Case No.

1511

Application, Transcript,
Small Exhibits, Etc.

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1511

Application, Transcript,
Small Exhibits, Etc.

BEFORE THE OIL CONSERVATION COMMISSION
OF THE STATE OF NEW MEXICO

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

CASE NO. 1511
Order No. R-1287

APPLICATION OF NEWMONT OIL CORPORATION
FOR AN ORDER AUTHORIZING A PILOT WATER
FLOOD PROJECT IN THE LOCO HILLS POOL,
EDDY COUNTY, NEW MEXICO.

ORDER OF THE COMMISSION

BY THE COMMISSION:

This cause came on for hearing at 9 o'clock a.m. on October 2, 1958, at Santa Fe, New Mexico, before Elvis A. Utz, Examiner duly appointed by the Oil Conservation Commission of New Mexico, hereinafter referred to as the "Commission," in accordance with Rule 1214 of the Commission Rules and Regulations.

NOW, on this 25th day of October, 1958, the Commission, a quorum being present, having considered the application, the evidence adduced and the recommendations of the Examiner Elvis A. Utz, and being fully advised in the premises,

FINDS:

(1) That due public notice having been given as required by law, the Commission has jurisdiction of this cause and the subject matter thereof.

(2) That the applicant, Newmont Oil Corporation, proposes to institute a pilot water flood project in the Loco Hills Pool to inject water into the Grayburg formation through five (5) wells located in Section 6, Township 18 South, Range 30 East, NMPM, Eddy County, New Mexico, and through one (1) well located in Section 1, Township 18 South, Range 29 East, NMPM, Eddy County, New Mexico.

(3) That the proposed injection wells are as follows:

Yates "A" No. 2	NE/4 NW/4	Section 6 T-18-S, R-30-E
Yates "A" No. 11	NW/4 NE/4	Section 6 T-18-S, R-30-E
Yates No. 5	NW/4 SW/4	Section 6 T-18-S, R-30-E
Yates No. 2	SW/4 NW/4	Section 6 T-18-S, R-30-E
Yates No. 3	SE/4 NW/4	Section 6 T-18-S, R-30-E
Ballard "B" No. 5	NE/4 NE/4	Section 1 T-18-S, R-29-E

(4) That the proposed pilot water flood injection project will not adversely affect the interests of any other operators in the Loco Hills Pool.

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

IT IS THEREFORE ORDERED:

(1) That the application of Newmont Oil Corporation for permission to institute a pilot water flood project in the Grayburg formation of the Loco Hills Pool in Eddy County, New Mexico, be and the same is hereby approved.

(2) That the following-described wells be and the same are hereby authorized as water injection wells:

Yates "A" No. 2	NE/4 NW/4 Section 6 T-18-S, R-30-E
Yates "A" No. 11	NW/4 NE/4 Section 6 T-18-S, R-30-E
Yates No. 5	NW/4 SW/4 Section 6 T-18-S, R-30-E
Yates No. 2	SW/4 NW/4 Section 6 T-18-S, R-30-E
Yates No. 3	SE/4 NW/4 Section 6 T-18-S, R-30-E
Ballard "B" No. 5	NE/4 NE/4 Section 1 T-18-S, R-29-E

(3) That monthly progress reports on the water flood project herein authorized shall be submitted to the Commission in accordance with Rule 704 and Rule 1119 of the Commission Rules and Regulations.

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

STATE OF NEW MEXICO
OIL CONSERVATION COMMISSION

EDWIN L. MECHEM, Chairman

MURRAY E. MORGAN, Member

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

ir/

OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO

Date 10-3-58

CASE NO. 511 HEARING DATE 10-2-58

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

1. Grant this Pilot Water Flood as requested.

2. The 6 injection wells to be approved are as follows:

(a) Franklin Aston & Dair - Yates "A" Std 2 NE NW Sec. 6-T18S-R30E
(b) " " " - " "A" " #11 NW NE " " "
(c) Yates et al - " [redacted] #5 NWSW " " "
(d) " " " " - " [redacted] #2 SWNW " " "
(e) " " " " - " [redacted] #3 SE NW " " "
(f) Franklin, Aston & Dair - Ballard "B" #5, NENE Sec. 1 - T18S - R29E.

3. No allowables requested exceptions required by statewide rules.

Elvis A. Utz

Staff Member

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

October 28, 1958

COPY

Mr. Jack Campbell
Campbell & Russell
P.O. Box 721
Roswell, New Mexico

Dear Mr. Campbell:

On behalf of your clients, we enclose two copies of each of the following orders issued by the Oil Conservation Commission on October 25, 1958:

Order R-975-C in Case 1225
Order R-1267 in Case 1511

These cases were both heard on October 2nd before an examiner at Santa Fe.

Very truly yours,

A. L. Porter, Jr.
Secretary - Director

bp
Encls.

IN THE MATTER OF THE APPLICATION OF)
NEWMONT OIL CORPORATION FOR AN ORDER)
AUTHORIZING A PILOT WATER FLOOD PROJ-)
ECT IN THE LOCO HILLS OIL POOL IN)
EDDY COUNTY, NEW MEXICO.)

CASE NO. 1511

1958 AUG 25 AM 8:43
MAIN OFFICE OCC

APPLICATION

Comes now Applicant, Newmont Oil Corporation, by its attorneys and states:

1. By reason of an Operating Agreement effective July 1, 1958, Applicant is the owner of all operating rights in an area delineated on "Exhibit 1" attached hereto, down to a depth of 100 feet below the Loco Hills Sand, and as such owner has full authority to file this Application.

2. Applicant proposes to institute a pilot water flood project within the area covered by the Operating Agreement and to inject water into the Grayburg Formation of the Permian System through six (6) certain injection wells in Section 1, Township 18 South, Range 29 East and Section 6, Township 18 South, Range 30 East, which wells are identified on "Exhibit 1" attached hereto.

3. Applicant, for the purpose of the pilot project, proposes to obtain water from a well on the project at a depth of approximately 300 feet.

4. The proposed program will promote conservation and prevent waste by greater ultimate recovery of oil and such program will not adversely affect the interests of any other operators in the pool.

5. Applicant is furnishing the Office of the State Engineer at P. O. Box 1079, Santa Fe, New Mexico with a copy of this Application and such information as is required by the Oil Conservation Commission Memorandum No. 5-58 dated January 31, 1958.

WHEREFORE, Applicant respectfully requests the Commission to issue its Order authorizing the pilot water flood project as requested, permitting the injection of water into the following described wells, to-wit:

1	Franklin, Aston & Fair	Yates	2	NENW Sec. 6 T-18-S R-30-E
2	Franklin, Aston & Fair	Yates	11	NWNE Sec. 6 T-18-S R-30-E
3	Yates, et al	Yates	[redacted] 5	NWSW Sec. 6 T-18-S R-30-E
4	Yates, et al	Yates	[redacted]	SWNW Sec. 6 T-18-S R-30-E
5	Yates, et al	Yates	3	SENW Sec. 6 T-18-S R-30-E
6	Franklin, Aston & Fair	Ballard "B"	5	NENE Sec. 1 T-18-S R-29-E

Applicant further requests that this matter be set down for hearing before an Examiner for the Commission at the earliest possible date and that notice be given of such hearing as provided by law.

