

NEW MEXICO OIL CONSERVATION COMMISSION

COMMISSION HEARING

SANTA FE, NEW MEXICOHearing Date MARCH 15, 1974 TIME: 9 A.M.

NAME	REPRESENTING	LOCATION
Jason Kellahin	Kellahin & Fox (Belco)	Santa Fe
R.S. Fulton	USGS	Carlsbad
Andrew V. Bailey	USGS	Reston, Va.
E. M. Gorceuce	Phillips Petroleum	Odessa, TX.
Joe V. Peacock	" "	" "
Charles E. Childers	International Minerals & Chem	Carlsbad
ROBERT G. KIRBY	AMAT CHEMICAL CORP	CARLSBAD
A.W. Highfill	DUAL CORP.	CARLSBAD
Carl Traywick	USGS	Roswell
JIM GILLHAM	USGS	ROSWELL
D M Van Sickle	"	"
Wallace Sutherland	"	Denver
Eddie R. Wyatt	"	Reston, Va.
N.O. Frederick	✓	Roswell, NMEX
ARTHUR B. BROWN	USGS	HOBBS, NM
H. J. Kuehlich	El Paso Natural Gas	El Paso
Walter H. Lammerton	TEXACO Inc.	MIDLAND
Ben Donegan	Leland A. Hodges, Trustee	Albuquerque
R.L. Lane	Her-McBee Corp.	Hobbs
John D. Robb	Rodey, Dickerson, Sloan,	Albuquerque
Clark Adams	Alkin + Robb, P.A.	"

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NAME	REPRESENTING	LOCATION
James H. Russell	Ammap Chemical Corp	Santa Fe
R H Blaetman	Petask Co of America	Carlsbad
J. Evans Ottwell	Belco Pet.	Houston
James	Belco	Albany
Dean C. Boundy	Belco Pet.	Midland
Lee G Nering	Belco Petroleum	Houston
Dave Selzer	(Perry R. Bass Bass Enterprises Prod Co.	Midland
W. J. Green	Belco Pet Corp	Midland
R L Medley	Natural Gas Pipeline Co	Midland
Bill H. Hymas	WELEX (BELCO)	MIDLAND
J. W. J. J.	PETROLEUM Cons. Serv	MDL
P. R. STEWART	Belco Pet. Corp.	Hou.
W. D. Bill Henry	Belco	MIDLAND
Glenn Cooper	"	"

BEFORE THE
NEW MEXICO OIL CONSERVATION COMMISSION
Morgan Hall
Santa Fe, New Mexico
9:00 A.M., March 15, 1974

IN THE MATTER OF:)

Application of Belco Petroleum Corporation)
for a drilling permit in the Potash-Oil Area,)
Lea County, New Mexico. Applicant in the)
above Federal cause, seeks authority to drill)
its proposed Bass Federal Well No. 1 to test)
the Pennsylvanian Formation at an unorthodox)
location 660 feet from the south line and)
1300 feet from the east line of Section 30,)
Township 20 South, Range 33 East, South Salt)
Lake Field, Lea County, New Mexico, said)
location being within the boundaries of the)
Potash-Oil area as defined by the Commission,)
Order R-111-A, and having been objected by)
the owner of the potash leases in the area.)
This unorthodox location was previously)
approved by the Commission by Order R-4699.)
-----)

BEFORE MEMBERS OF THE COMMISSION:

- A. L. Porter, Secretary and Director
- Ralph Trujillo, Chairman of the Commission
- Alex J. Armijo, Member of the Commission

APPEARANCES

For the Commission:

William Carr, Esq.
Land Office Building
Santa Fe, New Mexico

For Belco Petroleum Corp.:

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KELLAHIN & FOX
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Santa Fe, New Mexico
and
Evans Attwell, Esq.
William Pannill, Esq.
VINSON, ELKINS, SEARLS,
CONNALLY & SMITH
Houston, Texas

For Kerr-McGee:

John Robb, Esq.
Mark Adams, Esq.
RODEY, DICKASON, SLOAN, AKIN
& ROBB
P. O. Box 1888
Albuquerque, New Mexico

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MR. PORTER: Gentlemen, we are going to take up next, Case 5193. Mr. Armijo tells me that because of pressing business elsewhere and a meeting with the Governor that he will not be able to stay with us for very long so Commissioner Trujillo and I will be here until the Hearing is concluded and later review the case with Commissioner Armijo in the event he does have to leave.

I wish at the outset to say that we want you to have the time you need in this case, but we would like for you to move as expeditiously as possible, because we would like to conclude this Hearing today, because all of us have some Saturday commitments and so with that we will ask the attorney to read a description of the case to be considered and then ask for appearances in the case.

MR. CARR: Case 5193. Application of Belco Petroleum Corporation for a drilling permit in the Potash-Oil Area, Lea County, New Mexico.

MR. PORTER: Mr. Kellahin?

MR. KELLAHIN: Jason Kellahin of Kellahin and Fox, Santa Fe, appearing on behalf of the Applicant Belco Petroleum Corporation. I am appearing in association with Mr. Evans Attwell and Mr. William Pannill, members of the firm of Vinson, Elkins, Searls, Connally and Smith, Houston, Texas,

and members of the Texas Bar who will be participating in the case with me.

MR. ROBB: I'm John Robb of the Rodey law firm and I'm appearing with Mr. Mark Adams of the same firm on behalf of Kerr-McGee. I have also been asked to make an appearance this morning on behalf of Teledyne Potash Company.

MR. PORTER: All right, sir.

MR. KELLAHIN: If the Commission please, we object to any appearance on behalf of Teledyne Corporation in opposition to the Application of Belco for the reason they have not complied with the rules of this Commission in filing a protest in this case. I'm not aware of any protest ever being made on behalf of Teledyne and we object to their participation in this case at this time.

MR. ROBB: Teledyne desires for us to make a statement on its behalf with respect to its position it has not filed a formal protest.

MR. PORTER: The Commission feels it is proper for Teledyne to make a statement at the closing of the testimony, as there will probably be other people who desire to make statements at that time.

Are there other appearances?

MR. PEACOCK: Mr. Joe Peacock with Phillips

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Petroleum Company. We are the owner with interest in this proposed unit and I will want to offer a statement in support of Belco's Application, and since I may have to leave before the end of this Hearing I wonder if I might offer the letter supporting the Application at this time?

MR. PORTER: Yes, sir, you may.

MR. TRUJILLO: Who did you represent, Mr. Peacock?

MR. PEACOCK: Phillips Petroleum Company.

MR. PORTER: Mr. Robb, have you seen it?

MR. ROBB: No, sir, I haven't.

MR. PORTER: Does anyone else desire to make an appearance?

Mr. Kellahin, how many witnesses do you have?

MR. KELLAHIN: I believe I have eight, Mr. Porter, however, don't let that disturb you. We may not use a number of them depending on whether we use them for rebuttal.

MR. PORTER: All right. Mr. Robb, how many?

MR. ROBB: We have possibly three, but probably one.

MR. PORTER: Let's have all of the witnesses and potential witnesses stand and be sworn. It won't be much wasted effort if somebody raises his right hand and does not have to testify later.

(Witnesses sworn.)

MR. PORTER: The Commission will recognize Mr. Kellahin who is the attorney for the Applicant.

MR. KELLAHIN: If the Commission please, the Commission I know is thoroughly familiar with many of the problems that are involved in applications to drill in the potash area. However, this case is slightly different from some of the others and I would like to comment just very briefly on that point before we start with our testimony. The South Salt Lake-Morrow Gas Pool, which was involved in said cases was created by the Commission in November of 1961. By virtue of the date of creation of pool it came under the old rules of 160-acre spacing. On the application of Belco this pool was spaced on 320-acre units by Order R-4600 on August 1st, 1973, so what we're talking about here today is a 320-acre unit.

The location of Belco's proposed well is an unorthodox well location. However, it was approved by the Commission by Order R-4699. So there is no problem in connection with the well itself. Now, the area -- I think we all would agree is both under R-111-a and under the Secretary of Interior's Order creating the oil-potash zone area.

The Application has been objected to by Kerr-McGee Corporation. Kerr-McGee owns the Potash Lease, as our

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testimony will show, within one mile of the location but not within the section involved here.

The only potash lease which exists under Section 30, the subject Section, is held by Teledyne Potash Company as subject to U. S. Potash and Chemical Company. Now, Teledyne, as stated in my objection to Mr. Robb's appearance on their behalf, did not file any form of objection to this Application.

With that, I would like to call as our first witness, Mr. Omar Brown.

MR. PORTER: Mr. Brown.

OMAR BROWN

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

DIRECT EXAMINATION

BY MR. KELLAHIN:

Q Would you state your name, please?

A Omar L. Brown.

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

A I'm employed by Belco Petroleum Corporation in the capacity of District Landman.

Q Where are you located?

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A In Midland, Texas.

Q Does your work as District Landman involve southeastern New Mexico?

A Yes, it does.

Q Does it involve the area involved in this Application South Salt Lake-Morrow Gas Field?

A Yes, it does.

Q Do you have anything to do with the acquisition of the rights to drill this area?

A Yes, I did.

Q For the benefit of the Commission, would you briefly outline your education and experience as a landman?

A I obtained an Associate of Arts degree from Casper College in 1956 and additional college work at a total of approximately three years. I have approximately 18 years of experience in the oil and gas industry, beginning as a draftsman, progressing to a drafting supervisor, associate landman, landman and acting district landman. I have been active in the Permian Basin Area in southeast New Mexico since January of 1969.

Q Are you a member of any associations?

A Yes, I'm a member of the Permian Basin Landman's Association, the American Association of Petroleum Landmen and

the New Mexico Association of Petroleum Landmen.

Q What companies have you worked for as a landman?

A I've worked for a Midwest Oil Corporation and for Belco Petroleum Corporation.

Q When did you start working for Belco?

A I was employed by Belco on February 8, 1972, in my present capacity.

Q Mr. Brown, are you familiar with Belco's operations in southeastern New Mexico?

A Yes.

Q Is it actively engaged in exploration of oil and gas in southeastern New Mexico?

A Yes. We are very actively engaged exploring for oil and gas in southeast New Mexico.

Q How long has Belco been active?

A Belco has been active in southeast New Mexico for approximately eight years. They have been actively exploring for Morrow gas production for approximately three-and-a-half years.

Q Has Belco had any success in their exploration for Morrow production?

A Yes, we have been successful. We have a number of producing gas wells and anticipate additional development

work that will be necessary to fully develop what we have discovered at this point in time.

Q Now, would you refer to what has been marked Belco's Exhibit No. 1 and state what that is?

A Exhibit No. 1 is a copy from the production by operators by -- run by some pipeline and oil sales in the State of New Mexico and it will show that Belco Petroleum Corporation is actively selling both oil and gas products in New Mexico.

Q What is the source of that information? Is that the official report of the Oil Conservation Commission?

A This is the official report of the Oil Conservation Commission.

Q Referring to what has been marked as Belco's Exhibit No. 2, would you identify that?

A Exhibit No. 2 is a composite map compiled from the U.S.G.S.-15-minute quadrangle topographic series.

Q For what purpose is this Exhibit offered?

A The purpose of the Exhibit is to show the geographic setting of the South Salt Lake Field, the location of the wells, the location of Belco proposed tests, the cultural features in the area such as roads, pipelines, ranches and the location of the Kerr-McGee potash mine, which is approximately five miles to the southwest of the South Salt Lake

Gas Field.

Q Is that almost a direct southwestern direction from the -- how is it shown?

A It is shown almost west, slightly south. It's in the Sections 3 and 4 of Township -- I believe that is 21 South, Range 30 East. Let me just double check that, please. I believe that's correct.

Q Does that show all wells completed in the South Salt Lake Morrow Gas Pool?

A It does today.

Q Now, does Belco own the lease underlying the proposed location?

A Belco has a right to the lease underlying the proposed location by virtue of a farmout agreement from the various leasehold owners.

Q Referring to what is marked as Exhibit No. 3, would you identify that?

A Exhibit No. 3 is an oil and gas lease ownership map of the immediate area surrounding the South Salt Lake Gas Pool.

Q Does it show Belco's holdings in there? How are they shown?

A Belco's holdings are shown in yellow. Belco owns

the south half of Section 24 of Township 20 South, Range 32 East. We own the west half of Section 29, the west half of the east half of Section 30 and we own the operating rights to the east half of the northeast quarter of Section 30 and the northwest quarter of Section 30. These are Belco leases and then, of course, in addition, Belco has farm-out rights to the east half of the southeast quarter and to the east half of the southwest quarter.

Q That is the prospect involved in this Application.

A The prospect involved in this Application is the lands that would be dedicated to this well would be the south half of Section 30 and conformity with the field rules, spacing rules for this South Salt Lake-Morrow Pool.

Q How many acres, roughly, does Belco hold in this area?

A Belco owns leaseholds covering 800 acres and we have farm-out rights to an additional 880 acres.

Q From whom were those farm-out rights obtained?

A They were obtained from Perry R. Bass, Bass Enterprises Production Company, Atlantic Richfield Company, Phillips Petroleum Company, Frank Elliott Trustees and Edna Hall Trustees, which these parties represent a 94-percent working interest in the farm-out land. The remaining six

percent is owned five percent by Texaco, Incorporated and one percent by Tenneco. These two parties did not farm-out to Belco and have indicated that they intend to join in this test and participate with their aggregate total of six percent.

Q As of the present time all of the working interests would be participating in the drilling of the proposed well, is that correct?

A That is correct.

Q Either by virtue of farm-out or by joining?

A That is correct.

Q Now, would you state to the Commission Belco has rights to drill at the present proposed location in the south half of Section 30?

A Belco's right to drill the subject well, of course, is derived from our ownership of the west half of the south east quarter, our contractual rights to a gross 160 and net 150.40 acres granted to us under previously mentioned farm-out agreement and commitments on the part of the remaining parties to join. However, Belco's farm-out rights will terminate at some point in the future if this well is not drilled.

MR. ROBB: We're not challenging Belco's land holdings in this area. We're not challenging the documents under which they derived title. We're not challenging that those

documents give them the right to drill if this will expedite the matter at all. There is no issue on this.

(Whereupon, a discussion was held off the record.)

BY MR. KELLAHIN:

Q With that in mind, Mr. Brown, would you just identify Exhibit No. 4 without any explaining?

A My Exhibit is not numbered; which one is it?

Q Farmout.

A Exhibit No. 4 is the farmout agreement from the various parties that I referred to, together with copies of various extension letters which Belco has received from these parties.

Q What date has it been extended to?

A It has been extended to April 1, 1974, as to all of the parties except Atlantic Richfield Company which granted us an extension to July 1, 1974. Atlantic Richfield having only a very small interest, one percent, I believe.

Q Now, did Belco drill another well in this same section?

A Yes, we did.

Q What was that well?

A That was Belco and Bass Federal No. 1 and located in the southeast quarter of the northwest quarter of Section 30, Township 20 South, Range 33 East.

Q Now, did Belco receive any protests from any pot-ash companies at that time?

A No, we did not.

Q You did receive the permits to do it?

A We did receive a permit to drill.

Q That instrument is marked as Belco's Exhibit No. 5?

A Yes, that is. This instrument is a copy of Belco's Application to drill which gives evidence of receipt on the part of the United States Geological Survey and a letter dated October 12, 1972, signed by Mr. N. O. Frederick, Aera Oil and Gas Supervisor, granting Belco permission and indicating that our Application to drill this well had been approved.

Q Referring to Exhibit No. 6, would you identify that?

A Exhibit No. 6 consists of a copy of the Belco Petroleum Corporation letter dated September 28, 1972, signed by Mr. Glen Cope, our District Engineer, informing Kerr-McGee Corporation of Belco's application to drill the No. 1 Bass Federal Well, which was sent in conformity with our R-111-A

regulations and attached thereto is a letter dated October 6, 1972, from Kerr-McGee Corporation, signed by Mr. Harold J. Klein, Vice President of Mineral Exploration, waiving any objection to the drilling of this well.

MR. ROBB: If this will expedite, we will stipulate that the Bass No. 1 was drilled and Kerr-McGee made no objection to the Bass Well.

BY MR. KELLAHIN:

Q Was the well completed by the producer?

A Yes, it was.

Q With what results?

A The well was completed as a commercial gas well.

Q Has the gas been contracted to any pipeline company?

A The gas has been sold to El Paso Natural Pipeline Company.

Q Referring to Exhibit No. 7, can you identify that Exhibit, please?

A Exhibit No. 7 is a copy of the gas contract with El Paso Natural Gas together with a copy of a mandatory letter dated September 21, 1973.

Q Now, does that contract cover gas which might be produced from proposed well?

A No, it does not.

Q Have you had any discussions with El Paso in connection with that?

A We've not had any formal discussions as I understand it, but I also have had some conversations with El Paso personnel and they have indicated to me that they are desirous of purchasing the gas from this well, are ready, willing, and able to do so and we have, in my opinion, that we can obtain a gas price for any gas that might be produced from the well that we propose to drill at a price equal to or perhaps greater than our present contract price.

Q What led Belco to the decision to drill Bass Federal No. 2 as proposed in this Application?

A Of course, the well appeared to be commercially an excellent well.

MR. ROBB: We make no issue of the fact that the proposed location of the Bass No. 2 is a good drilling prospect, if this will expedite the testimony some, that would be fine.

A There, of course, were some other decisions. We feel we have an obligation to protect the correlative rights of the royalty owners under the south half of Section 30, of the mineral owners within the south half of Section 30 is 80 acres that the United States Government, 80-acre State,

and 160 acres fee. This fee tract was broken up into approximately 25 mineral owners, the largest being Atlantic Richfield. These royalty owners are now being drained by existing production.

Q By what well, Mr. Brown? Would that be from the Bass Federal No. 1?

A I would assume it's from the Bass Federal No. 1. It is one of the closest wells to the proration unit dedicated to our -- would be dedicated to our proposed well.

Q You're not testifying to the drainage as an engineer, are you?

A No, I'm not.

Q You are basing your testimony as to drainage on the fact that the Commission has spaced this unit on 320 acres?

A They have, and I am basing my testimony on that basis.

Q Now, would you tell the Commission approximately the amount of royalty income that the proposed test could be expected to generate and how that would be allocated?

A Assuming that the proposed test, when drilled, results in production comparable to the No. 1 Bass Federal which is a little better than 5,000,000 cubic feet of gas per

day and 150 barrels of condensate per day. We estimate that royalty income would approximate \$15,938 per month or \$191,268 per year. This, would, of course, be a split between the U. S. Government, the State and the fee owners with a yearly basis with the U.S. receiving approximately \$48,000, the State of New Mexico a like amount, \$48,000, and the fee owners \$95,628.

Q Referring to what has been marked as Exhibit No. 8, would you identify that, please?

A I believe Exhibit No. 8 is Belco's Application to drill out the Number 2 Bass Federal location located 1,300 feet from the east line and 660 feet from the south line of Section 30, Township 20 South, Range 33 East. Attached to this Application of materials of various support -- material that some of which is required to be submitted to the authorities, other giving evidence of designation of operator form to Belco, a copy of the Order of the Commission approving the unorthodox location.

Q Referring to what has been marked as Exhibit No. 9, would you identify that Exhibit, please?

A Exhibit No. 9 is a potash lease-ownership map of the same area as the oil and gas lease-ownership map.

Q That shows in the south half of Section 30 an area

that is uncolored. What does that indicate?

A There's a white area that designates the areas that are not to our best knowledge under potash lease.

Q The other areas which is marked, I believe, in green, is that leased?

A The area shown in green is under potash lease to the Teledyne Corporation.

Q Are you aware of any protest to this Application from Teledyne?

A No, I'm not aware of any protest. I'm aware that all potash operators to within one mile of the proposed test were notified by certified mail and evidence of that is attached to Belco's Application to drill in the previous Exhibit.

Q Is Belco's proposed location on the Teledyne potash lease?

A No, it is not. It is on land that is not subject to potash lease.

Q How close is the nearest Kerr-McGee lease?

A The nearest Kerr-McGee potash lease is in Section 25 of Township 20 South, Range 32 East, being almost a mile away, just under one mile. Incidentally, I might point out that the date of the Teledyne Potash Lease, which is in Section

30 is December 15, 1936. Kerr-McGee's Potash Lease in Section 25 is February 24 of 1953.

Q Are you aware of any potash mining in the area?

A I'm not aware of any potash mining any closer than approximately three to four miles.

Q Is that shown on Exhibit No. 9?

A In the lower-left-hand corner of Exhibit No. 9 is shown the present workings of the Kerr-McGee mine, as our information indicates, it may not be entirely correct, but we believe it to be substantially correct.

Q What is the source of that information? Do you know?

A This information has been compiled, I believe, from several sources and I don't think I could say exactly just where this source came from.

MR. ROBB: It's very close, Mr. Porter.

A I think one other point that I would like to make in connection with this map is the fact that we have several wells in the oil-potash -- pardon me -- several wells in the South Salt Lake Field. You will note that that well location is not a wildcate location off two or three miles from its field, but on the contrary is a development location.

— BY MR. KELLAHIN:

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MR. KELLAHIN: If the Commission please, I have here an abstractor's certificate from the Federal Abstract Company. I only have one copy. Mr. Robb does have a copy, I believe.

MR. ROBB: What does it show?

THE WITNESS: It's just an abstractor's certificate, signifying that the only potash lease existing in the Section 30 is the Teledyne.

MR. ROBB: We don't quarrel with that.

BY MR. KELLAHIN:

Q Mr. Brown, just in summary, would you discuss Belco's reasons for applying to drill this particular location in potash area and what has occurred? When did you start to work on this project in the first place?

A Work began on this project in the first few months of 1972. We were, of course, aware that it was within potash area as Exhibits show with location of secretaries area and R-111 boundary. We determined that there was very little lands that were subject to potash lease and prospect and we subsequently drilled a No. 1 Bass Federal, and as previously testified, no objection was made to drilling that well.

Q Now, in your opinion, does Belco's Application to drill subject tests in the south half of Section 30 comply with

the regulations of Oil Conservation Commission's Order R-1118?

MR. ROBB: I object to that as calling for conclusion of the witness; move to strike the answer.

BY MR. KELLAHIN:

Q I'll rephrase the question. If Belco is allowed to drill this well, in your opinion, will it protect the correlative rights?

A I'm sorry. I didn't hear the question.

Q Would it protect correlative rights?

MR. ROBB: We object to that as calling for a legal opinion. I think that decision is not for the witness.

MR. KELLAHIN: If the Commission please, the witness has already testified as to ownership of drainage. I'll just withdraw the question, because I believe he's already answered it.

MR. ROBB: Well, the question asks whether it will protect correlative rights and he is passing judgment on whether or not what they're doing is going to affect adversely the rights of Kerr-McGee and Teledyne. We have no basis for drawing any such conclusion.

MR. KELLAHIN: I withdraw the question. We're talking about correlative rights in relation to the leasehold ownership and he has already answered the question on previous

testimony without objection so I don't believe we have--

MR. ROBB: Thank you.

MR. PORTER: Mr. Kellahin, in respect to that question, were you referring solely to oil and gas rights?

MR. KELLAHIN: Yes, sir. I don't believe this witness is qualified to testify in connection with the potash distribution. We have another witness for that.

That's all I have in connection with this witness.

BY MR. KELLAHIN:

Q Mr. Brown, were Exhibits 1 through 9 prepared by you or under your supervision?

A Yes, they were.

Q Now, Exhibit No. 10 is an abstractor's certificate. I would like to offer Exhibits 1 through 10, inclusive.

MR. ROBB: I haven't seen Exhibit No. 10, but if it says what Mr. Kellahin says it does and I have no reason to doubt it we have no objection.

(Whereupon, a discussion was held off the record.)

MR. ROBB: Do you offer No. 10 to show Teledyne owns the potash in Section 30?

BROWN-DIRECT
CROSS

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MR. KELLAHIN: That is right.

MR. ROBB: We have no objection to any of those Exhibits.

MR. PORTER: Exhibits 1 through 10, Belco's Exhibits 1 through 10, will be admitted.

(Whereupon, Belco's Exhibits Nos. 1 through 10 for identification were admitted for evidence.)

MR. PORTER: Anyone have any questions of Mr. Brown?

CROSS EXAMINATION

BY MR. ROBB:

Q Mr. Brown, you indicated that you were aware of the fact that you were in a non-potash area at the time you were planning for this well?

A That's correct.

Q You're aware that that proposed location for Bass No. 2 is in the Secretary of the Interior's non-potash area?

A That's correct.

Q You mentioned the fact there has been no protest by Teledyne Potash Company. You know for a fact don't you, that Teledyne Potash Company is shut down; it's inactive; it's not mining any potash at this time at all?

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A I did understand that certain restrictions in their activity has taken place. I'm not cognizant of the extent of that.

MR. ROBB: Thank you.

MR. PORTER: Anyone else have a question of Mr. Brown? He may be excused.

Call your next witness.

MR. KELLAHIN: Mr. Bill Henry.

WILLIAM J. HENRY

called as a witness, having been previously sworn, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. KELLAHIN:

Q State your name, please.

A William J. Henry.

Q What business are you engaged in, Mr. Henry?

A Consulting geologist.

Q Where are you located?

A Midland, Texas.

Q How long have you worked as a consulting petroleum geologist?

A Approximately four years.

Q And where?

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A In Midland.

Q In connection with your work do you do work in southeastern New Mexico?

A Yes, almost exclusively. Prior to becoming a consultant and since, exclusively southeast New Mexico.

Q Prior to becoming a consultant, what were you doing?

A I went to work for the Pure Oil Company as a petroleum geologist in 1962 and then with Union Oil Cal in merger in '65-'66 and in '70 resigned to go as consultant.

Q Since 1970 you've been consulting?

A Right.

Q What is your education, Mr. Henry?

A I got my BS in petroleum geology from Texas Tech University.

Q When did you get that?

A 1952.

MR. ROBB: We are willing to stipulate that the witness is a qualified consulting petroleum geologist.

MR. KELLAHIN: Thank you.

BY MR. KELLAHIN:

Q Mr. Henry, were you employed by Belco to make any studies in connection with their proposed location of the Bass

Federal No. 2 Well?

A Yes, sir.

Q What did you do in connection with that?

A I reviewed the Salt Lake area and recommended a proposed location.

Q Did you recommend the proposed location?

A Yes, sir.

Q That is the location that has been approved by the Commission; is that correct?

A Right.

Q Now, refer to what has been marked as Exhibit No. 11, would you discuss the information shown on that Exhibit, please?

A Exhibit -- this is not marked, but this is Exhibit 11 and is a structure map contoured on top of the lower Morrow structure point or the South Salt Lake Atoka-Morrow Pool.

Q Now, with reference to that Exhibit, how would you consider the proposed prospect as a development well in the South Salt Lake?

A Well, it is a development well as designed and it is my own estimation it is the common source of supply with the field.

Q Your geological point of view is it is a development field?

A Yes, sir.

Q You consider it a good location?

A Yes, sir.

Q Generally, what is the geology of the South Salt Lake Field?

A It's an anticlinal structure plunging to the south-east.

Q What kind of formations are encountered?

A Morrow is more productive on this feature which is sand, primarily productive from sand.

Q Is it productive from the Atoka?

A From Morrow sand.

Q What is the nature of the Morrow sand in general; have you had any experience with them?

A The Morrow sands are very lenticular, stratigraphically speaking. In other words, they come and go and they are difficult to predict.

Q Referring to what is marked as Exhibit No. 12, what is depicted on that?

A Exhibit No. 12 is a stratigraphic cross section that goes through, beginning on the left side, the Belco No. 1

Bass Federal through the Texaco No. 1-A Audie Richards, which was a discovery well in the field into Texaco No. 1-CH then, to Texaco No. 1-CM to the recently completed Amini No. 1 SL-State which is marked in blue on the structure map and also there is a little index map down in the southwest corner of this map or left-hand corner.

Q Would you comment on the information as shown on the cross section?

A Yes, this cross section is hung on structure datum to the top of the Lower Morrow as a flat zone and the sands are colored to show more or less the pictorial of the topography and the lenticular nature of this sand as they occur in the South Salt Lake feature.

I would like to point out that--you'll notice that the Belco No. 1 Bass Federal is located on the structure map on the northeast flank--shows a good gross aggregate of sand. I have not marked all of the sands. These sands have been culled to what I consider reservoir quality sands. There are other sands there that don't exhibit cleanliness to come up to reservoir quality. You will notice there are quite a few sands in the entire Morrow section there where I have labeled Lower and Upper Morrow. Move on up on the crest of the structure to the Texaco-Audie Richards you will notice that

there are some sands, less in the lower part of the Morrow and if you want to call them Middle Morrow, there seems to be a bar of cleaning sand and some in the upper part and the Audie Richards is producing from very near what I call the top of the Morrow sand on this particular well.

Let me digress just a minute. On this map the perforations are marked in red from these zones up in where each well is producing and the testing and calculated open flow is underlined in red by each log. I believe it's to the left of each well log. Then, moving to the Texaco No. 1-CH, you'll note it's over on the southwest part of the structure and it has fairly good sand development.

Then, moving onto the Texaco No. 1-CM, which is, or was originally, I'll not say originally, but it has been one of the better performers from the three Texaco wells which were first drilled in the late fifties and early sixties.

It has fairly good Morrow sand and almost the entire Morrow section is perforated. I would like to back up to the Texaco CH and show that the Texaco CH was originally completed from the Morrow-Atoka. Now it is producing only from the Atoka, from the top yellow mark up near the top of the log. Cumulative on the Morrow was almost a half-a-billion when it was plugged back.

Moving on over to the Texaco CM, it produced about 5.2 billion to my records and it is contined to produce. We move on over to the right-hand corner and it's a Meaney SL New Mexico State which is a recent completion from the Morrow which is colored in red up about the middle of your log and you will notice that there is a little decrease in the sand section in the Morrow there.

Q With reference to the proposed location, you believe that that is a good prospect in the Morrow formation?

A I believe that is the best location of the Morrow. It has an excellent chance of discovering commercial, better than average commercial reserve.

Q Is the well necessary for full development of the South Salt Lake Pool?

A Yes, it is.

Q Would it result in the production of gas that would otherwise not be produced?

A Yes, sir, that's right.

Q If the well is not drilled that gas would be wasted?

A That's right, yes, sir.

Q Refer to what has been marked as Exhibit 13, could you identify that, please?

A Yes. Exhibit No. 13 is a graph chart of the production of the No. 1 Bass Federal. It's on a 10-by-10 grade.

It's daily production rate since it went on the stream in September of '73, you will notice that after the well was tested and they were satisfied with the flow rate that it has averaged almost 5,000,000. Right at the present time it makes 4.8. You can see the condensate was about 200 barrels originally and it settled down to, I think, oh, say, an average of 150 barrels a month, I think that's explained here on the graph; that's up through February 28th of this year.

Q That's the last information you had?

A That's the last I had, yes, sir.

Q Would you find a change in the porosity and permeability if you moved the well location one way or the other?

A Yes, sir.

Q What would be the result?

A Well, up-dip you have a loss of porosity and permeability in the sand conditions, and this location is on a strike with the Bass Federal and about the same structural position as the Texaco CM and from these two wells I've drawn my conclusion that this is the best place to encounter the maximum number of sands for maximum completion in the Morrow sands.

Q You have testified as to the lenticularity of the

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Morrow formation. In your opinion, would this well encounter lens development that does not exist in other wells?

A Yes, sir.

Q In your opinion, the Bass Federal No. 1 is possibly draining lenses that are not present?

A Yes.

Q Is this normal?

A This is a normal trend of the Morrow sand.

Q Is it true in all Morrow?

A Yes, sir.

MR. KELLAHIN: That's all I have on Direct Examination.

BY MR. KELLAHIN:

Q Mr. Henry, were Exhibits 11, 12 and 13 prepared by you or under your supervision?

A Yes, sir.

MR. KELLAHIN: I'd like to offer in evidence Exhibits 11, 12 and 13.

MR. PORTER: Any objections?

MR. ROBB: No objections.

MR. PORTER: Exhibits 11, 12 and 13 of Belco will be admitted.

(Whereupon, Belco's Exhibits Nos.

11, 12 and 13 were admitted in evidence.)

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MR. PORTER: Any other questions of the witness?

MR. ROBB: It's your custom to ask questions sitting down. I'm used to courtroom order, so is it satisfactory to sit down?

MR. PORTER: Perfectly satisfactory. You can sit down and ask the questions.

MR. ROBB: All right.

CROSS EXAMINATION

BY MR. ROBB:

Q Mr. Henry, do I understand that it is your testimony that there will be a substantial amount of drainage from the south half of Section 30 as a result of production from Bass No. 1?

A There will be drainage, how much I couldn't tell you.

Q You're not sure how much?

A No. That's right.

Q Spacing until recently in this area was 160 acres?

A Originally started out that way, yes.

Q I noticed that you included the Bass No. 1 in your projections and also the Amini Well?

A Yes, sir.

Q Did you determine whether or not individual zones

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porosity could be easily traced from well to well in this group?

A That's the reason I colored them.

Q You felt they could?

A The individual zone?

Q Yes, sir.

A This cross section exhibits a lenticularity which is noted for Morrow in southeast New Mexico.

Q I'm sorry?

A The Morrow is lenticular in southeast New Mexico and these yellow tips on these particular logs are to demonstrate the lenticularity of the log of the sands in relation to South Salt Lake Field.

Q I see. The producing intervals, which you say are stratigraphic in nature with porous permeable zones randomly distributed throughout the Section; would that be another way of saying it?

A I don't say random, but I say they're stratigraphic lenticular.

Q All right, sir. Would you consider the volumetric determination of reserves from a four-volume study is very hazardous?

A I'm not a reservoir engineer, I'm a geologist and

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I'm not qualified on that to testify as an engineer.

Q All right, sir. Well, I don't understand it very well either.

A I can testify, but I won't.

Q What would you determine to be --

MR. ROBB: Are you going to have an engineer testifying about the reservoir?

MR. KELLAHIN: Yes, sir.

MR. ROBB: You are?

MR. KELLAHIN: Yes, sir.

MR. ROBB: In that case, I have no further questions of Mr. Henry.

MR. PORTER: Does anyone else have a question of the witness? You may be excused.

(Witness excused.)

MR. PORTER: Call your next witness.

(Whereupon, a short recess was taken.)

MR. PORTER: The Hearing will come to order. Mr. Robb; do you have something?

MR. ROBB: I made an error about what witnesses I need to ask questions of. I would like to have Mr. Henry back.

MR. PORTER: Mr. Henry, will you please take the

stand?

CROSS EXAMINATION

BY MR. ROBB:

Q Mr. Henry, you testified that you considered that this is a good location and a central location, is that right?

A Yes, sir.

Q In arriving at that determination did you consider the fact that this location had been spotted in a known potash area?

A I just did the geology. I know about the potash being here, but I didn't take that into consideration that the potash was there or not there.

Q I'll ask you now for a moment to take that into consideration, that you are within a known potash area, that you are within the Secretary's 1965 Order. You know what that is, don't you?

A A little bit, yes, sir.

Q All right, sir. That you are within a R-111 area of the State of New Mexico.

A Okay. I agree with that.

Q All right. Now, I'm asking you to take that into consideration. Now, did you consider in your testimony that this was a good location the possibility of rechecking this

formation from directionally drilled well that was not an offset well?

A No, I did not. This is a straight hole.

Q All right, sir. Are you familiar with directional drilling?

A Now, what are you talking about, controlled deviated surveys, whipstocking or what?

Q Yes, sir. You know the terminology better than I do; whipstocking, I guess, is the phrase you would use.

A Now, whipstocking, you keep the hole for just a very short distance and it's not controlled. It can go anywhere.

Q No, I'm talking about drilling at a reasonably sharp angle of a distance up to a mile or more. What do you call that?

A Pinpointing a point at bottom of the hole. In other words, you want to put the bore hole in a certain spot.

Q In a general area, yes, that's right.

A Not any done in the State of New Mexico that I am aware of.

Q All right. You are familiar though with what directional drilling is, are you not?

A Yes, sir.

MR. PORTER: Mr. Robb, may I interrupt here a second?

You are asking him about the possibility of drilling where your surface location might be a mile from the bottom of the well?

MR. ROBB: Right, from the desired location. Not only from the horizontal displacement of an area approximately four to 5,000 feet.

MR. PORTER: And you want the bottom hole 660 feet from the south line and 1300 feet from the east line?

MR. ROBB: Yes, sir, and I'm going to ask about a specific drilling location in just a moment, but I wanted to establish the fact that as a consulting petroleum geologist he was generally familiar with directional drilling.

THE WITNESS: Well, you're qualifying me that I'm not. We had a little bit in school, but there has been none done in New Mexico and primarily my consulting work has all been in southeast New Mexico and I do not know of any controlled deviated drilling in New Mexico other than the whipstocking to get around a junction or whatever.

BY MR. ROBB:

Q But this is within your field, is it not? Directional drilling is a part of the thing you were trained to study and to consider?

A No, sir. I'm not an engineer or directional driller.

I'm a consulting geologist for oil and gas.

MR. KELLAHIN: If the Commission please, we object to this line of questioning. The man is qualified as a geologist and certainly plays some role in the question of directional drilling, but any question should be confined to those aspects and not to engineering aspects as this witness is not qualified in this line.

MR. PORTER: We sustain the objection, Mr. Robb. Do you have any further questions?

MR. ROBB: That was the main line I was going to ask about.

MR. PORTER: Mr. Kellahin, do you have a witness that will later testify to this?

MR. KELLAHIN: Mr. Porter, we have a number of witnesses to testify on this and will have our engineering witness who is qualified in this part to some extent. We also have two drilling contractors and a drilling consultant available who can testify at great length on the question of directional drilling. We hadn't planned to call him unless the question came up. It has come up, so we will certainly call him.

MR. ROBB: I want some witness as part of your case that I can question about directional drilling because your

landmen have both said they spotted this location and this was the only good location and I think I'm entitled to cross examine as to why that's the only good location.

MR. KELLAHIN: I agree with you, but my objection, Mr. Robb, is based, of course, on the questioning which was going to engineering and not to geology.

MR. ROBB: I see that's true so if you will assure me you're going to call a witness who can answer my questions as far as your direct, I will withdraw the question.

MR. KELLAHIN: Yes.

MR. PORTER: Does that conclude your questioning?

MR. ROBB: Yes, sir, it does.

MR. PORTER: No further questions, do you have anything further on Redirect?

REDIRECT EXAMINATION

BY MR. KELLAHIN:

Q Mr. Henry, directional drilling has come up. Does the nature of the formation involved in this area have any bearing on what happens on directional drilling?

A From my limited knowledge, yes, they do.

Q Generally, what is that?

MR. ROBB: I don't understand. I thought this

witness was not qualified to give any directional drilling.

MR. PORTER: I'm having a little difficulty.

MR. KELLAHIN: I'm talking about the nature of formations that are going to be encountered in any well bore drilled in South Salt Lake-Morrow Gas Pool

MR. PORTER: And not to the mechanics of directional drilling, whether it can be done a mile away?

MR. KELLAHIN: That's right.

MR. PORTER: I think the question is probably proper with those specific qualifications.

BY MR. KELLAHIN:

Q Does the nature of the formations encountered have any effect on directional drilling?

A Yes, they do.

Q What is the nature of the formation in this area that would have some effect?

A Well, there's sands and shales and we have heaving shales and Morrow sands are notorious, they can be notoriously banded by being on these formations, mud being on these formations for a great length of time and in a deviated hole there is slower drilling and there would be a real good chance that you're going to damage the formation and possibly not make a successful completion because the

Morrow is real susceptible to damage.

Q I believe you testified to your knowledge there has been no controlled directional drilling in southeastern New Mexico?

A No, as we pinpoint the bottom of the hole. In other words, whipstock which is just sitting and kicking the well off, but no deviated controlled survey, no.

MR. KELLAHIN: That's all.

CROSS EXAMINATION

BY MR. PORTER:

Q Whipstocking is generally employed to bypass junk in a hole or to straighten a crooked hole?

A Right. It goes wherever it wants to.

MR. PORTER: Mr. Robb, do you have any questions?

MR. ROBB: I have one.

RECROSS EXAMINATION

BY MR. ROBB:

Q You are not telling us, Mr. Henry, as I understand it, based on your limited experience that if a hole were directionally drilled underneath to the desired location from, let us say, Bass No. 1, you are not telling us that that would damage the Morrow formation, are you?

A Would you repeat your question?

Q You are not telling us that if a hole, in fact, were directionally drilled to the location for which application has been sought here, but it was started at the surface at the Bass No. 1 --

A (Interrupting) Yes.

Q (Continuing) -- you are not telling us that that would, in fact, damage the Morrow formation, are you?

A As I stated, the Morrow would be damaged insofar as the time that the mud and the bit and you're working in the Morrow formation. In other words, we normally drill the Morrow with a controlled mud system and try to get off it as quick as we can. Directional drilling, which I do have knowledge of the time, because of the slowness of the way the bit turns drilling would take considerably longer and there is a good chance you can damage it, which is not repairable in some cases.

Q What you are telling us is that it would take longer and cost more money?

A I didn't say either. Yes, sir.

MR. ROBB: Thank you.

REDIRECT EXAMINATION

BY MR. KELLAHIN:

Q You are also telling us that you can damage the formation and not make a well, is that correct?

