CASE 2139: Application of COSDEN PETRO. CORP. for Special Rules governing the South Prairie-Penn. Pool

Case No.

2139

Application, Transcript,
Small Exhibits, Etc.

Case 2137
EXHIBIT No. 7

RESERVOIR DATA
South Prairie-Pennsylvanian Pool
Roosevelt County, New Mexico

1. Physical Properties of Reservoir Rock

   a. Average Porosity (Core & Log Calc.) - 6.9%

   b. Average Permeability (Core) - 131 md. (Range <0.1-1035)

   c. Average Interstitial Water Saturation - 26%

   d. Average Net Thickness - 12 ft

2. Lithology

   Grey to tan, very fine crystalline fosiliferous limestone with pin-point to large vugs, intercrystalline porosity, and some fracturing.

3. Structural Features of Reservoir

   The structure appears to be a northwest-southeast trending anticline. No original gas cap was present and the oil-water contact has not been determined.

4. Characteristics of Reservoir Fluids

   a. Gravity of Stock Tank Oil - 46.7° API

   b. Saturation Pressure - 2987 psig

   c. Formation Volume Factor - 1.841 @ Sat. Press.

   d. Viscosity of Reservoir Oil - 0.165 cp @ Sat. Press.

   e. Dissolve Gas-Oil Ratio - 1490 CFPB @ Sat. Press.

5. Pressures and Temperatures

   a. Reservoir Pressure (-5540) - 3159 psig (10-1-60)

   b. Reservoir Temperature - 157°F

   c. Productivity Index - 7.22 BOPD/psi draw-down
      (Cosden-Fed "C" No. 1 10-1-60)

Form F-11B

CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS, TEXAS

Cores generally best info. [illegible] Case 2139 # 8

Page 1 of 1 File WP-3-1579
Well New Mexico Federal "NM" No. 1

CORE SUMMARY AND CALCULATED RECOVERABLE OIL

FORMATION NAME AND DEPTH INTERVAL: Bough 9655.0-9685.0

FEET OF CORE RECOVERED FROM ABOVE INTERVAL		30.0	AVERAGE TOTAL WATER SATURATION: PER CENT OF PORE SPACE		44.4
FEET OF CORE INCLUDED IN AVERAGES		13.9	AVERAGE CONNATE WATER SATURATION: PER CENT OF PORE SPACE	(c)	44.4
AVERAGE PERMEABILITY: MILLIDARCYS	Max. 90°	83 61	OIL GRAVITY: °API	(e)	42
PRODUCTIVE CAPACITY: MILLIDARCY-FEET	Max. 90°	1154 848	ORIGINAL SOLUTION GAS-OIL RATIO: CUBIC FEET PER BARREL	(e)	1600
AVERAGE POROSITY: PER CENT		4.5	ORIGINAL FORMATION VOLUME FACTOR: BARRELS SATURATED OIL PER BARREL STOCK-TANK OIL	(e)	1.92
AVERAGE RESIDUAL OIL SATURATION: PER CENT OF PORE SPACE		7.8	CALCULATED ORIGINAL STOCK-TANK OIL IN PLACE: BARRELS PER ACRE-FOOT		101

Calculated maximum solution gas drive recovery is barrels per acre-foot, assuming production could be continued until reservoir pressure declined to zero psig. Calculated maximum water drive recovery is barrels per acre-foot, assuming full maintenance of original reservoir pressure, 100% areal and vertical coverage, and continuation of production to 100% water cut. *(Please refer to footnotes for further discussion of recovery estimates.)*

FORMATION NAME AND DEPTH INTERVAL:

FEET OF CORE RECOVERED FROM ABOVE INTERVAL		AVERAGE TOTAL WATER SATURATION: PER CENT OF PORE SPACE	
FEET OF CORE INCLUDED IN AVERAGES		AVERAGE CONNATE WATER SATURATION: PER CENT OF PORE SPACE	
AVERAGE PERMEABILITY: MILLIDARCYS		OIL GRAVITY: °API	
PRODUCTIVE CAPACITY: MILLIDARCY-FEET		ORIGINAL SOLUTION GAS-OIL RATIO: CUBIC FEET PER BARREL	
AVERAGE POROSITY: PER CENT		ORIGINAL FORMATION VOLUME FACTOR: BARRELS SATURATED OIL PER BARREL STOCK-TANK OIL	
AVERAGE RESIDUAL OIL SATURATION: PER CENT OF PORE SPACE		CALCULATED ORIGINAL STOCK-TANK OIL IN PLACE: BARRELS PER ACRE-FOOT	

Calculated maximum solution gas drive recovery is barrels per acre-foot, assuming production could be continued until reservoir pressure declined to zero psig. Calculated maximum water drive recovery is barrels per acre-foot, assuming full maintenance of original reservoir pressure, 100% areal and vertical coverage, and continuation of production to 100% water cut. *(Please refer to footnotes for further discussion of recovery estimates.)*

(c) Calculated (e) Estimated (m) Measured (*) Refer to attached letter.

