BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
February 21, 1963

EXAMINER HEARING

IN THE MATTER OF: Application of Compass Exploration, Inc. for the creation of a Gallup Gas Pool, Rio Arriba County, New Mexico. Applicant, in the above-styled cause, seeks an order deleting certain acreage from the South Blanco-Tocito Pool and redesignating portions of said acreage to comprise a new Gallup gas pool for its Northwest Lindrith Well No. 1-3, located in Unit K of Section 3, Township 26 North, Range 7 West, Rio Arriba County, New Mexico.	Case 2761

BEFORE: Elvis A. Utz, Examiner.

TRANSCRIPT OF HEARING

MR. UTZ: The hearing will come to order, please. The first case on the docket will be 2761.

MR. DURRETT: Application of Compass Exploration, Inc. for the creation of a Gallup Gas Pool, Rio Arriba County, New Mexico.

MR. UTZ: Are there any appearances in Case 2761?

MR. KELLAHIN: Jason Kellahin, Kellahin and Fox, Santa Fe, appearing for Calkins. We have filed with the Com-

mission a request that this case be continued to the next hearing before the same examiner.

MR. DURRETT: If the Examiner please, we do have that request in the form of a letter from Mr. A. F. Holland requesting that the case be continued to the next Examiner Hearing. We also have a telegram from Compass Exploration, Inc., the applicant, stating that they concur the request of Calkins Oil Company for a postponement of the hearing on Case 2761.

MR. UTZ: Without objection, Case 2761 will be continued to the March 20 Examiner Hearing.

STATE OF NEW MEXICO)
) ss
COUNTY OF BERNALILLO)

I, ADA DEARNLEY, 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 24th day of February, 1963.

Ada Dearnley
Notary Public-Court Reporter

My commission expires:

June 19, 1963.

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 2761, heard by me on Jan. 23, 1963.

....., Examiner
New Mexico Oil Conservation Commission

BEFORE THE
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
March 20, 1963

EXAMINER HEARING

IN THE MATTER OF:

Application of Compass Exploration, Inc., for the creation of a Gallup Gas Pool, Rio Arriba County, New Mexico. Applicant, in the above-styled cause, seeks an order deleting certain acreage from the South Blanco-Tocito Pool and redesignating portions of said acreage to comprise a new Gallup gas pool for its Northwest Lindrith Well No. 1-3, located in Unit K of Section 3, Township 26 North, Range 7 West, Rio Arriba County, New Mexico. Case 2761

BEFORE: Elvis A. Utz, Examiner.

TRANSCRIPT OF HEARING

MR. UTZ: Case No. 2761.

MR. DURRETT: Application of Compass Exploration, Inc., for the creation of a Gallup Gas Pool, Rio Arriba County, New Mexico.

MR. KELLY: Booker Kelly with Gilbert, White & Gilbert, Santa Fe, New Mexico, appearing on behalf of the plaintiffs. Mr. T. P. Stockmar is associated with me.

MR. STOCKMAR: We have two witnesses and ask that they be sworn.

MR. UTZ: Any other appearances in this case?

MR. KELLAHIN: Jason Kellahin of Kellahin & Fox, Santa Fe, appearing on behalf of the Caulkins Oil Company.

MR. SPANN: Charles C. Spann, 914 Bank of New Mexico Building, Albuquerque, New Mexico, appearing on behalf of El Paso Natural Gas Products Company.

MR. UTZ: Any other appearances?

You may swear the witnesses.

(Witnesses sworn.)

MR. STOCKMAR: I might state for the record that one of the witnesses may only be called as a rebuttal witness.

If I may make a very short opening statement. This seems to be a fairly simple case. I hope it doesn't develop into something more, on the basis of routine nomenclature hearings. We have added to a fairly old and established pool simply by geographic proximity an area which now contains there three obvious gas wells. The geologic evidence to be presented here I think will show very clearly that there is no geologic connection between the two pools and we have separate sources of supply. As I am sure the Commission is fully aware, the oil pool is one of ancient vintage, well advanced on secondary recovery mechanism and I am sure well on the way exhaustion to secondary oil. It would certainly be impracticable, even if there is a redefinition of certain wells into gas wells to attempt to operate under common pool rules.

Another facet of the applicant's application was that in

addition to having a new field designated that 160-acre spacing be permitted. There was not an intent here to have a full dress spacing hearing as such, but simply to rely on the statewide rules at this time. So there is no intent to move forward with a full dress appearance on that.

With that, I would like to call our first witness, Mr. Farrelly, who has been sworn.

PETER J. FARRELLY

a Witness, called by the Oil Conservation Commission, having been first duly sworn, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. STOCKMAR:

Q Mr. Farrelly, would you state your full name, address, and employment for the record, please?

A Peter J. Farrelly, 101 University Boulevard, Denver, Colorado. I am employed by Compass Exploration, Inc., as Manager of Exploration and Production.

Q Mr. Farrelly, have you ever been qualified and have you ever appeared as a witness before this Commission?

A No, I have not.

Q Would you then give us some idea of your general educational background?

A Bachelor of Science Degree from the University of Illinois, 1952; Master of Science Degree from the University of Illinois, 1953; employed by Continental Oil Company in the Durango

area for approximately four years and then went to work for Compass Exploration for a period of another four years.

During this period I have worked on the San Juan Basin, both for horizon--I have actually supervised and done the basin work for exploration and the production of Gallup and Dakota formations in the area.

Q Mr. Farrelly, was your educational work and your employment as a geologist?

A Yes,it was.

Q Do you have a specific knowledge of the data available as to the South Blanco-Tocito Oil Pool?

A Yes, I do. I have worked the area. I have analyzed the electrical logs and completion data available in the South Blanco-Tocito Oil Pool and the drillings of our wells in the same area. I have supervised their completion and actually worked up the initial exploration for the Gallup-San Juan area.

MR. STOCKMAR: Mr. Examiner, I ask that the witness' qualifications as a geologist be accepted.

MR. UTZ: He is qualified.

Q I would like to have marked as Applicant's Exhibit 1 a map entitled Structure Contour Map on Top Sanastee Formation. Mr. Farrelly, would you generally describe what this exhibit is?

A This exhibit is a structure contour map on the top Sanastee Formation, South Tocito area. The map is contoured on the 50-foot interval. Logs have been examined in a four township

area in which the field is included and immediately adjacent to the field.

Q Are there any corrections or things that you might wish to point out with respect to the exhibit?

A Yes, in Section 10 of 26 North, 6 West, the gas well which falls in Section 10 of 26 North, 6 West, the gas well which falls in the Northeast of the Southeast--pardon me--Northwest of the Southeast should be deleted, that is a shallow producing well.

Q Could that be Section 9 that you are referring to?

A Pardon me, it is 9, I am sorry--Section 9, it's in the Northwest of the Southeast, the gas well there, the gas well symbol you see there immediately below the oil well.

Q Is it your contention, Mr. Farrelly, that this should be simply eliminated from the map as a shallow producing well?

A As a shallow producing well. The area that is shown in the dash lines across 26 Northwest, 6 West, 27 North, 7 West, represent the boundaries of the South Blanco-Tocito Pool. And in examination of these logs and construction of this cross section, I mean of this map, we have found generally northeast regional addition across the area. There are no particular structural observations. There are a few ridges in our strike but that is about it.

We have constructed this map for two reasons. The first reason was, No. 1, to determine whether there was a structural consideration between the two fields, and about the only thing

we can derive is that the Tocito Pool proper, as opposed to our gas pool, is downdip; generally, the strike across the bottom is the same, as there is no closure represented, so we can assume then that is a stratigraphic trap.

No. 2, the second reason we constructed this map was, generally speaking, in the regional setting of the entire basin, the Gallup oil and hydrocarbon accumulations run parallel to the strike on the Sanastee and we wanted to establish just how these two fields set in there. You will note on it that there is a cross section represented as of AA brim, this is a later exhibit, but too, we will again refer back to this map, the cross section was set up as such. Let it be noted the cross section is set up as such to obtain a normal position to the strike of the area.

Q I would like to have marked for identification Exhibit No. 2, which is a map entitled Isopach Map of Gallup Sand.

Mr. Farrelly, should the same correction be made on the shallow gas well in Section 9 on the map?

A Yes, with respect to the well in Section 9, it should be deleted from the map.

Q Mr. Farrelly, will you please describe Exhibit 2 and state what it purports to show?

A Exhibit 2 is an isopach constructed on the gross Gallup sand in the producing interval of both the Compass Gas Pool located 26-7 and South Tacito located 26 North, 6 West. Our company in the analysis of this thing, the way we approached it initially,

we tried to take the most general rules for parameters possible in the construction of this map. It was vitally important to us to find out whether we were hooked up with the field. Basically, on assuming this very gross parameter, all that is meant by the total Gallup sand in this area is that from the electrical logs any kick that was, we first took--let me re-explain that--we first took a typical well in our field in the Gallup Gas Pool and a typical well in the oil pool. From this, we compared all the logs in the four-section area. We came to the point where there were no overlaps. We gave them every benefit of the doubt to say that there was possibly some sand in this well in this interval and we contoured, we added those up and totalled the thickness and contoured on that basis. The wells have no data represents zero, that there was no Gallup sand present. Now, so we won't get a nomenclature problem I know in some areas--in the past, the Tocito has been referred to as a separate sand. For our purposes, we consider the Tocito and the Gallup one and the same. This is a lower Gallup sand accumulation and this is what we have examined.