NEWMONT OIL CORPORATION

By: Jack M. Campbell

Campbell & Russell
P. O. Box 721
Roswell, New Mexico

Attorneys for Applicant

DOCKET: EXAMINER HEARING OCTOBER 2, 1958

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

The following cases will be heard before Elvis A. Utz, Examiner:

CASE 1225: Application of Moab Drilling Company for authority to expand its water flood project in the High Lonesome Pool, Eddy County, New Mexico, and for approval of certain unorthodox well locations therein. Applicant, in the above-styled cause, seeks an order authorizing the expansion of its water flood project in the High Lonesome Pool, Eddy County, New Mexico, to include its Davis-Federal Well No. 11-W, a proposed water injection well to be drilled on an unorthodox location 1310 feet from the North line and 2630 feet from the West line of Section 15, Township 16 South, Range 29 East. Applicant further seeks an administrative procedure for the future expansion of said water flood project to include the following proposed water injection wells to be drilled on unorthodox locations:

Davis-Federal No. 1-W; 10 feet from the North line and 2630 feet from the West line of Section 15.

Davis-Federal No. 2-W; 10 feet from the North line and 1310 feet from the West line of Section 15.

Skelly-State No. 15-W; 1310 feet from the North line and 2630 feet from the West line of Section 16.

Skelly-State No. 25-W; 2630 feet from the North line and 2630 feet from the West line of Section 16.

All in Township 16 South, Range 29 East.

CASE 1511: Application of Newmont Oil Corporation for an order authorizing a pilot water flood project. Applicant, in the above-styled cause, seeks an order authorizing it to institute a pilot water flood project in the Loco Hills Pool in Eddy County, New Mexico. Applicant proposes to inject water into the Grayburg formation through one well in Section 1, Township 18 South, Range 29 East, and through five wells in Section 6, Township 18 South, Range 30 East, all in Eddy County, New Mexico.

CASE 1512: Application of Humble Oil & Refining Company for approval of a unit agreement. Applicant, in the above-styled cause, seeks an order approving its Bandana Point Unit Agreement embracing approximately 14,293 acres of Federal, state and fee acreage in Township 22 South, Range 23 East, and Township 23 South, Ranges 23 East and 24 East, all in Eddy County, New Mexico.

CASE 1513: Application of Drilling and Exploration Company, Inc. for an exception to the casing requirements for the potash-oil area in Lea and Eddy Counties, New Mexico. Applicant, in the above-styled cause, seeks an order authorizing an exception to the shallow-zone casing requirements for the potash-oil

CASE 1513 continued

area as set forth in Order No. R-111-A for its Ballard No. 1 Well located 1980 feet from the North and West lines of Section 27, Township 20 South, Range 34 East, Lea County, New Mexico. Applicant proposes to drill with cable tools to an approximate depth of 3,700 feet adjacent to the Lynch Pool. Applicant proposes to use the following casing program in lieu of the program prescribed for cable tool holes by Order R-111-A:

(1) 13 3/8 inch casing to be cemented at approximately 70 feet.

(2) 10 3/4 inch casing to be landed at approximately 700 feet.

(3) 8 5/8 inch casing to be landed at approximately 1250 feet.

(4) 5 1/2 inch casing to be cemented at the top of the producing formation with 50 sacks cement for testing purposes.

(5) 10 3/4 inch casing and 8 5/8 inch casing to be pulled.

(6) In the event commercial production is obtained, 5 1/2 inch casing to be perforated and cement circulated to surface.

CASE 1514: Application of Continental Oil Company for approval of a unit agreement. Applicant, in the above-styled cause, seeks an order approving its Tonto Deep Unit Agreement embracing 2,000 acres, more or less, of Federal and state lands in Township 18 South, Range 34 East, Lea County, New Mexico.

CASE 1515: Application of Continental Oil Company for a non-standard gas proration unit. Applicant, in the above-styled cause, seeks an order establishing a 320-acre non-standard gas proration unit in the Jalmat Gas Pool consisting of the S/2 Section 22, Township 22 South, Range 36 East, Lea County, New Mexico, said unit to be dedicated to the applicant's Meyer B-22 Well No. 1 located 1650 feet from the South line and 990 feet from the East line of said Section 22.

CASE 1516: Application of El Paso Natural Gas Company for two non-standard gas proration units and for the approval of one unorthodox gas well location. Applicant, in the above-styled cause, seeks an order establishing a 120-acre non-standard gas proration unit in the Jalmat Gas Pool consisting of the N/2 SW/4 and the SW/4 SW/4 of Section 4, Township 25 South, Range 37 East, said unit to be dedicated to the applicant's Wells Federal No. 3 Well located 1980 feet from the South and West lines of said Section 4. Applicant further seeks the establishment of a 200-acre non-standard gas proration unit in the Jalmat Gas Pool consisting of the SE/4

CASE 1516 continued

SW/4 of Section 4 and the NW/4 of Section 9, Township 25 South, Range 37 East, Lea County, New Mexico, said unit to be dedicated to the applicant's Wells Federal No. 11 Well located 430 feet from the South line and 2317 feet from the West line of said Section 4. Applicant further seeks approval of the unorthodox gas well location of the said Wells Federal No. 11 Well.

CASE 1517: Application of Amerada Petroleum Corporation for a dual completion. Applicant, in the above-styled cause, seeks an order authorizing the dual completion of its State BT "M" Well No. 2, located in the SE/4 NE/4 of Section 33, Township 11 South, Range 33 East, Lea County, New Mexico, in such a manner as to permit the production of gas from the upper Pennsylvanian formation adjacent to the Bagley-Upper Pennsylvanian Gas Pool, and the production of oil from the lower Pennsylvanian formation adjacent to the Bagley-Lower Pennsylvanian Gas Pool through the casing-tubing annulus and the tubing respectively.

CASE 1518: Application of Magnolia Petroleum Company for permission to commingle production from two separate oil pools. Applicant, in the above-styled cause, seeks an order authorizing it to commingle the production from the Wantz-Abo (oil) Pool and Terry-Blinebry Oil Pool on its Stephens Estate Lease comprising the SW/4 of Section 24, Township 21 South, Range 37 East, Lea County, New Mexico.

CASE 1519: Application of Sunray Mid-Continent Oil Company and British American Oil Producing Company for an order authorizing a secondary recovery project. Applicants, in the above-styled cause, seek an order authorizing a secondary recovery project in the Bisti-Lower Gallup Oil Pool in San Juan County, New Mexico. Applicants propose to inject liquefied petroleum gas and dry gas into the Gallup formation through the British American Marye Well No. 2 located in the NE/4 NE/4 of Section 12, Township 25 North, Range 13 West, and the Sunray Mid-Continent Federal "C" Well No. 20 located in the SW/4 NW/4 of Section 7, Township 25 North, Range 12 West, all in San Juan County, New Mexico.

