CASE 3498: Application of PAN AM. for a pressure maintenance project, San Juan County, N. M.

CASE NO.
3248

Application,
Transcripts,
Small Exhibits
ETC.

GOVERNOR
JACK M. CAMPBELL
CHAIRMAN

State of New Mexico
Oil Conservation Commission

LAND COMMISSIONER
GUYTON B. HAYS
MEMBER

P. O. BOX 2088
SANTA FE

STATE GEOLOGIST
A. L. PORTER, JR.
SECRETARY - DIRECTOR

December 9, 1966

Mr. Louis Ross
Pan American Petroleum Corporation
Security Life Building
Denver, Colorado 80202

Re: Case No. 3498
Order No. R-3163
Applicant:

PAN AMERICAN PETROLEUM CORP.

Dear Sir:

Enclosed herewith are two copies of the above-referenced Commission order recently entered in the subject case.

Very truly yours,

A. L. Porter, Jr.

A. L. PORTER, Jr.
Secretary-Director

ir/

Carbon copy of order also sent to:

Hobbs OCC x
Artesia OCC
Aztec OCC x
OTHER Mr. Frank Irby

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. 3498
Order No. R-3163

APPLICATION OF PAN AMERICAN PETROLEUM
CORPORATION FOR A PRESSURE MAINTENANCE
PROJECT, SAN JUAN COUNTY, NEW MEXICO.

ORDER OF THE COMMISSION

BY THE COMMISSION:

This cause came on for hearing at 9 a.m. on November 30, 1966, at Santa Fe, New Mexico, before Examiner Daniel S. Nutter.

NOW, on this 9th day of December, 1966, the Commission, a quorum being present, having considered the testimony, the record, and the recommendations of the Examiner, 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, Pan American Petroleum Corporation, proposes to institute a pressure maintenance project in the Pinon-Gallup Oil Pool, San Juan County, New Mexico, with injection of water initially through the following four wells, San Juan County, New Mexico:

Lease Name	Well	Unit	Section	Township	Range
Gallegos Canyon Unit	Well No. 257	K	19	28 North	11 West
Gallegos Canyon Unit	Well No. 258	G	24	28 North	12 West
Gallegos Canyon Unit	Well No. 259	P	14	28 North	12 West
Gallegos Canyon Unit	Well No. 260	I	15	28 North	12 West

(3) That the applicant proposes that an administrative procedure be established whereby said proposed maintenance project may

be expanded for good cause shown, and whereby additional wells in the project area may be converted to water injection.

(4) That Special Rules and Regulations for the operation of the Pan American Petroleum Corporation Piñon Gallup Pressure Maintenance Project should be promulgated and, for operational convenience, such rules should provide certain flexibility in authorizing the production of the project allowable from any well or wells in the project in any proportion, provided that no well in the project area which directly or diagonally offsets a well outside the project area producing from the same common source of supply should be allowed to produce in excess of top unit allowable for the Piñon-Gallup Oil Pool until such time as the well has experienced a substantial response from water injection. When such a response has occurred, the well should be permitted to produce up to two times top unit allowable for the Piñon-Gallup Oil Pool. Production of such well at a higher rate should be authorized only after notice and hearing.

IT IS THEREFORE ORDERED:

(1) That the applicant, Pan American Petroleum Corporation, is hereby authorized to institute a pressure maintenance project in the Piñon-Gallup Oil Pool, San Juan County, New Mexico, by the injection of water into the Gallup formation through the following-described wells:

Lease Name	Well	Unit	Section	Township	Range
Gallegos Canyon Unit	Well No. 257	K	19	28 North	11 West
Gallegos Canyon Unit	Well No. 258	G	24	28 North	12 West
Gallegos Canyon Unit	Well No. 259	P	14	28 North	12 West
Gallegos Canyon Unit	Well No. 260	I	15	28 North	12 West

(2) That Special Rules and Regulations governing the operation of the Pan American Petroleum Corporation Piñon Gallup Pressure Maintenance Project, San Juan County, New Mexico, are hereby promulgated as follows, effective January 1, 1967:

SPECIAL RULES AND REGULATIONS
FOR THE
PAN AMERICAN PETROLEUM CORPORATION
PIÑON GALLUP PRESSURE MAINTENANCE PROJECT

RULE 1. The project area of the Pan American Petroleum Corporation Piñon Gallup Pressure Maintenance Project, San Juan County,

New Mexico, hereinafter referred to as the Project, shall comprise that area described as follows:

TOWNSHIP 28 NORTH, RANGE 11 WEST, NMPM
Section 19: Lots 1, 2, 3, 4 (W/2 W/2), E/2 NW/4, S/2 NE/4, SE/4, E/2 SW/4

TOWNSHIP 28 NORTH, RANGE 12 WEST, NMPM
Section 10: SE/4 SW/4, S/2 SE/4
Section 13: S/2 S/2, NW/4 SW/4
Section 14: NW/4, SW/4 NE/4, S/2
Section 15: NE/4, E/2 NW/4, N/2 SE/4, SE/4 SE/4
Section 23: N/2 N/2, SE/4 NE/4
Section 24: N/2, N/2 SE/4

RULE 2. The allowable for the Project shall be the sum of the allowables of the several wells within the project area, including those wells which are shut-in, curtailed, or used as injection wells. Allowables for all wells shall be determined in a manner hereinafter prescribed.

RULE 3. Allowables for injection wells may be transferred to producing wells within the project area, as may the allowables for producing wells which, in the interest of more efficient operation of the Project, are shut-in or curtailed because of high gas-oil ratio or are shut-in for any of the following reasons: pressure regulation, control of pattern or sweep efficiencies, or to observe changes in pressures or changes in characteristics of reservoir liquids or progress of sweep.

RULE 4. The allowable assigned to any well which is shut-in or which is curtailed in accordance with the provisions of Rule 3, which allowable is to be transferred to any well or wells in the project area for production, shall in no event be greater than its ability to produce during the test prescribed by Rule 6, below, or greater than the current top unit allowable for the pool during the month of transfer, whichever is less.

RULE 5. The allowable assigned to any injection well on an 80-acre proration unit shall be top unit allowable for the Piñon-Gallup Oil Pool.

RULE 6. The allowable assigned to any well which is shut-in or curtailed in accordance with Rule 3, shall be determined by a

24-hour test at a stabilized rate of production, which shall be the final 24-hour period of a 72-hour test throughout which the well should be produced in the same manner and at a constant rate. The daily tolerance limitation set forth in Commission Rule 502 I (a) and the limiting gas-oil ratio (2,000 to 1) for the Pinon-Gallup Oil Pool shall be waived during such tests. The project operator shall notify all operators offsetting the well, as well as the Commission, of the exact time such tests are to be conducted. Tests may be witnessed by representatives of the offsetting operators and the Commission, if they so desire.

RULE 7. The allowable assigned to each producing well in the Project shall be equal to the well's ability to produce or to top unit allowable for the Pinon-Gallup Oil Pool, whichever is less, provided that any producing well in the project area which directly or diagonally offsets a well outside the project area producing from the same common source of supply shall not produce in excess of top unit allowable for the pool until such time as the well receives a substantial response to water injection. When such a response has occurred, the well shall be permitted to produce up to two times top unit allowable for the pool. Production of such well at a higher rate shall be authorized only after notice and hearing. Each producing well shall be subject to the limiting gas-oil ratio (2,000 to 1) for the Pinon-Gallup Oil Pool, except that any well or wells within the project area producing with a gas-oil ratio in excess of 2,000 cubic feet of gas per barrel of oil may be produced on a "net" gas-oil ratio basis, which net gas-oil ratio shall be determined by applying credit for daily average gas injected, if any, into the Pinon-Gallup Oil Pool within the project area to such high gas-oil ratio well. The daily adjusted oil allowable for any well receiving gas injection credit shall be determined in accordance with the following formula:

$$A_{adj} = \frac{TUA \times F_a \times 2{,}000}{\frac{P_g - I_g}{P_o}}$$

where:

A_{adj} = top well's daily adjusted allowable

TUA = top unit allowable for the pool

F_a = the well's acreage factor

P_g = average daily volume of gas produced by the well during the preceding month, cubic feet

I_g = the well's allocated share of the daily average gas injected during the preceding month, cubic feet

P_o = average daily volume of oil produced by the well during the preceding month, barrels

In no event shall the amount of injected gas being credited to a well be such as to cause the net gas-oil ratio, $\frac{P_g - I_g}{P_o}$, to be less than 2,000 cubic feet of gas per barrel of oil produced.

