

GOVERNOR
EDWIN L. MECHEM
CHAIRMAN

State of New Mexico
Oil Conservation Commission

LAND COMMISSIONER
E. S. JOHNNY WALKER
MEMBER



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

P. O. BOX 871
SANTA FE

January 3, 1962

Re: CASE NO. 2447

ORDER NO. R-2154

APPLICANT:

HUMBLE OIL & REFINING COMPANY

Mr. Howard Bratton
Hervey, Dow & Hinkle
P. O. Box 10
Roswell, New Mexico

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.
Secretary-Director

ir/

Carbon copy of order also sent to:

Hobbs OCC X
Artesia OCC
Aztec OCC X

OTHER Mr. George Verity
Mr. John Mason

Mr. Guy Buell



HUMBLE OIL & REFINING COMPANY

CENTRAL REGION

POST OFFICE BOX 120 • DENVER 1, COLORADO

DENVER AREA

RAYMOND D. SLOAN
AREA MANAGER
RICHARD S. HICKLIN
AREA EXPLORATION MANAGER
J. ROY DORROUGH
AREA PRODUCTION MANAGER
G. T. PHIPPS
AREA MARKETING MANAGER

December 14, 1961

Mr. Elvis A. Utz
The Oil Conservation Commission
of the State of New Mexico
Santa Fe, New Mexico

Dear Sir:

As per your verbal request, the following data is transmitted to you:

- 1) The average reservoir pressure at the mid-point of the pay zones of the Northwest Cha Cha Gallup Unit in the project area was 1,230 psig based on the September, 1961 survey. Atmospheric pressure in this area is 12.00 psi.
- 2) The compressibility factors (z) based on analysis of the sample taken from the Humble Oil and Refining Company's Navajo "L" No. 3 for the liberated gas are as follows:

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	.853
250	.935	750	.891	1250	.849
300	.930	800	.886	1300	.845
350	.927	850	.882	1350	.842
400	.923	900	.877	1400	.838
450	.918	950	.873		

If additional information is needed, please advise.

Yours very truly,

HUMBLE OIL & REFINING COMPANY

J. Roy Dorrough

By

James A. Kelley
James A. Kelley

RLS/blr



GRANTHAM, SPANN AND SANCHEZ
ATTORNEYS AT LAW
914 BANK OF NEW MEXICO BUILDING
POST OFFICE BOX 1031
ALBUQUERQUE, NEW MEXICO

EVERETT M. GRANTHAM
CHARLES C. SPANN
MAURICE SANCHEZ

TELEPHONE
243-3525

December 8, 1961

Mr. A.L. Porter, Jr.
Director of N.M. Oil Conservation Commission
Santa Fe, New Mexico

Re: Case No. 2447
Application of Humble Oil & Refining Co.
for Approval of Pressure Maintenance
Project, Cha Cha Gallup Oil Pool, San Juan
County, N.M.

Dear Mr. Porter:

Please enter my appearance as local Attorney of record for
El Paso Natural Gas Products Company in the above entitled and
numbered cause, which is set for examiner hearing on Monday,
December 11, 1961.

Mr. John Mason, Attorney, or some other representative of
El Paso will be personally present at the hearing.

Very truly yours,

GRANTHAM, SPANN & SANCHEZ

CCS/s
cc. John Mason

BY:



HUMBLE OIL AND REFINING COMPANY

P. O. Box 3082
Durango, Colorado
November 22, 1961

New Mexico Oil Conservation Commission
P. O. Box 871
Santa Fe, New Mexico

Attention: Mr. D. S. Nutter

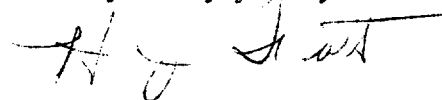
Dear Sir:

For your information, attached are 1 copies of a report titled "A Reservoir Study of the Proposed NW Cha Cha Unit, Cha Cha Gallup Field, San Juan County, New Mexico." This report summarizes the status of unit engineering studies as of May, 1961.

Three development wells (Humble's Nos. L-14 and L-15, and Pan American's No. H-15) have been drilled since the May study. Since these development wells do not alter the conclusions and recommendations of the May, 1961 study, the report has not been updated. However, it has been necessary to revise the "A" sand net pay isopach map and water flood injection wells to accomodate the new developments. A revised "A" sand isopach map is attached.

During the reservoir study it was estimated that water injection would begin October 1, 1961, however, it was not possible to complete unitization and initiate injection by that date. Design of the water injection system is now near completion and it is estimated that water injection will start during the first quarter of 1962.

Very truly yours,



H. J. Flatt
Chairman
NW Cha Cha Engineering
Committee

MMW/jal
Attach.

DISTRIBUTION

New Mexico Oil Conservation Commission (1)
Box 871
Santa Fe, New Mexico
Attention: Mr. D. S. Nutter

New Mexico Oil Conservation Commission (1)
1000 Rio Brazos Road
Aztec, New Mexico

United States Geological Survey (2)
P. O. Box 959
Farmington, New Mexico

United States Geological Survey (2)
P. O. Box 1809
Durango, Colorado

United States Geological Survey (2)
Drawer 1857
Roswell, New Mexico

El Paso Natural Gas Products Company (2)
P. O. Box 1161
El Paso, Texas
Attention: Mr. M. L. Ayers

El Paso Natural Gas Products Company (1)
P. O. Box 1560
Farmington, New Mexico
Attention: Mr. E. N. Walsh

Pan American Petroleum Corporation (2)
P. O. Box 1110
Fort Worth 1, Texas
Attention: Mr. Bruce A. Landis, Jr.

Pan American Petroleum Corporation (2)
P. O. Box 480
Farmington, New Mexico
Attention: Mr. Fred L. Nabors

Humble Oil and Refining Company (2)
P. O. Box 120
Denver 1, Colorado
Attention: Mr. J. Roy Dorrough

Humble Oil and Refining Company (2)
P. O. Box 3082
Durango, Colorado
Attention: Mr. B. M. Bradley

GILBERT, WHITE AND GILBERT
ATTORNEYS AT LAW
SANTA FE, NEW MEXICO

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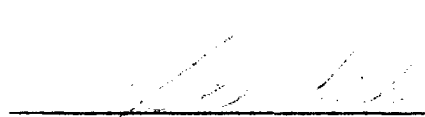
BEFORE THE NEW MEXICO OIL CONSERVATION COMMISSION

RE: IN THE MATTER OF THE APPLICATION
OF HUMBLE OIL & REFINING COMPANY FOR
APPROVAL OF A PRESSURE MAINTENANCE
PROJECT IN THE CHA CHA-GALLUP OIL
POOL, SAN JUAN COUNTY, NEW MEXICO.

Case No. 2447

ENTRY OF APPEARANCE

Comes now L. C. WHITE of GILBERT, WHITE AND GILBERT, Santa Fe, New Mexico,
and hereby enters his formal appearance in the above entitled matter as
resident counsel for Aztec Oil & Gas Company.



L. C. WHITE

P. O. Box 3082
Durango, Colorado
November 22, 1961

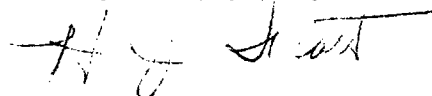
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NW Cha Cha Engineering
Committee

MMW/jal
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Attention: Mr. Fred L. Nabors

Humble Oil and Refining Company (2)
P. O. Box 120
Denver 1, Colorado
Attention: Mr. J. Roy Dorrough

Humble Oil and Refining Company (2)
P. O. Box 3082
Durango, Colorado
Attention: Mr. B. M. Bradley

A RESERVOIR STUDY
OF THE
PROPOSED NW CHA CHA UNIT
CHA CHA GALLUP FIELD
SAN JUAN COUNTY, NEW MEXICO

Status as of May, 1961

This report compiled by Humble Oil and Refining Company
from initial and supplemental Engineering Committee
reports through May 11, 1961.

Engineering Committee
(Companies Represented)

El Paso Natural Gas Products Company
Humble Oil and Refining Company
Pan American Petroleum Corporation

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RESERVOIR STUDY OF THE PROPOSED NW CHA CHA UNIT
CHA CHA GALLUP FIELD
SAN JUAN COUNTY, NEW MEXICO

INTRODUCTION

Early in the development of the Cha Cha Gallup Field, the ultimate need for a water injection project was recognized and an engineering committee was established to consider unitization of the entire field. However, to expedite unitization and secondary recovery, the pool was divided into two areas and operators holding Navajo Tribe of Indians leases formed an engineering committee to study the reservoir and recommend a secondary recovery program for Indian leases. The companies represented were El Paso Natural Gas Products Company, Humble Oil and Refining Company, and Pan American Petroleum Corporation. This report presents the findings of the committee as of May, 1961.

SUMMARY

The Cha Cha Gallup Field, located approximately 5 miles southwest of Farmington, New Mexico, produces from the Gallup sand at a depth of approximately 5,000 feet. The original reservoir pressure was 1,560 psig and the production mechanism is dissolved gas drive. To expedite initiation of water injection for secondary recovery, a unit is proposed consisting of developed Navajo Tribe of Indians leases. Pore volume calculations of the proposed unit indicate 19,885,000 barrels of stock tank oil originally in place in the "A" sand. Because of the limited production data on the tight "B" sand, its reserves are not shown in this study. Primary recovery was calculated to be 2,724,000 barrels, or 13.7 percent, using standard dissolved gas drive calculation procedures. As of May 1, 1961, the unit area had produced 760,000 barrels of oil, or 3.8 percent of the oil originally in place. Cumulative production from the entire field on May 1, 1961, was 1,220,000 barrels.

The proposed unit consists of 5 adjoining Navajo Indian leases which form a large single block in the northwest portion of the field. These leases contain 35 wells on 160-acre development, or 53 percent of the producing wells in the field. Because of relatively high withdrawal rates, production is expected to decline rapidly and an injection project is needed to retard this decline and increase recovery. A combination of primary and water flood will provide an ultimate recovery of 38.3 percent of the oil originally in place or a total ultimate recovery of 7,616,000 barrels.

Several potential water sources for a water flood exist within the vicinity of the NW Cha Cha Gallup Field. These are the San Juan River alluvium sands, the Pictured Cliffs, the Upper Menefee and the Menefee Proper, and the Morrison subsurface formations. Preliminary investigations indicate San Juan River alluvium sand and the Morrison formation are the more desirable because of anticipated higher capacities.

The following is an economic summary of remaining primary and water flood operations for a flood starting October 1, 1961.

SUMMARY OF PRIMARY & WATER FLOOD ECONOMICS
FROM INITIAL DEVELOPMENT (6-1-60)

	<u>Recovery</u>		<u>Total</u>	<u>Profit Before F.I.T.</u>		<u>Life</u>
	<u>%</u>	<u>Barrels</u>	<u>Investment</u>	<u>Actual Value</u>	<u>PDV @ 6%</u>	<u>Years</u>
Primary Operations	13.7	2,724,000	\$2,503,100	\$ 3,741,500	\$3,336,700	4.7
Secondary Operations (Flood Start 10-1-61)	38.3	7,616,000	\$3,089,600	\$12,121,500	\$9,870,900	9.9
Incremental	24.6	4,892,000	\$ 586,500	\$ 8,380,000	\$6,534,200	5.2

Water flood of the Cha Cha Unit is an attractive investment which will more than double the anticipated recovery and increase the current income for all concerned.

CONCLUSIONS

1. Primary recovery of the proposed NW Cha Cha Unit will be in the order of 13.7%.
2. Water flood will increase the total recovery to 38.3% of OOIP.
3. Water flooding this field is an economically attractive venture from a current day income standpoint as well as from additional recovery.

RECOMMENDATIONS

It is recommended that:

1. The proposed NW Cha Cha Unit in the Cha Cha Gallup Field be water flooded on a center line pattern.
2. A water source be developed to supply injection water.
3. Injection be initiated at the earliest possible date.

FIELD HISTORY

Location and Discovery:

The Cha Cha Gallup Field is located in north-central San Juan County, New Mexico, approximately 5 miles southwest of Farmington, New Mexico. The field was discovered on October 19, 1959, by Benson-Montin-Greer Drilling Company's Jones No. 2, located in Section 17-T28N-R13W. The northwest extension of the field was discovered by the completion of El Paso Natural Gas Products Company's Ojo Amarillo No. 1 on May 17, 1960. Subsequent

development has joined the two areas. Figure 1 shows the entire Cha Cha Gallup Field and the proposed NW Cha Cha Unit which is discussed in this report. As can be seen from the map, the NW Cha Cha Unit consists of all Navajo Tribe of Indians land within the Cha Cha Gallup Field. Pertinent field and reservoir data are tabulated in Table I.

Geology:

The Cha Cha Gallup Field is a northwest-southeast trending stratigraphic trap, typical of Gallup off-shore sand bar type developments. The structure is a monocline gently dipping to the northeast with field development occurring approximately on strike as shown in Figure 2. Since there is no evidence of a gas cap or underlying water, structure should have no appreciable effect upon field performance.

The field is approximately 1.5 miles in width and 10.5 miles long. Production is from the Gallup "A" (Upper) and "B" (Lower) sand members of the Mancos formation of Cretaceous age. The "A" sand is the main member and is productive throughout the field. The Gallup "A" is a fine to medium grained, light gray, glauconitic sand which varies in thickness from 2.0 to 13.0 feet in the study area.

The "B" sand is a tight, fine-grained sand containing minute fractures. It varies in thickness from 0 to 12 feet, and has been proven productive in a limited number of wells. Because of the low permeability of the sand, production is apparently from natural fractures that have been observed in some cores. Also, natural fractures have been observed in cores of the shale zone between the two sands.

Because of surface features and structure, the depth of wells in the study area varies from 4,600 feet to 5,600 feet. A maximum depth of 6,209 feet was reached by Humble's well No. L-7, however, this well was completed in the Gallup at 5,506-18 feet.

Development:

In May, 1961, there were 59 producing wells in the field, 31 of which were in the proposed NW Cha Cha Unit. Four additional wells were being drilled or completed in the unit. Development within the NW Cha Cha Unit area has been on 160-acre spacing except for one non-standard drilling unit, an 89-acre block developed by Pan American's well No. E-7.

Production is based on an allowable of 164 barrels per day, or a GOR limit of 2,000 ft.³/bbl. As of May 1, 1961, accumulated oil production for the field was 1,220,000 barrels of which 760,000 barrels were produced from the NW area.

ANALYSIS OF RESERVOIR DATA

Determination of Original Oil-in-Place:

The proposed NW Cha Cha Unit "A" sand has a productive volume of 37,340.6 acre-feet and averages 6.5 feet in thickness. The original oil-

in-place was 532.53 barrels of stock tank oil per acre-foot, or a total of 19,885,000 barrels. These values are based on net pay, average core properties, and reservoir fluid analysis discussed in the following paragraphs.

Net Pay:

"A" sand net pay picks are based on core analysis and microlog separation. For wells with core analysis only, net pay is picked on those samples with permeability equal to or greater than 1 millidarcy and porosity equal to or greater than 6 percent. Wells having microlog and no core use microlog separation as net pay, and for wells with both core and micrologs, net pay is picked as the average of the two. For wells which have neither core analysis nor microlog, net pay is based on 79 percent of the average gross sand as shown on the Spontaneous Potential (SP) log and the Gamma-Ray log. The factor of 79 percent was determined by a comparison of core analysis and microlog with the average of SP-Gamma Ray gross pay as shown in Table II. In arriving at Gamma-Ray gross sand, indicated shale streaks were excluded. Certain edge wells were further adjusted based on known producing characteristics. Figure 3 shows a net pay isopach for the "A" sand.

For the "B" sand, an analysis similar to that on the "A" sand was found to be unsatisfactory since most of the "B" sand shows a uniformly low porosity ranging from 1.0 to 11.9 percent and permeabilities of less than 0.01 to 2.9 millidarcies. Minute natural fractures have been observed in cores and apparently increase flow rates and recovery from the tight sand; however, data are not adequate for analysis of the fractures and development of a net pay isopach. A gross sand isopach map was constructed using gross SP sand thickness with Gamma-Ray gross sand thickness being substituted when the SP was not available. The gross sand isopach of the Gallup "B" sand is shown in Figure 4. Cross sections of the field showing the "A" and "B" sands are shown in Figures 5 through 9.

Average Core Properties:

Based on core analysis of 102 feet of cores from 14 wells in the study area, average core properties of the "A" sand are 14.7 percent porosity and 57 millidarcies permeability. In obtaining average values, data on cores of less than 1 millidarcy permeability or 6 percent porosity, were not included. Core permeabilities ranged from 1.0 to 244 millidarcies and porosities varied from 3.8 percent (at 1.0 millidarcy) to 21.9 percent.