Q Mr. Farrelly, do I understand from your explanation that the contours, isopach contours here do not necessarily represent net pay but simply the existence?

A No, they do not represent net pay at all, simply the existence of the sand.

Q Mr. Farrelly, what are the small numbers lying between

each well designation that are inside the zero contour limits?

A That is actually the thickness of the sand as pictured from the electric logs.

Q You testified that anywhere on the map which is outside of the zero contour had zero thickness?

A Had zero thickness.

Q Mr. Farrelly, were there in some instances two independent bodies of sand counted?

A Yes, in the examination of the South Tocito-Blanco Field, we found that in this portion of the Gallup there were in essence two separate sand developments. We totalled these again, approaching the benefits of given gross sand, as a later exhibit will show that actually what is producing from the Compass Gas area over in 26-7 Compass Gas area is actually just the top sand at the South Blanco-Tocito Pool and equivalent I should say to the South Blanco-Tocito Pool. In order to just reiterate what we have done, we have prepared this thing in total of all sands in interval to give the broadest possible sand connection. What we have come up with can well be seen. We come up with one large body of sand setting in the South Blanco Pool area and to the north. The sand has not been developed to the north and we understand by examination of the Case File 1420 that the people who are the operators in that area felt it had a little too low permeability. We did not consider the permeability of the sand at all. So we represent one area to the east and then another area building up to the west. We

can show that by the well in the northeast of Section 3 of 26-6, the well in the north--actually it would be in the northeast of Section 10 of that same township and range--but the two feet represented in Section 1 of 26-6 and by the well located in Section 23 of 26-6--pardon me, 13 of 26-6--these are all zero wells in contouring this thing logically. When I say zero except for the two feet represented up here, I mean there is no sand at all present. This is in essence a three point picture across the area. Any pinching or anything would represent no sand across the area. This forces us to draw a blank spot in the area--an area of no sand and demonstrates there is in essence two separate sand pods.

CROSS EXAMINATION

BY MR. UTZ:

Q Let's go through the streaks again. Either you are wrong or I am wrong. I am not sure which.

A On Section 1 there is two feet of sand, Section 1 of 26-6. In Section 3 in the Northeast there is no sand. In Section 10 the well in Section 10, of the same township and range, there is no sand. In Section 13 there is no sand.

Q Well, now that is where I left you. This would be 13 over here.

A 13, right above 24 of the same township and range. And, Mr. Examiner, what I am referring to in particular are the three wells that are zero and one well going to practically zero, having

two feet of sand, and the three points of the three zero wells would cause us to contour these two separate units. It should also be noted the rate of pinch out of the sand established in South Tocito. In the area again, going from Section 9 of 26-6, where you have 16 feet on down to 5 feet and eventually to the South to zero feet, we have established a rate of pinch out across there. If we do carry the same rate of pinch out around you will note we have a decrease in the sand from the Tocito on westward. When you come to the Compass area, you have an increase in sand as you go westward from 8 feet to 12 feet. We have a decrease to the West at Tocito, increase to the West on the Compass, which again would lead us to believe that there is no sand in between the two fields.

Q What are those wells completed in?

A The wells in the Compass area or other wells?

Q These wells that you have described.

A They are Dakota wells which penetrated the Gallup formation.

REDIRECT EXAMINATION

BY MR. STOCKMAR:

Q In each case you did have a log available?

A In each case I did have a log available.

MR. STOCKMAR: Any further questions?

MR. UTZ: No.

Q Mr. Farrelly, in describing your qualifications, you indicated a degree of familiarity with the Gallup reservoir and the entire basin. From this experience, are there any further

conclusions you can draw with respect to there being two fields here?

A I would like for the Commission to note the fact that Totah and Cha Cha are just about a mile apart, producing from like sands. They are considered by the Commission as two separate fields. It is very possible in the deposition, the strike valley type of deposition we get in the Gallup, to have two separate fields, less than a mile apart but in essence two separate sand bodies to be treated as two separate sand bodies. I would also like to note again sand as such were found on a log. The areas can be as far apart as 10 miles or 15 miles and you will see a like similarity in the Gallup sand so that the fact that the log characteristics in one area are the same as that in another area, it does not necessarily make it the same pool.

Q Mr. Farrelly, have you prepared a cross section AA Prime? Assuming your answer to be yes, I would like to have it marked for identification as Applicant's Exhibit 3.

Mr. Farrelly, would you please identify Exhibit 3 and explain it?

A Exhibit 3 is a West-East Stratigraphic Cross Section, which has a datum at the top on the Sanastee. The most of the section is represented on the earlier two exhibits. It will be noted that the section wasn't carried directly into the boundaries of the South Blanco-Tocito Pool as it came eastward. I went up north of the actual boundaries of the field. I will endeavor

to explain why. Starting with the Compass Well in the section on the west end at A of the cross section, you will note the log characteristics and the sand characteristics of the Gallup formation, the lower Gallup formation. Then as we come into the El Paso NCRA Well, Section 3 of 26 North, 7 West, we lose the sand characteristics completely. We instead have replaced with siltstone. As we come back, or as we come further east into Section 36 of 27 North, 7 West, the zone is oil in the Rincon No. 1 Well. We again pick up sand and going into Section 31 of 27 North, 6 West, we again have the sand characteristics. What we did, as I have explained earlier, while talking about Exhibit No. 1, we attempted to make a cross section across the strike area, get a cross section normal to these two sand buildups. In doing this, of course, we show sand in the Compass area going to no sand in the NCRA Well and then coming back into sand in the Rincon area. I can show the Commission and we have the logs available the cross section can be carried down below other sections in South Blanco area, in the actual field area. The same sand conditions exist and can be carried on across.

MR. UTZ: Your testimony then is, Mr. Farrelly, that within the zero contour lines of the larger body of sand there is continuity of the sand and the logs can be correlated?

THE WITNESS: That is correct, sir.

MR. STOCKMAR: Mr. Examiner, would you care to see any additional logs laid by this to show this correlation?

MR. UTZ: I don't think so.

Q To reiterate again, a cross section was designed--one of the places of that cross section was taken and designed on that going to sand, to no sand, and back into sand again. So that the Commission may be able to appraise the fact that there is actually a zero sand band through the middle of these two areas. Does this study further confirm your stated opinion that no sand body exists between these two developed areas?

A Yes, it does.

Q Mr. Farrelly, were Exhibits No. 2 and 3 prepared by you or under your supervision?

A They were.

MR. STOCKMAR: Mr. Examiner, I ask these exhibits 1, 2 and 3 be accepted into evidence.

MR. UTZ: Without objection, Exhibits 1, 2 and 3 will be made a part of this record.

MR. STOCKMAR: Mr. Farrelly is available for questions by Mr. Examiner or others.

RECROSS EXAMINATION

BY MR. KELLAHIN:

Q Mr. Farrelly, I am Jason Kellahin. I represent Caulkins Oil Company. In connection with your preparation of Exhibit 1, did I understand you correctly to say that the Tocito Oil Pool is downdip from the Compass Area?

A Yes, you did, sir.

Q Assuming that the Tocito is a solution gas drive reservoir and then assuming again for the purposes of this question that there is a connection between two zones, it would be normal to expect you would find a gas cap at the upper zone, would it not, at an advanced stage of completion?

A If the reservoirs were connected at all, yes, sir, you would, but as described in our direct testimony, we don't feel we have any evidence prepared that the reservoirs are even connected, and should be treated as two separate units.

Q You do find gas in the Compass Wells?

A Yes, we do.

Q Referring to your Exhibit No. 2 where you cut off your zero isopach line, what control did you have between the Tocito area as you described it and the so-called Compass area?

A I had the controls of the wells that I pointed out in direct testimony. Also, I was very surprised to note this, on examination of the Caulkins and El Paso files in Case 1420 that their zero lines were the same practically as mine in the old testimony.

Q That testimony was submitted prior to the drilling of Compass wells, was it not?

A Yes, sir, it was.

Q And they had no control then in that direction, did they?

A No, sir. They did have control in Section 36, in Section 1 and in Section 13.

Q That would be on the other side?

A On the west side of the field, they did have that control. They did have those three well controls.

Q They did not have the benefit of the information obtained from the Compass Wells?

A No, sir.

Q For the purposes of your testimony, you treated the Tocito and Gallup as one and the same formation?

A Yes.

Q Although it is defined as a lens in the Maucas shale, is it not, the Tocito?

A There is a great deal of discussion going on amongst all geologists. Actually, Tocito or Gallup sand buildup, all the buildups are actually lower on any previous sand accumulations overlying the Carlisle unconformity or hiatus between the Carlisle and any hiatus and these things, as I mentioned just previously in the testimony--actually probably this is the consideration of most geologists--are probably strike valley sands and are actually sands that are quest of valleys of this unconformity.