RULE 8. Credit for daily average net water injected into the Pinon-Gallup Oil Pool through any injection well located within the project area may be converted to its gas equivalent and applied to any well producing with a gas-oil ratio in excess of two thousand cubic feet of gas per barrel of oil. Total credit for net water injected in the project area shall be the gas equivalent volume of the daily average net water injected during a one-month period. The daily average gas equivalent of net water injected shall be computed in accordance with the following formula:

$$E_g = (V_{w\ inj} - V_{w\ prod}) \times 5.61 \times \frac{P_a}{15.025} \times \frac{520^{\circ}}{T_r} \times \frac{1}{Z}$$

where:

E_g = Average daily gas equivalent of net water injected, cubic feet

$V_{w\ inj}$ = Average daily volume of water injected, barrels

$V_{w\ prod}$ = Average daily volume of water produced, barrels

5.61 = Cubic foot equivalent of one barrel of water

P_a = Average reservoir pressure at a datum of + 100 feet above sea level, psig + 12.00, as determined from most recent survey

15.025 = Pressure base, psi

520° = Temperature base of 60°F expressed as absolute temperature

T_r = Reservoir temperature of 158°F expressed as absolute temperature (618°R)

Z = Compressibility factor from analysis of Piñon-Gallup gas at average reservoir pressure, P_a, interpolated from compressibility tabulation below:

Pressure Psig	Z	Pressure Psig	Z	Pressure Psig	Z
0	1.000	500	.907	1000	.864
50	.983	550	.902	1050	.860
100	.969	600	.896	1100	.856
150	.958	650	.893	1150	.852
200	.948	700	.889	1200	.848
250	.939	750	.884	1250	.844
300	.932	800	.880	1300	.840
350	.924	850	.876	1350	.837
400	.918	900	.872	1400	.833
450	.912	950	.868	1450	.829
				1470	.827

RULE 9. Each month the project operator shall, within three days after the normal unit allowable for Northwest New Mexico has been established, submit to the Commission a Pressure Maintenance Project Operator's Report, on a form prescribed by the Commission, outlining thereon the data required, and requesting allowables for each of the several wells in the Project as well as the total Project allowable. The aforesaid Pressure Maintenance Project Operator's Report shall be filed in lieu of Form C-120 for the Project.

RULE 10. The Commission shall, upon review of the report and after any adjustments deemed necessary, calculate the allowable for each well in the Project for the next succeeding month in accordance with these rules. The sum of the allowables so calculated

shall be assigned to the Project and may be produced from the wells in the Project in any proportion except that no well in the Project which directly or diagonally offsets a well outside the Project producing from the same common source of supply shall produce in excess of two times top unit allowable for the pool.

RULE 11. The conversion of producing wells to injection, the drilling of additional wells for injection, and expansion of the project area shall be accomplished only after approval of the same by the Secretary-Director of the Commission. To obtain such approval, the Project operator shall file proper application with the Commission, which application, if it seeks authorization to convert additional wells to injection or to drill additional injection wells shall include the following:

(1) A plat showing the location of proposed injection well, all wells within the project area, and offset operators, locating wells which offset the project area.

(2) A schematic drawing of the proposed injection well which fully describes the casing, tubing, perforated interval, and depth showing that the injection of gas or water will be confined to the Gallup formation.

(3) A letter stating that all offset operators to the proposed injection well have been furnished a complete copy of the application and the date of notification.

The Secretary-Director may approve the proposed injection well if, within 20 days after receiving the application, no objection to the proposal is received. The Secretary-Director may grant immediate approval, provided waivers of objection are received from all offset operators.

Expansion of the project area may be approved by the Secretary-Director of the Commission administratively when good cause is shown therefor.

(3) That jurisdiction of this cause is retained for the entry of such further orders as the Commission may deem necessary.

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

STATE OF NEW MEXICO
OIL CONSERVATION COMMISSION

JACK M. CAMPBELL, Chairman

GUYTON B. HAYS, Member

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

S E A L

Township 28 North, Range 11 West
Section 19 Lots 1, 2, 3, 4 (W/2 W/2),
E/2 NW/4, S/2 NE/4, SE/4, E/2 SW/4

Township 28 North, Range 12 West
Section 10 SE/4 SW/4, S/2 SE/4
Section 13 S/2 S/2, NW/4 SW/4
Section 14 NW/4, SW/4 NE/4, S/2
Section 15 NE/4, E/2 NW/4, N/2 SE/4, SE/4 SE/4
Section 23 N/2 N/2, SE/4 NE/4
Section 24 N/2, ~~NE/4 SW/4~~ N/2 SE/4

OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO

Date 12/2/66

CASE 3498 Hearing Date 9am 11/30/66
dkm @ SF

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

Enter an order approving the Pan American Petr. Corp Piñon Gallup Pressure Maintenance Proj in San Juan Co N. M.
Wtr. Injection is to be into the Gallup formation of the Piñon Gallup Oil Pool through the following wells.

Lease name	Well No	Unit	S T R
Gallegos Canyon Unit	Well No 257	K	19-28N-11W
" " "	" " 258	G	24-28N-12W
" " "	" " 259	P	14-28N-12W
" " "	" " 260	I	15-28N-12W

The project area shall be; the project area identical to those contained in Order No R-2211 for the Pan Am Cha Cha Gallup Press maint Project except for Reservoir chart characteristics which are on attached sheet.

Reese 8

Pa datum + 100 feet above sea level

Reservoir temp 158° F and 618° R

Z factors

0	1.000
50	.983
100	.969
150	.958
200	.948
250	.939
300	.932
350	.924
400	.918
450	.912
500	.907
550	.902
600	.896
650	.893
700	.889
750	.884
800	.880
850	.876
900	.872
950	.868
1000	.864
1050	.860
1100	.856
1150	.852
1200	.848
1250	.844
1300	.840
1350	.837
1400	.833
1450	.829
1470	.827

ATWOOD & MALONE
LAWYERS

JEFF D. ATWOOD (1887-1958)
ROSS L. MALONE
CHARLES F. MALONE
RUSSELL D. MANN
PAUL A. COOTER
BOB F. TURNER
ROBERT A. JOHNSON
JOHN W. BASSETT, JR.

P. O. DRAWER 700
TELEPHONE 505 622-6221
SECURITY NATIONAL BANK BUILDING
ROSWELL, NEW MEXICO
88201

November 21, 1966

Mr. A. L. Porter, Jr.
Secretary-Director
Oil Conservation Commission
Post Office Box 2088
Santa Fe, New Mexico

RE: Case Number 3498 on the November 30, 1966 Docket

Dear Mr. Porter:

We enclose herewith our Entry of Appearance on behalf of Pan American Petroleum Corporation. The actual presentation for Pan American Petroleum Corporation will be made by Louis C. Ross, Esquire, of the Colorado Bar Association.

Very truly yours,

ATWOOD & MALONE

Paul A. Cooter

PAC:sah

Encl.

cc: Louis C. Ross, Esquire

BEFORE THE OIL CONSERVATION COMMISSION

STATE OF NEW MEXICO

IN THE MATTER OF THE APPLICATION OF PAN AMERICAN PETROLEUM CORPORATION FOR AUTHORITY TO INSTITUTE A PRESSURE MAINTENANCE PROJECT IN THE PINON GALLUP OIL POOL, SAN JUAN COUNTY, NEW MEXICO.	)	No. 3498

'66 NOV 22 AM

ENTRY OF APPEARANCE

The undersigned, Atwood & Malone of Roswell, New Mexico, a firm of attorneys whose members are duly licensed to practice law in the State of New Mexico, hereby enters its appearance in this cause as New Mexico counsel for Pan American Petroleum Corporation.

DATED at Roswell, New Mexico, this 21st day of November, 1966.

ATWOOD & MALONE

BY _____

Attorneys for Pan American
Petroleum Corporation
Post Office Drawer 700
Roswell, New Mexico

(Case 3497 continued)

36 East, Eumont Gas Pool, Lea County, New Mexico, to be dedicated to its Wallace State Well No. 3 located at an unorthodox location 3,300 feet from the South line and 1980 feet from the West line of said Section 3. Applicant further seeks the assignment to said proration unit of the accumulated underproduction presently carried by its Wallace State Well No. 2 located in Unit L of said Section 3, said well currently being dedicated to a 160-acre non-standard gas proration unit comprising Lots 5, 6, 11, and 12 of said Section 3, and also the assignment to said unit of the accumulated underproduction presently carried by the aforesaid Wallace State Well No. 3, said well currently being dedicated to an 80-acre non-standard proration unit comprising Lots 13 and 14 of said Section 3.

CASE 3498: Application of Pan American Petroleum Corporation for a pressure maintenance project, San Juan County, New Mexico. Applicant, in the above-styled cause, seeks authority to institute a pressure maintenance project in the Piñon Gallup Oil Pool by the injection of water into the Gallup formation through five wells located in Section 19, Township 28 North, Range 11 West and Sections 14, 15, and 24, Township 28 North, Range 12 West, San Juan County, New Mexico. Applicant further seeks the promulgation of special rules for the operation of said project.

CASE 3499: Application of Pan American Petroleum Corporation for pressure interference tests, Chaves County, New Mexico. Applicant, in the above-styled cause, seeks authority to conduct a pressure interference test in the Cato-San Andres Pool, Chaves County, New Mexico, by shutting in a number of its wells in said pool and producing its Baskett "D" Well No. 1 located in Unit G, Section 11, Township 8 South, Range 30 East, Chaves County, New Mexico. Applicant also seeks authority to transfer the allowable from other wells on said Baskett "D" lease to Well No. 1, to temporarily overproduce said lease, and to make-up the overproduction at the conclusion of the test period by curtailment of wells on said lease. Applicant further seeks authority to accumulate underproduction on any lease where wells will be shut-in, for production upon conclusion of the interference tests.

Docket No. 30-66

DOCKET: EXAMINER HEARING - WEDNESDAY - NOVEMBER 30, 1966

9 A.M. - OIL CONSERVATION COMMISSION CONFERENCE ROOM,
STATE LAND OFFICE BUILDING - SANTA FE, NEW MEXICO

The following cases will be heard before Daniel S. Nutter, Examiner, or Elvis A. Utz, Alternate Examiner:

CASE 3492: Application of Midwest Oil Corporation for special pool rules, Lea County, New Mexico. Applicant, in the above-styled cause, seeks the promulgation of special pool rules for the Cinta Roja-Morrow Gas Pool, Lea County, New Mexico, including a provision for 640-acre proration units.