Based on core analysis of 75 feet of cores from 14 wells in the study area, average core properties of the "B" sand are 7.7 percent porosity and 0.33 millidarcies permeability. Average values are based on all permeable sand since the "B" sand contains minute fractures which are apparently providing some production from sands with less than 1.0 millidarcy permeability. Analysis of a pressure buildup curve on Humble's Navajo "L" No. 10 indicates that the effective permeability of the "B" sand, including natural fractures, is approximately 1.0 millidarcy. In the study area, core permea-

bilities varied from less than 0.01 to 2.9 millidarcies and porosity varies from 1.0 percent to 11.9 percent.

A connate water saturation of 35 percent was used for the "A" sand based on Totah and Horseshoe Gallup capillary pressure data weighted in accordance with the permeability distribution discussed above. Figure 10 shows a plot of permeability versus water saturation.

Average core properties are summarized in Table I.

Reservoir Fluid Analyses:

A subsurface sample analysis was not available from the study area at the time the initial engineering committee study was prepared. It was agreed that sample analysis data for the Totah Gallup Field should be representative of the Cha Cha Gallup Field and would be used. Figures 11 through 15 show fluid flow and reservoir fluid properties based on other Gallup sands and adjusted to Cha Cha Gallup reservoir conditions. The fluid sample was taken from Tennessee Gas and Oil Company's Glen "H" Callow No. 9 which is in the Totah Gallup Field. It was assumed that the oil was initially saturated at the original reservoir pressure of 1,560 psig in Cha Cha Gallup Field. Subsequent analysis of a subsurface sample from the Cha Cha Gallup Field indicates that the adjusted Totah sample data were reasonably close to actual Cha Cha conditions and the small difference did not justify recalculation of performance.

PRIMARY ("A" SAND) PERFORMANCE

A primary performance prediction was made for the reservoir using the Tracy method. Results are shown in Figure 16. A recovery of 13.7 percent of the original oil-in-place is estimated at an abandonment pressure of 200 psig. This represents a recovery of 2,724,000 barrels of oil or 72.9 barrels per acre-foot.

Figure 17 shows predicted primary performance as a function of time. This estimate is based on an initial average well productivity index of 0.75 BOPD per psi-drawdown, an initial formation capacity to oil of 200 md. ft., a completion ratio of 2.0 and appropriate fluid and core properties. Rates were limited by the lesser of allowable, gas-oil ratio limit of 2,000, or producing capacity. With the data used, capacity of the average well was limited by allowable to a pressure of 1,200 psig, gas-oil ratio from 1,200 to 800 psig and producing capacity from 800 psig to abandonment pressure. It is estimated that an economic limit of 4 BOPD per well will be reached at a reservoir pressure of 200 psig.

Field performance to date is compared with predicted performance on Figure 16.

WATER FLOOD ("A" SAND) PERFORMANCE

After consideration of several water injection patterns, a center line pattern was selected. Figure 18 shows the proposed water injection

pattern which consists of 9 injection wells plus some possible additional wells for boundary and/or areal sweep efficiency considerations. An interpretation of probable areal sweep is also shown. The center line pattern was selected because it will result in a higher stabilized injection rate, without a sacrifice in efficiency, than can be obtained by other patterns. It is estimated that a stabilized injection rate of 1,000 BHPD per well can be obtained. On a volumetrically weighted basis, this pattern gives an areal sweep efficiency of approximately 85 percent. As may be noted, this pattern appears readily adaptable to cooperative flooding in the event several separate floods are involved.

Vertical sweep efficiency of 86 percent was arrived at, based on a Stiles type calculation modified to allow for varying hydrocarbon pore volumes using an average porosity and connate water saturation for each permeability grouping. A limiting water cut-off of 97.5 percent of produced fluid was used.

Average residual oil saturation after flood of 31 percent is anticipated. This is based on average values measured by Atlantic Refining Company for Horseshoe and Central Bisti Unit floods in similar Gallup sands.

As shown in Table 3, water flood recovery was calculated assuming 50 percent resaturation of the unconformable zone, vertical and sweep efficiency of 86 percent and 85 percent, respectively, a residual oil saturation of 31 percent, a connate water saturation of 35 percent and appropriate formation volume factors and saturations as indicated by primary material balance prediction and fluid property data. Results indicate a recovery of 38.3 percent of the original oil-in-place for a flood at 1,200 psig (approximately October 1, 1961).

A detailed plot of predicted water flood performance with time for a flood commencing October 1, 1961, is given in Figure 19. Some initial gains are indicated in approximately 7 months after injection start with complete fillup being obtained in approximately 21 months with allowance for additional voidage. Significant water breakthroughs should also commence about this time. A total life of 10 years from initial development is indicated, however, most water flood oil will be produced within 2 to 3 years after fillup. Individual well maximum fluid production of approximately 400 barrels per day is anticipated.

WATER SOURCE

Several potential water source formations exist in the vicinity of the NW Cha Cha Gallup Field study area. There are the San Juan River alluvium sands, the Pictured Cliffs, the Upper Menefee and the Menefee Proper, and the Morrison formations. Preliminary investigations indicated that because of deliverability considerations, the San Juan River alluvium sands and the Morrison formation would prove most suitable. Tests are planned to evaluate the potential of the alluvium sands with a water well drilled in the SE Section 15-T29N-R11W. If these tests indicate that

sufficient capacity can be economically developed, it is recommended that the alluvium sands be utilized as a water source for the pressure maintenance program. If it is not feasible to develop this water source, it is then recommended that the Morrison formation be completely tested to determine its true potential as a water source.

ECONOMICS OF OPERATION

Primary economics ("A" sand only) and economics for a pressure maintenance program commencing October 1, 1961, are shown in Table V with economic factors and investment schedules shown on Table IV. This analysis envisions utilizing the San Juan River alluvium sand as a water source and is subject to revision if it becomes necessary to develop an alternate source. As shown on Table V, primary operation to depletion is estimated to yield a return of only \$1.49 per dollar invested whereas the return on operations based on initiating pressure maintenance on October 1, 1961, is estimated to be \$3.92 per dollar invested. Thus the proposed pressure maintenance program is economically attractive.

Economics of operation in the "B" sand have not been evaluated as the probable fractured nature of the reservoir necessitates obtaining additional performance data through testing, including a pilot injection program prior to making a definitive evaluation.

TABLE I
PERTINENT DATA SHEET
CHA CHA GALLUP FIELD
NORTHWEST CHA CHA UNIT AREA
SAN JUAN COUNTY, NEW MEXICO

<u>Date of Discovery</u>	October 19, 1959															
<u>Discovery Well</u>	Benson-Montin-Greer Drilg. Co. - Jones No. 2, NW SE Sec. 17-28N-13W IPF 132 BOPD GOR 1272 Perforations 5623-27' and 5660-76'															
<u>2nd Well & Northwest Area Discovery</u>	El Paso Natural Gas Products - Ojo Amarillo No. 1 NE NE Sec. 27-29N-14W IPF 304 BOPD GOR 386 Perforations 5322-5344' Completed May 17, 1960															
<u>Structural Features of Reservoir</u>	<table><tr><td>Producing Formation</td><td>Gallup</td></tr><tr><td>Structure</td><td>Monocline</td></tr><tr><td>Gas-Oil or Water-Oil Contacts</td><td>None Indicated</td></tr><tr><td>Type Accumulation</td><td>Stratigraphic Trap (Sand Bar)</td></tr><tr><td>Producing Depth</td><td>4600-5600' Average 5400'</td></tr><tr><td>Average Gross Thickness "A" Sand</td><td>8' +</td></tr><tr><td>Average Gross Thickness "B" Sand</td><td>6.0'</td></tr></table>		Producing Formation	Gallup	Structure	Monocline	Gas-Oil or Water-Oil Contacts	None Indicated	Type Accumulation	Stratigraphic Trap (Sand Bar)	Producing Depth	4600-5600' Average 5400'	Average Gross Thickness "A" Sand	8' +	Average Gross Thickness "B" Sand	6.0'
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Structure	Monocline															
Gas-Oil or Water-Oil Contacts	None Indicated															
Type Accumulation	Stratigraphic Trap (Sand Bar)															
Producing Depth	4600-5600' Average 5400'															
Average Gross Thickness "A" Sand	8' +															
Average Gross Thickness "B" Sand	6.0'															
<u>Reservoir Temperature</u>	158°F															
<u>Initial Reservoir Pressure</u>	1560 psig @ + 400' Datum															
<u>Estimated Abandonment Pressure</u>	200 psig															
<u>Properties of Reservoir Rock</u>	<u>"A" Sand</u>	<u>"B" Sand</u>														
Average Porosity	14.7%	7.66%														
Average Permeability (air)	57.0 md.	.33 md.														
Mean Permeability (air)	41.0 md.															
Average Interstitial Water Saturation (Capillary Press.)	35.0%															
<u>Properties of Reservoir Fluids</u>																
Oil Gravity	38 - 45° API Average 43° API															

Properties of Reservoir Fluids (Con't)TABLE I (Con't)

Estimated Flash FVF to 0 psig 2/1560 psig bpp and Flash Separation at 40 psig & 75°F	1.350
Estimated Diff. FVF to 0 psig 2/1560 psig bpp and 158°F	1.392
Estimated Diff. GOR to 0 psig @ 158°F	649 cu. ft./Bbl.
Estimated Avg. Initial Separator GOR @ 40 psig & 75°F	490 cu. ft./Bbl.
Estimated Oil Viscosity @ bpp.	.415 cp.
Estimated Water Viscosity @ 158°F	.45 cp.

Number of Wells

As of May 10, 1961	35
Estimated Ultimate (160-Acre Spacing)	35

Northwest Area Pore Volume Data

	<u>Current Net "A" Sand</u>	<u>Gross "B" Sand</u>
Acre-Feet	37,340.6 *	36,971.8 *
Productive Acres	5,729.5 *	6,156.5 *
Average Thickness	6.52	6.01
Original Oil-in-Place Within NW Unit Area		
Bbls/Ac. Ft.	523.53	
Bbls/Ac.	3,470	
Total Bbls.	19,885,000	

Ultimate Primary Recovery

% OOIP	13.7
Bbls/Ac. Ft.	72.9
Total Bbls.	2,724,000

Ultimate Water Flood Recovery

	<u>(1200 psig)</u>
% OOIP	38.3
Bbls/Ac. Ft.	203.8
Total Bbls.	7,616,000

* Excludes Humble's Navajo Tribal lease in Section 12-28N-14W
and Atlantic's Navajo lease.

TABLE I (Con't)

Cumulative Production 5-1-61

% OOIP	3.82
% Ultimate Recovery	27.90
Bbls/Ac. Ft.	20.35
Total Bbls.	760,000

Pertinent Proration Rules

Proration Units	80 Acres (Temporary)
Current Allowable	16 $\frac{1}{4}$ Bbls/Cal. Day/Well
GOR Limit	2000 cu. ft./Bbl.
Spacing	Within 150' of center of either 1/4 1/4 Section

TABLE II
NORTHWEST CHA CHA UNIT AREA
DATA FOR "A" SAND
GROSS TO NET RATIO

<u>Operator</u>	<u>Lease</u>	<u>Well No.</u>	<u>ML</u>	<u>Core</u>	<u>Avg Core-ML</u>	<u>Avg SP-GR</u>
El Paso	Ojo Amarillo	1	8	7	7.5	12.5
		2	10	10	10.0	13.0
		3	12	14	13.0	13.0
		4	7	3	5.0	9.0
		5	10	--	10.0	12.0
		6	6	6	6.0	7.0
Humble	Navajo "L"	1	7	8	7.5	10.0
		2	9	--	9.0	14.0
		4	10	--	10.0	12.0
		5	13	--	13.0	11.5
		6	7	7	7.0	9.0
		7	9	--	9.0	10.0
		8	10	--	10.0	11.0
		9	7	7	7.0	10.0
		10	7	4	5.5	7.5
Pan American	Navajo "E"	7	--	6	6.0	8.0
		8	--	11	11.0	12.0
	Navajo "G"	3	--	7	7.0	9.0
		5	--	3	3.0	8.0
	Navajo "H"	1	--	9	9.0	12.0
					<u>165.5</u>	<u>210.5</u>

$$\text{"A" Sand Gross to Net Ratio} = \frac{165.5}{210.5} = .79$$

TABLE III
NORTHWEST CHA CHA UNIT AREA
PRIMARY AND WATERFLOOD RECOVERIES

Original Oil-in-Place

$$N = \frac{7758 \phi (1-S_{wc}) A h}{b_o}$$

$$N = \frac{7758 \times .147 \times (1-.35) \times 37,340.6}{1.392} = 19,885,000 \text{ Bbls.}$$

Primary Recovery

$$\text{Bbls.} = N \times RF = 19,885,000 \times .137 = 2,724,000 \text{ Bbls.}$$

Total Recovery with Water Flood

$$\text{Total Rec.} = \text{Rec. to Start WF} + \text{WF Rec.}$$

$$\text{WF Rec. Bbls./Ac-Ft.} = 7758 \phi \left[\frac{S_{o1}}{B_{o1}} - \frac{E S_{or}}{B_{o2}} - \frac{(1-E)(1-S_{wc}-S_{g2})}{B_{o2}} \right]$$

$$\text{Total Rec. \%} = \frac{\text{Total Rec. Bbls./Ac. Ft.}}{\text{OOIP Bbls./Ac.Ft.}}$$

$$\text{Total Rec. Bbls.} = \% \text{ Rec.} \times N$$

$$\begin{aligned} \text{Free Gas in p.s., cu. ft./Bbls} &= 5.615 \frac{B_{o1} S_{g1}}{S_o} \left(\frac{P_1}{P_{sc}} \frac{T_{sc} + 460}{T + 560} \right) \frac{1}{Z} \\ &= .321 \frac{B_{o1} S_{g1} P_1}{S_{o1} Z_1} \end{aligned}$$

Assumptions

1. 50% resaturation of unconformable zone
2. $S_{or} = .31$ (Average Atlantic Horseshoe & CBU)
3. $S_{g1} = \frac{1}{2} S_{g1} = \frac{1}{2} (1-S_{L1})$
4. $E_v = .86$, $E_a = .85$, $E = .731$

Other Data

Free gas in p.s. @ Flood Start	1200 psig
New bpp with $\frac{1}{2}$ back in soln.	81.3 cu. ft./bbl.
B_{o1}	1322 psig
B_{o2}	1.342
S_{o1} (primary MB)	1.376
S_{g1}	.5747
	.0753

Other Data (Con't)

TABLE III (Con't)

Swc	.3500
Ø	14.7%
Rec. to Start WF, Bbls./Ac.Ft.	44.14

Results

WF Rec., Bbls./Ac.Ft.	159.66
Total Rec., Bbls./Ac.Ft.	203.80
Total Rec., % OOIP	38.3%
Total Rec., Bbls.	7,616,000 Bbls.

TABLE IV
NORTHWEST CHA CHA UNIT AREA
ECONOMIC FACTORS AND INVESTMENT SCHEDULE
USED IN PROFIT AND LOSS STATEMENT

1. Net Interest Factor		.875
2. Value of Oil to W.I. (2.75-0.05 Gathering)		\$2.70/Bbl.
3. Value of Nat. Gas and Liquids (40% of 15.9¢)		\$0.0636/MCF
4. Ad Valorem, Severance and State Sales Tax (7.4% of Oil Value)		\$0.20/Bbl.
5. Combined Taxes of Gas and Liquids (4.7% of Sales Value)		\$0.003/MCF
6. Direct Operating Expenses		
Flowing Wells		\$100/well/mo.
Pumping Wells		\$200/well/mo.
Water Flood (Producers & Injection Wells)		\$300/well/mo.
Operating & Maintenance (Supply & Injection Water)		\$0.025/Bbl.
7. Investment Schedule (Primary)		
1960 - 22 Wells @ \$60,000/Well & Lease		\$1,320,000
1961 - 13 Wells @ \$60,000/Well & Lease	\$780,000	
- Electrical Distribution System		
84,500' @ \$1.25/ft.	\$105,625	
- 15 PPG Units @ \$8,500/Unit	<u>\$127,500</u>	\$1,013,125
1962 - 20 PPG Units @ \$8,500/Unit		\$ 170,000
1964 - 35 PPG Units Salvaged @ \$2,000/Unit		<u>(\$ 70,000)</u>
		\$2,433,125
8. Investment Schedule (10-1-61 Water Flood)		
1960 - 22 Wells @ \$60,000/Well & Lease		\$1,320,000
1961 - * 16 Wells @ \$60,000/Well & Lease	\$960,000	
- 10 PPG Units @ \$8,500/Unit	\$ 85,000	
- Electrical Distribution System		
84,500' @ \$1.25/ft.	\$105,625	
- Water Injection Plant	\$ 90,000	
- Water Dist. System	\$100,000	
- Input Well Conversion	\$ 45,000	
- Water Supply Wells	<u>\$ 11,000</u>	\$1,396,625
1962 - 19 PPG Units @ \$18,000/Unit		\$ 342,000
1963 - Produced Water Disposal System		\$ 31,000
1970 - Salvage		<u>(\$ 58,000)</u>
		\$3,031,625

* Three additional wells for flooding.