CASE 1520: Application of Phillips Petroleum Company for permission to commingle oil produced from two separate pools. Applicant, in the above-styled cause, seeks an order authorizing it to commingle the oil produced on its Santa Fe Lease from the Yates formation adjacent to the Vacuum Yates Pool with the oil produced from the Vacuum (San Andres) Pool in four separate existing tank batteries located in Sections 26, 27, 28, and 33, Township 17 South, Range 35 East, Lea County, New Mexico.

CASE 1521: Application of Humble Oil and Refining Company for an oil-oil dual completion. Applicant, in the above-styled cause, seeks an order authorizing the dual completion of its New Mexico State "V" Well No. 1, located 660 feet from the South and West lines of Section 10, Township 21 South, Range 37 East, Lea County, New Mexico, in such a manner as to permit the production of oil from the Blinebry Oil Pool and the Drinkard Pool through parallel strings of 1½ inch tubing.

10-13-58

Box 395
Artesia, New Mexico
October 7, 1958

Mr. Elvis Utz, Examiner
New Mexico Oil and Gas Conservation Commission
Santa Fe, New Mexico

Dear Mr. Utz:

Regarding the application of the Newmont Oil Company to waterflood their leases in the Loco Hills Field, Eddy County, New Mexico, I am enclosing certain well data which Mr. Frank Darden requested that I send you. This information includes size and setting depths of surface and production casing strings, amount of cement used, and total depths for each well within and adjacent to the pilot area.

I trust that this information is sufficient; however if there is anything further that you might desire, please let me know.

Very truly yours

H. C. Porter
Project Supervisor

Newmont Oil Company

Loco Hills Field Pilot Area

Well	Surface Casing			Long String			Total Depth
	Size	Feet	Sacks	Size	Feet	Sacks	
Yates 1A	8 1/4"	437	50	7"	2702	100	2810 1/2
Yates 2A	8 1/4"	459	50	7"	2610	100	2834
Yates 3A	8 1/4"	460	50	7"	2710	100	2845
Yates 4A	8 1/4"	451	50	7"	2718	100	2850
Yates 5A	8 1/4"	443	50	7"	2694	100	2816
Yates 6A	8 1/4"	475	50	7"	2741	100	2855
Yates 8A	8 1/2"	473	50	7"	2740	100	2859
Yates 9A	8 1/2"	470	50	5 1/2"	2703	100	2825
Yates 11A	8 1/4"	451	50	7"	2745	100	2841
Yates A #1	8 1/4"	452	50	7"	2705	100	2874
Yates A #2	8 1/4"	458	50	7"	2672	100	2808
Yates A #3	8 1/4"	456	50	7"	2705	100	2845
Yates A #4	8 1/4"	455	50	7"	2730	100	2840
Yates A #5	8 1/4"	431	50	7"	269[illegible]	40	2848
Yates A #6	8 5/8"	439	50	7"	2695	100	2859
Ballard B #3	8 1/4"	463	50	7"	2632	100	2771
Ballard B #4	8 1/4"	450	50	7"	2667	100	2800
Ballard B #5	8"	481	25	7"	2666	100	2890
Ballard A #1	8 1/4"	415	50	7"	2690	100	2828
Ballard A #3	8 1/4"	450	50	7"	2665	100	2795

Case 1511

LAW OFFICES OF

CAMPBELL & RUSSELL

FIRST NATIONAL BANK BUILDING

ROSWELL, NEW MEXICO

MAIN OFFICE OCC

1958 AUG 25 AM 8 41

JACK M. CAMPBELL
JOHN F. RUSSELL

21 August 1958

TELEPHONES
MAIN 2-4641
MAIN 2-4642

Mr. A. L. Porter, Jr.
New Mexico Oil Conservation Commission
P. O. Box 871
Santa Fe, New Mexico

Dear Mr. Porter:

Enclosed please find Application of Newmont Oil Corporation relative to a pilot water flood project in the Loco Hills Pool, Eddy County, New Mexico.

Very truly yours,

CAMPBELL & RUSSELL

Jack M. Campbell

Jack M. Campbell

JMC:bb
Enclosure

Docket mailed
9-19-58
B.P

BEFORE THE
OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO

IN THE MATTER OF:

CASE 1511

TRANSCRIPT OF HEARING

OCTOBER 2, 1958

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

BEFORE THE
OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO
OCTOBER 2, 1958

IN THE MATTER OF:

CASE 1511 Application of Newmont Oil Corporation for an order authorizing a pilot water flood project. Applicant, in the above-styled cause, seeks an order authorizing it to institute a pilot water flood project in the Loco Hills Pool in Eddy County, New Mexico. Applicant proposes to inject water into the Grayburg formation through one well in Section 1, Township 18 South, Range 29 East, and through five wells in Section 6, Township 18 South, Range 30 East, all in Eddy County, New Mexico.

BEFORE:

Mr. Elvis A. Utz, Examiner.

T R A N S C R I P T O F P R O C E E D I N G S

MR. UTZ: Next case on the docket will be Case 1511.

MR. COOLEY: Case 1511. Application of Newmont Oil Corporation for an order authorizing a pilot water flood project.

MR. CAMPBELL: I am Jack M. Campbell, Campbell & Russell, Roswell, New Mexico, appearing on behalf of the applicant, Newmont Oil Corporation.

MR. UTZ: Is there any other appearance to be made in this case? If not, you may proceed.

MR. CAMPBELL: We have one witness, Mr. Darden, to be sworn.

(Witness sworn)

FRANK DARDEN,

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

DIRECT EXAMINATION

BY MR. CAMPBELL:

Q Will you state your name, please?

A Frank Darden.

Q Where do you live, Mr. Darden?

A Fort Worth, Texas.

Q By whom are you employed?

A Newmont Oil Corporation.

Q Have you ever previously testified before this Commission or any of its Examiners?

A No, I have not.

Q Have you testified before any other oil or gas regulatory agency?

A Yes, sir.

Q Which --

A Railroad Commission of Texas.

Q Will you please give the Examiner a brief summary of your educational and professional background?

A I was graduated from the University of Kansas with a Bachelor of Science degree in mechanical engineering in 1946. And in January of 1948 I commenced my petroleum engineering with Humble

Oil & Refining Company. In the ensuing ten years, I worked for Humble Oil, Murphy Corporation of El Dorado, Arkansas, and Empresa Colombiana de Petroleos, a petroleum company in Colombia, South America as a petroleum engineer and reservoir engineer. For the past two and a half years, I have been employed as reservoir engineer for Newmont Oil.

Q Mr. Darden, in connection with your experience with Humble and with the Murphy Corporation and whatever that company was in British Colombia, have you had occasion to work on matters relative to secondary recovery?

A Yes, sir.