CASE 3493: Application of H. N. Sweeney for a unit agreement, Eddy County, New Mexico. Applicant, in the above-styled cause, seeks approval of its Hale Unit Area comprising 1920 acres, more or less, of Federal, State and Fee lands in Township 20 South, Range 30 East, Eddy County, New Mexico.

CASE 3494: Application of Texaco Inc. for a non-standard gas well location, Lea County, New Mexico. Applicant, in the above-styled cause, seeks approval of its Cotton Draw Unit Well No. 64 at an unorthodox gas well location 660 feet from the North line and 1652 feet from the West line of Section 18, Township 25 South, Range 32 East, in an undesignated Devonian gas pool, Lea County, New Mexico.

CASE 3495: Application of Burleson & Huff for a non-standard proration unit and a non-standard location, Lea County, New Mexico. Applicant, in the above-styled cause, seeks the approval of a 50.30-acre non-standard oil proration unit comprising all of Lot 3, Section 2, Township 16 South, Range 32 East, North Anderson Ranch-Wolfcamp Pool, Lea County, New Mexico, to be dedicated to a well to be drilled at a non-standard location for said pool 990 feet from the North line and 330 feet from the East line of said Lot 3.

CASE 3496: Application of Newmont Oil Company for a waterflood expansion, Eddy County, New Mexico. Applicant, in the above-styled cause, seeks authority to expand its West Square Lake Waterflood Project, Square Lake Pool, by the conversion to water injection of its Continental State Well No. 1, located 1980 feet from the North line and 1980 feet from the West line of Section 36, Township 16 South, Range 31 East, Eddy County, New Mexico.

CASE 3497: Application of Me-Tex Supply Company for a non-standard gas proration unit and a non-standard gas well location, Lea County, New Mexico. Applicant, in the above-styled cause, seeks the approval of a non-standard gas proration unit comprising Lots 5, 6, 11, 12, 13, and 14 of Section 3, Township 21 South, Range

BEFORE THE OIL CONSERVATION COMMISSION
OF THE STATE OF NEW MEXICO

IN THE MATTER OF THE APPLICATION OF
PAN AMERICAN PETROLEUM CORPORATION
FOR AN ORDER APPROVING THE DRILLING
OF FOUR INJECTION WELLS AND CONDUCTING
A PRESSURE MAINTENANCE PROJECT IN THE
GALLUP FORMATION, GALLUP PARTICIPATING
AREA "D", GALLEGOS CANYON UNIT,
PIÑON GALLUP OIL POOL
SAN JUAN COUNTY, NEW MEXICO

Case 3498

APPLICATION

COMES NOW Pan American Petroleum Corporation and respectfully presents this Application to the Oil Conservation Commission of the State of New Mexico for an Order approving the drilling of four injection wells to conduct a Pressure Maintenance Project in the Gallup formation, Gallup Participating Area "D", Gallegos Canyon Unit, Piñon Gallup Oil Pool, San Juan County, New Mexico. In support of this Application, Pan American Petroleum Corporation states:

1. That the Applicant, Pan American Petroleum Corporation (hereinafter called Pan American), is a Delaware Corporation duly authorized to transact business in, and is transacting business in the State of New Mexico.

2. That Pan American is the Operator under terms of the Gallegos Canyon Unit Agreement and files this Application as Unit Operator and on behalf of all persons owning interest in lands committed to the Gallegos Canyon Unit Area, Gallup Participating Area "D", under terms of the Unit Agreement.

3. That there is a plat marked Exhibit "A" attached hereto and made a part hereof which shows the location of the proposed injection wells and the location of all other wells within a radius of two miles from said proposed injection wells and the formation from which said wells are producing or have produced. The plat also indicates the leesees within said two mile radius.

4. That the Applicant, Pan American Petroleum Corporation, seeks an order creating a Pressure Maintenance Project Area for the Gallup formation to be designated the Piñon Gallup Pressure Maintenance Project Area consisting of the following described acreage in San Juan County, New Mexico:

Township 28 North, Range 11 West
Section 19 Lots 1, 2, 3, 4 (W/2 W/2), E/2 NW/4, S/2 NE/4, SE/4, E/2 SW/4

Township 28 North, Range 12 West
Section 10 SE/4 SW/4, S/2 SE/4
Section 13 S/2 S/2, NW/4 SW/4
Section 14 NW/4, SW/4 NE/4, S/2
Section 15 NE/4, E/2 NW/4, N/2 SE/4, SE/4 SE/4
Section 23 N/2 N/2, SE/4 NE/4
Section 24 N/2, NE/4 SW/4, N/2 SE/4

MAILED
4-1-66
JL

5. That the four injection wells proposed have not yet been drilled. A log of Gallegos Canyon Unit Well No. 250 is attached and is believed to be representative of the Gallup formation which will be encountered in the four proposed injection wells.

6. That a diagramatic sketch is attached of the proposed completion procedure for the four injection wells, showing all casing strings, including diameters and approximate setting depths, quantities used and tops of cement, perforated intervals, tubing strings, including diameters and setting depths, and the type and location of packers.

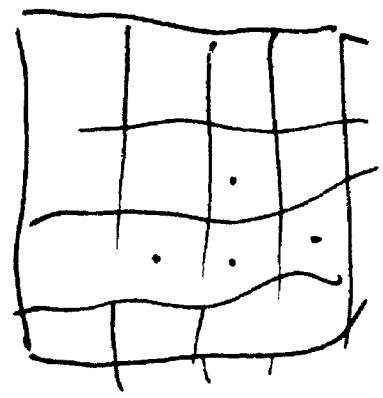
7. That a description of the particular operation for which approval is requested is the initiation of a pressure maintenance project in the Gallup reservoir, the Gallup formation being encountered in the Piñon Gallup Pool at a depth of approximately 5,500 to 5,650 feet below the surface. The Pressure Maintenance Project is to be accomplished by drilling four injection wells at the following locations:

Gallegos Canyon Unit Well No. 257
NE/4 SW/4 Section 19, T28N-R11W
San Juan County, New Mexico

Gallegos Canyon Unit Well No. 258
SW/4 NE/4 Section 24, T28N-R12W
San Juan County, New Mexico

Gallegos Canyon Unit Well No. 259
SE/4 SE/4 Section 14, T28N-R12W
San Juan County, New Mexico

Gallegos Canyon Unit Well No. 260
NE/4 SE/4 Section 15, T28N-R12W
San Juan County, New Mexico



That the Gallup formation into which water will be injected is sandstone. The rate of water injection will be approximately 1,000 barrels per day into each well. That the source of the water to be used for injection is to be obtained by drilling one water supply well to the Ojo Alamo formation at the following location:

Gallegos Canyon Unit Water Well No. 4
NW/4 Section 24, T28N-R12W
San Juan County, New Mexico

8. That this pressure maintenance project is in the interest of conservation and will allow recovery of oil which would not be recovered otherwise.

9. That attached hereto is an Exhibit "B" showing evidence that a copy of this Application, complete with Attachments, has been mailed to the State Engineer's office, Capitol Building, Santa Fe, New Mexico as required by the Rules of the Commission.

WHEREFORE, Pan American requests the Oil Conservation Commission to set this matter for hearing and give notice thereof as required by law and the rules of the Commission. That the Commission also make a finding granting permission to drill or utilize such additional wells for injection or production purposes as may be necessary in the future expansion of the project, but subject to the prior approval by the Commission or its authorized representative.

Respectfully submitted,

PAN AMERICAN PETROLEUM CORPORATION

By _____
Its Attorney-in-Fact

EXHIBIT "B"

A F F I D A V I T

STATE OF COLORADO)
) ss
COUNTY OF DENVER)

JOHN R. KENNEDY, of lawful age, being first duly sworn on his oath deposes and says:

That he is employed by Pan American Petroleum Corporation as a Petroleum Engineer in its Denver, Colorado office; that under his direction and supervision, a copy of Pan American Petroleum Corporation's Application for an order approving the drilling of four injection wells to conduct a pressure maintenance project in the Gallup formation, Gallup Participating Area "D", Gallegos Canyon Unit, Piñon Gallup Oil Pool, San Juan County, New Mexico, was mailed from Applicant's Denver, Colorado office on November 15, 1966, to the State Engineer's Office, Capitol Building, Santa Fe, New Mexico, in accordance with the provisions of the Rules and Regulations of the Oil and Gas Conservation Commission of the State of New Mexico.

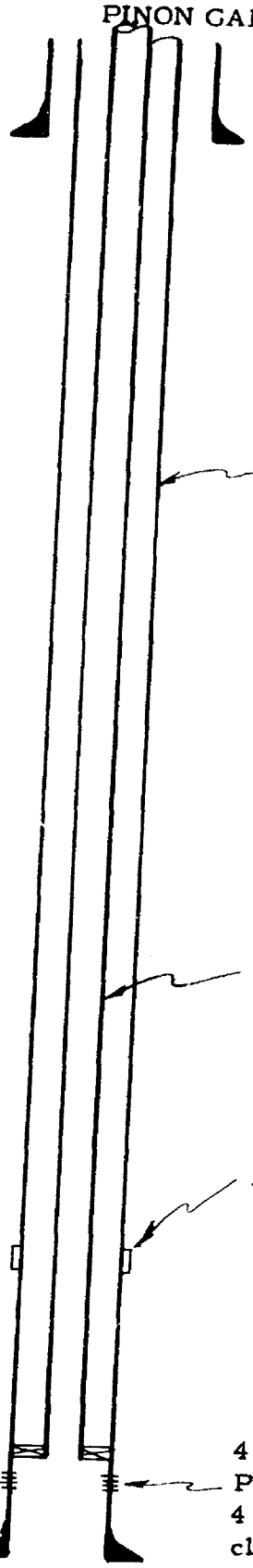
John R. Kennedy
John R. Kennedy

Subscribed and sworn to before me on this 14TH day of November, 1966.