TABLE V
NORTHWEST CHA CHA UNIT AREA
PROFIT AND LOSS STATEMENT

<u>Time</u>	<u>Avg. No. of Wells</u>	<u>Gross Oil Production Bbls</u>	<u>Gross Gas Production MCF</u>	<u>Net Oil Production Bbls</u>	<u>Net Gas Production MCF</u>
<u>PRIMARY OPERATIONS</u>					
7 Mos. 1960	10.5	244,000	185,000	213,500	161,900
1961	32.0**	1,599,000	2,359,000*	1,392,100	2,064,100
1962	35.0	649,000	3,580,000	567,900	3,132,500
1963	24.5	168,000	2,206,000	147,000	1,930,300
1964	10.5	64,000	810,000	56,000	708,800
TOTALS		2,724,000	9,140,000	2,383,500	7,997,600

Gross Inv. = \$2,503,100

ROI = 1.49

SECONDARY OPERATIONS (10-1-61 WF)

1960	10.5	244,000	185,000	213,500	161,900
1961	32.0	1,591,000	2,359,000	1,392,100	2,064,100
1962	38.0	1,047,000	3,222,000	916,100	2,819,300
1963	38.0	1,796,000	934,000	1,571,500	817,300
1964	38.0	1,370,000	593,000	1,198,800	518,900
1965	35.0	746,000	323,000	652,800	282,600
1966	35.0	301,000	130,000	263,400	113,800
1967	30.0	207,000	89,600	181,100	78,400
1968	25.0	156,000	67,500	136,500	59,100
1969	20.5	124,000	53,700	108,500	47,000
(4 Mos) 1970	20.0	34,000	14,700	29,800	12,900
TOTALS		7,616,000	7,971,500	6,664,100	6,975,300

Total Gross Inv. = \$3,089,600

ROI = 3.92

Incr. Gross Inv. = \$586,500

Incr. ROI = 14.3

* Gas Sales Start 7-1-61.

Cumulative Gas Prod. 7-1-61 = 954,000 MCF

** 15 Wells Pump 3 Months.

W. I. Oil Income \$	W. I. Gas Income (.4)(15.9¢) per MCF \$	Total W. I. Income \$	Ad Val-Sev State In- come Taxes (Oil) \$	Combined Tax Rates (Gas) 4.7% \$	Operating & Workover Expenses \$	Supply & Ins. Water Oper & Maint. Exp. \$
576,500	-	576,500	42,700	-	7,400	-
3,777,600	88,500	3,866,100	279,800	4,200	42,900	-
1,533,300	199,200	1,732,500	113,600	9,400	84,000	-
396,900	122,800	519,700	20,400	5,800	58,800	-
151,200	45,100	196,300	11,200	2,100	25,200	-
6,435,500	455,600	6,891,100	476,700	21,500	218,300	-
576,500	-	576,500	42,700	-	7,400	-
3,758,700	88,500	3,847,200	278,400	4,200	67,900	22,800
2,473,500	179,300	2,652,800	183,200	8,500	156,800	89,700
4,243,100	52,000	4,295,100	311,300	2,500	156,800	77,500
3,236,800	33,000	3,269,800	293,800	1,600	156,800	81,700
1,762,600	18,000	1,780,600	130,600	800	146,000	79,400
711,200	7,200	718,400	52,700	300	146,000	77,600
489,000	5,000	494,000	36,200	200	128,000	77,600
368,600	3,800	372,400	27,300	200	110,000	75,900
293,000	3,000	296,000	21,700	100	92,000	75,800
80,500	800	81,300	6,000	-	29,000	25,000
17,993,500	390,600	18,384,100	1,332,900	18,400	1,196,700	683,000

Payout = 14.6 Mos.

Net PW @ 6% = \$9,870,900

Payout (10-1-61) = +14.5 Mos.

Net PW @ 6% = \$6,534,200

Total Direct Expenses	Net Operating Income	Investment	Net Cash Flow	6% Disc. Factor (7-1-60)	Disc. Cash Flow	Cumulative Disc. Cash Flow
\$	\$	\$	\$		\$	\$
50,100	526,400	1,320,000	(793,600)	.9853	(781,900)	(781,900)
326,900	3,539,200	1,013,100	2,526,100	.9424	2,380,600	1,598,700
207,000	1,525,500	170,000	1,355,500	.8874	1,202,900	2,801,600
94,000	425,700	-	425,700	.8358	355,800	3,157,400
38,500	157,800	(70,000)	227,800	.7871	179,300	3,336,700
716,500	6,174,600	2,433,100	3,741,500		3,336,700	

50,100	526,400	1,320,000	(793,600)	.9853	(781,900)	(781,900)
373,300	3,473,990	1,396,600	2,077,300	.9424	1,957,600	1,175,700
438,200	2,214,600	342,000	1,872,600	.8874	1,661,700	2,837,400
551,100	3,744,000	31,000	3,713,000	.8358	3,103,300	5,940,700
479,900	2,789,900	-	2,789,900	.7871	2,195,900	8,136,600
356,800	1,423,800	-	1,423,800	.7412	1,055,300	9,191,900
276,600	441,800	-	441,800	.6981	308,400	9,500,300
242,000	252,000	-	252,000	.6574	165,700	9,666,000
213,400	159,000	-	159,000	.6192	98,500	9,764,500
189,600	106,400	-	106,400	.5831	62,000	9,826,500
60,000	21,300	(58,000)	79,300	.5599	44,400	9,870,900
3,231,000	15,153,100	3,031,600	12,121,500		9,870,900	

NCF = \$12,121,500

Incr. NCF = \$8,380,000

EXHIBIT "C"
WATER INJECTION WELLS
PROPOSED NORTHWEST CHA CHA GALLUP UNIT
SAN JUAN COUNTY, NEW MEXICO

Name	Completion Date	Location	Total	Plugback	Casing Size	Casing Depth	Top	Perf Interval
			Depth	Total Depth			Cement (Est.)	
El Paso Natural Gas Products								
Ojo Amarillo No. 2	6-23-60	NE NW Sec. 27-29N-14W	6105	5330	5 1/2	5376	4120	5322-44
Humble Oil & Refining Company								
Navajo "L" No. 1	9-13-60	SW NW Sec. 26-29N-14W	5488	5447	4 1/2	5484	4800	5390-5400
Navajo "L" No. 4	10-6-60	SW SW Sec. 26-29N-14W	5591	5587	4 1/2	5587	3100	5499-5510
Navajo "L" No. 5	11-30-60	SW NW Sec. 36-29N-14W	5627	5588	4 1/2	5624	3100	5528-41
Navajo "L" No. 15	9-8-61	SW NE Sec. 25-29N-14W	5416	5385	4 1/2	5414	4418	(5305-15 5360-65)
Pan American Petroleum								
Navajo "E" No. 2	8-12-60	NE SE Sec. 21-29N-14W	5289	5238	5 1/2	5283	4600	5145-53
Navajo "E" No. 3	8-26-60	NE SW Sec. 21-29N-14W	5270	5226	5 1/2	5270	4600	5116-26
Navajo "G" No. 1	9-23-60	NE NE Sec. 20-29N-14W	4828	4796	4 1/2	4832	4200	4681-89
Navajo "G" No. 4	1-6-61	SW SW Sec. 17-29N-14W	4669	4626	4 1/2	4661	3900	4578-84

JOINT OPERATING AGREEMENT

NORTHWEST CHA CHA UNIT AREA

SAN JUAN COUNTY, NEW MEXICO

JOINT OPERATING AGREEMENT
NORTHWEST CHA CHA UNIT AREA
SAN JUAN COUNTY, NEW MEXICO

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JOINT OPERATING AGREEMENT
NORTHWEST CHA CHA UNIT AREA
SAN JUAN COUNTY, NEW MEXICO

THIS AGREEMENT, made and entered into as of the 1st day of October, 1961, by and between EL PASO NATURAL GAS PRODUCTS COMPANY, a corporation, hereinafter referred to as "El Paso Products", EL PASO NATURAL GAS COMPANY, a corporation, hereinafter referred to as "El Paso", HUMBLE OIL & REFINING COMPANY, a corporation, hereinafter referred to as "Humble", and PAN AMERICAN PETROLEUM CORPORATION, a corporation, hereinafter referred to as "Pan American", all of said parties being sometimes collectively referred to as "Working Interest Owners";

WITNESSETH:

WHEREAS, El Paso and El Paso Products are the owners of that Certain Oil and Gas Lease dated December 31, 1956, in which the Navajo Tribe of Indians is Lessor and which is designated Navajo Tribal Lands Contract No. 14-20-603-2168 insofar as said lease embraces all of Section 27, the North One-Half (N/2) and the Southeast Quarter (SE/4) of Section 28, and the North One-Half (N/2) of Section 34, Township 29-North, Range 14-West, San Juan County, New Mexico; and

WHEREAS, Humble is the owner of that Certain Oil and Gas Lease dated December 21, 1956, in which the Navajo Tribe of Indians is the Lessor and which is designated Navajo Tribal Lands Contract No. 14-20-603-2712 insofar as said lease embraces all of Sections 25, 26, 35, and 36, Township 29-North, Range 14-West, San Juan County, New Mexico; and

WHEREAS, Pan American is the owner of that Certain Oil and Gas Lease dated December 20, 1956, in which the Navajo Tribe of Indians is the Lessor and which is designated Navajo Tribal Lands Contract No. 14-20-603-2198 insofar as said lease embraces the Northwest Quarter (NW/4) and the South One-Half (S/2) of Section 23, and the South One-Half of the Southwest Quarter (S/2 SW/4) and the Southwest Quarter of the Southeast Quarter (SW/4 SE/4) of Section 24, that Certain Oil and Gas Lease dated December 20, 1956, in which the Navajo Tribe of Indians is the Lessor and which is designated Navajo Tribal Lands Contract No. 14-20-603-2199 insofar as said lease embraces all of that portion of the South One-Half (S/2) of Section 15 lying south of the mid-channel of the San Juan River, all of that portion of Section 16 lying south of the mid-channel of the San Juan River and all of Sections 21 and 22, and that Certain Oil and Gas Lease dated December 20, 1956, in which the Navajo Tribe

of Indians is the Lessor and which is designated Navajo Tribal Lands Contract No. 14-20-603-2200 insofar as said lease embraces all of those portions of Section 17 and 18 lying south of the mid-channel of the San Juan River, the Northeast Quarter (NE/4) of Section 19, and all of Section 20, all of said land being in Township 29-North, Range 14-West, San Juan County, New Mexico.

WHEREAS, all of the above-described lands shall in this agreement be referred to as the Unit Area.

WHEREAS, the Working Interest Owners desire to provide for the operation and further development of said leases for increasing the recovery of oil and gas and other hydrocarbons from the Gallup Formation, including the obtaining of source water and, in accordance with good engineering and production practices, to engage in pressure maintenance operations, which may include (without limiting the right of the parties to employ other methods) the injection of gas, water, or other substances, or combinations of such, into the Gallup Formation.

NOW, THEREFORE, for and in consideration of the mutual agreements herein set forth, it is agreed as follows:

ARTICLE 1 DEFINITIONS

As used in this agreement, the terms hereinafter set out shall have the following meaning:

1.1 Unit Area shall mean the lands situated within the Cha Cha Gallup Field, San Juan County, New Mexico, described by Tracts in Exhibit A, and shown on Exhibit B.

1.2 Unitized Formation shall mean that subsurface portion of the Unit Area commonly known as the Gallup Formation, which is that continuous stratigraphic interval occurring between the top of the Gallup Formation and the top of the Sanastee Formation, and which is the same formation that was penetrated between the elevations of plus 781 feet and plus 314 feet in El Paso's Ojo Amarillo #1 Well, located 890' from the North and East Lines of Section 27, Township 29 North, Range 14 West, as such formation is shown on the Schlumberger induction-electrical log of said well dated April 22, 1960.

1.3 Unitized Substances shall mean all oil, gas, gaseous substances, sulphur contained in gas, condensate, distillate, and all associated and constituent liquid or liquefiable hydrocarbons within or produced from the Unitized Formation.

1.4 Working Interest Owner shall mean any party hereto, including a carried working interest owner, holding an interest in Unitized Substances by virtue of a lease, operating agreement, fee title or otherwise, which interest is chargeable with and obligated to pay or bear, either in cash or out of production or otherwise, all or a portion of the cost of drilling, developing, producing and operating the Unitized Formation.

1.5 Tract shall mean each parcel of land described as such and given a Tract Number in Exhibit A.

1.6 Unit Operator shall mean the Working Interest Owner designated by the Working Interest Owners to develop and operate the Unitized Formation.

ARTICLE 2 EXHIBITS

2.1 Exhibits. Attached hereto and made a part hereof are the following exhibits:

2.1.1 Exhibit A is a schedule which contains the description, serial number, date of lease or application, and ownership of each of the tracts in the Unit Area insofar as is known to the Unit Operator.

2.1.2 Exhibit B is a map of a portion of the Cha Cha Gallup Field, showing the boundary line of the Unit Area and Tracts thereon.

2.1.3 Exhibit C is the Accounting Procedure applicable to the development and operation of the Unit Area. In the event of conflict between this agreement and Exhibit C, this agreement shall prevail.

2.1.4 Exhibit D contains insurance provisions applicable to the development and operation of the Unit Area.

ARTICLE 3 SUPERVISION OF OPERATIONS BY WORKING INTEREST OWNERS

3.1 Overall Supervision. Working Interest Owners shall exercise overall supervision and control of all matters pertaining to the development and operation of the Unit Area pursuant to this agreement. In the exercise of such power each Working Interest Owner shall act solely in its own behalf in the capacity of an individual owner and not on behalf of the owners as an entirety.

3.2 Particular Powers and Duties. The matters to be passed upon and decided by Working Interest Owners shall include, but not be limited to, the following:

3.2.1 Method of Operation. The kind, character, and method of operation, including any type of pressure maintenance or secondary recovery program to be employed.

3.2.2 Drilling of Wells. The drilling of any well within the Unit Area for use as an injection well, or for use as a source water well. Any other well will require ninety per cent (90%) approval.

3.2.3 Well Recompletions and Change of Status. The recompletion, abandonment, or change of status of any well in the Unit Area or use of any such well for source water, injection or other purposes.

3.2.4 Expenditures. The making of any single expenditure in excess of Ten Thousand Dollars (\$10,000) except as provided in Section 7.9 herein; provided, that approval by Working Interest Owners of the drilling, recompletion, drilling deeper, or plugging back of any well shall include approval of all necessary expenditures required therefor and for completing, testing and equipping the same, including necessary flow lines, separators and lease tankage.

3.2.5 Disposition of Surplus Facilities. The selling or otherwise disposing of any major item of material or equipment, previously declared surplus by the Working Interest Owners, the current list price of new equipment similar thereto being Two Thousand Five Hundred Dollars (\$2,500) or more.

3.2.6 Appearances. The designating of a representative to appear before any court or regulatory body in matters pertaining to unit operations; provided, however, that the authorization by Working Interest Owners of the designation of any such representative shall not prevent any Working Interest Owner, at its own expense, from appearing in person or from designating another representative in its own behalf.

3.2.7 Audits. The making of proper audits of the accounts of Unit Operator pertaining to operations hereunder; provided, that such audits shall

(a) not be conducted more than once each year except upon the resignation or removal of Unit Operator; and shall

(b) be made at the expense of all Working Interest Owners other than the Working Interest Owner designated as Unit Operator;

and

- (c) be upon not less than thirty (30) days' written notice to
Unit Operator.
- 3.2.8 Inventories. The taking of periodic inventories under the terms
of Exhibit C.
- 3.2.9 Technical Services. Any direct charges to the joint account for
services by consultants of Unit Operator's technical personnel not covered
by the overhead charges provided by Exhibit C or in Section 11.4 herein.
- 3.2.10 Assignments to Committees. The appointment or designation of
the purposes of committees or subcommittees necessary for the study of any
problem in connection with unit operations.
- 3.2.11 Plans of Development. The adoption or submission of any operating
and development plan to any regulatory body.
- 3.2.12 Other Matters. Other matters pertaining to the operation of
the Unit Area, such as
- (a) the removal of Unit Operator and the selection of a successor.
 - (b) the adjustment of investments.
 - (c) the termination of this agreement.

ARTICLE 4 MANNER OF EXERCISING SUPERVISION

- 4.1 Designation of Representatives. Each Working Interest Owner shall
advise the Unit Operator and all other Working Interest Owners in writing the names
and addresses of its representative and alternate authorized to represent and bind
it in respect to any matter pertaining to the development and operation of the Unit
Area. Such representative or alternate may be changed from time to time by written
notice to Unit Operator and all other Working Interest Owners.
- 4.2 Meetings. All meetings of Working Interest Owners for the purpose of
considering and acting upon any matter pertaining to the development and operation
of the Unit Area shall be called by the Unit Operator upon its own motion or at
the request of any Working Interest Owner. No meeting shall be called on less
than twenty (20) days' advance written notice, with agenda for the meeting attached.
The Working Interest Owners attending such meeting shall not be prevented from
amending items included on the agenda or from deciding such amended items or from
deciding such other items presented at such meeting. The representative of the
Unit Operator shall be chairman of each meeting.