Q Was that the principal type of work you were doing in South American for the Colombian government?

A Yes, sir.

Q Are you acquainted with the application of Newmont in this particular case?

A Yes, sir.

Q Mr. Darden, I refer you to what you have before you that has been identified as Newmont's Exhibit No. 1. Will you state what that is, please?

A Yes. This is a plat of the Newmont Oil Corporation properties in the Loco Hills Field with the proposed pattern injection wells circled, and with the other wells designated by number.

Q How are the properties of Newmont in that area identified

on the Exhibit, please?

A By a dashed line.

Q What is the nature of the operating rights or ownership that you have under the properties identified on Exhibit 1?

A We have operating rights to a depth of 100 feet below the Loco Hill sand.

Q And were those operating rights acquired by an agreement effective July 1, 1958 from those who had previously owned those properties?

A Yes, sir.

Q What is it, Mr. Darden, that you propose to do if the Commission gives you their approval in this case?

A We propose to inject water into the Loco Hill sand in the six wells circled on this plat in order to perform a pilot water flood in the expectation of increasing oil recovery from this property.

MR. CAMPBELL: Mr. Examiner, at this time with regard to Exhibit No. 1, you'll note that one of the wells circled, which is a proposed injection well, the one furthest to the southwest, identified by No. 5 on the application submitted, the application and the plat identified the injection well there as No. 1. I would like to at this time request that the application be amended to identify that injection well as the Yates et al "A" 1 as shown in the application. They are both in the same section, and I checked a notice this morning, and the notice identified the in-

jection well as being five of them in Section 6, and one in Section 1, so it would not change the notice on it in that regard.

MR. UTZ: You are requesting the plat and the application both to be amended?

MR. CAMPBELL: Yes.

MR. COOLEY: What is the quarter-quarter section of the well that you just referred to, Mr. Campbell?

MR. CAMPBELL: It is in the north -- I would say it is in the northwest quarter of the southwest quarter of Section 6, which is the same quarter-quarter section that the other well was in. There is, as you know, more than one well on some of these 40-acre units in that area.

MR. COOLEY: Is this a redesignation of the well that was identified as the Yates "A" 1, or is it a different well?

MR CAMPBELL: A different well.

MR. COOLEY: But in the same quarter-quarter section?

MR. CAMPBELL: Yes, sir.

MR. UTZ: What quarter-quarter section did you say that was in?

MR. CAMPBELL: In the northwest quarter of the southwest quarter of Section 6.

MR. UTZ: The previous well was "A" 2?

MR. CAMPBELL: No, the previous well was "A" 1. Yates et al "A" 1.

MR. UTZ: Is there objection to the amendment of the

application? If not, it will be so amended.

Q (By Mr. Campbell) What is the present stage of depletion of this area that you propose to use as a pilot area, and the general Loco Hill area, please?

A We estimate it is 92 percent depleted by primary means.

Q What is the average per well, per day, production of oil in the area?

A Approximately ten barrels per well per day.

Q If this pilot project is approved, what source of water do you intend to use?

A Well, we, recognizing that we would need a source for the pilot, made an extensive survey of the water sources in the area, and in this search, we drilled an exploratory well in Section 1.

Q Is that identified on the plat?

A It is identified on the plat as a supply well on 1 -- Section 1, 18 South, Range 21 East.

Q Were you able to obtain a source of water there?

A Yes, we were. We found an 18-foot water sand approximately 295 feet, and we have tested that sand, and we believe that that well or another well with it will supply water for the pilot.

Q Have you advised the office of the State Engineer with regard to the location of this water source for the pilot portion of your project?

A Yes, sir, we have.

Q Has the State Engineer been furnished with a copy of the application in this case?

A Yes, sir.

Q Has the State Engineering Office been furnished with an analysis of the water from that particular well?

A Yes, sir.

Q Mr. Darden, I am going to hand you what has been identified as Newmont's Exhibit No. 2, and ask you to state what that is, please?

A This is a survey and water report prepared by the Bradford Laboratories concerning several possible water sources which we examined, including an analysis of the water from the source which we plan to use for the pilot.

Q Has a copy of this laboratory report been furnished to the office of the State Engineer?

A It has.

Q Now, if you inject water in this pilot area, into what formation will the water move?

A The Loco Hill sand.

Q Do you believe that if the pilot project proves successful that you may be able to recover automatically more oil than would otherwise be recovered without a secondary recovery project?

A We certainly do.

Q Do you believe that that can be done without adversely affecting the rights of other owners in the area?

A Yes, sir.

MR. CAMPBELL: I believe that's all I have. I offer in evidence Newmont's Exhibits Nos. 1 and 2. Oh, let me ask him one other question too.

Q (By Mr. Campbell) How much water do you hope to inject into these wells initially?

A Well, we hope to be able to inject a thousand barrels per well per day. However, we won't know until we try. That may be optimistic.

MR. CAMPBELL: That's all.

MR. UTZ: How much was that?

A A thousand barrels per well per day.

MR. UTZ: Without objection, Exhibits 1 and 2 will be accepted. Are there any questions of the witness? Mr. Fischer.

MR. FISCHER: I have some questions.

MR. UTZ: You may proceed.

CROSS EXAMINATION

BY MR. FISCHER:

Q Mr. Darden, the way I understand it, there are two No. 5 Wells on that lease?

A No, sir. One of them is No. 5, the other one is No. 1.

MR. CAMPBELL: There is a Ballard. You've got two No.5, is that what disturbs you? They are separate leases. That's a Ballard "B" 5 in the northern portion there.

A And also in Section 6, there are two leases, both having

a No. 5 well.

MR. UTZ: Actually, there is considerable change over the plat, in respect to well numbers, over the plat that was submitted with your application?

A Yes, sir. These numbers of the wells in the Yates et al Lease were in error.

MR. CAMPBELL: The Exhibit that you have offered here today contains the correct identity of the wells, does it not?

A Yes, sir.

MR. CAMPBELL: And it does contain the proper location of the wells you propose to use as injection wells?

A Yes, sir.

Q (By Mr. Fischer) That hundred feet below the base of the Loco Hill sand, is that correct? Is that where you have your operating rights too?

A Yes, sir.

Q What is the characteristic of that hundred feet generally? Can you tell me?

A Generally shale.

Q Shale?

A Yes, sir.

Q Is that Loco Hill sand in the Grayburg?

A Yes, sir. I believe it is designated as zone 4 of the Grayburg.

Q You said that you -- according to your calculation,

depletion by primary method had been 92 percent?

A Yes, sir.

Q Could you give the Commission an approximation or recapitulation of what that amount of oil, or 100 percent of that, what the amount of oil was?

A Yes, sir. We estimated an ultimate recovery by primary of 4,599,500 barrels, and to the first of this year the property had produced 4,179,500 barrels.

Q At what pressure do you think you can get your estimated hundred barrels per day per well? What pressure will it take?

A Well, that's the reason for the pilot. We don't know.

Q You have no idea?

A No. It is impossible to guess that.