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A Yes, sir.

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Q Does the thickness of the formation involved have any bearing on directional drilling and in hitting your objective?

A On what?

Q Thickness of the formation; how thick is the Morrow formation in that area?

A The Morrow formation is approximately -- I'm speaking of the sands in one particular well, about 1,000 feet plus or minus.

Q They are lenticular?

A Lenticular sands, yes, sir.

Q With porosity development within that 1,000 feet, is that correct?

A That's right, yes.

Q That's what you testified to before?

A Right.

Q Now, if you'll assume with me for a moment that a later witness will testify on directional drilling he would come in at an angle, would this create a risk of missing your objective?

A Yes, sir, because of the lenticular nature of the sand, because you're coming in at an angle. That degree of angle
I don't know, but it could be a mile away; it would have to be

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probably pretty steep at that depth to get over that far.

Q Mr. Henry, you know for a fact there is considerable directional drilling on the Gulf Coast, don't you?

A Yes, I've heard of it.

Q Are you familiar at all with the formations involved there?

A Very inept -- let me think just a second -- in other words, a well on the Gulf Coast would take roughly a fifth of the time that it takes out here to drill a well. In other words, if it took --

Q (Interrupting) Why is that?

A Because you can almost wash those wells down rather than having to drill these hard formations out here where we use button and diamond bits.

Q What hard formations are you talking about in the South Salt Lake Morrow Pool?

A Well, when you get to the top of the Bone Springs at approximately -- I can't remember -- say, 7,000 feet is the total depth and you get on out of the salt and the Delaware sands, you're roughly in relatively hard formations.

Q Does that have any effect on directional drilling?

A Yes, sir, it slows us down to a crawl rather than a walk.

MR. KELLAHIN: That's all I have.

RE CROSS EXAMINATION

BY MR. ROBB:

Q You mentioned in answer to one of the questions by Mr. Kellahin that in directional drilling you might damage the formation. That's true in straight drilling, too, isn't it?

A You damage -- yes, that's true in the sense that in straight drilling you might be on this formation out here five days. Directional drilling is possibly you could -- there again, you got the argument you could do it in five days, but it's never been done that I know of even in whipstocking that I'm familiar with. You might be there 25 days drilling the same 1,000 feet. So you're on that formation, it is accessible to damage as is well known in New Mexico -- any operator can tell you -- you can't dangle there on it too long. Even with a straight hole you can damage.

MR. PORTER: What you are saying, I believe, with directional drilling you'd have a longer exposure to the damage?

A Yes, and the units increase your time.

MR. ROBB: That's all, sir.

MR. PORTER: Anyone else have a question? You may

be excused again.

I believe Mr. Cope is to be called.

GLEN COPE

called as a witness, having been previously sworn, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. KELLAHIN:

Q State your name, please.

A Glen Cope.

Q What business are you engaged in, Mr. Cope?

A I'm a consulting engineer.

Q Where are you located?

A Midland, Texas.

Q Did you formerly work for Belco Petroleum Corporation?

A Yes, I did.

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

A Yes, I have.

MR. KELLAHIN: I'll ask Mr. Robb if he'll stipulate to the witness' qualifications as a petroleum engineer?

MR. ROBB: I'm sure he is. Yes, I will.

BY MR. KELLAHIN:

Q Mr. Cope, were you employed by Belco in making any studies in connection with the drilling of the proposed Bass Federal No. 2 Well?

A Yes, I was.

Q What have you done in connection with that study?

A In connection with that study we have prepared reserve estimates for the proposed location, and a drilling program for the proposed well.

Q Did you make a study of the other wells within the pool?

A Yes, I did.

Q Did you make some determination of the possible reserve in the prospect?

A Yes, sir, I did.

Q Now, referring to what has been marked as Exhibit No. 14, would you identify that?

A Yes, sir. Exhibit No. 14 is a plot of the monthly production versus the time for the Texaco State CM Well No. 1 and the date that it began to produce in 1961 through the most recent information that I have.

Q Now, what did this indicate as to productive history of that well?

A This indicates that the early life of the well, from 1961 through approximately 1968, that the rate of withdrawal at the well was limited, probably would be due to the pipeline capacity, a limited market. In 1969, you'll note the producing rate of the well increased substantially and in 1971 the well began to decline.

Q Now, you say the well production increased substantially what was the capacity of the well at its peak performance, roughly?

A Well, in 1969, we have a month here of production in excess of 110,000,000.

Q Is that cumulative production?

A No, sir, that's monthly production.

Q What's the cumulative production on the well?

A The cumulative production on this well right now is approximately is 5.2 billion cubic feet.

Q It is still producing is it not?

A Yes, sir, that's affirmative.

Q On the basis of this performance history, do you anticipate it will produce much longer?

A No, sir. We constructed a pressure decline versus cumulative production curve.

Q Is that what is marked as Exhibit No. 15?

A Yes, sir, it is. This depicts the decline of the bottom hole pressure as the production from the well on a cumulative basis from the time the well began to produce and as you can see, the shut-in tubing pressure has declined to a point where the capacity of the well is declining at this time. The Morrow formation, one of the characteristics of a good Morrow well is that it would produce at a good rate until the bottom pressure declined to a point and the well declined rather rapidly to its economic rate.

Q Is a pressure production decline curve an accurate method of determining the reserve in the Morrow formation?

A Yes, sir, it's a very accurate method where you have adequate time and for the State CM No. 1 we have probably 80 or 90 percent of producing life of the well so this is a very accurate method by which to determine the curves of that well.

Q How would the production from the CM Well compare to the Belco Federal -- I mean the Bass Federal No. 1 Well?

A Well, we just -- the witness that proceeded me was a geologist that described the Bass Federal No. 1 geologically equivalent to the State CM No. 1.

Q Have you prepared a production curve on it? Is that marked as Exhibit No. 16?

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A Yes, sir, I have. Exhibit No. 16 was prepared -- it's monthly production of the Bass Federal Well No. 1 for the five-and-a-half months which it has been produced. The objective of this Exhibit is to illustrate the fact that capacity of the Bass Federal Well No. 1 is in excess of that of the Texaco CM No. 1. It's on the same scale as the performance curve of the Texaco State CM No. 1 so they can be compared.

Q Would you say that that indicates the Bass Federal No. 1 as comparable to Texaco CM No. 1?

A Yes, based on the geologic testimony and based upon the capacity of the two wells, I would say that probably the Bass Federal Well No. 1 is equal to or better than the Texaco State CM No. 1.

Q Would you expect that well to produce ultimately about the same amount of gas as they Texaco Well?

A Yes, I would expect that well to produce equal to or possibly slightly greater amount of gas than Texaco CM No. 1 Well.

Q Would you anticipate that it would have the same productive life?

A No, sir, not exactly. As I mentioned awhile ago, in review of Exhibit No. 1, for the first --

Q (Interrupting) You mean Exhibit No. 14?

A Yes, sir. On Exhibit No. 14 you'll recall that the producing rate for Texaco State CM Well No. 1 does not reflect its deliverability or the capacity of the well. As you will recall, the market for gas in southeastern New Mexico was somewhat limited during that period of time.

Being allowed to produce at the optimum capacity for the Bass Federal Well No. 1, I would anticipate the life of the Bass Federal Well No. 1 to be approximately seven years.

This is illustrated by my next Exhibit which is the projected performance of the proposed Bass Federal Well No. 2.

Q Have you arrived at that curve based on the production performance of the Texaco and the Bass Federal No. 1 Well?

A By analogy I arrived at this projected performance.

Q Would you anticipate a well location proposed be comparable to those two wells?

A Yes, sir. If I may, previous geological testimony has indicated that the State CM Well No. 1 is on a strike with No. 1 Bass Federal although the proposed location is not in a direct line with the two wells. It's on a strike and geologically should be between the two wells and exhibit the same

productive capacity and reserves as these two wells. It would possibly be slighter than the State CM No. 1 and approximately equivalent to the Bass Federal No. 1.

Q What would the anticipated life of the No. 2 Well be if it's drilled?

A Sir, as my Exhibit of the projected performance of proposed Bass Federal No. 2, I illustrate I expect the life of that well to be somewhat less than seven years, approximately seven years.

Q Now, on the basis of your study of this area, would you say that the proposed location then was a good location or choice location; how would you characterize them?

A Well, sir, I'm under oath and my recommendation originally was that the location in Section 25 would be an optimum location. However, the Bass Federal Well No. 2 location is definitely an inside location, as you can see. It's within the circumference of semi-circle. By other locations it's a proven location.

Q Would you characterize it as a development well?

A Definitely.

MR. PORTER: Would you call it a good location?

THE WITNESS: Yes, sir, I sure would. I would say

that this location is necessary because of the lenticular nature described by Mr. Henry in his testimony, that the zones that are correlated with the Bass Federal No. 1 would possibly be drained by the Bass Federal No. 1 due to the lenticular nature of the Morrow sand. I don't believe that you can deplete efficiently the entire reserves under the south half of this section from the proposal well.

Q Now, in your opinion, is it necessary that this well be drilled?

A Yes, sir, it is.

Q In your opinion as an engineer, is drainage occurring to the south half of Section 30 at the present time from the Bass Federal No. 1?

A Yes, sir, as I just stated, the zones that correlate into the Bass Federal No. 1 with excellent permeability exhibited by the sands in the Morrow, you would normally expect a degree of drainage.

Q In other words, within the south half of the Section for protection against that drainage, would it be necessary to drill a well on the south half?

A Yes, sir, it would.

Q On the Exhibit does that Exhibit show that the dates of completion of the wells and their cumulative

production?

A Yes, sir, it does.

Q I don't believe we need to go into it, but do you know what the source of that information is?

A Well, the source of information are the scout cards and various information that we have obtained on the various wells, the annual records of the New Mexico Oil Commission.

Q Now, Mr. Cope, in connection with your work for Belco did you make any programs for the drilling and completion of this well?

A Yes, I did.

Q Would you outline what is supposed to be done in the drilling and completing of this well?

A Sir, we plan to drill a 20-inch hole to the anhydrite stringer immediately above the salt section and set 13 and three-eighths inch surface casing. This casing would be cemented to the surface with approximately 700 sacks of cement.

MR. PORTER: What size pipe was that?

THE WITNESS: 13 and three-eighths.

MR. PORTER: Thank you.

A (Continuing) This casing would be tested to 600 pounds before drilling the shoe. After drilling the shoe,

the hole would then be drilled to approximately 3,100 feet or 150 feet below the salt section. The drilling of fluids through that section of the hole would comply with Rule R-111-A. The pipe that would be set at approximately 3100 feet would be 10 and three-quarter inch, 40.50 pounds, K-55 and F-80 grade casing. This casing string will be cemented by the inter-string method whereby the drill pipe is run in the casing, sealed into the float chute. Cement is then mixed and pumped down the drill pipe until cement is circulated to the surface. The drill pipe is then displaced and this volume of cement is circulated out of the surface.

The 10 and three-quarter inch casing will be cemented with the necessary volumes of Halliburton light cement containing one-quarter pound flow seal, 14 pounds of salt and five pounds of Gilsonite per sack followed by 200 sacks of Class C cement containing five pounds of salt and one-half of one percent CFR-2 per sack. The compressive strength of this cement will be 2,000 pounds after 24 hours. This will be tested to 1,000 pounds before drilling the shoe and retested to 1,000 pounds after drilling the shoe.

The hole will then be drilled to approximately 10,300 feet and the second intermediate string of seven and five-eighths inch 26-40 pound M-80 CF-95 grade and 29-70 pound CF-95 grade casing line.

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This stringer casing will be cemented to the surface in two stages. The first stage of cement will be approximately 800 sacks of Halliburton light cement containing one-half of one percent CFR-2 and one-quarter pound flow seal per sack followed by 200 sacks of Class H cement containing one-and-one half percent CFR-2 and three pounds of KCL per sack.

In the second stage the safe collar will be placed below the casing chute of the 10-and-three-quarter inch casing. From this point the cement will be circulated to the surface with light-weight cement followed by 300 sacks of loose cement. The hole will then be drilled to approximately 13,600 feet of five-and-a half inch 17 pound S-95 plus joint liner set from approximately 10,000 feet to the total depth. This liner will be cemented throughout from the bottom to the top of the liner.

This program complied in all aspects with the New Mexico Oil Conservation Commission Order R-111-A.

BY MR. KELLAHIN:

Q In your opinion, will the cementing and drilling and cementing program that you have outlined fully protect any potash known to be encountered in this well?

A Yes, it will.

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Q Now, have you examined R-111-A in regard to plugging of a well in this area?

A Yes, sir, I have.

Q In your opinion, will plugging of a well in compliance with that Order, assuming the well has been drilled as you have outlined, fully protect against any possible seepage of oil and gas into the potash zone?

A Yes, it would.

Q Would your testimony be the same if you assume that due to subsidence the upper portion of the casing may have been severed some place?

A Yes. Under the Rule of R-111-A, upon plugging and abandoning a well, a solid-cement plug should be set in the base of the salt section and through the potash interval and should the casing be sheared off at the level of the potash mine, you would still have approximately 1,000-foot cement plug between it and the base of the sale in addition to the various plugs set above any possible pay zones.

Q Mr. Cope, were Exhibits 14, 15, 16 and 17 prepared by you or under your supervision?

A Yes, they were.

MR. KELLAHIN: At this time I would like to offer into evidence Exhibits 14 through 17, inclusive.

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MR. PORTER: Without objection Exhibits 14, 15, 16 and 17 will be admitted into the record and the witness is available for Cross Examination.

(Whereupon, Belco's Exhibits Nos. 14, 15, 16 and 17 were admitted in evidence.)

CROSS EXAMINATION

BY MR. ROBB:

Q Mr. Cope, you were the representative of Belco who signed the Application that presently is pending before the Commission?

A That's correct.

Q You were the District Engineer at that time for Belco?

A Yes, I was.

Q And the filing of this Application and the planning of this location, including the drilling of this well, was at that time your responsibility for Belco; is that correct?

A That's correct.

Q You are the person then within Belco who made the decision to drill the well at this location?

A Negative. That is not correct.

Q Who within your company accepts the responsibility

for having selected this site?

A That's a function of our geological department.

Q The geological department?

A Yes.

Q Was that Mr. Henry, who testified here before?

A Mr. Henry is a consulting geologist. Our district geologist and his staff were primarily responsible for the selection of this location.

Q I see. Is your District Geologist here?

A Yes, sir, he is.

Q What is his name?

A Mr. Gene Boundy.

Q As the District Engineer are you his superior; does he report to you?

A No, we were all equivalent levels.

Q Equivalent levels?

A Yes, sir.

Q But you concurred in this decision that this was the right location for the well, didn't you?

A I concurred in that this is a justified location and a highly desirable location.

Q You testified it was a good location and that it was a necessary location; is that right?

A The drainage of the south half of this section.

Q Did you before you filed this Application with the Commission review the work of this Mr. Boundy?

A Yes.

Q All right. Did you, at that time, before you filed this Application concur that this was the right location?

A It's certainly obvious that this is a well-justified location. These are excellent wells.

Q All right, sir. Before arriving at this decision or was this decision based upon your decision concerning the value for simply developing an oil and gas well or did you consider the fact that you were within a known potash area within Secretary 65 or within an R-111-A area?

A Can you restate that question?

Q Yes. Did you consider the fact that it was potash or there might be potash in this area below your drill site at the time you made the decision?

A At the time we made the decision, or at the time the decision was made, I believe, that we felt like there was not potash beneath this location.

Q So you didn't consider the effect that this might have upon a possible potash deposit?

A We felt like that this would have no effect upon

deposit if we drilled this well in accordance with the Rule R-111-A.

Q Then you did consider it?

A We felt like it would have no detrimental effect.

Q All right. Do I understand then, that you addressed yourself to the question that there might be potash and concluded it would have no detrimental effect?

A Sir, you will have to recall that we obtained a waiver from Kerr-Mac to drill the Bass Federal No. 1. This is on the off side from this well from the mine.

Q Yes, sir. You obtained no waiver from Kerr-McGee on this location, did you?

A No, we did not obtain a waiver from Kerr-McGee on this location.

Q You were aware, I take it from your testimony, that you were within what is known as a known potash area designated by the USGS?

A We are very well aware that we're within a known oil-potash area.

Q Now, sir, with regard to the drilling, did you consider the possibility of an alternate location for this well?

A An alternate location for this well?

Q Yes, sir, other than Section 25, which you just testified to earlier?

A No, but the south half of this section -- I don't recall, we considered an alternate location.

Q All right. Now, I want to be really sure that I understand your testimony, Mr. Cope. Are you telling this Commission that you are going to guarantee that if this well drilled as you have indicated, that should subsidence occur as a result of potash mining operations in this area, that there would be no escape of methane gas from the hole?

MR. KELLAHIN: If the Commission please, we object to the question. The witness is in no position to guarantee anything. He has testified, he is an expert in his opinion, that this result would not occur, but to ask a witness or Belco or anyone else to make such a guarantee is an absurdance.

MR. ROBB: I would suggest, Mr. Porter, that because of the catastrophic results that can occur to the potash area that anyone who would presume to drill through a potash deposit ought to be prepared to give that kind of a guarantee. That's why I'm asking the question.

MR. PORTER: Objection sustained.

BY MR. ROBB:

Q Do you know of any person presently with Belco,

employed by Belco, who is prepared to give Kerr-McGee, or anybody else in this area, a guarantee that there would be no escape from such a well?

MR. KELLAHIN: We'll make the same objection. I think Counsel is overlooking the fact that under prior 111-A, we have the right to drill here. We're not interlopers. We're not presumptuous as he seems to indicate. We have filed our Application in accordance with Orders of this Commission. We are having a Hearing hopefully in accordance with this. To ask for any guarantee from anybody is, again, I say absurd and he has no right to ask us to guarantee.

MR. ROBB: Those questions were asked and answered at the Phillips Hearing. That's the reason I asked. I drew the questions directly from the Phillips IMC Hearing.

MR. KELLAHIN: This is a different case.

MR. ROBB: I must say in response to what Mr. Kellahin is saying that I do think that the operator who wants to drill through this area has a burden to show that it isn't going to result in damage to the potash. That's one of the burdens that they carry in the case of the Applicant, and I think I have a right to inquire whether or not this witness will be satisfied to testify to that.

MR. KELLAHIN: If the Commission please, the witness

has testified what we're going to do and if that isn't sufficient and you want something else done, let's hear what it is, but to have a guarantee is meaningless anyway. To say, "Yes, we'll guarantee it," what kind of a guarantee are we talking about? We put on our testimony that we are going to comply with the Orders of the Commission, which the Commissioner has said this will satisfy him that no damage is going to occur and if anybody wants to make this will, let them be put on the stand.

MR. PORTER: The Commission will sustain this objection, too.

BY MR. ROBB:

Q Will you tell me, Mr. Cope, what study you made of the subsidence existing in this area before you arrived at the conclusion that the precautions that you have testified about would adequately protect against it?

A As you know, Mr. Robb, I have attended the various Hearings where you were present and heard the testimony by your mining engineers as to the degree of turbulent disturbance which occurs during subsidence and to answer your question, we feel like that after the well is plugged and abandoned, that it would be safe, reasonably safe, within all practicable reasons.

First of all, let's compare the plugging of a well

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within the potash area to the plugging of a normal well. Reading from Rule 111-A, it said that a well plugged will provide a solid cement plug to the salt section and any water bearing horizon and prevent liquid or gasses from entering a hole at or below the salt section. If we plug a well, a normal well, say, within the town site of Carlsbad or within any other area, we would probably be required to place plugs above each possible pay zone encountered in the well bore and across the shoe of the intermediate casing and across the shoe of the surface plat, possibly a ten-sack plug at the surface. This has been accepted throughout Texas and New Mexico as adequate insurance that gas will not escape from these plugged wells and the Oil Conservation Commission of New Mexico witnesses the plugging of these wells and we accept this from experience that this is adequate.

In the potash area provisions have been made to set a plug in this particular well bore that would be approximately 1,000 feet of solid cement within the inner casing and surrounded by two strings of casing cemented completely to the surface. In other words, you would have a solid cement plug in this well bore for in excess of 1,000 feet and I have heard testimony by the mining engineers that the shearing forces could completely shear the casing off at the

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mining level and it appears to me that if this should so happen it would not change anything. The well would still be plugged with a solid 1,000 feet of cement between any possible gas entry and the level of mining.

Secondly, the staff of engineers made an in-depth study of the conditions involved and determined that if a well were drilled and plugged in a manner outlined by R-111-A, that it would be safe for subsequent mining.

Q Mr. Cope, that's a rather long answer to my question. My question was: Have you, sir, made a study of the subsidence that exists in this area including the kind of pressures that are exerted and your answer to me when you started, as I recall, was that you had observed -- you had been here and heard the testimony as I had at these Hearings, is that the extent of your knowledge about subsidence?

A Mr. Robb, I said that I accept your testimony that you're aware of that a most extreme case could be the shearing forces which could completely sever the casing string at the depth of the mining. I would say this is the most extreme example. This would be the most extreme hazard that could happen and in case this did after the well was plugged what might happen, I attempted to be completely honest with you in answering your question.

Q What you are saying, if I understand you correctly, Mr. Cope, you have not made an underground study of the forces subsident in this area; is that right?

A You see, I have been to the Hearings, too, and I don't consider myself an expert.

Q Did you accept the testimony as valid?

A Yes, sir, I did.

MR. PORTER: You have no quarrel with that testimony?

Q But that is the extent of your knowledge what you have picked up in these Hearings, is that right?

A Yes, sir, that is true. I accept this is what can possibly happen.

Q Now, let me ask you: Are you telling us it's not possible for gas to escape through the casing to the outside of the casing around your cement plug?

A If these wells are properly cemented, as it has been proposed here, then it's very difficult for gas to pass even a six-inch plug that is solid and we're talking about 1,000 feet.

Q You know, sir, don't you that the gas, in fact, does escape from wells that are plugged?

A Can you give me an example?

Q You mean you are not aware of the oil seepages that occur in this area or where the oil has come out, migrated 1,400 or more feet in the potash area of New Mexico from a plugged well?

A No, I'm not.

Q You're not?

A I'm under oath. I don't know of any specific examples.

Q Are you aware of no circumstances from your experience where a plugged well ever had gas escape?

A From the surface to the ground?

Q Or into the formation?

A I have no way of knowing.

Q You have no knowledge of this?

A No.

Q All right. I'd like to show you an Exhibit and ask whether or not you agree with this. I hand you what has been marked as Kerr-McGee Exhibit No. 2, Exhibit "H", about half way through it.

MR. KELLAHIN: Are you referring to a letter?

MR. ROBB: Yes, we are referring to a letter and a report from John Boyer.

MR. KELLAHIN: We object to the Exhibit, with any

reference to it as being completely hearsay. If Mr. Boyd's present and you call him as a witness to testify, but to ask this witness to accept this hearsay evidence for the purpose of a question, I object to it.

MR. ROBB: This witness says that he has heard testimony by Mr. Boyd and has attended these Hearings and this was an Exhibit attached to the presentation made to the Secretary of the Interior and is well known to everybody and I now ask if he agrees with the opinion of Mr. Boyd, whose testimony he's already cited.

MR. KELLAHIN: Mr. Boyd's testimony, you say, was submitted to the Secretary of the Interior. He is not here either. We object to the question.

MR. ROBB: The question is not whether he's here. The question is whether or not he agrees with Mr. Boyd, who was a witness of the IMC Hearing, and he testified here and this witness has said that he listened to the testimony.

Now, I want to ask him about a report that Mr. Boyd has prepared. This is a witness that he says he's familiar with. All I want to know is if he agrees.

MR. PORTER: Mr. Cope, as I understood, I believe you said you had no quarrel with the testimony that's being

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referred to here of Mr. Boyd?

MR. KELLAHIN: If the Commission please, the testimony was he had no quarrel with the testimony in regard to subsidence. Now, Mr. Robb has presented a book here, a statement by Mr. Boyd which bears on what we know not; I assume it has something to do with seepage in some mine. Now, If Mr. Cope is familiar with this, then, yes, he could answer the question, but just to hand a witness cold an Exhibit of that size and ask him if he agrees with it, I object to it.

MR. PORTER: As I understood it, there were specific statements in a paragraph in the Exhibit that he was asking about. Is this true, Mr. Robb?

MR. ROBB: Yes, sir, there are several specific pages I want to ask about. I haven't had a chance to do that. May I do that?

MR. PORTER: The Commission is going to allow Mr. Robb, your reference to specific sections of this testimony in order to refresh the memory of this witness, and question him specifically on those passages as to whether or not he agrees with them.

BY MR. ROBB:

Q Would you please look over Exhibit "H" and I'll direct your attention to specific parts of it which is a report

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from John T. Boyd, dated July 23rd, 1973, and that the Potash Committee of the New Mexico Mining Association has a copy of that Exhibit, I believe, already. It's Kerr-McGee Exhibit No. 2 and it's Appendix "H", which was about the middle of it.

A You're speaking of the second paragraph?

Q Well, I'll direct your attention in just a moment. Have you looked at it generally?

A Yes.

Q Now, you know who Mr. Boyd is, do you not?

A Yes.

Q You were present here at the Hearing, you and I both were, at the IMC-Phillips Petroleum Company Hearing? That was about a year ago.

A That's correct.

Q You heard him testify at that Hearing?

A Yes, sir.

Q You know that he is a mining engineer who has worked in and around the potash basin ever since 1952, over 20 years. You recall that testimony, don't you?

A It says, "I have a working knowledge of the Carlsbad Potash Basin."

Q Yes, sir. Do you recall his testimony at the Hearing,

IMC Hearing?

A Yes, sir.

Q And you recall that he has been a consultant for the potash company in the Carlsbad area since 1952?

A I don't specifically recall.

MR. KELLAHIN: If the Commission please, it sounds to me like the attorney is trying to qualify Mr. Boyd rather than whether he agrees or doesn't.

MR. ROBB: I'm asking him whether he accepts him as an expert.

BY MR. ROBB:

Q Do you accept Mr. Boyd as a mining engineer with vast experience in the potash mining area in New Mexico?

A I think he was accepted as an expert witness by the Conservation Commission.

Q You don't challenge that, do you?

A No, I don't.

Q All right. Now, on Page 2 of the Exhibit, it says, (Reading) With the underground mining of potash ore or hallite salt stresses originally distributed throughout a large area are concentrated in the pillars. These stresses are relieved as the pillars undergo continuous permanent deformation without a fracture, a process commonly called plastic flow.

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As the mining continues the pressure on the pillars increases and plastic flow continues indefinitely or until the pillar crushes. (End of Reading) Do you accept that as a statement of what happens in the underground after there's been mining and subsidence begins to take place and the salt section begins to flow?

A I'll say this, that I'm not qualified to challenge his testimony.

Q All right, sir. Then, down below, the third paragraph, (Reading) The bedded potash ore in the Carlsbad Basin with a 15 to 20 percent K20 content and the roof fall have the following characteristics when the force is applied perpendicular to the flank of the stratification, compressive test per square inch, potash ore 15 to 20 percent K20, 3300 yield strength per pound per square inch, 2000 pounds. Then for the salt section, the salt section will yield under pressure at the rate of 2,500 pounds per square inch and will at compressor's rate test at 4,400, will cause it not to only yield, but to break at 4,400. (End of Reading) Do you agree with that or don't you agree with that?

A Sir, I don't know in what manner these compressive tests were performed. I assume that they're as represented here.

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Q All right, sir. On the next page there is a three-column figure showing the amount of pressure of overburden thickness as exerted down at various levels of mining in the potash areas. Do you see that? One is at 1,000 feet, the other is 1,600 feet and the third column it is 2,100 feet.

A Yes, sir.

Q Now, you're in the eastern part of the potash ore area, are you not?

A That's correct.

Q And that's the deepest isn't it?

A Yes.

Q And about 2,100 feet would be about right if there's potash under this location and I know you won't concede that's right, but if there is, it's about 2,100 feet, isn't it?

A It should be.

Q All right, sir. If you have a mining recovery of only 30 percent, this table would indicate a pound per square inch pressure of 3,000; is that correct?

A The table illustrates this.

Q That would be the weight on the remaining pillars that are holding up that mine then?

A (No reply.)

Q And undoubtedly --

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MR. PORTER: (Interrupting) I don't believe the witness answered that question.

MR. ROBB: I'm sorry. What is your answer?

A I said I believe this is what the table illustrates.

Q All right. You don't challenge that statement, do you?

A I have no way to know whether that's right or not.

Q And then below it says, (Reading) The potash before it starts compressing with 50 percent mining recovery at 1,000 feet of cover and when first mining starts at 2,100 feet of cover. (End of Reading) You disagree with that statement?

A Sir, I am not a mining engineer. I have no way to agree or disagree with it.

Q All right. On the top of the page 4, it says, (Reading) With normal pillar recovery system and mining at 10-foot seams the salt base will move as much as 12 to 14 feet. The salt becomes plastic and flows as a mass, the forces that would build up against any oil or gas well caused casing in the subsidence area would be uncontrollable. (End of Reading) You have accepted that statement, haven't you, for purposes of your testimony?

A Yes, I said that this is the most extreme situation.

Q All right.

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MR. KELLAHIN: If the Commission please, in Cross Examination I feel it is improper going beyond anything that's testified to on Direct. Mr. Cope's made the assumption that the most extreme situation that could occur would occur, but his testimony then was that the cementing program would still protect the salt section and the potash section, if any existed there.

Now, of course, with this Cross Examination it would appear to be a means of just getting this testimony before the Commission without a witness being present to testify to it. We object to any further testimony on Cross Examination along this line.

MR. PORTER: We feel that the objection is properly taken. I don't feel that Mr. Cope is a mining engineer and actually qualified to testify on the questions that he's been asked. He has testified that he feels that the construction of this well is adequate under the most extreme conditions as have been outlined, and that would be the complete shearing of the casing at the potash depth. So I believe the Commission will ask you to discontinue this line of questioning.

MR. ROBB: All right.

BY MR. ROBB:

Q Are you aware of the properties of methane gas?

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A Yes.

Q All right. Are you aware of the fact that methane gas can migrate through porous deposits?

A Yes.

Q On Page 5 of this report it says, (Reading) Gas has been known to migrate through salt strata and could easily migrate along the mud seams in the Salada formation.

(End of reading) Do you agree with that statement?

A On Page 5 where?

Q That's Paragraph 5.

A I'm not personally aware of these examples. I believe it might be possible.

Q All right, sir. If not withstanding this super plug that you have in this well, Mr. Cope, if gas did get out from underneath that plug and got through the casing, or got through the cement, or if you didn't get a proper cement job and gas got loose and then the gas migrated along the mud seams, do you know what would happen to a potash mine in this area if it got into the workings?

A May I say this: There were many wells drilled in this area during the 1930's before these programs were adopted, and in our drilling program we have said that on our 3,100-foot string of casing, we're going to circulate cement. We're

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going to mix and pump cement until it circulates from the bottom of that string of casing to the surface. Now, I don't think that we can correlate between these instances where these wells are possibly drilled by other programs other than the one that we have designated.

Q Sir, my questions was: Do you know what would happen to a potash mine such as Kerr McGee's or any other mine in the area if that gas, in fact, got under the bore?

MR. KELLAHIN: If the Commission please, there isn't any mine under this area. There isn't any mine within five miles. He's asking this witness to assume that somehow Kerr McGee got himself a lease on this acreage and is in there mining it. The witness has testified that in his opinion, there isn't going to be any gas escape and that should be the end of the matter. Now, if they want to put on the testimony as to what happens when gas gets into the mine, they can call a mining engineer and testify to it.

MR. ROBB: Sir, we have our mine, at the present time, is approximately four miles away. We have a mining plan on file with the Commission to show that we expect to be within an area of approximately a mile-and-a-half within five years and we have other testimony which will indicate that if permitted to do so, Kerr-McGee is the only operator

that really can feasibly get into this area because of its workings and we expect to have mines a lot closer than the five miles from this location.

MR. PORTER: Mr. Robb, the Commission feels that it would be more properly matter to put into record from one of your own witnesses if you could develop this information, than trying to develop it through a man who is qualified only as, I believe, a petroleum engineer. Now, as you say the mine is some three to four miles away and this has not happened and Mr. Cope, I'm sure, has not had a chance to observe what happens to a mine when gas does escape into it. I doubt seriously if he is expert enough to testify on that so we're going to sustain that objection.

MR. ROBB: All right. I really didn't want to belabor that point, but this testimony has been covered a number of times before the Commission before. I wanted no expertise in this area.

Q Mr. Cope, let's be sure I understand your testimony correctly. With the enormous, tremendous, uncontrolled forces that are incorporated in this report by Mr. Boyd, that if those forces were brought to bear against the casing that you propose to put in this well, that under no circumstances would

there be no gas escaping from that well?

A Sir, I am not testifying to that at all. I said, that if this well were drilled and produced to depletion and plugged and abandoned in accordance with the program outlined in New Mexico Oil Conservation Commission Order R-111-A, where we have a solid 1,000-foot cement plug below the 2,100-foot potash level that I believe that within reason there would be no chance of escape of gas, even though the most extreme case of the casing being entirely sheared off would be the same.

Q In the process of shearing off this casing, the plug got dislodged, there would be gas escaping?

A Sir, it's very difficult to drill cement out of a casing, much less dislodge it. You might disrupt a few inches or a few feet, but certainly not 10 feet or hundreds of feet.

Q You're saying then that, in your opinion, then, it would not happen?

A Yes.

Q I see. All right. Now, let me ask you about the life of this well, Belco No. 2? The other wells in this area have been producing at a considerable longer period than the seven-year life that you give this well, haven't they?

Let's take the average-expected life of Texaco Audie Richards No. 1. What do you give that expected life in years?

A Sir, I'm presenting evidence where we compared like-well characteristics and conditions and previous geologic testimony to the effect that our Bass Federal Well No. 1 and our proposed Bass Federal Well No. 2 would be like the Texaco State CM Well No. 1 and in order to compare our proposed Morrow Well with the anticipated geological development to the Audie Richards is not comparing the equals.

Q You don't consider them comparable?

A No, sir.

Q All right. How about the Texaco CH No. 1 Well, would you consider that comparable?

A No, based on previous geological testimony, they're not comparable.

Q I believe you testified you considered the Bass No. 1 to be comparable to Bass No. 2; is that right?

A We anticipate these wells to be comparable.

Q All right, sir, but you rejected the other wells that are located nearby and your Exhibit, the two Texaco Wells, the CH No. 1 and the CM No. 1 -- I'm sorry -- the Richards No. 1 and the CH No. 1, right?

A That's right.

Q And instead you took the well to the north, the Bass No. 1 and the one to the south, CM No. 1; is that right?

A That's correct.

Q You overlook the intermediate two that are actually just as close or perhaps even closer than the CM No. 1?

A The proximity of the wells is not the critical factor here. The Morrow formation, where you're better development is on the flanks of your structure, you compare the wells on strike as being possibly more equal where the wells on top of the structure, as illustrated by the contours on Exhibit No. 11 illustrates the fact that the two wells which you are dwelling upon, are on the crest of the structure and are not comparable.

Q What was the production life of the CM No. 1 that you testified to?

A CM No. 1 has been producing since 1961.

Q 1961 and how many more years of life do you give that?

A I think that possibly this well has three years of additional life maximum with compression.

Q All right. Whether you agree they are comparable or not, do you agree that the average expected life of the

Texaco Audie Richards No. 1 which is right close to the Bass No. 2 is approximately 23 years?

A Sir, I'm not involved with the life of this well. We're not completing our well. We're not proposing to complete a well in equivalent zones with well conditions encountered in your well.

Q Whether you consider it equivalent or not, do you agree that that is the expected life of that well?

A I have not determined what the expected life of that well might be.

Q You've made no look, no check at all on the well adjacent to your own well location to see what that life was?

A Yes, I certainly have.

Q How about the Texaco CH No. 1 which is also right next to the 1?

A Yes.

Q Have you checked on the expected life of that well?

A I did not calculate the remaining life of that well or the total expected life of that well.

Q Well, sir, are you willing to testify that 23 and 21 years would be a normal expected life for a well of that kind in that location?

MR. KELLAHIN: If the Commission please, I don't

see the CH Well he's specified or what formation he's talking about.

MR. ROBB: Well, it's on your maps. Don't you know what formation the Texaco CH No. 1 is producing from Mr. Cope?

A Yes, I know what interval is perforated in that well.

BY MR. ROBB:

Q Would you say a 21-year life for that well would be about right?

A No, I would not say that. As I said before, I've not calculated the life of that well.

Q What reserve figure did you arrive at with regard to Bass No. 2?

A I said that the reserve was attributal to the drilling of that well and would be in the magnitude of five billion cubic feet plus.

Q You have Exhibit 1-A in front of you?

A Is this the --

Q It should be marked at the bottom.

A I've got Exhibit 1-B.

Q 1-B, that's the one. Do you know Mr. Roy Williamson?

A Yes, I do.

COPE-CROSS

Q Do you accept him as a qualified petroleum engineer?

A Yes.

Q You heard him testify at the Phillips IMC Hearing, did you not?

A Yes, I did.

Q All right. Exhibit 1-B -- the Commission has a copy there -- is a letter dated March 9, 1974. I want to ask if you agree with certain statements here. (Reading)

In accordance with your request we have calculated reserve producing wise from the product value from a more mature producing well in the vicinity of the proposed location and have discussed various questions concerning this area proposed in the letter of March 15, 1973. (End of Reading.)

I direct your attention now to the second page where it says, (Reading) Belco's proposed location -- Since the Atoka-Morrow Zone is stratigraphic in nature, the volumetric determination of reserves from a core-volume study is very hazardous. Therefore, no attempt was made to determine the reserve to be expected from Belco's Bass Federal No. 1 in Section 30, Township 20 South, Range 33 East, Amini's Well in Section 32 and 33, 20 South, 33 and Section 4, 21 South, 24 East or from Phillips Hat Mesa No. 1. (End of Reading)

Now, do you agree with that statement?

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MR. KELLAHIN: If the Commission please, I don't know what he could mean that to agree with. The witness says that he didn't make the calculation and we agree that he didn't make the calculation, if that's what he wants, but if the witness didn't make the calculation, he should be produced and testify as to why he didn't make the calculation if Mr. Cope did.

MR. ROBB: I think you know what the question is. The question is: Whether or not the Atoka-Morrow Zones are stratigraphic in nature and a volumetric determination of the reserves from a core-body study is hazardous?

THE WITNESS: Yes, I will agree that reserve based upon volumetric calculations in the Morrow formation is very hazardous. That's the reason I prepared my reserve calculation and predictions based on performance history.

BY MR. ROBB:

Q You also notice in his doing the very same thing you attempted to do and he included the Texaco Audie Richards No. 1 and the Texaco State CH No. 1 as being comparable, do you not --at the bottom of the page-- comparable to the Bass No. 2, sir?

MR. KELLAHIN: There's nothing on the Exhibit to indicate that and, again, I object to this attempt to get hearsay testimony before the Commission by the back door of

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cross examining our witness. If you have any questions about our witnesses testimony or his competence in making calculations on his own behalf we certainly have no objection to that kind of cross examination, but to come in here with this so-called Exhibit which is nothing but hearsay. There is no witness present to testify to it or subject himself to cross examination, we object to it. It's impossible for proper cross examination.

MR. ROBB: The feature of an expert witness by the use of an opinion by another expert is one of the classic means of cross examination. I think we are entitled to cross examine without the opinion of another expert.

MR. PORTER: The Commission is going to sustain this objection, too, Mr. Robb. At this time we are going to recess the Hearing until 1:30.

(Whereupon, the Hearing was
' recess at 12:03 P.M.)

AFTERNOON SESSION

(1:30 P.M.)

MR. PORTER: The Hearing will come to order, please.
Mr. Robb, do you have some further questions of Mr. Cope?

CROSS EXAMINATION (Continued)

BY MR. ROBB:

Q Mr. Cope, are you qualified in the field of directional drilling?

A Of original drilling?

Q Directional drilling?

A No, sir, I would say that I would not be qualified as a directional drilling expert.

MR. ROBB: Mr. Kellahin, do you have another witness on that?

MR. KELLAHIN: We'll have some other witnesses.

BY MR. ROBB:

Q If potash mining were to go first, go ahead of oil and gas drilling in this location and the area mined out and subsidence were completed and assuming that in the mining operation -- there will be testimony to this later on -- there are barren areas or other areas in or around mining workings where no mining has been conducted, dirt in place. Would you -- I have two questions. First is: Do you see any damage that would result to the oil and gas deposits from the mining

operations itself?

A I doubt that the deposits would be damaged. However, I think it would be difficult to drill a well to these deposits.

Q Okay. You lead to the second question. That's my next question. Would it be feasible to drill a well through this area, either through the subsident area where there has actually been mining or go through firm ground that has not be disturbed by the mining in adjacent areas?

A That appears to be two questions. After hearing the testimony that you introduced by Mr. Boyd about the tremendous forces involved in subsidence and the degree by which the rock is broken up and flows, I would say it would be very difficult to drill through this area and obtain a reliable cement job in this area of the hole.