4.3 Voting Procedure. Working Interest Owners shall act upon and determine
all matters coming before them as follows:

4.3.1 Voting Interest. In voting on any matter each Working Interest
Owner shall have the voting interest set out opposite its name below, to-wit:

El Paso Products and El Paso.	15.83 *
Humble	43.64
Pan American	40.53

* This interest in which El Paso Products owns the oil rights
and El Paso owns the gas rights shall be voted by El Paso Products.

4.3.2 Vote Required. Except as otherwise provided herein, Working
Interest Owners shall act upon and determine all matters coming before them
by the affirmative vote of two or more of the parties owning in the aggregate
fifty-one per cent (51%) or more of the voting interests, and such affirmative
vote shall be binding on all parties hereto.

4.3.3 Voting at Meeting by Non-attending Working Interest Owners. Any
Working Interest Owner not represented at a meeting may vote on any matter
included on the agenda of the meeting by letter or telegram addressed to the
chairman of the meeting, provided such vote is received prior to the sub-
mission of such item to vote. Such vote shall not be counted with respect
to any item considered which is amended at the meeting, provided, however,
non-attending Working Interest Owners may vote by mail on such amended items
following receipt of the minutes of the meeting.

4.3.4 Poll Votes. Working Interest Owners may decide any matter by
vote taken by letter or telegram, provided the matter is first submitted in
writing to each Working Interest Owner and no meeting on the matter is
called as provided in Section 4.2, within seven calendar days after such
proposal is dispatched to Working Interest Owner. Unit Operator will give
prompt notice of the results of such voting to all Working Interest Owners.

ARTICLE 5 INDIVIDUAL RIGHTS AND PRIVILEGES OF WORKING INTEREST OWNERS

5.1 Reservation of Rights. Working Interest Owners severally reserve to
themselves all their rights, power, authority and privileges, except as expressly
provided in this agreement.

5.2 Specific Rights. Each Working Interest Owner shall have, among others,
the following specific rights and privileges:

5.2.1 Access to Unit Area. Access to the Unit Area at all reasonable times to inspect the operation hereunder and all wells and records and data pertaining thereto.

5.2.2 Reports by Request. The right to receive from Unit Operator, upon written request, copies of all reports to any governmental agency, reports of crude oil runs and stocks, inventory reports and all other data pertaining to unit operations. The cost of gathering and furnishing data not ordinarily furnished by Unit Operator to all Working Interest Owners shall be charged to the Working Interest Owners requesting the same.

ARTICLE 6 UNIT OPERATOR

6.1 Initial Unit Operator. Humble Oil & Refining Company is hereby designated as initial Unit Operator.

6.2 Resignation or Removal. Unit Operator may resign at any time. Working Interest Owners may remove Unit Operator for cause by the affirmative vote of one hundred per cent (100%) of the voting interest remaining after excluding the voting interest of Unit Operator. A Unit Operator who resigns or is removed shall not be released from its obligations hereunder for a period of three (3) months after its resignation or discharge unless a successor Unit Operator shall have taken over the operations hereunder prior to the expiration of said period.

6.3 Selection of Successor. In the event of the resignation or removal of a Unit Operator, a successor Unit Operator shall be selected by the Working Interest Owners by the vote provided in Section 4.3.2 hereof, provided, however, that no Unit Operator who has been removed may vote to succeed himself.

ARTICLE 7 POWERS AND DUTIES OF UNIT OPERATOR

7.1 Exclusive Right to Conduct Operations. Subject to the provisions of this agreement and to the orders, directions and limitations rightfully given or imposed by Working Interest Owners, Unit Operator shall have the exclusive right and be obligated to develop and operate the Unit Area for the production of Unitized Substances.

7.2 Workmanlike Conduct. Unit Operator shall conduct all operations hereunder in a good and workmanlike manner and, in the absence of specific instructions from Working Interest Owners, shall have the right and duty to conduct such operations in the same manner as would a prudent operator under the same or similar circumstances.

Unit Operator shall freely consult with Working Interest Owners and keep them advised of all matters arising in connection with such operations which Unit Operator, in the exercise of its best judgment, considers important. Unit Operator shall not be liable to Working Interest Owners for damages unless such damages result from the gross negligence or willful misconduct of Unit Operator.

7.3 Liens and Encumbrances. Unit Operator shall endeavor to keep the lands and leases in the Unit Area free from all liens and encumbrances occasioned by its operations hereunder, except the lien of Unit Operator granted hereunder.

7.4 Employees. The number of employees used by Unit Operator in conducting operations hereunder, the selection of such employees, the hours of labor, and the compensation for services to be paid any and all such employees shall be determined by Unit Operator. Such employees shall be the employees of Unit Operator.

7.5 Records. Unit Operator shall furnish to each Working Interest Owner periodic reports of the development and operation of the Unit Area.

7.6 Reports to Working Interest Owners. Unit Operator shall furnish to Working Interest Owners periodic reports of the operations.

7.7 Reports to Governmental Authorities. Unit Operator shall make all reports to governmental authorities that it has the duty to make as Unit Operator.

7.8 Engineering and Geological Information. Unit Operator shall furnish to each Working Interest Owner, upon written request, copies of the log of, and copies of engineering and geological data pertaining to wells drilled by Unit Operator for the joint account.

7.9 Expenditures. Subject to the provisions of Section 3.2.4, Unit Operator is authorized to make single expenditures not in excess of Ten Thousand Dollars (\$10,000) without prior approval of Working Interest Owners except in case of blowout, explosion, fire, flood or other sudden emergency, Unit Operator may take such steps and incur such expenses as, in its opinion, are required to deal with the emergency to safeguard life and property; provided, that Unit Operator shall, as promptly as possible, report the emergency and the action taken to the Working Interest Owners. The Unit Operator shall be permitted to perform well workovers, repairs, and stimulations without additional approval of the Working Interest Owners, provided each such expenditure does not exceed the Ten Thousand Dollar (\$10,000) limit.

7.10 Settlement. Unit Operator may settle any single damage claim not involving an expenditure in excess of Two Thousand Dollars (\$2,000) provided such payment is a complete settlement of such claim and Unit Operator shall have secured complete release for Working Interest Owners of and from all liabilities relating to the cause or alleged cause of such claim.

ARTICLE 8 TAXES

8.1 Ad Valorem Taxes. Unit Operator shall, beginning in the first calendar year after the effective date hereof, make and file for ad valorem tax purposes all necessary renditions and returns with the proper taxing authorities or governmental sub-division covering all real and personal property, excluding the surface rights to lands lying within the Unit Area and improvements located on said lands not utilized for unit operations, of each Working Interest Owner within the Unit Area and used in connection with the development and operation of the Unit Area. Any Non-Operator dissatisfied with any proposed rendition or assessment of its interest in real or personal property shall have the right, at its own expense, to protest and resist the same. All such ad valorem taxes due and payable on account of real and personal property of each Working Interest Owner located within the Unit Area and used in connection with unit operations shall be paid by Unit Operator for the joint account in the same manner as other costs and expenses of unit operations; provided, however, that the account of any Working Interest Owner owning less than a seven-eighths (7/8) working interest covered by this agreement shall be charged only for its proportion of the ad valorem taxes levied on the full working interest, adjusted so as to reflect a credit for such taxes levied on values assigned to outstanding excess royalties, overriding royalties, and production payments burdening such working interest.

8.2 Direct Taxes and Assessments. Each Working Interest Owner shall pay or cause to be paid all production, severance, gathering and other direct taxes and assessments imposed upon or on account of the production or handling of its share of Unitized Substances.

ARTICLE 9 INSURANCE

9.1 Insurance. Operator shall carry, with respect to unit operations subject to this agreement, such insurance as set forth in Exhibit D, Insurance Provisions.

ARTICLE 10
ADJUSTMENT OF INVESTMENTS

10.1 Personal Property Taken Over. Upon the effective date hereof, Working Interest Owners shall deliver to Unit Operator possession of:

10.1.1 Wells. All wells shown on Exhibit B which are completed in the Unitized Formation or which Working Interest Owners determine are necessary or desirable for conducting operations hereunder, together with the casing, tubing and inhole equipment up to and including the Christmas tree.

10.1.2 Equipment. All lease and operating equipment being used in the operation of the wells in the Unitized Formation shown on Exhibit B which Working Interest Owners determine is necessary or desirable for conducting operations hereunder.

10.1.3 Records. A copy of all production and well records pertaining to such wells.

10.2 Inventory and Evaluation of Personal Property. The Working Interest Owners shall appoint an inventory committee which shall, as of the effective date hereof, or as soon thereafter as feasible, cause to be taken, under the supervision of the Unit Operator and at unit expense, joint physical inventories of lease and well equipment within the area shown on Exhibit "B", which inventories shall be used as a basis for determining the controllable items of equipment to be taken over by the Unit Operator hereunder. The Unit Operator shall notify each Working Interest Owner within each separate Tract at least five (5) days prior to the taking of the inventory with respect to said Tract, so that each of said Working Interest Owners may make arrangements to be represented at the taking of the inventory. Failure of a Working Interest Owner to be represented at the taking of the inventory shall, nevertheless, bind such Working Interest Owner to accept the inventory taken by representatives of the other Working Interest Owners. Such inventories shall include and be limited to those items of equipment normally considered controllable by operators of oil and gas properties, as indicated in the "Materials Classification Manual (Revised 1960)", prepared by the Petroleum Accountants Society of Oklahoma, except that certain items normally considered noncontrollable, such as sucker rods, Kobe tubing of sizes less than two inches (2"), and other items as agreed upon by the Working Interest Owners, may be included on the inventories in order to insure a more equitable adjustment of investments. All other noncontrollable items of lease and well equipment installed

within the Unit Area, although excluded from the inventories, shall nevertheless be taken over by the Unit Operator. Immediately following completion, such inventories shall be priced in accordance with the provisions of Exhibit C, Accounting Procedure, attached hereto and made a part hereof, such pricing shall be performed under the supervision of, by the personnel of, and in the offices of the Unit Operator, with other Working Interest Owners furnishing such additional pricing help as may be available and necessary. Casing shall be included in the inventory for record purposes but shall be excluded from pricing and investment adjustment.

10.3 Investment Adjustment on Equipment. Upon approval by Working Interest Owners of such inventory and evaluation, each Working Interest Owner shall be credited with the value of its interest in all personal property, exclusive of the casing in wells, so taken over by the Unit Operator under Sections 10.1.1 and 10.1.2, and charged with an amount equal to that obtained by multiplying the total value of all such personal property, except casing, so taken over by Unit Operator under Sections 10.1.1 and 10.1.2 by such Working Interest Owners' participation as shown in Section 11.1. If the charge against any Working Interest Owner is greater than the amount credit to such Working Interest Owner, the resulting net charge shall be paid and in all other respects be treated as any other item of unit expense chargeable against such Working Interest Owner. If the credit to any Working Interest Owner is greater than the amount charged against such Working Interest Owner, the resulting net credit shall be paid to such Working Interest Owner by Unit Operator out of funds received by it in settlement of the charges described above.

10.4 Intangible Adjustments. There shall be an adjustment with respect to the intangible costs incurred in the following wells: El Paso Product's Ojo Amarillo No. 5, Humble's "L" 10, 12, 13, 14, and 15, and Pan American's "E" 2 and 9 and H-15. With respect to each such well the Working Interest Owner thereof shall be credited with the sum of \$8,000.00, and the total of all such credits shall be charged to all of the Working Interest Owners in the proportions set forth in Section 11.1 Such credits and charges shall be handled in the manner set forth in the last two sentences of Section 10.3

10.5 General Facilities. The acquisition of warehouses, warehouse stocks, lease houses, camps, facility systems, and office buildings necessary for operations hereunder shall be by negotiation by and between the owners thereof and Unit Operator, subject to the approval of Working Interest Owners. There shall be no adjustment for lease roads or appurtenances.

10.6 Ownership of Personal Property and Facilities. Each Working Interest Owner, individually, shall by virtue hereof own an undivided interest in all personal property and facilities taken over or otherwise acquired by Unit Operator pursuant to this agreement equal to its Participation shown in Section 11.1. All lease and well equipment and other personal property within the Unit Area not taken over by the Unit Operator, as hereinabove provided, shall remain the property of the original owners.

ARTICLE 11
DEVELOPMENT AND OPERATING COSTS

11.1 Basis of Charges to Working Interest Owners. Unit Operator initially shall pay and discharge all costs and expenses incurred in the development and operation of the Unit Area. All charges, credits and accounting for costs and expenses shall be in accordance with Exhibit C or Section 11.4 herein. Each Working Interest Owner shall reimburse Unit Operator for all such costs and expenses in the following respective proportions, to-wit:

El Paso Products and El Paso	15.83*
Humble	43.64
Pan American	40.53
	<hr/> 100.00

*The proportionate share of such costs and expenses which are attributable to this interest in which El Paso Products owns the oil rights and El Paso owns the gas rights shall be billed to and borne by El Paso Products.

11.2 Budgets. Before or as soon as practical after the effective date hereof, Unit Operator shall prepare a budget of estimated costs and expenses for the remainder of the calendar year and on or before the first day of each October thereafter shall prepare a budget of estimated costs and expenses for the ensuing calendar year. Such budgets shall set forth the estimated costs and expenses by quarterly periods. Unless otherwise specified in the budget, it shall be presumed for the purpose of advance billings that the estimated costs and expenses for each month of a quarterly period shall be one-third (1/3) of the estimate for the quarterly period. Budgets so prepared shall be estimates only and shall be subject to adjustment and correction by Working Interest Owners and Unit Operator from time to time whenever it shall appear that an adjustment or correction is proper. Approval of a budget shall not constitute approval of expenditures for any item contained therein. A copy of each such budget and adjusted budget shall be promptly furnished each Working Interest Owner.

11.3 Advance Billing. Unit Operator shall have the right at its option to require Working Interest Owners to advance their respective proportions of such costs and expenses by submitting to Working Interest Owners, on or before the 15th day of any month, an itemized estimate of such costs and expenses for the succeeding

month with a request for payment in advance. Within fifteen (15) days thereafter, each Working Interest Owner shall pay to Unit Operator its proportionate part of such estimate. Adjustment between estimates and the actual costs shall be made by Unit Operator at the close of each calendar month, and the accounts of the Working Interest Owners shall be adjusted accordingly.

11.4 Facility Charges. The charges provided for in Paragraph 12 of Section II of Exhibit C do not apply to any facility, such as water injection plants, or other similar installations, which are constructed or acquired by the unit and operated by the Unit Operator. In connection with any such facilities, the Unit Operator is hereby authorized to charge and collect the following charge:

11.4.1 Construction, Addition or Alteration to Facility. Eight per cent (8%) of the first \$25,000 of the total cost of original construction and/or addition or alteration, and two per cent (2%) of all such costs in excess of \$25,000.

11.4.2 Amendment of Facility Charges. The specifically authorized facility rates may be amended from time to time by agreement between the Unit Operator and the Working Interest Owners if in practice they are found to be insufficient or excessive.

11.5 Commingling of Funds. No funds received by Unit Operator under this agreement need be segregated by Unit Operator or maintained by it as a joint fund, but may be commingled with its own fund.

11.6 Lien of Unit Operator. Each Working Interest Owner grants to Unit Operator a lien upon such Working Interest Owner's leasehold and other mineral interests except royalty interests in each tract, its interest in all jointly-owned materials, equipment and other property and its interest in all Unitized Substances, as security for payment of the costs and expenses chargeable to it, together with interest thereon at the rate of six per cent (6%) per annum as provided in Exhibit C, Accounting Procedure. Unit Operator shall have the right to bring any action at law or in equity to enforce collection of such indebtedness with or without foreclosure of such lien. In addition, upon default by any Working Interest Owner in the payment of costs and expenses chargeable to it, Unit Operator shall have the right to collect and receive from the purchaser or purchasers the proceeds of such Working Interest Owner's share of Unitized Substances up to an amount owing by such Working Interest Owner plus interest, as aforesaid, until paid. By execution hereof, each subscribing party hereto agrees that

each such purchaser shall be entitled to rely upon Unit Operator's statement concerning the existence and amount of any such default.

11.7 Wells Drilled by Unit Operator. All wells drilled by Unit Operator shall be drilled on a competitive contract basis at the usual rates prevailing in the area. Unit Operator may employ its own tools and equipment in the drilling of wells, but in such event the charge therefor shall not exceed the prevailing rate in the area, and such work shall be performed by Unit Operator under the same terms and conditions as are customary and usual in the area in contracts of independent contractors doing work of a similar nature.

11.8 Investments Prior to Effective Date. Working Interest Owners may, prior to the effective date hereof, expend sums for the obtainment of source water, the installation of injection equipment and the conversion of wells for injection purposes. All such expenditures shall be charged to the joint account on the effective date hereof.