Q Now, as I understand your testimony in regard to Exhibit No. 2, you pointed to certain wells inside of the area as being wells which had no sand development.

A Inside of the Tocito area, inside the area zero line.

Q You said, for example, one of the wells had two feet. You would consider it as no sand at all?

A That well I referred to, I believe is outside the pool limits.

Q It was outside the pool limits in the northeast section of Section 2?

A I will correct that statement. The wells have datums inside the pool areas, no footage marked. They are not zero, they are just wells that we did not have any data on, we did not have the logs.

Q You don't say that they have no development?

A No.

Q Now, do you say the El Paso NCRA 1 in 1 had no sand development?

A Yes, I do.

Q Did you compare the log on that well to the logs on our other two Compass wells?

A Yes, sir, I did.

Q You still say there was no sand development?

A I say no sand. There is probably siltstone development, which is very characteristic in the Gallup.

Q Did you take into consideration permeability at all in defining your sand zone here?

A No, sir, I did not.

Q Did you have information other than the logs on this El Paso NCRA Well?

A I have the logs and completion data, as reported by

service.

Q You had no core information?

A No.

Q Why do you not consider then that the development below the point you show that sand development as being sand?

A I told you, sir, that in selecting a parameter for this we selected the logs on the two production areas; we considered those sands since we had examined those sands in the drilling of the wells in our area and we are able to make an analysis. We could have set up a set of parameters and really not have been fair to your people. We could have stopped at over 50 ohms or 5 million ohms, but we didn't. Instead we attempted to use the overlay theory to just get as gross a pick as we could of these things and I am just sorry to say the NCRA well would in no way overlay.

Q The microlog shows permeability in that zone?

A I don't think the microlog shows permeability on any well. Microlog demonstrates porosity but not permeability.

Q How did you determine gross pay in these other wells?

A I didn't call it gross pay, I said gross sand. I determined it from the E log or the induction ES log.

Q Mr. Farrelly, did you know that there is a gas cap development in the Tocito reservoir?

A I noted that in examining the past exhibits in the field area yesterday that you people did draw a gas cap through approxi-

mately the southwest edge of Tocito. I did note that.

Q And what date was that exhibit that you were referring to?

A I think it was 1959 Exhibit, I can't recall.

Q You haven't made any investigation since that date to determine whether there is a gas cap and to what extent it may have grown since '59?

A You mean on the South Tocito Pool itself?

Q Yes.

A Just the investigation that my people have told me and I am not prepared to testify in Engineering things, on the accumlatives, and so forth that they have rounded up. They have told me that in the injection program that is presently going on, the pressure maintenance program that some of the wells, of course, that had been high gas - oil ratio wells had been converted to inject wells as such. I couldn't definitely say that I have explored the exact size of the gas cap and how far it expanded. I had just general conversation with my people.

MR. UTZ: Any other questions?

MR. STOCKMAR: Mr. Examiner, the record might be clear if we identified the map to which he is referring to Case File 1420.

MR. STOCKMAR: Mr. Farrelly, is the map you refer to Exhibit A to a letter of El Paso Natural Gas Company of April 1st, 1959, addressed to the Commission and others, signed by Mr. C. L. Perkins, Vice President?

THE WITNESS: Yes, sir, it is.

MR. UTZ: Are there any other questions?

MR. STOCKMAR: I do have one question on redirect examination if there are no others.

MR. UTZ: Any other questions of this witness?

BY. MR. UTZ:

Q Mr. Farrelly, the well in the northeast, northeast of Section 1, 26-7, I believe you stated that was completed as a Dakota Well?

A Yes, sir, I did.

Q But you show two feet of Gallup pay?

A Yes, sir.

Q It was not completed in the Gallup?

A No, sir, it was not.

Q Now, the well down in northeast corner of Section 13, the same township and range, you inspected that log and you found no pay in the Gallup?

A No, sir, I did not.

Q Now, in the southwest portion of the South Blanco-Tocito Pool, do you have all wells which were dipped through the Gallup plotted on the map?

A Yes, sir, as far as I know, I do.

Q So you can be sure that there were no gas wells in the southwest portion of this pool?

A Yes, sir.

Q In the Gallup?

A Yes, sir.

Q Now, the gas wells shown in the northwest portion of the pool which you have net pays marked, which I presume are Gallup net pays?

A Not net pays, they are sand, sir.

Q Gross sand?

A Yes.

Q Are those wells completed in the Gallup?

A The wells with circle around them are the Dakota completions only.

Q So that in the northwest portion of this pool, there were no Gallup gas wells?

A No, sir.

Q Do you have any information as to the gas-oil ratios of any of the Gallup wells or Tocito wells in Section 6 or 7 portion of the pool that is nearest to your area?

A Yes, sir, we have the latest gas-oil ratio.

Q I imagine on Caulkins wells?

A Yes, sir, in Section 7, the B unit well is not GOR listed, it is a border injection well as shown.

In Section 6, the P unit well, which is an El Paso Natural Gas Products Company well, has a GOR of 1008 report. Also, in Section 6, the F unit well has a GOR of 17,400 report.

Q Those wells are pretty high gas-oil ratio for an oil

pool, aren't they?

A Yes, sir, they are.

Q Do you have any idea as to the gravity of the liquid produced in South Blanco-Tocito?

A No, sir, I do not.

Q Are your wells producing any liquid?

A Yes, sir, their condensate and gravity is up around 49 degrees.

Q Do you have any GOR's on your well?

A Yes, sir, I do. Mr. Utz, I would like to call your attention to the fact that actually if the wells in the northwest on the structure map of Section--pardon me--in Section 6 is a Tocito-Blanco and wells in the northeast portion are further downdip even than our wells and actually structural strike with the majority of the pools.

Q Yes, I understand that.

A On the 13th well located in Section 3 with the box around it of 26-7 is the Compass Exploration, Inc.; 1-3 GOR is 80,833. The well in the east--the easterly most well in Section 4 of 26-7 is recently hooked up; the western most well is not on the line shaft as yet. The GOR on the 14, which is the well in the northeast of Section 4 is 100, 450.

Q Both of those wells produce the same type of fluid?

A Yes, sir.

Q Mr. Farrelly, have you done any subsurface work on any

other Gallup areas in San Juan Basin?

A Yes, I have.

Q The results of your studies show that the Gallup invariably follows the trend directly and tend to cut across the trend in there?

A In the entire basin which I refer to as area inside the Mesaverde outgrowth it will follow the strike except for a slight cocking. Now this change in attitude has been caused by late structural movement of deposition of the sand. We feel sand was deposited along the strike and late structural movement caused some cocking. When you see a structure contour map without a tilt eliminated, you will note sometimes they run slightly obliquely to the strike.

Q Is it your contention the fact that there are some 100 feet difference in contours between the South Blanco-Tocito Pool and your area, that there would be no connection? That is one of your contentions?

A Yes, sir, there are no connections, through reservoir connections as such. The sand does not exist in between.

MR. UTZ: Does Caulkins intend to put on any testimony?

MR. KELLAHIN: Yes, sir.

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

REDIRECT EXAMINATION

BY MR. STOCKMAR:

Q Very briefly so the record is clear. Mr. Farrelly, would you refer to the four wells marked Dakota Completions on Sections 13, 14, 15 and 16 of 26 North, 6 West, around which pen circles have been drawn.

A There was error in the plotting of our map.

Q In essence it is a Dakota only completion and not a Gallup gas completion?

A That is true, sir.

Q Mr. Farrelly, in one of Mr. Utz' questions about the well in the northeast quarter of Section 17, 26 north, 7 west, he asked you if that had two feet of net pay and you answered yes. Is that your answer?

A No, sir, if I answered yes to that, I was wrong. It should be two feet of gross sand.

Q To your knowledge is there any production in the Gallup through that well?

A No, sir.

Q Mr. Farrelly, is there any way in which the net pay by any definition could be larger than the gross sand, as you have used that term here?

A No, sir.

MR. STOCKMAR: That is all the questions we have.

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

MR. STOCKMAR: If there is to be other testimony, I

would like to reserve the right to make a statement at the conclusion of the matter and put on rebuttal testimony.

MR. UTZ: You may have that permission. You just have the one witness at this time?

MR. STOCKMAR: Yes, sir.

A. H. HOLLAND

a Witness, called by the Oil Conservation Commission, having been first duly sworn, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. KELLAHIN:

Q State your name, please.

A My name is A. H. Holland.

Q By whom are you employed and in what position, Mr. Holland?

A I am Manager of Production for Caulkins Oil Company.

Q Mr. Holland, are you a Petroleum Engineer?

A Yes, I am a graduate Petroleum Engineer.

Q Have you testified before the Oil Conservation Commission and made your qualifications a matter of record before the Commission?

A I have.

Q Have you had any experience in the South Blanco-Tocito Pool?

A Yes, sir, I have followed the development of the pool for approximately the past ten years.

Q Were you connected with the development of this pool practically from its inception to the present time?

A That is correct, from about the second well completed in the pool to the present.

Q Have you had actual field experience in this connection?

A Yes, I have.