Q I wouldn't want you to be drilling through that area, Mr. Cope, while it's still subsiding and if my question wasn't clear, let me make it clear. I'm assuming that the subsidence has ceased. There will be evidence that all but insignificant amounts of subsidence terminate at the end of five years. I'm really talking about after that. Let's assume your subsidence is over. You wouldn't have a problem drilling other than the loss of circulation problem, would you?

A The problem that comes to mind other than the loss of circulation is the obtaining of a reliable cement job. Any time you have loss of circulation you have the problem of obtaining a dependable cement job.

Q It increases the difficulty in drilling the well, isn't that what you're saying?

A Yes, sir.

Q But you have drilled through areas where you have that same problem, have you not?

A No, I have not.

Q I don't mean where it's mined out, but where you have circulation problems getting a good cement job?

A Yes, we have drilled through areas like that, but it was localized to one zone, more than a 2,100-foot zone as in this case.

Q If I understand your testimony, you are saying that you would have increased difficulty. You are not saying the well couldn't be drilled, are you?

A I'm saying that without an absolute guarantee that subsidence has entirely depleted, that to drill a high-pressure gas well like we're talking about would be a challenging proposition drilling through a disturbed area like this 2,100 feet, having to rely upon that casing string in that cementing

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REDIRECT

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job after drilling --

Q (Interrupting) You're the one who is looking for the guarantee now?

A Yes.

Q That's a hard one. If you were to drill through adjacent areas to the mined out area where there hadn't been any mining at all, you would not expect any undue difficulty in drilling the well?

A As your question is worded, we would not expect any undue problems in an undisturbed area.

Q Fine.

MR. ROBB: No further questions.

MR. PORTER: Any questions of the witness?

REDIRECT EXAMINATION

BY MR. KELLAHIN:

Q Mr. Cope, you have drilled or supervised drilling wells in this area, have you not?

A Yes, sir, I have.

Q Was that for Belco?

A Yes, sir.

Q Where was that?

A Well, sir, I supervised the drilling of Bass Federal Well No. 1.

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Q What kind of problems did you encounter on the vertical hole in this area?

A The most prominent problem we encountered in this well after we had set our intermediate casing, we drilled a shoe and we encountered a severe-crooked hole problem. Instead of running 40 to 50,000 pounds of weight which we normally would run on our bit, we were only able to run 10 to 20,000 with our crooked hole problem.

Q To what did you attribute that crooked-hole problem?

A Well, you have areas where you encounter crooked-hole problems. You never can tell where this will occur.

Q Is that due to the formation you are drilling in and the way it lies?

A I don't know why these areas are there. They just -- we just encounter crooked-hole areas.

Q Is that a problem that is common to Morrow, drilling through Morrow in this particular area? Have you found it in other wells?

A Well, sir, we have only been able to drill that one well so far, but I would say that this is a problem that would be common within a reasonable radius of that well, two or three miles.

Q Are there any other problems you encountered?

A Not in drilling our Bass Federal No. 1, we drilled a well on day work where Belco was responsible for drilling the well straight instead of the drilling contractor and, all in all, outside of the normal problems associated with drilling in a gas area, we encountered no abnormal problems.

Q Are the formations hard in this area or dense?

A Yes, sir, this is hard-rock country.

Q What kind of bits do you use in drilling?

A In drilling the Bass Federal Well No. 1 we justified the use of journal bearing bits. These are tungsten-carbide bits made for drilling in extra hard formations.

MR. KELLAHIN: That's all I have.

MR. PORTER: Any further questions?

MR. ROBB: No further questions.

MR. PORTER: Anyone else have a question of the witness? You may be excused.

(Witness excused.)

MR. ROBB: At this time we move for introduction of Exhibits 1-A, 1-B and 2.

MR. KELLAHIN: If the Commission please, Exhibit 1-A is a letter from Roy Williamson. Mr. Williamson is not present apparently, haven't seen him at least. The letter contains matters which purports to contain cost involved in

drilling in this area and he's not subject to cross examination. Letter 1-B is the same situation. It's a letter from Roy Williamson giving his reserve calculations and estimated life of the wells. In fact, that is a cross section prepared by Mr. Williamson, and again, he is not present in this Hearing Room to subject himself to cross examination as to these calculations and information contained in this letter.

Did you say 2, also, Mr. Robb?

MR. ROBB: Yes, that's right.

MR. KELLAHIN: 2 is an extremely lengthy document and it's a cover letter from Mr. R. H. Blackman, Potash Company of America, to Steve Wakefield transmitting the industry's position, papers relating to the drilling of the potash area. Now, I believe, the Commission has seen this. It contains a great deal of hearsay testimony. It contains calculations, exhibits and it goes on in great length to show economics of drilling in this area and the value of potash in the area, none of which is subject to cross examination. We think all of these Exhibits, our objection would be as being hearsay.

MR. ROBB: Mr. Porter, on Exhibit 1-A and 1-B, I think would be very helpful to the Commission. I don't think the criteria for admitting evidence at an administrative

attempts to arrive at what is the truth with regard to conflicting statements of fact. Mr. Williamson has been before this Commission on many occasions. You have heard his testimony. You know his background and qualifications.

Now, with regard to No. 2 --

MR. PORTER: What about 1-B, what was that letter?

MR. ROBB: 1-B, your Honor, deals with the question of reserves. It deals with the problem of -- specifically it deals with the problem of the calculated reserves which are regarded as No. 2. It deals with the question of directional drilling. It deals with the question of ability to successfully drill through a mined out potash area if the potash mining were to go first. That's on Page 3 and then on Page 4, it contains the opinion about directional drilling. It is feasible; it is technically and economically feasible. Drilling from Bass No. 1 over to the proposed Bass No. 2. All those things are directly pertinent to what this Commission has to decide here today.

Now, those are the two Williamson letters. The first one deals with -- 1-A deals with the problem of directional drilling also and gives a breakdown of the cost of what directional drilling would cost if it were drilled on a horizontal displacement of up to 5,000 feet. It seems to me

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that those things are directly relevant to what the Commission has to determine here today.

Would you like my argument on No. 2 or do you want to take them one at a time?

MR. PORTER: Go ahead.

MR. ROBB: All right. Now, No. 2 is more a historical document than anything else. No. 2 is a compilation of a history of development of potash in this area. It goes into the fundamental things that I hoped we wouldn't have to spend a lot of time here with the Commission, such as subsidence and how subsidence occurs, what the result is, where subsidence has occurred in the potash area, the migration of oil through potash. It deals with the problem of directional drilling. It has the Boyd report that I used extensively in cross examination. It deals with the question of whether or not you are likely to have danger to potash deposits from drilling in this area. It has a whole historical development basically of what has taken place in the oil-potash area and as a result we attached as an Exhibit -- everybody has seen it and knows what is in it -- 90 percent of it is not controversial at all. 90 percent of it is history that everybody agrees to, the history of the

Orders to this area from the very beginning, R-111-A, the Orders of the Secretary of Interior, it was attached as a historical background primarily, although it has some current pertinent things in it as well as in the submission that potash companies made to the Secretary of the Interior last summer. I believe a copy of that -- I believe everybody has got a copy of it, everybody has seen it -- and to raise a cross examination objection to a document like this, to me, seems ridiculous.

MR. KELLAHIN: In connection with Exhibit No. 2, he says 90 percent of it would be acceptable and I say 99 percent of it would not be acceptable and just as an example of the hearsay character of this thing, Exhibit A, Page 2, for example, purports to give values of ore that they claim would be left in the mine if we drilled. Now we are certainly hardly in agreement with this, but on the face of it we have no way of knowing how those figures are arrived at. We can't intelligently answer this without having witnesses who prepared it here and present to testify. The effect of this is simply to make Kerr-McGee's case on hearsay documents which have surely had wide circulation, but nobody agrees with them necessarily, because they have been circulated. The oil industry certainly does not, and prepared a counter statement which was filed with Mr.

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Wakefield, also. This was admitted and we have the right to put in the New Mexico Oil and Gas Association's statement. The only thing here to constitute any evidence at all is 1-B, the cross section and even it is not entirely accurate, but we can intelligently look at it and see what it purports to show. Now, for Kerr-McGee to come in here saying this sort of thing is admissible to make their case denies us the right to be heard. We certainly do object to this type of material being admitted in any way.

MR. PORTER: Any response?

MR. ROBB: Exhibit A has a complete breakdown in calculations. If he's not satisfied with that, we have Mr. Lang here who can testify to what the differences are if there are any between these calculations and the ones that he's made. With regard to the question of the oil and gas presentation being submitted, I have no objection to that. Let them put in the oil and gas presentation to the Secretary. That may have some pertinent stuff in it, too. It seems to me the Commission is entitled to have the benefit of everything that bears directly on the issue here and this does bear on the issues. We respectfully renew our tender of those Exhibits into evidence.

MR. PORTER: The Commission does not feel that the

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admission of these Exhibits is appropriate in connection with the cross examination of Mr. Cope and we are going to sustain Mr. Kellahin's objection.

MR. ROBB: May I be free to offer these again as part of our case?

MR. PORTER: You may offer them again at the appropriate time and the Commission will then rule on whether or not they should be admitted.

Mr. Kellahin, do you have any other witnesses?

MR. KELLAHIN: Yes, I do. I'd like to call Mr. H. L. Kendrick.

H. L. KENDRICK

called as a witness, having been previously sworn, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. KELLAHIN:

Q Would you state your name, please?

A Harold L. Kendrick.

MR. ROBB: Is this an El Paso Natural Gas witness and is he going to testify that they're going to negotiate with you to cut Bass No. 2, going to make a well?

MR. KELLAHIN: He's going to testify that they've already negotiated.

KENDRICK-DIRECT
McPETERS-DIRECT

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MR. ROBB: Why? I stipulate. I don't see any reason to call a witness to establish things like this.

MR. KELLAHIN: Will you stipulate further that this witness would testify that El Paso Natural Gas Company has the need for all the gas that they can get from this particular area and will take the gas from this well when it's available?

MR. ROBB: Yes, you bet.

MR. KELLAHIN: Thank you, Mr. Kendrick.

MR. TRUJILLO: Is that the extent of his testimony?

MR. KELLAHIN: Yes.

Would you further stipulate that they presently have a line in this area connected to the Bass Federal No. 1?

MR. ROBB: Yes, I so stipulate.

MR. PORTER: Then there won't be any necessity for you to come forward with this witness, Mr. Kellahin. The stipulations have been agreed that they are in the area and available for connection and have need for the gas.

MR. KELLAHIN: Yes, sir. That's all we need.

MR. PORTER: Mr. Kendrick may be excused.

(Witness excused.)

MR. KELLAHIN: I'd like to call Mr. Ken McPeters.

MR. PORTER: I believe Mr. McPeters has not been sworn. Did he come in after the --

MR. KELLAHIN: I was going to ask you that.

MR. PORTER: Mr. Derryberry, would you swear the witness?

(Witness sworn.)

KENNETH McPETERS

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

DIRECT EXAMINATION

BY MR. KELLAHIN:

Q Will you state your name, please?

A Kenneth McPeters.

Q Where are you employed and what position, Mr. McPeters?

A Moranco, executive-vice president.

Q Where is Moranco located?

A We're located in Hobbs, New Mexico.

Q What business are you engaged in?

A We're in the oil and gas well drilling contracting business.

Q Where do you operate?

A Mostly around the Carlsbad area.

Q In southeastern New Mexico?

A Yes, we have seven rigs and right now six of them are operating in the Carlsbad area and one in Andrews County. We have had as many as all seven of them drilling for gas in that Carlsbad area.

Q In connection with your drilling operation, have you drilled for production from the Morrow formation?

A About 100 percent of our wells in the Carlsbad area are drilled in the Morrow formation.

Q Do you personally have anything to do with this drilling operation?

A Yes, I'm responsible for taking the contracts and pretty well responsible for running the company.

Q Do you have anything to do with procurement of supplies?

A Yes.

Q Drill pipes?

A Drill pipes, yes.

Q Now, Mr. McPeters, have you ever had any experience in directional drilling of wells?

A Yes, sir, we do it quite frequently. Some we whipstock to get around junk in the hole and a few, well, we drill to a depth target.

Q At what distance have you --

A (Interrupting) Up to 1,000-foot horizontal displacement.

Q Do you know of any case where a well has been directionally drilled to the Morrow formation in southeastern New Mexico?

A There probably has been some directional-drilled wells with small horizontal displacements.

Q Do you know of any where there has been as much as 3,000-foot displacement?

A There has not, to my knowledge.

Q In connection with your work would you make a bid on a well to be directional drilled to a displacement of 2,500 to 3,000 feet?

A No, sir, we would not.

Q Why not?

A There are several factors involved here. We are in the business to make a profit naturally. We would not take a contract -- first of all, normally, it would take to drill a Morrow Well to the depth of 13 - 14,000 foot, neighborhood of 60 to 70 days to drill it vertically. To directionally drill a well, one of displacement of 3,000 foot -- and I would just be guessing, it hasn't been done -- would take

at least three to four times longer than that.

Q Do you encounter any problems in directional drilling that are not normal to a vertical hole?

A Yes, we have extreme wear to our drill pipe -- drill collars in a directional drilled hole. They are rubbing against the side of the formation and all these formations are extremely abrasive and it shortens the length of the drill pipe and the few wells that we've --

Q (Interrupting) You said the "length", you mean the length of the life?

A Life of the drill pipe. The times we did the directional drilling, we've had a real difficulty with the operator establishing what factor -- how much the drill pipe wears, what is it worth. So we shy away from even 1,000-foot displacements because you don't know really how much your damage is to your drill pipe. Along that line, another reason we wouldn't take it is because if you lose drill pipe today, we're looking at delivery of displacement of drill pipe of the first quarter of 1978. In a 14,000-foot well we would have in the neighborhood of \$130,000 investment in a drill pipe and about \$35,000 invested in drill collars and we would be jeopardizing how we're going to get it out of the hole and you can't replace it in today's market.

Another objection, of course, we would have is when you have troubles on a well and the longer you're on a well the more problems you are going to have. Instead of ending up with a friend, you end up with an enemy. We've got too many enemies as it is. We feel like we could do our customers more good by drilling a straight hole than drilling maybe three wells from one directional hole, rather than drilling one directional hole. Then there comes a personnel problem. Any directional hole, that number of days, we're going to have a lot of problems. Some of which I wouldn't even think of until we got there and got into doing it. You would be having more trips, more work. You would have very dissatisfied personnel; it would be difficult to keep your hands on the job.

Q When you're drilling a well deviated to the extent we're talking about, 2,500 to 3,000 feet, does that impose any problems on making drill-stem tests and well stem bore?

A Poses a problem with everything you do. The biggest problem is turning the drill pipe. On the wells that we've drilled directionally of 3,000 foot or more, you have a considerable amount of torque to the drill pipe and you could approach the point that you couldn't turn the drill pipe. You just twist it off on the surface.

Q That would mean loss of tools in the hole then?

A Yes, sir.

Q Would that incur a fishing job?

A Exactly.

Q Is that an additional expense?

A Yes, sir. Fishing is -- sky is the limit as to the cost of fishing.

Q Can you always recover fishing?

A No, sir.

Q That would mean a lost hole?

A Right.

Q Now, referring to the Exhibit on the board up there, Mr. McPeters, assuming with me for the moment that you would have a surface location approximately in the area of the Bass Federal No. 1 with a target area as a proposed location of the No. 2 Well.

A Which one is the Bass?

Q The one to the north, right there.

A How much displacement is there?

MR. ROBB: About 4,000 feet.

BY MR. KELLAHIN:

Q Is that a feasible operation from your point?

A In my opinion, it is not.

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CROSS

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Q Does the fact that it is on strike apparently, as far as the formation is concerned, to pose any problems?

A That really doesn't have anything to do with my testimony. I'm just talking about the horizontal displacement. The strike, whether it's on strike or not, doesn't make any difference.

Q Does the cost of the drilling increase by the mud and other supplies?

A Yes, sir. My testimony is only has to do with the number of days on the job and it would be proportional and anything else would be an increase, porportionately.

Q As I understand your testimony, your company would not take it?

A We would not, no, sir.

MR. KELLAHIN: That's all I have of this witness.

MR. PORTER: Mr. McPeters, I have one question. You said there probably had been some wells deviated in this area. Do you have certain knowledge of any?

THE WITNESS: No, sir. I have no knowledge that any have or have not.

MR. PORTER: I see.

CROSS EXAMINATION

BY MR. ROBB:

Q Mr. McPeters, let's assume for the moment that

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you didn't have a shortage of drill pipe and that you were willing to put up with the customer who might be a little bit unhappy and you were to drill a directional hole or somebody else were to drill. I'm not saying your company would have to do it. I understand you wouldn't want to do that, but you're familiar with drilling costs, are you not?

A Yes, sir.

Q If that hole were to be drilled, directionally drilled, how much additional cost would you say, could you estimate that it would cost over the drilling of a straight hole?

MR. KELLAHIN: If the Commission please, I think you would have to specify displacement distance.

MR. ROBB: I'm sorry. I thought we were talking about drilling from Bass No. 1 to Bass No. 2. That's the only thing you suggested, Mr. Kellahin, isn't it?

MR. KELLAHIN: Yes.

MR. ROBB: Add that to it, please.

A With that in mind, I would estimate the cost would be three to four times to infinite times. It could be infinite. You might not ever get it drilled. Your assumption that drill pipe is not scarce is a real good assumption, but we're faced with it.

BY MR. ROBB:

Q I'm just saying if it was not a factor.

A Yes, sir.

Q You are familiar, aren't you, with directional drilling that has taken place off-shore?

A On the Gulf Coast?

Q Yes, sir.

A I am familiar with it by talking to my other competitors. I have not done any of it.

Q You know, don't you for a fact, that directional drilling of distances up to four or 5,000 feet occurs in that situation?

A Yes, sir, but we're talking about the difference between tangerines and pineapples.

Q I don't think that's suitable. That's equivalent.

A Just because they do it on the Gulf Coast does not mean we can do it in Eddy County, because you have different formations basically. These soft formations, they would probably be on a 14,000-foot well 25 or 30 days and we'd have to take 60 to 70 days.

Q Let's talk about hard-rock formation.

A All right, sir.

Q Are you familiar with the directional drilling

programs that have been conducted over in Europe?

A No, sir.

Q Do you know that in Holland they have achieved horizontal displacement of over 9,000 feet in hard rock?

A I was not aware of it. We do not operate in Holland.

Q I understand. Now, the increased technical difficulties that you are referring to in drilling of a well, the estimate of the three to four times the amount, that's strictly a guess on your part, isn't it?

A To infinity, that's a guess.

Q You've never drilled one like this?

A No, sir. No one else has either.

Q You say no one else has?

A No one else has in Eddy County, to my knowledge.

Q Not down in your area?

A That's right. It might be possible to, but we don't want the contract.

Q All right. I'm not suggesting that we've got to go all the way to the moon. I just mean a little bit short of that distance. We have to bring in somebody; we want to bring in somebody who has done the kind of directional drilling that I referred to like this, like Templehauf over in Holland. You'd want somebody like that to consult with, wouldn't you?

A Yes, sir.

(Whereupon, a discussion
was held off the record.)

Q Now, do you have Exhibit 1-B?

A Exhibit 1-B?

Q Yes. That top sentence, would you just read
that?

A This is Mr. Williamson speaking here. (Reading)
It would be technically and economically feasible to
directional drill subject location from Belco's Bass
Federal No. 1, located northwest quarter of Section 30.
(End of Reading.)

Q All right. Second sentence?

A (Reading) Directional drilled holes have been
successfully completed in southeastern New Mexico area.
(End of Reading)

Q All right, that last sentence agrees with your
earlier statement that there has been directional drilling
down there near Carlsbad?

A He didn't say how much displacement though.

Q No, sir. Then, you agree the main consideration of
such contemplated operation are the technical feasibilities and
the additional cost incurred in directional drilling a well?

A I haven't agreed with any of this.

Q Okay. Then, you don't agree it is technically feasible to directional drill a well?

A Mr. Williamson is not in the drilling business.

Q No, sir.

A It's real easy for him to say this when it's not his money.

Q No, sir, but he has consultants available to him who have qualified competent knowledge, does he not?

A I haven't seen them, no. He might have, but I haven't seen any.

Q Then, you don't agree with his statement that contingency cost for unexpected trouble is estimated to be the cost of directional drilling to be \$170,000 or approximately 22 percent of estimated straight hole cost of \$781,000.

A How much displacement is he talking about?

Q 4,000 feet from Bass No. 1 to No. 2.

A I think he's a dreamer.

Q Do you know Mr. Williamson?

A No, I do not.

Q All right.

A For the record, I am also a professional engineer and I disagree with this professional engineer.

Q Exhibit 1-A, would you look at that, please?

A That's a cross section?

Q No, sir, that's a letter of July 31.

A I don't think I have it. Mr. Robb, I probably wouldn't agree with that either, probably save a little time here.

Q Okay. Let me summarize. That purports to be a cost breakdown of the drilling cost of horizontal drilling up to 5,000 feet at a depth of 13,500, which is the depth of the formation in this case. It comes up with the conclusion that approximately 21.39 percent additional cost for directional drilling over a straight hole.

A Mr. Williamson did this?

Q Yes, sir. Well, he and his consultants.

A I mean, did he actually drill a well, is that what he's basing it on?

Q He's basing it on consultants who have, yes, sir.

A In Eddy County?

Q No, sir, Midland, Texas.

MR. KELLAHIN: In the first place I object to Counsel testifying. This is another thing that is vicious about this sort of approach. This is purely hearsay evidence. Counsel says that he has consulted with engineers who have drilled this

well. There is nothing here to indicate who they are, where they are, what well was drilled, what displacement or anything else. This is improper line of questioning.

MR. ROBB: I answered this witness' question, Mr. Porter. I didn't bring it up, he did.

MR. PORTER: You were answering his question?

MR. ROBB: Yes, sir. He asked me whether I had consultants.

THE WITNESS: Well, would you like to change places with me.

MR. ROBB: That might be a good idea.

THE WITNESS: I'm sorry if I was leading you.

MR. ROBB: When you get through testifying, how about sitting down here with me?

MR. PORTER: Mr. McPeters, in giving your answers refrain from asking Mr. Robb questions. He's not under oath and I don't believe he's qualified to make an answer.

MR. ROBB: Thank you, Mr. Porter. I would be the first to agree.

BY MR. ROBB:

Q You don't agree with Mr. Williamson's letter?

A No, sir, I do not agree with either one of these letters from Mr. Williamson.

Q Let me ask you one question, Mr. McPeters. Did you testify at the Hearing before Mr. Riggs, Assistant Secretary of the Interior, in Albuquerque two weeks ago?

A I did not. I made a statement.

Q What did you say in that statement, do you remember?

A Essentially what I did today, I think. In fact, I'm looking at the same notes that I did that day. I think I spoke of the torque and drag and the wear, pretty well the same, yes, sir.

Q Didn't you testify -- let me see if I can refresh your memory?

A Testify, I did not testify.

Q In your statement, didn't you say that you favored the drilling in this area, because it would hurt your business if wells couldn't be drilled through a potash area?

A It would hurt our business if you closed any area to drilling.

Q Isn't that what you said at the Hearing?

A Yes, sir, absolutely.

MR. PORTER: Any further questions?

CROSS EXAMINATION

BY MR. NUTTER:

Q Mr. McPeters, in reference to the torque on the

drill pipe and the drag and the wear and tear and everything, you were considering whipstock drilling. How about Dyna-drilling, you wouldn't have that in Dyna-drilling in a directional?

A Right, but usually the Dyna-drill is just used for kicking a well off and then you go back to conventional drilling.

Q What's the maximum normal lateral displacement which you attempt with the Dyna-drill?

A We have displaced holes in the neighborhood of 500 to 1,000 feet.

Q That's using the Dyna-drill entirely?

A No, sir. The Dyna-drill is only used to kick the well off initially. The Dyna-drill costs \$900, I believe, for an eight-hour minimum.

Q So you never use it for accomplishing the lateral displacements, just to kick it off?

A Just to kick it off is the only experience we have had. The cost of the tool is quite expensive and if you used it for the entire operation, you don't need it, it would be quite costly.

Q Is it feasible to use the Dyna-drill for lateral displacement rather than just kicking the well off?

Technically feasible, I'm saying?

A I don't think so.

Q So it would be a matter of comparison of the cost of the Dyna-drill and the cost of wear and tear on your string of drill pipe then would be the economics of --

A (Interrupting) There would be no wear and tear on the drill pipe if you used the Dyna-drill, is that what you're saying?

Q Now, you wouldn't have all the abrasive effect on your drill pipe with the Dyna-drill that you have with conventional whipstock drilling, would you?

A You wouldn't have as much, Mr. Nutter, but you would still have wear because you're pulling this pipe around corners. Anytime you do that you are going to have some wear.

Q But you're not turning with going around the corner?

A That's right. You're not turning.

Q You haven't made any comparison then of the economics of directional displacement with the Dyna-drill as compared with conventional directional drilling?

A No, sir. Of course, in our business we usually don't make economic comparisons like that, usually the operators do so.

Q All right, sir. Thank you.

HOLBERT-DIRECT

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MR. PORTER: Any further questions? You may be excused.

MR. KELLAHIN: Call Mr. W. J. Holbert.

W. J. HOLBERT

called as a witness, having been previously sworn, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. KELLAHIN:

Q Will you state your name, please?

A William J. Holbert.

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

A Rowen Drilling, USA Division of the Rowen Company, Division Manager, Western Division.

Q What is the business of Rowen Drilling?

A Oil well contract drilling.

Q What areas do you operate under?

A I'm responsible for all land-rig operations in the lower 48 States.

Q Does Rowen Drilling operate world-wide?

A Yes, sir.

Q They are not confined to southeastern New Mexico?

A Well, no, sir.

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HOLBERT-DIRECT

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Q Do you operate in southeast New Mexico?

A Yes, sir.

Q Have you had any experience in southeastern New Mexico?

A Yes, sir, we have two rigs under my supervision, one in Lea and one in Eddy at the present time.

Q What formations are they drilling in?

A Both of the rigs at the present time are on Morrow.

Q What is your education and experience in the drilling business, Mr. Holbert?

A I have a BS degree from Texas A & M in geological engineering and BS degree from Texas A & M in petroleum engineering and a year-and-a-half of graduate work.

Q How long have you been engaged in the drilling business?

A 26 years.

Q For whom have you worked?

A Well, I have been -- I was with the former Pan American Production Company which was later absorbed into Stanolind and then into Amoco, when they had company-operated drilling rigs and I was with Darvey Drilling Company for a very short time, primarily as a consultant, and then I was with Phoenix, Inc. an engineering company who was the engineer

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architect for the drilling for the AEC at Nevada, about five-and-a-half years, the rest of the time with Rowen.

Q Where are you located at the present time?

A Midland.

Q Mr. Holbert, have you had any experience in directional drilling and by directional drilling I am talking about controlled directional drilling in target areas?

A Yes, sir.

Q Where was that experience?

A Texas Gulf Coast, south Texas and considerable experience in Nevada Test Site with AEC and have been associated with it some in Cook Inlet.

Q You say you have had experience in those areas. Do they compare to the directional drilling problems which would arise in the South Salt Lake-Morrow Pool, in your opinion?

A No, sir, in no way. We, at the present time, do have one rig in west Texas drilling a controlled deviation well. However, it is in Ward County and not in Eddy County.

Q In Ward County?

A Yes, sir.

Q Now, have you had any problems with that well?

A Yes, sir.

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Q Would you describe those problems?

A Well, actually this is the third time we've tried to drill that same well. It's for a major company. Normally, these 17,000-foot wells would take in the neighborhood of 90 to 105 days. We re-entered this one at the casing set at approximately 9,800 feet and we have been on it between 80 and 90 days and we're at 12,700.

Q Did you have any problem with having to replace drill bits frequently?

A Yes, sir, the kickoff was done with downhole motor unit with a Dyna-drill or turbo drill. With the deviation and direction being established with that and then drilling with conventional bits and rotary, we have done others in that area and where we're furnishing the drill pipe, we add a 50 percent charge per day for the pipe while it's in use in a directional hole with another stipulation that should the pipe be damaged beyond repair, we expect the operator to replace that drill pipe in kind or rent pipe or until such time as it is available.

Q Do you know anything about the situation of availability of drill pipe?

A Yes, sir, that comes under my responsibility for requisitioning drill pipe through our Houston office.

Q How soon would you replace drill pipe should you lose it?

A I received a purchase order this week for pipe requisitioned about the middle of February, delivery in the third quarter of 1978.

Q Does directional drilling, controlled directional drilling, pose any problems in the drilling operation?

A Yes, sir.

Q Can you describe them?

A As Mr. McPeters said, extensive wear to drill pipe and drill collars, also you have additional wear in your hoisting and rotating equipment because of the high torques involved and the additional number of trips for bit changes. After using the Dyna-drill, you have considerably more expense to either high pump pressures and high volumes to operate these down-hole hydraulic motors.

Q In controlled directional drilling, do you use the Dyna-drill throughout the entire operation or as Mr. McPeters said, just to kick it off?

A Normally, to establish the angle of deviation and the direction. Now, we have used them all the way in some special cases. However, it's extremely expensive and normally the rig requirements are considerably larger or requires a

larger rig than what you would have for that depth in order to provide the necessary hydraulic horsepower pump to operate the Dyna-drill.

Q Do you have any problem in controlling the direction of your deviation or in the hard rock country such as has been described here?

A Very much.

Q What effect does that have on your drilling operation, do you have to re--

A (Interrupting) Well, it's quite frequent that you'll drift off in direction. If you can maintain the angle which will necessitate a plug back and redrill operation or you build too much angle or drop angle.

Q Now, assume with me for a moment that you're going to have a surface location at the site of the Bass Federal No. 1, which is the uppermost well on the chart here. You wanted to deviate that well to bottom it at the site of the star which is the proposed location of the Bass Federal No. 2. In your opinion, would that be an economically feasible operation?

A It would be marginal. I'd like to qualify that by stating it's been my experience with Morrow that it's not the most prolific reservoir and you get damage from the drilling

fluids in them and this has been pointed out earlier, this lenticular, which means limited reserves and you're going to spend three times or four times as much in drilling the well and it's not a barn burner, so to speak. In other words, it's not economical, no, sir.

We would not take one of those on what we normally call a footage basis under any circumstances.

Q You would not take a footage contract?

A No way.

Q Would you take a turnkey contract?

A No way.

Q What basis would you take it on?

A Straight day work.

Q Then, as I understand, you also make special arrangements as to the replacement of the drill pipe?

A Yes, sir.

Q Is there any danger of losing your string pipe in drilling such a well?

A Quite frequently.

Q Does deviating the hole in that manner cause any problems in making drill-stem tests or running logs?

A From my experience we have done some testing, drill-stem testing to deviated holes. However, the success ratio

was very low. Also, you have considerable problems with fishing jobs. Logging most of the time where we've had high angles, large displacements I'm talking about to the 6,000-foot displacement. Your logging is all done through a drill pipe which limits the type of logging you can do. The only way you can get the logging tool down is run it inside the drill pipe and pump it down.

MR. KELLAHIN: That's all I have of Mr. Holbert. Thank you, sir.

MR. ROBB: No questions, Mr. Porter.

MR. PORTER: The witness may be excused.

(Witness excused.)

MR. PORTER: Anyone else have questions of the witness. I have hope. Then, Mr. Kellahin, call your next witness, please.

MR. KELLAHIN: Could we have just a brief recess, Mr. Porter. I think this completes this portion of our testimony and we want to get together our Exhibits on the next witness which would take a few minutes.

(Whereupon, a discussion was held off the record.)

(Whereupon, a short recess was taken.)

HOLBERT-DIRECT
WARNOCK-DIRECT

MR. PORTER: Would you call the next witness?

MR. KELLAHIN: If the Commission please, Mr. Attwell will present the next witness, he being somewhat smarter than I am.

MR. ATTWELL: We'll call Mr. George Warnock.

GEORGE WARNOCK

called as a witness, having been previously sworn, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. ATTWELL:

Q State your name and address.

A George Warnock, 403 Simms, Albuquerque, New Mexico.

Q What is your business, Mr. Warnock?

A Consulting mining geologist.

Q How long have you been a consulting mining geologist?

A Right at four years.

Q In your capacity as a consulting mining geologist, Mr. Warnock, have you become familiar with potash mining?

A Yes, sir, but more correctly in my previous employment with W. R. Grace and Company.

Q Have you previously testified before this Commission?

A No, sir.

Q Generally summarize for the Commission your education and your experience.

A I've a BS in mining geology from the University of Arizona, 1958, MS in geology, University of Arizona in 1953. I was employed by American Smelting Refinery Company, Cerro de Pasco Corporation, a Canadian corporation by the name of Dominion Employers Limited, W. R. Grace from 1962 to 1969. The Goldfield Corporation from 1969 to '70 and began consulting in March of '70.

Q In your consulting capacity, have you become familiar with the potash mining area in southeast New Mexico which is covered by Order of this Commission in R-111?

A I was familiar with it prior to going into consulting and I have had occasion to work there since then as a consultant.

Q Have you prepared any feasibility study, for example, for clients concerning potash extraction in this area?

A Yes, sir, once under previous employment with W. R. Grace and once since then as a consultant.

Q Are you a registered geologist in any state?

A Yes, sir, State of Arizona.

Q Have you prepared studies for Belco showing where you believe commercial deposits of potash may exist or may not

exist in the vicinity of the proposed location of Bass Federal No. 2 Well based on core-hole data available to you?

A Yes, sir.

Q Let me ask you at the outset, is there any core-hole data available in Section 30, which is the section in which the well is proposed to be drilled?

A Located within the section?

Q Yes.

A No, sir.

Q Let me direct your attention now, Mr. Warnock, if I may, to Exhibit No. 18.

A Yes, it was.

Q Does this Exhibit reflect results of one of the studies that you prepared for Belco showing the potash ore in the vicinity of the proposed Bass Federal No. 2 Well?

A Yes, sir.

Q Would you generally explain how this Exhibit was prepared and in that connection would you explain the method that this was used as well as the data that was used?

A Yes, sir. Of course, ore reserve by definition means commercially refineable oil. So the first criteria

in oil reserve calculation is the so-called cutoff grade, which in essence is decimally the lowest amount contained in this page of potash versus the thickness that can be mined at an operating cost to break even. Anything bigger than that, of course, you make a profit on, but the cutoff grade and/or fees percent in this case, especially potash, is your gross operating cost or cash out.

Now, detail costs in this area are obviously proprietary information of the company and to set up basis for this calculation we had to use reported data from the U.S. Bureau of Mines and it's reported as an average of all of the costs. There is, as most people are familiar with here, an information circular put out in 1972, detailing economic problems of Carlsbad potash industry. This is the source of the basic economic data. That information in that report is tabulated as averages for the better mines that are in quotation marks and averages for poorer mines to come in for two reasons: No. 1, Kerr-Mac operations, the latest in the area and even though it's the newest and even though they have a certain operating problem that some of the operations don't, to come in on the conservative side of the calculation or on their favor we use the average for the better mines. So we assume Kerr-Mac is one of those better mines. Now, at

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that time there were only seven so this is at best an average of four out of seven. Now there is six as you know. Based on this published data, we then calculated what feet percent is necessary to constitute ore in this area based against average cost only, not against Kerr-Mac's costs. Now, as a unit calculation we arrived at 72-feet percent. Of course as everyone knows the feet percent is the percent of K20 in sylvite times the thickness of the bed, the mineable thickness of the bed.

Based on this, we calculated cutoff for this area out here will be in the range of 72-feet percent and for rounding up ground for presentation on these maps, we have drawn these things as 70-feet percent. In other words, we're saying that based on the average cost as reported our calculation back, 70-feet percent is the cutoff.

Now, in addition, of course, there regardless of thickness, there's a minimum percent K20 that can be mined, otherwise, the theoretical feet percent, you have a 100 percent and take 100 feet of K20, you got 70-feet percent there for ore. Obviously, there's a minimum percent K20 that can be mined. We calculated that in a 10.5 percent range.

Q Let me interrupt you for a minute and ask you if I understood you correctly, you said that you used the average

cost for the better mines as published by the U. S. Bureau of Mines in determining the cutoff of feet percent factor used in your Exhibit 18. That average cost data for the better mines; at what depth were those mines mined in potash?

A Again average for the district, and I haven't calculated that, but the average is going to be between 700 and 1400 feet, say, an average of 1,000 feet as a --

Q (Interrupting) At what depth is the potash located in the area of the Bass Federal No. 2 Well?

A 2100 feet.

Q Does the cost of mining potash increase as the deeper you go?

A Yes, as a generality, it does, but it is not as important a factor perhaps as the distance away from the cap, exception terms are first infraction versus second infraction which we'll get into.

Q What method did you use in arriving at the results shown on Exhibit 18?

A Okay. Once you have a feet-percent cutoff for an ore-reserve calculation, there are obviously certain functions you have to make and they're all based on the continuity of the economic grade with a given bed. There are two accepted systems in the Carlsbad potash area. That's the polygonal

system and the feet-percent system. This map shows the polygonal system calculation, using certain parameters which are outlined on the map, of which I'll go through.

To start out with, I'd like to say this is the broadest possible interpretation of the formal-ore-reserve calculation in this area. We'll get into this map. This is what I would call an objective calculation. You can see the difference in the outlines. Now, the parameters we used, experience factors in the district, what proof ore in terms of drill holes, how far can you project from a drill hole? I'm sure we'll get into a minor debate on that. I have used, as is enumerated in internal blockings within the polygons that you can see outlined on the map, the broad guideline of a 1500-foot radius, which is essentially equivalent to four holes per second. For proven ore the red, 2,000 feet projected, or which is roughly equivalent to two holes per second. For the probable ore, which is the blue on this map, 2,500 feet; for possible ore, which is the yellow on this map and which is equivalent to roughly one hole or one ore-hole per second.

Now, just to give you the background on the map, I should say all three of these maps are the same base maps with just different interpretations on them. The red, the solid red darts are ore holes as we calculate them from the

logs and the sole difference between this map -- well, that's not quite true -- the basic difference between the days of this map and that map --

Q (Interrupting) I think you ought to refer to the Exhibit No. that has been assigned to it, if you would?

A Exhibit No. 18, this is Exhibit No. 19, exactly the same system. The major difference is we did not have, as you can see, the mark for these four holes. The log is not available. The red marks -- I'm sorry -- crosses, all of these things and we did not have these newly drilled internal holes of Kerr-Mac's at that time.

Q Just focus, if you will, on Exhibit 18. Would you explain to the Commission how you went about making your polygonal method of ore reserve determination. After, I think you said you got a percent foot cutoff also a 10 percent factor for K20 content as a minimum regardless of height of bed?

A Yes, sir.

Q Then you had the core-hole data that's available to you, I presume, is shown from the core holes there on Exhibit 18. What did you do with that core hole data?

A Okay. Plotted the following schedule down here. It should be drawn in red there. The numerals around the

given hole are the hole number on the top, the surface elevation on the right hand, the elevation of the top of the Number 10 ore horizon following the USGS terminology on the left, the percent K20 as sylvite, the first number drills the hole on the part that's the thickness. The thickness is the first number below the hole, percent K20 is the second number, the feet-percent factor is the third number. That is simply multiplying the thickness times the grade and the last factor there where it is available is the insol aspect.

Q Mr. Warnock, is that the hole that you have colored red to determine --

A (Interrupting) That color is supposed to be green around the high insol hole.

MR. PORTER: Just a minute. Is that insol?

THE WITNESS: Insol, i-n-s-o-l, insoluble mix.

BY MR. ATTWELL:

Q Mr. Warnock, is it correct that the hole that you have colored red, you determined the net -- your minimum cutoff criteria for feet percent and those that have a brown center did not meet your criteria?

A That's correct.

Q Now, let me direct your attention, at least on my map, on Section 34, I believe is a hole that shows a brown

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center and it's got a lot of blue around it.

A Which hole number?

Q F-11, I believe.

A Yes, if it's colored brown it's an ore hole, 75.8 feet percent. It should be colored red and the ore factor is a blue circle or blue polygon indicates an ore hole.

Q But the other holes that are colored brown in the center were determined to be used by you to be in effect economically not feasible because of the minimal content of K20?

A That's correct. There are, of course, minor areas for interpretations in this type of calculation. I should also say that we had posted in some of these instances minor differences in the data we had at that time from Kerr-Mac's calculations and our calculations of these logs and there's one possible exception on this map, they are so close --

Q (Interrupting) Refer to that Exhibit number.

A This is Exhibit No. 20, another method we'll get to, the K20 feet percent projection method. Now, you always have the polygonal method accepted in all mining, specifically imbedded deposits, but I don't think there is probably no data on that. The mechanics are very simple: One bisects the line between the holes, draws a line there, he does that all the way around, and he ends (Transcriber's break)

up at the polygon as you can see. In the case of enough holes all the way around and that polygon, that block takes the value that you see there. Then of course, all the polygons are adequately done or average taken toward the whole area.

Now, on the fringe -- there's always a fringe problem in everyone. How far can you project the hole where there's no data. Now, following the format down here, this says we can run this where there's a hole not close enough to put them together, we can run 1,500 feet out from the hole with proven ore around the fringe of a general ore body which you have internal holes you can generally connect up. In other words, this is a good ore body in here and no one argues with that. Based on that, you can project 1,500 feet out from proven ore around the sides of this thing. This is in essence what we've done here.