ARTICLE 12 OIL IN LEASE TANKAGE ON EFFECTIVE DATE

12.1 Gauge of Merchantable Oil. Unit Operator shall make a proper and timely gauge of all lease and other tanks within the Unit Area in order to ascertain the amount of merchantable oil produced from the Unitized Formation in such tanks as of 7:00 A.M. on the effective date hereof. All such oil as is a part of the prior allowable of the well or wells from which the same was produced shall be and remain the property of the Working Interest Owners entitled thereto the same as if the Unit had not been formed; and such Working Interest Owners shall promptly remove said oil from the Unit Area. Any such oil not so removed may be sold by the Unit Operator for the account of such Working Interest Owners, subject to the payment of all royalty by such Working Interest Owners to Royalty Owners under the terms and provisions of the applicable lease or leases and other contracts. All such oil as is in excess of the prior allowable of the well or wells from which the same was produced shall be regarded and treated the same as Unitized Substances produced after the effective date hereof. If, as of the effective date hereof, any Tract is overproduced with respect to the allowable of the well or wells on that Tract and the amount of such overproduction has been sold or otherwise disposed of, such overproduction shall be regarded and included as a part of the Unitized Substances produced after the effective date hereof and the amount thereof charged as having been delivered to the party contributing such Tract to this agreement.

ARTICLE 13
OPERATION OF NON-UNITIZED FORMATIONS

13.1 Right to Operate in Non-Unitized Formations. Any Working Interest Owner
now having or hereafter acquiring the right to drill for and produce oil, gas or
minerals, other than Unitized Substances, within the Unit Area shall have the full
right to do so notwithstanding this agreement. In exercising said right, however,
such Working Interest Owner shall exercise every reasonable precaution to prevent
unreasonable interference with operations hereunder. No Working Interest Owner shall
produce Unitized Substances through any well drilled or operated by it. If any Working
Interest Owner drills any well into the Unitized Formation, the Unitized Formation
shall be cased or otherwise protected in such a manner that the Unitized Formation and
the production of Unitized Substances will not be adversely affected.

13.2 Dual Completions. Notwithstanding anything herein expressed or implied
to the contrary, no well which is dually completed in the Unitized Formation and a
non-unitized formation shall be taken over by the Unit Operator. The Working
Interest Owners or owners of any such well which is within the Unit Area, or any
revision thereof, at his, or their sole cost, expense and risk, prior to the date on
which this agreement becomes effective as to the Tract on which such well is located
shall seal off with cement all formations, other than the Unitized Formation from
which such well is producing or is capable of producing oil or gas.

ARTICLE 14
TITLES

14.1 Warranty and Indemnity. Each Working Interest Owner represents and
warrants that, to the best of its knowledge, it is the owner of the respective working
interest set forth opposite its name in Exhibit A and hereby indemnifies and holds
the other Working Interest Owners harmless from any loss due to failure, in whole or
in part, of its title to any such interest, except failure of title arising out of
operations hereunder; provided, however, that to the extent that such damages are
based upon the values of Unitized Substances produced from such Working Interest
Owner's lands such indemnity shall be limited to an amount equal to the net value
that had been received from the sale of Unitized Substances attributed hereunder to
the interest as to which title failed. Each failure of title will be effective,
insofar as this agreement is concerned, as of the first day of the calendar month
in which such failure is finally determined, and there shall be no retroactive

adjustment of development and operating expenses, Unitized Substances, or the proceeds therefrom as a result of title failure.

The acreage content of each tract has been established using the best information available. In the event it subsequently is determined by all of the Working Interest Owners or is finally determined by a court having jurisdiction that a miscalculation has been made as to the acreage content of any tract covered hereby, then there shall be a retroactive adjustment, to the effective date of this agreement, of ownership or production, investments, development, and operating costs. Such retroactive adjustment shall not include any re-evaluation of engineering or geological interpretation used in establishing ownership of production, and the original basis of computation of such ownership shall be employed.

14.2 Failure Because of Unit Operations. The failure of title to any working interest in any Tract by reason of unit operations, including non-production from such Tract, shall be borne by all Working Interest Owners in accordance with their respective unit participations. Any Working Interest Owner whose title has so failed shall remain a party to this agreement and shall continue to participate hereunder to the same relative degree as existed prior to the title failure.

ARTICLE 15 LIABILITY, CLAIMS AND SUITS

15.1 Individual Liability. The duties, obligations and liabilities of Working Interest Owners shall be several and not joint or collective; and nothing herein contained shall ever be construed as creating a partnership of any kind, joint venture, or an association or trust between or among Working Interest Owners. Each Working Interest Owner shall be individually responsible only for its own obligations as set out in this agreement and shall be liable only for its proportionate share of the costs, expenses, and liabilities as herein stipulated. Except with respect to damages arising from loss of title to a Tract each Working Interest Owner, to the extent of such Owner's percentage of participation, indemnifies and agrees to hold each other Working Interest Owner harmless of and from any claim of or liability to any third person, asserted upon the ground that operations under this agreement have resulted in or will result in any loss or damage to such third person, to the extent, but only to the extent, that such claim or liability is asserted against such other Working Interest Owner's share of such claim or liability corresponding to the latter's per cent of participation; it being the intention of Working Interest Owners that

any claim of or liability to any third person asserted upon the ground that operations under this agreement have resulted in, or will result in, any loss or damage to such third person shall be borne by all Working Interest Owners in proportion to their respective unit participations.

15.2 Settlements. In the event claim is made against any Working Interest Owner or any Working Interest Owner is sued on account of any matter or thing arising from the development and operation of the Unit Area and over which such Working Interest Owner individually had no control because of the rights, powers, and duties granted by this agreement, said Working Interest Owner shall immediately notify the Unit Operator of such claim or suit. Unit Operator, on behalf of the Working Interest Owners, shall assume and take over the further handling of such claim or suit and all costs and expenses of handling, settling or otherwise discharging such claim or suit shall be borne by Working Interest Owners as any other cost or expense of operating the Unit Area.

ARTICLE 16 INTERNAL REVENUE PROVISION

16.1 Internal Revenue Provision. Each Working Interest Owner hereby elects that it and the operations covered by this agreement be excluded from the application of Subchapter K of Chapter 1 of Subtitle A of the Internal Revenue Code of 1954, or such portion or portions thereof as the Secretary of the Treasury of the United States or his delegate shall permit by election to be excluded therefrom. Unit Operator is hereby authorized and directed to execute on behalf of each Working Interest Owner such additional or further evidence of said election as may be required by regulations issued under said Subchapter K, or should said regulations require each party to execute such further evidence, each Working Interest Owner agrees to execute or join in the execution thereof.

ARTICLE 17 NOTICES

17.1 Notices. All notices required hereunder shall be in writing and shall be deemed to have been properly served when sent by mail or telegram to the address of the representative of each Working Interest Owner as furnished to Unit Operator in accordance with Article 4 hereof.

ARTICLE 18 WITHDRAWAL OF WORKING INTEREST OWNER

18.1 Withdrawal. If any Working Interest Owner so desires, it may withdraw from this agreement by conveying, assigning and transferring without warranty of

title, either express or implied, to the other Working Interest Owners who do not
desire to withdraw herefrom, all of the former's rights, title and interest in and
to its lease or leases, or other operating rights in the Unit Area, insofar as said
lease, leases or rights pertain to the Unitized Formation, together with the with-
drawing Working Interest Owner's interest in all wells, pipe lines, casing, injection
equipment, facilities and other personal property used in conjunction with the
development and operation of the Unit Area; provided, that such transfer, assignment
or conveyance shall not relieve said Working Interest Owner from any obligation or
liability incurred prior to the date of the execution and delivery thereof. The
interest so transferred, assigned and conveyed shall be taken and owned by the other
Working Interest Owners in proportion to their respective unit participations. After
the execution and delivery of such transfer, assignment or conveyance, the withdrawing
Working Interest Owner shall be relieved from all further obligations and liability
hereunder and the right of such Working Interest Owner to any benefits subsequently
accruing hereunder shall cease; provided, that upon delivery of said transfer, assign-
ment or conveyance, the assignees, in the ratio of the respective interests so acquired,
shall pay to the assignor for its interest in all jointly owned equipment, casing
and other personal property the net salvage value thereof, as estimated and fixed by
Working Interest Owners. This section shall not prevent a Working Interest Owner from
assigning its interest, in whole or in part, subject to the terms of applicable lease
agreements, provided such assignment is made subject to the terms of this agreement.

18.2 Creation of New Interest. If any Working Interest Owner shall, after
executing this agreement, create any overriding royalty, production payment, or other
similar interest, hereafter referred to as "New Interest", out of its interest subject
to this agreement, such New Interest shall be subject to all the terms and provisions
of this agreement. In the event the Working Interest Owner, owning the interest from
which the New Interest was created, withdraws from this agreement under the terms of
Section 18.1, or fails to pay any expenses and costs chargeable to it under this
agreement and the production to the credit of such Working Interest Owner is insuffi-
cient for that purpose, the owner of the New Interest will be liable for the pro rata
portion of all costs and expenses which the original Working Interest Owner, creating
such New Interest, would have been liable by virtue of his ownership of the new
Interest had the same not been transferred. In this event, the lien provided in
Section 11.6 may be enforced against such New Interest. If the owner of the New Interest

bears a portion of the costs and expenses or the same is enforced against such New Interest, the owner of the New Interest will be subrogated to the rights of the Unit Operator with respect to the interest primarily chargeable with such costs and expenses.

ARTICLE 19
OWNERSHIP OF PRODUCTION

19.1 Separate Ownership. All oil, gas and other hydrocarbon substances produced and saved from the subject lands during the life of this agreement, except Unitized Substances used or consumed in operations hereunder, or unavoidably lost, shall, subject to the payment of royalty, be owned by Working Interest Owners as tenants in common in the following proportions, to-wit:

El Paso Products and El Paso.	15.83*
Humble.	43.64
Pan American.	40.53
	<u>100.00%</u>

*All production attributable to this interest shall be owned by El Paso Products.

Each party hereto shall separately own its proportionate share of all such production and shall at all times take, receive and separately dispose of its proportionate share of such production to whomsoever it may desire. To the extent that royalty production is not taken in kind, each Working Interest Owner shall pay or cause to be paid all royalties, overriding royalties and other payments out of production due and payable under its leases included in the Unit Area, provided that the basic one-eighth (1/8) royalty prescribed by the terms of each of the leases covered hereby shall be borne by the parties hereto in the proportions hereinabove set forth in this Section 19.1

19.2 Failure to Take in Kind. If any Working Interest Owner should fail to take or adequately provide for the disposition of any part of its share of the production from subject lands, Unit Operator shall have the right, revocable at will, subject to the provisions of Section 19.1, to dispose of such production on a day-to-day basis at not less than the prevailing market price in the area for like production and such Working Interest Owner, upon such disposition, shall be considered as having received the same; provided, however, that any proceeds received by Unit Operator from such disposal shall, subject to payment of royalty, overriding royalties, and other payments out of production, be credited and paid to such Working Interest Owner ~~less~~ the reasonable costs and expenses incurred in making such disposition.

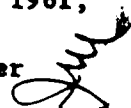

[Handwritten signatures and initials]


19.3 Payment of Rentals. Each Working Interest Owner shall timely pay all rentals which become due and payable under the terms and provisions of its lease or leases committed to this agreement and, on or before the date on which such rentals shall become due and payable, shall furnish evidence of such payment to the other parties hereto. To the extent that such rentals so paid are attributable to land lying within the Unit Area and are not recovered by the withholding of royalty pursuant to the terms of the leases covered hereby, they shall be treated as items of operating expense hereunder, incurred at the end of the year specified in the lease or leases for which such payments are made.

ARTICLE 20
FORCE MAJEURE

20.1 Force Majeure. All obligations of each party hereto, except for the payment of money, shall be suspended while said party is prevented from complying therewith, in whole or in part, by strikes, fire, war, civil disturbances, acts of God, federal, state or municipal laws, orders or regulations, inability to secure materials, or other causes beyond the reasonable control of said party. This agreement or the leases or other interests subject hereto shall not be terminated by reason of suspension of unit operations due to the aforesaid causes. Any party hereto who relies upon this Section 20.1 as excusing any performance hereunder, extending this agreement, or extending any interest or estate in oil or gas-in-place shall, within a reasonable time after the occurrence of the interference giving rise to the application of this section, give written notice to all other parties hereto stating reasonable particulars of such interference, and shall use diligence to obviate the same. Said requirement that reasonable diligence be used to obviate any such interference shall not be deemed to require any party to settle any labor dispute against its will.

ARTICLE 21
EFFECTIVE DATE AND TERM

21.1 Effective Date. This agreement shall ^{be} ~~become~~ effective ^{as of October 1, 1961,} ~~on the first~~ day of the calendar month next following the execution of this agreement by all Working Interest Owners.  

21.2 Term. This agreement shall continue in full force and effect for and during the time that Unitized Substances are produced in paying quantities and thereafter until all wells jointly owned by Working Interest Owners have been abandoned 

and plugged or turned over to Working Interest Owners in accordance with Article 22
hereof, and all personal and real property owned by the Working Interest Owners has
been disposed of by Unit Operator in accordance with instructions of Working Interest
Owners.

ARTICLE 22 ABANDONMENT OF WELLS

22.1 Rights of Former Owners. If Working Interest Owners decide to permanently
abandon any well within the Unit Area prior to termination of this agreement, Unit
Operator shall give written notice of such fact to the Working Interest Owners of the
Tract on which such well is located and said Working Interest Owners shall have the
right and option for a period of ninety (90) days after receipt of such notice to
notify Unit Operator of their election to take over and own said well and to deepen or
plug back said well to a formation other than the Unitized Formation. Within ten (10)
days after said Working Interest Owners have so notified Unit Operator of their desire
to take over such well, they shall pay to the Unit Operator, for credit to the joint
account of the Working Interest Owners, the amount as estimated and fixed by Working
Interest Owners to be the net salvage value of the salvable casing and equipment in
and on said well. At the same time, the Working Interest Owners taking over the well
shall agree by letter addressed to Unit Operator to effectively seal off and protect
the Unitized Formation, and at such time as the well is ready for abandonment to plug
and abandon the well in a workmanlike manner in accordance with applicable laws. In
the event the Working Interest Owners of a Tract do not elect to take over a well
located thereon which is proposed for abandonment, Unit Operator shall plug and
abandon the well in accordance with applicable laws.

ARTICLE 23 ABANDONMENT OF OPERATIONS

23.1 Termination. Upon termination of this agreement, the following will
occur:

23.1.1 Oil and Gas Rights. Possession of all oil and gas leasehold rights
in and to subject lands shall revert to the Working Interest Owners thereof.

23.1.2 Right to Operate. Each Working Interest Owner desiring to take
over and continue to operate any well or wells located on the portion of the
subject lands covered by its lease may do so by paying Unit Operator, for the
credit of the joint account, the salvage value of the casing and equipment in
and on the well less the costs of recovering and salvaging the same, and by

agreeing to properly plug each such well at such time as it is abandoned.

23.1.3 Salvaging Wells. With respect to all wells not taken over by Working Interest Owners, Unit Operator shall at the joint expense of Working Interest Owners salvage as much of the casing and equipment in or on such wells as can economically and reasonably be salvaged and shall cause the same to be properly plugged and abandoned.

23.1.4 Cost of Salvaging. Working Interest Owners shall share the costs of salvaging, liquidating or other distribution of assets and properties used in the development and operation of the Unit Area in proportion to their respective unit participations.

ARTICLE 24 SUCCESSORS AND ASSIGNS

24.1 Successors and Assigns. The terms and provisions hereof shall be covenants running with the lands and unitized leases covered hereby and shall be binding upon and inure to the benefit of the respective heirs, successors and assigns of the parties hereto.

ARTICLE 25 LAWS AND REGULATIONS

25.1 Laws and Regulations. This agreement shall be subject to the conservation laws of the State of New Mexico, to the valid rules, regulations and orders of the New Mexico Oil Conservation Commission, and to all other applicable federal, state and municipal laws, rules, regulations and orders. It is not the intention of this agreement to limit, restrict or prorate production from the Unit Area, it being recognized that such powers are exclusively exercised by governmental authority.

Article 26 contained on Page 22a is a part of this Agreement prior to its execution.

IN WITNESS WHEREOF, the parties have respectively executed this agreement as of the day and year first above written.

ATTEST:

Assistant Secretary

EL PASO NATURAL GAS PRODUCTS COMPANY

BY

Robert L. Hamilton

ITS

Attorney-in-Fact

ARTICLE 26
SUPERVISION AND RIGHTS OF INDIAN LESSORS

26.1 Supervision and rights of Indian Lessors. It is agreed between the parties hereto that the Secretary of the Interior, or his duly authorized representative, shall have the right of supervision over all operations within the area covered by this Joint Operating Agreement to the same extent and degree as provided in the applicable oil and gas mining leases on Navajo Tribal Lands and in the applicable oil and gas regulations of the Department of the Interior.

