effort to obtain salt water from the [illegible] salt water disposal system which is presently being installed. The [illegible] that is what Nevada has informed us that they are anticipating [illegible] possibly re-injecting the salt water from the

disposal system back into the Devonian Formation and their investigation won't be complete for approximately six months to another year's time, so we have made application to the state engineer's office for the use of fresh water from presently completed water wells in the 350-foot sand interval occurring locally in the area of Section 31 and Section 6 and have obtained approval from the State Engineer's office for the use of 94 acre feet per annum from each of these water wells for use in the pilot flood.

Q What depths are these water wells?

A Approximately 350 feet, a sand interval of 350 feet, which is water productive. The wells have been tested and are capable of producing in excess of 2000 barrels per day each.

Q Mr. Vich, is this telegram and other papers pertinent to the application, the ones that you have in your file with reference to obtaining permits for the use of these fresh water wells?

A Yes, sir, that is.

MR. ELIOTT: At this time I would like to introduce as Exhibit No. 5 the telegram and other papers pertinent to this hearing that the use of these fresh water wells has been approved.

MR. KELLY: Do you want to have these returned or do you wish to have them made a exhibit or record?

A We have copies of them.

MR. KASTLER: Exhibit No. 1?

A Yes, sir.

MR. KASTLER: Could it be No. b-1, [illegible].

(Guardise's exhibits Nos. b-A, b-B and b-C, respectively, marked for identification.)

Q Mr. Vieh, generally is this project as proposed in the interest of conservation and protection of waste?

A We definitely consider it so from an engineering standpoint. The majority of the wells in the Caprock pool, in this portion of the pool, are at the approximate economic limit and unless some secondary recovery means is installed, a great majority of the wells will have to be abandoned due to economic conditions and with the subsequent loss of the volumes of oil that we have indicated on Exhibit No. 4 which can be recovered by water flooding would be otherwise unrecoverable.

MR. ELLIOTT: I believe that's all the questions we have at this time but at this time I should like to give Gulf Oil Company, which is represented, an opportunity to make a statement or ask any questions.

MR. KASTLER: We will get to that too, shortly.

MR. QUINEY: We would like to ask one thing, Mr. Elliott. Suggest that you finish qualifying your exhibits as to the examination, if you will, sir; as to whether or not they were prepared by him or under his direction.

Q Mr. Vieh, these five exhibits that we have entered here

were they prepared by you or under your direction?

A Yes, sir, they were either prepared by me or under my supervision. Yes, sir.

MR. WALKER: You want to move the admittance of your exhibits?

MR. ELLIOTT: I move that these five exhibits be introduced into evidence as a matter of record.

MR. MANKIN: Is there any objection to entering Exhibits Nos. 1 through 5 in Case No. 1165? If not, they will be so entered. Do you have anything further?

MR. KASTLER: Nothing further. Gulf Oil Corporation does not have anything to add at this time. This matter has been discussed with our water flood people in Fort Worth. The question is somewhat open. Mr. Walker wasn't instructed to come in and make any further statement at this time, but we are going to examine the exhibits at an early date and we will enter our statement later.

MR. QUIGLEY: No cross-examination of the witness at this time?

MR. KASTLER: No, we don't --

MR. QUIGLEY: Just a moment. We are going a little ahead.

MR. MANKIN: You want to finish the questioning before we get the statements?

CROSS-EXAMINATION

BY: MR. MANKIN:

Q. Mr. Nash, this proposed pilot water flood is essentially

all on State lands, is that correct?

A That's correct.

Q All of the injection wells and the producing wells of Gulf, Granidge and Great Western are essentially in a standard location, is that correct?

A That's correct.

Q The pilot water flood which you propose to put in is essentially a five spot pattern?

A Two ninety acre five spot pattern.

Q Two eighty acre five spot patterns?

A Yes, sir.

Q Do you wish to amend your application to reflect that instead of the Caprock field, that this is the Caprock-Queen pool? In New Mexico we use the term "pool." Would you like to amend your application accordingly?

A Yes, we would.

MR. WYKIN: We will accept that amendment.

Q Mr. Vich, you indicated that the State Engineer's office has authorized the use of this fresh water from a zone of approximately 350 feet. Was this authority for just the pilot flood operation?

A That's correct.

Q After the pilot flood has been terminated, the amount of water, if it is to be taken from a fresh water zone, would then be determined?

A That is correct. Well, we can't the process or we will continue to investigate the other water source studies for possible expansion of the pilot flood if it proves successful.

MR. MANKIN: Are there any other questions of the witness?

MR. MORLEY: I have a question. On your Exhibit No. 1, Mr. Vich, you indicate that most of these wells owned by Mobil and Livermore are affected. Is Graridge the operator for these particular wells?

A Yes, sir. The operator's name is on the top of the lease there.

MR. MORLEY: Oh, I see. That's fine. Thank you.

MR. MANKIN: Any other questions?

MR. CAMPBELL: Just for the purpose of clarifying that, I would like to ask whether or not other companies are involved in this other than Grace Western or Gulf?

A They are the only ones that have producing wells that will be immediately affected by the proposed pilot flood.

MR. IRBY: I am Frank E. Irby. With respect to the State Engineer's permit, you stated the limitations that were placed on there with respect to the same field of water and with respect to the pilot flood. Is there not another limitation there in time?

A Yes, sir. In our application I believe it is definitely stated for the time element of the pilot. I believe it is seven

years, I am still open.

MR. IRBY: There is a date of termination on your approval there, isn't there?

A This was just a notice that the approval would be forthcoming, Mr. Irby.

MR. IRBY: The time element is approximately eighteen months from the date of your application. I want to get that into the record. I didn't realize that you didn't have the approved permit.

A I see.

MR. IRBY: Would it be agreeable to Graridge Corporation and the Commission to enter that final date in your record on information from your office or from Mr. Rich's either?

MR. GURLEY: You stipulate that that would be the date. Is that what you are asking, sir?

A Well, Mr. Irby stated that the formal, I mean, the formal approval of our application, which will be forthcoming in a few days, which was noted on the telegram, did stipulate that the time element was eighteen months.

MR. GURLEY: And you gentlemen are agreeable to that date?

A Yes, sir.

MR. GURLEY: We will enter into the record.

MR. MANKIN: Are there any further questions? I have a question.

the amount of water drawn from these two wells. Will the wells support such withdrawal?

A Yes, sir, they have been tested.

MR. MANKIN: And would those at 4000 barrels a day be within the acre-feet withdrawal as granted by the State Engineer's office?

A That is correct, yes, sir.

MR. MANKIN: Are there any other questions of the witness?

MR. HAWKIN: How soon do you expect to obtain results from this flood? I don't believe that was in your water flood data determination was it, Mr. Vich?

A No, sir. We estimate between six months and a year's time. We don't have definite data concerning the exact sand thickness due to gas and such from the reservoir. We have good production record, oil production record, but without the other matter we were unable to definitely ascertain more or less exact fill up time in response to the flood.

MR. MANKIN: So you don't know what percent fill-up you would expect at six months time?

A No, sir. We would definitely be able to evaluate the pilot program sometime between six months and a year's operation, we are quite sure.

MR. MANKIN: When you say "evaluate the program," you feel that within six months to a year's time you would have

MR. MANKIN: Mr. Fish, your Exhibit No. 2, which is your water flood data, indicated that there was to be injection, initial injection of about 500 barrels per inj. per well, is that correct?

A Yes, sir.

Q And there are six wells?

A Yes, sir.

Q And would all six wells be put in at the same time?

A Yes, sir.

Q So there would be some 3000 barrels a day that would be utilized for injection purposes?

A That's correct. Now the situation that exists is that we presently have a right from the State Engineer's office for a varied volume of water which is currently being used in the properties for cementing operations and drilling operations and domestic use in the same site, and we were instructed to make our one application to include both, both industrial uses, I mean, the current uses and the water flooding under one total.

MR. MANKIN: What would be the total withdrawal from the two wells, the two source wells of water per day?

A It would be a minimum of 4000 and a maximum, never a maximum of over 4500. It would range between these -- depending upon the water consumption for drilling purposes and de-salting and general lease operation.

MR. MANKIN: So 4500 barrels a day would be

obtained some beneficial results?

A Yes, sir.

MR. MANKIN: Some increase in production?

A Yes, sir.

MR. MANKIN: Are there other questions of the witness? If there are no further questions of the witness, the witness may be excused in this particular case. Is there any statement to be made in this case? I believe we already have one essential statement made by Gulf. Does Great Western wish to make one?

MR. CRUZ: Yes, sir. I am O. A. Cruz of Midland representing Great Western Drilling Company and we wish to concur in this application.

MR. MANKIN: Any further statements? Does Amerada wish to make any statement at this time? If there is no further statement, we will take the case under advisement.

(Witness excused.)

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

I, J. A. Trujillo, Court Reporter, do hereby certify that the foregoing and attached transcript of proceedings before the New Mexico Oil Conservation Commission at Santa Fe, New Mexico, is a true and correct record to the best of my knowledge, skill, and ability.

IN WITNESS WHEREOF I have affixed my hand and notarial seal, this, the 31 day of January, 1957.

J. A. Trujillo
NOTARY PUBLIC - COURT REPORTER

My Commission Expires:
October 5, 1960

OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO

Date 3/7/57

CASE 1195 Hearing Date 9 am on 1/9/57 @ SF before Mkdy

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

OK to approve pilot waterflood as recommended by ERW to expire 6/30/58

Staff ~~Member~~
Examiner

OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO

Date 2-28-57

CASE 1195 Hearing Date 1-9-57

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

I recommend that the applicants request be granted as requested.

Findings:

(1) ~~That~~ applicant has permits # L-3322 and L-3323 from the office of the State Engineer to appropriate 188 Acre feet of fresh water from two water wells located in SW SW NE Sec. 31-12S-32E and SE NW NW 31-12S-32E.

(2) That ~~these~~ permits require this water to be used for secondary recovery on this water flood project.

(3) That these permits expire June 30, 1958.

(4) ~~That the applicant proposes to inject fresh water into oil wells located in the S/2 Sec. 31-12S-32E, NW/4 Sec. 5 and NE/4 Sec. 6-13S-32E.~~

(5) That, monthly progress reports ~~should~~ be made to the Commission.

(6) That the applicant proposes to convert 4 wells from oil wells to water injection wells in the Queen Red ~~Lynch~~ Pool. These wells are located in S/2 Sec. 31-12S-32E, NW/4 Sec. 5 and NE/4 Sec. 6-13S-32E.

Staff Member

OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO

Date_____

CASE_____ Hearing Date_____

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

Order:

(1) That the following wells are hereby approved for conversion from oil wells to water injection wells in the Caprock-Queen oil ~~Pool~~.

Grayridge	Malco St. "A" #5	N-31-12S-32E
"	Lineman Maxwell St. "F" #5	J-31-12S-32E
"	" " " #7	O-31-12S-32E
"	Mary St. "A" #2	B-6-13S-32E
"		H-6-13S-32E
Gulf	Lea St. "B" #2	D-5-13S-32E
Great Western	St. "R" #1	

(2) That this order shall remain ~~in full force~~ valid until June 30, 1958 unless proof is submitted to the commission after notice & hearing that another source of water is available to the applicant to carry on the operation after that date.

Staff Member

STATE OF NEW MEXICO

STATE ENGINEER OFFICE

ROSWELL

S. E. REYNOLDS
STATE ENGINEER

ADDRESS CORRESPONDENCE TO:
P. O. BOX 810
ROSWELL, N. M.

January 11, 1957

Files: L-3322 and L-3323

Graridge Corporation
Box 752
Breckenridge, Texas

Gentlemen:

Enclosed are your applications for permit to appropriate for pilot flooding purposes, which have been approved.

Proof of Completion of Works for permits No. L-3322 and L-3323 should be filed in this office as soon as possible after the installation of equipment, but in no event later than December 30, 1957. Forms are enclosed for your convenience to be executed in triplicate, notarized and returned to this office.

Wells L-3322 and L-3323 are to be abandoned to pilot flooding before June 30, 1958. A totalizing water meter is to be installed in the line between the two wells and the place of use so as to measure the amount of water appropriated from both wells.