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

MR. UTZ: Any other questions of the witness?

MR. COOLEY: One question, please.

QUESTIONS BY MR. COOLEY:

Q Mr. Darden, is the particular zone in which you intend to limit your formations, your injection, commonly identified in this area as the Loco Hills?

A Yes, sir.

Q Has it been so identified by the Commission? If not, how has the Commission identified this particular zone?

A I am not sure.

Q I understand that your entire operation -- your operation

would not extend to the entire Grayburg formation?

A That is correct.

Q Is this the only productive zone in this area?

A No. The Premier zone, which is below the Loco Hills, is productive to a limited degree, but this is the principal producing horizon in this area.

Q Are you aware of what the vertical limits of the Loco Hills Pool consist of?

A Well, it varies considerably because you have an appreciable dip from east to west.

Q How are the vertical limits of the Loco Hills Pool identified by the Commission Order which established the Pool?

A I don't know.

MR. CAMPBELL: I am not aware of that either. I presume the Commission's records will reflect it. Of course, any order should, identifying -- it is my understanding it is commonly known as the Loco Hill portion of the Grayburg. Whether it is identified as such as to vertical limits, I am not certain.

Q (By Mr. Cooley) Is there any other productive zone other than the one that you intend for injection, other than the Loco Hills Pool?

A Yes, sir. There are a few wells producing from the Premier.

Q Your operation would not extend, in any event, to the Premier?

A No, sir.

Q Mr. Darden, you said the average producing well in the area was somewhere around ten barrels a day, --

A Yes, sir.

Q -- am I correct?

A Yes, sir.

Q What do you know is the highest producing well in the area, and what is the production from that area?

MR. CAMPBELL: Which area?

MR. COOLEY: He must have picked his own area. He said --

A I was speaking of our properties when I said "an average of ten barrels of oil per day."

Q What are the extremes in the productivity that you have which you calculated as average?

A Well, we have one or two wells which will make 35 barrels per day.

Q Where are those located, Mr. Darden?

A The State 5 "BX."

Q In what quarter-quarter section?

A That's the southeast of the southeast of Section 32, 17 South, Range 30 East.

Q 5 "BX?"

A Yes, sir.

Q Any other high producing wells?

A I can't offhand recall any specific one, no, sir.

Q Can you account for the unusual high productivity of this 5 "BX" Well?

A No. That is an anomalous condition. We have not been able to determine why that one should be higher than the surrounding wells. Actually, as you can see from the plat, the other wells have been plugged, and possibly they have been plugged for mechanical reasons, and the well is draining a larger area. That is the only reason we can think of.

Q Are the completions in your wells, the Newmont wells, entirely limited to this Loco Hills sand, or do these include some perforations in the Premier?

A We have two wells, as marked on the plat, which are completed in the Premier zone also.

Q How are those identified?

A Well, the Premier zone is opened, and there are designating arrows to these two wells. They are in Sections 31 and 32, Township 17 South, Range 32 East.

Q Noen of theother wells are opened in the Premier?

A No, sir.

MR. COOLEY: That's all the questions I have. Thank you, Mr. Darden.

QUESTIONS BY MR. UTZ:

Q Mr. Darden, is there much structural dip in this particular area, particularly in regard to Sections 1 and 6?

A Well, from the west side of Section 1 to the east side

of Section 6, there is probably as much as 100 feet of structural dip.

Q What would be the approximate top of the Loco Hills sand that you have designated?

A Approximately 2,800 feet. That's well depth.

Q What is the approximate elevation in this area?

A I'll have to check that. Approximately 3550.

Q Now, are all of the wells in Sections 1 and 6 opened in the entire interval of the top of the Loco Hills to a hundred feet below, or are they just opened in the Loco Hills?

A They are just opened in the Loco Hills, and actually, some of them have not completely penetrated the Loco Hills.

Q About how thick is the Loco Hills sand in this area?

A Approximately 22 feet.

Q That's gross?

A That's net sand.

Q What would be the gross thickness?

A Oh, possibly 30 feet. It is a pretty solid sand, pretty clean sand.

Q Pretty homogeneous?

A Yes.

Q In Sections 1 and 6 again, can you tell me what the highest producing well would be in the last month of production in that immediate area?

A We'll have to check this record, I suppose, but I would

say it has not exceeded ten barrels. Most of those wells in the pilot area are producing less than ten barrels.

Q Well, if you think that is close, you needn't bother with looking up the record. In your injection wells, is it your intention to perforate them the full length of the 30 feet of gross sand, or where do you intend to inject the water in the formation?

A All the wells in this area are completed open hole with the pipe set on top of the pay, so the full sand -- gross sand will be exposed.

Q In other words, these injection wells that you are proposing are already completed?

A Yes, sir. All of the wells shown on this plat are existing wells.

Q Do you know how these wells are cased?

A Yes, sir. I have the list if you would like it, of specific wells in the pilot area.

Q Well, if you have a list you can submit that to the Commission.

A Well, it is not in form for submittal. I could do that later if you like.

Q Will you do that, please? Does that include all of the injection wells or producing wells in the area?

A The injection and producing wells?

Q The areas 1 and 6?

A No, sir, just the wells adjacent to the pilot area.

either enclosed wells, or offsetting producers.

Q That will be sufficient for the present. In your opinion, is the casing program for the wells -- all the wells in this pilot area sufficient to protect the fresh waters in this area?

A Yes, sir.

Q In other words, the cement is circulated up over the fresh water?

A I don't believe that cement was circulated through the fresh water sand. The only fresh water sand that we have any record of is at this 300 feet where we found our water supply well, and, of course, the casing program is carried down through that zone and cement is covering it. The oil string cement program did not tie into the surface casing.

Q But, at any rate, you feel that the schedule you will submit to the Commission will show that the surface casing is cemented through the fresh water zone?

A Yes, sir.

MR. UTZ: Any other questions of the witness?

MR. STAMETS: Yes, sir.

MR. UTZ: Mr. Stamets.

QUESTIONS BY MR. STAMETS:

Q I am not sure if this was asked or not. What is the vertical distance between the base of the vertical limits and the upper part of the Premier sand producing area?

A I will have to talk from memory on that, but I think it

is approximately 150 feet, maybe 200 feet.

Q Is there any possibility that this water will get down into the Premier sand zone?

A No, sir, I don't believe so, because for accumulation in the Premier you would have to have a seal above it, and, of course, our wells are above that seal which is a shale.

Q Is this Newmont General American "G" 2-A Well in Section 31, 17 South, 30 East, the closest Premier producing well in the pilot area?

A Yes, sir. I'd say that's true. I have not examined all the well logs of the offsetting properties which are owned by General American and by Roland Richwolly, but as far as we know, that is the nearest Premier producing well.

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

QUESTIONS BY MR. COOLEY:

Q Mr. Darden, in your opinion, what, if any, will be the effect of your injection program, if approved, upon offsetting property not belonging to Newmont Oil Corporation?