Q Have you had anything to do with the pressure maintenance program which is being conducted by Caulkins Oil Company and was conducted by its predecessor in this pool?

A Yes, I have. I handled what was involved in the initial engineering, have followed it to the present time.

MR. KELLAHIN: We submit the qualifications of this witness.

MR. UTZ: He is qualified to testify in this case.

Q Referring to what has been marked Exhibit No. 1, Mr. Holland, would you identify that exhibit and state how it was prepared?

A Exhibit 1 is a structure contour map on the top of the Tocito sand. The map was prepared under my supervision by an examination of electric logs.

Q In connection with the picking of the top of the Tocito sands, Mr. Holland, is there a well defined electric log marker which can be picked for the purpose of identifying the top of the sand?

A Yes, there is. By correlation of logs, I experienced

no difficulty in picking the top of the sand. There is also above the sand there about 50 feet or so there is a conductive member in the Maucas shale that can be traced out throughout a very broad area.

Q Is that marker uniformly 50 feet above the Tocito?

A It varies just slightly, not a great deal, so that the sand can be easily identified. In connection with this contour map, we have had contours on the Tocito production for a number of years. At the time that the Compass' first producing well that they had located in Section 3 was drilled we compared this log with the logs of our Tocito wells, extended our contour map over to the area and this, to our way of thinking, was just an extension of our Tocito sand and extension of the South Blanco-Tocito gas cap.

Q Do you agree with the testimony of Mr. Farrelly to the effect that the Compass wells, which are the subject of this hearing, are located higher on the structure than the South Blanco-Tocito wells in the original portion of the pool?

A This exhibit brings that out. It illustrates that they are located at a higher structural level. To us it just appears a continuation of the present contour pattern over in the Tocito Oil Pool Area.

Q Do you have anything further to add in connection with this particular exhibit?

A No, sir, I do not.

Q Now, have you had prepared a cross section showing some of the wells involved in this hearing? I am now referring to what has been marked Caulkins Exhibit No. 2, would you identify that exhibit and state what is shown thereon?

A Exhibit 2 is a comparison of the electric logs of the Compass Federal Lindrith 1-3, the Caulkins T-123, Caulkins T-129. The red line on the cross section indicates that conductive member that I mentioned, that is traceable throughout a wide area. There are also other points on these logs. You can look at them and practically lay one log right on top of the other. The upper resistive members, there is very good correlation across the area. And I would particularly like to point out the Tocito sand indicated in general on the Caulkins T-123, as compared to the Tocito sand indicated in general on the Compass Federal Lindrith 1-3. They are both almost exactly 50 feet below this conductive member. They look practically exactly alike on the logs except for perhaps a few feet of thickness. I would like to point out that our T-123 well was a gas well. It is located in the gas cap to the Tocito Reservoir. To us, it just looks like the sand extends over into the Compass area and they are producing from this Tocito gas cap.

Q Would you locate the T-123 well you referred to as being gas well located in the gas cap?

A T-123 northeast quarter, Section 7, 26 North, 6 West. The Compass Federal Lindrith 1-3 is located in the southwest

quarter of Section 3, Township 26 North, Range 7 West. And the T-129 is located in the northwest quarter of Section 9, Township 26 North, Range 6 West.

Q T-123 you indicated was a gas well which was located in the gas cap in the Tocito Pool, is that correct?

A That is correct.

Q It was a gas well when originally completed?

A Yes, it was. I don't have the initial potential. As I remember, it was 4 to 5 million cubic feet. It was an excellent gas well.

Q That is the same well that Mr. Farrelly referred to now as being an injection well?

A It is a water injection well.

Q And while we are on the subject, it might help if we discussed the T-111 in Section 6. Is that the correct number of that well?

A Yes, that is correct.

Q What is the situation in regard to that well?

A It is also a gas injection well--I mean a water injection well.

Q And was it completed as an oil well?

A It was a very high ratio oil well.

Q Do you recall what the ratios on that well were before it was converted to water injection?

A I don't recall exactly. It was a very high ratio well. As a guess, I would say in excess of 25,000 to 1.

Q Is it your practice to produce in the South Blanco-Tocito Pool Gas Wells, which are in the gas cap of the pressure maintenance project?

A We have never produced T-123.

Q You never produced it?

A It was a shutin well.

Q And when a well represents a high gas-oil ratio, what do you do with it in this pool?

A Well, we have produced and are producing in wells in excess of 2,000 to 1 limits. We were regulated by the Commission. We are under a gas-oil ratio limitation.

Q Now, getting back to our Exhibit No. 2, Mr. Holland, would you say that this exhibit reflects a uniform sand member going across the area covered by this cross section?

A We think so. There are such good correlation in the experience that I have had in this and other areas, correlating electric logs, I don't believe I have ever worked with an area that correlated as well as this one.

Q You heard the testimony of Mr. Farrelly in regard to the conclusion he reached that you would expect to find correlation between Gallup sand members, although they may not be connected? Did you hear that testimony?

A Yes, I did.

Q Are you in agreement with that conclusion in this area?

A In this area, I very definitely think the Compass

wells are connected to the South Blanco-Tocito reservoir.

Q In your experience with the South Blanco-Tocito reservoir, have you ever found a situation such as he has described, where there is the intersection connection between the areas, as closely located as these two are?

A Not to my knowledge.

Q Have you anything further to add in connection with Exhibit No. 2?

A I have nothing further.

Q Referring to what has been marked Caulkins Exhibit No. 3, would you identify that exhibit and state what is shown thereon?

A Exhibit No. 3 is an electric log cross section of the Compass Northwest Lindrith 2-4, the Compass Northwest Lindrith 1-4, and the Compass Federal Lindrith 1-3. And this exhibit is intended to show that the three wells are producing from a common source of supply. I think if you examine the exhibit, you will find that the Tocito sand is a little lower in the Maucas shale section for the 2-4 well as compared to the 1-3, the 1-4 Tocito sand. It is lower in the Maucas shale section again when compared with Federal Lindrith 1-3.

Q Have you examined the log on the El Paso NCRA No. 1 Well?

A Yes, I have examined that log.

Q Do you have a copy of that log here?

A I have a copy of it with me. And in this connection, I cannot understand the reason for making a division of the sand that was made in the Compass Exhibit No. 3, I believe it is.

Q Number 3?

A Number 3. I think in correlating, if you will use, especially if you will use one of the other wells, one of the other Compass wells, say the Northwest Lindrith 2-4, that you find that sand section correlates with the lower member of the El Paso NCRA No. 1 Well and that there would be no way other than to connect these sand thickness lines.

Q Mr. Holland, would you step over to the Examiner and point out to him the correlation you were referring to?

A I will. I want to show on their Exhibit 3 where they have discontinued there sand isopach lines, saying that there was no sand in the well. This is the well that avoided or separated the area. This is the log of the well, the El Paso Gas Products NCRA-1. I would like to show you how it correlates with one of the other Compass wells. Here is the same little conductive member that you can trace throughout the area. If you line it up with the conducting member there, there is no question that they are the same. This sand correlates exactly with that sand. So my contention is that isopach map should have been continuous.

CROSS EXAMINATION

BY MR. UTZ:

Q Is this the log that is shown on Exhibit 3?

A Yes, sir.

Q This is the member here, right here, that they are showing on their Exhibit 3?

A That is right. The producing section in their wells to the west is lower in the Maucas shale and correlates almost exactly with the sand section in this El Paso Well. So to my way of thinking, there was no reason to subdivide that isopach map in the manner it was presented.

REDIRECT EXAMINATION

BY MR. KELLAHIN:

Q I hand you what has been marked as Caulkins Exhibit No. 4 and ask you if that is the log of the El Paso NCRA Well No. 1 to which you have been referring?

A Yes, sir, that is the log that I have been using as a comparison.

Q Now, Mr. Holland, you heard the testimony of Mr. Farrelly in conclusion, stating that there is no reservoir connection because the sand does not exist between the South Blanco-Tocito Pool and the Compass Wells. Do you agree with that conclusion?

A No, I do not. I think that although there are no wells drilled in the interval between Caulkins T-123 that there is such good log correlation over that area that is one and the same sand member.

Q Now, assuming that it is one and the same sand member, Mr. Holland, and since it is higher on the structure,

would you expect to find a gas cap in the area of the Compass well?

A Yes, we would. The only gas well completed as such in the Tocito reservoir is the highest well that we drilled.

Q Which was?

A T-123.

Q And you do not produce that as a gas well?

A We are using it as a water injection well.

Q Now, assuming that this connection exists, which you have stated, would production of the Compass wells, as gas wells, have any adverse effect upon the pressure maintenance program being conducted by Caulkins Oil Company in the South Blanco-Tocito Pool?

A Any well that is allowed to produce unrestricted in gas cap will affect an oil reservoir, irregardless of whether you are injecting water or producing under a gas cap expansion drive.

Q An adverse effect would exist whether you have pressure maintenance program or not, is that correct?

A That is correct. Our opinion and recommendation is that they should be regulated.

Q Should they be regulated under the rules of South Blanco-Tocito Pool?

A We believe they should, yes, sir.