Now, in a case of probable ore and I might mention here that there is a very strict technical definition of proven probable and possible ore. There is generalized confidence factors attached to it.

In a case of proven ore, one, as a general criteria for industry, one says you are going to get the tons out there that you calculated within 95 to 100 percent. That's pretty

obviously not going to be in that shape. The lines always contract and expand, but the tonnage is a statistical method, the total tons that come out of that general area will very closely follow the calculation.

The probable ore, you have a probability factor in the range of 75 percent. Once you've added all these up and calculated the blue area as a guideline, probably you'll get about 75 percent of that calculation, without further data and based on a statistical method.

In the case of the yellow, when you're working internally we show what happens because I should state again, we did this calculation before we had this new data. The yellow areas were blocking this possible ore. You can talk about a generalized confidence factor, 25 to 30 percent range. Kerr-Mac then came back and drilled internally and it's no coincidence frankly that they drilled and these holes happen to fall in the yellow and blue areas. That's the obvious place to drill. I would agree that's where we drill; I would agree also that certainly in this case, they had to drill. In other words, they did not have enough data in here to, with confidence, consider this whole thing ore.

Q Where is Kerr-Mac mine located here on Exhibit 18?

A Right there. This is the open-working outline.

A new addition is here and here, up here as filed with the Commission, right off the Commission's files and these dashed lines here, this is the 1973-five-year plan. The dashed line there and the dotted line here is the 1974 plan filed just in January of this year.

Q Mr. Warnock, you said that the red coloring on Exhibit 18 constitutes proven reserves. The blue coloring constitutes probable reserves and the yellow coloring constitutes possible reserves. What does the white coloring represent?

A In this case it's formal calculation on the polygonal method. It indicates no ore reserve calculated in the white area. This has not said anything about projected mineralization. It just said that for investment decision for management, the assumption is this is barren.

Q Now, let's direct your attention, if I may, to Exhibit No. 19 and ask if you prepared that Exhibit?

A Yes, I did.

Q Would you please explain how the Exhibit was prepared and pay particular attention to how it differs from your Exhibit No. 18?

A It's exactly the same base as No. 18. It shows how it takes into effect the new data in these holes which

we didn't previously have.

Q When did you obtain that new data?

A 10:40 A.M. yesterday.

Q Would that be data from Kerr-McGee as a result of a subpoena?

A That's correct.

Q Would you explain your explanation?

A Now, because of that, I have to apologize for the condition of these maps. The numbers on the new holes which I have handwritten in here are not on your prints, but I understand that it's proper that we can correct this deficiency and get new prints.

Q I think you should address that to the Chairman and not to me.

A I had this blocked out. We knew where the hole locations were so we had this drafted up and blocked out as you see it, but then once we got these logs yesterday, I had to sit down and quickly calculate the logs and plot on the values. We simply did not have time to have those drafted again and printed.

Q In Exhibit 19, have you used the polygonal method again as you used in Exhibit 18?

A This is the polygonal method again and in this case,

it's a much more valid projection of ore reserve calculation than this one, because we're not taking full advantage of all those filled in holes. You'll note your polygons have become much smaller. Now, this is an important point in your confidence factor on reserves. The smaller the polygon, the less area given to a single hole and obviously because there's more holes the better ore calculation we have.

Q How many adjacent core holes did you receive data for?

A 13, I think.

Q That data was included in the estimate you have shown there on Exhibit 19?

A Correct.

Q Studies you have made?

A Correct.

Another prime feature of this is, we have not run possible ore or probable ore outside of the margins. Anywhere inside where we have drill data, if the blue ran past 2,000 why we gave it the benefit of the doubt and took the full polygon. On a marginal calculation we did not. We held the 1,500-foot radius. This is an important point because there is a certain amount of evasive reasons in the case of the margins how far one should run. The two previous studies

I have done in this area used 1,000 feet which was as far as they would project out from a hole.

I think that's conservative. I think 15 is all right. I agree this is correct development of margins as opposed to this. As I said, this is the optimum case one can make for ore reserves. So the total projection included possible ores is 3,000 feet on the margins. Now, this is discussing only on the margins. It doesn't affect the inside. Here we have much better data inside and could do a complete polygon calculation. Where I have enough data to where it becomes accurate and one can see my interpretations of the ore reserves Kerr-Mac has in this area.

MR. PORTER: Are you saying that your information on Exhibit 19 is more accurate than your information on 18?

THE WITNESS: Yes, sir. On the basis of statistical method you have 13 additional data points to work from. So that's exactly what I am saying. Now, one thing I didn't say here, I put the lease map up as Exhibit No. 9. It's not an important factor, but I would like to point out the color scheme on this thing, on both of these, on all of these if it is solid, it's a calculation within Kerr-Mac lease. The hatched, it's the same thing outside Kerr-Mac lease. So the solid color versus the hatched is simply inside Kerr-Mac leases,

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outside Kerr-Mac leases.

Now, another point you make strongly is the size of the polygons is extremely important. This type -- this large of a polygon up here and that's about the biggest guy I would ever draw is really getting too big. Here you got two holes exactly one mile apart following this theme that you can block possible ore one hole to a section. Put these together with polygons as you can see, the projection there. Then look at these -- there is more holes on here that aren't colored. I hope that they are on your map, the brown hole. The brown hole with the negative hole and that's a brown hole.

Are these colored on the sheets you're looking at?

MR. PORTER: Yes, the one I have is.

THE WITNESS: Let me see if I can find a better example; here is a better example of why I joined up these following that method. Keep in mind this is a geometrical method, that it is not interpretation of apart how far you can send it. Following these guidelines, there's really not that much personal interpretation involved.

BY MR. ATTWELL:

Q When you refer to these guidelines, Mr. Warnock, are you referring to Exhibit 18 and the material under the legend "ore reserve blocking method?"

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A Exactly, which is that if the holes are within one mile of each other, you can consider that in terms of possible ore only following method as ore because these are more than one mile apart and there is some other factors which we'll show you here. We did not join these because they don't stretch. They're too far apart to join up even as possible ore.

Now, of course, from the practical point of view, if Kerr-Mac has that lease and they come in here and again drill internal holes and then they would know that following a system of what we know now, that's as close as you can run them under the broadest possible interpretation which is really 3,000 -- I beg your pardon -- 2,500 feet out for possible ore.

Q Direct your attention to Exhibit 19 again. I noticed there is no yellow coloring on that map?

A No, sir.

Q Does that mean there is no possible reserve shown?

A No, it does not mean that at all. This then would be a formal-type ore reserve calculation which, if I may make the assumption, Kerr-Mac might submit to their management to make an investment decision. Under that definition one does not block possible ore and calculate it into a dollar interval.

Calculate only the proven and probable that some of this is judgment factor thereof obviously depends on how strongly you believe in these factors here. We have in Kerr-Mac as opposed -- in the Carlsbad district as opposed to some potash areas and extremely erratic nature of the potassium content in the bed relative to other areas. This brings us to the point that you want basically, if you're making an investment decision on this type of calculation, you want an objective relative conservative calculation.

As I say, the two previous ones I did ran only 1,000-foot range rather than 1,500 feet.

Now, again, this question of how densely, this question of drilling density, how many holes do you drill per section before you have a confidence factor. I'm saying or I don't know how much argument I'll get on that, I think it's a pretty well accepted generality in this district. On that basis you see the difference here and this doesn't say that there's no ore here. It does not say that. It simply says that for formal calculations the ore is here and here. We have not yet, in these two calculations, we are not saying anything about geological projections in terms of trends of the mineralization.

Q Looking at Exhibits 18 and 19, what do you conclude

as to the question of whether core data available shows any potash commercial reserves around the Bass Federal No. 2 site?

A In a formal and relatively objective ore reserve calculation there is no ore that gets into the Belco location and further more, this flange of 2100 radius, which isn't on here, unfortunately will not reach that ore. So now, from a formal ore reserve calculation point of view, there is no formal ore reserves under this hole.

Q Let me direct your attention in that to what appears on my map as core hole 141 that USP which is -- I guess, that's United States Potash Company?

A Yes, sir.

Q It's a little to the north and to the east of the proposed well site. Can you see that core hole?

A Yes, sir.

Q Now, if I understand your map correctly, you show that as a core hole indicating existence of commercial potash reserves. In your opinion, why has no potash lease been taken on that, this tract?

MR. ROBB: We object to that as going beyond the competency of the witness. He can testify about the geology, but his opinion in regards to the fact nobody has taken a lease on there or why it hasn't been taken, is beyond the scope

of his competency. He's just speculating.

MR. ATTWELL: Well, I think expert witnesses do speculate, Your Honor. I mean, that's what we are relying upon is his expert testimony.

MR. ROBB: They don't speculate about things they don't know anything about.

MR. ATTWELL: I think I can get at it another way, perhaps to avoid the objection.

BY MR. ATTWELL:

Q How far is United States Potash 141 from the nearest mining operation?

A About six miles, four-and-a-half, five miles.

Q How far is it from the shaft of the nearest Kerr-Mac mining operation?

A I beg your pardon. How far from the --

Q (Interrupting) From the shaft, the shaft going down vertically into the ground?

A How far is that from 141? How far is that?

Q Yes.

A At least six miles.

Q Is the distance between the location of the potash reserve and the shaft as the distance that must be travelled by the miners an economic factor to be taken into consideration?

A Yes, it certainly is. I think probably the distance in this case is of more consequence than a slight change in dip going down. This was brought up before. Again, all ore reserves are calculated on an average cost for the better mines in the district mining within their immediate shaft area, we assume, or most of them I should say, mined within their immediate shaft area. There will be additional cost as they come out this way, no doubt about it.

Q Again, reflecting on U. S. Potash hole -- core hole 141, is it surrounded by core holes in which a negative result was obtained?

A It's triangulated by them. It's not surrounded by them, no. I see 153 is 63.7 feet percent. USGS 17 is 48 feet. Farmer No. 29 is 57.2. Incidentally, I should interrupt here. I didn't explain to the Commission, I don't think, that when you see two percents the left one is my calculation from the logs. The right one is Kerr-Mac's calculation of the logs. I would point out in USP 141 there is simply no conflict. This is too close to worry about. The same is true for USGS 17. The same is true for F-29 and my calculations on this one is by hand up here. I have 66.7 whereas Kerr-Mac 63.7. The point I make is there is no figure that's interpretation of logs that's within, I would say those agree in

principal.

Now, back to your question. It is triangulated by negative holes. However, there is a positive hole here, there is a positive hole here. These three closest holes are negative and that certainly will come into then the interpretation of trends as opposed to ore reserve calculations.

Q Let me ask you about U.S. Potash Company's O-141. Do you know when that core hole was drilled, how many years ago?

A No, sir, I don't. It's going to be a minimum of 20 years. That's a guess, a speculation, I don't know.

Q All right. Would you now direct your attention to the document which has been marked as Exhibit No. 20.

A Yes.

Q Was Exhibit 20 prepared by you?

A Yes, sir.

Q Does this Exhibit reflect the result of a study that you made for Belco as to showing whether or not commercial potash existed in the area?

A Yes, sir, it does.

Q Would you please explain Exhibit 20, how it was prepared and the data used?

A This is a feet percent calculation. Again, we put

on here the outline also only of the polygon blocking system. You can see on here this conforms with this outline in color in this case.

Q Let me interrupt, if I may. Is it correct that the polygonal system was used in Exhibit 18 and 19 and feet-percent system was used by you in Exhibit 20?

A That's correct.

Q Would you just briefly explain, if you can, the difference between the two methods?

A The feet-percent contour, which gives one a calculation of the effect of width or thickness on grade is a very accepted method to the district and it is probably more accurate in calculating your average grade, because of course, you're being influenced by the trends of mineralization in the area . So while this is a pure geometrical mathematical method -- in other words, this block was calculated at 5.3 of 17.5 percent potash. Over here you have the effect of the trend as interpreted. Now, I think we should just take a minute and go into some detail as to construction of a proper foot percent map. It's important in the interpretation. First of all the colors simply -- following the explanation -- simply designate the feet percent as its own. This is the 70 contour. This is the 90. The area colored in between it

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is the 70 to 90 feet percent, the gray and the green going up into the red which is plus 150 feet percent. Again, as we follow the pattern of the solid colors on this map they are within the ore block and defined by this expansive type of ore blocking and where the color is solid it is inside Kerr-Mac's lease -- no, I beg your pardon -- it is not. Where it is colored solid inside of the ore block and where it hangs outside of the ore block and therefore becomes a projection of trend of mineralization.

Now, we have not calculated ore, Kerr-Mac ore reserve factor here. There is no interest to us other than their material, their material obviously, but if one were doing it in-house for Kerr-Mac he would then calculate the area of 70 to 90 foot percent within the boundary and he would average that percent and so forth and arrive at an ore reserve calculation in terms of tons and percent K20. The tons would be very similar to this and the percent K20 may vary because this is more accurate depiction, if you like, of the variances of grade in the ore body.

Q Le me interrupt if I may, Mr. Warnock, and ask you: Looking at the dashed areas, I call it, or the hatched areas, does that area represent either proof probable or possible reserves as comparable to what is shown on your prior

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Exhibits?

A No, sir, it certainly does not. Proven ore reserve under the feet percent method is colored solid. Everything out of that is a geological projection of the trend of mineralization.

Q Again, looking at Exhibit 20, when you prepared that Exhibit, did you have available to you all of the core-hole data that you had available when you prepared your Exhibit No. 19?

A No, sir. This was prepared on this data. We did not have the internal holes as they are marked black.

Q Those are the 13 additional core holes from which you obtained data from Kerr-McGee?

A That's correct and, again, there was strictly no time to draft a change in this and draft up another proper map. The very important controlling holes are these in here. You will note that they're negative holes. They are low grade.

Q You are pointing to Exhibit 19?

A No. 19, yes. I'm referring to Kerr-Mac holes Nos. 114, 113 and 109, and these holes materially affect this interpretation.

Q Now, before we get into that though --

MR. PORTER: (Interrupting) You mean they materially affect the interpretation shown on Exhibit 20?

THE WITNESS: Yes, sir, that's correct, that's what I said.

A Now, first of all just one quick word on construction of a foot percent contour map. This is not all interpretation. The basics of the system are, one, as numbered here, the 18.2 feet percent and one has another here at 122.6. He must accurately and mathematically extrapolate between the two. He puts a point there for each line and he does that for all the holes that he has data on. Then, he has some interpretation freedom to connect them up, but the point is these lines where they pass between a hole must go there. They can't vary.

Now, with these additional holes and this hole here, is one that we seemed to have -- the only one I know of that we have no material difference with Kerr-Mac in the interpretation of the log.

MR. PORTER: What's that number?

THE WITNESS: That's D-165.

BY MR. ATTWELL:

Q As shown on Exhibit No.?

A No. 19. Now, we have no data out here. We received

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from the Counsel for Kerr-Mac our Exhibit No. 121 -- I'm sorry -- No. 21, which is a blowup of a map they supplied to the USGS and the Commission, I understand, with calculations and which then their Counsel gave our Counsel. I understand that's the way I got it. From the map, we got data, additional data, which we previously didn't have in that Kerr-Mac had thickness, say, or values on here for certain holes.

Q Now, are you referring to Exhibit No. 22?

A 21.

Q 21, excuse me.

A See them written on there IM-5153 up here 4.3 feet, 14.7 K20. This then, is an only source for this hole up here at 4.0 feet at 22.3 percent. Using that data, I made this calculation and this calculation. When I got these logs yesterday, I don't know where they got the 18.2 feet percent. So I come up with 68.09. Now, I'm not sure what the discrepancy is. It's immaterial in trying to draw this picture, but it's not immaterial to this question out here.

Q Let me ask you, Mr. Warnock, again, directing your attention to Exhibit 20, which is the Exhibit in which I understand you used the foot-percent method?

A That's correct.

Q I believe you said that the more recent core-hole

data you obtained from the 13 wells would make a material change in the geological interpretation that was made there?

A Yes, sir.

Q What would that change be?

A First of all, with your permission, just a word about when we get into the much more ill-defined realm of geological projections. Number one, in the northwest fringe on this map should be fairly obvious to everyone, the color map. That page of course, is a great trend, foot-percent trend. We know from the structure map still on the top of -- still to what displacement --

Q What is that Exhibit No.?

A 11.

There is a continuing --

Q (Interrupting) Number 11?

A Yes, Exhibit No. 11. This is a structural-contour map down on the Morrow somewhere. I'm not familiar with the geology of that, frankly. Anyway, from that structure map, you see the same northwest trend. We have USGS generalized information on the district. There's a structure contour on the map and so forth. Without bordering, but putting all this stuff on the wall, my interpretation of that data is they support this general northwest trend.

Now, your specific question, how does the new data change this picture.

Q The picture shown on Exhibit 20?

A On Exhibit 20, yes. We have, as we do the mathematical procedure at this point of finding the point where the contour line is supposed to go is a mathematical formula. It is not an interpretation. We have three sheets, two new holes that affect the calculation, these two here. I have done that on another piece of paper. This is just a crude pencil line. I propose to do it here, just roughly.

Why don't we put this up? Now, there is no other copy than this. Is that permissible?

MR. ATTWELL: Could we have this marked?

MR. PORTER: As long as you put it in the record as an Exhibit.

MR. ATTWELL: Please mark this as the next Exhibit, No. 23.

(Whereupon, Belco's Exhibit
No. 23 was marked for identification.)

MR. ATTWELL: I think it would be 23 because there may be a document we have already marked as 22, that we still have to come to.

So if we could have this map marked as Exhibit 23.

(Whereupon, a discussion was held off the record.)

MR. ATTWELL: Mr. Chairman, I think it might simplify matters if the map that Mr. Warnock has just put up on the wall behind you was identified as Exhibit 20(A), since there are some other documents which have been previously marked, so if you will agree we will refer to it as Exhibit 20(A).

(Whereupon, the document just previously marked as Exhibit 23 was remarked as Belco's Exhibit No. 20(A) for identification.)

BY MR. ATTWELL:

Q Mr. Warnock, I direct your attention to the map on the wall that has been marked as Exhibit 20(A) and ask you if that was prepared by you?

A Yes, sir, at 2:00 A.M. this morning.

Q Would you please explain what is shown on Exhibit 20(A) by comparing it with Exhibits 20, which I believe you have put on the wall just next to Exhibit 20(A)?

A First of all there will be major changes in this contour over in this area, but major changes because we have

so much more data on that side. I've not tried to do that because of the hour and so forth. I just roughly tried to estimate what changes this new data, which we got from Kerr-McGee yesterday, what effect it will have in this general area.

Q When you say "this general area", are you speaking of the general area of the location?

A Right.

Q Bass Federal Well No. 2?

A Yes, sir. Now, I mentioned these additional holes along the fringe which are the only ones that play into the projection to the east. These two here are the only ones affecting the foot contours.

Taking that into account, the 90-percent contour, which is right here on this map will move west into the corner here of Section 101, I guess that is, no, that's section 2. The general line, this is 86.54 here, the general line then, the gray -- the line between the yellow and the gray which is a 90-foot percent will move west by approximately 1,000 feet in this calculation on this map here. Now, we have a problem here. We have a low zone coming through here and we get into a little bit of interpretation of contours. You can cut these things off and you can run this gray line back

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like this and run this one around here to catch that, 70 here is why it has to be yellow in there. Those kind of interpretations are just that, interpretations. Again, the points between the hole will control the line interpretation. That's a mathematical extrapolation between the holes. Using that method, the 90 will move here, the 70 will move here. Otherwise you have the same data so the problem is an interpretive one getting it back into the area to look something like that.

Now, I have no argument on whether it swings like that or out like that. That's interpretation. Generally with moves the projected area are slightly west with the new data.

Q Again, looking at Exhibit 20(A) you have shown an area colored in yellow, would that area constitute proved, probable or possible reserves as you previously identified them in discussing your earlier Exhibits?

A No, where they entered the ore block they would be ore reserves of that foot-percent factor, and a fairly low grade; the yellow is the 70 to 90. Where they are outside of the ore block they are a geological projection, you could hope to find low-grade ore in the yellow area, as a geological supposition.

MR. NUTTER: Mr. Warnock, just one moment. I think
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you said that the new data would cause this percent line to move into the Section 2. I believe that is the extreme northeast corner of Section 1, I believe.

THE WITNESS: 3, 4, 5, 6, you're absolutely correct. I'm sorry.

MR. NUTTER: That's for the sake of the record.

THE WITNESS: That should be the extreme northeast corner of Section 1.

I want to say again, this is a rough approximation done late at night. If given the time, we'll redo the complete thing with the new data in detail. It will look quite different, but the same geological trends will be there. They are based on all the various evidence which is to a large part supposition. We're comparing various things. I have some personal data on the northern area, that is I don't have the data. I have personal knowledge of it. We know that there's good ore coming up through here. We know there are salt cores over here and there is low-grade ore around it. Based on that, all of the geology I have espoused here, there is no doubt in my mind that there is a northwest trend, to the potash mineralization through that area, and that as we find, would be my interpretation of it.

— Q Mr. Warnock, let me ask you to direct your attention

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to Exhibit No. 21, which is, I believe, previously mentioned in your earlier testimony and identified as a map, I believe that Kerr-McGee submitted to the USGS and to this Commission?

A Yes, sir.

Q Would you please explain what is shown there?

A Well, this, of course, is a sketch map of the general area. I note out of curiosity the first mined areas conform very nicely to our sketches with the exception of this right here is not mined out. If you go into detail of that ore reserve, we're not interested in the detail of the ore reserves down there by their mine. If one looked into it, that's good reason, that's a negative hole. They've mined up here to an assay face and quit. Anyway --

Q (Interrupting) Does this Exhibit 21 indicate to you though that Kerr-McGee used identical parameters on its --

A (Interrupting) Yes.

Q Then this is an estimate that you have used in your estimates?

A Yes. May I take this down where the others are and compare them? I want to compare it with the oil reserve map which is Exhibit No. 19

Now, in this case, we made the supposition that these dotted lines are Kerr-Mac's raw ore outline. They're

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not detailed, those are outlined. Now, what else can we garner from this map? Number one, please note Hole No. 114. Do you see the polygonal shape there? This is strong evidence to me that in house formal calculation of Kerr-McGee used this polygonal system.

Number two, the Martin areas, should we project it, say, out probably 2,000 feet or only 1,500 feet.

If you refer to Hole No. F-13, which is in the center of 33, this arc is exactly 1,500 feet to scale away from that hole, as is mined. This tells me that Kerr-Mac is conforming to the generalized system, 1500 feet on the margin.

How about the feet percent, what is the -- is the 70-feet percent really valid? If you refer to Hole F-18, I have in there at 62-feet percent and is outside of Kerr-Mac's ore outline. That tells me that given the insol or the intimate details of that hole, they are blocking no lower than 62 and probably close to my 70-feet percent.

Now, what else can we garner from this thing? First of all, I have no argument with Kerr-Mac's generalized-sketch-type map sent to the Commission so the difference in drafting and accuracy and so forth there is no argument on. It purports though, here we have probable ore outline.

Now, probable, as I mentioned, takes a technical

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definition. It has a certain factor of confidence. Is Kerr-Mac -- now, what I'm going to lead up to here, you cannot simply draw a broad line and say this is probable ore. You can draw a broad line and say this is a known potash area or this is a potential, generally speaking, for potash.

One cannot call it probable ore. This does not fill the 75 percent factor. Those are three negative holes. They do not show on this map, but the three positive holes do show. I assume that's just coincidence. Coming on down here they draw a broad line up through here. I should qualify that last remark. If they were pinned down, say, in relation to the ore then they would have to show a negative hole.

The fact that they show a positive hole and not the negative ones they can argue, well, they were just generalizing.

As we go down into this fringe, this line, of course, follows the known KPE boundary roughly and they apparently in the case of F-29, they ran a line right through the hole and in this one, however, that hole by their calculations is 57.2 feet percent. It is just not ore. Under those circumstances this line simply has to turn up in there and demonstrate that, but it does not. Again a very generalized type of representation, which I have no argument with

other than I don't want to mislead anyone as to these being accurate boundaries. I don't think Kerr-Mac will argue that they are. The same thing applies for this again for this hole No. 113 and 109. Again, you see the dashed line there. They show it negative also within their probable ore outline. The same thing applies to No. 111 down here, which was very low in the logs, which they have. I can't really see any on here on this map.

Now, in the interest of fairness, I should also say that there maybe certain interpretations used on this thing. They apparently have one more hole in here than we do, K-103, and this right here is 69.68 percent or just four-tenths of the number below ore. It's a high insol, unfortunately shown by a green circle from their five-year plan. This is running down here. I have no argument that that might conceivably be ore. However, again, that then shows up in the feet percent where you can see there is strong foot percent running through there. It shows up in the sense you still show a formal calculation and you would not put it in unless they have on the basis of detailed cost come in, say, 66 percent cutoff. Then it would be entered, but don't confuse the formal calculation for what they do practically in the mine. That is so close to ore, they surely will run out and have a

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look and then they will play it by ear of what they get, how good it is.

So the point I make is, again, this is a formal calculation and these lines will very definitely contract and expand both ways.

Q Mr. Warnock, turn your attention to the document there that is on the wall. It's been marked as Exhibit No. 22 and ask you to explain that map?

A Yes, sir, this is composites, open mine work of Kerr-Mac for the last nine years and filed with the Commission. The last two years are not colored. The heavy dashes is 1973, the dotted, 1974. There is really not too much taken from this apart from the general concept that all mining is east of the Section 3 line -- I beg your pardon -- west of the Section 3 line up until 1973 when they first -- 1972. Right, the red is 1972, when they mined out there and also in January of 1973 they put in a five-year plan showing this outline and the holes -- the new holes -- were not drilled at that time. The new holes show the IMC -- the old holes, I beg your pardon -- show IMC-142 and the good holes seven feet or 16 percent. So on that basis and generality they put their five-year plan in this form. They went back, drilled these holes in the middle here and this showed them that it really wasn't quite like

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this blocking on Exhibit No. 18 depicted. Their five-year plan doesn't vary materially from this type of ore reserve calculation. So, of course, they change their -- plus 111 was low. It was not only low, it was good. There was very little in the log. It's essentially a blank hole. There maybe another salt course coming in here.

109, a good thickness, but low grade. The same thing with 114. 113 is also low. So they honestly had to retract their five-year plan and, in other words, what this tells us, that the five-year plan is a very generalized sketch. Against that, this is where they want to develop to find out if these ore reserves will, in fact, hold up.

Q Mr. Warnock, is it correct that on your Exhibit 22, the colored area that is on the left-hand side of the page. I think there is some cross-hatched area of a couple of tunnels, indicates the full extent of the area that Kerr-McGee has mined over here, approximately over nine or ten years?

A That's the information they filed with the Commission, yes. I have no reason to doubt that by any means.

Now, in this respect, of course, they can put in five-year plans each year. The very low production -- the low advance, I'm sorry -- in 1973 relative to 1972 simply tells us that, of course, all of these panels aren't filled in. They

are taking further production back into these colored areas, but it's a well-taken point that while a good new entry advances in terms of new areas in 1972 they did not, and in 1973 they had very little outside advance outside the main mine workings in 1973. At that rate they would not get out here, to which I assume is what you're driving at, in many years, but of course, this is a question of mine management, mine planning and it could be changed.

Q Just so the Commission may focus on this last point, would you specifically identify by areas that you referred to for 1972 and 1973 areas?

A The 1972 open mine workings are in red on the map, and area wise that's a good percentage of the total. The 1973, the latest year, are these cross-hatched areas. This development here, where you can start, I assume, from the main development coming out the main entry, this advance here, this advance down here, couple of entries here to test ore. This is -- these holes here based on Kerr-Mac ore lines are probably very low. They've got their ore line inside of those holes. We do not have the data. I take this supposition here that these are fairly negative holes even though I don't have the data and that is only on the basis of this map. Now, what this entry on here tells me is they're going out

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there to find out just exactly the same thing. These holes are either low enough to be doubtful so they drove out there to see what it's all about. While the holes inside, again, no data, but that must be good ore because they've mined through there and they've developed it, of course.

Incidentally, I should say that you have here down to the southwest, we've no further data and no entry. That is blocked in the polygonal system strictly from supposition on these ore outlines here. So from here down we just -- it's all supposition. The data is on your base map of what we have information on. As you can see there is one in there. They are all cross-hatched.

Q Mr. Warnock, based on your Exhibits in your testimony, in your opinion, would there be any loss of proved probable or possible potash ores if the Bass Federal No. 2 were drilled?

A No, sir.

MR. ATTWELL: Mr. Porter, I at this time will tender the witness for cross examination, but before doing so I would like to offer in evidence Exhibits 18, 19, 20, 20(A), 21 and 22.

MR. PORTER: Has the witness testified that these were prepared by him?

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MR. ATTWELL: I tried, Your Honor, to ask every time, but I think perhaps in the interest of being extra cautious I would ask the witness a general question now of whether each of these Exhibits was prepared by him?

THE WITNESS: Each with exception of the Kerr-Mac was prepared by me.

MR. ATTWELL: Thank you.

MR. PORTER: Any objections to the Exhibits, Mr. Robb?

MR. ROBB: No objections.

MR. PORTER: The Exhibits shall be admitted.

(Whereupon, Belco's Exhibits Nos. 18, 19, 20, 20(A), 21 and 22 were admitted in evidence.)

(Whereupon, a short recess was taken.)

MR. PORTER: Gentlemen, the Hearing will come to order again. There are some people here who have to make some travel arrangements, hotel arrangements, so our plan is to try to conclude the examination, the cross examination, of Mr. Warnock and then recess the Hearing until 8:30 tomorrow morning. Reporters are hard to come by. For one thing I had an 18-hour day yesterday and I wouldn't like two in a row.

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We just feel that it would be better if we would announce at this time that the Hearing would run on late into the night if we try to finish and it would be better to knock it off as soon as concluded the cross examination of this witness. Mr. Robb tells me he just has a few questions. I hope we could finish the cross examination of this witness so that Mr. Robb may come forward with his testimony tomorrow morning at 8:30. So, Mr. Robb, the witness is available for cross examination.

CROSS EXAMINATION

BY MR. ROBB:

Q Mr. Warnock, you have testified about your experience in the mining area and you have indicated that you received your geology degree in 1963?

A BS in 1958, MS in 1963.

Q All right, sir, and when did you start working full time in mining matters?

A 1958.

Q And you went to school while you were --

A (Interrupting) No, sir. I had finished the graduation requirement by the time I left the University of Arizona in the spring semester in 1958 and after three years of struggle at nights sent back a thesis, made one trip back to the U

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on leave from the company, defended the thesis and received the MS degree. The resident requirements were finished all at once.

Q All right. Will you tell me please whether you have ever been employed in any kind of supervisory or responsible position for an operating potash company?

A No, sir, not for an operating potash company.

Q All right, sir. Have you had any experience in supervising then, any potash mining operation?

A I have had extensive experience in the supervision and management of mines. I have not -- this was experience gained with W. R. Grace who are major people in the fertilizer business and who had an inherent in-house desire to find potash deposits and I explored, as I mentioned, worldwide for potash deposits. The specific answer to your question, no, I have not managed a potash mine, is that the question?

Q Yes. Your work with Grace then was exploration for potash?

A That's correct. Exploration, feasibility studies on specific property. Calculation of oil reserves as you see here today.

Q All right. Have you ever been employed in the Carlsbad Potash Basin?

A No, sir, I was employed by a Carlsbad potash producer.

Q Yes, sir.

A No.

Q Any kind, that's right?

A No.

Q All right.

A I've worked in the area for outside people, right.

Q You've done two feasibility studies, do I understand for potash mines?

A Yes, for potash prospects, exactly, for potash properties, on potash bearing properties.

Q What did those consist of?

A The same thing you see here today, a review of the detailed data, no operations in any of them. I think I've already inferred that one was the Haroon Run north of here, for W. R. Grace. The other was a client, who I am not at liberty to reveal in a completely different area in the langbeinite area to the south of Carlsbad, consists of review of detailed logs and data as supplied by the leaseholder, this type of calculation and estimation as to the potash ore reserves potential, performance feasibility studies in using average cost, is this ore profitable, a recommendation to management to spend "X" additional money in fill-in drilling

to prove this up or not.

Q Those two feasibility studies are essentially the extent of your experience in potash in the Carlsbad Basin?

A The Carlsbad Basin, that's correct.

Q How long did those studies take you, would you say, on a full-time basis?

A On a full-time basis?

Q How many man days would you say?

A The first one was an ongoing eight-to-10 month project. Now, how much time, I would say, two to three months. In other words, it was one of the major properties, projects being worked on, one of two or three, four in a given year.

Q How about the other one?

A Approximately the same. No, that would have been less, that was a shorter evaluation. Full-time spread over a month to six weeks.

Q But you never had to take those feasibility studies and economics that you assumed and have the proof of the pudding? In other words, go in there and mine it under the conditions you had outlined?

A Neither property has been mined yet to date for good reasons, it's uneconomical.

Q Now, sir, in making your study you testified that you arrived at a certain cutoff?

A Yes, sir.

Q That you used to determine the preference of ore, is that right?

A That's correct.

Q You arrived and you picked that figure at No. 72, but used 70 in terms of your maps?

A Yes, sir.

Q That was because data generally available in this area from the U. S. Bureau of Mines was used in the absence of having any specific data concerning the Kerr-McGee operation, is that correct?

A That's correct.

Q So you do not pretend to testify concerning the specifics of the Kerr-McGee operation?

A I do not and I would point out that Kerr-McGee has no better cost data on an area four miles out from their current mine.

Q Well, that remains to be seen.

A Okay. No one has operated or produced in Section 30 and no one ever will, as an aside.

Q All right. I think that you will find that your ~~statement~~

is subject to rather sharp challenge in these proceedings.
Have you ever been under ground in the Kerr-McGee mine?

A No, sir.

Q And you have already said that you have no access to the Kerr-McGee economic data?

A That's correct.

Q In determining this cut-off of 72-or-73-percent-grade times thickness product, did you, sir, consider the cut-off grade used by the United States Geological Service?

A Yes, sir.

Q What is that?

A The USGS uses a boundary of 40 feet percent to outline, broadly outline its KPA area, known potash area. It says clearly in the Minutes of the Administrative Meeting that there are known potash bearing areas within the boundary and I have made a very careful--I should characterize that--a very thorough-going attempt to try to determine if the USGS themselves consider 40 feet percent as an economic cut-off in the current economy of Carlsbad Basin in 1973, when these figures were developed, and we'll get into that I'm sure but that's against a 34 cent per short-ton-unit sales price.

Q Now, 34 cents or 34 dollars?

A 34 cents per short-ton unit.

Q Per unit?

A Yes, which equates to \$20.74 per ton of product at 61 percent. Kerr-Mac uses 62; I've absolutely no argument with that. It may average 62; the industry norm is 61, taking it down, but no argument, so say \$21 per ton of product, and that of course was the price for 1971 through 1973 and was the prorated-fixed price by the Saskatchewan Government.

Q Saskatchewan Government?

A That is correct. The Saskatchewan Government has fixed their prices, as I'm sure you are aware, at 33.75 Canadian per short-ton units and forced this on the Canadian mine which set the floor price world wide up until recent developments.

Q Do you know what the current posted field price is?

A No, I do not.

Q Per ton in the Carlsbad Mine?

A No, I do not, but when one talks of posted field prices one must talk of spot price versus long-term contracts and long-term price trends.

Q You have no information what it is now?

A No, sir. The last public price I saw in late 1973 was the supported price.

Q And you would be surprised if I told you that it approaches \$34 a ton?

A Yes, I would be very surprised.

Q You did not take that into consideration in your calculations?

A These calculations are not based on that price. They are based on 1973 price and 1973 extrapolated costs from base date of 1969-70.

Q And that was approximately \$20 a ton?

A \$21 a ton, yes, quite correct.

Q Now, I believe you testified about some rather rigid rules that you had come up with in connection with the proven, probable and possible ore, is that right?

A Yes, sir. Rigid is your term but rules in any case.

Q All right, sir. I think you said that you had to have precisely four holes per section to have proven ore, two per section for probable and one per section for possible, is that right?

A No, that's not correct. If you will look at

the explanation of the map it says "Plus" or "Minus" which means more or less.

Q There's a little bit of variation?

A I beg your pardon?

Q There's a little bit of variation?

A Yes, all right.

Q In arriving at this did you consult with any personnel of Kerr-McGee to determine what terminology they used in terms of classifying ore?

A No, sir, I couldn't find any. I would like to point out to you on the map, they have here approximately the average of one-hole section out here; two holes per section in this area and they went back and filled that in with close-in holes. This tells me, by supposition, that while they might not have to hold to the rigid rules, they felt this had to be drilled to prove it up and now you have approximately, of all things, three to four holes per section average in this area.

Q Do you consider it important that Kerr-McGee had gone back and done some additional drilling?

A Based on the first calculation it was imperative that Kerr-McGee go back and drill that.

Q Did you talk to the Kerr-McGee people to find

out precisely why that additional drilling was done?

A No, sir, would they have told me?

Q Well, you issued a subpoena and you got all the warrants, and you got two more than you asked for, didn't you?

A Yes, sir.

Q All right. Now with respect to the data that you have of the classifications, have you made any other determinations of this formula that you have described for us? Would you measure the distance between the Bass No. 2 proposed location and Kerr-McGee's nearest mine workings to see if maybe the distance between there is closer to four miles than four-and-one-half or five?

A Yes, sir, I would be glad to; it was just estimated before. I beg your pardon; what do you want measured?

Q The differences between the proposed Bass No. 2 and the Kerr-McGee nearest mine workings as shown on the map.

A Nearest mine workings?

Q Yes, sir.

A It is 20,800 feet. A little short; around 4 miles.

Q You spoke a number of times of negative holes.

A Yes, sir.

Q By that you meant a hole that's below your 17-foot percent cut-off, is that right?

A Correct.

Q You suggested that maybe Kerr-McGee was using the polygonal directional method?

A Yes, sir.

Q Have you asked whether that is so?

A No, sir, I have not asked.

Q Do you know what method or reserve determinations Kerr-McGee uses?

A I beg your pardon.

Q Do you know what method or reserve determination Kerr-McGee has found to be the most effective in the potash area?

A Do I know that as a fact?

Q Do you know, yes.

A No, sir, I do not.

Q Now, let us go, if we can, to your Exhibit No. 20. This is your K20-feet method, is that right?

A Yes, sir.

Q All right. Now, what are the three closest

drill holes to the Bass No. 2 location?

A Three closest to Bass No. 2 location are
USG No. 141, IMC No. 155 and Packer 29.

Q And if you draw a line connecting those three
holes you will find that the Bass No. 2 falls within that
area, would you not?

A Yes, you would. A triangle using those three
holes as points, it passes somewhere inside this triangle.

Q All right, sir. And the hole to the northeast
from there which is USG No. 141, would you agree is about
4200 feet away?

A I think I measured it at 44 plus or minus.

Q That's the closest to those three holes is it
not?

A Yes, sir.

Q Those being the three closest holes, would or
would not those be the three holes that you would place
primary reliance on in arriving at a determination of
whether there is or is not ore within that triangle?

A There are not, for the simple reason that this
is 11,500 feet across here or 2.2 miles, this is just
short of 2 miles, and this is 1.7 miles. You cannot, in
good engineering practice -- and that is obviously a

matter of opinion -- you cannot in good engineering practice make a calculation in the Carlsbad potash area on holes two miles apart. The influence of this area in a formal pattern that is a 17.5-percent hole, and therefore high in grade in the average of the three, it's too bad because in an objective calculation the difference of the month doesn't make up for the other three.

Q Would you please draw a line between those three holes so we can see just where Bass No. 2 fits in.

A On this map?

Q Yes, sir, if you would.

A Can you see that? I might add that when you consider the area of influence drilling, the other prime engineering rule or opinion of a prime engineering rule is that you cannot average or grade hole with lower grade hole. You must cut that off somewhere, so even if you could triangulate that, even if you did you cannot include this hole because it is a below-ore grade and these two are above.

Q Fine, we'll get to that.

A Okay.

Q Now, the nearest hole, USG No. 141, I believe you said was the highest grade hole of the three?

A Correct.

Q All right. You projected ore around that hole out to about what distance? How close to Bass No. 2 did you come?

A In a formal closure calculation?

Q No, in the K20?

A In the feet-percent?

Q Yes, sir.

A That's right at 2500 feet out.

Q All right. So you are within about 1700 feet approximately, is that correct, of Bass No. 2 but you couldn't quite stretch it to reach Bass No. 2, is that right?

A I beg your pardon?

Q You couldn't quite stretch your projections to reach Bass No. 2?

A You're going to have to clarify that. What projections am I stretching?

Q The map, the calculations that you made here.

A I think that I specified that. It is not a matter of interpretation. You have two points; you have to extrapolate from the two points you have control on the contour line, along that line you cannot move that

control. The interpretation comes when you are drawing a line between two of those extrapolated points.

Q I understand that is what you said Mr. Warnock, but what you did when you found that you couldn't quite reach Bass No. 2, it lacked 1700 feet.

A Bass No. 2 was not in for consideration when the contour map was constructed.

Q Well, whether it was or was not, that is how it turned out.