A Well, I think it possibly will stimulate production on the offsetting properties. The amount of increase will then be dependent upon whether they participate in backing up their own producers.

Q In your opinion, is there any reasonable possibility of adversely affecting offset operators' wells?

A I don't believe so, but, of course, we don't know until

we put water into the ground. We have no evidence of any high permeability zones which would cause rapid change.

Q Have all operators been notified of this application?

A I believe they have.

MR. CAMPBELL: I don't know whether they have received special notice or not.

Q (By Mr. Cooley) Of course, they have been notified by the advertisement, but I wondered if they had been consulted on the possibility of a cooperate lease line type of flood in the event this thing proved definite?

A I have talked with Mr. Crosscup of General American and generally outlined what we had in mind here. However, during this pilot phase we did not feel that it was necessary for offset cooperation. In the event the pilot is successful, we will certainly be consulting them for offset cooperation.

Q Do you think the way this area is laid out and the lease in the area is conductive to a cooperative lease line type of flood?

A We believe so.

Q I note that the projected plan on the Exhibit attached to the application would indicate that you thought that there was some possibility of --

A Yes, sir.

Q -- indications of possible offset wells on other acreage in the Exhibit?

A Yes, sir.

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

QUESTIONS BY MR. UTZ:

Q Does the yellow outline on the plat submitted with the application outline your interests --

A Yes, sir.

Q -- that you hold in the area?

MR. CAMPBELL: Yes, sir. That's identical with the dashed line markings on Exhibit 1 which we have offered in evidence here.

Q You own all rights in that entire area?

A Yes, sir, down to the depth indicated.

Q It is not communitized through?

MR. CAMPBELL: No.

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

(Witness excused)

MR. UTZ: Are there any statements to be made in this case? If not, we will take the case under advisement. We will take a ten-minute break.

C E R T I F I C A T E

STATE OF NEW MEXICO)
: ss
COUNTY OF BERNALILLO)

I, J. A. TRUJILLO, Notary Public in and for the County of Bernalillo, State of New Mexico, do hereby certify that the foregoing and attached Transcript of Proceedings before the New Mexico Oil Conservation Commission was reported by me in stenotype and reduced to typewritten transcript by me and/or under my personal supervision, and that the same is a true and correct record to the best of my knowledge, skill and ability.

WITNESS my Hand and Seal, this, the 9th day of October, 1958, in the City of Albuquerque, County of Bernalillo, State of New Mexico.

Notary Public

My Commission Expires:

October 5, 1960.

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 1511, heard by me on Oct-2, 1958.

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

BRADFORD LABORATORIES, INC.

An Associate of Hall Laboratories

HAGAN BUILDING · PITTSBURGH, PA.

Abilene, Texas
August 26, 1958

ADDRESS REPLY TO:
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ABILENE, TEXAS
ORchard 4-2731

Water-Flood Associates
Box 395
Artesia, New Mexico

Case No. 58T19
58T27

Attn: Mr. Harold C. Porter

Newmont Oil Company
Loco Hills Project
Ballard "A" Lease and
Harvey E. Yates, Snowden, and McSweeney Lease
(Benson Field)

SURVEY AND WATER REPORT

The attached sheets contain the results of mineral analyses, compatibility testing, and preliminary reports on bacterial counts made on water samples taken during the August 15 visit to the Loco Hills projects.

Mineral Analysis

An examination of the mineral analysis sheet reveals the Ballard shallow well was producing a brackish water of fairly high turbidity, hardness, and sulfate content. It contained a very high level of dissolved oxygen and a small amount of carbon dioxide. Much of the turbidity of this water was due to debris in the form of clays and silica. This material should decrease in the amount present as the well is "cleared" by future pumping. The iron content of this water is also quite low. Most of the iron present was in the solid or oxidized form due to the presence of high levels of dissolved oxygen. This form of iron would be easily filtered from this water.

The waters produced at the Yates et al No. 4 well and that collected at the tank battery just west of this well were essentially the same. Both were high brines of high hardness, calcium, magnesium, alkalinity and total solids. Their iron content was fairly low. The amount of dissolved hydrogen sulfide was extremely high in each water. The high turbidity of the water from the Yates No. 4 well was due to the presence of oil. At the tank battery this oil had been removed and the turbidity was greatly

reduced. Storage however had caused some of the hydrogen sulfide to become oxidized to free sulfur. The free sulfur, present in the colloidal state, is responsible for the yellow color of the water at the tank battery.

The water from the Benson Field supply well was very turbid due to the presence of oil. It contained fairly high levels of sulfates, chlorides and hardness constituents and was very high in alkalinity and hydrogen sulfide content. The amount of dissolved iron present was negligible.

Bacterial Analysis

The bacterial analysis sheets indicates the shallow well on the Ballard "A" Lease had 160,000 bacteria per milliliter. While this count is not high, it does indicate that future checks should be made on this water for any increase in the bacterial population. It further leads us to suggest that it will probably be necessary to use a chemical such as chlorine to control the growth of these bacteria throughout any injection system that might be used to pressure this water.

The extremely high hydrogen sulfide content of the Benson Field supply water and the Yates et all produced water renders aerobic bacterial growth unlikely and further hinders the growth of most sulfate reducing bacteria. Storage tanks however offer a "breeding grounds" for bacteria and the preliminary sulfate reducer counts indicate that this species is established in the tank battery west of the Yates No. 4 producing well.

Attention should be given to this condition if this water is to be used for injection in the future.

Compatibility Tests

Various proportions of the Ballard "A" Lease shallow well water, the produced water from the tank battery west of the Yates et al No. 4, produced water from producing well Yates et al No. 4, and water from the Benson Field supply well #1; were mixed and turbidity determinations made at regular time intervals as indicated on the Compatibility Test sheet.

All waters were of fairly low turbidity prior to mixing. The Benson Field supply water was of the highest turbidity while the Yates No. 4 produced water was slightly less turbid.

Turbidity readings made immediately after mixing were unchanged after the mixed waters were allowed to stand for intervals of two and four hours. After twenty four hours standing there was some increase in turbidity in most of the mixtures. This increase was due to the precipitation of small amounts of calcium

carbonate and calcium sulfate. A yellow color also developed in the mixtures in proportion to the degree of oxidation (by the dissolved oxygen in the Ballard shallow water) of the dissolved hydrogen sulfide in the Ballard produced and the Benson supply well No. 1 waters.

No gross incompatibilities were observed as a result of this testing. All waters could be mixed as in this test for the purpose of water flooding but mixing will require treatment to aid in the prevention of corrosion, scale formation, and resultant producing formation plugging.

Suspended Solids

Suspended solids as determined by filtration of a known volume of sample in the field through a membrane filter are listed on the Suspended Solids sheet. An identification of the solids is also included.

The Ballard "A" shallow well had considerable suspended material. It was mostly silica and clays with some iron in the form of iron oxide. The amount of silica will diminish as the well is pumped and finally cleared. Iron in the oxidized form will continue to be present. Proper "sizing" of the turbine pump at this well should prevent excess take-up of oxygen and reduce the amount of iron present as insoluble iron oxide.