These permits have been approved for pilot flooding purposes only. A Declaration should be filed for these two wells to establish the rights for such uses as Oil Well Drilling, equipment maintenance and Domestic use.

Your rights under this permit will expire December 30, 1957, unless proofs are filed or applications for extension of time are received in this office on or before the above date.

Very truly yours,

Fred H. Hennighausen
District Supervisor

By: William D. L. Brown
William D. L. Brown
Basin Supervisor

BB: jt
cc: State Engineer
encl: Applications (2)
Forms-Proof of Works (6)

WR-15

IMPORTANT—READ INSTRUCTIONS ON BACK BEFORE FILLING OUT THIS FORM

APPLICATION FOR PERMIT

1956 DEC 12 P. 1:56

OFFICE
SANTA FE, N. M.

To Appropriate the Underground Waters of the State of New Mexico

LEA COUNTY UNDERGROUND WATER BASIN

Application No. L-2222 Book 16-12 Date Received October 11, 1956

1. Name of applicant Graridge Corporation

Postoffice address Box 750, City or Town Breckenridge, Texas

County of Stephens, State of Texas

2. Source of water supply Shallow ground water basin (350'). (state whether artesian or shallow ground water basin)

located in Lea County Basin (name of underground stream, valley, artesian basin, etc.)

3. The well is to be located in the SW ¼, SW ¼, NE ¼,

of section 31, Township 12-S, Range 32-E, N.M.P.M.

on land owned by State of New Mexico. Leased by Graridge Corporation.

4. Description of well: drilled Whitaside, Inc. Drilled in Levelland, Texas, W.D. No. 1967; depth drilled 350' feet; diameter (outside) of casing 7" inches; type of pump and power plant to be used Peerless (20-stage) 7½ h.p. turbine pump

5. Quantity of water to be ~~appropriated~~ and beneficially used 730,000 bbls/year, or 9½ acre-feet/year total from this well. (feet depth or acre feet per acre)

for secondary recovery of oil by waterflooding purposes.

6. Acreage to be irrigated 160 acre pilot flood. acres

located and described as follows (describe only lands to be irrigated):

Subdivision	Sec.	Twp.	Range	Acres Irrigated	Owner
(SEE ATTACHED LETTER OF EXPLANATION)					

(Note: location of well and acreage to be irrigated must be shown on plat on reverse side.)

7. Time required to commence construction Water well is already completed;

Time required to complete the works 60 days (see attached letter);

Time required to fully apply water to beneficial use 60 days

8. Additional statements or explanations (including data on any other water rights appurtenant to above lands)

(SEE ATTACHED LETTER OF EXPLANATION)

FILED
JAN 7 1957
OFFICE
STATE ENGINEER
SANTA FE, NEW MEXICO

I Robert H. Vich being first duly sworn upon my oath, depose and say that I have carefully read the foregoing statement and each and all of the items contained therein, and that the same are true to the best of my knowledge and belief.

Robert H Vich, applicant

Robert H. Vich, Pet.Engr. for Graridge Corp.

Subscribed and sworn to before me this 9th day of October, A. D., 19 56

My commission expires Sept. 1, 1957

Celia Wadkins Ingerford
CELIA WADKINS INGERFORD
Notary Public, Stephens County, Texas

FILED
DEC 11 1956
OFFICE
STATE ENGINEER
SANTA FE, NEW MEXICO

APPROVAL OF THE STATE ENGINEER

Number of this permit [illegible] Date received corrected _____

Recorded in Book 16-12 Publication of notice ordered _____

Page [illegible] Name of paper _____

Application received October 11, 1956 Affidavit of publication filed _____

Date returned for correction _____ Date of approval Jan. 4, 1957

This application is approved for 180 acre feet of water subject to all prior valid and existing rights to the use of the waters of said underground source and provided that the applicant complies with all rules and regulations of the State Engineer pertaining to the drilling of wells.

Appropriation of water to be limited to 180 acre feet per annum from Wells Nos. L-[illegible] and L-[illegible] and not to exceed the amount produced by the wells only. This application is approved for [illegible] only and only to the oil wells [illegible] in the pool described with this application. Wells L-[illegible] and L-[illegible] to be equipped to yield flowing meters with B. [illegible]. A totalizing meter meter is to be installed in the line between the two wells and the place of use so as to measure the amount of water appropriated from both wells.

Works shall be completed and proofs filed on or before December 30, 1957

Water shall be applied to beneficial use and proofs filed on or before _____

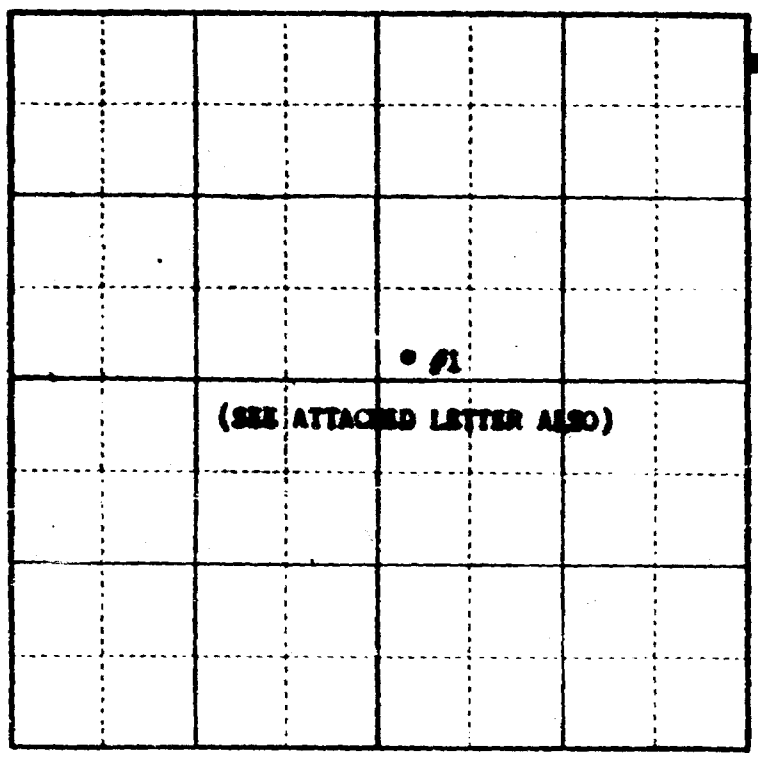
This is to certify that I have examined the above application for permit to appropriate the underground waters of the State of New Mexico and hereby approve the same subject to the foregoing provisions and conditions.

Witness my hand and seal this 4 day of Jan., A. D., 1957.

S. E. [illegible]
State Engineer

LOCATE WELL AND ACREAGE TO BE IRRIGATED AS ACCURATELY AS POSSIBLE ON FOLLOWING PLAT:

Section (s) 21, Township 12-S, Range 32-E, N.M.P.M.



By: D. E. Kienlen
Asst. Chief,
Water Rights Division.

INSTRUCTIONS

This form shall be executed, preferably typewritten, in triplicate and shall be accompanied by a filing fee of $5.00. Each of triplicate copies must be properly signed and attested.

A separate application for permit must be filed for each well used.

Secs 1-4--Fill out all blanks fully and accurately.

Sec. 5—Irrigation use shall be stated in feet depth or acre feet of water per acre to be applied on the land. If for domestic, municipal, or other purposes, state total quantity in acre feet to be used annually. Domestic use may include the irrigation of not more than one acre of lawn and garden for noncommercial use.

Sec. 6--Describe only the lands to be irrigated. If on unsurveyed lands describe by legal subdivision "as projected" from the nearest government survey corners, or describe by metes and bounds and tie survey to some permanent, easily located natural object.

Sec. 7--Estimate time reasonably required to commence and to complete project.

Sec. 8—If lands are irrigated from any other source, explain in this section. Give any other data necessary to fully describe water right sought.

If additional space is necessary, use a separate sheet or sheets and attach securely hereto.

WR-15

IMPORTANT—READ INSTRUCTIONS ON BACK BEFORE FILLING OUT THIS FORM

APPLICATION FOR PERMIT

1956 OCT 12 P 1:04

STATE ENGINEER
SANTA FE

To Appropriate the Underground Waters of the State of New Mexico

LEA COUNTY UNDERGROUND WATER BASIN

Application No. L-2888 Book 16-13 Date Received October 11, 1956

1. Name of applicant Gruridge Corporation

Postoffice address Box 728, City or Town Breckenridge, Texas

County of Stephens, State of Texas

2. Source of water supply Shallow ground water basin (1st). (state whether artesian or shallow ground water basin)

located in Lea County, Lea County Basin (name of underground stream, valley, artesian basin, etc.)

3. The well is to be located in the SE ¼, NW ¼, NE ¼,

of section 31, Township 16-S, Range 38-E, N.M.P.M.

on land owned by State of New Mexico. Leased by Gruridge Corporation.

4. Description of well: driller [illegible], Texas; W.D. No. [illegible]; depth drilled 250 feet; diameter (outside) of casing 7" inches; type of pump and power plant to be used Peerless (20-stage) 7½ h.p. turbine pump

5. Quantity of water to be appropriated and beneficially used (total) 730,000 bbls/year, or 2¼ acre-feet/year (feet depth or acre feet per acre)

6. for secondary recovery of oil by waterflooding purposes.

7. Acreage to be irrigated 160 acre pilot flood. acres

located and described as follows (describe only lands to be irrigated):

Subdivision	Sec.	Twp.	Range	Acres Irrigated	Owner
(SEE ATTACHED LETTER OF EXPLANATION)					

(Note: location of well and acreage to be irrigated must be shown on plat on reverse side.)

7. Time required to commence construction Water well is already completed;

Time required to complete the works 60 days (see attached letter);

Time required to fully apply water to beneficial use 60 days

8. Additional statements or explanations (including data on any other water rights appurtenant to above lands)
(SEE ATTACHED LETTER OF EXPLANATION)

I, Robert H. Vick, being first duly sworn upon my oath, depose and say that I have carefully read the foregoing statement and each and all of the items contained therein, and that the same are true to the best of my knowledge and belief.

Robert H. Vick, applicant

Robert H. Vick, Pet. Engr. for Gruridge Corp.

Subscribed and sworn to before me this 9th day of October, A.D. 19 56

My Commission expires June 1, 1957

Notary Public, [illegible] County, [illegible]

FILED
OCT 11 1956
OFFICE
GROUND WATER SUPERVISOR

FILED
JAN 7 1957
OFFICE
GROUND WATER SUPERVISOR
ROSWELL, NEW MEXICO

APPROVAL OF THE STATE ENGINEER

Number of this permit [illegible] Date received corrected _____

Recorded in Book 12-13 Publication of notice ordered _____

Page [illegible] Name of paper _____

Application received October 11, 1956 Affidavit of publication filed _____

Date returned for correction _____ Date of approval Jan. 4, 1957

This application is approved for 100 acre feet of water subject to all prior valid and existing rights to the use of the waters of said underground source and provided that the applicant complies with all rules and regulations of the State Engineer pertaining to the drilling of wells.

Appropriation of water to be limited to 100 acre feet per annum from wells [illegible]

Works shall be completed and proofs filed on or before December 20, 1957

Water shall be applied to beneficial use and proofs filed on or before _____

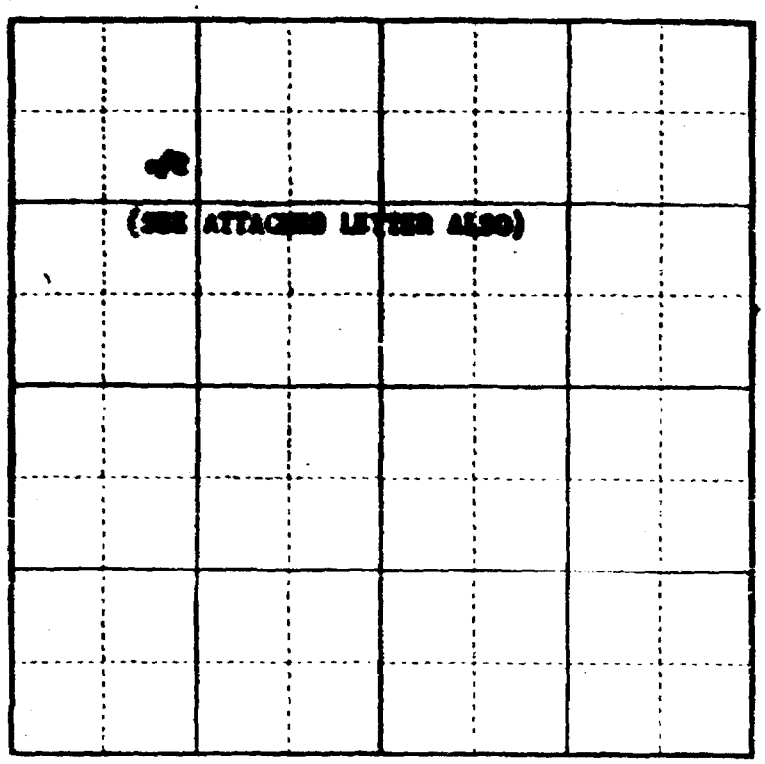
This is to certify that I have examined the above application for permit to appropriate the underground waters of the State of New Mexico and hereby approve the same subject to the foregoing provisions and conditions.