Q Now, these wells are removed at some distance from

your nearest injection and producing wells, isn't that correct?

A That is correct.

Q Based on your experience with the South Blanco-Tocito Pool and your familiarity of the producing characteristics of that pool, would the production of the Compass wells have an adverse effect on your pressure maintenance program?

A They would have, unrestricted production would decrease our ultimate oil recovery.

Q In your opinion that communication across that area which would affect you?

A I believe so, yes.

Q Do you have anything further to add to your testimony?

A No, sir.

Q Were Exhibits 1 through 4 prepared by you or under your supervision?

A They were prepared under my supervision.

MR. KELLAHIN: At this time I would like to offer in evidence Exhibits 1 through 4.

MR. UTZ: Without objection, Exhibits 1 through 4 will be entered into the record of this case.

RECROSS EXAMINATION

BY MR. UTZ:

Q Mr. Holland, what is the gravity of fluid producing in South Blanco-Tocito Pool?

A That gravity ranges from 42 to 45 API.

your nearest injection and producing wells, isn't that correct?

A That is correct.

Q Based on your experience with the South Blanco-Tocito Pool and your familiarity of the producing characteristics of that pool, would the production of the Compass wells have an adverse effect on your pressure maintenance program?

A They would have, unrestricted production would decrease our ultimate oil recovery.

Q In your opinion that communication across that area which would affect you?

A I believe so, yes.

Q Do you have anything further to add to your testimony?

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RECROSS EXAMINATION

BY MR. UTZ:

Q Mr. Holland, what is the gravity of fluid producing in South Blanco-Tocito Pool?

A That gravity ranges from 42 to 45 API.

Q And the fluid in the Compass area was testified to as 49?

A Let me elaborate a little on our gravities in producing T-123--I am recalling from memory--but the liquid from that was nearly white and as in many of our wells, it was a gas cap encroachment the gravity would increase. I have no figures to show you but I know that to be a fact. And if we had produced that well T-123, our gravity would have been well above 42 to 45 range that I gave you.

Q T-123 was the only gas well that you drilled on the west side?

A We drilled there and quit, yes, sir.

MR. UTZ: Any other questions of this witness?

MR. STOCKMAR: Yes, I have, Mr. Examiner.

BY MR. STOCKMAR:

Q Mr. Holland, referring to your Exhibit 3, you have colored in green certain parts of the log there. Would you tell me what the significance of that is?

A What I colored is just a portion of the resistivity curve on the electric log.

Q What is the significance of coloring just a portion of it?

A I colored it principally for identification.

Q You seem to have colored only the resistivity above a certain point. What point is that? There is a legend on top of Exhibit 3 here?

A I colored, I believe, above the 50 ohm line.

Q We refer to your Exhibit No. 4, which is the log then of NCRA well and refer to the part which you have identified as being the same sand, does any part of that kick on the curve there exceed 50 ohms?

A Well, it looks like at one point it is a little over 50, but not very much.

Q Would you identify for me the place on the log we are talking about?

A This is it right there. That looks like it is just barely over the 50 line.

Q It looks like it just touches on it, maybe a line possibly penetrates it, is that the one?

A This is the one right here.

Q Would you identify the depth measurement of that, please?

A That logs about 6645.

Q 6645. And what does the wiggle on the right-hand side of the curve mean on a log of this kind?

A That is a resistivity measurement.

Q What does that tell you about the formation that you have penetrated and logged?

A It is simply an electrical measurement. In some cases it would indicate oil or hydrocarbon production. You would say hydrocarbon fluids were present which would influence resistivity.

Q It measures some kind of fluid in the formation, is

that it?

A It measures similar resistivity.

Q Then the absence of resistivity would indicate no fluid present?

A I didn't say that. I said you could--in areas you can use resistivity as a correlation measure. By that, I mean if you measure an oil and gas zone or log an oil and gas zone, such as Tocito, you actually produce hydrocarbon fluid from it. You measure the resistivity of an offset well or well in the area, the resistivity then is a guide in helping you correlate and possibly an indicator of whether it would be on hydrocarbon productivity.

Q Don't resistivities in some way measure the porosity of sand or rock, whatever it is you have encountered?

A I have never used it as such, no, sir.

Q Well, doesn't the resistivity measure some of the ability of the rock to pass the electric current?

A It is a resistivity of the rock, nothing else.

Q It has nothing to do with the fluid that might or might not be in the rock, is that correct?

A Well, I don't think, from resistivity, you can positively say what type of fluid is there.

Q I didn't ask that. Can we fairly state that the lower the resistivity, the lower the porosity of the rock?

A No, I don't think that is true at all.

Q Well, it it true, Mr. Holland, that the maximum resistivity on this seems to be the cutoff point that you have used on your exhibit for coloring in green the kind of resistivity there?

A I could just as well have colored the other side of the log, the SP which is indicative of porosity.

Q You have talked about the Tocito sand, what do you mean when you say "sand"?

A Well, Tocito sand stone is the formation that we are producing from and in South Blanco-Tocito Pool.

Q Is this a member of the Gallup formation?

A It is a sand member in the Maucas shale section.

Q Is it fairly uniform over wide areas? Does it extend in all parts of the basin here? Is it limited or its lensing or what?

A The oil productive portion of it is there on the map you have.

Q I am just talking about the member, whatever it is, is it a broad blanket like thing of some kind?

A No, not necessarily. This essentially covers the Tocito sand section.

Q Well, it is not a broad blanket of some kind then? Does it occur in lenses or pods of some kind?

A It is a sand lens.

Q Are there many of these in the general vicinity of

the two or three counties here?

A What do you mean "many"?

Q I mean a number of pods of sand that have been lenses of sand that have been encountered.

A Throughout the San Juan Basin there are several producing sands in the Maucas shale section.

Q And each of those others, except the ones we are talking about here, have been found to be separate sources of supply?

A Those that I know of, there is no way of correlating with the Tocito sand here, as compared to correlating the Compass wells with the Tocito oil wells.

Q Is it a possibility, Mr. Holland, that we do have two separate lenses here?

A I don't think we do, no, sir.

Q Do you have any control whatsoever for tying, for showing that there is a continuity across this three-mile distance here?

A The exhibit that we have presented.

Q Is it your testimony that the drilling of any well in between these two areas should be productive of gas?

A It is.

Q Do I infer then that the El Paso Natural Gas NCRA No. 1 should have been completed as a gas well?

A Whether it should or shouldn't, I don't think is

pertinent. El Paso owns the well, they elected not to complete it as a gas well.

Q Does every place on this Exhibit No. 1, where you have shown Tocito sand development, should that be productive of oil or gas?

A Getting back to this NCRA well, I think it would be productive. I don't know how good a gas well it would be, but I think it would be productive of gas.

Q Is it possible that it also may be productive of oil?

A I would predict gas production.

Q It is not on strike practically according to the Applicant's Exhibit No. 1, with some oil wells that--

A The Tocito sand in that well is some 50 feet higher and continuous to our way of thinking, as compared to gas well we completed in the gas cap; based on that, I think it would produce gas.

Q What is it that defines the productive limits of the Tocito Pool, as you have worked on it these ten years?

A The sand essentially disappears updip. Downdip it seems to graduate grade into lower and lower permeability. We have some wells in which he has indicated some 20 feet of sand. We got a few barrels of oil out of. He assigned gross pay to them.

Q I think he might have testified it was gross sand, not gross pay, Mr. Holland. Did you hear the testimony that

the formation there became siltstone? Do you agree with that?

A Well, in the course that we took in the area, I don't recall siltstone in comparable sections I have made across here.

Q Whatever, it was found that the low permeability would not give up oil and gas, is that correct?

A As you move downdips, some wells, I guess that is what is defined as the reservoir downdip.

Q Why is it impossible then that the same condition could not exist to the wells as you leave the Tocito Pool?

A Well, our exhibit indicates that there is a permeable Tocito sand that extends from the western producing portion of our reservoir to the Compass gas cap area.

Q Well, is this whole project of yours that this is all permeable sand, based on your study 1 log, which is your Exhibit No. 4?

MR. KELLAHIN: I object to the question. We have three exhibits showing logs which have been examined and correlated and certainly the witness didn't testify to any such thing that he based it on one log.

MR. STOCKMAR: Well, he can say no.

A It is based on the exhibits of which there are four or five different logs and correlated with other logs in our area.

Q Is there any correlation on what you have called Exhibit No. 3? These seem to be all Compass Wells. That doesn't show any correlation with the Field Tocito Pool, does it?

A It shows that it is a common reservoir between the 3 Compass wells. It shows that comparison of the El Paso Well, NCRA Well that we have been talking about correlates with the 3 Compass Wells, more specifically with some of the wells with the sand member a little lower in the section, that is what the exhibit shows.

Q Mr. Holland, you testified that the production of some reasonable amount of gas from the so-called Compass area would have an adversed effect on your pressure maintenance program. Would you develop that a little more, if you will? Just how could this happen?

A Broadly, my basic belief and it is the belief of a number of Conservation Commissions that gas production from a gas cap should be regulated. I recommend it and I subscribe to it.

Q Let's assume for a moment that there is some connection across here. What would be the engineering route of some production from the gas wells that Compass has?