It is further agreed that nothing herein contained and no approval hereof by the Navajo Tribe or the Bureau of Indian Affairs shall impair any of the rights of the lessor or relieve any of the duties of the lessee under said Tribal Leases.

ATTEST:

~~Assistant Secretary~~

EL PASO NATURAL GAS COMPANY

BY

ITS

ATTORNEY-IN-FACT

ATTEST: WITNESS:

~~Assistant Secretary~~

HUMBLE OIL & REFINING COMPANY

BY

ITS

Attorney in Fact

J. J. Mullane
Attorney in Fact

O. K. as to
transaction
O. K. as to
form

JRD/RH

ATTEST:

~~Assistant Secretary~~

PAN AMERICAN PETROLEUM CORPORATION

BY

ITS

Attorney-in-Fact

APPROVED
1304

CORPORATE ACKNOWLEDGMENTS

STATE OF TEXAS
COUNTY OF EL PASO

On this 1st day of December, 1961, before me appeared
Roland L. Hamblin, to me personally known, who, being by
me duly sworn did say that he is the Attorney-in-Fact
of EL PASO NATURAL GAS PRODUCTS COMPANY, and that the seal affixed to said instrument
is the corporate seal of said corporation and that said instrument was signed and sealed
in behalf of said corporation by authority of its Board of Directors, and said
Roland L. Hamblin acknowledged said instrument to be the
free act and deed of said corporation.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my seal on this, the
day and year first above written.

MARY T. SAXON
Notary Public in and for El Paso County, Texas
My Commission Expires June 1, 1963

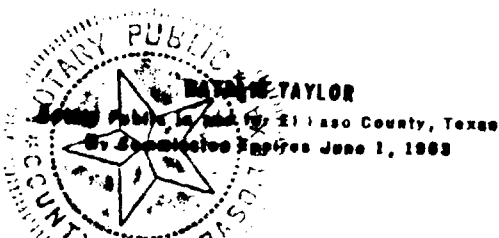
Mary T. Saxon
NOTARY PUBLIC in and for
EL PASO County, TEXAS

.....

STATE OF Texas
COUNTY OF El Paso

On this 1st day of December, 1961, before me appeared
Sam Smith, to me personally known, who, being
by me duly sworn did say that he is the ATTORNEY-IN-FACT of
EL PASO NATURAL GAS COMPANY, and that the seal affixed to said instrument is the corporate
seal of said corporation and that said instrument was signed and sealed in behalf of
said corporation by authority of its Board of Directors, and said Sam Smith
acknowledged said instrument to be the free act and deed of said corporation.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my seal on this, the
day and year first above written.



Mary T. Saxon
NOTARY PUBLIC in and for
County, _____

STATE OF Colorado

COUNTY OF Denver

On this _____ day of December, 1961, before me appeared
Raymond D. Slean, to me personally known, who,
being by me duly sworn did say that he is the Attorney in Fact
of HUMBLE OIL & REFINING COMPANY, ~~and that the seal affixed to said instrument is the~~
~~corporate seal of said corporation~~ and that said instrument was signed and sealed in
behalf of said corporation by authority of its Board of Directors, and said
Raymond D. Slean acknowledged said instrument to be the
free act and deed of said corporation.

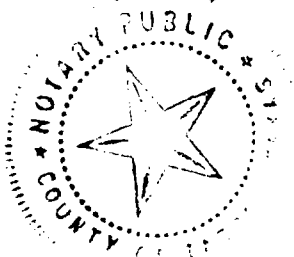
IN WITNESS WHEREOF, I have hereunto set my hand and affixed my seal on this, the
day and year first above written.

NOTARY PUBLIC in and for
Denver County, Colorado

STATE OF TEXAS
COUNTY OF TARRANT

On this 38th day of November, 1961, before me appeared
C. F. BEDFORD, to me personally known, who, being by me duly sworn
did say that he is ATTORNEY-IN-FACT of PAN AMERICAN PETROLEUM CORPORATION, and that the
seal affixed to said instrument is the corporate seal of said corporation and that
said instrument was signed and sealed in behalf of said corporation by authority of
its Board of Directors, and said C. F. BEDFORD acknowledged
said instrument to be the free act and deed of said corporation.

IN WITNESS WHEREOF, I have hereunto set my hand and affixed my seal on this, the
day and year first above written.



Ada Belle Zartman Ada Belle Zartman
NOTARY PUBLIC in and for
TARRANT County, TEXAS

EXHIBIT "A"

SCHEDULE SHOWING THE PERCENTAGE AND KIND OF OWNERSHIP
OF ALL LANDS WITHIN THE NORTHWEST CHA CHA UNIT
TOWNSHIP 29 NORTH, RANGE 14 WEST, SAN JUAN COUNTY, NEW MEXICO

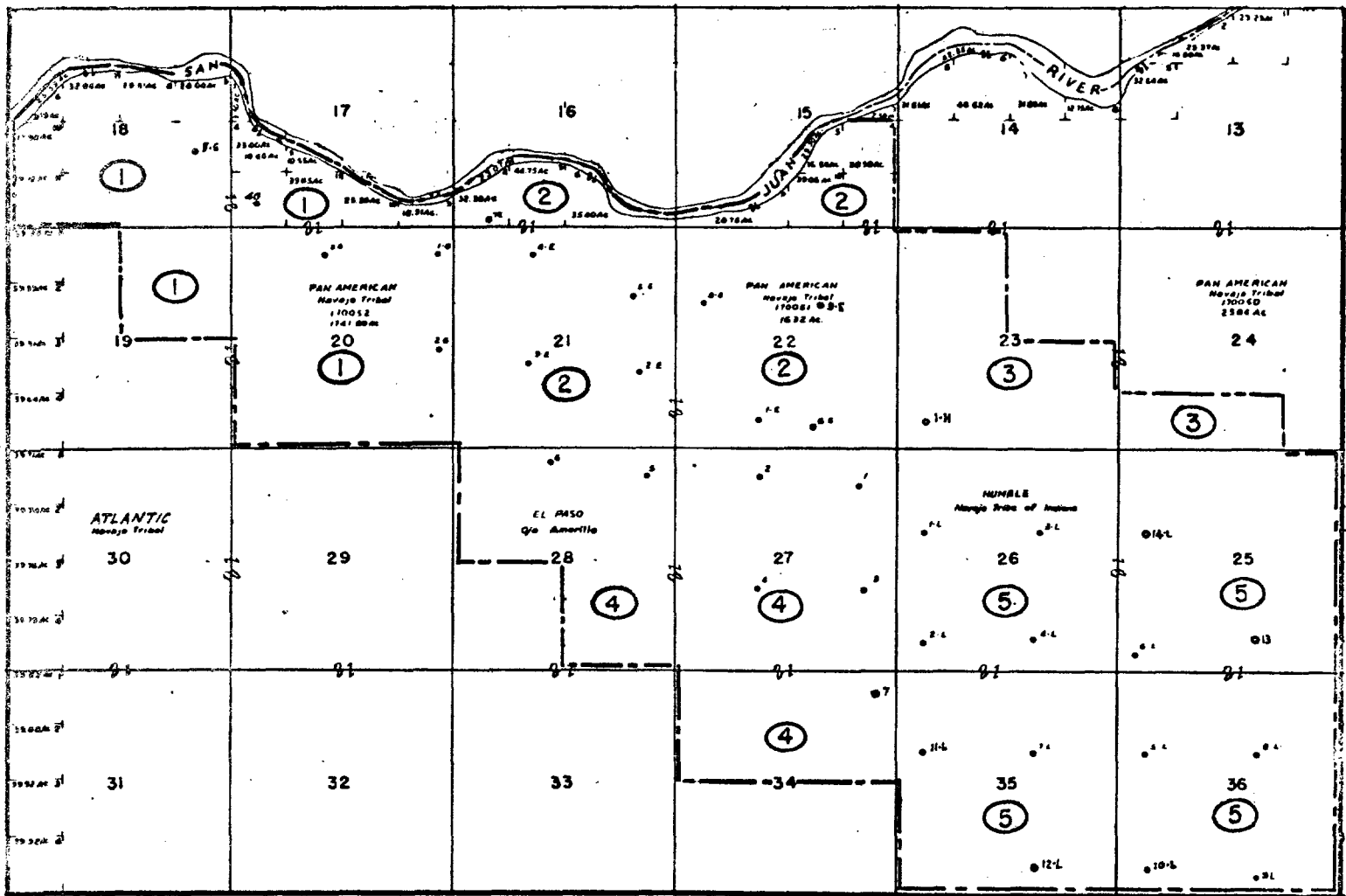
<u>Tract No.</u>	<u>Description</u>	<u>No. Acres</u>	<u>Serial No. & Date of Lease or Application</u>	<u>Basic Royalty & Percentage</u>	<u>Lessee of Record</u>	<u>ORRI and Percentage</u>	<u>Working Interest and Percentage</u>
<u>NAVAJO TRIBAL LAND</u>							
1	T-29-N, R-14-W: Sec. 17 - All South of Mid-Channel, San Juan River Sec. 18 - All South of Mid-Channel, San Juan River Sec. 19 - NE/4 Sec. 20 - ALL	989.17	14-20-603-2200 12-20-56	USA in Trust for Navajo Tribe 12.50%	Pan American	None	Pan American 87.50%
2	T-29-N, R-14-W: Sec. 15 - All that portion of the S/2 lying south of Mid-Channel, San Juan River Sec. 16 - All South of Mid-Channel, San Juan River Sec. 21 - ALL Sec. 22 - ALL	1595.68	14-20-603-2199 12-20-56	USA in Trust for Navajo Tribe 12.50%	Pan American	None	Pan American 87.50%
3	T-29-N, R-14-W: Sec. 23 - NW/4 & S/2 Sec. 24 - S/2 SW/4 and SW/4 SE/4	600.00	14-20-603-2198 12-20-56	USA in Trust for Navajo Tribe 12.50%	Pan American	None	Pan American 87.50%

EXHIBIT "A" (Cont'd)
Page 2

Tract No.	Description	No. Acres	Serial No. & Date of Lease or Application	Basic Royalty & Percentage	Lessee of Record	ORRI and Percentage	Working Interest and Percentage
4	T-29-N, R-14-W: Sec. 27 - All Sec. 28 - N/2 and SE/4 Sec. 34 - N/2	1440.00	14-20-603-2168 12-31-56	USA in Trust for Navajo Tribe 12.50%	El Paso Natural Gas Products Company	None	El Paso Natural Gas Products Co. and El Paso Natural Gas Company*
5	T-29-N, R-14-W: Sec. 25 - All Sec. 26 - All Sec. 35 - All Sec. 36 - All	2560.00	14-20-603-2172	Paul Jones, Chairman for the Navajo Tribal Council for the Navajo Tribe of Indians 12.50%	Humble Oil & Refining Company	None	Humble Oil & Refining Company

* - The gas rights in Tract No. 4 are owned by El Paso Natural Gas Company and the oil rights in said tract are owned by El Paso Natural Gas Products Company. The oil rights are subject to a 6.25% production payment owned by El Paso Natural Gas Company.

R-14 -W



UNIT AREA

⑤ = TRACT NO.

EXHIBIT "B"

NORTHWEST CHA CHA UNIT

T 29 N R 14 W

SAN JUAN CO., NEW MEXICO

SCALE: 1" = 4000'

EXHIBIT " C "

Attached to and made a part of JOINT OPERATING AGREEMENT
NORTHWEST CEA CEA UNIT AREA
SAN JUAN COUNTY, NEW MEXICO

ACCOUNTING PROCEDURE

(UNIT AND JOINT LEASE OPERATIONS)

I. GENERAL PROVISIONS

1. Definitions

"Joint property" as herein used shall be construed to mean the subject area covered by the agreement to which this "Accounting Procedure" is attached.

"Operator" as herein used shall be construed to mean the party designated to conduct the development and operation of the subject area for the joint account of the parties hereto.

"Non-Operator" as herein used shall be construed to mean any one or more of the non-operating parties.

2. Statements and Billings

Operator shall bill Non-Operator on or before the last day of each month for its proportionate share of costs and expenditures during the preceding month. Such bills will be accompanied by statements, reflecting the total costs and charges as set forth under Subparagraph C below:

A. Statement in detail of all charges and credits to the joint account.

B. Statement of all charges and credits to the joint account, summarized by appropriate classifications indicative of the nature thereof.

C. Statements as follows:

(1) Detailed statement of material ordinarily considered controllable by operators of oil and gas properties;

(2) Statement of ordinary charges and credits to the joint account summarized by appropriate classifications indicative of the nature thereof; and

(3) Detailed statement of any other charges and credits.

3. Payments by Non-Operator

Each party shall pay its proportion of all such bills within fifteen (15) days after receipt thereof. If payment is not made within such time, the unpaid balance shall bear interest at the rate of six per cent (6%) per annum until paid.

4. Adjustments

Payment of any such bills shall not prejudice the right of Non-Operator to protest or question the correctness thereof. Subject to the exception noted in Paragraph 5 of this section I, all statements rendered to Non-Operator by Operator during any calendar year shall conclusively be presumed to be true and correct after twenty-four (24) months following the end of any such calendar year, unless within the said twenty-four (24) month period Non-Operator takes written exception thereto and makes claim on Operator for adjustment. Failure on the part of Non-Operator to make claim on Operator for adjustment within such period shall establish the correctness thereof and preclude the filing of exceptions thereto or making of claims for adjustment thereon. The provisions of this paragraph shall not prevent adjustments resulting from physical inventory of property as provided for in Section VI, Inventories, hereof.

5. Audits

A Non-Operator, upon notice in writing to Operator and all other Non-Operators, shall have the right to audit Operator's accounts and records relating to the accounting hereunder for any calendar year within the twenty-four (24) month period following the end of such calendar year, provided, however, that Non-Operator must take written exception to and make claim upon the Operator for all discrepancies disclosed by said audit within said twenty-four (24) month period. Where there are two or more Non-Operators, the Non-Operators shall make every reasonable effort to conduct joint or simultaneous audits in a manner which will result in a minimum of inconvenience to the Operator.

II. DEVELOPMENT AND OPERATING CHARGES

Subject to limitations hereinafter prescribed, Operator shall charge the joint account with the following items:

1. Rentals and Royalties

Delay or other rentals, when such rentals are paid by Operator for the joint account; royalties, when not paid directly to royalty owners by the purchaser of the oil, gas, casinghead gas, or other products.

2. Labor

A. Salaries and wages of Operator's employees directly engaged on the joint property in the development, maintenance, and operation thereof, including salaries or wages paid to geologists and other employees who are temporarily assigned to and directly employed on a drilling well.

B. Operator's cost of holiday, vacation, sickness and disability benefits, and other customary allowances applicable to the salaries and wages chargeable under Subparagraph 2 A and Paragraph 11 of this Section II. Costs under this Subparagraph 2 B may be charged on a "when and as paid basis" or by "percentage assessment" on the amount of salaries and wages chargeable under Subparagraph 2 A and Paragraph 11 of this Section II. If percentage assessment is used, the rate shall be based on the Operator's cost experience.

C. Costs of expenditures or contributions made pursuant to assessments imposed by governmental authority which are applicable to Operator's labor cost of salaries and wages as provided under Subparagraphs 2 A, 2 B, and Paragraph 11 of this Section II.

3. Employee Benefits

Operator's current cost of established plans for employees' group life insurance, hospitalization, pension, retirement, stock purchase, thrift, bonus, and other benefit plans of a like nature, applicable to Operator's labor cost, provided that the total of such charges shall not exceed ten per cent (10%) of Operator's labor costs as provided in Subparagraphs A and B of Paragraph 2 of this Section II and in Paragraph 11 of this Section II.

4. Material

Material, equipment, and supplies purchased or furnished by Operator for use of the joint property. So far as it is reasonably practical and consistent with efficient and economical operation, only such material shall be purchased for or transferred to the joint property as may be required for immediate use; and the accumulation of surplus stocks shall be avoided.

5. Transportation

Transportation of employees, equipment, material, and supplies necessary for the development, maintenance, and operation of the joint property subject to the following limitations:

A. If material is moved to the joint property from vendor's or from the Operator's warehouse or other properties, no charge shall be made to the joint account for a distance greater than the distance from the nearest reliable supply store or railway receiving point where such material is available, except by special agreement with Non-Operator.

- B. If surplus material is moved to Operator's warehouse or other storage point, no charge shall be made to the joint account for a distance greater than the distance from the nearest reliable supply store or railway receiving point, except by special agreement with Non-Operator. No charge shall be made to the joint account for moving material to other properties belonging to Operator, except by special agreement with Non-Operator.

6. Service

A. Outside Services:

The cost of contract services and utilities procured from outside sources.

B. Use of Operator's Equipment and Facilities:

Use of and service by Operator's exclusively owned equipment and facilities as provided in Paragraph 5 of Section III entitled "Operator's Exclusively Owned Facilities."