A It turned out that Bass No. 2 is within 1700 or 1800 feet of potentially geological potential order.

Q All right. Now, let's go down to the hole, the next one in that triangle, the one that is marked F 29.

A That's right.

Q That is the southerly most of those three holes, is that right?

A Yes, sir.

Q Did you find that to have a factor of 56.4?

A Correct.

Q So that didn't measure up to the 70 percent that you had?

A That's right.

Q All right. Now, the difference between 56.4, which is the factor you had for that hole, and 92.3 which is the factor you had for the 141 hole, the one closest to Belco, what's the difference in those figures approximately?

A It's approximately, Mr. Robb, what 60, say 35 or so, but I would draw your attention to the fact that you have better grade holes to the left, and therefore the trend is increasing in this way and decreasing in that way, is it not?

Q I'm not asking about the trend; I'm asking you to tell us, describe to us -- and I'm leading up to -- the influence or effect you gave to that hole. Now, let me ask you some specific questions and then we'll get around to whatever explanation you would like to make.

A All right.

Q Now, in the contour method that you have used, isn't it customary that you draw contour lines between the two holes and go ahead, and then arrive at a standard. For example, if you had, let's say, that this hole down here, the south hole, was 70 instead of 56, are you with me?

A Yes.

Q And the one up there was 92, you would draw a contour line, would you not, normally between the 90 and the 70 and draw an 80 line, wouldn't you or would you split the difference between the two?

A In a hypothetical question you would.

Q All right, sir, and would there be an 80 line approximately equi-distance between those two holes and would include the Bass No. 2 site?

A Under theoretical consideration that F 29 is 17 and the theoretical consideration that is 70, that would be true.

Q All right, sir. Now, will you please take a line and draw a contour line and a dotted line, if you will please, midway between 141 and F 29.

A What is the purpose of this line?

Q Well, just draw it please, and I will explain the purpose later. I want to see where it falls.

A Do you want me to measure?

Q Well, do it anyway you want.

A What is the supposition, that this hole is not 57?

Q There is no supposition at all. I want a dotted line midway between those two holes.

A A line midway between those two holes.

Q All right. Now, the difference between 56.4 and 92.3 I didn't calculate, did you?

A No, sir.

Q 35.9, is that right, roughly thirty-six feet; thirty-six points or whatever you want to call them? Percentage points.

A Yes.

Q All right, and 18 would be mid one, right?

A Yes, sir.

Q All right. 18 from 92.3 is what?

A I beg your pardon?

Q 18 from 92.3; can you make that calculation?

Lawyers are terrible calculators.

A Yes, I'm terrible in my head, also.

Q It's 74.3.

A Fine.

Q Now, if you had done that, if you had split the difference between the values in that hole up to the northeast No. 141 and F 29, you would have arrived at a figure roughly of 74.3, is that right, at the mid-point?

A If I had split them, yes, sir.

Q And that would then mean that if you had made

that split, that Bass No. 2 would be somewhere between 74.9, 34.3 and 92.3 in grade climb, is that right?

A Yes, that would be correct, yes.

Q Somewhere about 74 above your cut?

A Yes, sir.

Q Now, you did not do that, did you?

A No, I didn't.

Q What weight did you give to that hole down below that F 29?

A I gave full weight to it, and as any of the petroleum and/or potash people here know in general contours of any kind, including topographical contouring, I am coming up a high or off a high. I have 130, 110, 90, 70; I am going down a slope, am I not? Therefore, the 57 which is down slope from 2 Seventies then we have a firm control on this 70 line here, have we not?

Q That is your testimony; I am not agreeing with that.

A Okay, sorry. I don't know whether you do or not. I'm not supposed to ask you questions. We have a firm control on the 70 line; we have these down slope situations here; we have a saddle here, quite clear from the colors. The interpretations and this, of course, is a firm line

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here. The 70 must be up here. If this is the 57, the 70 must be here. It can be nowhere else. If this is the 90, this is 130, if this is a 92, the 90 actually should just not get to your direct line between them to be absolutely perfectly correct. You have a low here 62; you have a 90 here, and there must be a 70 between them; there can be no other way. You are coming up slope in this direction, up slope in this direction. You have a saddle trend here. The interpretation is to put another 70 in here, splitting it exactly is an absolutely incorrect interpretation of the data. Look at the trend. There is a saddle coming through here; there is a saddle coming through there; you're going down dip here; you're going down dip there.

Q How many pounds of ore did you attribute to hole No. F 29?

A There is no ore -- I beg your pardon, F 29?

Q Yes, sir.

A There is no ore in F 29.

Q The answer is zero, isn't it?

A Correct.

Q And in determining whether or not there was any ore in the area up by Bass No. 2, you gave that hole

zero influence, didn't you?

A In terms of formal ore or in terms of geological projection?

Q Any way you look at it.

A Formal ore, it would have no influence on this location in a formal-ore calculation.

Q Now, let's go up to hole No. IMC 155.

A Yes, sir.

Q That's the third side of the triangle, and I guess we made a mistake. That's got the highest grade product, doesn't it; that's 129.

A No, that is the highest peak percentage, but not the highest grade product. It is a much thicker, lower grade.

Q No, but the highest grade product.

A In terms of contouring, it's the highest point, yes.

Q Yes. That's 129 against 92 over in the eastern-most hole.

A That's correct.

Q Now, in arriving at that 129.3, did you include only the sylvite that was in that hole, or did you include the carnallite that was in there too?

A Carnallite?

Q Carnallite.

A I may be predicting your question, but if this is it, I have no argument with it. That's another interpretation. That's strictly interpretive. You could bend the knotty line around like that. To go back to your answer, on IMC 155 -- and let me just check on this map -- no, there would be no K20 as carnallite.

Q All right. There was carnallite in the hole, was there not?

A I would have to check the load. I will if you like.

Q All right. I wish you would check that, yes.

A Yes, sir. There is a 0.95 percent K20 as carnallite.

Q All right. If you had added that grade product, what would that have amounted to?

A I would have to think. Well, it would have been 13.5.

Q So instead of 139 it would have been 142?

A Instead of 122 -- well, why don't we just calculate this log quickly. Now, do we want to debate that now?

Q No, I just want to know, that would have added approximately 13 to 139?

A Yes, but you don't want to debate why I didn't?

Q I want to answer your question about it.

A Would that increase it about 140; just one second.

Q All right.

A It would come to 13.88 percent K2O and sylvite and carnallite, right?

Q I don't know. I am relying implicitly on your figures.

A And that would give us 138.8 feet percent, yes.

Q All right, sir. Did you inquire whether or not Kerr-McGee extracted and used carnallite values in its mining operations?

A No, sir, I did not. Now, as a generality and I'm not familiar with the Kerr-Mac mill, the details thereof. As a generality, as has been testified before this Commission, carnallite is a dilatorious mineral in the process. It also has a K2O content, and up to the point that carnallite becomes dilatorious constituent I have said miner-K2O advantage of carnallite is offset by the dilatorious affects to the mill, and that is as strictly

experience or generalized factor.

Q Did you check to see whether or not Kerr-McGee had a flotation process to which the carnallite would be dilatorious?

A No, sir, I did not check.

Q So your reading off of those values was strictly based on speculation?

A And testimony before this Commission, and hearsay and discussions of people in the business, yes.

Q What discussions did you have with Kerr-McGee people as to whether or not those values were real values in the mill?

A None whatsoever.

Q Now, the areas of influence that you have established or the -- I guess that is what you call it, isn't it -- the distance that you go between holes to infer probable or possible ore?

A Yes, projection distances.

Q All right. Your figures were, I believe, that you would go as much as 2000 feet with a two holes per section to project probable ore and one and possibly 2500 feet to -- did I understand you correctly -- to a mile under some circumstances?

A Holes a mile apart or holes in a 2500-foot radius.

Q In a 2500-foot radius.

A If they are in adjoining sections, as I pointed out up there and they were both ore holes, I would let the whole area in between be called "possible ore" which is not possible under a feasibility-type statement.

Q And you have used these figures, as in hole No. 141 you allowed that at only 2500-foot intervals, isn't that right?

A Correct. On what projections?

Q On the contour K20-foot method?

A Yes, sir.

Q All right. Now, doesn't the amount of influence that you give to a hole depend to some extent upon what the mining experience is of the operator in the area who first drills, and then goes underneath to find out whether or not his earlier estimates proved out?

A State that again, please.

Q Is it the proof of the pudding, that a worker can infer from a hole that you actually find when you go underground?

A Yes, sir.

Q To what extent did you attempt to determine what Kerr-McGee's experience was in being able to infer ore, either probable or possible, based upon its prior mining experience?

A Two points. As I previously testified, I did not talk to Kerr-McGee; I can draw from the sketch maps that they put in the area of influence they put into their holes on the margins of the block; I can infer that they're using the polygonal system, and, second, therefore the answer to that part of your question was that I did not speak to them; I agreed that the proof is in the pudding, and there comes point number 2. Nobody, but nobody -- not even Kerr-McGee -- have mined, as you have pointed out, within four miles of this area, and when one calculates an area out that far or when one makes a general appraisal of the Haroon grounds out that far from known shafts, he must make an evaluation that assumes essentially a new operation because he has no detailed mining experience in that area either.

Q Kerr-McGee is the closest potash mine operator to Bass No. 2, is that not correct?

A Correct.

Q And so presumably it has information from areas

that are closer to Bass No. 2 than any other operator; would you agree with that?

A That's not true. Belco has the same information on Section 30 and the sections around it that Kerr-Mac has.

Q Is Belco in the mining business?

A No, sir.

Q What mining experience does Belco have to draw on?

A Well, you will have to ask the Belco representative for that. The point is, of course, that there is no one who has any mining experience in Section 30, including Kerr-Mac, and everybody in this case now that the data has been made available through various means, and after somewhat of a struggle, everyone has the same data available to make an appraisal of Section 30.

Q You are talking about drill-hole data, are you not?

A Absolutely. Is there any other data available on Section 30?

Q My question related to the mining experience what Kerr-McGee was finding underground as a mining operator of the hole, and now you are talking about drill

data.

A I'm saying there is no mining experience in Section 30.

Q Do I understand you to say that you would give zero influence to the experience that Kerr-McGee has acquired as the result of eight years of operations in the closest adjacent mining area in the Carlsbad Potash Basin?

A Zero?

Q Yes.

A No, I would not go that far. I would love to see their data, obviously. They have the very best data in close through mining experience, and let me reemphasize again that all these lines expand and contract, and that is where the miner finds out when he really has the ore. The proof of the pudding is when he eats that ore. On that basis there is no one better than Kerr-Mac to evaluate where they have mining that they have previously drilled to, and the immediate projected outcome in terms of maximum amount. Everyone is working with the same data on Section 30.

MR. ROBB: No further questions.

MR. PORTER: Does anyone else have a question?

The witness may be excused.

MR. ATTWELL: I'm sorry; I have a few redirect questions.

REDIRECT EXAMINATION

BY MR. ATTWELL:

Q Mr. Warnock, I am going to ask you some questions about core hole F 29. Did this core hole have an influence on your geological projection?

A F 29?

Q Yes.

A It certainly does, as described in the foot-percent method.

Q And you testified that you do not believe it is proper to split the difference between values in USG 141 and F 29, why not, in your opinion?

A In my opinion they are more than one mile apart; they are 1.7 miles apart, and it is simply too far to average them, in my opinion.

MR. ATTWELL: I have no further questions.

RECROSS EXAMINATION

BY MR. ROBB:

Q Your consideration of hole No. F 29 resulted in providing not one pound of ore for the proposed Bass

No. 2?

A I beg your pardon.

Q Your geological influence that you gave to hole No. F 29, the southerly most of that triangle, resulted in your attributing not one pound of ore to the proposed Bass No. 2 site.

A Please define "ore," geological projection or formal ore reserve?

Q Either way.

A Formal ore reserve, not one pound because it's non-existent.

Q And projections?

A Projections, it just cuts into it as you can see up there. Now, the new data, let me point that out; the new data mathematically cannot affect this line. This line stays right there, as it is here; the same place because all the data is over here. It's a simple mathematical contouring. That line stays as you say and is about 1700 or 1800 feet from the site, so potentially -- and if you want I can give you my opinion on the potential. Anywhere in the yellow is a very low potential. I wouldn't recommend drilling. I would recommend drilling the gray areas for possible ore. The 2100-foot radius will cut into that by what, 400, a 1000 feet, I'm not sure. I'll

have to calculate that.

Q But that is just a result of the geological data that you developed in the northern part of that area rather than as the result of F 29 data.

A The interpretation is a result of all the data available.

Q Did F 29 figure in that?

A Yes, sir, it certainly did.

Q How?

A How? By giving its influence to the location of the contour lines as every other hole and this was my testimony that you very obviously are coming down the slope in contouring, and you must interpret F 29 as the 70 being on the west side and the 50 on the east side because you are coming down slope. You have the northwest trend; you see it there in colors.

Q Then do I understand that F 29 data resulted in bringing ore from the north on down to close to Bass No. 2?

A Say that again.

Q That the holes in the south F 29 resulted in your bringing that yellow area down south?

A Yes, it did influence why, at this line here, F 29.

It certainly's influenced by F 29. If this were 10-foot percent, the other line would obviously have to contract in this direction.

Q I'm talking about the area immediately around Bass No. 2.

A All right.

Q Did F 29 have any influence on that?

A Yes.

Q What?

A It locates this line.

Q The line to the north?

A The line here that you see. It is just that this hole locates this one. It can be no other way.

Q I'm not even going to ask you the question.

MR. PORTER: Are there any further questions?

The witness may be excused and the hearing will recess until 8:30 tomorrow morning. If there is anything you would like to leave in here, the room will be locked for the night.

(Whereupon, the Hearing was recessed
at 5:00 P.M.)

BEFORE THE
NEW MEXICO OIL CONSERVATION COMMISSION
Morgan Hall
Santa Fe, New Mexico
8:30 A.M., March 16, 1974

IN THE MATTER OF:

Application of Belco Petroleum Corporation)
for a drilling permit in the Potash-Oil Area,)
Lea County, New Mexico. Applicant in the)
above Federal cause, seeks authority to drill)
its proposed Bass Federal Well No. 1 to test)
the Pennsylvanian Formation at an unorthodox)
location 660 feet from the south line and)
1300 feet from the east line of Section 30,)
Township 20 South, Range 33 East, Santa Salt)
Lake Field, Lea County, New Mexico, said)
location being within the boundaries of the)
Potash-Oil area as defined by the Commission,)
Order R-111-A, and having been objected by)
the owner of the potash leases in the area.)
This unorthodox location was previously)
approved by the Commission by Order R-4699.)

BEFORE MEMBERS OF THE COMMISSION:

A. L. Porter, Secretary and Director

Ralph Trujillo, Chairman of the Commission

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(Exhibits 11 & 12 are portions of
Exhibit 2 which was not admitted.)

MR. PORTER: The Hearing will come to order. I believe that, Mr. Robb, you had finished your cross examination of Mr. Warnock. Mr. Kellahin, I think that was your last witness.

MR. KELLAHIN: That is correct, Mr. Porter.

MR. PORTER: The Commission will recognize Mr. Robb now. He can call his witness.

MR. ROBB: I would like to read at this time a statement of Teledyne Potash Company. (Reading) Teledyne Potash Company holds a State of New Mexico Mining Lease -- (end of reading) A copy of that is in your schedule of exhibits, Mr. Porter.

MR. PORTER: Yes, sir, I know.

MR. ROBB: (Reading continued) Which includes all of Section 36, all of Section 32, the North half of the North half of Section 31, and the West half of the East half of Section 30 in Township 20 South, Range 33 East, Lea County, New Mexico. Jim Walls, General Manager of Teledyne, has authorized for me, John D. Robb, Jr., Attorney, to advise the New Mexico Oil Conservation Commission that Teledyne is opposed to any intrusion of any well location that would penetrate a commercially valuable potash deposit and particularly to the intrusion of its

above-leased area including the present Belco Application to drill a gas well in Section 30 immediately adjoining its holdings. Teledyne has granted Kerr-McGee a sub-lease to mine other potash properties in this area and it is willing to enter into negotiations with Kerr-McGee for sub-lease to mine potash under the above State. Dated this 14th day of March, 1974. (End of reading.)

I am authorized to make that statement on behalf of Teledyne Potash Company to this Commission.

MR. PORTER: All right, sir.

MR. ROBB: Prior to presenting evidence, Mr. Porter, I would like to make a few brief remarks including presenting a statement by Kerr-McGee. There apparently has been some confusion, gentlemen, in the minds of some people concerning Kerr-McGee's intentions with regard to this matter and that is because Belco has been advising others that Kerr-McGee has not been serious about its protests. This statement is not correct. Ever since filing its protest, Kerr-McGee has acted in good faith and, we believe, the well-founded belief that there is a commercial ore deposit, potash deposit, which will be largely destroyed by the granting of the Belco Application. At Belco's suggestion, Kerr-McGee did recently make a

second review of its position, in an attempt to comply with the letter and the spirit of the proposed decision by the Secretary of the Interior in this dispute, concerning the controversy between the oil and the potash companies. However, Kerr-McGee concluded, after a second review of its position, that its position was precisely in accord with the proposed decision of the Secretary of the Interior which has now been entered, now been finalized, and that it could not conscientiously permit what it believes to be the obliteration of an important and valuable natural resource merely to gratify Belco. Kerr-McGee failed to protest early applications to drill in this same section but this was because it had failed to analyze the available data which demonstrates the existence of a commercial ore body. We submit to the Commission that the mere fact that other drilled wells have been drilled in this area at earlier times and under different economic conditions does not justify the wiping out of the bulk of what we believe to be a valuable potash deposit. Now, Belco advised Kerr-McGee that the USGS has already made up its mind to grant its Application to drill at this site and that a hearing before this Commission would be futile. We don't believe that.

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don't believe the USGS has prejudged this Application. The USGS has recently affirmed to this Commission in the ordering that it was going to give deference and consideration to the decision of this Commission, so we don't think we are here for a dry run, Mr. Porter and Mr. Trujillo; we think we're here for an effective hearing.

That having been said, may I present the statement of Kerr-McGee Corporation? A copy of that is also in your files.

I would like to discuss very briefly the history of Kerr-McGee's operations in the area. Kerr-McGee Corporation is one of the major potash operators in the Carlsbad Potash Basin with a capital investment in mining and milling plants and equipment exceeding \$35,000,000. It employs approximately 440 in this operation. Its annual pay-roll has increased from 2.2 million dollars in 1966 to approximately \$5,000,000 in 1973. Kerr-McGee and its predecessors have conducted a flourishing development in mining in the Carlsbad Potash Basin starting back in 1952, but large-scale mining and milling operations have been continuously conducted there by Kerr-McGee and its predecessors since 1965, so it has been about eight years they have been doing major operations

in this Basin. Major potash, of course, has been conducted in the Basin since 1932 and it has continued until the present time. The Basin is the only major source of potash in the United States. At a hearing in Albuquerque it was estimated that 75 percent of all the potash deposits in the United States were located in the Carlsbad Basin. For many years it has been well-known that subsidence has been a normal and inevitable result of the only economically-feasible method of mining potash in this area. Now, the New Mexico and Federal restrictions on drilling, as the Commission well knows, oil and gas drilling in the area have either been prevented or restricted since 1939 when the Secretary of the Interior reserved the potash deposits from oil and gas leases. Then in 1951 the Secretary enlarged the potash area and then permitted oil and gas leasing where it would not result in undue waste of or hazard to the potash. In the same year the Commission issued order R-111, since modified by R-111-A and subsequent modifications. On May 11, 1965, the Secretary issued a further order enlarging the potash area and permitting potash in oil and gas operations where no waste of, or hazard to mineral deposits existed, and furthermore the United States Geological Service has

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established, outlined and maintained an area where potash is known to exist, which has been aptly described as a known-potash area. We are within that area and this Hearing is concerned with a proposed-well location in that area. Now, the events leading up to this present controversy are that in 1973, following increasing controversies between oil and potash companies in this area, there was an application by the New Mexico Oil and Gas Association for modification of the 1965 Secretarial Order. This resulted in the submissions by both the Oil and Gas Association and the Potash Association with regard to various material. Exhibit 1, that we have entered in evidence in this case or will enter shortly, is the submission that Kerr-McGee made to the Secretary of the Interior, and this contains a good deal of background material and its position in regard to the matter. Exhibit 2, which we discussed a little bit yesterday in the cross examination -- partly we did -- was the submission made by the potash companies to the Secretary of the Interior and in that presentation Kerr-McGee had picked a position that potash mining should be accorded a priority because, (1) There is a risk of losing large quantities of valuable potash and recurring hazards to

the men and mining operation if the oil-gas operations precede mining operations, whereas there is no such danger to the oil and gas deposits if the potash mining should precede the oil and gas; (2) the relatively small area involved contains the major source of potash in the United States, and is thus of enormous importance to the nation as well as the potash industry; and (3) that within this relatively small area the economic values of the potash and the large-scale mining and many pay-rolls coupled with the huge investment in mining and milling plants, outweighs the potential for oil and gas in this area. In our statement -- and I'm not going to read it all -- we have outlined the factual basis underlining those contentions and why we took the position we did, which I think is pertinent as part of the history before this Commission, and on pages 4, 5 and 6 of that statement, that the Commissioners have in front of them, we have outlined the major reasons and why we feel that from both the standpoint of natural resources and from the standpoint of economics that very careful consideration must be taken in preserving the potash deposits even as we think we can establish today at this Hearing, there are commercial deposits of potash underlying this location.

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Now, it is Kerr-McGee's position that the Application of Belco should be denied; that the drilling of this proposed location would result in undue waste of commercial ore deposits; that it would unduly reduce the total quantity of such deposits which may reasonably be recovered, and also that it would constitute a hazard to other Kerr-McGee deposits and its miners, and finally it would seriously interfere with the commercial development of ore deposits in this area. Finally, we take the position that these effects are wholly unnecessary in that if Belco insists on drilling in spite of this evidence, that it should do so and can do so by directional drilling. Now, I'm not going to review the applicable statutes, but I have set those forth in our statement.

Now, in our contentions we say that the location proposed to be drilled does contain commercial deposits of potash ore. We say that it is an integral part of the potash ore body which Kerr-McGee is already presently mining approximately four miles away. Although Kerr-McGee's operations are some distance away, the ore deposit which it is mining, including the ore which we contend is present in this area, constitutes 30 percent of our overall reserves that are available in the Carlsbad Potash Basin,

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available to Kerr-McGee. Now, we estimate that there is probable ore of 6.48 in thickness with a grade of 14.7 percent which is within the range of ore grades that we are presently mining and milling. If the proposed well is drilled, Kerr-McGee can do no second mining of any kind within 4200-foot pillar areas, our evidence will show. In other words, you have a diameter 4200 feet across which is a good portion of an entire section that would have to be left in place except for a very limited first mining, and we would have to look at the economics of the first mining at the time that the question posed itself to see if we can even do that. We are not sure that we can even do first mining which depends upon what the economics were at that time. Now, this enormous pillar enterprising the better part of an entire section contains enough ore, just as an example, to sustain Kerr-McGee's entire operation for over one year. Our evidence will show that that much ore would be wasted if this location is approved.

Now, the waste involved totals, our evidence will show, approximately 472,000-final-product tons at a posted price of \$33.89 a ton. Our retail value in excess of \$15,000,000 which we contend will in all probability be wasted if this Application is granted. We contend that

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the dangers and the risks resulting from subsidence are sufficient that Belco's Application should not be approved. In addition, there are risks to the surrounding area if the methane gas should impregnate that area, if there should be a break in the casing or the cement job, and that would cause a risk of explosion as well as condemning a large area of potash deposits in the vicinity.

Now, finally, we take the position that the Belco Application will interfere with the orderly development of potash deposits in this area, and we say that, first of all, the proposed Belco site is less than a mile from Kerr-McGee's existing Federal potash leases. Kerr-McGee presently has no leases on the area covered by the drill site, however it does have an orderly plan of development for its existing lease area and for that portion of its ore body beyond the limits of the present leases to the northeast which includes the area in question. Kerr-McGee has filed a proposed five-year mining plan with the Commission showing that it anticipates being within approximately a mile-and-a-half of the proposed drill site within that period of time, within five years. Kerr-McGee holds the only Federal potash leases in this immediate vicinity and the proposed Belco location is a logical and natural

extension of its present leases. We also contend that Kerr-McGee expects in the normal course of its operation to apply for Federal leases in this area, and because it is the only company that has existing operations in this area, we believe that Kerr-McGee would appear to be the only company which could economically develop and mine the ore in this vicinity. Complete mining of the area, of course, would require some arrangements with Teledyne which owns a small potash lease in this area and assuming we obtain the Federal lease, it is Kerr-McGee's present intention and plan to mine this area within ten years from this date.

Now, we contend, gentlemen, that the conservation objective in this case should be the development of both the products, both the potash and the oil and gas, and that the question then before the Commission is how can that best be done? How can we best preserve the benefits of both natural resources, the economics that flow from developing both of those, including substantial royalties in both potash and oil and gas. We believe that the only sure way that we can be certain that both can be fully developed is, assuming that there is potash ore of commercial quantity underneath this location, that this

potash should be developed first since that can be done without damaging the oil and gas. Now, we contend that there is a heavy burden of proof that rests upon the Applicant, Belco, in this case, to establish that a well location at this site will not have the harmful effects, which we contend that it does, on the ore. So the key question seems to us in this Hearing -- and what we will devote much of our testimony to -- is are there underlying deposits of commercial ore. We contend that there is probable ore under this location. That concludes our statement. We're prepared to testify.

MR. PORTER: Mr. Robb, I don't believe my files contain a copy of your statement.

MR. ROBB: That was an oversight.

(Whereupon a discussion was held

off the record.)

MR. ROBB: I would like to call our first and only witness, Mr. Bob Lane.

MR. PORTER: Let the record show that the witness was sworn previously.

MR. ROBB: Yes, sir, he was.

DIRECT EXAMINATION

BY MR. ROBB:

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LANE-DIRECT

Q Would you state your name please, sir.

A Robert H. Lane.

Q How old are you, Mr. Lane?

A Fifty-two.

Q And what do you do?

A I am employed by Kerr-McGee as Superintendent of Engineering at the present time.

Q All right, sir. And would you please explain to the Commission what are your duties as Superintendent of Engineering.

A To control the Mine Engineering Department, which is responsible for reserve calculations, exploration, general geology, lease and control, royalty calculations. That covers it, generally, I think.

Q All right, sir. Insofar as your relationship is concerned to the mining operations, do you have any responsibility for mining plans?

A Yes. We develop the mining plans and also develop the production in capital forecasts which go with that.

Q All right, sir. Do you have responsibility concerned with mine equipment?

A Yes. We review on equipment needs to go along

with the mining plans. We will run efficiency studies on present equipment, and make recommendations for new equipment.

Q Do you have responsibility with regard to leases and the use of land?

A Yes, sir.

Q Explain to the Commission what that is, please?

A We maintain the lease files, prepare the extensions to applications for new or old leases.

Q Do you have some responsibility in connection with budgets and forecasts?

A Yes, to go along with the mining plans we will prepare our production and capital forecasts to go with it.

Q In connection with preparing mining plans and budgets, is economics or the price of ore or price of your product perhaps a factor?

A It is a major factor.

Q Now, would you please outline your education and experience to the Commission?

A I have a BS in Mining Engineering from New Mexico School of Mines, received in 1950. I was employed by International Minerals and Chemicals in their Carlsbad

operation from 1950 to 1957 as geologist and mine engineer; employed by IMC in Canadian operations from 1957 to 1960 as mine superintendent during the shaft construction; employed back in Carlsbad with IMC from 1960 to 1962 as Chief Mine Engineer. Since that date I have been with Kerr-McGee in their Hobbs operation. In the Hobbs operation, I have been Chief Mine Engineer, Mine Superintendent and, at the present time, Superintendent of Mine Engineering.

Q Do I understand, Mr. Lane, that you have been continuously associated on a full-time basis in a supervisory capacity with potash operating companies for the last 23 years?

A Yes.

Q Do I understand from that summary that during 20 of those 23 years you have been involved in actual mining operations in Carlsbad Potash Basin?

A Yes.

Q Would you please explain to the Commission what the duties of a Mine Superintendent are that you perform?

A The Mine Superintendent has complete control of the mining operations as far as production, maintenance, employment of new employees, termination of old ones,

responsible to the Manager for his daily, monthly and yearly costs and production tonnage.

Q In your work with International Minerals Corporation as the geologist, what were you doing there?

A Reserves, exploration, mine sampling, grade control on a daily and monthly basis.

Q All right, sir. Are you familiar with the Teledyne situation with regard to Teledyne's present operations or lack of them?

A I am.

Q Will you tell the Commission, please, whether Teledyne at this time is engaged in exploration, development or mining operations in the Carlsbad area?

A Teledyne Potash is not engaged in any active mining operations. They are in a way moth-balling the equipment they have. They have removed the narrow-gauge railroad from their mining site to their plant which indicates that it will be some time before any active mining operations would commence.

Q Would it be fair to describe the present situation as sort of a caretaker situation?

A It would be a caretaker situation.

Q Would you please describe very briefly when

Kerr-McGee first commenced commercial operations on a major scale of potash in the Basin in Carlsbad?

A Construction of the plant site and surface facilities was started in 1963; underground development started in January of '64, January of '65 rather, and actual mining operations on a production scale were started in October, '65.

Q Approximately how much tonnage does Kerr-McGee mine each year?

A Approximately 3,000,000 tons at the present time.

Q Has that been steady or has that been decreasing over the years since 1965?

A Gradually increased. It's been fairly stable for the last two years.

Q During the time that Kerr-McGee has been in this area, has it simply rested with its holdings or has it attempted to expand its holdings from time to time?

A We've expanded our lease holdings; we acquired some new leases. In 1964 or '5 we purchased leases from the old IMC property in the northeast, which portions are all of four sections. In 1970 we entered into a sub-agreement with Teledyne Potash for a State section over

in the western portion of the property.

Q Are you mining the potash under that sublease?

A Not under that sublease at the present time.

Q You have acquired the right to mine it?

A Yes, and in 1973 we acquired a new lease which was formerly held by National Potash and we're mining in that lease now.

Q Approximately, what is the annual pay-roll from your mining and milling operations?

A At the present time around \$5,000,000.

Q How many employees do you have involved in the operations?

A Actual and the end of '73 there was 390.

Q Will you tell the Commission, please, what the total capital investment is that Kerr-McGee has in its milling and mining properties and facilities in the Carlsbad Potash Basin?

A In Excess of \$35,000,000.

Q When Kerr-McGee first entered the Basin and first made its plans in 1963 to amortize this \$35,000,000 investment, will you tell the Commission, please, how many years' supply of ore did you count on as being necessary to handle that operation?

A At that time, 30 years.

Q Now, would you turn your attention, please, to Exhibit No. 1. Can you identify Exhibit No. 1, please?

A Exhibit No. 1 is a letter from Mr. Roy C. Williamson; the subject is feasibility and additional costs of drilling.

Q No, you've got the wrong Exhibit.

A That's 1-A.

Q Exhibit 1 starts with a letter to Mr. Wakefield, Secretary of the Interior, signed by James J. Kelley.

A Yes.

Q Is that the signature of the President of Kerr-McGee Corporation?

A Yes. Exhibit 1 is from James Kelley, who is President of Kerr-McGee Corporation.

Q And was that material all submitted to the Secretary of the Interior in connection with this dispute last summer?

A Yes, sir.

Q Can you identify Exhibit 1-A?

A 1-A is a letter signed by Roy C. Williamson; subject is feasibility and additional costs of drilling a directionally-controlled hole.

Q Do you know Mr. Williamson?

A Yes, I do.

MR. KELLAHIN: We object to any questions along this line. This Witness has not been qualified as a Drilling Engineer or as Petroleum Engineer and he is not qualified to testify as to the accuracy of the feasibility studies made by Mr. Williamson. We object to any testimony in regard to Exhibit 1-A.

MR. ROBB: We're not going any further. We are just identifying the document right now.

BY MR. ROBB:

Q Can you identify Exhibit No. 1-B?

A Exhibit 1-B?

Q Yes, sir.

A Exhibit 1-B is another letter signed by Roy C. Williamson; subject in this letter is proposed location of Belco Bass Federal No. 2, Section 30, Township 20 South, 32 East, the location is 660 feet to the South and 1320 from the East.

Q All right, sir. Those are two letters that were discussed yesterday?

A Yes.

Q Can you identify Exhibit No. 2, do you have

your copy?

A I've seemed to have misplaced them or something.

Q In order to save time, Mr. Lane, can you identify Exhibit No. 2 as the submission made by the potash companies to the Secretary of the Interior last summer in connection with this oil-potash dispute?

A Yes.

Q Can you identify Exhibit No. 3?

A Yes, that's the latest guide lines or the Order of the Secretary.

Q Attempting to resolve this dispute between the oil and potash companies?

A Between the oil and potash companies.

MR. ROBB: At this time we move to introduce into evidence Exhibit 1, 1-A, 1-B, 2 and 3.

MR. KELLAHIN: If the Commission please, we would object to the introduction of these instruments as exhibits for the same reason as stated yesterday. The identification of the exhibit lends no merit to it as being testimony or evidence that can be considered by this Commission. Now, this is purely hearsay evidence and the attempt to get it into the record here by this manner is wholly improper. Well, let's take Exhibit 1, for

example: It's a statement by Mr. J.J. Kelley. This witness has not testified he prepared this or knew anything about it. Attached to it are tables; information concerning, for example, the economics of Eddy County. There is nobody here present to testify as to the accuracy of that information. The instrument has tables on employment in Eddy County, employment in the mines and the value of this oil and gas well drilling in potash areas, the value of potash mining in the area, a letter by Mr. Williamson relating to the economic impact of oil and gas industry in southeastern New Mexico. That is nothing but hearsay evidence. The same is true as to Exhibit 1-A and 1-B, being letters by Mr. Williamson regarding feasibility of additional drilling costs. Mr. Williamson is not here to state the source of his figures, nor are we able to test the accuracy of these computations. Now, when it comes to Exhibit 2, that table contains such a mass of information it would take us two weeks to cross examine any witness who is competent to withstand cross examination on the material contained in there. The whole thing is wholly improper and we do object to its introduction and I call the Commission's attention to its own rules in this regard in the conduct of hearings. The Commission requires

that full opportunity shall be afforded to all interested parties at the hearing to present evidence and to cross examine witnesses, and we are being denied the right to cross examine these witnesses whose testimony is contained in these instruments. That's Rule 1212, Rules of Evidence. In general the Rules of Evidence applicable in a trial before a court without a jury shall be applicable providing such rules may be relaxed where by so doing the ends of justice will be better served. No order shall be made which is not supported by competent legal evidence. Now, this material is certainly not competent legal evidence. The Commission cannot consider it as evidence. To introduce it merely clutters the record and causes confusion, and we object to its introduction.

MR. ROBB: In support of it, Mr. Porter, let me say that it seems to us that the Commission should be interested in any information which will help it arrive at the decision which it needs to make in this case. This is such information. Much of it, true, is simply background information, but it deals with matters such as subsidence; it deals with matters which the Commission has heard before. I'm not sure Mr. Trujillo has, but it will save a great deal of time in letting some of this

stuff come in so we don't have to spend a lot of time going through the substance testimony that the Commission has gone through so many times, but is necessary for us to make a record in case this matter is referred to court at a later time, and the purpose basically of this submission is to save a lot of this Commission's time. Much of this testimony, virtually all of it, was explored fully in the Phillip IMC Case. Mr. Kelley, in effect, cross examined the potash witnesses at that time at length about all the matters that are contained in here. None of this is new to anybody. It is simply information that is common knowledge basically. There are very few things in here that I could even describe as even remotely controversial, and we are trying to expedite this proceeding. Now, now the rule that Mr. Kellihan read of this Commission says unless the interests of justice required. We submit the interests of justice in trying to bring this Hearing to a conclusion, in trying to develop this material, that this is the simplest and most expeditious way to do it, and I honestly do believe that this will assist the Commission in arriving at its overall decision or I wouldn't tender it to the Commission at all. Now, we really think that this is crucial and that it will

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save a great deal of time at this Hearing if the Commission will grant it.

MR. KELLAHIN: We would agree it would save a great deal of time, but Mr. Robb well knows the legal point of view does not go to make a record on which he could stand in court. Now, to say that we had ample opportunity to cross examine potash witnesses in the Phillips case is wholly immaterial. We have a different potash company, a different application, different circumstances involved, and it has no bearing whatever on this case.

MR. PORTER: The Commission, Mr. Robb, will sustain the objection. We will not accept these exhibits, Exhibits 1, 1-A, 1-B, 2 and 3. You may proceed with your witness.

MR. ROBB: Let the record respectfully show our exception to that ruling.

MR. PORTER: The record will show your exception.
BY MR. ROBB:

Q Mr. Lane, could you please turn to Exhibit No. 4?

A Yes, sir.

Q What does that show, please?

A Exhibit 4 is a copy of the known potash area

which was developed and drawn by the USGS. It also shows Section 30, the area in question today, is shown in red.

Q And does that indicate that the area that is in dispute in this case at this Hearing is within the known potash area designated by the Secretary of the Interior?

A Yes, sir.

Q Would you identify Exhibit 5, please.

A Exhibit 5 is a map showing several different things. One, it shows Kerr-McGee leases outlined in yellow; the blue outlines Belco's Exhibit, which there are several errors in, mainly in Section 19 and the Southwest quarter of 25 should be brought in.

The R-111-A line and the solid-blue line over on the east, our five-year mine developments, which have been submitted to the Commission in January as outlined in green, and State lands are in a broken-blue line.

Q Now, let's go through it a little more slowly so we can all follow that.

A All right.

Q The yellow line, do I understand, represents the exterior of the leases, basically the land held by Kerr-McGee under potash leases?

A Yes, sir.

Q Are most of those Federal leases?

A The majority are Federal leases, yes.

Q Approximately how far does the nearest point of the Kerr-McGee lease fall from the proposed Bass No. 2 site?

A Less than one mile.

Q Now, you say there are some errors in the Belco-oil-and-gas-lease agreement of the area covered by that?

A If I read their map right yesterday, yes, sir.

MR. ROBB: Now, Mr. Kellahin, I asked you to confirm that the information you had given me last year was accurate. I heard nothing further from you, so this is prepared on the basis of that.

MR. KELLAHIN: That is correct; you did ask me. It was my understanding at the time that it was correct, however, the Exhibit that was offered yesterday correctly reflects Belco's interests in this area. Any error in regard to their Exhibit, would have to be blamed on me.

BY MR. ROBB:

Q The dark-blue line that is over on the east side of this Exhibit, do I understand that that is the outline

of the New Mexico R-111-A area?

A Yes, sir.

Q And the green I believe you have identified as going the five-year-development plan for Kerr-McGee?

A Yes.

Q The blue over here on the left-hand side, the lower-left-hand side of the exhibit, what does that project?

A The unshaded blue in the green area?

Q The blue area, yes, within the green area.

A That shows open-mine workings.

Q All right. Does that indicate areas that have been mined up to the present time by Kerr-McGee?

A The areas shown here were mined up to January 1 of '74.

Q Is that shown at the very bottom of that Exhibit; is that what that means?

A Yes. Mined to date, 1/74.

Q Now, the green area over about the middle of the page which shows you driving toward the northeast and in the general direction of the proposed Bass No. 2 location, does that outline the approximate five-year-development plan that has been filed with this Commission?

A Yes, sir.

Q And is that the area that Kerr-McGee intends to mine within the next five years?

A We do.

Q Now, I notice down in the lower-left-hand side there among the existing mine workings, the open-land workings, you had a drift there as pointing up in the direction of this proposed location in the blue, that's the extreme-right-hand edge of the blue?

A Would you repeat your question again?

Q Yes. I notice over near the bottom of this Exhibit in the existing blue area, you seem to be going toward the northeast in Section 3, is that correct?

A Yes.

Q All right, sir, and is Kerr-McGee presently working in this area at this time?

A Yes, sir, we are approximately at the section line between Sections 3 and 2.

Q Then you have advanced further from the date this map was prepared in January 2, 1974, in the direction of the Bass No. 2 well?

A There has been continuous operations in this area to the northeast.

LANE-DIRECT

Page.....

Q Are those operations continuing at the present time?

A Yes, sir.

Q So would it be fair to say, then, that Kerr-McGee at this time is mining generally in the direction toward the Bass No. 2 well?

A Yes, sir.

Q When did Kerr-McGee start its operations in this eastern part of the mine going out in the general direction of the Bass No. 2 well, starting from the shaft or where you started from?

A I think it was in December of '71.

Q Have you in that period of time done mining in and around that core area before you started directionally out to the east, as you are going now, or the northeast.

A Would you repeat your question?

Q Did you do a good deal of mining in and around the shaft area before you started out to the northeast as you are going at the present time?

A Yes.

Q Would you explain, please, the system that you used in advancing your mining operation as you're doing

here in the area where you're now heading toward Bass No. 2?

A We have a four-rotor boring machine in this area, which as it indicates is a continuous-type mining machine. There is no blasting in the area. They're developing a five-entry system at a height of eight feet for our belt entry, and approximately five feet for the side entries, and we are advancing at a rate of approximately 600 feet a month.