A In what way do you mean? You mean the loss of ultimate oil recovery?

Q This is what I am trying to get at. You have testified that it has an adverse effect and I want to find out why you think so?

A Well, any depletion of energy in a reservoir in a gas cap area would affect the oil portion of the reservoir.

Q Have you made any calculations as to how much pressure decline or how much withdrawal that the Compass areas might have to result before these wells could have any affect whatsoever, a distance of three miles away?

A Well, I think that any production would affect the area. I don't subscribe to shutting the wells in. I don't believe that is the correct approach. I recommend and subscribe to the idea of regulation.

Q You have followed the secondary recovery, the program of the Tocito Field for many years. What is your estimate of the time in which that program will be completed?

A I have made no estimate.

Q Have you testified in previous hearings on this particular matter?

A As far as the time element is concerned, I don't believe I have.

Q Do you have any rough estimates or are we talking about two years or ten years or fifty years?

A I don't know.

Q Have you made any economic projections of any kind with respect to the secondary recovery mechanism?

A I have made reserve calculations. It is a continuing study.

Q Have you made any calculations with respect to elements of recovery you hope to obtain?

A Yes, we have and it has been presented in other hearings.

Q Assuming, Mr. Holland, that the recovery program will be completed in, say, three years, what possible effect would some production of the Compass wells have on that program?

A You mean now?

Q Yes, sir, or three years from now.

A Its unrestricted production would affect ultimate oil recovery.

Q Are you saying that within a three-year period the Compass wells would have created a drainage pattern of some kind that would reach $3\frac{1}{2}$ or 4 miles?

A What kind of production are you talking about? Unrestricted?

Q Say unrestricted production to pipeline--restrictions of some kind.

A I testified several times, about three times that is what I believe.

Q Is that equivalent to testifying Compass wells will drain 2 or 3 or 4 millidarcies in a three-year period?

A I think the situation here isn't any different than any other oil field in the State of New Mexico. Wells producing from a gas cap should be regulated, that is the basic conservation procedure.

Q Can we agree, Mr. Holland, that the pressure is no doubt higher, reservoir pressure is no doubt higher at Compass

wells than it is at the Tocito Pool?

MR. KELLAHIN: If the Commission please, there is no testimony before the Commission on pressures at the present time.

MR. UTZ: Objection is sustained. I don't believe there is any testimony as to pressures in any of these wells.

Q Mr. Holland, I think it has been testified that what you have identified as the T-123 Well and the T-11 Well are now water injection wells?

A That is correct.

Q By the injection of water into the wells is there not a barrier being put up between the oil part of the field and this alleged gas cap?

A Irregardless of water injection, I recommend and believe that gas wells and gas cap of a reservoir should be regulated. It is a practice in other oil and gas pools, it should be the practice here.

Q Well, is that a regulation because of some waste of oil that might arise through those well bores or some conservation of energy concept?

A It is basically, I believe, an ultimate oil recovery conservation procedure.

Q Is it your opinion that the owner of the gas cap should be entitled to some fair recovery of the gas under the gas cap?

A I have already testified that I didn't think that it

was right to shut those wells in. I think they should be regulated.

Q What kind of regulation do you think is reasonable?

A The South Blanco-Tocito Pool Field Rules.

Q Do not those rules presently apply to oil wells only?

MR. KELLAHIN: If the Commission please, I believe the rules speak for themselves. He is just belaboring this point.

MR. UTZ: Objection sustained. I believe that is true. South Blanco-Tocito rules have been in effect several years and gas is regulated as a matter of information to counsel.

MR. STOCKMAR: I don't think I have any more questions, Mr. Examiner.

BY MR. UTZ:

Q Mr. Holland, do you have any pressure information on your pool?

A Yes, sir, we do have.

Q Do you have any pressure information on some specific wells, say, those wells that are nearest to the Compass area?

A Those two wells are water injection wells. The closest wells, we have not measured pressures on those. I can tell you on the injection wells and in the water injection area, we have pressures on from 2300 to 2500 pounds.

Q Is this your face pressure?

A No, these are bottom hole. Our producing oil wells weigh from the water injection wells in the range of 1000 pounds.

Q What datum would that be?

A Minus 100.

Q The range of 1000 pound bottom hole. You have no pressures on the Compass areas?

A I have none. I have seen face pressures.

MR. UTZ: Does consolidated on Compass have any pressure sub-surface pressures in your area?

MR. STOCKMAR: I believe some surface pressures. Do you want to put those in the record? I think we can stipulate as to what they are, not necessarily as having any bearing on precise bottom hole pressure however.

Q (By Mr. Utz) Mr. Holland, what is the GOR limitation on gas wells in your area?

A 2000 to 1.

Q And what is top allowable for Tocito?

A I think it has been running about 135 barrels a day, something like that. Depth break of 1.33. It is 80-acre factor which would be 2.77 depth factor. 135 or 140 barrels a day, I believe, is the--

Q But you give the gas well a little less than 300,000--roughly, 280,000 a day on an 80-acre tract?

A Yes, sir.

BY CARL SPANN:

Q Mr. Holland, I would like to request one question here. Do you know of other areas in the San Juan Basin, other

than the South Blanco Field, wherein the Gallup formation gas is found associated with oil?

A I know there are areas. I believe the Escrito area is one. I haven't followed; I haven't correlated logs; I know nothing about it.

Q This is not an uncommon situation you find here?

A No, I don't think so. And in the best tie area there is some we have no production in by tie so I am not qualified to be specific.

MR. SPANN: That is all.

BY P. T. MC GRATH:

Q Mr. Holland, if the Commission would grant Compass permission to produce these wells, these three gas wells, could you tell within a reasonable length of time the reaction of pressure maintenance program, whether there was interference or not?

A Unless we shut the water injection down, I doubt it.

Q Just wondered if there was some way we could prove it, one way or the other. We can prove it on the taking of bottom hole pressure, if connected with the pressure maintenance program, it is going to maintain the pressure on these wells?

A I don't think we could discontinue injecting water in over a period of several years.

MR. UTZ: Any other questions?

MR. STOCKMAR: Mr. Examiner, if I could suggest a very

short recess, I think we could shorten down the rebuttal.

MR. UTZ: I have one more question and we will have a recess.

MR. STOCKMAR: Yes, sir.

BY MR. UTZ:

Q I would like to get back to interpretation of the resistivity side of your electric log. Mr. Holland, you maintained that this side of the log measured resistivity in the formation. Now, what is there in the formation that would change resistivity measurement?

A Water within a formation would reduce resistivity measurement.

Q Any reason why that water would be there? Porosity have anything to do with the amount of water and amount of resistivity in the formation?

A I think to a limited degree. Probably permeability has perhaps a little more. These are fresh waters in these sands so the resistivity analysis I have used is simply a correlation, just showing that it identifies sand members across the field.

Q In a general way, would you say that the more porosity and sand stone, the farther to the right the resistivity curve would fall?

A The higher the porosity?

Q Yes.

A It would depend.

Q Even in the absence of liquid?

A I don't know. I simply don't know.

MR. UTZ: Are there any other questions? We will take a 15-minute recess.

AFTER RECESS

MR. STOCKMAR: I would like to recall Mr. Farrelly for a question or two on redirect examination.

PETER J. FARRELLY

a Witness, was recalled, examined, and testified as follows:

REDIRECT EXAMINATION

BY MR. STOCKMAR:

Q Mr. Farrelly, would you compare for us the NCRA No. 1 Well log characteristics with those of producing wells in this vicinity?

A I think that actually there isn't any producing well in either our area or the South Blanco-Tocito area that has a like log characteristic. I won't disagree with Mr. Holland. In fact, I will more than agree to the effect that you can correlate through this. These correlations don't necessarily represent the presence of sand which would have been able to compose an isopach which composed a four township area which correlated something all the way through to see something was or was not present. The correlation exists as you get outside of this area. As you approach the limits of either one of these

reservoirs, you are going to get in tighter silter sands. The Gallup is this way in nature in all fields, that you go into siltstone before you in essence shale out. I think perhaps that happens in the NCRA Well. I don't think it is producible. If you were going to say it was in a producible state, the fact you could frac Gallup shale any place. It would produce something too. I don't doubt that a bit. It is completely beyond the realm of completion to complete it. And I definitely feel that it does make a block over there and does represent a zero sand.

Q It is your opinion then that there are two separate sources of supply involved here?

A Yes, sir, it is.

MR. STOCKMAR: That is the end of redirect examination for this witness. We do want to put on some pressure data.

MR. UTZ: The other witness will give the pressure data?

MR. STOCKMAR: Yes, sir.

RECROSS EXAMINATION

BY MR. UTZ:

Q Since I inquired into the interpretation of the resistivity curve with Mr. Holland, I will do the same with you. What is your interpretation of what the resistivity curve actually shows you in the formation?