Kathleen L. Allison
Notary Public

My Commission expires 7/26/70.

DIAGRAMATIC SKETCH
COMPLECTION PROCEDURE AND EQUIPMENT
PROPOSED WATER INJECTION WELL
PINON GALLUP PRESSURE MAINTENANCE PROJECT



Top 2nd stage cement 0'

8 5/8" CSA 250' Cement with 150 sacks class "C" containing 2% calcium chloride

4 1/2" Casing

2 1/2" Tubing

Dv tool at 4400' Top 1st stage cement 4400'

2 1/2" tbg. landed at 5550'

4 1/2" Baker Model "P", Packer set at 5550'
Perforate 5600-25' with 4 spf
4 1/2 " CSA 4700'. Cement 1st stage with 350 sacks class "C" containing 6% gel & 2 lb. med. tuf plug per sack followed by 100 sacks class "C" Neat. To be circulated. Cement 2nd stage with 1100 sacks class "C" containing 6% gel and 2 lb. med. tuf plug per sack followed by 50 sacks class "C" neat. To be circulated

BEFORE THE NEW MEXICO
OIL CONSERVATION COMMISSION
Santa Fe, New Mexico
November 30, 1966

EXAMINER HEARING

In the Matter of:

Application of Pan American Petroleum Corporation for a pressure maintenance project, San Juan County, New Mexico.

CASE NUMBER
3498

BEFORE:

DANIEL S. NUTTER, Examiner

TRANSCRIPT OF HEARING

MR. HATCH: Case 3498, Application of Pan American Petroleum Corporation for a pressure maintenance project, San Juan County, New Mexico.

MR. ROSS: May it please the Commission, my name is Louis C. Ross. I am the attorney in the Law Department of Pan American Petroleum Corporation, Denver Division Office. I believe the record shows that the firm of Atwood and Malone have entered their formal appearance in this case. Is that correct?

MR. NUTTER: Yes.

MR. ROSS: This appearance concerns Pan American's application for permission and an order to drill four injection water wells and to conduct a pressure maintenance program in the Gallup formation, Gallup participating area D, Gallegos Canyon Unit, Pinon-Gallup Oil Pool in San Juan County, New Mexico. We have only one witness and I would like to request that you swear him at this time.

(Witness sworn.)

George W. Eaton, called as a witness on behalf of the Applicant, having first been duly sworn, was examined and testified as follows:

DIRECT EXAMINATION

BY MR. ROSS:

Q Please state your name, your occupation, your

employer and your residence.

A George W. Eaton, Jr. I am area engineer for Par American Petroleum Corporation in Farmington, New Mexico.

Q Mr. Eaton, have you ever appeared before this Commission before?

A Yes, sir, I have, many times, I might say.

Q A few times.

MR. ROSS: I believe -- are our witness's qualifications acceptable?

MR. NUTTER: Yes, they are.

(Whereupon, Applicant's Exhibits 1 through 10 were marked for identification.)

MR. ROSS: Very well. At this time, I would like to state that we have ten exhibits. To keep from shuffling so many exhibits around, I would like to introduce them. They are all numbered 1 through 10, inclusive, and I will formally introduce them at the end of the hearing.

Q But first of all, Mr. Eaton, these ten exhibits that we propose to introduce, were they prepared under your supervision and direction or in the case of any reproductions, reproduced by you?

A Yes, sir, they were.

MR. ROSS: Mr. Commissioner, we have several large exhibits that we are placing on the wall, but for the convenience

of the Commission we have small facsimilies also of the larger ones. I believe that our Exhibit Number 1 is a vicinity map just to clarify the area about which -- clarify the area that we are going to discuss and I will ask Mr. Eaton to please explain the vicinity map.

A Our Exhibit Number 1 which has been placed on this far end of the wall here, is a map of a portion of San Juan Basin showing thereon the general vicinity of the Pinon-Gallup Oil Pool which is colored solid green, with respect to the town of Farmington, to which is outlined here in red, showing the town of Farmington to be some five to six miles north and west of the Pinon-Gallup Oil Pool. In addition, pool outlines are shown for other Gallup Pools in the general vicinity of the Pinon-Gallup Pool. You will notice that they have generally one thing in common, they are all a northwest-southeast trending pool and they are all, for your information, typical, typically sand bar deposits that were left by the Gallup Sea as it retreated back out to the northeast, during predatious periods but this is the Pinon-Gallup Oil Pool we will be talking about colored in solid green with the other Gallup pools just merely outlined with a green line.

MR. ROSS: Gentlemen, these exhibits are all more or less inter-related and that our Exhibit 2 is a Gallup formation net pay isopac chart, which is this exhibit, and I

believe it would be best that Mr. Eaton explain this to you gentlemen.

THE WITNESS: Actually, Exhibit 2 shows quite a number of things. Exhibit 2 is, basically, an isopac map showing the net pay distribution in the Pinon Gallup Oil Pool. In addition to the isopac lines, which are the dark blue lines, it also shows the boundaries of the Gallegos Canyon Unit which is the yellow line in the vicinity of the Pinon-Gallup Pool. All of the area to the north and to the west of the pool is in the Gallegos Canyon Unit which is operated by Pan American.

In addition to that the exhibit also shows the existing Gallup oil wells in the Pinon Pool represented by the squares colored in green. It shows points on wells that penetrated the Gallup but were not completed in the Gallup, but which were useful in defining the isopac lines as being identified by the triangles. It shows four proposed wells which will be drilled for the use as injection wells under the proposed pressure maintenance project. These are the wells enclosed by a circle and colored in blue.

In addition to all these other things, it also shows the proposed location of a water supply well which will be drilled to the Ojo-Alamo formation at about a 450 foot depth to obtain water for use in injection. The last thing

that Exhibit 2 shows is the recommended outline for the Pinon-Gallup Pool, pressure maintenance project area. This is the red line as it is displayed on Exhibit 2.

Q Mr. Eaton, I wish you would at this time explain completely the type formation with which we are dealing with how the -- whether it's sandstone, limestone, the rock formation, et cetera.

A The Pinon-Gallup sand is a sandbar which occurs in the Mancos Shale and, therefore, becomes a Gallup sand which is totally enclosed or encased in the shale formation. In other words, shale overlies or underlies it. It exists out in the direction to the northeast and to the southwest where there is no sand, the body itself is enclosed in shale. It is a sand itself, however.

Q In other words, it's a completely, in your opinion, enclosed reservoir?

A Yes, sir.

Q Now, I noticed that these blue wells are your water injection, your proposed water injection well sights. They are not drilled as of this time but it strikes me a somewhat unusual pattern from some others I have seen and I wish you would explain why you show these particular locations and why.

A At first glance, it would appear that there is no

pattern but really the location of these proposed water injection wells is somewhat based on our experience with other water injection projects in the Gallup formation in the San Juan Basin. Particularly, injection projects in the Totah-Gallup Pool which lies to the northwest of the Pinon-Gallup Pool and it is the Cha-Cha-Gallup Pool which lies in the immediate vicinity of the Totah-Gallup Pool.

In both of these pools, one thing that we noticed that caused a great deal of trouble in conducting a successful project was that this is a situation involving either a very definite permeability orientation crossing the sandbar in a traverse manner to its longitudinal axis. In other words, water injected at a location in the center of the sandbar would have a very strong tendency to go to the edges of the sandbar rather than up and down the longitudinal axis.

Therefore, any well which was used as injection well which had as an offset to it, a producer which would locate along this area of permeability orientation would very immediately suffer water breakthrough and very little oil recovery. So we have picked a location for these injectors in such a manner that no such well exists and anticipation that this field will also show this orientation of permeability that has been exhibited in these other pools. Now, if this is the case, what we expect to happen, as we begin our injection

program, is for water injected into this well in Section 19 for example, the first water will immediately take the course of least resistance out towards the feather edge boundary to the northeast and to the southwest of the well. Once it hits this feather edge, then it will have a chance to move laterally down the longitudinal axis toward producing wells and in this manner, give us a much greater conformance factor and better sweep efficiency and hopefully a more successful project.

Q Mr. Easton, the reason that you can make this prediction is based on previous wells drilled in that area, is that correct?

A Our experience in other water flood projects or water injection projects in Gallup Oil Pools, would, exhibits very similar characteristics to this, yes.

Q I see.

MR. ROSS: At this point, I think, Mr. Commissioner, I better point out a discrepancy in our application description from that shown on our Exhibit 2. There is a one 40-acre tract in Section 24 that is included in the application but isn't shown on our exhibit within this reservoir.

Q Will you point out that particular tract, Mr. Eaton, and describe it?

A You're referring to the Northeast quarter of the Southwest quarter of Section 24. This particular 40-acre tract

was included as being proposed for inclusion in the pressure maintenance project area on our application, but upon contemplation of it, we believe that it should not be in there and the reason for that is this: The special project rules which we will recommend here will provide for complete freedom in transfer of allowable from any well to another well in any proportion within this proposed pressure maintenance project area.