Q 600 feet a month?

A Yes.

Q What is the boring machine; what does it do?

A It augers the ore from the face. It breaks it loose from the solid.

Q Is it a large machine?

A A machine that weighs approximately 50 tons, and 52 inches in height, 30-feet long. That would be the general description of it.

Q And it literally chews into the ore, does it?

A That is correct.

Q How, in your entry system how wide is that, how many machines do you have working in that area?

A There is one machine on this development, the

entry system to the northeast, the normal drift width is 25 feet.

Q 25-foot wide?

A Yes.

Q Would you describe, please, how Kerr-McGee intends to move out in this general area toward the northeast, including now the green area you have shown here, you show certain drifts going off to the side and also you show the advance; do you intend to continue with just one machine on the advance or will that be changed?

A On the advance of the entry system only, there will be one machine.

Q All right, sir. Just describe in general what your plans are within this five-year-plan area; what you'll do to implement that plan?

A The plans at present are to continue the development of the northeast main to a point in the southwest quarter of Section 35, at which place the boring machine will be exchanged to a conventional unit. The conventional unit will develop the main both to the northwest and to the southeast.

Q Is that where you show a kind of intersection there?

A The intersection in the southwest quarter of 35.

Q With the blue lines going up toward the northwest and toward the southeast?

A That is correct.

Q Okay.

A At that point we have a transmission in our ore body where the top and bottom members of the 10th ore zone are mineralized. In the area where the boring machine is today, or the development of this entry system, the bottom member is only mineralized. So we're looking at present equipment limitations, we will use conventional mining where we have two member mineralization.

Q By that you mean ore at two different heights?

A We will be mining the total 10th ore zone. At the present time we are only mining the bottom member.

Q When you say you mine it by conventional methods, what do you mean?

A Drilling, undercutting, and blasting using explosives.

Q When you continue the advance, after you have reached this point, will you go conventional system?

A Yes, sir, driving the mains into the east.

Q You will continue, then, in the northeast direction

with your conventional method, if I understand you?

A That's correct.

Q All right. Then you get to the next intersection here; what is that?

A It shows development of another set of sub-mains to the northeast, that is getting in preparation to set up additional panel areas which would be out in four, about four-and-a-half years.

Q What do you mean by "panel areas"?

A Panel areas where they're mined off the sub-main; where we can take our maximum extraction and still maintain haulage and travel routes to and from the area.

Q Is this what you call "first mining" or are you now referring to the total mining operation?

A To date Kerr-McGee has not used first and second mining terms. We found out early in our operations that the strength of our ore would not permit normal first mining, and then at some later date come back in and do second mining.

Q What do you mean, the "strength of the ore"? Do you mean it's not strong enough to hold up after you've done first mining?

A We are mining ore with a content of 7 percent

insol, where other operators in the Basin are normally operating around one, one-and-a-half percent of clay content.

Q What does that mean, the strength of the ground?

A The strength of the remaining pillar; it reduces the maximum.

Q So mining as you do, then, is a complete extraction of an area rather than first mining and then retrieving in a second-mining fashion?

A We use the terms "development of a panel" and "retrieve a panel" and the retreat immediately follows the development of the area.

Q Now, you showed this mining operation opposite Section 25 approximately almost to the center of Section 25, within this five-year period?

A Yes, sir.

Q Does this map also show the proposed or possible mining beyond that five-year period?

A Yes, sir.

Q Will you explain that to the Commission?

A The light-dotted-blue lines underneath would be our present mine plans, the layout of those mine plans, for the area to the northeast. Generally our mains are

on 5000-foot centers, or sub-main centers rather, normal panel connections would be 800 feet by 2500 feet in length. At a place in between Sections 30 and 36 there is a series of panels which are greater than the 2500 foot in length than the normal panel. That is brought about by other wells in this area, including Federal Bass No. 1 and the Audie Richards gas wells.

Q I notice those two blue lines beyond the green area going in a southeasterly direction, one on one side and one on the other side of the proposed Bass No. 2 location?

A Yes, sir.

Q What does that indicate?

A That there are sub-mains located; that's about the only spot available due to the Audie Richards and the Federal Bass No. 1 well at the present time.

Q You have a note there called "Proposed Bass Federal Well No. 2" with a circle around it, and then you have a small blue line going right to the center of that. Does that blue line and that small circle in the center indicate the approximate location of Bass No. 2?

A Yes, sir.

Q What is the small circle drawn around there

right at the center?

A That would represent a primary barrier pillar around a gas well and would be 300 feet in diameter.

Q What is the purpose of that?

A To give us protection if first mining was done in that area.

Q If a well were put in there, would it be your opinion that it would be necessary to leave that kind of pillar in which you would do no mining at all?

A That's correct.

Q Now what is the larger circle?

A The larger circle is a circle with a radius of 2100 feet which we would call our subsidence area, and the 2100 feet is derived from the depth from the surface to the ore zone.

Q Now, tell us what oil and gas wells were in that area, why would you leave a 2100-foot pillar and what mining would you do within that pillar?

A The 2100 feet or the depth from the surface to the ore zone represents the known subsidence angles which have been recorded in the potash area. Subsidence angle at 45 would be equal to the depth of the bed from the surface.

Q And in that area what mining would you do if you had a well there?

A It may be possible to do limited extraction mining up to 35 percent. There again at this time I'm not in a position to say if Kerr-McGee would do any mining in that area.

Q What would be the purpose of leaving the pillar in place, if you did leave it in place?

A The 2100 foot or the 300 foot?

Q The 2100 foot.

A To avoid possible contamination of the mine if there was a leak in a productive gas well.

Q Would that 2100 foot in general support oil and gas casings?

A I feel that it would prevent any damage to that well by subsidence.

Q In general, if the proposed Federal Bass No. 2 is not drilled, Mr. Lane, do these light-blue lines in this area indicate the approximate location of the entry system and the advance that you would use to extract whatever ore might be in the area?

A Yes, sir.

Q Now, I notice also in this diagram you have in

red an outline which is designated "probable ore outline."

A That is correct.

Q And what does that indicate?

A It indicates, to the best of my judgment, where commercial ore could be found or the possible limits of that commercial ore with the present data we have today.

Q What does that suggest with regard to whether or not, according to this probable ore outline, that there is probable ore underneath the proposed Bass Federal No. 2 site?

A Under this outline it shows that all of Section 30 and all the area under the proposed site would contain ore.

Q Now, I notice also on this Exhibit a black line starting in the lower-left-hand side there in Section 3 that starts "A" and connects the various ore holes. It starts with No. 50, is that correct?

A Fifty, that's right.

Q And goes to 103?

A Correct.

Q I can't read the next one.

A Eleven.

Q Eleven.

A 132.

Q 132

A 10.

Q 10.

A 133.

Q All right.

A The east to US 141.

Q All right, sir. What are you showing there basically?

A We have exhibits which will show a cross section ore in a little more detail on the data received from the core test of each of these tests.

Q All right, sir, well then we'll get back to that in connection with the next exhibit. Do I understand from this diagram then, Mr. Lane, that most of the mining that Kerr-McGee has done during the first eight years of its major mining operations has been in what you would call the central or northwestern portion of the mine?

A On this map, yes. There is some mining to the south.

Q Would you identify Exhibit No. 6, please?

A Exhibit No. 6 is the letter transmittal and the maps which were put on file with the Oil Conservation

Commission in January showing our five-year development plan and open-mine workings.

Q January of this year, 1974?

A 1974.

Q Is this your signature at the bottom of that letter?

A It is.

Q I call your attention to the language, "In addition you are being furnished with two copies of a map showing lands that will be developed by Kerr-McGee Corporation during the next five years." Is that correct?

A That is correct.

Q Is that Kerr-McGee's intention?

A Yes.

Q Now, over on page 2, what does that show?

A On my exhibit it shows the open-mine workings as of January 1, 1974.

Q And over on the lower-right-hand side does that show that same advance that is going on in the direct of Bass Federal No. 2?

A Yes, sir.

Q And what is on page 3 of that Exhibit?

A Page 3 shows our five-year-development plan

superimposed over the open-mine-working plans.

Q And these documents were actually filed with the Commission?

A Yes, sir.

Q On that date?

A Mailed January 22, 1974.

Q Have you superimposed that five-year-mining plan that's shown on this page 3 of Exhibit No. 6, on Exhibit 5 that we're looking at on that general layout?

A Yes, sir.

Q Okay. Would you explain to the Commission what Exhibit No. 7 is?

A Exhibit 7 is the cross section which we described before going from hole 50 which is located in Section 3 of 2131 through a series of holes and ending up in US 141 core test located over in Section 29 of 2033.

Q All right. Tell us first of all what a cross section is.

A A cross section is a diagram or sketch of what we found in the core itself as a result of the core test.

Q As a result of drilling?

A As a result of drilling, yes, sir.

Q All right, sir, and would you explain what the

colors mean?

A Colors, the top orange is the USGS marker 119 which is present throughout the potash area. The yellow would represent waste or salt; the brown would be a non-mineralized member of the 10th ore zone, and at the bottom is sylvite or K20 mineralization.

Q Now between the places marked "top member" and the bottom of the places marked "bottom member," is that the area replaced by the so-called 10th ore zone?

A Yes, sir.

Q All right. And then in order to see whether or not there is ore present in the 10th ore zone, do I understand you would begin at the top-dotted line there over in the left-hand where it says "top member" and then work on down or what's the trick: Do you blow one of them up and then look and see what it shows in that core hole; is that the area to look at basically?

A Yes, we can recognize where the 10th will be by polyhallite 119 marker beds. All members are easily recognized by clay partings always on the top and generally on the bottom also of each of the members.

Q By what, sir?

A A clay parting.

Q What is that?

A The clay seam can be a thickness of a 32nd of an inch to a half inch, but it is always present.

Q What is the significance of that seam?

A It occurs at the end of the mineralization cycle I would think so that it does define the top of an ore zone.

Q Looking at the bottom member, now, which is between on the left-hand side between the figures 1801 and 1797, you have shown an area in gray, is that, right in the middle of the purple bottom members?

A Yes, sir.

Q What is that?

A That is a high clay zone.

Q All right, sir.

A It will be anywhere in thickness from 6 inches to 18 inches and it can go up to 15 to 20 percent clay or insolubles.

Q Now going down, just tracing that bottom member from the left-hand side of this Exhibit all the way across to the right, is that clay member encountered in each one of the holes that were drilled?

A Yes, sir. You will find it in the bottom member

of any hole drilled in this general area.

Q Can you tell the Commission, please, whether or not that clay is a type of substance which would or would not permit the transmission of the migration of methane gas?

A I think it would afford a place where it could migrate.

Q Now, looking again at these colors if I understand you, the purple represents the ore?

A Yes, sir.

Q All right. The yellow represents the waste?

A Waste or salt.

Q All right. The brown represents what; is that wasted within the area?

A The area waste, it is not a mineralized portion of the ore zone. It contains high clays and salt.

Q All right. Then going from the left-hand side of this Exhibit over to the right, I noticed that you find ore in the first two holes in the bottom member and when you get to the third hole, which is described as I-132, do I understand that you have ore both in the top member and the bottom member?

A The bottom member is mineralized in the first

three holes, not the first two.

Q Yes.

A We have the transition from one-member mineralization to two-member mineralization between holes F 11 and I 132.

Q Now, is that the same situation you described just a moment ago when we were looking over here at Exhibit No. 5 where you were going to go from the boring machine to the conventional mining?

A That's correct.

Q As we continue to go over to the right, and we're going in a generally northeast direction, are we not?

A Yes.

Q As we go from the left side to the right side?

A Yes, sir.

Q And maybe, so the Commission can visualize this, would you on Exhibit 5, the one we had before, can we tie the holes now on this cross section Exhibit 7 to the holes on Exhibit 5?

A Yes, sir.

Q Starting at the lower-left-hand side, where it says "A" we looked at that black line before.

A That is F 50.

Q Do we then generally go, when you are going from the left side of Exhibit 7, that cross section, over to the right side, in a northeast direction and in the general direction toward the proposed Bass No. 2 well?

A Yes, sir.

Q And now going on Exhibit 7 over to the last two holes, I 155 and US 141; do you have those spotted?

A Yes, sir.

Q Now, going up to Exhibit No. 5 on the map, would the one on the extreme right, US 141, be the same as what's listed as A'?

A That's correct.

Q Over on the right-hand side of this Exhibit 5?

A That's correct.

Q That's the first hole to the east that you've shown on this?

A That is right.

Q That is the hole that we identified yesterday as being approximately 4200 feet from the proposed Bass Federal No. 2?

A That is correct.

Q All right. And then 155, I 155, which also has ore in two zones, two members?

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A That is correct.

Q That would be, then, the hole on the section to the west of Section 30, is that right, in Section 25?

A That's correct.

Q And it's also designated on Exhibit B?

A That's correct.

Q Now, in each of these holes that you have depicted here, can you tell us whether or not from this cross section these holes do or do not indicate the existence of commercial ore at those locations?

A All holes in this cross section represent commercial mineralization.

Q What is the significance of that, that as you go in a continuous line toward the proposed Bass Federal No. 1, that you find indications of commercial ore in every hole?

A That we probably have a continuous ore body from I 155 test over to the US test 141. Continuous ore would be present.

Q What does it indicate with regard to whether or not there is continuous ore from A in the vicinity where you are presently working over to 155?

A That would be continuous also.

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Q Do I understand, then, that this cross section suggests the presence of continuous ore from the area where you are presently mining right up to the main vicinity of Base No. 2?

A Yes.

Q And would that include the vicinity of Base No. 2?

A Yes.

Q Would you please next identify Exhibit No. 8?

A Exhibit No. 8 contains our basic mine plan for the general area. Over on the right --

Q (Interrupting) General area of the proposed Base Federal?

A Federal and northeastern portion of the property.

Q All right, sir.

A It contains contour lines which are referred back to as K20 feet which is the produce of the K20 value of the hole times the thickness of the mineralization. It shows the proposed Base Federal No. 2 location in Section 30; probable ore is outlined again and it also contains the height and analysis values for most of the holes over on the right-hand side.

Q All right, sir. Now the blue lines that you

lines going to the southeast and northwest are the same blue lines that we showed in the earlier Exhibit 5 that showed your general mining plans in that area?

A Yes, sir.

Q Now, these holes that you have shown here, over on the right-hand side, you have a line connecting three holes. 29 on the east side; I can't see the one on the south.

A It's 29.

Q 29, okay, and then up to the northwest is 155?

A That's correct.

Q 155 and 29 are the two holes that you showed on the earlier exhibit, the cross section?

A That's correct.

Q Oh, I'm sorry; I confused Section 29 for hole 141 up in the northeast. I apologize. The hole on the northeast side, to make the record clear is US 141?

A Correct.

Q And the hole to the south in that short triangle is F 29?

A Correct.

Q Now, you have a legend at the bottom that says, "Probable ore outline," and that seems to start a line

right approximately a little bit below F 29, that's the southerly hole, right?

A Right.

Q And it goes around, and then there's a dotted portion of it over there on the east side, and it goes up through Section -- let's see -- 33, what is that section below 30?

A 31.

Q 31, I'm sorry, and then it goes around on the extreme east side of this Exhibit that you call "Probable Ore Outline"?

A Yes.

Q All right. And then you have some additional, on that line you have 60, right next to that hole F 29 you have the letters 60. What does that mean?

A 60 would be a K20-foot line, which would represent four feet at 15-percent ore or 5 feet at 12-percent ore, that would be reasonable values.

Q That is multiplying the grade times the thickness of the ore?

A That is correct.

Q And is that the outline of the probable ore of the grade product of 60?

A That hole in the vicinity of hole F 29.

Q Yes, and the dotted line running to the east and the northeast from there.

A The dotted line to the east and northeast would represent the same 60 line that are available to the southeast, so I put it in as a dotted line.

Q That's why you drew it in as a dotted line?

A Yes, sir.

Q Let's go up to the next line, now, which is entitled "80." That's just up a short distance to the northwest from hole F 29?

A That's correct.

Q What does that mean?

A That represents the 80 K20 feet.

Q All right, sir. And does that intersect the proposed, the 2100-foot area surrounding the proposed Bass Federal No. 2 as you go to the northeast?

A It does.

Q Then the next line is what, 100?

A 100.

Q And then 120?

A 120 and so on up through.

Q And then up to 140?

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A Correct.

Q Do those lines indicate that in your opinion, or what does it indicate?

A It gives a value of ore which you may expect to find in that area taking height and grade which are the two most important factors in any mining operation, and as long as height mainly fits your mine equipment or your mining method and the factor is still above your cut-off grade, I mean above your cut-off factor, it should be mineable ore.

Q When you say it "should be mineable ore," would you please explain to the Commission whether or not based upon this contour or K20-foot method that you made, was this done by you or under your direct supervision?

A Yes, sir.

Q Were all the maps that we have prepared prepared by you or under your direct supervision?

A Yes, sir.

Q What does this K20-contour map indicate with regard to whether or not, in your opinion, there is probable ore underneath the Bass No. 2 proposed location and the 2100-foot area surrounding it?

A In my opinion the area in question is underlain

by commercial ore.

Q Now, I notice that the Section of Bass No. 2 is right in the center there of that circle, lies between the 80 and 100 lines under the contour method, what does that indicate to you with regard to the grade produce of the ore at the place where they propose to drill?

A The well above our reserve cut-off values or our mining cut-off values?

Q What value would that suggest at that location, approximately?

A Slightly over 90.

Q All right. Now, did you have what is known as a cut-off that you use in calculating ore reserves or does Kerr-McGee have?

A For ore-reserve calculations we use the cut-off of four-and-a-half foot in height and 14-percent K20.

Q And what grade product does that give you?

A 63.

Q 63?

A Yes.

Q All, right, sir. How do you arrive at that cut-off point?

A The cut-off values we use on our ore reserves

was established about the time we went into operation and for continuity of reserves and everything, we still use the four-and-a-half or 14 percent which was considered commercial at that time.

Q Has experience in the mining and milling business in this area since that time confirmed that this is an economic reserve cut-off figure?

A It has for reserves.

Q So for the purposes of computing ore reserves, do I understand this correctly, Mr. Lane, that you treat as commercial ore anything down to 63 grade product or above?

A Yes, sir, for reserve calculations.

Q Now, do you have a different or lower cut-off that you use when you're actually underground mining?

A Underground mining I would say in nearly every case when we have gone to the limits of the ore body, we have dropped that in actual practice down to about 11 percent at four-and-a-half feet or a product's value of around 53.

Q Do I understand correctly, then, that in actual practice, when you are actually mining underground, you will mine ore down to a grade product of 53?

A Yes, sir, in most cases at the extremities of an ore body or individual units.

Q Is the entire Belco site, the entire 2100-foot radius, or 4200 diameter around the Belco well, above the 5300 mining cut-off?

A Yes, sir.

Q Is the entire 4200-radius diameter of that gas well above the 63 on its ore reserve cut-off?

A Yes, sir.

Q Now, this K20 method that you used or the contour method that you used, is this the same as the contour method that was testified yesterday by Mr. Warnock?

A Methodwise, yes.

Q Now, in arriving at this ore determination, what values did you give to the three closest holes that form the triangle that is shown here, that is the three closest holes to the Bass No. 2.

A Starting up in Section 25 with hole I 155, that has a height of ten feet at 13.9-percent K20 or a K20-foot-contour value of 139.

Q That was a different figure than was used yesterday, isn't it?

A Yes, sir.

Q What is the difference between the figure you used and the figure that Mr. Warnock used?

A I think Mr. Warnock used only the sylvite value, which was shown on the log, where I've used the value of carnallite also.

Q Why did you use the value of carnallite?

A In our type process all values report when we have a chance of recovering it.

Q You used the milling system or process that Mr. Warnock had assumed you used yesterday?

A No, sir.

Q What system do you use?

A We use a flotation system where all mineralization is dissolved, put into solution, and it is recrystallized back out.

Q Do you consider the carnallite that's in this hole to be a detriment to the milling process as Mr. Warnock assumed yesterday?

A No, sir.

Q Do you expect to recover positive value in that?

A Yes, sir.

Q Is that why you included that in your calculations?

A Yes, sir, that was the reason it was included.

Q Now, the values you have described to hole No. US 141 on the northeast side and F 29 on the south are essentially the same values as Mr. Warnock?

A Yes, sir.

Q Is that correct?

A Yes.

Q But you arrived at a different calculation?

A I did.

Q Now, in making up an ore reserve determination, do you use the same category that Mr. Warnock uses, "possible, probable, proven" ores?

A Yes.

Q I believe your conclusion here is that this is probable ore?

A It is.

Q Now, how do you arrive at what is probable ore based on Kerr-McGee's practices and experience in the mining business in this area?

A My thoughts on it are when you have several drill holes at wide spacing which are located adjacent or a proven ore body, and also a big factor is actual mining operations in the general area.

Q Now, here you have three holes that are rather widely spaced, is that right?

A Yes, sir.

Q What is the distances essentially between 155 and 141 on the north side there?

A I think it is approximately 12,000 feet.

Q Do you have a calculator?

A No, I don't.

(Whereupon, a discussion was held off the record.)

Q Okay.

A Approximately 12,000 feet; its under 12,000.

Q And the distance between 141 and F 29?

A Slightly over 8,000 feet.

Q And then the distance from F 29 up to 155 on the other side of the triangle?

A Approximately 10,000 feet. I'm making these measurements off of the map that has been reduced from the actual scale map and it's not quite correct. It's approximate.

Q I see, okay. I had written down 10,500. Let me ask you this, Mr. Lane: You mentioned, now, that in arriving at this reserve you considered not only the

findings of these particular holes, but the proximity of these holes to a proven-ore deposit, is that correct?

A Yes, sir.

Q Where is that proven-ore deposit?

A Proven-ore deposit within our lease would be approximately 4500 feet to the northwest.

Q All right, sir. And that was a factor in your conclusion that this is probable ore?

A Yes.

Q You also mentioned that one of the factors that caused you to conclude this is probable ore was your mining experience in the area.

A Yes, sir.

Q During the eight years that you have been mining in this general area some four miles, four-and-a-half miles to the southwest, has your mining experience contributed to this result and in what way?

A The area around the shaft and to the northwest, the actual results of that mining has been very close to the original estimate from the drill hole data; the bottom member of the 10th ore zone is fairly consistent. It usually represents a large area of influence. I mean you can give a large area of influence to any hole that

has good bottom mineralization.

Q Is that the reason you prepared that earlier exhibit, cross section, showing a continuous seam of commercial ore in the bottom member starting from your existing mining operations all the way over to the vicinity of Bass No. 2?

A Yes, sir.

Q Now, based upon your use of this K20 or contour method that is depicted here in Exhibit No. 8, have you attached the data sheets concerning these three holes in question, US 141, F 29 and I 155 as exhibits 8-A, 8-B and 8-C to Exhibit A?

A Yes, sir.

Q Do they show what you have testified to?

A Yes, sir.

Q Now, based upon your conclusions that there was probable ore in the vicinity and under the proposed Bass No. 2, have you made calculations concerning the amount of ore that is located within that 2100-foot pillar?

A I have.

Q Are those calculations depicted on Exhibit 8-D?

A They are.

Q Would you turn, now, to Exhibit 8-D and explain

what page 1 is?

A Page 1 shows the mathematical values which we used in determining K20 tons which may be present under the proposed location. Going back again to Exhibit 8, the contour map, you see that the proposed area is encompassed by values which may range from 105 on the north side of the circle to some values of 75 on the south side. We broke down the contour; instead of a 20-foot contour interval, like we have on Exhibit 8, to approximately two-and-a-half foot K20 contours so our calculations would be a little more accurate. Doing that we come out with 12 different areas.

Q Within this proposed 4200-foot diameter?

A We used 12 different areas to make our calculations firm.

Q All right, thank you.

A On page 1 of Exhibit 8-B, the numbers on the first left-hand column, the area number, you see 12 of those, and that will be going from K20 values, areas with K20 values, from approximately 105 down to 75. The second column from the left is planimeter reading.

Q That's under the K20-feet column?

A No, on the second column from the left we have

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planimeter readings.

Q But the K20-foot values are shown in the third column?

A That's right.

Q And that .7625, the fourth line, too, if I understand you correctly, the extreme south edge of that 2100-foot radius around the proposed Bass No. 2?

A It is.

Q And between those two contour lines shown on Exhibit A between the 60 and the 80 lines?

A Yes.

Q And then the figure at the top where you say "Area No. 1" under the K20 5th column, would that be the north edge where the contour line would intersect the north edge of that circle around the proposed Bass No. 2?

A Yes, sir.

Q And so these are calculations of values between?

A That is correct.

Q And now proceed if you will, please?

A We make a planimeter reading, which is the second column from the left, for each of these 12 areas. All that does is give you a reading which is calculated back into the planimeter itself, and will give you area in

square feet. The fourth column over is the factor that was used and that factor is one planimeter reading which was equal. In this case we used a map with a scale of 4 inches equal one mile. That factor calculation would be one square inch on a four-inch map would equal 40 acres of 1320 feet squared divided by a factor of 15.3 which represents the number of cubic feet of ore in a ton of ore. The values over on the right-hand side of this sheet are K20 tons in each of these 12 areas, some of which would give K20 values of the total circle.

Q Now by K20 tons, do you mean the amount of ore that has actually been taken out of there?

A K20 tons?

Q Yes, sir.

A That's what we would expect to mine from that area, yes.

Q Is this the amount of raw ore that you have taken out of there?

A That is the ore in place, yes, sir.

Q That figure that you have, you're planning basically in this area about what grade of ore?

A In the area of the proposed oil well?

A Yes, sir. What grade of ore would you be mining,

based on your calculations?

A 14.5, 15 percent.

Q And then of every ton of ore you take out of there about 14.5 percent of it would be, or for every ton of material you take out of there about 14.5 percent of it would be ore, or 14.5 percent would be K20 content?

A Right.

Q So actually you would be moving more tons than this, wouldn't you, in a mining operation than 762,000?

A Yes, more tons, yes.

Q These would be the number of tons if you had 100-percent K20 content, is that right?

A This is the value of K20 tons in this circle. We don't mine K20 tons; we mine tons which have potassium chloride, and this is converted over to K20 system.

Q Okay, fine. We'll get to the other system where you made the calculation of the actual tons in place.

A Right.

Q Now on the second sheet, what does that show on Exhibit 8-D?

A It shows the calculation which base figure came from the first page, taking that K20 value and running it through to product tons or the tons we expect to ship

to the market.

Q After you have processed it through your mill?

A Yes, sir.

Q Will you explain to the Commissioner how you arrived at these calculations and what your result was?

A On page one we obtained the figure 762,254-K20 tons in place. Under normal mine plans we would expect to have an extraction in this area of approximately 80-percent mine extraction so we would reduce these tons in place to the 80-percent figure. Then the tons that are mined, we ship to the mill and in the mill we expect a 82-percent milling recovery and we produce a 52-percent K20-product value, and so the tons that the mill receives would be 609,803-K20 tons. They will lose 18-percent of that, so in the product that is made by the mill is still in K20 tons, which is divided by the product grade, which is 62 and we would end up with an expected product produced in this area of 806,513-product tons.

Q All right. Do I understand that you are assuming that there was no well in this area your tree to extract 80-percent of the material that was in place?

A Yes, sir.

Q All right, sir. You call this your normal mine

plan?

A Normal mine plan.

Q Now, in the lower part of that sheet have you made calculations what the loss would be if it was necessary to leave the 150-foot radius pillar in place and only do 35-percent first mining in that 2100-foot radius?

A Yes, sir.

Q All right. Have you made the calculations, in other words, of the amount of ore you would lose if you had to leave those pillars around this proposed well site?

A Yes, sir. With 35 percent extraction and the same milling recovery in product grade, we could expect to obtain 352,850 tons from the second plan of mining.

Q All right, sir, and have you calculated what that loss would be in terms of retail value or sales value of the milled product?

A Yes. It is the difference our normal mine plan and a mine plan with no second mining which would be the difference of the two values, and that would amount to 453,663-product tons which would be lost to the well.

Q Do I understand you correctly, Mr. Lane, that would be the amount of resale value lost as a result of

leaving this ore in place and not mining it?

A That would be the loss by only doing first mining or 35-percent mining in this vicinity.

Q That would be the value of the material that is not extracted and processed?

A Correct.

Q Did you use another ore reserve calculation procedure in order to back stop or verify or to give further assurance to the ore calculations you have just described under the K20-feet or contour method?

A Yes, sir.

Q Will you explain to the Commission, please, what that was?

A Referring to Exhibit 8-E, is what we call a Triangular Method. It is the use of three test wells which encompass most of the area in question. You get a value for the triangle by averaging the data from the three test wells and use it for all of the area encompassed.

Q Now, are the three holes you've used here the same three we have been discussing?

A Yes, sir.

Q And is this diagram sort of a blow-up of the triangle that appears on Exhibit 8 we looked at

earlier?

A It is.

Q This just shows more detail?

A Yes.

Q All right, sir. Will you explain to the Commission how you go about doing that?

A Taking three holes and it is a straight average of the height and grade of each or K20 values of each and in this case the three would average out 6.48 feet in height and a 14.7-percent K20 grade.

Q Will you explain to the Commission, is that your opinion based on the Triangular Method of grade and thickness of the ore expected to be encountered within the triangle?

A It is an indicator, yes.

Q Maybe my question wasn't quite accurate. Within the triangle and the adjacent parts included within the whole 2100-foot radius, is that what the figure is, the whole 2100-foot radius around the well?

A Yes, I would use it for the 2100-foot radius.

Q Now, will you explain to the Commission what your experience has been with the Triangular Method. Is that a method normally and customarily used by Kerr-McGee in ore-reserve calculations in this area of the Carlsbad Potash

Basin?

A Yes, sir.

Q Now, you start out in the mining business, do you not, Mr. Lane, with some drill holes? You can't look under the ground, can you?

A No.

Q Okay. Do you, after you have drilled some initial holes, drill some additional ones in order to develop a mine plan? Just explain to the Commission how you go about mining, and then I want to get back to the correlation whether or not you have confirmed the validity of this method of ore-reserve calculation by your mining.

A In the case of Kerr-McGee, the original exploration started in 1952; a series of holes were drilled and evaluated by several companies, and in 1957 the data obtained from this early drilling was thought sufficient so they go ahead and start construction of property, at least to put down a production shaft. Things were delayed -- and I do not know the reason why they were delayed between 1957 and '62-- but at that time they did do some extra drilling generally in the shaft or around the shaft area or plant-site area. They added ten holes within approximately four sections, and the results from the original drilling

coupled with the results of the last ten holes that were drilled showed no difference in results for ore-reserve calculations. They still had roughly the same grade, same tons, same things available to them.

Q So the additional drilling made no difference in the result?

A Not in that case, the ten holes covering some four sections.

Q And then were some of those additional holes done for the purpose of developing a specific mine plan or was that done later?

A Are you talking about the ten holes I just described?

Q Yes. I'm really trying to get the procedure that you used.

A I'm sure they were used for specific mine plans at that time. I know they were used later.

Q Do you drill holes only for the purpose of outlining ore reserves or do you drill holes also for helping you to develop a specific mine plan in an area?

A You drill holes to obtain results to meet both those ends. We drilled a series of holes last summer which were primarily for mine planning, and that's to the north-east of the present workings, and that was to better

delineate our two-member mineralization of the 10th ore zone so equipment plans could be made at this time.

Q Were those the holes that Mr. Warnock referred to yesterday as the holes you had to drill in order to block out your ore and prove your ore reserves?

A Yes, sir.

Q And were they drilled for that purpose?

A Not primarily, no, sir.

Q What were they drilled for?

A For equipment selection and mining plans.

Q Now, after you have done your drilling and sunk a shaft and go underground, then is it correct that you are able then to look back to see whether or not you're pretty close to what your ore-reserve projections were before you went underground?

A That's the proof of the pudding, yes, sir.

Q All right. And does Kerr-McGee do that in order to attempt to verify the accuracy of its ore-reserve practices?

A We do.

Q Will you tell the Commission, please, whether or not that kind of study or that kind of review has resulted either in verifying or not verifying the validity of the triangular method of ore-reserve calculations you have used

here in this case?

A In most cases, it will verify the triangular method.

Q And have you from your practical experience found that the contour of K20-feet method, as you have used it in your testimony before the Commission today, is or is not verified by your actual experience in mining?

A That is also verified.

Q Now, sir, did you make the same calculations or did you arrive at the same results from the triangular method of ore-reserve calculation and from the contour method K20 method that you testified about earlier today?

A Yes, I ran it off by the triangular method also to look at the product value which might be lost by this well and, simply, they are the same.

Q Is the result of those calculations shown in the second sheet on Exhibit 8-E?

A Yes, sir.

Q Will you run very quickly through those for the Commission.

A Looking at the second page at the top, the area of the 2100-foot circle would be equal to some 13.8-million square feet. From that we deducted 1.15-million feet which we considered lost to the Federal Bass No. 1, giving a

remaining area of some 12.7 million square feet left. Coming down to the actual calculations we took 12.7-million square feet divided by our 15.3-cubic-feet-per-ton factor and we have a height of ore of 6.48 which again is the average of the heights of the test wells. Multiplying the area times the height will give us also -- which includes the tonnage factor -- you'll end up with 5,379,626 tons in place at a grade of 14.7 which is the average of the three grade values of these holes resulting in a K20-ton value of 790,849 tons.

Q Now, does that compare with the figure that we used over on the contour method or the K20-foot method of 806,000?

A The 790,000 figure which I just gave for the triangular method compares with the 762,000 figure of the K20-foot method.

Q I see, and that is why you say the results of the second method of ore-reserve calculations were essentially the same as the first?

A Yes.

Q All right. The second one revealed a little higher figure?

A Yes.

Q All right, sir. More tons. And then did you

the same calculations based upon 790,000 K20-ton figure that you did with regard to the calculations to the K20 feet, in otherwords did you determine what the value would be of the product if you could remove it without having to worry about the well and how much retail value would be lost if you had to leave that same pillar around that well?

A Yes, sir.

Q Are these results depicted on the rest of the Exhibit?

A They are.

Q What value did you arrive at with regard to the sales value of the mill product that would be lost if you were not permitted to do any more than mine 35 percent around that well?

A \$16,000,000.

Q That's a slightly higher value than by the other method?

A Yes.

Q Going back up to the middle of this Exhibit, do I understand this 5,379,000 tons, is that actually the amount of material you would move?

A No, that's the amount in place before any mining starts.

Q Okay. How does that compare with the amount of ore that Kerr-McGee mines each year, both full and annual production?

A It is slightly over a year, year-and-a-half.

Q Do I understand your testimony to be that you must maintain this 2100-foot pillar and the 150-foot pillar and only have 35-percent first mining; do I understand correctly that you would leave in the ground unmined and unused more than one year's total supply of ore that Kerr-McGee uses in its present operations?

A Yes, sir.

Q Now, sir, you used in calculating your values a price of \$33.89 per ton of product, is that right?

A That's correct.

Q You testified, I believe, that that was the value of the ore that was the closest price of the ore in the Carlsbad Potash Basin for your --

A (Interrupting) Posted price for the finished product, yes, sir.

Q All right, sir. Would you explain what Exhibit 9 represents, please?

A Exhibit 9 is a copy of the price schedule which is distributed publicly. It shows the price in units of K20.

We ship a product which has a minimum value of 62-percent K20, or units of K20, so we arrive at a value for a ton of a product by if it is a course product, we would use 55 cents per K20 unit or it would be 55 cents times 62 or some 33-plus dollars.

Q Then you convert units into tons?

A Units into values, meaning into dollars.

Q Yes, sir.

A Our product split is a third and a third and a third of standard. We make a third standard-grade product, a third course-grade product and a third granular-grade product, so in this case here we'd average those up and we can derive at an average value for our product.

Q First of all, this represents 100 percent so you have to convert 62 percent, is that right?

A All muriate of potash is sold by K20 value. A ton of product is essentially 100 percent potassium chloride so this is a conversion to potassium oxide.

Q All right, sir. Then you convert it to tons from units?

A No.

Q How do you work the mathamatics on that? Oh, I'm sorry; dollars to units, that's how you arrived at the

33.89?

A Thirty-three.

Q All right, sir. And is Kerr-McGee actually selling potash ore for the posted-field prices?

A To the best of my knowledge, they are.

Q Now, Exhibit No. 10; would you look at that, please?

A Yes, sir.

Q What does that show?

A The base map the same as several we've looked at before so open-mine workings over on the left-hand side, coupled along with the five-year development plan shown on the cross-hatch. There are test wells without value on them and also existing gas wells over on the right-hand side.

Q You show the Bass Federal No. 1 up there?

A Yes, sir.

Q At the top, and two of the Texaco wells right below there?

A That's correct.

Q In other words, you've shown those three wells plus the one proposed well that are within the probable-ore outline, is that correct?

A Yes.

Q Now, you also have the proposed-mining plan shown in there, those lines going down there, blue lines, into the area of the Bass Federal No. 2, is that right?

A Yes.

Q Now, Bass No. 1 and the two Texaco wells, that area you've not shown as any mining being done under there, is that correct, except your drifting through between Bass Well No. 1 and that northerly Texaco well in order to get down to the vicinity of Bass Federal No. 2.

A On the Exhibit, we show panels laid out throughout the area but that would be our sub-main system to the end of the area of the proposed Bass Federal No. 2.

Q All right, sir. Now if the Bass Federal No. 2 is drilled and it is necessary to leave this 2100-foot pillar that we've described before, would it be economic for Kerr-McGee to go in this area and try to mine the area between Bass Federal No. 2 and those two Texaco wells?

A When this mining takes place, it might not be.

Q If you were going into that area and all you could get out was the ore between Bass Federal No. 2 and those two Texaco wells, would that by itself be an economic-- mining operation?

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Q Would you repeat that again, please?

Q If the only ore you can get out of this area is the area not covered by the circles, not included within those subsidence-color circles, and namely the area between Bass Federal No. 2 and the two Texaco wells, would it be economic for Kerr-McGee to go in there and mine just that area there outside those circles?

A I haven't made a special study of it, but I believe it would be economical today to do it.

Q If that were the only ore that you had to take out?

A Yes.

Q All right. I believe that's all on that. Now, are there any other holders of Federal potash leases in this immediate area except for Kerr-McGee?

A Not in there. The closest would be approximately two miles to the northwest.

Q Are there any other operations being conducted at this time by any potash company that are as close as Kerr-McGee's operations?

A No, sir.

Q How far away is the nearest operation other than Kerr-McGee's?

A I would think National Potash would be some eight miles, approximately eight miles.

Q Do you know of any operator in this area who could economically mine this area covered by the Bass Federal No. 2 except for Kerr-McGee?

A No, sir.

Q And why could Kerr-McGee mine that and the others not?

A It is adjacent to our present leases and is in the general vicinity of our proposed-mining operations. It's an integral part of it actually.

Q Now, part of the area within this 2100-foot circle of Bass Federal No. 2 is included within the State lease to Teledyne, is that correct?

A Yes, a quarter of Section 30 belongs to Teledyne, yes.

Q So a portion of the 2100-foot radius around the proposed Bass Federal No. 2 is included as a large portion of it in that State lease to Teledyne, is that correct?

A That's right.

Q All right. Kerr-McGee then could not completely mine that circle without making some deal with Teledyne, could it?

A That's correct.

Q And have you had any discussions with Teledyne concerning the possibility of negotiations for that?

A Yes.

Q Has Kerr-McGee, in fact, in the past had other successful negotiations with Teledyne while you described this in the other part of the mine where you're mining some of their products and have you had any indications from Teledyne that they are willing to negotiate that kind of a deal where you could mine their ore in this area?

A Yes, sir.

Q Is this the expectation of Kerr-McGee in the normal course of events: Application will be made to the Federal Government to obtain a Federal potash lease on the area embraced by the Bass No. 2 location?

A At the present time there is, yes, sir.

MR. ROBB: Now, we're going to go into things like subsidence that we're going to have to take up with the Commission.

MR. PORTER: We'll take a ten minute break.

(Whereupon, a short recess was had.)

MR. PORTER: The hearing will come to order, and please excuse the delay. Notice the proposed location

is on our Federal land as administered by the United States Geological Survey, and we would at this time like to thank the USGS for having a number of representatives attend the hearing. I'm advised that they're going to have to leave. They were trying to get some idea of how long we thought that this proceeding might go on, and, of course, we don't know, so because of prior travel arrangements they're going to have to leave and so we're really sorry gentlemen that you can't stay for the rest of the hearing but as you have requested to me, we will make available to you a copy of the transcript as soon as it comes out. Thank you very much.

MR. ROBB: Before they leave, I would like to make an apology to the USGS for the fact that in the letter of February 18, 1974, addressed to Mr. Fulton, we used an erroneous sales price in calculating the amount of ore lost to the well. We used a \$24 figure instead of an approximate \$34 figure, and I want to apologize to USGS before they leave.

MR. PORTER: You may resume your examination of the Witness. Thank you very much, gentlemen, for coming to the Hearing.