Witness my hand and seal this 4 day of Jan., A.D., 19 57.

S. E. [illegible]
State Engineer

LOCATE WELL AND ACREAGE TO BE IRRIGATED AS ACCURATELY AS POSSIBLE ON FOLLOWING PLAT:

Section (s) [illegible] Township [illegible] Range [illegible] N.M.P.M.



By: D. E. Kienlen
D. E. Kienlen
Asst. Chief,
Water Rights Division.

INSTRUCTIONS

This form shall be executed, preferably typewritten, in triplicate and shall be accompanied by a filing fee of $5.00. Each of triplicate copies must be properly signed and attested.

A separate application for permit must be filed for each well used.

Secs. 1-4—Fill out all blanks fully and accurately.

Sec. 5—Irrigation use shall be stated in feet depth or acre feet of water per acre to be applied on the land. If for domestic, municipal, or other purposes, state total quantity in acre feet to be used annually. Domestic use may include the irrigation of not more than one acre of lawn and garden for noncommercial use.

Sec. 6—Describe only the lands to be irrigated. If on unsurveyed lands describe by legal subdivision "as projected" from the nearest government survey corners, or describe by metes and bounds and tie survey to some permanent, easily located natural object.

Sec. 7—Estimate time reasonably required to commence and to complete project.

Sec. 8—If lands are irrigated from any other source, explain in this section. Give any other data necessary to fully describe water right sought.

If additional space is necessary, use a separate sheet or sheets and attach securely hereto.

1956 DEC 12 P. 1:56

October 1st, 1956

Files : L-3322; L-3323

Office of State Engineer
Water Conservation Department
909 East Second Street
Roswell, New Mexico

Attention: Mr. Fred H. Hennighausen

Gentlemen:

This is an attached letter of explanation for the forms submitted covering "Application for Permit to Appropriate the Underground Waters of the State of New Mexico" under Section 31, Township 12-S, Range 32-E, of Lea County.

This land is now included in the expanded "Lea County Water Basin". The two (2) water wells described on the separate applications were both originally drilled in 1947, for industrial uses. The two wells were drilled to the 350' sand and gravel formation. The past and current uses for the wells are as follows: to furnish water for drilling purposes in the oil production development program, to furnish fresh water for daily operations such as equipment maintenance, and for de-salting of the producing formation in the oil wells. Another use has been in conjunction with periodic water-injection tests conducted in several of the oil producing wells to evaluate the feasibility of secondary recovery operations in the oil producing formation.

The results of the above water-injection tests together with accepted engineering calculations have proven the possibility of recovering an additional twenty-five hundred (2500) barrels of oil per productive acre from the field which under present producing means would not be obtainable. Ultimate royalties to the State, for a field-wide flood under such an operation, would be in excess of $4,000,000.00 over a period of approximately eight (8) years.

The pilot flood which we propose to install, as shown on the attached plat, would include approximately 480 acres and require 3,000,000 barrels of water (375 acre feet) distributed over an eight (8) year period. Ultimate royalties to the State from this 480 acre pilot flood would amount to approximately 150,000 barrels of oil.

2 - Office of State Engineer

October 18, 1956

Application is therefore made to produce and to use two thousand (2,000) barrels water per day from each of the two existing water wells for the proposed pilot waterflood. This would amount to a total yearly volume of 730,000 barrels water or 9⅛ acre-feet of water per year from each of the two water wells listed on the attached applications. This total requested volume would include the miscellaneous uses listed at the first of this letter.

As previously stated, the water wells are already completed. It will, however, require approximately sixty (60) days to complete arrangements and obtain approval for the waterflood from the Oil Conservation Commission. Application of the water would commence immediately thereafter.

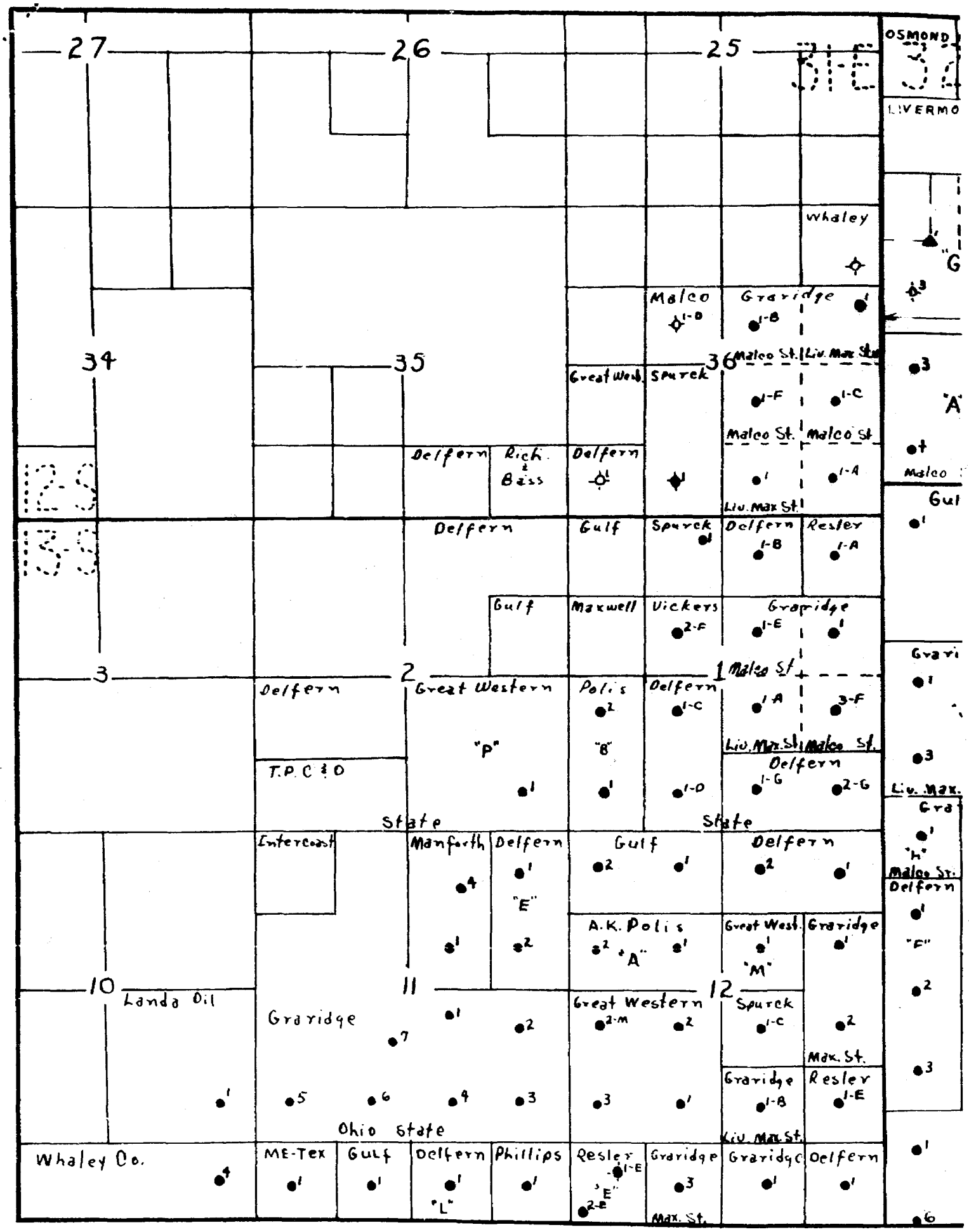
Sincerely yours,

SINCLAIR OIL CORPORATION

Robert H. Vick

Robert H. Vick
Engineer

rhv/jbs


27
26
25
OSMOND
LIVERMO
Whaley
Malco
Gravridge
Malco St.
Liv. Max St.
34
35
36
Great West.
Spurck
Delfern
Rich. Bass
Malco St.
Malco St.
Liv. Max St.
Delfern
Gulf
Spurck
Delfern
Resler
Gulf
Maxwell
Vickers
Gravridge
3
2
1
Malco St
Delfern
Great Western
Polis
Delfern
"P"
"B"
Liv. Max St.
Malco St.
Delfern
T.P.C & O
State
State
Intercoast
Manforth
Delfern
"E"
Gulf
Delfern
A.K. Polis
"A"
Great West.
"M"
Gravridge
10
11
12
Landa Oil
Gravridge
Great Western
Spurck
Max. St.
Gravridge
Resler
Liv. Max St.
Ohio State
Whaley Co.
ME-Tex
Gulf
Delfern
"L"
Phillips
Resler
"E"
Gravridge
Max. St.
Gravridge
Delfern
Liv. Max.
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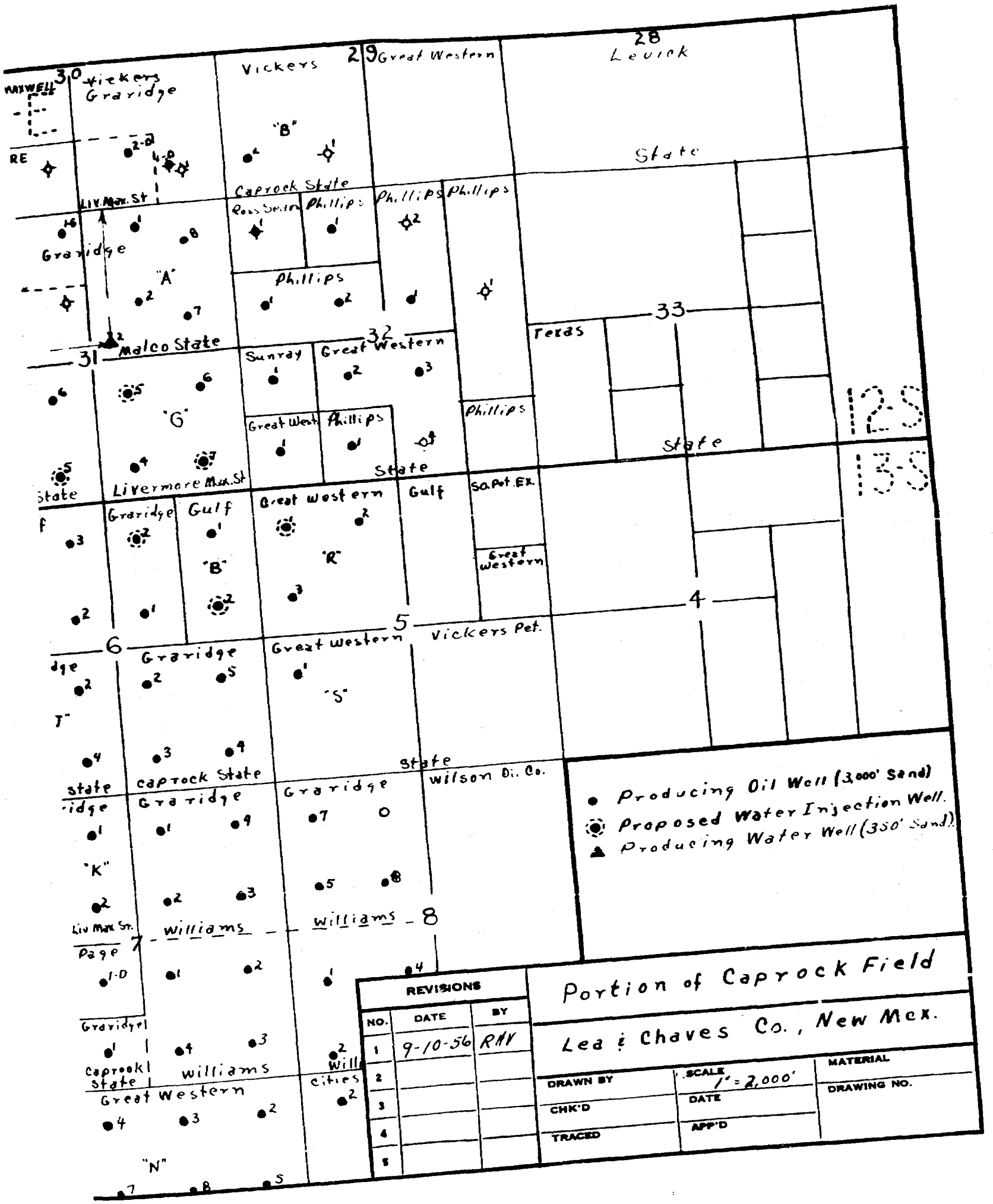
"H"
Malco St.
Delfern
"F"