Now, this particular 40-acre tract of the Northeast to the Southwest quarter of Section 24 contains a Gallup well which is producing from the Simpson-Gallup Pool. We certainly do not want to ask for a rule which will permit transfer of allowable from a Pinon-Gallup well to a well in the Simpson-Gallup Pool. At such time as this well or this tract becomes productive, if it ever does, from the Pinon-Gallup Pools, then at that time we will, under the administrative procedure, ask that the project be enlarged to include it.

Q I believe your presentation logically leads into Exhibit 3 here which I believe represents a stratigraphic cross section of previous wells drilled in this area; would you explain that exhibit, please, sir?

A Yes, sir. I should have mentioned there is one other thing that is shown on Exhibit 2 is that the green line running from the northwest end of the pool to the southeast

end of the pool and labeled AA Prime is the trace of a cross section. That cross section is our Exhibit Number 3. It is simply designed to show that the sand member of the Gallup Formation which is the Pinon-Gallup producing interval, is a readily correlatible which can be traced from well to well throughout the pool. It is, therefore, a continuous member and there are no impediments to free movement of fluid in there which will hinder the successful operation of the pressure maintenance project. This is really what Exhibit 3 is designed to show, that the sand member is continuous, it can be correlated; that for this reason there is no reason to expect that a pressure maintenance project would not be successful.

MR. ROSS: Gentlemen, our next exhibit is a small one and it consists of a pertinent data sheet which more or less speaks for itself, but I would like for Mr. Eaton to clarify what it represents.

A For the most part, Exhibit Number 4 is self-explanatory. However, I would like to call your attention to a few of the pertinent items on it because it is on the basis of the data as shown in Exhibit 4 that we want to recommend the granting of this pressure maintenance project and the adoption of special rules to govern it.

Please note that the ultimate primary recovery from

this reservoir is expected to be 715,000 barrels. We expect by the conductance of this pressure maintenance project to increase that recovery by 476,000 barrels giving a total ultimate recovery of 1,191,000 barrels. To do this, we must then under economics, $329,000 as additional investment over and above that required for primary operation. The increase in recovery of 476,000 barrels will give us a profit from the pressure maintenance project of $365,000.

Q Mr. Eaton, would you say that this project would tend to foster conservation and would tend to protect correlative rights of all of the parties in this area?

A It's certainly in the interest of conservation for it leads to an increase in recovery amounting to nearly a half a million barrels of oil. There is no question of violation of correlative rights for the entire area is in the Gallegos Canyon Unit which is already under unitized operations with Pan American Petroleum Corporation as unit operator.

Q Well, now, isn't it true that your next Exhibit Number 5 more or less is a part of the Exhibit 4 and they are closely related?

A Yes, sir, it is.

Q Would you please explain Exhibit, then?

A Actually, Exhibit 5 is simply a graphical representation of the performance which we expect to achieve

from the Pinon-Gallup Pool. The heavy line that is solid which is beginning at zero in May of this year and rising to approximately 12,000 barrels of oil per month is the actual producing rate that has been experienced in this pool to date. This graph shows oil producing rate in barrels per month as a function of time. Now, we expect this field to immediately go on decline under contended primary operations and follow the line shown by the heavy dashes, the area under which is colored pink. This is the performance we expect from continued primary operations.

In approximately March of 1967 there is an arrow indicating that the commencing of injection operations. This is a time that we hope that we will be able to start our project secondary our pressure maintenance project in this pool. When we do, we expect that after a period of time of approximately nine months later the performance, producing rate performance will commence to deviate from the expected primary performance and will follow the dotted curves labeled pressure maintenance performance with the area between the expected primary and the expected pressure maintenance performance identified in green. This green area represents the 476,000 barrels of additional oil that we expect to recover from the project.

Q I think at this time we should probably consider the

proposed completion procedures on the proposed four injection wells shown on Exhibit 2. Do you have a proposed completion procedure for your injection wells?

A Yes, sir. That has been marked as Exhibit Number 6.

Q I beg your pardon, it is Exhibit 6. Let the record so show. Please explain Exhibit 6, Mr. Eaton.

A Mr. Ross, as you have mentioned, this is just the proposed completion procedure for as you know we have not yet drilled the injection wells. Our special pool rules or special pressure maintenance operating rules, as well as Rule 701 requires that for a well to be granted injection well privileges, if the application for such shall be accompanied by a diagrammatic sketch of completion of the well and a log and we expect to furnish these at the time the wells are actually converted to injection.

But this is the general procedure that will be used. The only difference between this and the actual well is that perhaps the depths won't be the same but in either case, we expect to completely penetrate the Gallup rison with the oil string to cement that oil string from, completely from top to bottom using a D.V. tool set immediately below the Mesa Verde Formation to selectively perforate the casing in the Gallup interval and to inject downtubing landing on a packer with the packer set above immediately about the set of perforations.

We would load the annulus between the tubing and the casing with an inhibited fluid.

Q Very well. Now, you propose to drill a water well on the location indicated there and before we go to Exhibit 7, why did you pick this particular location for this well at that point?

A This well location is subject to a small degree of change, but it is known that this is a pretty good location from a drainage standpoint. Actually, this entire pool lies in a fairly rough terrain country so if you have any choice of the matter you like to put your machinery and plant and everything on a fairly flat spot, and this location in the Northwest quarter of Section 24 fits that condition pretty well.

Q Now, what is your proposed completion procedure and what equipment do you propose to use in connection with this well as shown on Exhibit 7?

A We actually are ready, in connection with another pressure maintenance project operate two wells producing from the Ojo-Alamo formation in the Northeast quarter of Section 34 in the Northwest quarter of Section 35 of Township 28 North, Range 12 West. The proposed completion of the Ojo-Alamo water supply well to be drilled for supply purposes in the Pinon-Gallup pool would be conducted in the same general manner as

was used for these two existing wells.

In this case, the eight and five eighths inch casing is landed at T.D. of about 450 feet and is slotted through the Ojo-Alamo sand section and this is the completion of the well.

MR. ROSS: I'm sure the Commission and the Commissioner realize we can't give you a log on these injection wells until we drill them, but I would like to ask the witness if we have anything that we can offer which would reasonably tend to show what we expect to encounter and I believe you do have a log, Exhibit 8.

A Yes, sir, we do.

Q Please describe it and explain it.

A I have identified as Exhibit 8 the inductional electrical log on the Gallegos Canyon Unit Well Number 250 which was the discovery well for the Pinon-Gallup Pool and is so indicated on Exhibit 2. It is located in the Southwest quarter of Section 14, Township 28 North, Range 12 West. There are really only two things on this log that I would like to call your attention to. Near the bottom of the log the Pinon-Gallup pay sand from approximately 5645 to 5662 is identified, and then up near the top of the log at a location of 280 feet to 470 feet there is an interval colored in yellow which is the Ojo-Alamo Sand, which is that sand that we propose to use as a water supply source.

Q Mr. Eaton, about your water source, you expect to supply it from the Ojo-Alamo. What is the condition or chemical nature of that water and would you explain Exhibit 9 to the Commission, which I believe shows the analysis made by Pan American's Research Department in this area.

A Exhibit No. 9 is a water analysis showing the chemical constituents of the Ojo- Alamo water found from what we call the Gallegos-Canyon Unit water well Number 2, which is the Ojo-Alamo well which I previously mentioned as being in the Northeast quarter of Section 24, Township 28 North, Range 12 West. The analysis shows the total solid contents of that water to be thirteen hundred fifty-eight parts per million containing some sodium three hundred and eight parts per million and mostly being a sulphate type water containing 660 parts per million sulphate. I expect that the water that we will encounter at the Ojo-Alamo well in Section 24 will substantially be identical to the water that is shown by the analysis from the well in Section 34.

Q Although this water is somewhat contaminated, Mr. Witness, I would like to ask you, in your opinion, do you believe that the water is compatible with the formation that you intend to inject it into?

A Yes, sir. I believe it is. We, as I have mentioned, are using this water successfully in another project. The

project may not be too much of a success, but it's not on account of the water.

MR. ROSS: Well, I think you're fair about that. Now, gentlemen, our application asks for the Commission to, in its order if we are favorably considered here, to enter in certain special rules for this area and this project, and our witness has reproduced an Exhibit 10 here which shows a previous order in the Cha Cha-Gallup Oil Pool.

Q Do you have any comments to make in connection with this, Mr. Eaton?

A Only that we consider the rules which were granted for operation of the Gallegos Canyon Unit area pressure maintenance project and the Cha Cha-Gallup Oil Pool in Order R-2211, Case 2516 and dated May 1, 1962 to be almost model rules for the operation of a project of this nature and that we would recommend the adoption of rules similar to these for the operation of the Pinon-Gallup Pool project.

MR. ROSS: Gentlemen, we so move.

I believe, gentlemen, that concludes our testimony except I would like at this time to ask the Commissioner to accept Pan American's Exhibits 1 through 10, inclusive, and enter the large sheets and copies of the other exhibits in the record.

MR. NUTTER: These proposed rules are Exhibit Number

10.

MR. ROSS: Yes, sir, they are Number 10.

MR. NUTTER: Pan American's Exhibits 1 through 10 will be admitted in evidence.

(Whereupon, Applicant's Pan American's Exhibits 1 through 10 inclusive, were received into evidence.)

MR. ROSS: We proposed this just for the convenience of the Commission, of course. I believe that concludes our direct examination. I would like the witness to answer your questions, if you have any.