MR. KELLAHIN: If the Commission please, in the

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interests of trying to save at least some time, in the question of subsidence, Belco is prepared to stipulate that subsidence will occur when section mining is done; that subsidence could cause to generate terrific forces in strata overlying the potash mine; that the 45° angle for determining what pillars should be left around a well bore is a valid concept for the purposes of first mining. We will not stipulate that even though we will stipulate it's possible that the forces generated could possibly rupture a casing in a well, we will not stipulate, however, that a well that has been drilled, completed, produced, plugged and abandoned in accordance with the provisions in R-111-A -- and as proposed by Belco -- would rupture or would permit methane gas to escape into potash formations or any mine workings. We will not stipulate that second mining cannot take place around a well bore when the well has been produced to abandon.

MR. PORTER: Mr. Robb, would you say that such a stipulation would shorten your testimony?

MR. ROBB: I think so. I've got to be sure that I understood him correctly. You will stipulate, as I understand it, that any mining within this 2100-foot radius would result in some subsidence, do I understand you correctly?

MR. KELLAHIN: Yes. We'd stipulate that any second

mining would result in some subsidence.

MR. ROBB: Even first mining.

MR. KELLAHIN: We're not talking about first mining as I understood your proposal; you would leave a 2100-foot pillar around the well bore in first mining.

MR. ROBB: Yes, but there is a possibility of subsidence in the first mining, if you take it out.

MR. KELLAHIN: We won't stipulate to that.

MR. ROBB: Subsidence would be within the potash formation as well, you're not meaning to exclude that because the flowing salt?

MR. KELLAHIN: We're not agreeing that there's any potash in this area.

MR. ROBB: All right, in the salt section.

MR. KELLAHIN: In the salt section if subsidence would occur, we would assume that you would have mined the potash before the subsidence occurred.

MR. ROBB: Yes. Will you stipulate that ordinarily the subsidence is approximately 65 percent of the height being mined at the surface?

MR. KELLAHIN: We will not stipulate that subsidence would extend to the surface from 2100 feet.

MR. ROBB: Let me confer with Mr. Lane, if I may.

MR. PORTER: I doubt seriously if we are going to save any time I think because --

MR. ROBB: (Interrupting) We're going pretty fast.

MR. PORTER: (Continuing) What would have to happen here before a stipulation, Mr. Kellahin would have to state clearly what he would be willing to stipulate to point by point so it can be made into a clear record and then you would have to agree to that. It appears that would take a lot of time point by point so, we'd like to shorten the Hearing, but I think we probably wouldn't save any time, so we might as well proceed.

MR. ROBB: Mr. Porter, we move the admission of Exhibits 4, 5, 6, 7, 8-A, 8-B, 8-C, 8-D, 8-E, 9 and 10.

MR. PORTER: Are there any objections to the admission of these records?

MR. KELLAHIN: We have no objection to admission subject to motion on any matters developed on cross examination.

MR. PORTER: Well, under ~~those~~ conditions they'll be admitted.

BY MR. ROBB:

Q Mr. Lane, during your 20 years of actual experience

in the Carlsbad Potash Mining Basin, had you encountered the phenomenon known as subsidence?

A Yes, sir.

Q Will you tell the Commission what that consists of?

A It's a phenomenon that results from high extraction of potash ores and results in crushing of your remaining pillars underground; it causes the plastic flow in the salt formations right above the mining zone; results in the fracture of what we call the over burden of the area from the surface to the salt section; it results in the actual subsidence of the dropping of the surface to approximately two-thirds of the mining depth underground.

Q That much subsidence takes place at the surface level?

A Yes, sir.

Q This phenomena of subsidence, when you mine out underneath the ground, you're mining in a cavity, is that right?

A So speaking, yes.

Q What causes the subsidence?

A It's the removal of supports within the ore zone; you reach a certain point where the pressures of the

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overlying stratas will completely crush-out your remaining supports left after second mining.

Q What percentage extraction is customary in the Carlsbad Potash Basin, specifically in Kerr-McGee's operations?

A Kerr-McGee's? Upward of 80 percent.

Q This subsidence that takes place that you testified is a 45° angle, how is that computed?

A That is derived at from actual elevations run on the surface and plotting these changes in elevation on the surface from underlying workings.

Q Would you describe just very briefly what the geology is in this area and what the flowing processes and cracking process is?

A General geology in the area, we have what we call the over-burden which consists of sand, caliche, and gypsum for several feet; sandstone, limestones, shales, and clays, and some water-bearing dolomites just overlying the salt section, and this over-burden will range in 300 to 400 feet in the west to some 900 to 1000 feet out in Kerr-McGee area on the eastern side of the Basin. Underlying what we call the over-burden would be Salada formation which consists of hallite beds intermingled with clay seams,

polyhallite beds anhydrites, and some mineralized-potassium zones.

Q And the potash is contained within the salt zone?

A Yes, sir.

Q The salt zone is known as the Salada?

A Salada.

Q Okay. Above the Salada is it designated the Rustler Formation?

A Rustler Formation overlying the Salada.

Q All right, and that's the part you identified, you call it in a general classification, the over-burden?

A Yes, sir.

Q And that did you say contains limestone, dolomites, clays and shales?

A Shales.

Q Have you actually observed this subsidence in mined-out areas in this area?

A Yes, sir.

Q On numerous occasions or a few?

A I'd say numerous.

Q In connection with what operations have you observed this subsidence, what company operations?

A As an employee both with International Minerals

and Kerr-McGee.

Q And are these both within the Carlsbad potash area?

A Yes, sir.

Q Would you describe just very briefly what that has done to the surface?

A I have visually seen surface cracks over two properties, those being Southwest Potash Company and U.S. Potash Company, where you have tension cracks visible on the surface. Underground you can see a bending of the salt roof; sometimes it will block out the fall for a short height or distances above the ore zones and crushing out of the ore pillars that are remaining, and you visualize nearly complete closure of the ore zone.

Q Do you mean by that that the roof or the top will come down and meet the bottom or back to the floor?

A Yes.

Q And about how long does that take to occur in your experience?

A For the back to meet the floor?

Q Yes, sir.

A I think this would occur in five years, or approximately five years, maybe a little bit more.

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Q Is it your opinion that essentially all of the subsidence will be completed in approximately five years?

A I believe it would be. I have to qualify that a little bit. That is in areas where large extractions have been extended over a large area of the mine without existing entry-ways or something else which are still standing.

Q Now, have you observed or are you familiar with subsidence encountered in the Carlsbad potash area?

A Yes, sir.

Q Have you actually observed this condition?

A I observed subsidence and these conditions both on the surface and underground at the U.S. Potash Company's holdings.

Q Will you please, in Exhibit 2, Exhibit B attached to there, that is a report on underground movement and subsidence over the United States Potash Company mine -- as part of Exhibit 2 that the Commission has in front of them -- are you familiar with that report?

A I am familiar with the report, yes, sir.

Q Does that report accurately describe the conditions of subsidence that you observed in that ground?

A Yes, sir, very well.

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Q Moving in the introduction of Exhibit B to Exhibit 2.

MR. KELLAHIN: If it please the Commission, Exhibit B to Exhibit 2, did you say?

MR. ROBB: Yes, sir, that's right.

MR. KELLAHIN: Is that confined solely to subsidence?

MR. ROBB: Yes, sir. It's a report on subsidence with attached diagrams showing the measurements that were taken of the subsidence in that area.

MR. KELLAHIN: We have no objection to admission of Exhibit B to Exhibit 2.

MR. ROBB: None of the copies I have seen are very clear and only one copy that I know of, and that's Bob Lane's copy. They're all pretty bad. I'm going to ask Mr. Lane if he will make his copy available to the Commission so we can all have a rather better copy.

MR. KELLAHIN: I would ask that Exhibit B be extracted from Exhibit 2 and made a separate exhibit rather than leaving it in the form it is presently in.

MR. ROBB: All right.

BY MR. ROBB:

Q What happens in that Rustler Formation above the

salt beds when that condition of subsidence that you have observed occurs?

A It is indicated by the surface cracks. We do have fracturing.

Q All right, sir. What happens down in the salt formation when the subsidence occurs?

A In all indications, we have pressures which will cause the salt section to flow or a type of plastic flow.

Q All right, sir. Can you qualify those pressures with regard to what you would encounter when that volume or when that mass begins to flow?

A Yes, we know what the crushing strength of our ore-zone material would be, and we can visually see when the back starts to bend and deformation starts.

Q Have you observed the results of that flow?

A Yes, sir.

Q Would it be fair to categorize those as enormous pressures?

A I would.

Q How does subsidence operate? Does it just operate uniformly in one direction; is it just always down, or does it have different contours and configurations?

A No, there is both horizontal and vertical movement.

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Q Is there twisting movement?

A If you would have both horizontal and vertical, I would think you would have twisting.

Q Is it fair to describe it as sort of a hula dancer, would that kind of explain it?

A Horizontal and vertical movement.

Q Mr. Lane, would you tell the Commission whether or not you have an opinion if more than 35 percent of ore is extracted from within the 2100-foot area of the proposed Bass No. 2 well, can you ascertain whether or not the subsidence of the kind that you testified would occur?

A More than 35 percent?

Q Yes.

A Yes, sir, I'm sure it would.

Q Would the conditions that you have testified about earlier with regard to the area generally apply to this location?

A Yes.

Q Do you have an opinion whether or not it would result in danger of the shearing of a well casing of the kind described here in this case for the Bass No. 2 location?

A In my opinion it would have a very good chance of shearing that casing, yes, sir.

Q Have you had an opportunity of observing the oil seepages that have occurred in this area from time to time?

A I observed one oil seepage, yes.

Q All right, sir. Was that from the plugged well in the Potash Company of America mining area?

A It is from an abandoned well. I don't know if it was plugged or not.

Q Was that in January of 1962 that you observed that?

A No, sir.

Q I'm sorry, did that seepage occur approximately in 1962 or prior to that time?

A No, that seepage occurred back in the '50s or earlier than that even.

Q Was it?

A Yes, sir.

Q All right. Did you observe that underground?

A I saw the seep underground, yes, sir.

Q Are some photographs in Exhibit No. 2, that you have in front of you, that you could show to the Commission and demonstrate to them what you observed at that time?

A Yes.

Q Would you please take those out and show the

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Commission. We don't have color reproductions of the other. We will have some made. He is the only one who has a color photograph.

Would you explain to this Commission what the main one of those photographs show?

A These are photographs taken in the PCA Mine, dated January the 18th, 1962. The photograph on the top left shows a tension crack in the salt section, or in the high-grade section which was then filled with salt. The one on the top right is also in an anhydrite bed. It shows oil seeps which are depicted in dark here.

MR. KELLAHIN: If the Commission please, I object to the Witness testifying further from this Exhibit. There is no evidence to show that he took the pictures, that he made any analysis of the stains involved in this potash section or that he has any personal knowledge whatsoever that those are or are not oil seeps.

MR. ROBB: The Witness testified, Mr. Porter, that he observed these conditions himself.

THE WITNESS: I have seen the actual faces where these appeared.

MR. ROBB: Do those photographs actually portray the conditions that you have examined at the time of your

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inspection?

THE WITNESS: They do.

MR. KELLAHIN: What led you to believe that that was oil?

THE WITNESS: I believe that I put it in the cars; nice and sticky or something. I feel pretty sure. It was a hydrocarbon that I would class as oil.

MR. PORTER: The Commission will overrule the objection.

MR. ROBB: We would offer that photograph in evidence as Exhibit 11. I guess it would be 12. No, it would be 11. This would be 12. The earlier one, which was the U.S. potash study would be No. 11. Let the record so show.

MR. PORTER: Are you saying that the Exhibit D are two, should be labeled Exhibit No. 11?

MR. ROBB: It might be simpler to do it that way so we'd have the consecutive --

MR. PORTER: (Interrupting) I think it would, if you remove that from Exhibit 2 and, incidently, we would like to have the best copy you have of that because the one I have is unreadable.

MR. ROBB: Yes, sir, we will. We will furnish

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those to the Commission. I would like the copy that the Commission has, Exhibit 2 that the Commissioner has, to remain **intact** so that if there has to be a review of the decision it will know what it is that the Commission refused to accept.

BY MR. ROBB:

Q Now, with regard to this oil seep in PCA, did you as a part of your duties review the studies that were made by PCA concerning this oil seepage?

A No, I have not reviewed the studies they made.

Q Did you as part of your work, are you generally acquainted with the study -- not review of it -- but are you generally familiar with the findings that were made with regard to that? What I'm asking is where is the nearest oil; did you determine the location of the nearest oil well in which that seep could have occurred, approximately?

A An employee of PCA showed me a map where the seep was located underground, and on that mine plat there was several oil wells in the general vicinity which they showed.

Q Where is the location of the nearest one?

A Either 9 or 1400 feet. 900 and 1400 feet, yes.

Q May I show you, to refresh your recollection, Figure No. 1 from the Exhibit No. 2, containing a map showing that seepage?

A Yes, sir.

Q Which show the Continental Chase oil tests?

A Yes, sir.

Q That's about half of the way through that Exhibit. It's two pages ahead of the photographs. There are sort of blanks in it. It falls just a short distance beyond that unreadable report you were just asking us to make copies of, Mr. Porter.

Is that essentially the situation that was portrayed to you on this map?

A Yes, sir.

Q Does that indicate a seepage of 900 feet and 1400 feet respectively in these different portions of the mine?

A In the different portions, yes.

Q Were those the conditions which you observed?

A Yes, sir.

MR. ROBB: Second page. I guess the photographs are attached to that same report, that same map. We offer into evidence Figure 1 and Figure 2 which are the two pages just ahead of the photographs, part of the same study.

MR. KELLAHIN: If the Commission please, we would object to the Exhibit. It purports to show that a seepage occurred which moved some 1400 feet and some 900 feet from a well, but there is no evidence to show that that well ever leaked any oil or caused any seepage. The Commission well knows that in the drilling for oil, seeps are encountered under many circumstances, and there certainly is nothing to support this Exhibit. If the witness wants to testify that he made some examination of the well bore in terms of its leaking, I would be happy to hear it.

MR. ROBB: Well, Mr. Chairman, this Exhibit has been offered in two or three different hearings by this Commission. It is kind of late to be objecting to it on the basis that the oil came from a well. That has been testified to many times.

MR. KELLAHIN: In the first place, that is not a correct statement. I objected to it every time it has been offered in any case that I have been involved in. I'm objecting again.

MR. ROBB: It was testified to fully and admitted in evidence in the Phillips case.

MR. KELLAHIN: Over my objection, and I'm objecting again.

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MR. PORTER: The Commission will sustain the objection so far as the Exhibit is concerned if you will develop further the line of questioning that the oil seep came from those particular wells or you can proceed to do so.

MR. ROBB: Let me continue in another line, and I'll see whether we can.

BY MR. ROBB:

Q You had testified earlier, Mr. Lane, that in your opinion methane gas, which might escape from that well, could migrate along mud seams that you showed us in those cross sections, do you remember?

A I think it could, sir.

Q If that were to happen, sir, what hazard, if any, does escaping gas from a well such as the Bass No. 2 or any well in this area pose as to your potash operation in the immediate vicinity?

A If methane gas was found in potash mine, the mine would be classed as gaseous, and would make a major change in all equipment, ventilation requirements, explosive use, and in our case I'm sure it would cause some full shut-down for some period of time. Where equipment changes and ventilation changes could be rectified.

Q Is your mine presently, is it a gas-free mine?

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A Yes.

Q No gas in the mine.

A No methane gas, no, sir.

Q All right, sir. Is that true of the other mining operations in this area?

A I would assume so, that would be correct.

Q Do you know of any mining operation in the Carlsbad potash area where methane gas has impregnated the mine?

A No, sir.

Q Can you tell us whether or not the equipment that Kerr-McGee presently uses in its mine would be suitable if they encountered methane gas?

A We have no equipment underground at the present time which would be permissible in a gaseous mine.

Q What equipment do you need to operate a gaseous mine, Mr. Lane?

A You need equipment which has permissible electric, fire suppression equipment attached, all motors must be permissibly constructed, transformers of which we have none at the present time.

Q Do I understand that the danger of fire and explosion is a very real hazard if methane gas impregnates

the mine?

A Yes.

Q Do you know of instances where hard mining operations have sustained fires and explosions and loss of life?

A Moab, Utah Disaster back in the '60s; they had an explosion which reportedly was caused by methane gas and there was a great loss of life. They were not set up for permissible equipment at the time.

Q Has that occurred also in the case of coal mines?

A Numerous times.

Q Is that the reason why the U.S. Bureau of Mines has very strict regulations pertaining to acceptable equipment in a gaseous mine?

A Yes, sir.

Q Would you have to comply with those strict regulations if methane gas were encountered in the Kerr-McGee potash mine?

A I'm sure we would come under the coal mine regulations which we are not under now.

Q Now, do I understand you would have to replace essentially all of the present equipment that you are using in your underground mine if you encountered methane gas?

A In a general statement, I would say all.

Q What would it cost you to replace that with equipment that could cope with methane gas if this were to result?

A I made an estimate for our mine at present-operating levels and it would approach the \$4,000,000 mark for mine equipment which includes the face equipment, transportation, maintenance vehicles, transformers, motors, and so forth. In addition to that, our mine is not laid out to give separate air splits to the different working areas. That would have to be revamped. We have two shafts located 250-feet apart. One is a 15-foot diameter, the other an 8½-foot diameter, with fans located underground. They would have to be moved to the top and supply enough air for separate splits. We would have to construct a larger shaft to replace the 8½-foot ventilation shaft we have now.

Q Do I understand that that would increase air circulation requirements that would have to be met by an extra shaft if methane gas were encountered in the mine?

A Yes, sir. We could not get the quantity to pass through the two shafts we have at the present time.

Q What would be the cost of an additional shaft for ventilation?

A I'd estimate a shaft at somewhere around \$2,000,000.

Q You said earlier that it would require a shut-

down essentially in your operation during the conversion period?

A Conversion period and in shaft construction time.

Q All right, sir. How long would that take?

A A minimum of two years.

Q Once you got back into operation, sir, would your operations be as efficient with the new equipment as they were with the old?

A No, sir. It is not as efficient because we would have to have secondary ventilation carried closer to the face which is done by plastic cloth lines which direct the air flow or fans with vents on them; it would hinder the movement of our face equipment for hauling ore back to the conveyor heads to get rid of it. That would restrict maintenance where, for example, the cover on a control box on a machine is now held on by possibly two bolts, in a permissible control box it could be up to thirty bolts, which would have to be loosened each time; it would decrease efficiency.

Q Could you give a rough estimate as to the percent of loss of production that would result in that, a ballpark figure?

A Possibly 25 percent, possibly.

Q And from that time forward, would the presence of methane gas pose a continuing risk of some kind of mine disaster or fire explosion assuming these precautions did not prevent them?

A The risk is always there, yes, sir.

Q And at the present time, do I understand you correctly, none of those risks exist?

A No, sir.

Q May I call your attention, please, to the Exhibit H attached to Exhibit 2 which is a report by John T. Boyd Company of the Potash Committee of the New Mexico Mining Association. Are you familiar with that report, sir?

A Yes.

Q Do you agree with the conclusions that are contained within that report?

A I generally agree with the conclusions in the whole report.

Q We move the introduction of Exhibit H which should be No. 14, I guess.

MR. KELLAHIN: If the Commission please, we would strongly object to the introduction of Exhibit H. It is a report prepared by John T. Boyd which reaches numerous conclusions. The Witness has shown no ability to

withstand cross examination on the contents of this Exhibit, and if he did it would take hours to go through it and accurately query him on it. Now, the Exhibit H does not stand alone; it has a number of schedules attached to it such as a schedule showing Total Potash Reserves in the Area, the Area's Mining Depth, the Grade of Ore. These other factors, costs, figures, none of which could be sustained by this Witness. The Exhibit is objectionable.

MR. ROBB: I don't know how long it would take him on his cross examination, but the matters in that report he's already essentially expressed his opinions on to the Commission. I don't think it could take several hours to cross examine because if he is going to cross examine at all, the Witness is here; he has already testified about many of those areas. As far as the Exhibits are concerned, Mr. Porter, we would be glad to eliminate those.

MR. PORTER: We're going to sustain the objection. That portion that's referred to as Exhibit H will not be admitted.

BY MR. ROBB:

Q Mr. Lane, you have testified earlier that in your opinion there are commercial deposits of potash ore under Section 30 and particularly under the 2100-foot-radius

area underlying the Bass No. 2 proposed Federal well.

A Yes, sir.

Q Do you have an opinion as to whether or not the granting of this Application, the drilling of this well will unduly cause a waste of the potash deposits underneath that site?

A Yes, if the potash was mined before the well was drilled, it would be no question. There is always a question after the well is drilled to come back in.

Q Do I understand it is your opinion that there would be undue waste if the well is drilled first?

A Yes, sir.

Q Is that for the reasons you have outlined before, leaving the ore in place?

A Leaving the ore in place.

Q Do you have an opinion as to whether or not permitting the drilling of this gas well before the mining of that area will cause an undue interference with the mining of commercial ore underneath that site?

A There is a good chance that it would, sir.

MR. ROBB: No further questions.

MR. PORTER: Mr. Robb, do you have any more witnesses?

MR. ROBB: No, sir.

MR. PORTER: Then we'll be back at 1:15. The Hearing will recess until 1:15 at which time the Witness will be made available for cross examination.

(Whereupon the Hearing was recessed at approximately 12:00 P.M. and was reconvened at 1:15 P.M.)

MR. PORTER: The Hearing will come to order please. Mr. Lane, would you take the stand? Before we begin our cross examination, Mr. Lane, I would like for Mr. Carr to review the Exhibit numbers to be sure we've gotten them correct as he has written them down here.

MR. CARR: The Commission has admitted the following exhibits offered by Kerr-McGee: Exhibits 4, 5, 6, 7, 8, 8-A, 8-B, 8-C, 8-D, 8-E, 9, 10, 11 and 12, 11 and 12 being portions of Exhibit 2 which was not admitted.

MR. ROBB: That's my understanding, yes, sir.

MR. PORTER: All right. Any questions? Yes, Mr. Attwell?

CROSS EXAMINATION

BY MR. ATTWELL:

Q Mr. Lane, I don't know if my notes on your qualifications are complete, but I believe that I understood

that you are the Superintendent now of the Engineering of Kerr-McGee at Hobbs, New Mexico?

A Superintendent for Mine Engineering, yes.

Q And how long have you been in that position?

A Approximately six months.

Q And before that, what position did you occupy?

A Mine Superintendent.

Q Would it be a fair statement of your experience both with Kerr-McGee and prior thereto to say that your specialty really has been in the operating end in the potash-mining business?

A I have been in the engineering branch of the companies I have been with more times than in the operating end of it.

Q In the engineering part of it; basically what has been your responsibility from just generally speaking?

A Mine plans, geology, exploration, leasing.

Q Do you recommend to Kerr-McGee's management, make recommendations to them to construct drifts?

A That is part of the mine plans, yes.

Q Aren't these recommendations based on economic formalities made by you and your staff, the cost of the drift versus the ore you expect to recover?

A The recommendations are made, our accounting people enter into it; the economics as far as the value of the product; our mill people have to come into it; we get some milling costs tied in with it, so it's a group function. For final acceptance, it has to come from a group.

Q I would accept that, but the analysis that's made by this group is really an analysis of the cost versus the ore reserves to be recorded in the value of that ore reserve?

A Direct-mining costs, we would have most control over, yes.

Q And you analyze the input of these various groups and then they are recommended to your management?

A I'm a part of that group.

Q That in itself is a group decision?

A Right.

Q In your job as Superintendent of Engineering, do you keep up with Kerr-McGee's sales of potash?

A Not as an official duty or anything like that.

Q But do you otherwise?

A I like to keep after it for my own information.

Q Do you do that in order to perform your responsibility to make royalty calculations?

A I don't make royalty calculations.

Q I'm sorry, my notes show that maybe that was one of your functions that I overlooked.

A I provide the figures for the royalty calculations, the extractions, the tons produced, and the content of the tons produced.

Q I see. Again, relating to your qualifications, are you a geologist?

A No, sir, I graduated in mining engineering.

Q I believe my notes show that when you worked for IMC you said you worked as a geologist, but listening to you describe your duties, I thought that maybe they were more in an engineering nature?

A The geology duties in and around the potash mine lend itself more to engineering than it does to the hard-rock geology or uranium or some other field.

Q Now, you mentioned that the Teledyne Company was not active in the area. When did Teledyne shut down its operations?

A I think it was sometime during '73.

Q Would you accept the statement in a press release of June, 1973, announcing the shut-down of that mine?

A I might have given it.

Q Do you know why Teledyne shut the mine down or what the reason they stated for it?

A I couldn't give that reason today, no.

Q Does it refresh your memory if announced that they were shutting it down because it was no longer economic?

A That would have been a possibility.

Q All right. I would like if you would to turn to your Exhibit No. 5; I want to ask you some questions about that Exhibit. Now, looking at the area that has been colored in green, you said that those areas reflect Kerr-McGee's five-year plans at present. Isn't it true that Kerr-McGee had filed a series of five-year plans with this Commission and that these five-year plans change from time to time?

A They do.

Q And that such a change is based on what you encounter in your drilling in additional core-hole data you obtain, isn't that right?

A Would you repeat that question?

Q They're subject to change based on the conditions you encounter in your mining and the data you obtain from additional core-hole drilling?

A On a year-to-year basis, I think it would come

more from conditions in mining and availability of equipment.

Q More so than from the data you obtained from core-hole drilling or from actual mining?

A No, from the actual mining more so than core-hole drilling or from actual mining?

A No, from the actual mining more so than core-hole data.

MR. PORTER: Would the price of the product influence that?

THE WITNESS: It could to some extent. I can't relate a specific case where you made a change just on price change.

BY MR. ATTWELL:

Q Now, you defined this area that has been outlined in red as a probable-ore outline.

A That's correct.

Q Would you tell me what you mean by "probable ore"?

A Probable ore in this case is where we have several drill holes, very wide spacing, but they are adjacent to or near proven-ore bodies, relatively close to actual mining operations.

Q How far away from a core hole which shows economic

ore did you go in this particular Exhibit in projecting probable-ore reserves?

A The distance from the core holes 155, US 141 and F 29, is the general area.

Q Are you telling me, then, that it was those three core holes that were used to define the probable ore outline shown in your Exhibit 5?

A They were the basic holes, yes.

Q Were any other holes used?

A In drawing the K20-foot, yes; there were some holes to the north.

Q I'm speaking just of Exhibit 5, now.

A Yes, sir, on Exhibit 5.

Q Yes.

A Hole 128, 153 helped in the determination of the contour lines.

Q All right, so we got 153, 128 and the three holes you mentioned previously?

A Yes, sir.

Q Now, those five holes are the ones you relied upon to draw this probable-ore outline?

A Probable-ore outline?

Q Yes, sir, this in red shown on Exhibit 5?

A No, sir.

Q Well, what other core holes did you rely on?

A That line was on the southeastern portion of this map in red; it starts approximately at the hole of D 165 which is within our definition of reserves. It goes right along the edge of F 29 which is, I think has a value of 57, which is marginal for a reserve outline but not our mining cut-off data, and passes up around the U.S. Hole, which fits all cases for mineralization.

Q It could be fair to say that what's shown on Exhibit 5 compared to what is shown by your later contour study, which I believe is Exhibit 8, Exhibit 5 relies on a geological entrance which you have shown here?

A The probable-ore outline on Exhibit 5 is, I think, a conservative estimate in my own mind of probable-ore outline.

Q I am having some difficulty, though, in understanding what you mean by probable ore. What percentage change do you think that there will be there within that outline that is economically probable. Do you recommend to your management to make the investment necessary to recover the ore?

A I feel the ore is good enough to go ahead and make

plans for mining. Also, in my own mind, to recommend to our management to obtain leases and sublease agreements to that area and go ahead and make final plans for mining.

Q Let's assume, if you will, that there was no shaft sunk as you already have here in the lower left-hand corner of Exhibit 5 and you were confronted with recommending to your management to make an investment to sink a shaft to obtain potash from the area shown, shall we say, around the Sections 25, 30, 36, and that general area, could you or would you recommend, based on the data available to you, that they make the investment necessary to sink a shaft in order to mine this ore?

MR. ROBB: We object to that as a purely hypothetical, theoretical question. There is a shaft and the testimony has established that there is a shaft, there are underground workings, and it's purely speculation, and we object to it.

MR. ATTWELL: Your Honor, the Witness, of course, is presented as an expert and, of course, proper cross examination always asks a witness theoretical or abstract or hypothetical questions. This question, of course, is asked to test his recommendation here, particularly the reliance upon what we consider to be very widely scattered data and

I think that a very true test of that would be whether this man would recommend to his management that they make a major investment right here if he thinks there's sure enough of this potash here regardless of what may be over here on the lower left-hand side of the map.

MR. ROBB: What we object to is that he is asking the Witness to ignore the facts as they exist in this case; that there is a shaft and mine workings already there. It is not an accurate statement and it proves nothing.

MR. ATTWELL: Mr. Porter, I may be able to put another element into the hypothetical question that would take care of the objection that has been lodged, and that is if he would also assume that some geological condition occurred and developed that made it impossible to extend any further tunnels from the major shaft that now exists in order to get this potash out at these sections.

MR. ROBB: Well, that just compounds the problem. He is to assume things that are simply not in evidence. That's not the case we have before us and I don't see how it can help assist the Commission in any way to assume a state of facts that are false.

MR. PORTER: The Commission will sustain the objection.

MR. ATTWELL: All right. I'm really just trying to search for a more accurate definition, your Honor, of "probable ore." I find it is kind of elusive, at least in my own mind.

MR. PORTER: We understood your reasoning.

BY MR. ATTWELL:

Q I think that I asked this question before, but I don't believe it was answered. How far from any core hole have you projected economically-recoverable reserves which you classify as probable-ore reserve on Exhibit 5?

MR. ROBB: I think he answered that and said that he considered the area directly underneath the hole to be in that category.

MR. ATTWELL: Well, let me ask him, how far out from the hole he would go in classifying ore reserves as probable-ore reserves as he has used that term?

MR. PORTER: Do you feel that you can answer that question, Mr. Lane? Would you restate the question?

BY MR. ATTWELL:

Q All right. Let's say you can identify the core holes to rely on. How far out from those core holes, in your opinion, would you go in classifying ore reserves as probable-ore reserve if you had used that term; would

you go 1500 feet, 5000 feet; what is the limit?

A I classified all the area between these holes and under Section 30 as probable ore.

Q That still doesn't answer the question. How far out from the various holes, that you said you relied upon to draw this red line, did you go in projecting probable-ore reserves, as you'd use that term?

A For the red line?

Q Yes.

A As I stated before, I showed the red line at D 165, at F 29 encircling to the right of US 141.

Q I believe you said you had relied upon this hole No. 105 that appears in Section 23?

A I didn't say that.

Q You do not allow that hole?

A No, sir.

Q You did not rely upon 105 in determining the general red outline as shown on Exhibit 5?

A Are you talking about the other red line outlined now going through Section 23?

Q Yes, I am.

A I took that into consideration, yes.

Q How far out from 0105 did you project probable

reserves?

A In this case here it's slightly over 2000 feet.

Q Is that the maximum distance you think it can be extended out from any hole for purposes of determining probable reserves as you have used that term?

A No.

Q Do you think it can go beyond that?

A In certain areas it could.

Q Just kind of a subjective judgment in each case?

A You have to use your knowledge of the area and the ore zone itself, yes, and other related holes.

Q Again, look at Exhibit 5, I notice you got a white area that's shown in it, well, it's really in the, kind of in the southeast corner of Section 34, and, of course, over into Section 33. See that white area that I'm referring to? It's Range 33 written across there.

A Right.

Q Why is that area left white?

A That area didn't come into our five-year mine plan. That is boring-machine area, and we wouldn't have machines available to mine it within this five-year period.

Q Only because of a lack of machinery?

A Yes, sir. Lack of need for it.

Q You say "lack of need"?

A It's not required to produce ore during this period.

Q What are your requirements during that period?

A Pardon?

Q What are your requirements during this period?

A Approximately 3,000,000 tons per year.

Q Now, isn't it true, Mr. Lane, that Kerr-McGee has committed to this Commission and to the United States Government a map that has been previously marked as Belco Exhibit 21?

A Yes, sir.

Q Did you prepare the map or was it prepared under your supervision and direction?

A Under my supervision.

Q Was Exhibit 5 prepared by you or was it prepared under your supervision and direction?

A Under my supervision and direction.

Q So someone else actually located the red lines that are shown there?

A As a group, yes.

Q A group working under your supervision, okay, but you didn't do it yourself?

A Not personally.

Q I notice that the outline has changed from Exhibit 21 to your Exhibit 5, it's a slightly thicker line, shall we say.

A Could I have a copy of the Exhibit, please?

MR. ROBB: You want the one of the right side?

THE WITNESS: I have the small one.

MR. ATTWELL: It will be easier for him to see.

MR. ROBB: The broad red line that marks the outline seems to be missing on your Exhibit, so your's doesn't have that.

BY MR. ATTWELL:

Q And what I'm suggesting is that the outer nature of Exhibit 5 the red line has been extended from that which you previously submitted to this Commission?

A Just in thickness?

Q Yes.

A Inward?

Q Well, just look at the circle that you drew around the proposed location of the Bass Federal No. 2. See where your line cuts off of part of that circle on the

Exhibit 21?

A Yes, sir.

Q You see on Exhibit 5 you've just drawn it right there so it covers it all, isn't that right?

A Yes, sir.

Q Are you responsible for that change?

A I wouldn't call it a change. When the original of your Exhibit 21 was made, it was made for just internal information and no extra pains were taken in establishing that.

Q Well, it was submitted over to this Commission and the U.S. Government, wasn't it?

A Yes, but I did not submit it.

Q Did an official of Kerr-McGee submit it?

A Yes, sir.

Q Did you recommend that it not be submitted?

A No, sir, I did not recommend it to be submitted or not be submitted.

Q Let's turn if you will now to your Exhibit No. 6. If I understand it, the second page of this Exhibit shows the present actual workings of the Kerr-McGee mine?

A It shows the mine workings of January 1st, '71.

Q Yes. Now, I know that you said that there is a

major--I call them tunnels; I don't know what their proper name really is -- extending down directly south; do you all have leases in that area?

A Yes, we have leases in the south portion of 21 South.

Q And I presume that you have suggested that as being an economic-core area like you're extending on down?

A A portion of it, yes.

MR. ROBB: Can I ask what the purpose of this is? That's completely removed from the -- going in the opposite direction from Bass No. 2.

MR. ATTWELL: It seems to be one of the points I'm trying to make, Mr. Robb, is that the angle of your tunnel there seems to be south and one to the southeast. All of a sudden we come up in this proceeding, and we have a finger shot right down at us. That's the protest that's lodged in this proceeding.

MR. ROBB: That's your --

MR. ATTWELL: (Interrupting) That's my interpretation. That's why I'm asking questions about it.

MR. ROBB: Go ahead.

BY MR. ATTWELL:

Q There's another major tunnel, if I may, going

down to the southeast there, isn't there?

A Yes, sir.

Q And those are in your actual tunnel workings. Turning over to, well staying at the same place, is it correct that this is the full extent of your workings over a period of nine years, ten years?

A Since start of operations, yes, sir.

Q When was that?

A October of '65.

Q Now, let's turn to your Exhibit 7 which is your cross section. What is the approximate distance between all of the core holes shown on here except US 141? It looks to me like they're about the same.

A The distance from F 50 to which core test?

Q Start with K03 and then the distance from K03 to the upper left mill, they look to me to be about the same; excuse me, I'm reading this plat backward.

A It would be slightly over 4000 feet each.

Q And then I believe that you testified in connection with another exhibit, you jump between I 155 and US 141 to approximately -- according to my notes -- 12,000 feet, is that correct?

A That is correct.

Q Does Exhibit 7 show that we're going down dip as far as potash is concerned?

A Yes, sir.

Q By the way, I believe earlier in your testimony you stated that Kerr-McGee had been active in foreign leases in this area since it came in there in about 1965; do you recall that testimony?

A Yes, sir.

Q I believe that you gave us an example of leases you acquired in 1970 and 1973. Isn't it true that basically all leases that you have in the area were acquired, well let's say, at least five or six years ago?

A Basically, yes.

Q What would you estimate to be the leases that you have acquired in the last five or six years, additional leases?

A Acreage or what?

Q Well just in acreage?

A Actually acquired, we obtained sublease on Section 36 of 2130, it's a State Section. We have obtained a Federal lease on the southeast quarter of Section 30 of 20 South, 32 East. We have a lease application pending on Section 25 of 2031.

Q Is it then Kerr-McGee's common practice and policy to consider leasing policy when it saw a lease which it thought was economic, that it would try to get the lease?

A Would you restate that again, please?

Q Well, would you state it's Kerr-McGee's common practice and policy in this area when it saw a lease that appeared to be economically attractive to it from a potash standpoint, to try to get the lease?

A It hasn't been that policy. We have gone ahead and obtained leases. As we approached the area, we might try to obtain the lease on.

Q How far away were you generally when you tried to get these leases?

A In the lease on Section 30 of 2032 negotiations started for that lease when we were within a half a mile of it. At the signing of the lease, we were within 50 feet of it, waiting to go in.

Q That has been generally your policy, to wait until you're that close?

A Very close, yes, sir.

Q Let me, again, ask you to look at Exhibit 7. What is the "insol," and I believe that's your term.

A Insol, yes, sir.

Q Insol content of core hole 141?

A I may have that data and I may not. Reading from the log of core test 141, water insolubles for bed No. 1 is 1.94 percent.

Q Does that complete your answer?

A Yes, sir.

Q And what is the insol content of core hole No. 155, nearest one to 141?

A At the ten-foot height, reading from the log of 155, water insolubles 2.99 percent.

Q The reason I asked these questions is, in your earlier testimony, you said that when you mine, you don't give first and second mining because of the insol content of the ore?

A Yes, that is part of it, yes.

Q These two core holes don't show that high percentage of insol content, I presume?

A Looking at core test 155 and on the second sheet of that which is Exhibit 8-C, the high insolubles are still present from the lower member of the 10th ore zone.

Q Do you think insofar as that particular core hole is concerned that would preclude you from doing first

and second mining?

A That does weaken the remaining pillar that you have to leave.

Q Certainly as far as core hole 141 is concerned you have no problem?

A I don't have from the log or Exhibit 11-A; the analysis sheet is not broken down the same as for core hole 155. I do not know the location of the water insoluble.

Q I thought you just gave me an insol factor a minute ago?

A Yes, this is for the total height.

Q I see. Average, so you just don't have the necessary data for that core hole?

A No, I don't.

Q Let me ask you now to turn to your Exhibit No. 8. Now, am I correct that you used the contour map that's shown on Exhibit 8 to prepare one of your subsequent computations which I believe is shown in Exhibit 18?

A Yes, sir.

Q Was Exhibit 18 prepared by you personally?

A Under my direction and supervision, yes.

Q But was it prepared by you personally?

A No, sir.

Q It was prepared by some member of your staff or members? Who actually drew this contour line that is shown in Exhibit 8?

A An engineer by the name of William Henderson.

Q William Henderson?

A Yes.

Q Now, could you state for the record the core holes that were used to define that contour that is shown on Exhibit 8?

A We've got contours in the uranium dispute.

Q I didn't want all the contours.

A All the contours?

Q Yes.

A Starting up in the northwest corner with the highest value, 160 contour, hole 105; going across to the east hole 128, hole 153, another hole to the north of that one mile would be F 27, hole 155, hole 141, hole 10, hole 110, hole F 29, hole 113, 109 and D 165.

Q Let me ask you, Mr. Lane, are you aware that there is a core hole for which the data is available and which we have and you have where USP 127 that is located in the lower southeast quarter of Section 18?

A No, I am not aware of it.

Q Southwest, excuse me, I'm sorry.

A No, sir, I am not aware of it.

Q So that that did not enter into the computation of the contour shown here?

A No, sir.

Q It did not enter into it?

A No, it did not enter into it. According to this map, it did not enter into it.

Q What about core hole USP 129 which is, I believe, also in Section 18? I believe it's in the northeast quarter of Section 18. I think I said core hole 129; that should be 139, I misspoke.

A Whose hole is that?

Q United States Potash Company, I presume; its identified as USP.

A I don't think I have that logged.

Q Let me ask you regardless of whether you have the log or not, whether or not that core hole was taken into consideration to contours which you have plotted here on Exhibit 8?

A I would have to say "no" to that because it's not on this map.

Q So the holes that you have enumerated are the only

holes that influenced the contour that is shown on Exhibit 8?

A I think that's correct, yes.

Q Looking back for a moment at one of the earlier exhibits, I believe it is Exhibit 6, the second page shows your present workings. Tell me what the average depth of those workings is, the average potash.

A Average?

Q Yes, Approximately.

A 1600 feet at our shaft; 1550 feet up in the northwest, and we should be approaching approximately 1800 to the east, 17 to 18.

Q Do you still have a copy of Belco's Exhibit No. 21 up there with you, Mr. Lane?

A Yes, sir.

Q Would you focus on Exhibit for me on Section 33? There's a dotted line that appears there. What does that mean or what is the significance of that dotted line?

A This outline is the ore outline; that's in Section 33 of 32 East.

Q Yes, I believe that is correct. Isn't there is a core hole in the middle of that Section?

A Yes, sir.

Q What is the distance between that core hole and the dotted line?