A Resistivity curve means everything. It will measure in part the fluid, the actual rock resistivity. Actually, in utilizing with other logs on calculations on log basis porosity,

you can arrive--it can apply as one of the factors in your calculations. I will not agree with the fact that you can have a lot of porosity and have a high resistivity, and because a lot of porosity fields with gas, which normally gives a high resistivity, it does measure hydrocarbons in an indirect sense. In that respect, you can in essence have a low resistivity and it can be either salt water or oil and it does definitely measure fluids in that respect or it can also be just shaley.

Q It wouldn't necessarily read porosity?

A It doesn't read porosity directly at all, Mr. Utz.

MR. UTZ: Any other questions of this witness?

BY MR. KELLAHIN:

Q Mr. Farrelly, you heard Mr. Holland's testimony that he has never found any siltstone in the Tocito formation, did you not?

A Yes, sir, I did.

Q Have you ever examined any course in the Tocito?

A In the Tocito, no, sir, I have not.

Q You don't know whether there is any siltstone in there or not, do you?

A I think I can say in the regional Tocito and Gallup that probably facie out into the siltstone.

Q Have you yourself ever found any siltstone in the Tocito?

A No, sir, I have not in core examination.

Q If there isn't any siltstone in the El Paso Well, then wouldn't that log then indicate porosity?

A No, sir, I do not feel that log indicates porosity at all. I don't think it shows siltstone. I do feel my interpretation, on the basis of the log characteristics, as opposed to log characteristics of the immediate surrounding area, shows there is a difference of rock type. I can correlate the rock types through both, as Mr. Holland pointed out, the upper and lower sands. I think the difference in the rock type has the affect on log characteristic.

Q What difference would there be if there were no siltstone?

A I would interpret it being siltstone.

Q You have not examined any cores and Mr. Holland testified he has examined cores, has testified there is no siltstone. For the purposes of this question, will you assume there is no siltstone, then what on the log indicates?

A Let's say a very shaley sand then.

Q What does the S-P curve indicate?

A I think originally any calculations that Schlumbeyer put out permeability wise in essence have been more and more utilized as a correlative device, I think in cases it can be interpreted as indicating a cleanness of something, with a cleanness of the sand, whether it does have any shale particles in this or it can also and probably does indicate a little bit of

fluid content at times too. I have seen areas where the SP, not this particular area, signifies oil-water contact, through an oil-water contact, see a change in the SP. It is a very qualitative, not a very quantitative thing at all.

Q It would indicate porosity development if it indicates fluid, wouldn't it?

A It wouldn't definitely, no. El Royden Schlumberger, I think, is the man who started kicking the thing out.

Q Well, in sandstone, doesn't the SP Curve indicate porosity?

A Not necessarily, no, sir. I could have a tight sand with a very good SP kick.

MR. KELLAHIN: That is all.

BY MR. UTZ:

Q That is not the rule, however, is it, that you have a tight sand and have a good SP kick?

A I doubt if that is the exact rule, but it does occur.

MR. UTZ: Any other questions of this witness? Witness may be excused.

THOMAS A. DUGAN

A Witness, called by the Oil Conservation Commission, having been first duly sworn, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. STOCKMAR:

Q Mr. Dugan, you have been sworn?

A Yes.

Q Will you state your name, address, and occupation for the record?

A Thomas A. Dugan, 1007 North Dustin Avenue, Farmington, New Mexico, Consulting Petroleum Engineer.

Q Have you previously testified before the New Mexico Oil Conservation Commission?

A Yes.

MR. UTZ: His qualifications are acceptable.

MR. STOCKMAR: Thank you, sir.

Q Mr. Dugan, did you not hear the interpretation of the other witnesses and their testimony here?

A Yes, sir.

Q Did you hear Mr. Utz' question with respect to bottom hole pressures?

A Yes, sir.

Q Do you have some knowledge with respect to the Compass wells and the pressure data?

A Compass has not taken any bottom hole pressure determinations with a bottom hole pressure bomb; however, recently I have made some bottom hole pressure calculations from surface pressures.

Q Would you continue and tell Mr. Utz what the results of your calculations were?

A Well, the pressure in the Compass area, as bottom hole

pressure in the Compass area, is a minimum of 1950 pounds.

BY MR. UTZ:

Q Bottom hole at what depth?

A Well, at a minus 100 datum.

Q Calculating 1950 pounds at minus 100 datum, did you consider gravity of the fluid?

A The gravity of the gas.

Q Consider any fluid in the bottom of the hole.

A No, sir, I did not, but I am certain that there was fluid in bottom of the hole, that is why I said it was minimum of 1950 pounds.

Q And what was the relative surface pressures?

A 1600 pounds. They varied.

Q How much did they vary?

A I calculated one on the Federal 1-3 from shutin, indicating pressure measured September the 3rd, 1962, of 1549 on it.

BY MR. STOCKMAR:

Q Which well was that, Lindrith Federal 1-3?

A That is PSIG. On the Lindrith Federal 1-4, measured October the 28th, 1962, by dead weight gage, of 1603 PSIG and then a pressure on the Lindrith Federal 2-4, measured 12-1-62, of 1543 PSIG.

MR. UTZ: Any other questions of this witness?

MR. STOCKMAR: Yes, I still have some more of him still in the nature of rebuttal. He is still on his direct examination.

BY MR. STOCKMAR:

Q Mr. Dugan, I think you just stated that these minium or conservative figures--as an engineer, is there any indication to you from this data which necessarily requires you to assume a connection between these two areas? Did I make myself clear?

A No, you didn't.

Q You have obtained some kind of calculated bottom hole pressures for the three Compass wells?

A Yes, sir.

Q Based on the other data, as a Petroleum Engineer, can you make any conclusion as to whether or not these wells are connected to the Tocito Pool?

A From that data, I can make no conclusion one way or the other from the information I have available, strictly by bottom hole pressures; however, considering all the other aspects, I believe they are separated.

Q Have you had occasion to study some of the physical rights to the Tocito Pool secondary recovery program?

A Yes.

Q Have you been able to make some estimates of the time within which that program might be concluded?

A Well, looking over their production figures and the way some of their wells are watering out, it would appear to me that their secondary recovery program would be completed within the next three or four years.

Q Could the production of a substantial quantity of gas from the Compass wells have any effect upon the Tocito Pool, even if we assume it is connected, until such time as the bottom hole pressure in the Compass wells was below that of the Tocito Pool?

A I don't see how the Compass area could affect the South Blanco-Tocito even if it was connected until the Compass areas bottom hole pressure is lower than the South Blanco-Tocito pressure.

Q Did you hear Mr. Holland's testimony in which he spoke of unrestricted production?

A Yes.

Q To your knowledge, is there any unrestricted production of gas anywhere in the State of New Mexico?

A Not in the San Juan Basin.

Q Mr. Dugan, if there is any impact of the Compass wells on the Tocito Pool, there must be quite a substantial drainage radius involved in the Compass wells. Do you have any comments with respect to that from your knowledge of the reservoir?

A Well, I am afraid that the Compass wells are not capable of draining a radius of three miles, although they are good wells.

Q You say you are afraid they are or are not capable of draining?

A I will say this. I am sure they are not capable of draining a radius of three miles.

Q Is it possible, Mr. Dugan, that if there is some con-

nection between these pools that the production from the Compass wells could have any effect within a year or two years or three years that might be measured?

A This is assuming that there is a connection?

Q Assuming that there is a connection, yes, sir.

A Well, as I stated before, I don't believe that we can affect the South Blanco-Tocito area until the Compass bottom hole pressure is lower than the South Blanco-Tocito area bottom hole pressure, and depending on the rate of withdrawal, but by the gas takes there in the San Juan Basin, I would anticipate this to be quite some time, probably in the neighborhood of five years or more.

MR. STOCKMAR: I think that is all the questions on direct that I have.

MR. UTZ: Are there any other questions of this witness?

CROSS EXAMINATION

BY MR. KELLAHIN:

Q Mr. Dugan, you said in your opinion the production from the Compass wells would not affect the South Blanco-Tocito Pool, assuming a connection of course, if the pressures were lower than those of the South Blanco-Tocito?

A Yes, sir.

Q Have you taken into consideration that there are two injection wells which would substantially affect the pressures in both directions?

A Assuming a connection?

Q Yes, sir, assuming a connection.

A Well, the water being injected in these two wells will naturally take a line of least resistance which is toward the lower bottom hole pressures of the South Tocito Oil Pool.

Q Also serve to maintain the pressures in Compass wells, would they not?

A It might be. Now, this is assuming a connection between the two fields, it will probably act as a temporary block as you are pointing out.

Q Now, as I understand you testified you could draw in conclusion based solely upon pressures as to whether there was a connection or was not a connection?

A Yes, that is correct.

MR. KELLAHIN: That is all the questions I have.

BY MR. UTZ:

Q Mr. Dugan, do you know when South Blanco-Tocito injection program was put into effect?

A 1953.

Q That is closest?

A I am not sure but I think that is it.

Q Do you have any knowledge of what the pressures were at that time?

A I glanced at an exhibit this morning that showed it to be around 1800 at that time.

Q That is bottom hole pressures?

A Yes, sir.

Q That would be comparable to pressures you have now possibly at lower--

A Lower.

Q Now, if there were a reasonable connection between this area and the South Blanco-Tocito area, do you believe that your pressures would be as high as they are or would not the South Blanco-Tocito area drain the pressures down from the Compass area?