Vickers
Graridge
Great Western
Levick
State
Caprock State
Phillips
Malco State
Sunray
Texas
Livermore Mex.St
Gulf
Great western
Sa.Pet.Ex.
Vickers Pet.
Graridge
Great western
State
Wilson Oi. Co.
Caprock State
Williams
Williams
Great Western
Producing Oil Well (3,000' Sand)
Proposed Water Injection Well.
Producing Water Well (350' Sand)
Portion of Caprock Field
Lea & Chaves Co., New Mex.
REVISIONS
NO. DATE BY
1 9-10-56 RHV
DRAWN BY
CHK'D
TRACED
SCALE 1" = 2,000'
DATE
APP'D
MATERIAL
DRAWING NO.

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. 1195
Order No. R-972

APPLICATION OF GRARIDGE CORPORATION;
GULF OIL CORPORATION, AND GREAT WESTERN
DRILLING COMPANY FOR AN ORDER AUTHORIZING
A PILOT WATER FLOOD PROJECT IN THE QUEEN
FORMATION OF THE CAPROCK-QUEEN POOL, LEA
COUNTY, NEW MEXICO.

ORDER OF THE COMMISSION

BY THE COMMISSION:

This cause came on for hearing at 9 o'clock a.m. on January 9, 1957, at Santa Fe, New Mexico, before Warren W. Mankin, 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 April 1957, the Commission, a quorum being present, having considered the application, the evidence adduced, and the recommendations of the Examiner, Warren W. Mankin, 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 case and the subject matter thereof.

(2) That the applicants, Graridge Corporation, Gulf Oil Corporation, and Great Western Drilling Company, propose to institute a pilot water flood operation in the Queen formation underlying certain of their leases in all or part of Section 31, Township 12 South, Range 32 East, and Sections 5 and 6, Township 13 South, Range 32 East, Caprock-Queen Pool, Lea County, New Mexico.

(3) That the applicants propose to accomplish the said flooding operation by means of water injection through six of their wells located in the S/2 of Section 31, Township 12 South, Range 32 East, the NE/4 of Section 6 and the NW/4 of Section 5, Township 13 South, Range 32 East, NMPM, Lea County, New Mexico.

(4) That the applicants have obtained authority from the State Engineer for the State of New Mexico to use fresh water in limited quantities until June 30, 1958, for the operation of the subject pilot water flood project.

(5) That the proposed program for secondary recovery will promote conservation and tend to prevent waste through the production of oil which might not otherwise be recovered.

(6) That the progress of the secondary recovery program should be reported periodically to the Commission.

IT IS THEREFORE ORDERED:

1. That the application of Graridge Corporation, Gulf Oil Corporation, and Great Western Drilling Company for permission to institute a pilot water flood in the Queen formation of the Caprock-Queen Pool underlying all or portions of Section 31, Township 12 South, Range 32 East, Sections 5 and 6 of Township 13 South, Range 32 East, NMPM, Lea County, New Mexico, be and the same is hereby granted.

2. That the following wells be and the same are hereby approved as water injection wells in the above Pilot Water Flood Project:

Graridge - Malco State "A" Well No. 5	660 feet from the South line and 1980 feet from the West line of Section 31, Township 12 South, Range 32 East, NMPM.
Graridge-Livermore Maxwell State "G" Well No. 5	1980 feet from the South line and 1980 feet from the East line of Section 31, Township 12 South, Range 32 East, NMPM.
Graridge-Livermore Maxwell State "G" Well No. 7	660 feet from the South line and 660 feet from the East line of Section 31, Township 12 South, Range 32 East, NMPM.
Graridge-Manry State "A" No. 2	654 feet from the North line and 1982 feet from the East line of Section 6, Township 13 South, Range 32 East, NMPM.
Gulf-Lea State "B" Well No. 2	1980 feet from the North line and 660 feet from the East line of Section 6, Township 13 South, Range 32 East, NMPM.
Great Western-State "R" Well No. 1	660 feet from the North line and 660 feet from the West line of Section 5, Township 13 South, Range 32 East, NMPM,

all in Lea County, New Mexico.

3. That monthly progress reports on the subject water flood project shall be submitted to the Commission in accordance with Rule 1119 of the Commission Rules and Regulations.

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/

OIL CONSERVATION COMMISSION
P. O. BOX 871
SANTA FE, NEW MEXICO

April 9, 1957

COPY

Mr. R. L. Elliott
Graridge Corporation
P.O. Box 752
Breckenridge, Texas

Dear Sir:

We enclose two copies of Order R-972 issued April 5, 1957, by the Oil Conservation Commission in Case 1195, which was heard on January 9th at Santa Fe.

Very truly yours,

A. L. Porter, Jr.
Secretary - Director

bp
Encl.

GRARIDGE CORPORATION

Producers of Oil and Gas

BRECKENRIDGE, TEXAS

December 6, 1956

Examiner Hg
@ SF
on 1/9/57

#1191

Oil Conservation Commission
Capitol Building
Santa Fe, New Mexico

Attention: Mr. A. L. Porter

Gentlemen:

The Graridge Corporation, Gulf Oil Corporation and Great Western Drilling Company request a hearing be scheduled before the Commission or an examiner to obtain Commission approval to install a pilot water flood in the Queen Sand formation in the Caprock Field of Lea and Chaves Counties, New Mexico.

Following is the complete information requested according to Section "I", Rule 701 of the Conservation Commission Rules and Regulations.

I. Field plat, showing all wells in the area, together with a copy of the cooperative pilot flood plans of Graridge, Gulf and Great Western, are attached.

II. Production of the area is obtained from the "Red Sand" interval of the Queen formation.

III. Proposed water injection will be as shown on the plat, into the "Red Sand" or "Artesia Sand" interval of the Queen formation.

IV. A copy of the log of a well in the vicinity of the proposed pilot flood is attached.

V. All proposed intake wells are presently equipped with $5\frac{1}{2}$" or 7" casing set at approximately 3,000 feet. All intake wells will be re-worked in the following manner: A liner will be set and cemented one foot into the top of the sand to be flooded. A packer, run on 2" tubing, will then be set near the bottom of the liner and injection will be down the tubing.

VI. Fresh water is to be used for injection purposes. The water is to be produced from two presently completed wells in Section 31, T12S, R32E, from a sand and gravel interval at 340-350 feet depth. Approval for the use of this water for the pilot flood operation is being obtained through the State Engineer's Office.

VII. The operator of the proposed project will be the Graridge Corporation, Box 752, Breckenridge, Texas, Attention: Mr. O. H. Reaugh.

Yours truly,

GRARIDGE CORPORATION

Robert H. Vick
Engineer

rhv/jbm
enc

No. 1-57

DOCKET: EXAMINER HEARING JANUARY 9, 1957

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

The following cases will be heard before Warren W. Mankin, Examiner:

CASE 1191: Application of Gulf Oil Corporation for an order establishing a 240-acre non-standard gas proration unit in the Eumont Gas Pool in exception to Rule 5 (a) of the New Mexico Oil Conservation Commission Special Rules and Regulations for said pool, as set forth in Order R-520. Applicant, in the above-styled cause, seeks an order establishing a 240-acre non-standard gas proration unit in the Eumont Gas Pool comprising the SE/4 of Section 8, and the W/2 SW/4 of Section 9, all in Township 21 South, Range 36 East; said acreage to be dedicated to applicant's R. R. Bell "A" No. 2 Well located 660 feet from the South line and 660 feet from the East line of said Section 8.

CASE 1192: Application of Amerada Petroleum Corporation for permission to convert its State S "G" No. 1 Well into a salt water disposal well in the San Andres, Paddock, Clearfork, and Abo formations of the Saunders Pool in accordance with New Mexico Oil Conservation Commission Statewide Rule 701. Applicant, in the above-styled cause, seeks an order granting permission to convert its State S "G" No. 1 Well into a salt water disposal well; said well is located in the NE/4 SW/4 of Section 10, Township 15 South, Range 33 East, Lea County, New Mexico. Applicant proposes to inject said salt water into the aforesaid four non-productive zones in the Saunders Pool through the annulus space between the intermediate and production casing.

CASE 1193: Application of Amerada Petroleum Corporation for permission to convert its Amerada State S "C" No. 5 Well into a salt water disposal well in the Pennsylvanian formation in the Saunders Pool, Lea County, New Mexico, in accordance with New Mexico Oil Conservation Commission Statewide Rule 701. Applicant, in the above-styled cause, seeks an order granting permission to convert its previously abandoned State S "C" No. 5 Well into a salt water disposal well by injecting water into the Pennsylvanian formation, producing horizon in the Saunders Pool; said well is located in the SW/4 SW/4 of Section 4, Township 15 South, Range 33 East, Lea County, New Mexico.

CASE 1194: Application of Magnolia Petroleum Company for permission to convert its T. Betenbough No. 2 Well into a salt water disposal well in the Pennsylvanian formation of the Bough Pool in accordance with New Mexico Oil Conservation Commission Statewide Rule 701. Applicant in the above-styled cause seeks an order granting permission to convert its previously abandoned T. Betenbough No. 2 Well into a salt water disposal well into the Pennsylvanian formation, the producing horizon in the Bough Pool; said well is located in the SE/4 SW/4 of Section 12, Township 9 South, Range 35 East, Lea County, New Mexico.

CASE 1195: Application of Graridge Corporation, Gulf Oil Corporation and Great Western Drilling Company in compliance with Rule 701 (a) of the New Mexico Oil Conservation Commission Statewide Rules and Regulations for an order granting approval of applicants proposed pilot water flood program in the Queen formation in the Caprock-Queen Pool in Lea and Chaves Counties, New Mexico. Applicants in the above-styled cause seek approval of their proposed pilot water flooding program for the purpose of secondary recovery in which water injection will be made into the Queen formation through six injection wells; said wells to be located in the S/2 of Section 31, Township 12 South, Range 32 East, the NE/4 of Section 6 and NW/4 of Section 5, Township 13 South, Range 32 East, Caprock-Queen Pool, Lea and Chaves Counties, New Mexico.

CASE 1196. Application of The Ibex Company for an order authorizing two pilot water flood projects in the Artesia Pool, Eddy County, New Mexico, in exception to Rule 701 of the New Mexico Oil Conservation Commission Statewide Rules and Regulations and further approval of the unorthodox location of a number of its old wells in said pool. Applicant, in the above-styled cause, seeks an order authorizing two separate pilot water flood projects in the Grayburg formation of the Artesia Pool; said projects to be effected by means of water injection through approximately 10 existing wells in Sections 21, 28, and 32, Township 18 South, Range 28 East, Eddy County, New Mexico. Applicant also seeks Commission approval of the unorthodox location of certain of its old wells in the Artesia Pool.

ir/

CLASS OF SERVICE
This is a fast message unless its deferred character is indicated by the proper symbol.

WESTERN UNION
TELEGRAM

W. P. MARSHALL, PRESIDENT

SYMBOLS
DL=Day Letter
NL=Night Letter
LT=International Letter Telegram

391.