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

MR. IRBY: Yes, Your Honor.

MR. NUTTER: Mr. Irby.

MR. IRBY: Frank Irby, State Engineers Office.

CROSS EXAMINATION

BY MR. IRBY:

Q Mr. Eaton, I noticed that your Exhibit 6 is slightly different than the diagrammatic sketch of the completion procedure submitted with the application, particularly in that the perforation points are slightly different and the setting of the four and a half inch casing is different.

A Yes, sir. We discovered an error on that and made

a correction. We found one thing, that the casing was shown to be set a thousand feet above the perforated interval, and also I noticed that the perforated interval shown was, appeared to be a great deal thicker than I expected the Gallup Sand to ever be so as this was just a typical diagram I thought it ought to be somewhat toned down though, to be more typical.

MR. ROSS: Does that answer your question, sir?

MR. IRBY: Yes, sir, it does. Now, I have another question.

Q On your water supply well, what sort of formation is above the top of this Ojo-Alamo Sand?

A Mostly shale and surface sands.

Q And immediately above I presume is where the shale is?

A Yes, sir.

Q Is it pretty dense shale?

A Yes, sir. Pretty dense shale.

Q And then down at your depth, I believe it's 480 or 470, isn't it, at the bottom of your Ojo-Alamo Sand?

A Yes, sir.

Q What do you find below that?

A Immediately below is about a fifty or sixty foot shale section, impervious shale section.

Q I realize it doesn't pertain to this case, but is

this Ojo-Alamo Sand found in rather extensive areas beyond the limits of this pool, the oil pool?

A Yes, sir, and no, sir.

MR. ROSS: We have an expert water witness, too. I think he is well qualified.

A The Ojo-Alamo Sand is actually a blanket. Sand throughout the San Juan Basin area and back in this east and southeast direction is quite extensive. In fact, it goes clear over to the Jemez Mountain range where it outcrops, which is probably seventy or eighty miles. Out to the north and to the west we are pretty near the end of it. In fact, it is exposed along the Gallegos wash here. It's also exposed along the Animus River which this map does not show, but the Animus River runs generally northeastward out of the town of Farmington. Between the town of Farmington and Aztec the big sandstone bluffs which drop off along the Animus are the Ojo-Alamo, so it is quite an extensive formation if you limit it to talking about back in the east and southeast and south direction. We are almost to the northwestern and western edge of it.

Q Then any saturation outside of your oil pool here would probably be to the south and east?

A Yes, sir.

MR. NUTTER: Has that been recharged over in the

Jemez, do you think, George?

THE WITNESS: Yes, I think it is. Along that exposure, along Animus River banks there are some springs that seep, so it appears that this is the exit portion and the recharge is up at a much higher elevation in the Jemez range. Of course, this is so far away that within the small time interval that we're going to be talking about we're not going to benefit from any recharge, anyway, but yes, it is being recharged.

MR. IRBY: I could ask you a lot more interesting questions, but it doesn't pertain to this case, so I quit.

CROSS EXAMINATION

BY MR. NUTTER:

Q Mr. Eaton, according to the way I count the wells, you've got four injection and five producing wells. Is this the complete pattern of production and injection wells, both?

A This is all that we plan at this time.

Q You feel that you have encountered the end of the pay on the northwest and the southeast in both, then. You have got it contoured out?

A Essentially you will notice, Mr. Nutter, that we picked two feet of pay out here in this well.

Q Which is the Dakota well at the southeast end?

A Yes, sir. That's correct. The well I'm pointing to

is the Dakota well in the southeast part of Section 20. Actually, two feet out on the edge of these Gallup sands is not the same as two feet up in the middle. You have a decrease in quality along with this deterioration and pay thickness, too, so I really don't think you could make a commercial well out here in Section 20 although there is indicated to be a little segment of sand cut there.

Now, if in sometime in the future this well 254 which is the well in the Southeast quarter of Section 19, if it began to buzz and make a lot of oil which indicates it might be completed in something that is in contact with more reservoir out here, then we can give consideration to the development of this and enlarge the project area. Yes, right now I think we have defined the ends of it.

Q So it will be a total of nine wells receiving allowable under rules such as you propose here?

A Yes, sir.

Q And you would have complete flexibility of transferring this nine well allowable on any producer that could make it?

A Yes, sir.

REDIRECT EXAMINATION

BY MR. ROSS:

Q With regard to Mr. Irby's question, don't you intend

to completely cement these injection wells above the Mesa Verde?

A Yes, sir, they will be completely cemented from top to bottom as are our producers, incidentally.

MR. IRBY: That's the way I read the sketch.

MR. ROSS: Yes, I wanted to be sure that point was clear.

Q In connection with the Commissioner's questions, isn't it sometimes desirable to switch your injection wells to producing wells and vice versa?

A On occasions.

Q I don't anticipate that will be true here, but we want flexibility so we can deal with the situation as it occurs.

A Yes, sir, and our proposed rules will provide for administrative approval for changing injection wells or the addition of injection wells.

RECROSS EXAMINATION

BY MR. NUTTER:

Q Well, now, Mr. Eaton, I noticed that three of the four injection wells are on the south side of the green line wh which runs more or less right down the axis of the sandwinds. Would those wells be up-dip slightly from the axis?

A Yes, sir, sure would.

Q Then the fourth well is located just north of the

green line, but that's in sort of a saddle between the two lenses that make up the large lens.

A Yes, sir.

Q Where is it structurally as far as the two producing wells east and west of it?

A Actually they are approximately equal elevation lines as far as the four injection wells are concerned. Am I answering your question?

Q Yes.

A There is a little hump in the structure right in here for some reason, so that in order to be equal it's got to be, have the appearance of being down-dip some.

Q It's a little hump but it shows on the isopac map as a saddle.

A Yes, it's an isopac saddle hump structurally.

Q Structurally it's high?

A Yes.

MR. NUTTER: I see. Are there any other questions of the witness: He may be excused.

(Witness excused.)

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

MR. ROSS: Only one comment. I would say this is a rather sophisticated project and it's made possible only because of our knowledge of this area and I recommend that you

approve it.

MR. NUTTER: Does anyone else have anything they wish to offer in Case 3498? If there is nothing in this case we will take the case under advisement and the hearing is adjourned.

(Whereupon, the hearing was concluded.)

STATE OF NEW MEXICO)
)
COUNTY OF BERNALILLO)

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

NOTARY PUBLIC

My Commission Expires:

July 10, 1970

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 3498, heard by me on 11/30, 1966.

Examiner
New Mexico Oil Conservation Commission

EXHIBIT NO. 4

PERTINENT DATA SHEET
RESERVOIR ROCK AND RESERVOIR FLUID PROPERTIES
PIÑON GALLUP OIL POOL
SAN JUAN COUNTY, NEW MEXICO

Original Reservoir Pressure, psig	1470
Estimated Reservoir Pressure at Initial Injection, psig	1000
Reservoir Temperature, ° F.	158
Saturation Pressure, psig	1470
Solution Gas-Oil Ratio, Cu. Ft./Bbl.	620
Original Formation Volume Factor	1.38
Crude Viscosity at Bubble Point Pressure and Bottom Hole Temperature, cp	0.44
Average Crude Gravity, ° API	41 - 43
Producing Mechanism	Solution Gas Drive
Average Porosity, % (Core Analysis Well No. 250)	10 (Range 9.0-13.6%)
Average Permeability, Md (Core Analysis, Well No. 250)	15 (Range 1.2 - 35)
Average Water Saturation, % (Core Analysis and Logs)	25
Average Net Pay Thickness, Ft.	4
Type Accumulation	Stratigraphic Trap (Sand Bar)
Proven Productive Acres	2420

PRESSURE MAINTENANCE PERFORMANCE

Ultimate Primary Recovery, Bbls.	715,000
Ultimate Primary Recovery, % OIP	15
Pressure Maintenance Recovery, Bbls.	476,000
Pressure Maintenance Recovery, % OIP	10
Ultimate Recovery (Primary and Secondary), Bbls.	1,191,000
Ultimate Recovery (Primary and Secondary), % OIP	25
Water Injectivity BWPD/Well	1,000
Water Injection Pressure, psig	1,000
Life of Project, Years	17

WATER SUPPLY

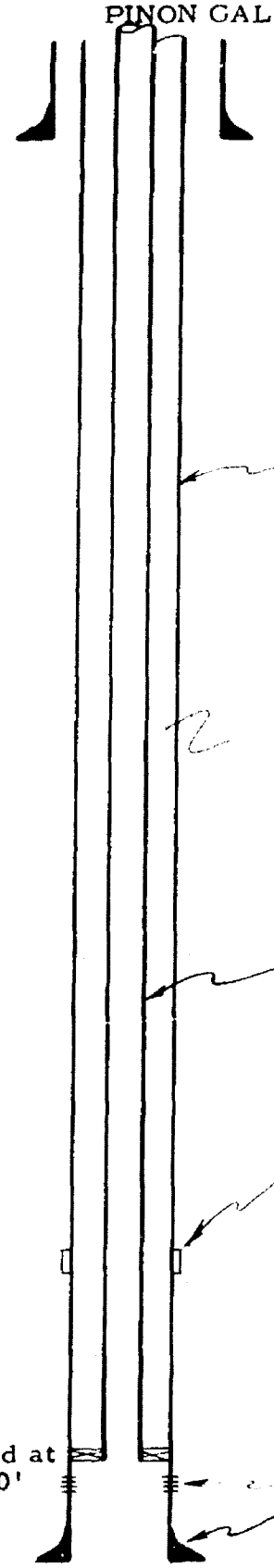
Formation	Ojo Alamo
Depth, Feet	450
Estimated Production Rate, BWPD	5,000-6,000