A Well, assuming a connection that was permeable enough to drain over an area that great, you might assume that they would be lower than they are now.

Q Do you have any knowledge of what the original pressures were in South Blanco-Tocito?

A I looked at an exhibit this morning that showed 2200.

Q As bottom hole?

A Yes, sir.

MR. UTZ: Are there any other questions?

BY MR. KELLAHIN:

Q Do you know what the pressures are now on the west side of the South Blanco-Tocito Pool closest to the Compass wells?

A Closest to the El Paso-Rincon Unit No. 20 is 1700 plus.

Q And you are figuring 1950 on the Compass?

A As a minimum.

Q And do you know what pressures would be in the vicinity of the injection wells?

A Well, the El Paso-Rincon Unit No. 20 was the highest pressure reported in South Blanco-Tocito. The rest of the pressures are down in the vicinity of 1000 pounds or lower.

Q I am referring to the injection wells themselves.

A What the bottom hole pressure of the injection wells would be?

Q Yes, sir. They are the closest wells, aren't they, to the Compass wells?

A Well, they are not closer than this Rincon Unit No. 20 I don't believe.

Q Did you have anything to do with filing the pressure of the completion reports with the Oil Conservation on these wells?

A On Compass?

Q Yes, sir.

A Not on the Federal 1-4 and 2-4, I might have filed a couple of reports on the Federal 1-3.

Q Now, what was the measure you gave on surface pressure you used on the Federal 3-1?

A I used the pressure of 1594 PSIG, taking 9326.

Q Do you know that the completion report showed the pressure of 1511 on that well?

A I am not aware of it. I wouldn't doubt it because as

I pointed out there is a lot of fluid in the wells. The wells haven't been cleaned up and of course fluid has a big affect on the pressures.

Q You calculated these pressures without consideration of the fluid?

A Yes, sir, that is correct.

Q All of the initial measures as reported to the Commission are generally lower than those figures you used, isn't that correct, or do you know?

A I don't know.

Q Would you take it as correct if I said that on the Lindrith No. 1-4 the tubing pressure was 1547, casing pressure 1561, reported to the Commission by Compass on it?

A On which well?

Q 1-4.

A Yes, sir.

Q On the 2-4 well, that was taken 10-9-62 the pressures that you read?

A The pressure taken 10-28-62 following an additional 19-day shutin.

Q Had the well been produced prior to that?

A On completion and testing, yes.

Q It hadn't been produced in the pipeline, had it?

A No, sir.

Q Now, on the 2-4 well, Compass reported casing pressure

1520 and tubing pressure 1543?

A Yes, that is the pressure I used. That further indicates there is water in the well bore.

Q Only one well has been produced to any extent?

A Yes, sir, the 1-3, and which is further proof and indication that the wells haven't been cleaned following fracing and completion and fluid in the well bore.

MR. KELLAHIN: Thank you.

MR. STOCKMAR: May I ask two questions on redirect examination?

MR. UTZ: Yes, sir.

REDIRECT EXAMINATION

BY MR. STOCKMAR:

Q Mr. Dugan, were these wells fraced with oil?

A All three wells were fraced with oil.

Q I understand from prior testimony that these wells were also drilled on the Dakota. Was it necessary to kill these wells with water?

A We had to kill the Lindrith Federal 1-4 and Lindrith Federal 2-4 on completion with water.

Q Would either of these things contribute to there being fluid in the hole when pressures were taken?

A We put several thousand barrels of water into both wells when we killed them because the formation was taking water and this water has not been produced back.

MR. STOCKMAR: That is all the questions I have, Mr. Examiner.

RECROSS EXAMINATION

BY MR. UTZ:

Q Mr. Dugan, do you think there is any chance that El Paso will try to drill a Gallup well in the four-section area between the Compass area and the South Blanco-Tocito?

A I wouldn't want to predict what El Paso does. This South Blanco-Tocito has been producing for some time and they have very nice accumulative production from these wells and I think I have enough confidence in El Paso to think if they thought it was productive they would have drilled it some ten years ago.

MR. UTZ: Any other questions? The witness may be excused. Any other statements in this case?

MR. SPANN: In behalf of El Paso Natural Gas Products Company, I would like to state we agree with the evidence presented here by Caulkins and concur in the opinions and conclusions that were made by Mr. Holland in regard to this situation and would join in the recommendations that he made to the effect that unrestricted production of the Compass wells should not be allowed in accordance with the applications filed.

MR. STOCKMAR: Mr. Examiner, I think the evidence has clearly demonstrated, first, that there is no geological connection between these two pools so that they could be called a

common source of supply of the Conservation Act. If that be your findings, then there also seems to be no alternative except to identify the new area as a new gas pool and treat it as such under the law of the State. Even if there should be some geologic connection, there is no longer a real connection. They are no longer really a common source of supply in any sense of the word. One of them is definitely an oil pool in the advanced stages of recovery which has been segregated to a large extent, if not entirely, from any other part of the formation by a huge water block of some kind. They are no longer a common source of supply, even if, one, they might have been geologically connected, it would certainly be awkward and unfair at best to attempt to bring in these wells that are three and a half miles from any present production; simply because they produce from comparable sand, to apply them to rather complex field rules that have grown up over the ten-year period to apply to secondary recovery project. There certainly seems to be no mechanism for a sharing, as this there be a common pool for the sharing by the gas people in the proceeds at this time. They have available energy. They are contributing that energy. If it is a common reservoir, there are certainly no indication that they would be recompensed within.

I think I can say that Compass does not wish to simply participate in gas storage project here. I think we hear those words in other times and places. It is entitled to produce a

reasonable and fair share of the hydrocarbons there are. The present order is primarily for the benefit of the oil production, and certainly, even if they are found to be the same pool of substance, revision of field rules would be indicated. The present limiting oil-gas ratio has true application to these wells that oil-gas ratio in Case 100 and 1000. In essence, this pool simply ought to be treated as what it is, a new gas discovery, whether or not there would or would not be one on geological connection. It is as simple as that.

MR. KELLAHIN: I think we have here a situation where our engineers and our engineering geologists at least meet head on in connection with their interpretation of the situation. The Compass attorney would seem to ignore the facts that have been presented in the course of this hearing.

In the first instance, we have a comparable sand, that has been admitted. We have a situation where you have an oil reservoir and a discovery called higher on the structure, the reservoir being a solution gas drive reservoir. We have shown by the evidence that in a comparable position Caulkins has drilled a gas well. Obviously you would expect to find on a comparable structural position gas wells drilled by Compass. Now, to say then that Caulkins has in the course of its pressure maintenance program injected water which may or may not form some sort of a barrier between there is to lose sight of the point that we are dealing with a conservation measure here. The

pressure maintenance program was set up by this Commission back in the early part of the 1950's. The Commission probably has more information on this reservoir in its files than any other reservoir in the State of New Mexico.

Our witness has testified, for example, that he has found no evidence of shale. He has examined cores. Compass' witness concludes that there is shale in here, although he has never seen cores, and cores are available. And on that basis, he says that he has shale in the El Paso Well and therefore no sand member present there. Obviously that is just a conclusion based on a lack of information. And the information was available, was examined by our witness and he concludes on the basis of the same information, and the information was available too but not examined by Compass, that there is a connection. They admit they have no control as between the two areas which they would seek to define as a common source of supply, other than the El Paso Well. Obviously there is no control simply because there are no wells drilled in there. But you can follow this across this formation, across from the east to the west side of the reservoir some five miles and it correlates in exactly the same fashion as it does from Tocito Reservoir, as it was originally designed to the extension of the reservoir which was so properly made by the Commission in its nomenclature hearing.

Now, to permit the production of gas from the gas cap in a solution gas drive reservoir, whether it be under pressure

maintenance or not, is a violation of good conservation practice in, one, that has never been followed by this Commission and we certainly urge that it not be followed in this case.

MR. STOCKMAR: I think the applicant normally gets the last word for one minute, does he not, Mr. Examiner?

MR. UTZ: We will allow you about 30 seconds.

MR. STOCKMAR: First, I think Mr. Farrelly clearly indicated that there is adequate control for him. He does not dispute that the top of something called a Tocito rock may extend all across there. What he does find and clearly find is that there is no sand, as such, that could contain a collection of hydrocarbons that is producible.

I think what strikes me most of all is if we have a field here that has--on which more information has been developed than any other field in the State of New Mexico, an oil field which contains what--6 or 7 square miles--and all this time there has been a gas cap that also has 6 or 7 square miles in it. This would have come to the attention of anybody dealing with this. It simply is too much involved there for this not to be immediately apparent to anyone dealing with our reservoir. I submit that it has never been connected or would have been known long before this.

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

STATE OF NEW MEXICO)
) ss
COUNTY OF BERNALILLO)

I, ELAINE BUCHANAN, 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 18th day of June, 1963.

Elaine Buchanan
Notary Public

My Commission Expires:

October 14, 1966.

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 2761, heard by me on Mar. 20, 1963.

....., Examiner
New Mexico Oil Conservation Commission

I N D E X