The time on domestic telegrams is STANDARD TIME at point of origin. Time of receipt is ... D TIME at point of destination

DB30 LC270

L SNA091 PD=SANTA FE NMEX 4 329P MM=

ROBERT H VICK=

GRARIDGE CORP BREKENRIDGE TEX=

BEFORE THE OIL CONSERVATION COMMISSION SANTA FE, NEW MEXICO EXHIBIT No. 5a Case No. 1191

GRARIDGE CORPORATION APPLICATIONS L-3322 AND L-3323 APPROVED THIS DATE. COPIES WILL BE TRANSMITTED TO GRARIDGE CORPORATION BY ROSWELL OFFICE IN A FEW DAYS=

S E REYNOLDS STATE ENGINEER BY D E KIENLEN ASST CHIEF WATER RIGHTS DIVN=

93302
93835

L-3322 L-3323=(

THE COMPANY WILL APPRECIATE SUGGESTIONS FROM ITS PATRONS CONCERNING ITS SERVICE

STATE OF NEW MEXICO

STATE ENGINEER OFFICE

ROSWELL

S. E. REYNOLDS
STATE ENGINEER

ADDRESS CORRESPONDENCE TO:
P. O. BOX 810
ROSWELL, N. M.

File: L-3322 & L-3323

November 2, 1956

Graridge Corporation
Box 752
Breckenridge, Texas

Attention: Mr. Robert H. Vinkl

Dear Sir:

Enclosed are two Notices of Publication for your Application for Permit to Appropriate Underground Water No. L-3322 and L-3323. As indicated, the notices are to be published in a paper of general circulation in Lea County. You will note that the notice indicates that the two wells are to be used in combination. This is necessary because your applications show on the sketches attached that the water from both wells is to be used in the same location.

Your attention is also directed to the area of oil wells to be flooded noted in the notices. According to the letter of explanation attached to the applications, it is your intention to flood 480 acres of oil wells. The plat attached to the letter appears to agree with this acreage and, therefore, the notices have been written on the basis of 240 acres of flooding from each well for a total of 480 acres. On each application under Item 6, "Acreage to be irrigated", 160 acre pilot flood is noted. If it is your intention to flood only 160 acres from each well, you should return these notices of publication and make corrections in your attached letters and sketches. If it is your intention to flood 480 acres from both wells, you should send us a letter to that effect. We will not be able to submit these applications to the State Engineer for consideration until the applications, letters, sketches and notices of publication are reconciled.

If the information contained in these notices of publication does not agree with your intentions, please contact this office before having them published.

Very truly yours,

Fred H. Hennighausen
Acting District Supervisor

William D. L. Brown

By: William D. L. Brown
Basin Supervisor

BB:rm
cc: State Engineer
encl: Notices (2)

File No. 3322

State Engineer's Office
P. O. BOX 810
ROSWELL, NEW MEXICO

No. 1446 R

CASH ☐ M.O. ☐ P.C. ☒ C.C. ☐

HOUSE CHECK

Date 10-11-56

Received of Gearidge Corporation $ 5.00

Address Box 752, Breckenridge, Tex.

For payment of:
Applicant's Name Gearidge Corp.

Address Box 752, Breckenridge, Tex.

The sum of Five and no/100 DOLLARS

To cover
payments for:

Application for permit

OIL CONSERVATION COMMISSION
EXHIBIT NO. 2
CASE 119

Roswell,
New Mexico

November 2, 1956

Graridge Corporation

Box 752, Breckenridge, Texas

Dear Gentlemen:

The following notice shall be published at applicant's expense once a week for three (3) consecutive weeks in the Lovington Leader or Lovington Press a newspaper published at Lovington, New Mexico, or in any other newspaper of general circulation in the county wherein the proposed well will be located. First publication should be made within ten (10) days from the date hereon, Publisher's affidavit of proof of such publication must be filed with the State Engineer not later than ten (10) days from the date of last publication. Failure to file proof of publication within the time allowed will render the application subject to cancellation.

W. B.

State Engineer

Note to Publisher: Immediately after last publication, publisher is requested to file affidavit of proof of such publication with the State Engineer. P. O. Box 810, Roswell, New Mexico

OIL CONSERVATION COMMISSION
EXHIBIT No. 5C
CASE 611

NOTICE
State Engineer's Office

Number of Application L-3322 Santa Fe, N. M. November 2, 19 56

Notice is hereby given that on the 11th day of October, 19 56, in accordance with Chapter 131 of the Session Laws of 1931, Graridge Corporation of Breckenridge, County of Stephens, State of New Mexico, made application to the State Engineer of New Mexico for a permit to appropriate 94 acre feet per annum of the shallow ground waters of the Lea County Underground Water Basin by using an existing well 7 inches in diameter and approximately 350 feet in depth at a point in the SW¼SW¼NE¼ of Section 31, Township 12 South, Range 32 East, N.M.P.M., for domestic purposes and oil production development and for the water flooding of 240 acres of oil wells for secondary recovery of oil within the following described location:

SUBDIVISION	SECTION	TOWNSHIP	RANGE
Pt. SW¼NE¼	31	12 South	32 East
Pt. SW¼	31	12 South	32 East
Pt. SE¼	31	12 South	32 East
Pt. SW¼SW¼	32	12 South	32 East
Pt. NW¼	6	13 South	32 East
Pt. NE¼	6	13 South	32 East
Pt. N½SE¼	6	13 South	32 East
Pt. NW¼	5	13 South	32 East

Wells L-3322 and L-3323 to be supplemental to each other for the production of 188 acre feet of water per annum and waters from said two wells to be commingled for the flooding of 480 acres of oil wells in the location described above.

Appropriation of water to be limited to 188 acre feet per annum from Wells Nos. L-3322 and L-3323 and not to exceed the amount produced by two wells only.

Any person, firm, association, corporation, the State of New Mexico or the United States of America, deeming that the granting of the above application will be truly detrimental to their rights in the waters of said underground source, may protest in writing the State Engineer's granting approval of said application. The protest shall set forth all protestant's reasons why the application should not be approved and shall be accompanied by supporting affidavits and by proof that a copy of the protest has been served upon the applicant. Said protest and proof of service must be filed with the State Engineer within ten (10) days after the date of the last publication of this notice. Unless protested, the application will be taken up for consideration by the State Engineer on that date, being on or about the ..... day of ....., 19 .....

S. E. REYNOLDS, State Engineer

NOTE TO PUBLISHER:

Fill in date to correspond to date 10 days after date of last (third) publication. Sundays and holidays not included if this date falls on one of them.

cc: State Engineer
1: House Check #1446-R ($5.00)

Graridge Corporation 12-18-56

See Attached List

Caprock Pool Lea & Chaves

"The Artesia Red Sand" uppermost member of Queen

November 21, 1940.

none at present.

Queen Sand

5500 ac

sand

stratigraphic trap located on a structural nose. Structure map included. See note (*) below.

solution gas drive

approx. 1040#

unknown no

480 ac affected

3000'

12'

19

147 0-150

45

37° @ 60° F.

Estimated at 3 cp.

November 21, 1940

Stripper stage. ** See below.

12 to be affected(see plat)

3 bopd/well

Cumulative average of 40,000 bbl/well or 40 ac tract.

44.5%

Yes. Cooperative Producers Company carried out an air injection program in 1951. Results were questionable. There was evidence of by-passing of air and formation plugging when intermittent water injection was tried.

*No Isopach Map could be drawn because a majority of the wells were not drilled through the Queen Sand.

** A great [illegible] the approximate economic limit and will be plugged [illegible] secondary recovery measures can be installed.

[illegible]

[illegible]

1. Source of injected water (formation, depth) sand & gravel bed at 350 ft.
2. Fresh or salt water fresh
3. Open or closed system semi-closed
4. Treatment of injected water filtering
5. Pattern and spacing 80 ac, 5-spot
6. Initial injection pressure to be used (psi) as needed to calculated max. of 900 psi
7. Estimated initial per well rate of injection (bbls.) 500 bbls/day
8. Will oil wells be converted into injection wells or will injection wells be drilled? (If to be converted, give well numbers.) All injection wells will be converted producing wells.

9. Will additional oil wells be drilled? No [illegible] location

IV. Results expected

1. Estimated residual oil saturation at abandonment (% of pore space) 20
2. Estimated ultimate additional oil that will be recovered as a direct result of injection (bbls.) 2500 bbls/ac.
3. Estimated original oil in place (bbls.) 8832 bbls STO/Ac.

V. Recommendations and reasons therefor: As noted earlier, a majority of the wells in the pool are at the "economic limit" and will have to be abandoned in the very near future unless some secondary recovery means are installed.

PRODUCING WELLS TO BE AFFECTED BY THE PILOT FLOODS

Lease, Well Number, and Location	Cumulative Oil Prod. to 11-1-56
Graridge Malco State "A" #2 (G-31-12-32)	42,310 bbls.
#4 (M-31-12-32)	56,518
#6 (K-31-12-32)	59,533
Graridge Livermore Maxwell St. "G" #4 (O-31-12-32)	56,546
#6 (I-31-12-32)	32,832
Graridge Manry St"A" #1 (G-6-13-32)	15,669
Graridge Caprock St #5 (I-6-13-32)	17,376
Gulf Lea St "A" #3 (C-6-13-32)	10,479
"B" #1 (A-6-13-32)	52,200
Great Western St "Q" #1 (M-32-12-32)	51,497
"R" #2 (C-5-13-32)	28,558
"R" #3 (E-5-13-32)	19,896

PROPOSED WATER INJECTION WELLS FOR THE PILOT FLOOD

Lease, Well Number, and Location	Cumulative Oil Prod. to 11-1-56
Graridge Malco St "A" #5 (N-31-12-32)	46,124
Graridge Livermore Maxwell St "G" #5 (J-31-12-32)	72,257
#7 (O-31-12-32)	19,809
Graridge Manry St "A" #2 (B-6-13-32)	53,606
Gulf Lea State "B" #2 (H-6-13-32)	21,560
Great Western State "R" #1 (D-5-13-32)	37,274
Total Primary Prod. -	697,234 bbls.

$\frac{697,234}{18}$ = 38,750 bbls/well or 40 ac.

40 ac X 12' = 480 ac ft

$\frac{38,750}{480}$ = 81 bbls/ac ft.

CO-OPERATIVE WATERFLOOD AGREEMENT
CAPROCK FIELD
LEA AND CHAVES COUNTIES, NEW MEXICO

This Agreement, made and entered into this 16 day of November, 1956, by and between GRARIDGE CORPORATION, hereinafter referred to as "Graridge" or as "Operator", and GULF OIL CORPORATION and GREAT WESTERN DRILLING COMPANY, hereinafter referred to respectively as "Gulf" and "Great Western" and collectively as "Nonoperators",

WITNESSETH: That,

WHEREAS, the above parties are each the owners of certain oil wells situate in the Caprock Field, of Lea and Chaves Counties, New Mexico, and in the interest of conservation of crude petroleum, each party desires to conduct a pilot waterflooding project on certain of its separate leases, and, to further such purpose, desires to cooperate with the other parties in providing facilities for such project, all in accordance with the terms and provisions hereof;

NOW, THEREFORE, in consideration of the mutual covenants and agreements herein contained, it is agreed:

1. The oil and gas bearing formation into which water is to be injected is known as the "Queen Sand" or "3,000 Foot Sand" that occurs in the Caprock Field in the sub-sea interval between plus 1,300 feet and plus 1,400 feet, and which has an approximate thickness of 10 feet to 30 feet, which formation is hereinafter referred to as the "Queen Sand."

2. Each of the parties hereto shall convert into water injection wells for injecting water into the Queen Sand its following listed presently producing Queen Sand oil wells, all located in Lea County, New Mexico, as follows, to-wit:

Graridge - Malco State No. 5, located in SE/SW, Section 31, T-12-S, R-32-E.

Graridge - Livermore Maxwell State Nos. 5 and 7, located in NW/SE, Section 31, T-12-S, R-32-E, and SE/SE, Section 31, T-12-S, R-32-E, respectively.

Graridge - Manry and Company State No. 2, located in NW/NE, Section 6, T-13-S, R-32-E.

Gulf - State "B" No. 2, located in SE/NE, Section 6, T-13-S, R-32-E.

Great Western - State "R" No. 1, located in NW/NW, Section 5, T-13-S, R-32-E.