7. Damages and Losses to Joint Property and Equipment

All costs or expenses necessary to replace or repair damages or losses incurred by fire, flood, storm, theft, accident, or any other cause not controllable by Operator through the exercise of reasonable diligence. Operator shall furnish Non-Operator written notice of damages or losses incurred as soon as practicable after report of the same has been received by Operator.

8. Litigation Expense

All costs and expenses of litigation, or legal services otherwise necessary or expedient for the protection of the joint interests, including attorneys' fees and expenses as hereinafter provided, together with all judgments obtained against the parties or any of them on account of the joint operations under this agreement, and actual expenses incurred by any party or parties hereto in securing evidence for the purpose of defending against any action or claim prosecuted or urged against the joint account or the subject matter of this agreement.

- A. If a majority of the interests hereunder shall so agree, actions or claims affecting the joint interests hereunder may be handled by the legal staff of one or more of the parties hereto; and a charge commensurate with cost of providing and furnishing such services rendered may be made against the joint account; but no such charge shall be made until approved by the legal departments of or attorneys for the respective parties hereto.

- B. Fees and expenses of outside attorneys shall not be charged to the joint account unless authorized by the majority of the interests hereunder.

9. Taxes

All taxes of every kind and nature assessed or levied upon or in connection with the properties which are the subject of this agreement, the production therefrom or the operation thereof, and which taxes have been paid by the Operator for the benefit of the parties hereto.

10. Insurance and Claims

- A. Premiums paid for insurance required to be carried for the benefit of the joint account, together with all expenditures incurred and paid in settlement of any and all losses, claims, damages, judgments, and other expenses, including legal services, not recovered from insurance carriers.
- B. If no insurance is required to be carried, all actual expenditures incurred and paid by Operator in settlement of any and all losses, claims, damages, judgments, and any other expenses, including legal services, shall be charged to the joint account.

11. District and Camp Expense (Field Supervision and Camp Expense)

A pro rata portion of the salaries and expenses of Operator's production superintendent and other employees serving the joint property and other properties of the Operator in the same operating area, whose time is not allocated directly to the properties, and a pro rata portion of the cost of maintaining and operating a production office known as Operator's Farmington Area Durango District office located at or near Farmington, New Mexico Durango, Colo (or a comparable office if location changed), and necessary suboffices (if any), maintained for the convenience of the above-described office, and all necessary camps, including housing facilities for employees if required, used in the conduct of the operations on the joint property and other properties operated in the same locality. The expense of, less any revenue from, these facilities should be inclusive of depreciation or a fair monthly rental in lieu of depreciation on the investment. Such charges shall be apportioned to all properties served on some equitable basis consistent with Operator's accounting practice.

12. Administrative Overhead

Operator shall have the right to assess against the joint property covered hereby the following management and administrative overhead charges, which shall be in lieu of all expenses of all offices of the Operator not covered by Section II, Paragraph 11, above, including salaries and expenses of personnel assigned to such offices, except that salaries of geologists and other employees of Operator who are temporarily assigned to and directly serving on the joint property will be charged as provided in Section II, Paragraph 2, above. Salaries and expenses of other technical employees assigned to such offices will be considered as covered by overhead charges in this paragraph unless charges for such salaries and expenses are agreed upon between Operator and Non-Operator as a direct charge to the joint property.

WELL BASIS (Rate Per Well Per Month)

Well Depth	DRILLING WELL RATE Each Well	PRODUCING WELL RATE (Use Completion Depth)		
		First Five	Next Five	All Wells Over Ten
ALL DEPTHS	\$ 225	\$ 50	\$ 40	\$ 30

- A. Overhead charges for drilling wells shall begin on the date each well is spudded and terminate when it is on production or is plugged, as the case may be, except that no charge shall be made during the suspension of drilling operations for fifteen (15) or more consecutive days.
- B. In connection with overhead charges, the status of wells shall be as follows:
- (1) Injection wells for recovery operations, such as for repressure or water flood, shall be included in the overhead schedule the same as producing oil wells.
 - (2) Water supply wells utilized for water flooding operations shall be included in the overhead schedule the same as producing oil wells.
 - (3) Producing gas wells shall be included in the overhead schedule the same as producing oil wells.

- (4) Wells permanently shut down but on which plugging operations are deferred shall be dropped from the overhead schedule at the time the shutdown is effected. When such wells are plugged, overhead shall be charged at the producing well rate during the time required for the plugging operation.
- (5) Wells being plugged back, drilled deeper, or converted to a source or input well shall be included in the overhead schedule the same as drilling wells.
- (6) Temporarily shut-down wells (other than by governmental regulatory body) which are not produced or worked upon for a period of a full calendar month shall not be included in the overhead schedule; however, wells shut in by governmental regulatory body shall be included in the overhead schedule only in the event the allowable production is transferred to other wells on the same property. In the event of a unit allowable, all wells capable of producing will be counted in determining the overhead charge.
- (7) Wells completed in dual or multiple horizons shall be considered as two wells in the producing overhead schedule.
- (8) Lease salt water disposal wells shall not be included in the overhead schedule unless such wells are used in a secondary recovery program on the joint property.
- C. The above overhead schedule for producing wells shall be applied to the total number of wells operated under the Operating Agreement to which this accounting procedure is attached, irrespective of individual leases.
- D. It is specifically understood that the above overhead rates apply only to drilling and producing operations and are not intended to cover the construction or operation of additional facilities such as, but not limited to, gasoline plants, compressor plants, repressuring projects, salt water disposal facilities, and similar installations. If at any time any or all of these become necessary to the operation, a separate agreement will be reached relative to an overhead charge and allocation of district expense.
- E. The above specific overhead rates may be amended from time to time by agreement between Operator and Non-Operator if, in practice, they are found to be insufficient or excessive.

13. Operator's Fully Owned Warehouse Operating and Maintenance Expense

(Describe fully the agreed procedure to be followed by the Operator.)

No charge, either direct or indirect, will be made to the joint account for operating and maintenance expense of Operator's fully-owned warehouse.

14. Other Expenditures

Any expenditure, other than expenditures which are covered and dealt with by the foregoing provisions of this Section II, incurred by the Operator for the necessary and proper development, maintenance, and operation of the joint property.

III. BASIS OF CHARGES TO JOINT ACCOUNT

1. Purchases

Material and equipment purchased and service procured shall be charged at price paid by Operator after deduction of all discounts actually received.

2. Material Furnished by Operator

Material required for operations shall be purchased for direct charge to joint account whenever practicable, except that Operator may furnish such material from Operator's stocks under the following conditions:

A. New Material (Condition "A")

- (1) New material transferred from Operator's warehouse or other properties shall be priced f.o.b. the nearest reputable supply store or railway receiving point, where such material is available, at current replacement cost of the same kind of material. This will include material such as tanks, pumping units, sucker rods, engines, and other major equipment. Tubular goods, two-inch (2") and over, shall be priced on car-load basis effective at date of transfer and f.o.b. railway receiving point nearest the joint account operation, regardless of quantity transferred.
- (2) Other material shall be priced on basis of a reputable supply company's preferential price list effective at date of transfer and f.o.b. the store or railway receiving point nearest the joint account operation where such material is available.
- (3) Cash discount shall not be allowed.

B. Used Material (Condition "B" and "C")

- (1) Material which is in sound and serviceable condition and is suitable for reuse without reconditioning shall be classed as Condition "B" and priced at seventy-five per cent (75%) of new price.
- (2) Material which cannot be classified as Condition "B" but which,
 - (a) After reconditioning will be further serviceable for original function as good secondhand material (Condition "B"), or
 - (b) Is serviceable for original function but substantially not suitable for reconditioning,shall be classed as Condition "C" and priced at fifty per cent (50%) of new price.
- (3) Material which cannot be classified as Condition "B" or Condition "C" shall be priced at a value commensurate with its use.
- (4) Tanks, buildings, and other equipment involving erection costs shall be charged at applicable percentage of knocked-down new price.

3. Premium Prices

Whenever materials and equipment are not readily obtainable at the customary supply point and at prices specified in Paragraphs 1 and 2 of this Section III because of national emergencies, strikes or other unusual causes over which the Operator has no control, the Operator may charge the joint account for the required materials on the basis of the Operator's direct cost and expense incurred in procuring such materials, in making it suitable for use, and in moving it to the location, provided, however, that notice in writing is furnished to Non-Operator of the proposed charge prior to billing the Non-Operator for the material and/or equipment acquired pursuant to this provision, whereupon Non-Operator shall have the right, by so electing and notifying Operator within 10 days after receiving notice from the Operator, to furnish in kind, or in tonnage as the parties may agree, at the location, nearest railway receiving point, or Operator's storage point within a comparable distance, all or part of his share of material and/or equipment suitable for use and acceptable to the Operator. Transportation costs on any such material furnished by Non-Operator, at any point other than at the location, shall be borne by such Non-Operator. If, pursuant to the provisions of this paragraph, any Non-Operator furnishes material and/or equipment in kind, the Operator shall make appropriate credits therefor to the account of said Non-Operator.

4. Warranty of Material Furnished by Operator

Operator does not warrant the material furnished beyond or back of the dealer's or manufacturer's guaranty; and in case of defective material, credit shall not be passed until adjustment has been received by Operator from the manufacturers or their agents.

5. Operator's Exclusively Owned Facilities

The following rates shall apply to service rendered to the joint account by facilities owned exclusively by Operator:

- A. Water, fuel, power, compressor and other auxiliary services at rates commensurate with cost of providing and furnishing such service to the joint account but not exceeding rates currently prevailing in the field where the joint property is located.

- B. Automotive equipment at rates commensurate with cost of ownership and operation. Such rates should generally be in line with the schedule of rates adopted by the Petroleum Motor Transport Association, or some other recognized organization, as recommended uniform charges against joint account operations and revised from time to time. Automotive rates shall include cost of oil, gas, repairs, insurance, and other operating expense and depreciation; and charges shall be based on use in actual service on, or in connection with, the joint account operations. Truck and tractor rates may include wages and expenses of driver.
- C. A fair rate shall be charged for the use of drilling and cleaning-out tools and any other items of Operator's fully owned machinery or equipment which shall be ample to cover maintenance, repairs, depreciation, and the service furnished the joint property; provided that such charges shall not exceed those currently prevailing in the field where the joint property is located. Pulling units shall be charged at hourly rates commensurate with the cost of ownership and operation, which shall include repairs and maintenance, operating supplies, insurance, depreciation, and taxes. Pulling unit rates may include wages and expenses of the operator.
- D. A fair rate shall be charged for laboratory services performed by Operator for the benefit of the joint account, such as gas, water, core, and any other analyses and tests; provided such charges shall not exceed those currently prevailing if performed by outside service laboratories.
- E. Whenever requested, Operator shall inform Non-Operator in advance of the rates it proposes to charge.
- F. Rates shall be revised and adjusted from time to time when found to be either excessive or insufficient.

IV. DISPOSAL OF LEASE EQUIPMENT AND MATERIAL

The Operator shall be under no obligation to purchase interest of Non-Operator in surplus new or secondhand material. The disposition of major items of surplus material, such as derricks, tanks, engines, pumping units, and tubular goods, shall be subject to mutual determination by the parties hereto; provided Operator shall have the right to dispose of normal accumulations of junk and scrap material either by transfer or sale from the joint property.

1. Material Purchased by the Operator or Non-Operator

Material purchased by either the Operator or Non-Operator shall be credited by the Operator to the joint account for the month in which the material is removed by the purchaser.

2. Division in Kind

Division of material in kind, if made between Operator and Non-Operator, shall be in proportion to their respective interests in such material. Each party will thereupon be charged individually with the value of the material received or receivable by each party, and corresponding credits will be made by the Operator to the joint account. Such credits shall appear in the monthly statement of operations.

3. Sales to Outsiders

Sales to outsiders of material from the joint property shall be credited by Operator to the joint account at the net amount collected by Operator from vendee. Any claims by vendee for defective material or otherwise shall be charged back to the joint account if and when paid by Operator.

V. BASIS OF PRICING MATERIAL TRANSFERRED FROM JOINT ACCOUNT

Material purchased by either Operator or Non-Operator or divided in kind, unless otherwise agreed, shall be valued on the following basis:

1. New Price Defined

New price as used in the following paragraphs shall have the same meaning and application as that used above in Section III, "Basis of Charges to Joint Account."

2. New Material

New material (Condition "A"), being new material procured for the joint account but never used thereon, at one hundred per cent (100%) of current new price (plus sales tax if any).

3. Good Used Material

Good used material (Condition "B"), being used material in sound and serviceable condition, suitable for reuse without reconditioning:

- A. At seventy-five per cent (75%) of current new price if material was charged to joint account as new, or
- B. At sixty-five per cent (65%) of current new price if material was originally charged to the joint property as secondhand at seventy-five per cent (75%) of new price.

4. Other Used Material

Used material (Condition "C"), at fifty per cent (50%) of current new price, being used material which:

- A. After reconditioning will be further serviceable for original function as good secondhand material (Condition "B"), or
- B. Is serviceable for original function but substantially not suitable for reconditioning.

5. Bad-Order Material

Material and equipment (Condition "D"), which is no longer usable for its original purpose without excessive repair cost but is further usable for some other purpose, shall be priced on a basis comparable with that of items normally used for that purpose.

6. Junk

Junk (Condition "E"), being obsolete and scrap material, at prevailing prices.

7. Temporarily Used Material

When the use of material is temporary and its service to the joint account does not justify the reduction in price as provided in Paragraph 3 B, above, such material shall be priced on a basis that will leave a net charge to the joint account consistent with the value of the service rendered.

VI. INVENTORIES

1. Periodic Inventories, Notice and Representation

At reasonable intervals, inventories shall be taken by Operator of the joint account material, which shall include all such material as is ordinarily considered controllable by operators of oil and gas properties.

Written notice of intention to take inventory shall be given by Operator at least thirty (30) days before any inventory is to begin so that Non-Operator may be represented when any inventory is taken.

Failure of Non-Operator to be represented at an inventory shall bind Non-Operator to accept the inventory taken by Operator, who shall in that event furnish Non-Operator with a copy thereof.

2. Reconciliation and Adjustment of Inventories

Reconciliation of inventory with charges to the joint account shall be made by each party at interest, and a list of overages and shortages shall be jointly determined by Operator and Non-Operator.

Inventory adjustments shall be made by Operator with the joint account for overages and shortages, but Operator shall be held accountable to Non-Operator only for shortages due to lack of reasonable diligence.

3. Special Inventories

Special inventories may be taken, at the expense of the purchaser, whenever there is any sale or change of interest in the joint property; and it shall be the duty of the party selling to notify all other parties hereto as quickly as possible after the transfer of interest takes place. In such cases, both the seller and the purchaser shall be represented and shall be governed by the inventory so taken.

EXHIBIT "D"

Attached to and made a part of
Joint Operating Agreement

NORTHWEST CHA CHA UNIT AREA
SAN JUAN COUNTY, NEW MEXICO

INSURANCE PROVISIONS

(1) Unit Operator shall comply with the Workmen's Compensation and Employer's Liability Laws of the State of New Mexico.

(2) Where Unit Operator retains an independent contractor for any of the operations hereunder, it shall require that contractor to have adequate insurance coverages in line with Unit Operator's usual practices.

(3) Each party may, individually and severally at its own expense, obtain such insurance in addition as it may desire; provided, however, that such additional insurance shall contain an endorsement waiving all rights by subordination or otherwise against the other parties, if the other parties are not named as a co-insured in the policy.