A I don't know what scale you made this map to.

MR. TRUJILLO: What section were you talking about; what section is that?

MR. ATTWELL: 33. I think you have your legal map up there and you're having problems with it. It's this Section right here.

MR. TRUJILLO: Thank you.

BY MR. ATTWELL:

Q Are you unable to scale that off?

A No, I haven't.

Q Would you accept that as checked as approximately 1500 feet?

A Or slightly more.

Q Plus or minus?

A Plus or minus.

Q 50 feet maybe?

A A hundred.

Q All right. Looking over to Section 35 in the upper right-hand corner of that Section, I notice that there is another dashed or dotted line; what's the significance of

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that line?

A In the northeast corner of Section 35?

Q Yes.

A Surrounding hole 114?

Q Yes, I had difficulty reading that number, but I believe that's correct.

A 114 is a hole containing carnallite, and for what this base map was made for, it was delineated out.

Q What was the base map made for?

A Study of ore reserve and mine plans.

Q Exhibit 21 is a copy of the ore-reserve map made by Kerr-McGee in your department?

A It was used as a base map, yes, for working.

Q And the dotted line in that Exhibit in Section 33 shows the limit, and then we just went on Section 35, and I presume that just shows there is no economically-recoverable potash in the area encompassed by the guideline there?

A For reserve purposes, we are not using it that way, but it still is within the mining plan.

Q All right. Does the shape there in the Exhibit in Section 35 of the dotted line indicate that a Polygonal Method was used?

A No, sir. If it is five-sided, I would agree to that but on that method we would split the distance between the surrounding holes, and I don't think you will find that it bisects the difference between there. It's not half way. I don't see any hole to the east of 114 to take and control lines which would come into lease line or lease boundary.

Q What method was used there on Exhibit 21?

A I think we were using straight K20 value, similar to K20-feet.

Q You say K20 value; would you explain what you mean when you say you were using "straight-K20 value" which is similar to K20-feet?

A I'm going by memory now to the K20 values for 114. I think it is around 9 percent.

Q According to our figures it is 9.9 percent.

A 9.9?

Q And I am referring to the Exhibit which was put into this proceeding by Mr. Warnock, Exhibit 19.

A Then we have a test hole to the south which is 110, which I show from Exhibit 8, to contain 4 feet 3 of 193 K20. I believe the line that is drawn between those two holes would approximate 14 percent.

Q It looks about equal distance. Let me see if I

understand what you have just said. Looking at hole 114 you got a certain K20 grade and in looking at, I believe, it says 9.9 and if you look at the K20 grade of hole 110, it said 19 approximately, and if you add the two of them up and divide by two you get what, 14.4 or something; is that what you said?

A 14.0.

Q 14.0?

A Someplace close to that from looking at this map.

Q What is the significance of 14.0?

A For reserve work we use four-and-a-half feet, 14 percent cut-off.

Q What that means is that method of evaluation, which obviously is used by Kerr-McGee, is that everything inside the dashed line then would be below 14 percent in ore-grade value?

A You would have to assume it, yes.

Q And that's what you have done here for the purposes of this Exhibit?

A Purpose of ore-reserve work, yes.

Q You said in response to a question which was put to you in direct examination about core holes on Exhibit 7 that contain commercial mineralizations. What do you mean

by "commercial mineralizations"; is that your 63 percent-foot, that they had at least that?

A We have a mining cut-off, $4\frac{1}{2}$ at 11 percent, so we would not mine 11 percent if it wasn't commercial also.

Q Well, as I understand it for reserve-estimating purposes?

A 14 percent reserves.

Q You used a 63-foot percent factor as your cut-off?

A That is correct.

Q Now, again referring to Exhibit 7 you also testified that this indicated to you it is probably -- that's your words -- a continuous-ore body here. I presume that what you're doing is extrapolating right down the line from the different core-hole zone there including the 1200-foot distance between I 55 and US 141 in making that statement?

A Yes, sir.

Q Let's turn, if you will, to your Exhibit 8-B which you said a few minutes ago was based upon the contours made there in Exhibit 8. All right, let me ask you if this calculation of value is determined, as well as your other calculation of value, is based on the assumption that Kerr-McGee would be unable to second mine within a 2100-foot radius of the Bass Federal No. 2 well; in addition to that assumption,

of course, there would be no mining of any kind within 150 feet of the well bore?

A In this calculation, we did it both ways: Normal mine plan and with no second mining.

Q But the net result though that you come up with of the sales value that you claim is lost is predicated on the assumption there could be no second mining?

A That is true.

Q I beg your pardon; within a 2100-foot radius?

A 2100-foot radius.

Q Isn't it true that the testimony that you have given that there can't be second mining within a 2100-foot radius is based on the assumption that subsidence might shear the well bore and gas escape?

A Yes, sir.

Q But if we will assume that no gas will escape even if the well bore is sheared, can second mine, isn't that right?

MR. ROBB: Just a moment. Are you going to guarantee us that there will be no --

MR. ATTWELL: (Interrupting) I'm going on the evidence in this record, the only evidence in this record, because our witness has said that no gas will

escape if R-111 is complied with.

MR. ROBB: Are you going to give us that guarantee?

MR. ATTWELL: I'm not giving any guarantees, and you know it Mr. Robb.

MR. ROBB: All right, will you give us a bond to protect us against the loss of life and the loss of this mine and injured mining profits from now on?

MR. ATTWELL: Mr. Robb, I have asked the Witness a question, and I think I am entitled to an answer. It is a perfectly proper question. This case is to be decided on evidence.

MR. ROBB: That's right, it sure is.

THE WITNESS: Would you repeat your question?

BY MR. ATTWELL:

Q If you assume that no gas will escape from Bass No. 2 even if the well is sheared, then there is no reason you can't second mine it?

A I would not make that assumption.

Q All right. I'm not saying you would make that assumption, but if you did make that assumption.

A I would not make the assumption.

Q You just refuse to make that assumption?

A Yes, sir.

Q You have used a 35-percent-recovery factor on first mining; I'm not quite certain that my notes correctly reflect the reason for that. According to my notes, you told Mr. Robb that you didn't believe that there could be any greater recovery than that?

A That is correct.

Q That's subject to a plus-or-minus factor?

A No, that would be the top figure.

Q I see. That's as high as you think you could go the first go around, but if you could go in and second mine, you could get a lot more, couldn't you; in fact, you've shown you could get up to 28 percent?

A Yes, sir.

Q Now, in your calculations you have used a price of \$33.89 per ton, is that correct?

A Yes, sir.

Q And that's based, I believe, is it not, on your Exhibit No. 9?

A Yes, sir.

Q You said that Kerr-McGee was actually selling potash at prices shown on Exhibit 9 to the best of your knowledge?

A That's correct.

Q How much potash has Kerr-McGee sold at this price?

A I couldn't answer that question. That schedule has been in effect since the First of January, but I don't know if there was any sold before or not.

Q Do you know how much has been sold since the First of January?

A No, I do not.

Q Do you know if any has been sold since the First of January at this price?

A Yes, sir, to the best of my knowledge.

Q Do you know how much?

A Since the First of January, we have sold approximately all of our production since that date.

Q At what price?

A To the best of my knowledge, we have got posted price.

Q How much of your production is sold under long-term contracts with fixed prices?

A I do not know.

Q It could be 95 percent, couldn't it?

A I do not know.

Q I see. Those contracts could provide for a price of \$.21, couldn't it?

A I do not know.

Q Does Kerr-McGee have other price schedules for sale of potash for longer terms and on a spot basis?

A Not to my knowledge.

Q They have no other price scale than Exhibit 9?

A Not published at this time so far as I know.

Q They sell no potash under any other price schedule that you know of?

A Not that I know of.

Q Prior to this price schedule becoming effective, what was the price in effect?

A I do not have that schedule with me.

Q Do you have information available what the price level was from the years preceeding January 1, 1974; don't you know whether it was below a \$20 figure, maybe \$24 per ton?

A There is one figure here available here in front of the Commission and here at the hearing, and that was on the sheet that was attached to the, I guess the original of Exhibit 21.

Q That was that \$24 figure that Mr. Robb made the dramatic apology about this morning, was it not?

A Yes.

Q Who put that \$24-figure on that sheet?

A That is a figure I received from Oklahoma City, and it is a figure which was received about one year ago.

Q But you prepared that part of that study?

A Yes, sir.

Q But you did not prepare the map, as I understand it, and you were not responsible for sending this to the USGS?

A No, sir.

Q Isn't the major production of potash in the Western Hemisphere and in Canada, would you know that to be a fact, overwhelming deposits of that?

A Would you repeat that; I'm sorry?

Q Isn't the major volume of potash that is produced in the Western Hemisphere produced in Canada, produced in North America?

A I think they produce over 50 percent, yes; if you call it major.

Q It produces over 70 percent or you just don't know?

A I wouldn't make a statement to it.

Q Do you know if potash production is now being prorated in Canada, held down?

A I hear it is, yes.

Q Substantially prorated isn't it, below capacity; you know that to be a fact, don't you?

Q I know it is prorated. To what percent today, I do not know.

Q What are prices for Canadian potash?

A I do not know.

Q Now, on Exhibit 8-B and I guess also on 8-E, you come up with what you call a sales value. In one instance you showed some 15,000,000-odd dollars and in the other \$16,000,000?

A Yes, sir.

Q Isn't it true that that is the gross revenue that Kerr-McGee would receive from the sale of potash if it was able to sell it at \$33.89 a ton?

A That would be gross revenue from the area in question, yes.

Q Based on the assumption that you made about the inability to second mine that radius of 2100 feet?

A As so stated on the Exhibit.

Q What would be the cost of mining this potash?

A This potash?

Q This potash. How many tons is it that's going

to be lost, according to you, 453,663?

A I don't know what it will be when we mine that potash, no.

Q Cost just doesn't even enter into your determination?

A Not in this, no.

Q Does it enter into your determination of what is economically feasible, whether or not this reserve is economically -- I repeat -- feasible reserve to be recorded?

A It will when the study is completed, yes.

Q The study hasn't been completed yet, has it?

A No, sir.

Q So you don't know whether it would be economic to recover this?

A In my opinion it is.

Q But you don't know for sure until you finish the study as to what the cost will be. Kerr-McGee is not an eleemosynary institution, is it?

A I would say that the economics in today's conditions.

Q You mean at the price of \$33.89 a ton?

A Yes, sir.

Q You are in the process of making a cost estimate, though of what it is going to cost to drill down 2100 feet

for potash, aren't you?

A Mining at 2100?

Q Yes.

A We have --

Q (Interrupting) That's where this potash is?

A Yes.

Q How far away from the mine shaft is it, about 7 miles?

A Six I think would be closer than 7.

Q All right. Would you agree, though, that the further away from the mine shaft you get, the higher the cost, and the deeper you get, the higher the cost of production; do you agree with that as a mining engineer?

A Distance has a larger effect than depth.

Q But they're both factors in increasing your cost, aren't they?

A Slightly.

Q I want to make sure I understand the record is clear on this: That you did not know and have not yet finished preparation of cost figures showing what it would cost to produce the potash which you say will be lost as shown on your Exhibit 8-D and 8-E?

A That is correct.

Q Do you consider such cost information private?

A Yes, sir.

Q So that if Mr. Warnock of Belco had asked you for your cost information, you would have given it to him?

A I wouldn't. I would refer him to our home office.

Q Do you know what your home office would do?

A I'm not sure?

Q You don't have a policy on this matter, a corporate policy?

A It depends what the needs of the figures might be.

Q I see. Let me ask you to look at Exhibit 8-E.

A E?

Q Yes. Is that Exhibit calculated on what you call the "triangular method"?

A Yes, sir.

Q Is it true that you were using Triangular Method strictly in the area of the radius around the Bass Federal No. 2 Well, it's cut-off by the line between F 29 and US 141 would be omitted in your calculations?

A No, sir.

Q It would not?

A No, sir.

Q That's your understanding of the Triangular

Method; how you applied it here in any event?

A The way I applied it here, yes, sir.

Q In your five-year projection -- I'm looking for the best of your exhibits here -- going back to Exhibit 5, you've got the five-year projection colored in green, and then I understood your testimony the lines that are the blue lines that go out are projections for a period beyond that time, is that right?

A Yes, sir.

Q And you show there is a tunnel -- as I call it -- coming on down to penetrate the 2100-foot radius around the Bass Well location, see that?

A Yes, sir.

Q You are aware that that would cross a substantial amount of fee land?

A Yes, sir.

Q And you think you could get a potash lease on that?

A I think we could, sir.

Q At least you made an assumption as you did in your five-year plan?

A Yes, sir.

Q I think you also made the assumption, have you

not, that you can get a potash lease on the tract with the well on it that are going to be drilled as the tract is not now subject to lease?

A The tract is subject to lease.

Q Is subject to potash lease?

A Yes, sir.

Q That's your understanding?

A It is on the east half of Section 30, subject to competitive bidding for lease.

Q Well, let's see where we stand. Where the well is supposed to be located, is that subject to lease?

A Yes, sir, to the best of my knowledge it is.

Q I see, and then the tract right next door to that, is that now subject to potash lease, I'm not talking about oil and gas lease?

A The tract to which side?

Q I guess it would be to the east; no, it would be to the west, excuse me, I'm sorry.

A The State land to the west?

Q Yes.

A We feel sure that we would get a sublease from Teledyne on that piece of State land.

Q But who has a potash lease, then, on the tract

where the well to be located is adjacent to Teledyne; does anybody presently have a potash lease on that?

A On the east half of the east half of 30?

Q Yes.

A No, sir. They don't.

Q That's where the well is to be located?

A Yes, sir.

Q And you assume that Kerr-McGee could get such a lease?

A I do.

Q And of course such a lease would be subject to competitive bidding by anybody else that wanted to try to get it?

A That's correct.

Q There is no guarantee that Kerr-McGee could get that lease or that they could get a lease on the fee tract, isn't that correct?

A You can say that, yes.

Q Has Kerr-McGee ever heretofore tried to get a lease on that tract where the well is to be located?

A Not to my knowledge.

Q In your opinion, one of the reasons that you feel that there is potash under this well location is because of

the test data shown in US 141 hole which is shown as that the potash hole test hole in Section 29?

A In conjunction with holes 155, 29, yes.

Q Would you say that US 141 had a major influence on your opinion? It had a pretty good 80-percent factor, didn't it?

A Approximately 90, yes.

Q A lot better than F 29, wasn't it?

A Better than F 29, yes.

Q In fact, when was that core hole drilled, that 141?

A I believe one of your exhibits shows that if I can find it here. Yes, 8-A shows it. 141 was drilled in September and October of 1954.

Q How long has this data been available to Kerr-McGee?

A Since last spring.

Q That's the first time you saw this?

A The first time I saw 141 test-well data.

Q Have you ever tried to get data on this test well before?

A Not to my knowledge.

Q When you say "last spring," you mean last March

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Page.....

or April, 1973?

A In the spring of 1973, yes.

Q They didn't know the results of that core data until then? No one that you know of at Kerr-McGee had that knowledge?

A Not to my knowledge.

Q Since they attained that data, has Kerr-McGee made any effort to lease that tract on which the well is to be drilled?

A No, sir.

Q Let me ask you some questions about your testimony on subsidence: You're going to have to educate me because I'm really not an expert like you are in the mining field.

Is it correct that subsidence occurs after second mining, is that what happens?

A Subsidence will occur after second mining, yes.

Q And subsidence occurs as the result of the mining regardless of whether there is any oil or gas well present?

A Would you repeat your question, please?

Q Subsidence occurs because of the mining, regardless of whether there is any oil or gas well present?

A I would assume that, yes.

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Q It's your opinion, if I correctly understood your testimony, that if more than 35 percent of the ore is extracted in the first mining that some subsidence will occur?

A Some subsidence may occur, yes, sir.

Q "May occur"?

A Yes, sir.

Q It may not occur, too?

A I do not know. It is my thinking that would be about the highest abstraction we could go.

Q Without having some subsidence possible?

A Possible.

Q Now, you gave some testimony about some oil seepages. Do you recall that?

A Yes, sir.

Q Do you know whether any of the sources of any of those oil seepages was from oil wells?

A I couldn't say for sure they were.

Q You don't know?

A No, I don't.

Q Do you know if the wells within the vicinity were operating and producing wells or whether they had been plugged?

A I couldn't say for sure.

Q Therefore, you don't know whether they were plugged in accordance with the stipulations that are contained in Order R-111 regarding production?

A No, sir.

Q You testified that if methane gas escaped it could migrate along the mud seams shown, I believe, on Exhibit 7, which is your cross section?

A Yes, sir.

Q Do you recall that?

A Yes, sir.

Q It makes sense, does it not, that if the gas would escape, that there is gas to migrate?

A That would be assumed, yes, that there would be gas.

Q Of course, if the testimony in this record shows that no gas would escape even if there was a shearing of the well, there would be no gas?

A I can't make that assumption.

Q Mr. Lane, you stated in conclusion, I believe, a couple of questions that I thought came very close to being matters of law. In any event, did I understand that you said that you thought there was commercial deposits of potash

ore under Section 30, and in your opinion the drilling of a well there for potash mining would duly waste potash?

A I think that is a fair summary of what was said.

Q Is it true that this opinion of yours is based on the assumption that you would not be able to second mine within a 2100-foot radius of the well bore?

A Our calculations indicate that, yes.

Q And in your calculation of commercial deposits you considered only the value of the ore that would be extracted at that \$33-plus-dollar-per-ton price, and did not consider the cost of mining potash?

A Commercial mineralization, yes.

Q I was correct in my statement, is that what you're saying?

A Repeat your statement?

Q That in your use of the term commercial deposits, commercial mineralization, you are not considering the cost of mining potash?

A No, sir.

Q You are not considering it?

A Not considering it at that time.

MR. ATTWELL: Thank you Mr. Porter. No further questions.

MR. PORTER: Does anyone else have any questions of this witness? Mr. Robb, do you have anything further?

MR. ROBB: I may have a little redirect. I wonder if we could have a five-minute recess, it may not be necessary.

(Whereupon, a short recess was had.)

MR. PORTER: The meeting will come to order, please. I believe Mr. Robb indicated he might have some redirect.

MR. ROBB: Yes, I just have a few questions.

REDIRECT EXAMINATION

BY MR. ROBB:

Q Mr. Lane, in my direct examination you indicated repeatedly that in your opinion there was economic-recoverable-commercial-ore body under Section 30, specifically under the Bass Federal No. 2 proposed location?

A Yes, sir.

Q And on cross examination you were asked whether or not you had made any cost study of mining costs in this area, and you indicated you had not. Would you please explain to the Commission what you mean by that?

A I made no direct cost estimates or studies of

the area in question. We have completed some cost studies of areas which are approximately five or a little bit over five miles away from the shaft, and from that study I feel that this area here, which is slightly further than that, would still fall within that study range.

Q Are you familiar generally with mining costs based upon your experience in this area?

A Yes, sir.

Q And in the calculation of an economic-ore body or I guess actually a commercial-ore body is an economic body, is it not?

A It should be.

Q That's a definition of a commercial-ore body; that's one where the ore is economically recoverable?

A Correct.

Q Okay. In giving your opinion concerning ore reserves, and the fact that this is a commercial-ore body, did you take into consideration, generally speaking, of the general cost information you have in this area?

A Yes.

Q You did not totally ignore costs, did you?

A No, not at all.

Q When you get ready to mine this area, Mr. Lane,

will you then make a detailed cost study?

A Yes, sir.

Q And was it that kind of cost study that you were referring to in your testimony in cross examination?

A A detailed one, yes, that is correct.

Q For purposes of making ore-reserve calculations normally, do you make that kind of detailed cost study of the kind that you make when you are about to mine?

A Not that complete, no.

Q Now, you were asked whether or not there was any guarantee whether you could get the fee land and the Federal leases that were in the immediate vicinity of this well, do you recall that?

A Yes, sir.

Q All right, sir, and I believe you said no there was no guarantee?

A That is correct.

Q You testified under direct examination that because of your existing workings in the area that Kerr-McGee was the only mining company that you felt could economically extract the ore in this area, is that right?

A I did.

Q Was that the reason why you stated that you

believed that you could get those two leases?

A That is correct.

Q You were asked about subsidence. If you mine more than 35 percent of the ore under the proposed-well location, will you tell the Commission whether or not, in your opinion, if more than 35 percent is mined, there will be subsidence in this area of the kind you described on direct examination?

A I feel subsidence would start at 35 percent, possibly less.

Q All right. And if you mined up to the 80 percent, that's normal and customary in this area, would you expect to encounter the kind of subsidence that you testified on direct examination?

A Yes, sir.

Q You were asked about the three particular holes that made up the triangle in this case that you testified to extensively under direct examination, do you recall that?

A Yes, sir.

Q And you were asked about whether or not those were the only holes that you used in making calculations?

A Yes, sir, I remember that.

Q On direct examination, you had testified that in making a determination with regard to probable ore, you used

those three holes coupled with the fact that there was a proven-ore body within less than a mile away to the west?

A Yes, sir.

Q And of the fact that you had achieved mining experience in the area showing a reasonable continuity of the lower-ore member of the 10th horizon?

A Yes, sir.

MR. ATTWELL: Your Honor, I think that counsel's leading of the Witness is in error. I know we're trying to hurry up.

MR. ROBB: We really are, sir, yes.

MR. ATTWELL: I appreciate that, but I still think the witness is testifying, not Mr. Robb.

BY MR. ROBB:

Q Let me ask you, Mr. Lane, is your testimony based upon a probable-ore reserve underneath that Bass No. 2 site based solely on those three holes or is it based on some of those other factors also that you testified about this morning?

A All calculations were based on those three holes. The delineation of the K20-foot line was influenced in part by other holes in the general area and its, from past experience of mining and the other holes in the area, and from

personal experience and I made that statement.

Q Was it influenced to any extent by the fact that you have the proven-ore body less than a mile away?

A Sure.

MR. ROBB: That's all.

MR. PORTER: Mr. Attwell, do you have any further questions?

REXCROSS EXAMINATION

BY MR. ATTWELL:

Q You are making a mining cost study for this area now; you testified that it's being prepared, didn't you?

A Not the complete detailed one, no.

Q But you're making a cost study of this area, you testified.

A We made some estimates, yes.

Q They have not been completed yet, have they?

A Not been completed, no, sir.

Q In the cost study of five miles away for a different part of your operations, what depth is that?

A The depth in that area would be 1500 feet. As stated before, depth does not have too much of a part on cost study.

LANE-RECROSS

Q As to subsidence, it occurred after second mining occurs, is that right?

A I can't use that term here. We advance and retreat right now.

Q Well --

A (Interrupting) The major subsidence will occur after second mining of high percentage extractions, yes, sir.

Q As far as danger is concerned, that's when it really is, after second mining, isn't that right?

A That's when you're hardest hit with dangers, yes.

Q That is what you had in mind so far as danger is concerned?

A This may be a reason, yes.

MR. ATTWELL: No further questions.

MR. PORTER: Does anyone else have a question of this Witness?

BY MR. NUTTER:

Q Mr. Lane, on your Exhibit No. 5, over here on Section 30 on the west side, according to the legend that is mined out and I can't read that light-fine writing, who mined that out?

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A The west half of Section 30 of 2032 was mined out by National Potash.

Q National Potash Mine comes all the way down here, then? Okay, thank you.

MR. PORTER: Any further questions? The Witness may be excused. Any further testimony, Mr. Robb?

MR. ROBB: We may have some further testimony at this time.

MR. PORTER: What do you have in mind?

MR. ROBB: Offering some of the testimony that occurred in the Phillips-IMC Hearing. At that hearing the Commission took notice of some of the early proceedings the testimony it had, and at this time I am calling attention to the Commission -- this is case No. 4906 involving the Phillips Petroleum Company -- the Hearing was held here on February 21, 1973. I offer in evidence, at this time, that portion of the transcript, pages 125 to 147, inclusive, and 178 to 194 inclusive.

MR. PORTER: What were those last pages?

MR. ROBB: 125 to 147. I'm sorry, that was the first one. The second one was 178 to 194.

MR. KELLAHIN: If the Commission please, we object to the Commission incorporating Phillips' records or

any portion of it into the record in this case for the reason that involved an entirely different hearing, a different type of ore, different parties, and different witnesses, and it has no bearing whatever on the matters before the Commission at this time.

MR. ROBB: All that goes to is the weight to be given the evidence. It does not say it's not admissible. The portions of the testimony and I'm quoting: "Our testimony that was given by John Boyd of that hearing and the testimony given by Roy Williamson, testimony fully given, and fully cross examined by the same attorney, Mr. Kellahin, in that proceeding is part of the official proceedings of this Commission of which this Commission has undoubted power to take judicial notice that at this time we offer that in evidence and ask the Commission to take judicial notice of that testimony."

MR. KELLAHIN: If the Commission please, the questions that we might ask in cross examination at this time and in this case and on the basis of this information that is now available to us, will be entirely different from anything previous in this record, and to say that I did the cross examination merely begs the question. I represent a different client here, different case, different testimony,

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and an entirely different situation. We object to the incorporation of the evidence.

MR. ROBB: These are the same witnesses who testified and it only goes to the weight to be given the testimony, not their admissibility.

MR. PORTER: The Commission will sustain the objection in this case and proceed to statements of whatever summary you want to make in the case, closing statements.

MR. KELLAHIN: If the Commission please, I believe in performance of this matter, we have the right to close if Mr. Robb does have a statement to make.

MR. ROBB: Yes, sir. I think that my statement will be brief. It seems to me, Mr. Chairman, Mr. Trujillo, that the main issue we have here that we are faced with is whether there is a commercial deposit of potash ore underneath the proposed location because if there is, then I think that the record is clear that the risks that are involved in permitting oil or gas development to go ahead of the mining are such that they are unacceptable risks from the conservation standpoint. Now, the question that the well, that the people will do the very best that they can to cap this well, that they will cement it in the way they indicated, and that

in the opinion of one of their witnesses that ought to do the job, is not sufficient in my judgment to provide the kind of assurance that is necessary to prevent the kind of catastrophe that could result if gas escapes. It is clear that gas does escape from time to time from wells however careful the people are. It is clear that cement jobs are not always good; there is not always a full circulation of the cement. It is clear that there is no way that you can guarantee that that well will not permit the escape of gas and will not threaten the existence of potash mining that may be done in that area. Now, I don't know what the extent of that risk is, but I know it is present and anyone who has anything to do with the oil and gas business and who knows about the problems that occur, including gas that sometimes escapes from the outside of the casing, out around cement plugs, blowouts that occur, all these things are a common knowledge and all of these things are matters that we all recognize are risks that are involved in the drilling business. Now, it seems to me that what this Commission has to do at this point is decide whether or not, first of all, there is commercial ore and, secondly, if there is, whether or not the risk of escaping gas is such that they are willing to take the chance in permitting that development to go

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ahead of the potash development. Now, I would submit that as long as there is any risks, however small it might be, that gas could escape and have the kind of result that has been testified here today, without contradiction, by Mr. Lane, the hazard that lies the men working the mines, the horrendous cost that would result or the abandonment of the potash mines, I would suggest that that kind of result is an unacceptable result from the standpoint of conservation. Particularly this is true where the testimony is undisputed -- and even by their own witnesses -- to the effect that if we permit the potash to be mined first, there is no corresponding risks to oil and gas deposits as there is the other way around. And so it seems to me that unless there is a guarantee here, which they refuse to give us, that there will be no such risk of that kind of catastrophe happening here, it seems to me that then the issue comes down to the question is there a commercial potash deposit underneath? Now, I submit that the testimony is overwhelming to the effect that there is such a deposit. I recognize that there is a difference of opinion among two qualified witnesses, and that this Commission is going to have to make that decision, but let me suggest why I think that the testimony of the Kerr-McGee witness, Mr. Lane, should be given a heavier weight than

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that by Mr. Warnock. I say that the experience of the miner in the area who has to make these decisions concerning the economics of the ore body, who has to make the decision of whether or not it can be extracted, ought to be given primary weight. Mr. Lane and his crew have to make the decision whether or not an ore body is commercial every day in that mining operation or they wouldn't be in business very long. It's their every-day job to determine whether or not they have commercial potash, and they have two advantages here -- I should say perhaps one advantage, that would be a fair way to put it -- they have one very important decided advantage in their operations, and that is they are able to go underneath the ground and see how their ore projections and drilling came out, and as we mentioned before, the proof of the pudding is in the eating. You can make ore projections all day long from core holes, but unless you get underground and find out whether the ore is really there at the place where you think it is based upon your prior drilling, there is no way to tell whether or not you really have ore, and Kerr-McGee with an 8-year experience has found there is a continuity of that lower member of the potash which causes them to have confidence in the fact that even though the spacing in this area is admittedly wide spaced, that even

with that wide-spaced drilling they can be reasonably assured there is a probable deposit of potash ore underneath this location. Now, it seems to me that with that kind of evidence, coupled with the fact that we presented a cross section showing, in effect, that you have commercial ore going all the way from their present operations almost like an arrow right through the area occupied by Bass No. 2.

Number 3, you have the fact that Kerr-McGee is willing to expend the money that is necessary to get to that area as witness the five-year plans they have filed with the Commission, and the statement by Kerr-McGee's representative that they intend to follow that plan and go out to this area and mine. Now, they are willing to put their money where their mouth is. They have made a statement of what their mining plans are; they have talked to Teledyne about negotiating for the lease and this is not a situation with regard to utter speculation as to whether anything will ever be mined there any day which does take place in some circumstances in the potash area, and admittedly they don't have those areas under lease yet, and it's not the same situation as though they could guarantee it, but it does seem that the testimony that is undisputed is the fact that they are the only company that can really extract the ore from this area.

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So it seems to me, that given the two alternatives of one development for the basic purpose of the conservation is to try to see that the very most of these very extremely valuable natural resources are extracted. That the \$15,000,000 or \$16,000,000-worth of potash that might otherwise be jeopardized or lost, will not be lost, but will be preserved as a national resource for the benefit of all the people including the economics involved from the employment of over one year of 400 men to extract it, which is the amount of ore that would have to be left because of the risks that are involved. Mr. Lane will not mine that area. He will not accept the risks of going into that area and the risk that methane gas may cause an explosion or danger to his men or equipment. And so it seems to me that given that state of facts, unless Belco can satisfactorily establish that it can directionally drill underneath this area, and do it without endangering the potash deposit, that it makes imminent more sense to have the mining take place first, which involves no risk at all to oil and gas, and then let the oil and gas development follow. That oil and gas will still be there. There may be minor drainage that takes place from that other location under the Bass No. 1, but essentially the deposits are going to remain there, and it seems to us that the alternative of

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permitting the risk to take place should be not acceptable.

MR. PORTER: Mr. Kellahin?

MR. KELLAHIN: If the Commission please, this is a rather strange case, really, in many ways. Here we are arguing with a Protestant who doesn't own any interest in the area, and certainly I can see how that would hurt, but basically I don't think that it really affects the jurisdiction of the Commission because it is enjoined by Statute to protect potash and that is part of the duties pursuant to that duty. We have adopted Order R-111-A and stated that the purpose of it is to protect against the waste and protect correlative rights, and permit the economic recovery of oil and gas and potash, and to treat them all equally. Now, Paragraph 3 of Order R-111-A states that no well shall be drilled for oil or gas at a location which in the opinion of the Commission or its duly authorized representative would result in undue waste of potash deposits or constitute a hazard or interfere unduly with potash deposits. And it further says that no mining operations will be conducted in the potash area that would in the opinion of the Commission or its duly authorized representative constitute any hazard to oil and gas production or that would unreasonably interfere with the orderly development and production from any oil or gas pool.

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Now, almost identical language is found in the Secretary's Order. Of course the Secretary's Order doesn't control this Commission, but it shows that they were working together in handling this situation and that Order provides that no mining operations under a potash lease would be permitted which would interfere with the orderly development and production under any oil and gas lease issued for the same land.

Now, what we're really talking about here, then, is whether in the first place this is the orderly development of the South Salt Lake Morrow Gas Pool. Certainly I think our testimony shows that it clearly is. We have some seven wells already drilled in the Pool which almost completely surround the well site. The pool is based on 320 acres which was done on the Application of Belco Petroleum, and I might point out that reduces the number of wells that I have because the Pool was originally under 160-acre spacing. Now, we're talking about whether or not this is a development well. There is just no dispute in question, in fact, I believe that counsel stipulated that it is. Now, we're talking about, then, whether or not there would be undue waste of potash, and the only evidence that is before the Commission. That's really the only controversy we have here. There has been considerable mention of directional drilling and other

things, but apparently that has been dropped and clearly the evidence that has been presented, Belco shows the impracticality of directional drilling to achieve any purpose in this particular area, and that evidence stands unquestioned in the record.

Kerr-McGee's testimony is constantly referring to the loss of potash which would result from the drilling of this well. Now, in the first place, of course, this is not their potash. Federal acreage is 80 acres; this is under a known geological structure and would have to be offered in open bid. You or I or Belco or anybody else could bid that acreage in if they wanted to, if they are willing to go high enough. The second acreage of 80 acres was held by Teledyne, and the only evidence we have in that regard is a letter or statement from Teledyne to the effect that they are willing to negotiate. I don't know just what "negotiate" means; it can mean a great many things. The fee acreage is 160 acres. It has some 25 owners, one of whom is the principal owner, as we have shown, is Atlantic Richfield who has an interest in the well if it is drilled, and I doubt that they would find a sympathetic potash owner to deal with in that regard. So I would say, off hand, that 160 acres is out of the question. Now, the question of gas occurring in the

mine, there is a very strong emotional appeal and it has been used to the fullest extent in this particular case. In this connection, we all know, that there is a great number of oil and gas wells drilled in potash area, and Kerr-McGee's witness says that he doesn't know of any methane gas in any potash mine in the Carlsbad area, and certainly that in itself would indicate that we don't really have a serious problem here. As to drilling in a cement plug, in this case they are mining and plugging the well as provided by R-111-A, and, testified to by Mr. Cope, would adequately protect against any leakage of gas into the mines if there is any mine in this area. He concluded that even if the casing were sheared at the level of the potash mine, no gas could possibly escape into the mine. We have a 1000-foot solid cement plug below that level. Now, again, this testimony stands unrefuted in the record, and the only thing that has been said in attack on it is pure speculation and no substantial evidence. So then we come back to standards of the question as set by R-111-A: Is there commercial potash in the area? We've shown the proposed area is essential to the orderly development of the Pool. The next question is, will the drilling of it unduly interfere with and cause waste of potash? Well, in the first place, as Mr. Robb said, their five-year plan

points the finger right out at the proposed-well location. That finger was pointed shortly after Belco brought its Application to drill in this area. Prior to that -- and the Commission's records will show this -- their five-year plan did not approach this area at all, and their own mining operations in nine years of activity, as shown by their exhibits, compared to where they're proposing to drill in the next five years, would cast some considerable doubt on whether they will be anywhere near this area in five years.

MR. ROBB: I'm sorry, I don't like to interrupt counsel, I'm sure he doesn't intend to state that fact, but the five-year plan that Kerr-McGee has filed with the Commission dating back to long before this year -- Mr. Kellahin, I'm sure you weren't aware of that -- do show that Kerr-McGee has intended to go out to this vicinity for quite some time. The Commission knows, it is in their own record. I have copies that were filed last year even before this Application was filed on the part of Belco.

MR. KELLAHIN: If the Commission please, I'll stand on the record that was filed and is in the Commission's records. It is my understanding and I looked at these two the five-year plan as filed in previous years came nowhere.

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near this area. It didn't extend in this direction, but this long shoot-out toward the Belco location was not filed until this year, in my judgment, and I think I'm correct in that, but the Commission's records will show.

Now, when we come down to the determination of whether there is any commercial ore in this area, we get a lot of definitions as to what is commercial ore, but I would point out that on cross examination of the Kerr-McGee witness the claim to state what their costs were, he gave a gross figure on what he said would be the ore left in place in there, but he wouldn't say what it would cost to remove it, so we don't know whether it's commercial or not. If he believes there is \$5,000,000 worth of ore in there that would cost \$6,000,000 to extract, it is certainly not commercial, and on the record we have before us today we don't know what is commercial. All we have is an assertion that they think it is commercial, but on cross examination he declined to give us any information on which we could judge this. Now, in Section 33, getting back to the exhibits on which Kerr-McGee reached a determination that there was commercial ore here, in Section 33 they used a core to project a 1500-foot cut-off point that is to the risk of the ore body, which we submit is the

proper way to do it, but then when they come over to where the Belco location is, they had the audacity to project some 12,000 feet in order to determine there was an ore body. In other words, they used the core information to suit the purpose, wherever it may be. Now, on the contouring exhibit, which was submitted by Kerr-McGee, they used only the ore data that was shown on the core which was shown on the exhibit and that, as was shown on cross examination, does not include all of the cores. In contract, Mr. Warnock utilized every available spec information they were able to get, including core data that was furnished to us by Kerr-McGee under subpoena.

Now, Kerr-McGee's conclusion, then, that there is ore underlying this area is just highly speculative. It's based on widely-spaced data and I'll call your attention again to the Triangular Method which they used to determine there is ore lying within that triangle. Here we're talking about a triangle which extended from 1.7 miles to more than 2 miles apart, and one of those cores, incidentally, by Kerr-McGee's own definition was non-commercial ore containing some 57-foot-per-peak percentage of ore where they said they had a cut-off point of 63. So nothing here shows that there is actually commercial ore underlying the tract. Now, when

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they come to the south half of Section 30 -- and that's the area we are talking about -- there is no core data in that section whatsoever, and there is none close to it. There is no core data in the entire section. There is no core data in the north half of the section. Now, they want us to conclude on the basis of this speculative material that there is commercial ore underlying the south half of Section 30 which would be lost to the development of the well. Now, going back to we're confronted here with a Protestant who doesn't own any acreage in this area; their closest lease is 4000 feet away. It is impossible for me to see how they are going to be damaged by our Application, and to deny Belco's Application for the development well in a proven-gas pool on the basis of such highly speculative evidence from a company holding no interest closer than almost a mile away, would do violence to both the letter and the intent of the Commission's order R-111-A, and we ask that the Application be approved.

MR. PORTER: Is there anything further to come before the Commission? Mr. Carr, do you have any correspondence?

MR. CARR: The Commission has received several letters and telegrams concerning this case. Atlantic Richfield Company wire was signed by Mr. A.J. Brown, Joint

Interest Superintendent in Texas. (Reading) Atlantic Richfield Company has 25-percent mineral interest in the southwest quarter of Section 30, Township 20 South, Range 33 East and a working-interest owners in other tracts, and feels that correlative rights will be violated unless the No. 2 Federal well is drilled. Atlantic Richfield supports Belco's position in this Section 30, Township 20 South, Range 33 East is suffering drainage from other wells in the area. (End of reading)

We have a letter from Mr. Henry Montcliff and Vera Riggs which states that (reading) they own royalty interests in the Southwest quarter of Section 30, Township 20 South, Range 33 East, Lea County, New Mexico. These royalty interests are presently being drained by offsetting production and consequently urge the approval of the Application of Belco Petroleum Corporation. (End of Reading)

We have a letter from Audie Richards, who states that (reading) ^{as} the mineral interests owner under the Southwest quarter of Section 30, Township 20 South, Range 33 East, ~~I~~ ^I ~~and~~ ^{and} urges that the Commission unitize this acreages, ~~and that~~ ^{as} ~~they reject the request~~ ^{ed} by Belco Petroleum Corporation. (End of reading)

We have a letter from G.F. Clark of Texaco, in Midland

Texas which reads in part (Reading) Texaco as a non-operator-interest owner files this letter in support and in favor of Belco Petroleum Corporation's Application. In denying Belco's Application, would prevent the orderly development of production of oil and gas in the South Salt Lake Field. (End of reading)

We also have a letter from Mr. Joe Peacock of Phillips Petroleum Company supporting the Application of Belco Petroleum Company.

We have received a wire from Tenneco Company in support of Belco's position in the drilling of the well in this case signed by Mr. D.D. Meyers, Denver Division, Production Manager for Tenneco.

We have received correspondence from Perry R. Bass supporting the Application of Belco Petroleum Company, and a letter from Sharp Drilling Company. The letter from Sharp Drilling Company goes to a question that was discussed here, but doesn't take an actual position on the question.

MR. ROBB: May I ask that the record attendance that was kept at this table be made available. Specifically, I would like to call attention to the Commission, for the record, that representatives of five other potash companies were here at the Hearing including Teledyne, for whom an

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appearance was made, International Minerals Company, who made an appearance through Chuck Childers, their Manager, Potash Company of America, through Mr. Blackman, the Duval Company through Mr. Jack Highfield, and Amack through Mr. Bob Kirby, all of them being potash companies in the Carlsbad Potash Basin.

MR. PORTER: I believe that attendance registration is made part of the transcript, is it not? If there is nothing further, the Commission will take the case under advisement.

(Whereupon, the Hearing was adjourned
at 3:26 P.M.)

STATE OF NEW MEXICO)
) ss.
COUNTY OF SANTA FE)

I, RICHARD L. NYE, Court Reporter, do hereby certify that the foregoing and attached Transcript of Hearing before the New Mexico Oil Conservation Commission was reported by me, and the same is a true and correct record of the said proceedings, to the best of my knowledge, skill and ability.



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