Each such well shall be temporarily abandoned as a producer of oil, and shall be so equipped as to permit water to be injected through such well into the full thickness of the Queen Sand presently penetrated by such well. Each such well shall have casing set and cemented into the top of the Queen Sand or a suitable liner cemented to the same point. Each party shall stand all costs in connection with so converting its own wells, and in maintaining them as injection wells.

In the event any of the parties hereto should, for any reason, be unable to satisfactorily convert any of the above listed wells as injection wells, then such party shall drill a replacement well, at its own expense, at a location as near as possible to the well which it was unable to convert, to be used as an injection well in lieu of the well that it was unable to convert.

3. The parties shall construct facilities for producing, treating, pressuring, and distributing to a water meter at each injection well the water to be used for waterflooding purposes, the plan of which facilities is shown generally on Exhibit "A" attached hereto, and in detail on Exhibit "B" attached hereto, and both made a part of this agreement. These facilities are hereinafter referred to as the "Plant." The costs of constructing said "Plant" shall be borne by Graridge 54%, Gulf 25% and Great Western 21%.

4. Water for injection purposes shall be fresh water produced from two wells presently completed in the 350 foot water gravel and sand formation on Graridge leases in Section 31, T-12-S, R-32-E. Graridge agrees to secure any necessary permission for the use of such water contemplated by this agreement from the Commissioner of Public Lands of the State of New Mexico, the

State Engineer of the State of New Mexico, any water district or any other agency or department claiming jurisdiction over such water or the use thereof;and Graridge further agrees to indemnify and save the Nonoperators harmless in the event it should fail to secure such permission.

It is contemplated there will be available for injection from the two wells mentioned above approximately 4,000 to 5,000 barrels of water per day. Should the contemplated amounts from the above source prove inadequate, supplemental water wells may have to be drilled later or an additional source of water developed. Should it become necessary to drill additional wells or to develop additional sources of water supply, such drilling or the nature of such additional source and the sharing of costs incident thereto shall be by mutual agreement of the parties hereto.

5. Graridge shall be the operator of the plant, and shall construct, or cause to be constructed, and shall operate said Plant for the mutual benefit of the parties in accordance with the provisions of this agreement. Construction of the Plant by Operator, and conversion of injection wells by the parties, shall be commenced within thirty (30) days after approval of this waterflooding project by the Oil Conservation Commission of New Mexico.

6. Upon completion of the Plant, conversion of the injection wells, and commission approval, flooding shall commence. Water shall be brought from its source, treated to a compatable condition for waterflooding purposes, and distributed in approximately equal volumes to each injection well. The parties recognize that, due to formation conditions in the various injection wells, there will be some variations between wells, both as to total water volume receivable and as to rate of injection. It is the intent, however, that approximately the same volume of water shall be injected into the Queen Sand each day, at the same rate, through each injection well, and each party shall diligently attempt to accomplish such results as regards its injection wells. The

plant shall commence operations on a gravity system. If, and when the wells fail to take the available supply of water on gravity, the pressure facilities shall be put into operation.

7. After installation, each party shall bear that proportion of the costs of operating and currently maintaining the plant which the volume of water injected by it into the Queen Sand bears to the total volume of water so injected. Such costs of operation and maintenance, as well as costs of construction and installation, shall be computed, billed, and paid in accordance with the provisions of the accounting schedule attached hereto and marked Exhibit "C". A betterment or addition to the Plant shall be a Plant charge; repairs to, or replacement of, a part of the Plant shall be considered as operating charges.

8. As Operator, Graridge:

(A) Shall carry (1) Workmen's Compensation as required by law; (2) Public Liability Insurance in the amount of $50,000/$100,000 for personal injury or death to persons and $5,000 for damage to property; and (3) Automotive Public Liability Insurance in like amounts as Public Liability Insurance.

(B) Shall not make an expenditure in expanding or operating the Plant in excess of $1,500.00 without the agreement of all parties, but this limitation shall not apply to current monthly operating expenses.

(C) Shall advise with the other parties as to methods of treating water, injection rates, and other problems in connection with Plant operation.

(D) Shall at all reasonable times give to the other parties access to the Plant and records pertaining thereto.

(E) Shall use its own employees, and such employees shall for all purposes be considered employees of Graridge.

(F) Shall use reasonable judgement and skill, but shall not be liable for damages to the other parties, or to their property resulting from Graridge's services as Operator, except such damages

which result from the negligence of Graridge or its employees.

9. The parties shall freely exchange information as to water injected, performance of injection wells, performance of production wells and production therefrom, and any other information that may be of value in determining the effectiveness of the water flooding operation. As Operator, Graridge shall each month furnish to the other parties a summary of information regarding Plant operation and water furnished for injection, and each month each of the parties shall furnish to the other parties information as to performance of its own wells, both injection and producing.

10. This agreement shall in no manner affect the obligations of any party to produce oil from its own wells, and each party shall be entitled to all production from its own wells and leases. The duties, liabilities, and obligations of the parties are intended to be several and not joint or collective, and nothing herein shall ever be construed to impose a partnership obligation or liability with regard to any of the parties. Each party shall be individually responsible for only its obligations as set out herein and shall be liable only for its proportionate share of the costs and expenses herein stipulated.

11. The parties agree that the creation, or attempted creation, of an artificial water drive as herein provided for is a reasonable producing and engineering practice. Each of the parties hereby releases the other parties from any liabilities or damages to its leases, subject hereto arising from or growing out of the injection of water into the Queen Sand pursuant to the terms of and conditions hereof.

12. It is contemplated that if the pilot flood is successful that it will be expanded into a field-wide project. In order to help evaluate the pilot flood, the parties agree that during the term hereof they will not drill additional Queen Sand wells within the "Assumed Drainage Boundary" shown on Exhibit "A" unless such wells are required in order to comply with the express or implied covenants of their leases.

13. It is believed that it will require approximately eighteen (18) months of actual water injection before the value of the waterflooding operations can be fully determined. For such reason, this agreement shall be and remain in full force and effect for a period commencing as of the date hereof and continuing thereafter for a period of eighteen (18) months after the day on which the Plant is first put into operation, which is the Primary Term hereof, and thereafter subject to the right of any party to terminate the agreement as to its participation in the project by thirty (30) days written notice to the other parties; provided that, if before the end of the Primary Term, the injection of water into the Queen Sand reasonably appears to be of no benefit to any party, such party shall have the right to stop water injection into its wells and to be relieved of participating in operating costs by thirty (30) days written notice to the other parties.

14. If either before or after the end of the Primary Term hereof, a party withdraws from the waterflooding project as set forth above, such party shall transfer to the remaining parties, in their ratio of ownership, its interest in the Plant, for which it shall be paid the reasonably depreciated cost (i.e. 5% per annum) of its interest in the Plant, but not including labor and installation and other intangible costs, and such other parties shall have the right to continue with the project insofar as their wells are concerned. If the waterflooding project is abandoned by mutual agreement of all parties, the Plant shall be salvaged for the best price obtainable, and the proceeds thereof distributed to the parties in the ratio of their proportionate share.

15. Notices and reports to be made hereunder may be given by mail or telegram addressed to the parties as follows:

Graridge Corporation
Attention: Mr. O. H. Reaugh
Box 752
Breckenridge, Texas

Gulf Oil Corporation
P. O. Drawer 1290
Fort Worth, Texas

Great Western Drilling Company
Attention: Mr. O. H. Crews
Box 1659
Midland, Texas

16. "Force Majeure" is any cause or event not within reasonable control, including, but not limited to: fire, flood, windstorm, lack of water supply, or other acts of God, strikes or industrial disturbances, inability to obtain material or equipment, wars, insurrection, riots, or governmental decrees. Whenever as a result of any cause normally covered by "Force Majeure," either party is prevented from complying with any obligation of this agreement, it shall not be held in default or liable for damages and such obligation shall be suspended so long as such cause persists. The party so prevented, however, shall use due diligence and good faith in an attempt to eliminate the cause so preventing his compliance with this agreement.

17. This Agreement shall be a covenant running with the lands and leases, and shall be binding upon the successors and assigns of the parties hereto.

18. This Agreement may be executed in counterpart with the same effect as if all parties had executed one instrument.

IN WITNESS WHEREOF, this Agreement has been executed as of the date aforesaid.

ATTEST:

Secretary

GRARIDGE CORPORATION

By _____
President

ATTEST:

Assistant Secretary
H. M. CRAIG

GULF OIL CORPORATION

Law Ckd. KER. Exp. Proj. H. M.

By _____

ATTEST:

Secretary

GREAT WESTERN DRILLING COMPANY

By _____
President

STATE OF TEXAS)
)
COUNTY OF YOUNG)

On this 23rd day of November, 1956, before me personally appeared Peter O. Peck, to me personally known, who, being by me duly sworn, did say that he is President of GRARIDGE CORPORATION, a Delaware Corporation, and that the seal affixed to the foregoing instrument is the corporate seal of said Corporation, and that said instrument was signed and sealed in behalf of said corporation by authority of its Board of Directors, and said Peter O. Peck acknowledged said instrument to be the free act and deed of said corporation.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my official seal on this the day and year first above written.

Notary Public in and for ~~Young~~ Stephens County, Texas

My Commission expires:

June 1, 1957

STATE OF TEXAS)
)
COUNTY OF TARRANT)

On this 16 day of November, 1956, before me personally appeared H. M. Dayer, to me personally known, who, being by me duly sworn, did say that he is VICE PRESIDENT of GULF OIL CORPORATION, a Pennsylvania Corporation, and that the seal affixed to the foregoing instrument is the corporate seal of said Corporation, and that said instrument was signed and sealed in behalf of said corporation by authority of its Board of Directors, and said H. M. Dayer acknowledged said instrument to be the free act and deed of said corporation.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my official seal on this the day and year first above written.

M. B. CHIPPEAUX
Notary Public in and for Tarrant County, Texas

My Commission expires:

June 1, 1957

STATE OF TEXAS }
COUNTY OF Midland }

On this 29 day of Nov., 1956, before me personally appeared R. C. Tucker, to me personally known, who, being by me duly sworn, did say that he is President of GREAT WESTERN DRILLING COMPANY, a Texas Corporation, and that the seal affixed to the foregoing instrument is the corporate seal of said Corporation, and that said instrument was signed and sealed in behalf of said corporation by authority of its Board of Directors, and said R. C. Tucker acknowledged said instrument to be the free act and deed of said corporation.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my official seal on this the day and year first above written.

Marguerite Vanover
Notary Public in and for
Midland County, Texas.

My Commission expires:

6-1-57

CEU:eap
11-6-56

31E

125

GREAT WESTERN DRILLING — 21 — U.S.A.

INTERCOAST PET. CO. — TRIGG — DICKSON — WHALEY — State — 22 — JOHN S. TRIGG — U.S.A.

McQUEEN & CLEVENGER — GULF — State — 23 — PHILLIPS — Hugh Graham

GULF — TIDEWATER — CRANDALL — W.F.LE — 24 — OSMOND — ATLANTIC — RE TEX SUPPLY — RICH & BASS — PENROSE — SUNRAY — State

GREAT WESTERN DRILLING — 28 — U.S.A.

HOLDER — MALCO REF. — GULF — 27 — HOLDER — DOYLE

PHILLIPS — WHALEY — DELFERN — TIDEWATER — 26 — HAMON — MALCO — CHAPMAN — OHIO OIL — CRAGDALL — MAXWELL — 25 — T.P.C. & O. — HAMON — MAXWELL — OSMOND — MILN

HEINATH — ANDERSON — BOOTHE — 33 — MOLDER — U.S.A.

ANDERSON — TRIGG — DOYAL — HOLDER — 34 — TRIGG — GULF

DELFERN — 35 — GR WEST. — MALCO. — DELFERN — RICH. & BASS — DELFERN — RICH. & BASS

GREAT WESTERN — GREAT WEST. — VIOLETTE — WHALE — RICH & BASS — MALCO — 1-D — GRARIDGE CORP. — 1-B — 36 — MALCO ST. — GREAT WEST. — SPURCK — 1-F — MALCO ST. — 1 — LIV. MAI. ST.

HOLDER — ANDERSON — 4 — ANDERSON — HOLDER

HOLDER — MALCO — 3 — LIVERMORE (PHILLIPS)

GREAT WESTERN — DELFERN — 2 — GULF — "P" — 1

DELFERN OIL — T.P.C. & O.