ECONOMICS

Primary Investment	$350,000
Secondary Investment	$329,000
Profit from Project	$365,000

EXHIBIT 6

DIAGRAMATIC SKETCH
COMPLETION PROCEDURE AND EQUIPMENT
PROPOSED WATER INJECTION WELL
PIÑON GALLUP PRESSURE MAINTENANCE PROJECT



Top 2nd stage cement 0'

8 5/8" CSA 250' Cement with 150 sacks class "C" containing 2% calcium chloride

4 1/2" Casing

San Juan Ex 6 Co 3458

2 1/2" Tubing

Dv tool at 4400' Top 1st stage cement 4400'

2 1/2" tbg. landed at 5550'

4 1/2" Baker Model "P", Packer set at 5550'

Perforate 5610-25' with 4 spf

4 1/2 " CSA 5700'. Cement 1st stage with 350 sacks class "C" containing 6% gel & 2 lb. med. tuf plug per sack followed by 100 sacks class "C" Neat. To be circulated. Cement 2nd stage with 1100 sacks class "C" containing 6% gel and 2 lb. med. tuf plug per sack followed by 50 sacks class "C" neat. To be circulated

EXHIBIT 7

DIAGRAMATIC SKETCH
COMPLETION PROCEDURE AND EQUIPMENT
PROPOSED WATER SUPPLY WELL FOR
PIÑON GALLUP PRESSURE MAINTENANCE PROJECT

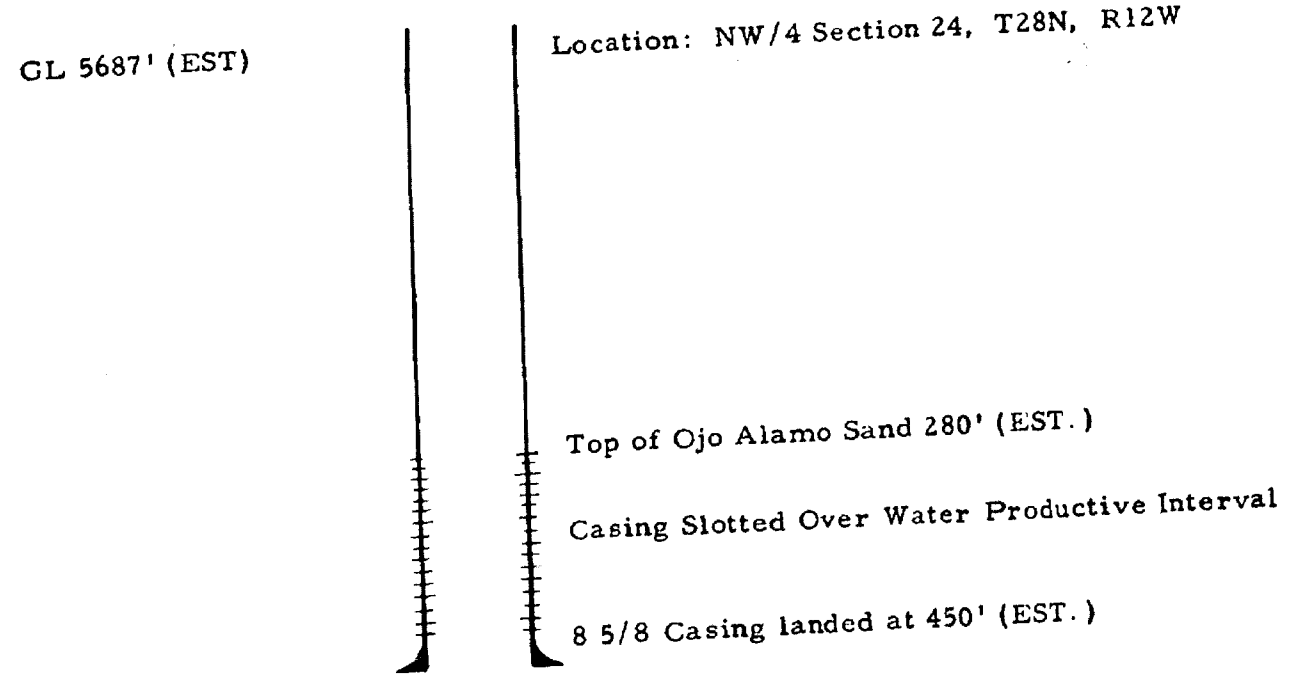


EXHIBIT NO. 9

FORM 66 7-62

PAN AMERICAN PETROLEUM CORPORATION
RESEARCH DEPARTMENT
WATER ANALYSIS

Lease Gallegos Canyon Unit — Well No. Water Well No. 2 — Lab. No. T-15,318
Field S. E. Cha Cha Gallup — County San Juan — State New Mexico
Quarter or Survey NE 14 — Blk — Section 34 — T 28N — R 12W
Exact Location — PBTD — Sample Series No. HG-9
Producing Stratum Ojo Alamo — From — To — Total Depth 487
Stratum Yielding Sample Ojo Alamo — Method Used
Condition of Well — Date Collected 2-25-63 — Date Received 3-1-63
Sample Collected From Well head — Date 2-26-63 — File N-1027-535.11
Collected by F. W. Foell
Transmittal Letter by L. O. Speer, Jr.

Radicle	Per Cent by Analysis	(a) P. P. M.	(b)	(a) X (b)	Per Cent Reacting Value	Calculated Compound	P. P. M.
Na	22.68	308	.0435	13.40	35.43	Na_2SO_4	584
Ca	6.92	94	.0499	4.69	12.40	NaCl	69
Mg	.74	10	.0822	.82	2.17	Na_2CO_3	
Fe						$NaHCO_3$	336
						$CaSO_4$	319
						$CaCl_2$	
						$CaCO_3$	
SO_4	48.60	660	.0208	13.73	36.30	$Ca(HCO_3)_2$	
Cl	3.09	42	.0282	1.18	3.12	$MgSO_4$	50
CO_3		0	.0333			$MgCl_2$	
HCO_3	17.97	244	.0164	4.00	10.58	$MgCO_3$	
H_2S						$Mg(HCO_3)_2$	

Total solids as a summation of radicles — 1,358 P.P.M.
Total solids by evaporation and ignition of residue at low red heat — 1,200 P.P.M.
Sample as received: Resistivity: ohms/M'M 6.27 at 77°F. — pH Value 7.8 — Specific Gravity 60°/60°F. 1.001

PROPERTIES OF REACTION IN PER CENT

PRIMARY SALINITY: $SO_4 + Cl$ = ... with equal value Na (K) ..... = 70.86 %
SECONDARY SALINITY: If $SO_4 + Cl$ is greater than Na (K) ..... = %
Then $SO_4 + Cl$ = ... with equal value of Ca + Mg ..... = 7.98 %
PRIMARY ALKALINITY: Excess Na (K) over $SO_4 + Cl$ = ... with equal value of CO_3 + S ..... = %
SECONDARY ALKALINITY: Excess Ca + Mg over $SO_4 + Cl$ = ... with equal value of CO_3 + ... = 21.16 %
CHLORIDE SALINITY: $Cl + (SO_4 + Cl)$ = ... X 100% ..... = 7.91
SULPHATE SALINITY: $SO_4 + (SO_4 + Cl$ = ... X 100% ..... = 92.09

NOTE: Multiply Parts per Million by .0583 to obtain Grains per Gallon.

REMARKS:

Ryznar Stability Index ($2pH_s - pH$) = 6.63 at 80°F

An index of 6.0 or less indicates a tendency to precipitate calcium carbonate; while an index above 7.0 indicates the water probably will not form a protective coating of calcium carbonate.

J. L. Hoyt, Jr.
W. T. Smith
T. M. Curtis
L. O. Speer, Jr.
G. R. Newton (2)

Analyst James L. Elliott Date 3-25-63

EXHIBIT 10

CHA CHA-GALLUP OIL POOL
(Gallegos Canyon Unit Area, Pressure Maintenance)
San Juan County, New Mexico

Order No. R-2211, Authorizing Pan American Petroleum Corporation to Institute a Pressure Maintenance Project in its Gallegos Canyon Unit Area, Cha Cha-Gallup Oil Pool, San Juan County, New Mexico, May 1, 1962.

Application of Pan American Petroleum Corporation for a pressure maintenance project, San Juan County, New Mexico.

CASE NO. 2516
Order No. R-2211

ORDER OF THE COMMISSION

BY THE COMMISSION: This cause came on for hearing at 9 o'clock a.m. on March 28, 1962, 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 13th day of April, 1962, 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, Pan American Petroleum Corporation, proposes to institute a pressure maintenance project in its Gallegos Canyon Unit Area, San Juan County, New Mexico, in the Cha Cha-Gallup Oil Pool, with the injection of water initially through 2 wells located in Section 23, Township 28 North, Range 13 West, NMPM, San Juan County, New Mexico.

(3) That the applicant proposes that an administrative procedure be established whereby said proposed maintenance project may be expanded for good cause shown, and whereby additional wells in the project area may be converted to water injection.