WATER INJECTION WELL DATA

PROPOSED N.W. CHA CHA UNIT

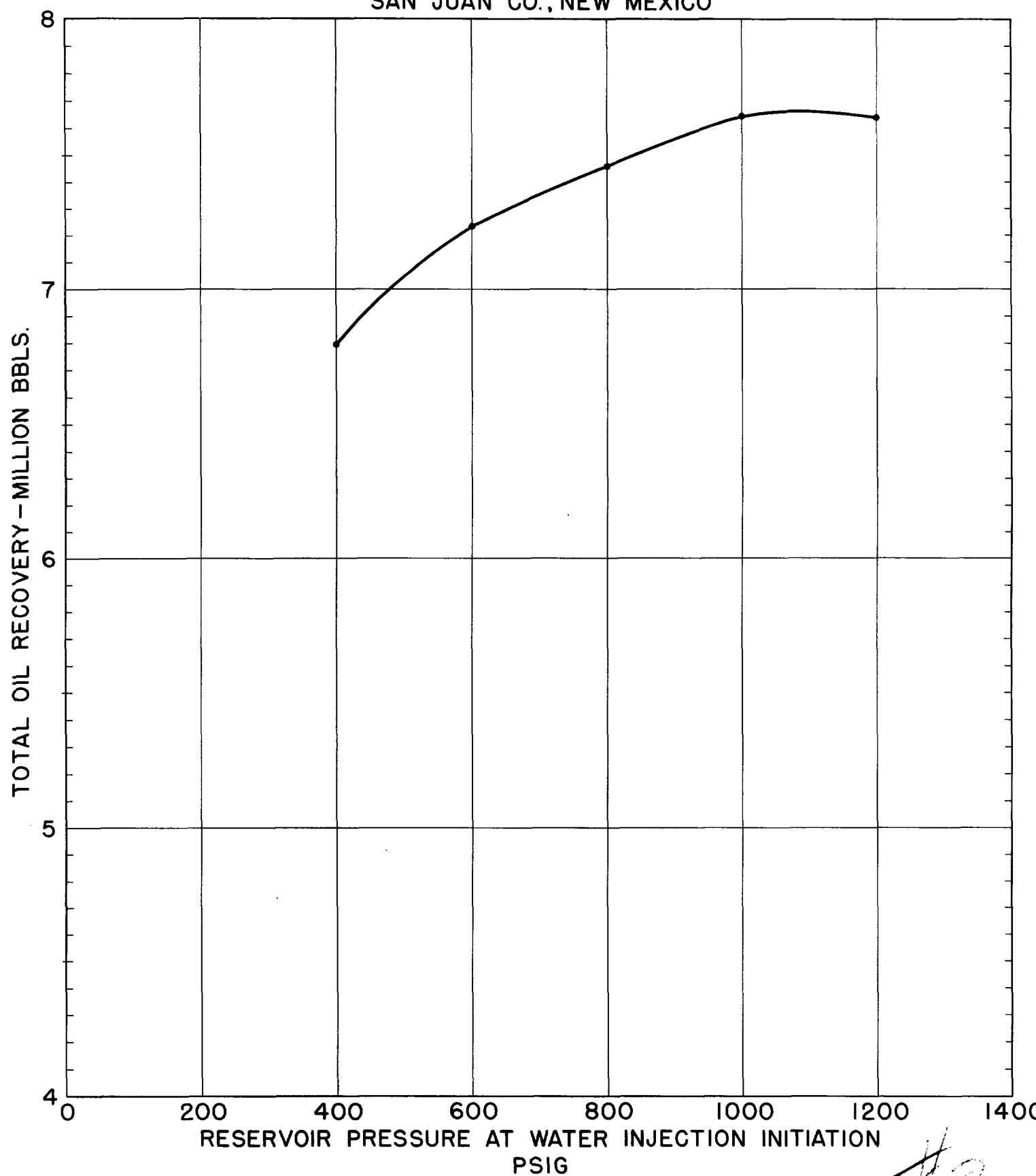
SAN JUAN COUNTY, NEW MEXICO

<i>Name</i>	<i>Completion Date</i>	<i>Location</i>	<i>Total Depth</i>	<i>Plugback Total Depth</i>	<i>Casing Size</i>	<i>Casing Depth</i>	<i>Top Cement (Est.)</i>	<i>Perf. Interval</i>
El Paso Natural Gas Products								
Ojo Amarillo No. 2	6-23-60	NE NW Sec. 27-29N-14W	6105	5330	5 1/2	5376	4120	5322-44
Humble Oil & Refining Co.								
Navajo "L" No. 1	9-13-60	SW NW Sec. 26-29N-14W	5488	5447	4 1/2	5484	4800	5390-5400
Navajo "L" No. 4	10-6-60	SW SW Sec. 26-29N-14W	5591	5587	4 1/2	5587	3100	5499-5510
Navajo "L" No. 5	11-30-60	SW NW Sec. 36-29N-14W	5627	5588	4 1/2	5624	3100	5528-41
* Navajo "L" No. 15	9-8-61	SW NE Sec. 25-29N-14W	5416	5385	4 1/2	5414	4418	5305-15 5360-65
Pan American Petroleum								
Navajo "E" No. 2	8-12-60	NE SE Sec. 21-29N-14W	5289	5238	5 1/2	5283	4600	5145-53
Navajo "E" No. 3	8-26-60	NE SW Sec. 21-29N-14W	5270	5226	5 1/2	5270	4600	5116-26
* Navajo "G" No. 1	9-23-60	NE NE Sec. 20-29N-14W	4828	4796	4 1/2	4832	4200	4681-89
* Navajo "G" No. 4	1-6-61	SW SW Sec. 17-29N-14W	4669	4626	4 1/2	4661	3900	4578-84

** Conversions to be delayed until
satisfactory Lease Line agreements
are effected.*

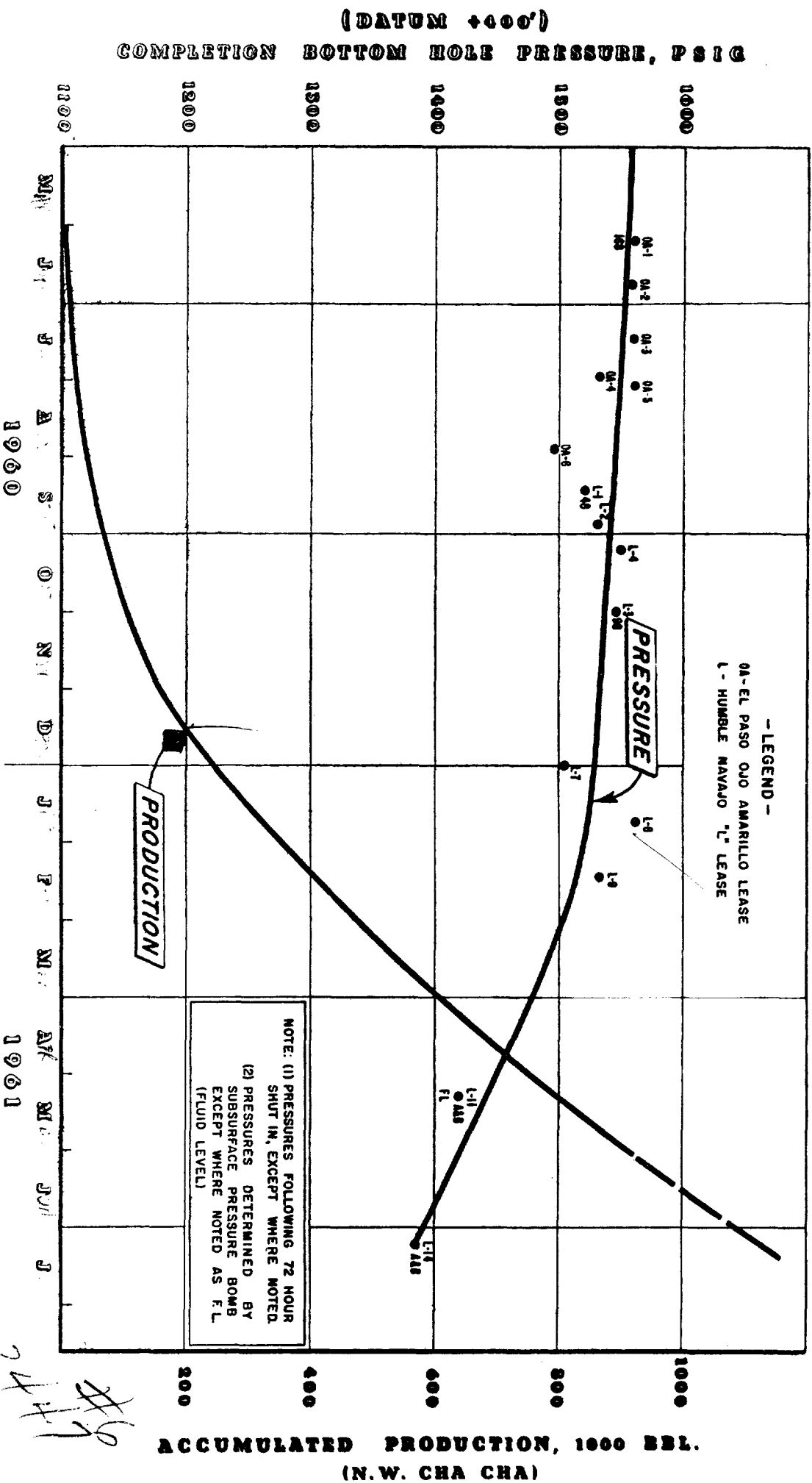
Handwritten initials and date:
2-2-89

TOTAL RECOVERY
VS
RESERVOIR PRESSURE AT WATER INJECTION INITIATION
N.W. CHA CHA GALLUP UNIT
SAN JUAN CO., NEW MEXICO



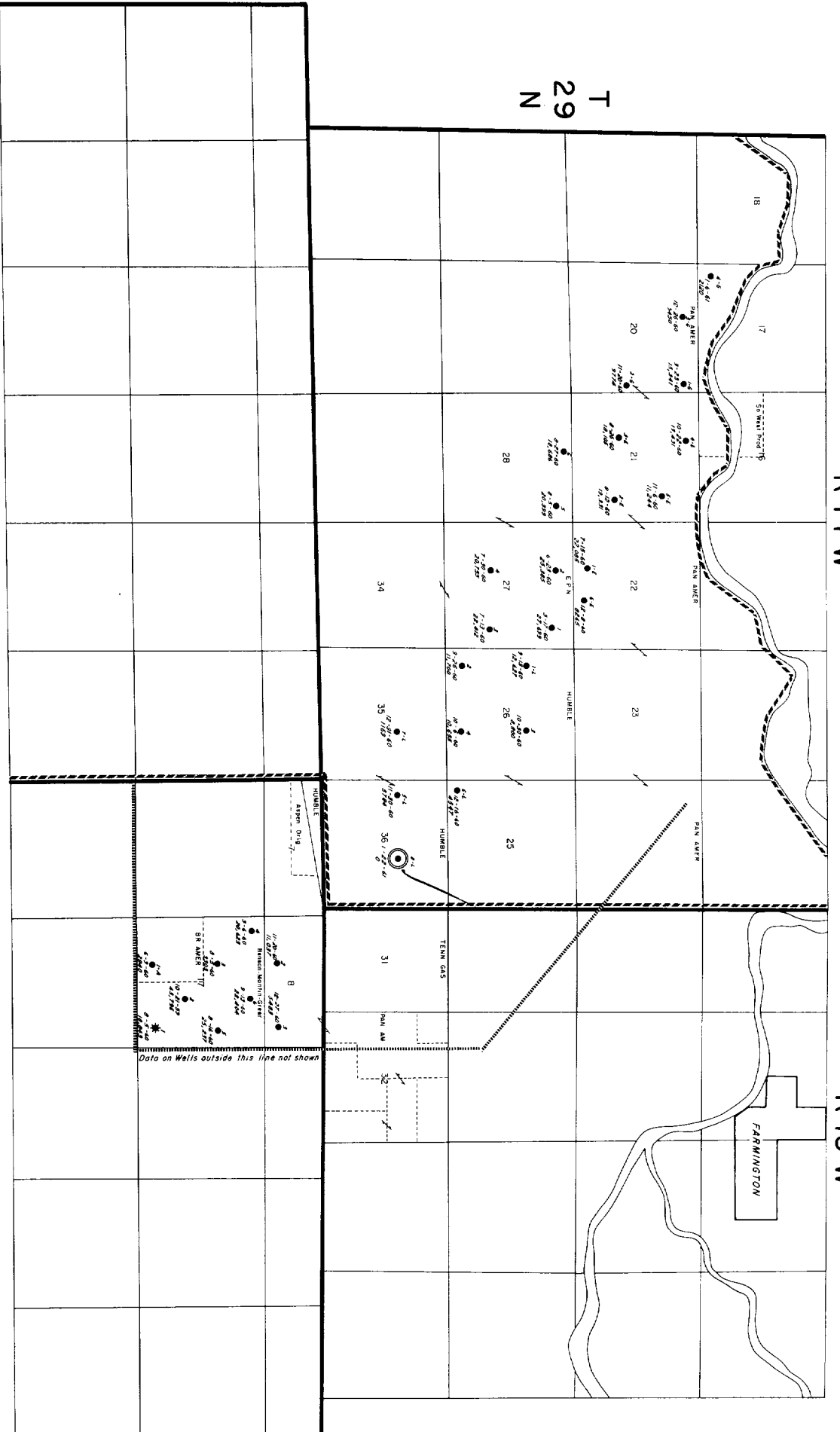
COMPLETION BOTTOM HOLE PRESSURES VS. TIME ACCUMULATED OIL PRODUCTION vs. TIME

CHA CHA GALUP FIELD
SAN JUAN COUNTY, NEW MEXICO



R 14 W

R 13 W



T 29 N

T 28 N

HUMBLE OIL & REFINING COMPANY
DENVER AREA
CHA CHA GALLUP FIELD
San Juan County, New Mexico

Notes:
Total Accum. Oil Prod. (1-22-61)
OF Wells Shown = 475,330 BBLs
Total Accum. Oil Prod. (1-22-61)
OF CHA CHA Gallup Field = 507,798 BBLs
Status on Jan. 22, 1961
Completion Date 1-22-61

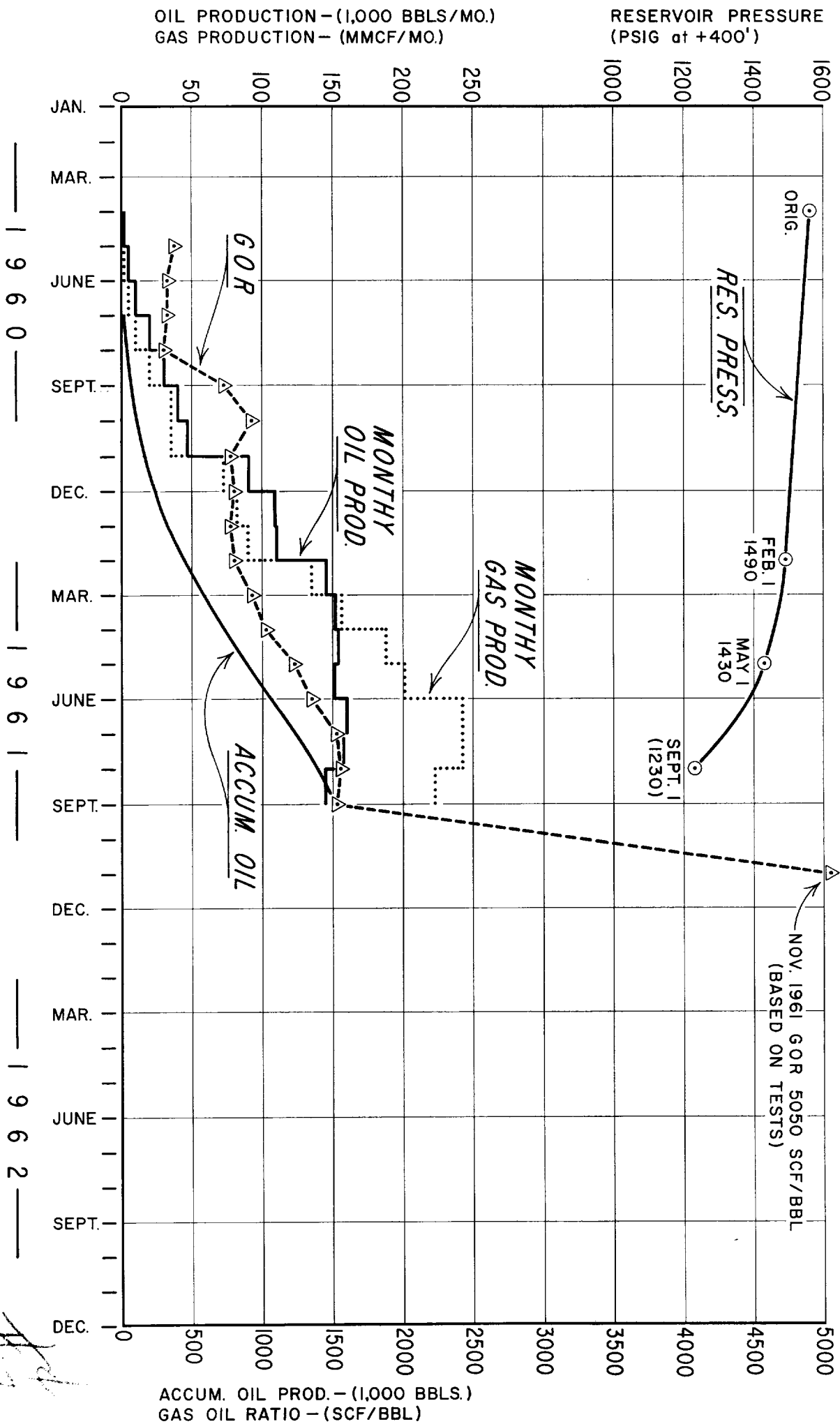
Legend:
1 Well No.
5-17-60 Completion Date
27,699 Accum. Oil Prod. BBLs (1-22-61)

44

PRODUCTION DATA

CHA CHA GALLUP FIELD

NEW MEXICO



LARGE FORMAT
EXHIBIT HAS
BEEN REMOVED
AND IS LOCATED
IN THE NEXT FILE

LARGE FORMAT
EXHIBIT HAS
BEEN REMOVED
AND IS LOCATED
IN THE NEXT FILE