The water from the Yates et al No. 4 producing well contained too much oil to permit any membrane filter determination to be made.

The tank battery west of this well contained insoluble iron sulfide as the major constituent with lesser amounts of silica and sulfides. The presence of insoluble iron sulfide attests to the fact some corrosion has occurred between the producing wells and in the storage tanks.

The supply water from the Benson Field supply well No. 1 contained major amounts of suspended silica and petroleum products. Trace amounts of iron and sulfides were present. Continued pumping should result in a reduction of the suspended silica but the oil will probably always be present. This must be removed before this water can be filtered and otherwise conditioned for injection purposes.

Recommendations

The shallow supply well on the Ballard "A" Lease was producing a water that, for the Loco Hills Area, is considered an excellent flooding medium. Water from this well will require a minimum of treatment and conditioning. The following suggestions are offered to outline general treating considerations for this water.

1. The oxygen pick up of the Ballard shallow water can be greatly reduced by sizing the supply pump so that a complete draw-down or "vortex whorl" does not occur at the pump suction.

2. Being a shallow well some oxygen will be present and this will render the water quite corrosive. To aid in prevention of future troubles we would suggest that corrosion resistant material be used throughout the injection system.

3. No elaborate precautions should be taken to keep the system air free since the supply water will contain some oxygen.

4. Adequate filtration should be provided to accomplish efficient iron, bacteria, and silt removal.

5. The use of a stabilizing chemical such as a complex hexameta-phosphate is indicated to prevent carbonate and sulfate deposition ahead of the injection sand face.

6. The use of a bactericide may be necessary. Future analysis and testing when the system is installed and operational will permit a better evaluation of the potential bacterial problem. The use of chlorine as a bactericide would afford the additional advantage of aiding in iron removal.

7. To secure good iron removal it may be necessary to use caustic soda or lime to raise the pH value of the water. The level to which the pH value can be raised is dependent in part on the type of formation to be water flooded. We would like to confer with you on this point later.

8. It would be advisable to design the plant and start injection on the basis of using a maximum volume of (if not all) Ballard "A" shallow well supply water. As the produced fluids increased and disposal of the produced brine became a problem, it would be possible to vary the water treating program so that a sizable proportion of produced brine would be mixed and injected with the shallow supply water. The use of a good corrosion inhibitor should help attain necessary protection of plant equipment not suited to corrosion protection by the choice of composition of material.

The water from the Benson Field would be the most difficult water to condition for injection purposes. It would be very corrosive to metal surfaces and its high alkalinity and hardness levels would necessitate elaborate treatment to secure a stable water if handled in an open system. This water could be handled in a closed system but corrosion and scale formation (deposition of calcium salts) would still be a problem. The use of an alkali to obtain controlled deposition of calcium salts would result in a high pH water. This water would be unsuitable for injection into a Bentonite or other type clay producing formation that would tend to swell upon contact with an elevated pH water.

The oxidation of the extremely high levels of hydrogen sulfide in the Ballard "A" produced water and the Benson Field supply water would result in the formation of insoluble sulfur. The sulfur is formed as a colloidal dispersion and in this form causes no trouble. Changes in pH (especially lowering the pH with acid) can result in the formation of amorphous sulfur from the colloidal dispersion. Amorphous sulfur is a flocular, insoluble precipitate that would plug any injection sand face in a short time if present in sufficient quantities. An examination of your core analyses and records would permit a better prediction of the probability of this undesirable reaction taking place on your project.

Summary

Of the waters tested, the Ballard "A" Lease shallow well offers the best prospects of furnishing a water suitable for injection purposes. It would be possible with proper plant design to provide for a mixing of this water with some Ballard Lease produced brine. However, if large volumes of produced brine are expected it would be better initially to handle them in a separate closed system.

The Benson Field supply water would be the most difficult, of the waters tested, to condition for injection. Like the Ballard produced brine it is high in hydrogen sulfide content and very corrosive. Of the waters tested it is the least stable as to the deposition of calcium salts. Its presence in the compatibility test mixtures resulted in most cases in higher twenty-four hour turbidity readings. Laboratory tests show this water to form the greatest amount of calcium sulfate upon standing. The high hydrogen sulfide content of this water (and the Ballard "A" produced brine) would be very difficult to lower to near zero levels even by aeration. For this reason it would be best to handle this water in a closed or semi-closed system.

Conclusion

We are deeply grateful to Mr. Hal Porter for his help in locating and securing necessary water samples. It is always a pleasure to work with energetic cooperative personnel.

Should you have any questions regarding this report or the analyses reported herein, please feel free to call on us.

We look forward to being of further service to your organization in the near future. We would greatly appreciate the opportunity of assisting you as much as possible in the design of your proposed water conditioning plant.

Very truly yours,

A. W. Baumgartner

AWB/pl
cc: Mr. Harold C. Porter (5)
File (1)

Case No. 58T27

BRADFORD LABORATORIES, INC.

Associate of Hall Laboratories

WATER ANALYSIS RESULTS

CLIENT: Newmont Oil Company

Sample No.		x1	x2	x3
Date Sampled		8/15/58	8/15/58	8/15/58
Time Sampled		10:00 A.M.	12:20 PM	1:15 PM
Date Received				
Time Received				
Location: BALLARD "A" LEASE		Loco Hills Field, Sec. 1, R-29-E Supply Well #1	Yates No. 4 N.E. S.W., Sec. 6, T1S S. R-30-E	Gun Barrel Just West of R-30-E. (West of Yates No.4)
Appearance When Sampled		Hazy, Red Color	Turbid, Oily	Yellow Color
Appearance After Standing		Clear Orange ppt.	Sl. Hazy	Yellow Color
Odor		None	Oily, H_2S	H_2S
Taste		Sl. Salty	Salty	Salty
Temperature	°F	71.0	86.0	98.0
pH		7.3	7.9	8.3
Carbon Dioxide	ppm CO_2	10.0	>100	>100
Dissolved Oxygen	ppm O_2	9.7	0	0
Residual Chlorine	ppm Cl	N.D.	N.D.	N.D.
Turbidity	ppm	47	V. Turbid	0.7
Manganese	ppm Mn	0.0	0.0	0.0
Iron (Total)	ppm Fe	1.5	0.4	0.7
Alkalinity to Phenolphthalein	ppm $CaCO_3$	0	150	200
Alkalinity to Methyl Orange	ppm $CaCO_3$	102	1,925	1,900
Sulfates	ppm SO_4	2,340	5,420	5,500
Chlorides	ppm Cl	4,960	79,000	80,000
Total Hardness	ppm $CaCO_3$	3,800	19,600	19,600
Silica	ppm SiO_2	21.3	2.8	2.7
Calcium	ppm Ca	980	2,160	2,160
Magnesium	ppm Mg	328	3,450	3,450
[illegible]	ppm Fe	Less than 0.1	0.1	0.1
Total Solids (Gravimetric)	ppm	12,850	147,000	147,400
Equilibrium Determination Phenolphthalein Alkalinity		0	320	650
Methyl Orange Alkalinity		104	1,724	1,325
Hydrogen Sulfide	ppm H_2S	0.0	1,270	1,270

17.1 ppm equal 1 grain per U. S. gallon. - "nd" means not determined.