GULF — SPURCK — DELFERN — RESLER — 1-B — MAXWELL — VICKERS — 2-F — GRARIDGE — CORP. — 1-E — 1 — MALCO ST. ? McQUEEN? — A.K.POLIS — 2 — "B" — 1 — DELFERN — 1-C — 1-A — LIV MAI ST. — MALCO — DELFERN — 1-G

GULF TIDEWATER

GRANDALL M.E LEE

24

MOND ATLANTIC ME TEX SUPPLY CO

BASS PENROSE SUNRAY TIDEWATER

State

LCO CHAPMAN CHIC OIL

MON

25

RSDALL MAXWELL T.P.C.&O. NAMON

WELL OSMOND MILNE

WEST. GREAT WEST. VIOLETTE WHALEY

BEBASS MALCO GRARIDGE CORP.

1-D 1-B 1

36 MALCO ST. LIV. MAL. ST.

WEST. SPURCK

1-E 1-C

MALCO ST. MALCO ST.

ELFERN

1 1 1-A

LIV MAL ST. DELFERN

SPURCK DELFERN RESLER

1-B 1-A

WELL VICKERS GRARIDGE CORP.

2-A 1-E 1

MAL. ST. McQUEEN

1

POLIS DELFERN

2 1-C 1-A 3-F

LIV MAL ST. MALCO ST.

DELFERN

1 1-D 1-G 2-G

MAGNOLIA HANSON MAGNOLIA

TEXAS TEXAS

GRANDALL M.E LEE

19

GULF

R. NIX TEXAS

State

SUPERIOR MAGNOLIA PET.

30

OSMOND MAXWELL GRARIDGE CORP.

LIVERMORE 2-B 1-D 1

LIV MAL ST.

GRARIDGE CORP. 1-G 1 6

LIV MAL ST.

"G" 2 "A" 2 7

3 31 MALCO STATE

"A" 3 6 "G" 5 6

4 6 4 7

MALCO STATE LIVERMORE MAL. ST.

GULF MANRY & CO. GULF

1 3 2 1-B "B"

2 1 2

6

GRARIDGE CORP GRARIDGE CORP.

2-J 2 5

1-J "J" 3-J 4-J 3 4

LIV MAL. STATE CAPROCK STATE

GRARIDGE CORP GRARIDGE CORP.

MACARIS AMERADA TEXAS SUNRAY

1 1-D

MACARIS TEXAS

32 1

SEABOARD AMERADA SUNRAY HONOLULU

20

MAGNOLIA AMERADA

State

R NIX BROWN & WHEELER SUPERIOR

SUPERIOR TPC&O PHILLIPS

29

GRARIDGE CORP. GREAT WESTERN

VICKERS

"B" 2 1

CAPROCK STATE

TEXAS CO. PHILLIPS PHILLIPS PHILLIPS

1 1 ϕ2

PHILLIPS

1 2 ϕ 1

32

MID-CONT GREAT WESTERN

1 2 3

GREAT WEST. PHILLIPS PHILLIPS

1 1 4

State

GREAT WESTERN GULF SO. PET. EX.

"R" 1 2

3 GREAT WESTERN

5

GREAT WESTERN (MALCO) VICKERS PET.

2 "S"

GRARIDGE CORP WILSON OIL CO

32E

1 2 2

2 2

Bess CUPP U.S. "Federal"

State 21

Doutnit Bros.

ROSS SEARS

1 1

28

LEVICK

State

JOHN M. KELLY TEXAS

L.B. HODGES

GULF

33

TEXAS GULF TEXAS HANSON

SUNRAY T.P.C.&O.

State

T.P.C.&O. CO. GULF

MALCO AMERADA

4

CITIES SERV. GR. WEST

State

SUPERIOR AMERADA

135

U.S.A.

LANDA OIL — ANDERSON — LANDA OIL — MALCO — INTERCOAST — MANFORTH — DELFERN — GULF — DELFERN

9 — 10 — 11 — 12

ANDERSON — WILLIAMS — MALCO — LANDA OIL — GRARIDGE CORP. — GREAT WESTERN — SPURCK — GRARIDGE

U.S.A. — Ohio State

W. E. LEE — INTERCOAST — W.E. LEE — WHALEY CO. — ME-TEX — GULF — DELFERN — PHILLIPS — RESLER — GRARIDGE — BRITISH AMERICAN

GULF — "A" — DELFERN — "L" — "E" — MAX. ST. — DELFERN — COCKBURN

16 — 15 — 14 — 13

FARRAR — GALE — EEROR WHITE — DELFERN — SHELTON (MANEY) — SALSICH — GULF — COCKBURN (GULF) — BARNEY C. CARSON — COCKBURN

"N" — "M" — LANDA OIL (ATLANTIC) — SALSICH (RESLER) — COCKBURN

State — State

BLANCH TRIGG — J.E. COCHRAN, JR. — GULF — GULF — GULF — SEARS — GULF OIL CORP. — GULF — GILPIN — T.P.C.&O.

"BMD" — "BMA" — LANDA — WHITE GEROR — GULF — TIDEWATER

21 — 22 — 23 — 24

GRT. WESTERN DRLG. — LIVERMORE — WHITE GEROR — GREAT WEST. — TPC&O — WHITE GEROR — CITIES SERVICE — "AN"

GULF — WHITE GEROR — LANDA OIL — WILLIAMS — SHELTON — GULF — GREAT WESTERN — GULF (YATES)

U.S.A. — State — State — "BMC" — State

KERR McGEE — BRITISH AMER. — SKELLY — M.R. ANTWEIL — WHITE-GEROR — GULF — SALSICH — SUPERIOR

"A" — GULF — DELFERN

"Las Cruces" — "Malco"

28 — 27 — 26 — 25

SKELLY — CITIES SERVICE — CITIES SERVICE — G.R. WESTERN — SHELTON — WHITE

"Fed. Hinkle" — GULF — LION

U.S.A. — U.S.A. — State — U.S.A.

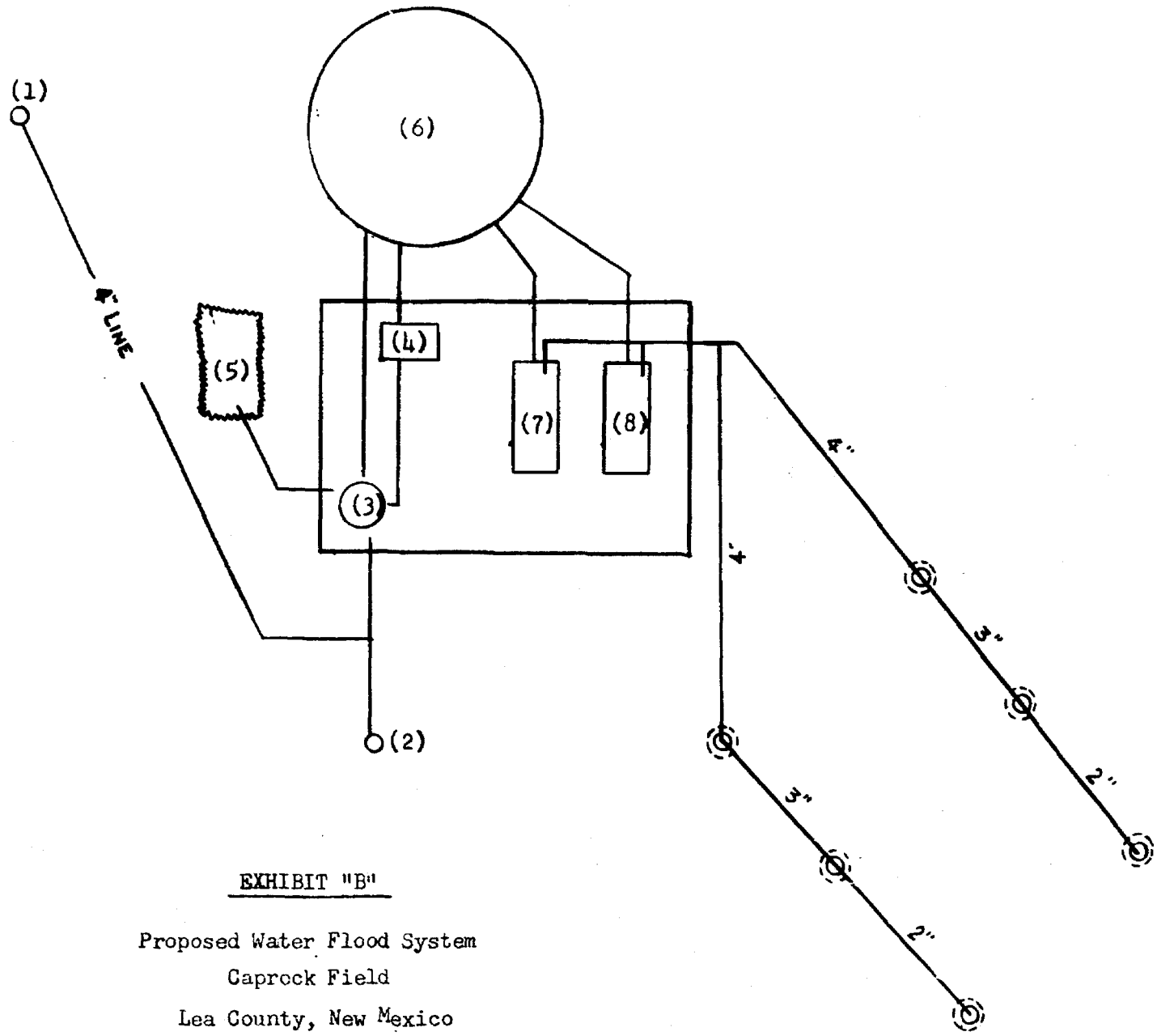


EXHIBIT "B"

Proposed Water Flood System

Caprock Field

Lea County, New Mexico

Scale - None

ITEM NO:

(1) Water Supply Well No. 1 (Equipped with 22½ H.P. Reda Pump)
(2) Water Supply Well No. 2 (Equipped with presently installed Beam Unit)
(3) (8' X 5')National Pressure Filter
(4) Centrifugal Backwash Pump (750 gpm at 50' Head)
(5) Backwash Pit
(6) 5,000 bbl Storage Tank (Presently Installed)
(7) F & M Fig 6182 (4" x 6") Duplex Pump (Presently Installed)
(8) Oilwell 36-P Triplex Pump with 75 H.P. Motor

EXHIBIT "C"

ACCOUNTING PROCEDURE

Attached to and made a part of Agreement between Gulf, Great Western, and Graridge - Caprock Field Waterflood

I. GENERAL PROVISIONS

1. Definitions

The term "joint property" as herein used shall be construed to mean the subject area covered by the agreement to which this "Accounting Procedure" is attached. The term "Operator" as herein used shall be construed to mean the party designated to conduct the development and operation of the project for the joint account.
The term "Nonoperator" as herein used shall be construed to mean any one or more of the nonoperating parties.

2. Statements and Billings

Operator shall bill Nonoperator on or before the last day of each month for its proportionate share of costs and expenditures during the preceding month. Such bills will be accompanied by statements, reflecting the total costs and charges as set forth under Sub-paragraph A below:

A. Statement in detail of all charges and credits to the joint account.
B. Statement of all charges and credits to the joint account, summarized by appropriate classifications indicative of the nature thereof.
C. Statements, as follows:
   (1) Detailed statement of material ordinarily considered controllable by Operators of oil and gas properties;
   (2) Statement of all other charges and credits to the joint account summarized by appropriate classifications indicative of the nature thereof; and
   (3) Statement of any other receipts and credits.

3. Payments by Nonoperator

Each party shall pay its proportion of all such bills within fifteen (15) days after receipt thereof. If payment is not made within such time, the unpaid balance shall bear interest at the rate of six per cent (6%) per annum until paid.