(4) That Special Rules and Regulations for the operation of the Gallegos Canyon Unit Cha Cha-Gallup Pressure Maintenance Project should be promulgated and, for operational convenience, such rules should provide certain flexibility in authorizing the production of the project allowable from any well or wells in the project in any proportion, provided that no well in the project area which directly or diagonally offsets a well outside the project area producing from the same common source of supply should be allowed to produce in excess of top unit allowable for the Cha Cha-Gallup Oil Pool until such time as the well has experienced a substantial response from water injection. When such a response has occurred, the well should be permitted to produce up to two times top unit allowable for the Cha Cha-Gallup Oil Pool. Production of such well at a higher rate should be authorized only after notice and hearing.

IT IS THEREFORE ORDERED:

(1) That the applicant is hereby authorized to institute a pressure maintenance project in the Cha Cha-Gallup Oil Pool, San Juan County, New Mexico, by the injection of water into the Gallup formation through the following-described wells in Section 23, Township 28 North, Range 12 West:

Gallegos Canyon Unit Well No. 97, Unit D, and
Gallegos Canyon Unit Well No. 112, Unit I.

(2) That Special Rules and Regulations governing the operation of the Gallegos Canyon Unit Cha Cha-Gallup Pressure Maintenance Project, San Juan County, New Mexico, are hereby promulgated as follows, effective May 1, 1962:

SPECIAL RULES AND REGULATIONS
FOR THE GALLEGOS CANYON UNIT CHA CHA-GALLUP
PRESSURE MAINTENANCE PROJECT

RULE 1. The project area of the Gallegos Canyon Unit Cha Cha-Gallup Pressure Maintenance Project, San Juan County, New Mexico, hereinafter referred to as the Project, shall comprise that area described as follows:

TOWNSHIP 28 NORTH, RANGE 12 WEST, NMPM
Section 19: Lot 4
Section 30: Lots 1 and 2

TOWNSHIP 28 NORTH, RANGE 13 WEST, NMPM
Section 14: SW/4
Section 23: All
Section 24: SW/4, S/2 NW/4, SW/4 NE/4, NW/4 SE/4, S/2 SE/4
Section 25: N/2 N/2, S/2 NE/4
Section 26: N/2 N/2

RULE 2. The allowable for the Project shall be the sum of the allowables of the several wells within the project area, including those wells which are shut-in, curtailed, or used as injection wells. Allowables for all wells shall be determined in a manner hereinafter prescribed.

RULE 3. Allowables for injection wells may be transferred to producing wells within the project area, as may the allowables for producing wells which, in the interest of more efficient operation of the Project, are shut-in or curtailed because of high gas-oil ratio or are shut-in for any of the following reasons: pressure regulation, control of pattern or sweep efficiencies, or to observe changes in pressures or changes in characteristics of reservoir liquids or progress of sweep.

RULE 4. The allowable assigned to any well which is shut-in or which is curtailed in accordance with the provisions of Rule 3, which allowable is to be transferred to any well or wells in the project area for production, shall in no event be greater than its ability to produce during the test prescribed by Rule 6, below, or greater than the current top unit allowable for the pool during the month of transfer, whichever is less.

RULE 5. The allowable assigned to any injection well on an 80-acre proration unit shall be top unit allowable for the Cha Cha-Gallup Oil Pool.

RULE 6. The allowable assigned to any well which is shut-in or curtailed in accordance with Rule 3, shall be determined by a 24-hour test at a stabilized rate of production, which shall be the final 24-hour period of a 72-hour test throughout which the well should be produced in the same manner and at constant rate. The daily tolerance limitation set forth in Commission Rule 502 I (a) and the limiting gas-oil ratio (2,000 to 1) for the Cha Cha Gallup Oil Pool shall be waived during such tests. The project operator shall notify all operators offsetting the well, as well as the Commission, of the exact time such tests are to be conducted. Tests may be witnessed by representatives of the offsetting operators and the Commission, if they so desire.

RULE 7. The allowable assigned to each producing well in the Project shall be equal to the well's ability to produce or to top unit allowable for the Cha Cha-Gallup Oil Pool, whichever is less, provided that any producing well in the project area which directly or diagonally offsets a well outside the project area producing from the same common source of supply

(CHA CHA-GALLUP AND CHACO CANYON UNIT AREA PRESSURE MAINTENANCE) OIL POOL—Cont'd.)

shall be produced at a rate of top unit allowable for the pool until such time as the well receives a substantial response to water injection. When such a response has occurred, the well shall be permitted to produce up to two times top unit allowable for the pool. Production of such well at a higher rate shall be established only after notice and hearing. Each producing well shall be assigned to the existing gas-oil ratio (2,000 to 1) for the Cha Cha-Gallup Oil Pool, except that any well or wells within the project area producing with a gas-oil ratio in excess of 2,000 cubic feet of gas per barrel of oil may be produced on a "net" gas-oil ratio basis, which net gas-oil ratio shall be determined by applying credit for daily average gas injected, if any, into the Cha Cha-Gallup Oil Pool within the project area to such high gas-oil ratio well. The daily adjusted oil allowable for any well receiving gas injection credit shall be determined in accordance with the following formula:

$$Aadj = \frac{TUA \times Fa \times 2{,}000}{\frac{Pg - Ig}{Po}}$$

where:

Aadj	=	the well's daily adjusted allowable
TUA	=	top unit allowable for the pool
Fa	=	the well's acreage factor
Pg	=	average daily volume of gas produced by the well during the preceding month, cubic feet
Ig	=	the well's allocated share of the daily average gas injected during the preceding month, cubic feet
Po	=	average daily volume of oil produced by the well during the preceding month, barrels

In no event shall the amount of injected gas being credited to a well be such as to cause the net gas-oil ratio, $\frac{Pg - Ig}{Po}$ to be less than 2,000 cubic feet of gas per barrel of oil produced.

RULE 8. Credit for daily average net water injected into the Cha Cha-Gallup Oil Pool through any injection well located within the project area may be converted to its gas equivalent and applied to any well producing with a gas-oil ratio in excess of two thousand cubic feet of gas per barrel of oil. Total credit for net water injected in the project area shall be the gas equivalent volume of the daily average net water injected during a one-month period. The daily average gas equivalent of net water injected shall be computed in accordance with the following formula:

$$Eg = (Vw\ inj - Vw\ prod) \times 5.61 \times \frac{Pa}{15.025} \times \frac{520°}{Tr} \times \frac{1}{Z}$$

where:

Eg	=	Average daily gas equivalent of net water injected, cubic feet
Vw inj	=	Average daily volume of water injected, barrels
Vw prod	=	Average daily volume of water produced, barrels
5.61	=	Cubic foot equivalent of one barrel of water
Pa	=	Average reservoir pressure at a datum of + 418 feet above sea level, psig ∓ 12.00, as determined from most recent survey
15.025	=	Pressure base, psi
520°	=	Temperature base of 60°F expressed as absolute temperature
Tr	=	Reservoir temperature of 158°F expressed as absolute temperature (618°R)
Z	=	Compressibility factor from analysis of Cha Cha-Gallup gas at average reservoir pressure, Pa, interpolated from compressibility tabulation below:

Pressure Psig	Z	Pressure Psig	Z	Pressure Psig	Z
0	.986	500	.912	1000	.869
50	.976	550	.906	1050	.865
100	.963	600	.902	1100	.860
150	.952	650	.899	1150	.857
200	.943	700	.895	1200	.852
250	.935	750	.891	1250	.849
300	.930	800	.888	1300	.845
350	.927	850	.882	1350	.842
400	.923	900	.877	1400	.838
450	.918	950	.873		

RULE 9. Each month the project operator shall, within three days after the normal unit allowable for Northwest New Mexico has been established, submit to the Commission a Pressure Maintenance Project Operator's Report, on a form prescribed by the Commission, outlining thereon the data required, and requesting allowables for each of the several wells in the Project as well as the total Project allowable. The aforesaid Pressure Maintenance Project Operator's Report shall be filed in lieu of Form C-120 for the Project.

RULE 10. The Commission shall, upon review of the report and after any adjustments deemed necessary, calculate the allowable for each well in the Project for the next succeeding month in accordance with these rules. The sum of the allowables so calculated shall be assigned to the Project and may be produced from the wells in the Project in any proportion except that no well in the Project which directly or diagonally offsets a well outside the Project producing from the same common source of supply shall produce in excess of two times top unit allowable for the pool.

RULE 11. The conversion of producing wells to injection, the drilling of additional wells for injection, and expansion of the project area shall be accomplished only after approval of the same by the Secretary-Director of the Commission. To obtain such approval, the Project operator shall file proper application with the Commission, which application, if it seeks authorization to convert additional wells to injection or to drill additional injection wells shall include the following:

(1) A plat showing the location of proposed injection well, all wells within the project area, and offset operators locating wells which offset the project area.

(2) A schematic drawing of the proposed injection well which fully describes the casing, tubing, perforated interval, and depth showing that the injection of gas or water will be confined to the Gallup formation.

(3) A letter stating that all offset operators to the proposed injection well have been furnished a complete copy of the application and the date of notification.

The Secretary-Director may approve the proposed injection well if, within 20 days after receiving the application, no objection to the proposal is received. The Secretary-Director may grant immediate approval, provided waivers of objection are received from all offset operators.

Expansion of the project area may be approved by the Secretary-Director of the Commission administratively when good cause is shown therefor.

(3) That jurisdiction of this cause is retained for the entry of such further orders as the Commission may deem necessary.

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

DOCKET MAILED

Date 11-18-66

to DSN

Sec 19 28 11

24 28 12

14 " "

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