COMMENTS

Case No. 58T19

BRADFORD LABORATORIES, INC.

Associate of Hall Laboratories

WATER ANALYSIS RESULTS

CLIENT: Newmont Oil Company

Sample No.		x1			
Date Sampled		8/15/58			
Time Sampled		2:15 P.M.			
Date Received					
Time Received					
Location: HARVEY E. YATES, SNOWDEN, AND McSWEENEY LEASE (BENSON FIELD)		Harvey E. Yates, Snowden, & McSweeney Supply Well #1			
Appearance When Sampled		Oily, Very Turbid, Gas			
Appearance After Standing		Oily, Hazy,			
Odor		H2S			
Taste		Salty			
Temperature	°F	82.0			
pH		6.5			
Carbon Dioxide	ppm CO_2	>400			
Dissolved Oxygen	ppm O_2	0			
Residual Chlorine	ppm Cl_2	N.D.			
Turbidity	ppm	Very Turbid			
Manganese	ppm Mn	0.0			
Iron (Total)	ppm Fe	0.05			
Alkalinity to Phenolphthalein	ppm $CaCO_3$	0			
Alkalinity to Methyl Orange	ppm $CaCO_3$	1,032			
Sulfates	ppm SO_4	1,370			
Chlorides	ppm Cl	9,600			
Total Hardness	ppm $CaCO_3$	3,300			
Silica	ppm SiO_2	2.9			
Calcium	ppm Ca	600			
Magnesium	ppm Mg	437			
[illegible] Dissolved Iron	ppm Fe	0.05			
Total Solids (Gravimetric)	ppm	19,200			
Equilibrium Determination:					
Phenolphthalein Alkalinity		0			
Methyl Orange Alkalinity		672			
Hydrogen Sulfide	ppm H_2S	790			

17.1 ppm equal 1 grain per U. S. gallon. - "nd" means not determined.

COMMENTS

Case No. 5827

BRADFORD LABORATORIES, INC.

BRADFORD, PENNSYLVANIA EVANSVILLE, INDIANA

BACTERIAL ANALYSIS RESULTS

CLIENT: Monsanto Oil Company

Sample No.	B1	B2	B3	
Date Sampled	8/15/58	8/15/58	8/15/58	
Time Sampled	9:30 A.M.	11:45 A.M.	12:45 PM	
Date Analyzed	8/16/58	8/16/58	8/16/58	
Time Analyzed	7:30 A.M.	7:30 A.M.	7:30 A.M.	
Location BALLARD "A" LEASE	New Shallow Supply Well	Yates NO 4 Producing Well	Gum Barrel Just West of Yates No. 4	
Total No. Aerobic Colonies on Agar 30° C — 24 hrs.	158,000	0	0	
Total No. Aerobic Colonies on Agar 30° C — 120 hrs. 7 Days	160,000	0	0	
Total No. Anaerobic Colonies on Agar — 24 hrs.				
Total No. Anaerobic Colonies on Agar — 120 hrs.				
Sulfate Reducers 9 Days	0	0	30	

COMMENTS:

The Aerobic count is final.

The Sulfate Reducer count is preliminary.

The final Sulfate Reducer count will be completed about September 6th and a report will be sent at that time.

Case No. 58T19

BRADFORD LABORATORIES, INC.

BRADFORD, PENNSYLVANIA EVANSVILLE, INDIANA

BACTERIAL ANALYSIS RESULTS

CLIENT: Neumont Oil Company

Sample No.	B1			
Date Sampled	8/15/58			
Time Sampled	2:30 PM			
Date Analyzed	8/16/58			
Time Analyzed	7:30 AM			
Location HARVEY E YATES, SNOWDEN AND McSWEENEY LEASE	Supply Well #1			
Total No. Aerobic Colonies on Agar 30° C — 24 hrs.	0			
Total No. Aerobic Colonies on Agar 30° C — 7 Days	0			
Total No. Anaerobic Colonies on Agar — 24 hrs.				
Total No. Anaerobic Colonies on Agar — 120 hrs.				
Sulfate Reducers - 9 Days	0			

COMMENTS:

The Aerobic count is final.

The Sulfate Reducer count is preliminary.

The final Sulfate Reducer count will be completed about September 6th and a report will be sent at that time.

BRADFORD LABORATORIES, INC.

COMPATIBILITY TEST SHEET

Sample Number	Proportion of each water* used to make mixtures (percent used)				Turbidity (ppm) after Time			
	x1	x2	x3	x4	1 Hr.	2 Hr.	4 Hr.	24 Hr.
1	100				0.55	no detectable change	no detectable change	1.85
2		100			2.15	"	"	1.85
3			100		0.55	"	"	0.55
4				100	4.0	"	"	3.60
5	50	25		25	4.40	"	"	4.40
6	50		25	25	3.25	"	"	3.60
7	25	50		25	3.60	"	"	4.40
8	25		50	25	2.85	"	"	2.85
9	25	25		50	3.25	"	"	4.00
10	25		25	50	2.85	"	"	3.85
11	50	50			2.15	"	"	2.75
12	50		50		1.60	"	"	2.85
13	50			50	3.60	"	"	4.40
14		50		50	3.25	"	"	3.75
15			50	50	3.05	"	"	3.60

*NOTE:

x1--Shallow Supply Well Water - Ballard "A" Lease

x2--Produced water from Yates et al No. 4 - Ballard "A" Lease

x3--Produced water from Tank Battery west of Yates et at No. 4 Well - Ballard "A" Lease

x4--Supply Well #1 water - Benson Field, Harvey E. Yates, Snowden and McSweeney Lease

BRADFORD LABORATORIES, INC.

SUSPENDED SOLIDS
(by Membrane Filter determination)

Sample No.		Mf 1	Mf 2	Mf 3
Location:		Supply Well #1 Ballard "A" Lease	Tank Battery West of Yates No. 4	Supply Well #1 Harvey E. Yates, Snowden, and McSweeney Lease
Total Suspended Solids	ppm	53.4	12.2	20.4
Identification of Suspended Solids				
Silica as SiO_2		Major	Low-Minor	Major
Iron as Fe_2O_3		Minor	Major	Trace
Sulfides as S^{--}		None	Low-Minor	Trace
Manganese as Mn		None	None	None
Sulfur as S		None	None	None
Organic Material as petroleum compounds		None	None	Major

NOTE: Quantitative Terms and their Equivalents

Terms	Percent Constituent
Major	greater than 30%
Low-Major	20-30
High-Minor	15-20
Minor	8-15
Low-Minor	4-8
Trace	1-4