4. Audits

Payment of any such bills shall not prejudice the right of Nonoperator to protest or question the correctness thereof. All statements rendered to Nonoperator by Operator during any calendar year shall be conclusively presumed to be true and correct after eighteen months following the close of any such calendar year, unless within said eighteen months period Nonoperator takes written exception thereto and makes claim on Operator for adjustment. Failure on the part of Nonoperator to make claim on Operator for adjustment within such period shall establish the correctness thereof and preclude the filing of exceptions thereto or the making of claims for adjustment thereon. A Nonoperator, upon notice in writing to Operator and all other Nonoperators, shall have the right to audit Operator's accounts and records relating to the accounting hereunder, within eighteen months next following the close of any calendar year. Nonoperator shall have six months next following the examination of the Operator's records within which to take written

exception to and make any and all claims on Operator. The provisions of this paragraph shall not prevent adjustments resulting from the physical inventory of property as provided for in Section VI, Inventories, hereof.

II. DEVELOPMENT AND OPERATING CHARGES

Subject to limitations hereinafter prescribed, Operator shall charge the joint account with the following items:

1. Labor, Transportation, and Services

Labor, transportation, and other services necessary for the development, maintenance, and operation of the joint property. Labor shall include (A) Operator's cost of vacation, sickness and disability benefits of employees, and expenditures or contributions imposed or assessed by governmental authority applicable to such labor, and (B) Operator's current cost of established plans for employee's group life insurance, hospitalization, pension, retirement, stock purchase, thrift, bonus, and other benefit plans of like nature, applicable to Operator's field payroll; provided that the charges under Part (B) of this paragraph shall not exceed five per cent (5%) of the total of such labor charged to the joint account.

2. Material

Material, equipment, and supplies purchased or furnished by Operator, for use of the joint property. So far as it is reasonably practical and consistent with efficient and economical operation, only such material shall be purchased for or transferred to the joint property as required for immediate use, and the accumulation of surplus stocks shall be avoided.

3. Moving Material to Joint Property

Moving material to the joint property from Vendor's or from Operator's warehouse in the district or from the other properties of Operator, but in either of the last two events no charge shall be made to the joint account for a distance greater than the distance from the nearest reliable supply store or railway receiving point where such material is available, except by special agreement with Nonoperator.

4. Moving Surplus Material from Joint Property

Moving surplus material from the joint property to outside vendees, if sold f.o.b. destination, or minor returns to Operator's warehouse or other storage point. No charge shall be made to the joint account for moving major surplus material to Operator's warehouse or other storage point for a distance greater than the distance to the nearest reliable supply store or railway receiving point, except by special agreement with Nonoperator; and no charge shall be made to the joint account for moving material to other properties belonging to Operator, except by special agreement with Nonoperator.

5. Use of Operator's Equipment and Facilities

Use of and service by Operator's exclusively owned equipment and facilities as provided in Paragraph 4, of Section III, "Basis of Charges to Joint Account."

6. Damages and Losses

Damages or losses incurred by fire, flood, storm, or any other

cause not controllable by Operator through the exercise of reasonable diligence. Operator shall furnish Nonoperator written notice of damage or losses incurred by fire, storm, flood, or other natural or accidental causes as soon as practicable after report of the same has been received by Operator.

7. Litigation, Judgments, and Claims

All costs and expenses of litigation, or legal services otherwise necessary or expedient for the protection of the joint interests, including attorney's fees and expenses as hereinafter provided, together with all judgments obtained against the joint account or the subject matter of this agreement; actual expenses incurred by any party or parties hereto in securing evidence for the purpose of defending against any action or claim prosecuted or urged against the joint account or the subject matter of this agreement.

A. If a majority of the interests hereunder shall so agree, actions or claims affecting the joint interests hereunder may be handled by the legal staff of one or more of the parties hereto, and a charge commensurate with the services rendered may be made against the joint account, but no such charge shall be made until approved by the legal department of or attorneys for the respective parties hereto.

B. Fees and expenses of outside attorneys shall not be charged to the joint account unless authorized by the majority of the interests hereunder.

8. Taxes

The Operator shall render for and shall pay for the benefit of the parties hereto all taxes of every kind and nature assessed upon or in connection with the project and shall charge the same to the joint account.

9. Insurance

A. Premiums paid for insurance carried for the benefit of the joint account, together with all expenditures incurred and paid in settlement of any and all losses, claims, damages, judgments, and other expenses, including legal services, not recovered from insurance carrier.

B. If no insurance is required to be carried, all actual expenditures incurred and paid by Operator in settlement of any and all losses, claims, damages, judgments, and any other expenses, including legal services, shall be charged to the joint account.

10. Overhead

Overhead charges, which shall be in lieu of any charges for any part of the compensation or salaries paid to managing officers and employees of Operator, including the district superintendent, the entire staff and expenses of the district office located at the Caprock Field Camp, and any portion of the office expenses of the principal business office located at Breckenridge and Graham, Texas, but which are not in lieu of any other expenses of Operator incurred in the development and operation of said properties; and Operator shall have the right to assess against the project covered hereby the following overhead charges:

A. Operation of the Plant shall be $100.00 per month.

B. The above specific overhead rate may be amended from time to time by agreement between Operator and Nonoperator if, in practice, they are found to be insufficient or excessive.

11. Warehouse Handling Charges

None

12. Other Expenditures

Any other expenditure incurred by Operator for the necessary and proper development, maintenance, and operation of the joint property.

III. BASIS OF CHARGES TO JOINT ACCOUNT

1. Purchases

Material and equipment purchased and service procured shall be charged at price paid by Operator, after deduction of all discounts actually received.

2. Material Furnished by Operator

Material required for operations shall be purchased for direct charge to joint account whenever practicable, except that Operator may furnish such material from Operator's stocks under the following conditions:

A. New Material (Condition"A")
   (1) New material transferred from Operator's warehouse or other properties shall be priced f. o. b. the nearest reputable supply store or railway receiving point, where such material is available, at current replacement cost of the same kind of material. This will include material such as tanks, rigs, pumps, sucker rods, boilers, and engines. Tubular goods (2" and over), shall be priced on carload basis effective at date of transfer and f. o. b. railway receiving point nearest the joint account operation, regardless of quantity transferred.
   (2) Other material shall be priced on basis of a reputable supply company's Preferential Price List effective at date of transfer and f. o. b. the store or railway receiving point nearest the joint account operation where such material is available.

   (3) Cash discount shall not be allowed.

B. Used Material (Condition "B" and "C")
   (1) Material which is in sound and serviceable condition and is suitable for reuse without reconditioning shall be classed as Condition "B" and priced at 75% of new price.
   (2) Material which cannot be classified as Condition "B" but which,
      (a) After reconditioning will be further serviceable for original function as good as second hand material (Condition "B"), or
      (b) Is serviceable for original function but substantially not suitable for reconditioning, shall be classed as Condition "C" and priced at 50% of new price.
   (3) Material which cannot be classified as Condition "B" or Condition "C" shall be priced at a value commensurate with its use.
   (4) Tanks, derricks, buildings, and other equipment involving erection costs shall be charged at applicable percentage of knocked-down new price.

3. Warranty of Material Furnished by Operator

Operator does not warrant the material furnished beyond or back of the dealer's or manufacturer's guaranty; and, in case of defective material, credit shall not be passed until adjustment has been received by Operator from the manufacturers or their agents.

4. Operator's Exclusively Owned Facilities

The following rates shall apply to service rendered to the joint account by facilities owned exclusively by Operator:

A. Water service, fuel gas, power, and compressor service: At rates commensurate with cost of providing and furnishing such service to the joint account but not exceeding rates currently prevailing in the field where the joint property is located.
B. Automotive Equipment: Rates commensurate with cost of ownership and operation. Such rates should generally be in line with schedule of rates adopted by the Petroleum Motor Transport Association, or some other recognized organization, as recommended uniform charges against joint account operations and revised from time to time. Automotive rates shall include cost of oil, gas, repairs, insurance, and other operating expense and depreciation; and charges shall be based on use in actual service on, or in connection with, the joint account operations. Truck, tractor, and pulling unit rates shall include wages and expenses of driver.
C. A fair rate shall be charged for the use of drilling and cleaning-out tools and any other items of Operator's fully owned machinery or equipment which shall be ample to cover maintenance, repairs, depreciation, and the service furnished the joint property; provided that such charges shall not exceed those currently prevailing in the field where the joint property is located.
D. Whenever requested, Operator shall inform Nonoperator in advance of the rates it proposes to charge.
E. Rates shall be revised and adjusted from time to time when found to be either excessive or insufficient.

IV. DISPOSAL OF LEASE EQUIPMENT AND MATERIAL

The Operator shall be under no obligation to purchase interest of Nonoperator in surplus new or secondhand material. Derricks, tanks, buildings, and other major items shall not be removed by Operator from the joint property without the approval of Nonoperator. Operator shall not sell major items of material to an outside party without giving Nonoperator an opportunity either to purchase same at the price offered or to take Nonoperator's share in kind.

1. Material Purchased by Operator

Material purchased by Operator shall be credited to the joint account and included in the monthly statement of operations for the month in which the material is removed from the joint property.

2. Material Purchased by Nonoperator

Material Purchased by Nonoperator shall be invoiced by Operator and paid for by Nonoperator to Operator immediately following receipt of invoice. The Operator shall pass credit to the joint account and include the same in the monthly statement of operations.

3. Division in Kind

Division of material in kind, if made between Operator and Nonoperator, shall be in proportion to their respective interests in such material. Each party will thereupon be charged individually with the value of the material received or receivable by each party and corresponding credits will be made by the Operator to the joint account, and such credits shall appear in the monthly statement of operations.

4. Sales to Outsiders

Sales to outsiders of material from the joint property shall be credited by Operator to the joint account at the net amount collected by Operator from Vendee. Any claims by Vendee for defective material or otherwise shall be charged back to the joint account, if and when paid by Operator.

V. BASIS OF PRICING MATERIAL TRANSFERRED FROM JOINT ACCOUNT

Material purchased by either Operator or Nonoperator or divided in kind, unless otherwise agreed, shall be valued on the following basis:

1. New Price Defined

New price as used in the following paragraphs shall have the same meaning and application as that used above in Section III, "Basis of Charges to Joint Account."

2. New Material

New material (Condition "A"), being new material procured for the joint account but never used thereon, at 100% of current new price.

3. Good Used Material

Good used material (Condition "B"), being used material in sound and serviceable condition, suitable for reuse without reconditioning.

A. At 75% of current new price if material was charged to joint account as new, or
B. At 75% of current new price less depreciation consistent with their usage on and service to the joint property, if material was originally charged to the joint property as secondhand at 75% of new price.

4. Other Used Material

Used material (Condition "C"), being used material which

A. After reconditioning will be further serviceable for original function as good secondhand material (Condition "B"), or
B. Is serviceable for original function but substantially not suitable for reconditioning, at 50% of current new price.

5. Bad-Order Material

Used material (Condition "D"), being material which cannot be classified as Condition "B" or Condition "C", shall be priced at a value commensurate with its use.

6. Junk

Junk (Condition "E"), being obsolete and scrap material, at prevailing prices.

7. Temporarily Used Material

When the use of material is of a temporary nature and its service to the joint account does not justify the reduction in price as provided in Paragraph 3B, above, such material shall be priced on a basis that will leave a net charge to the joint account consistent with the value of the service rendered.

VI. INVENTORIES

1. Periodic Inventories

Periodic inventories shall be taken by Operator of the joint account material, which shall include all such material as is ordinarily considered controllable by operators of oil and gas properties.

2. Notice

Notice of intention to take inventory shall be given by Operator at least ten days before any inventory is to begin, so that Nonoperator may be represented when any inventory is taken.

3. Failure to be Represented

Failure of Nonoperator to be represented at the physical inventory shall bind Nonoperator to accept the inventory taken by Operator, who shall in that event furnish Nonoperator with a copy thereof.

4. Reconciliation of Inventory

Reconciliation of inventory with charges to the joint account shall be made by each party at interest, and a list of overages and shortages shall be jointly determined by Operator and Nonoperator.

5. Adjustment of Inventory

Inventory adjustments shall be made by Operator with the joint account for overages and shortages, but Operator shall only be held accountable to Nonoperator for shortages due to lack of reasonable diligence.

6. Special Inventories

Special inventories may be taken, at the expense of the purchaser, whenever there is any sale or change of interest in the joint property, and it shall be the duty of the party selling to notify all other parties hereto as quickly as possible after the transfer of interest takes place. In such cases both the seller and the purchaser shall be represented and shall be governed by the inventory so taken.