These recovery estimates represent theoretical maximum values for solution gas and water drive. They assume that production is started at original reservoir pressure; i.e., no account is taken of production to date or of prior drainage to other areas. The effects of factors tending to reduce actual ultimate recovery, such as economic limits on oil production rates, gas-oil ratios, or water-oil ratios, have not been taken into account. Neither have factors been considered which may result in actual recovery intermediate between solution gas and complete water drive recoveries, such as gas cap expansion, gravity drainage, or partial water drive. Detailed predictions of ultimate oil recovery to specific abandonment conditions may be made in an engineering study in which consideration is given to overall reservoir characteristics and economic factors.

CORE LABORATORIES, INC. *Petroleum Reservoir Engineering*

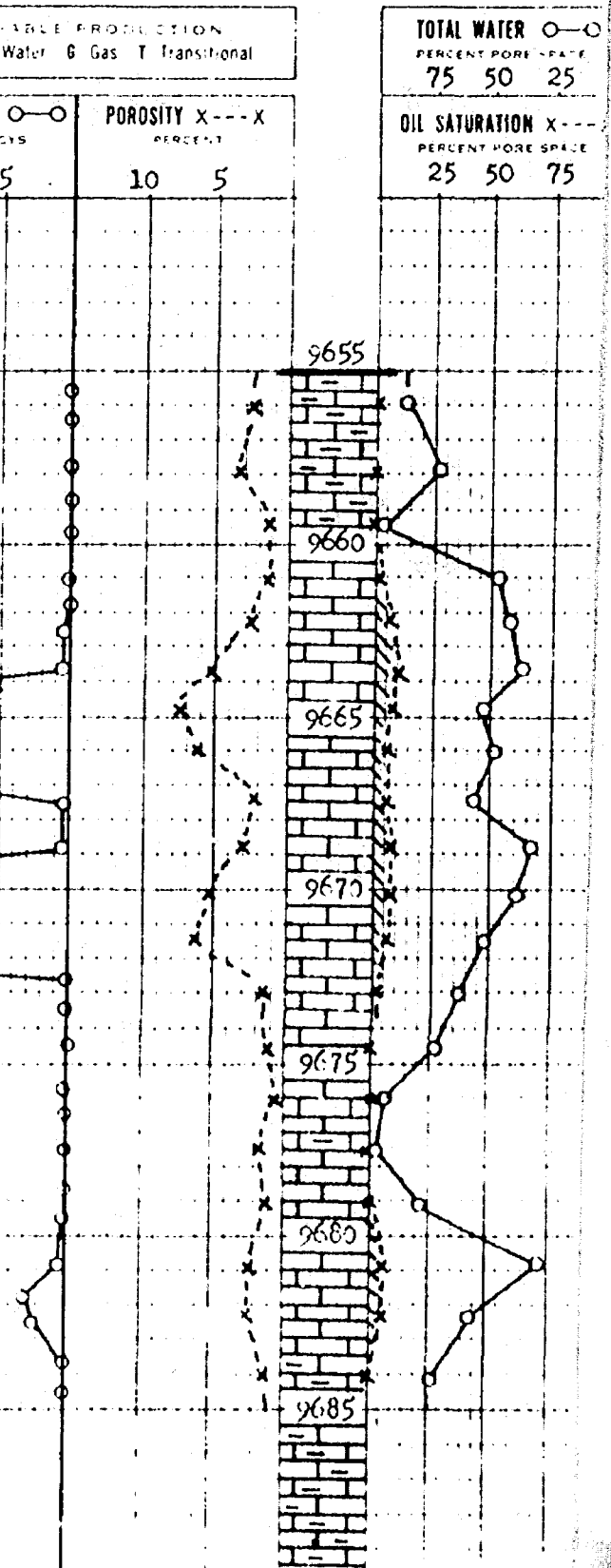
COMPANY LONE STAR PRODUCING COMPANY — FILE NO WP-3-1579
WELL NEW MEXICO FEDERAL "EM" NO. 1 — DATE 11-13-60 — ENGRS BOONE
FIELD UNDESIGNATED — FORMATION BOUGH — ELEV 4121' DF
COUNTY ROOSEVELT — STATE NEW MEXICO — DRLG FLD WATER BASE MUD* — CORES DIAMOND 3 1/2"
LOCATION SEC. 20-T8S-R36E — REMARKS SAMPLED AS DIRECTED BY CLIENT
*-9% OIL ADDED

COMPLETION COREGRAPH

SAND SHALE LIMESTONE DOLOMITE CONGLOMERATE OOLITES CHERT ANHYDRITE

SAMPLE CHARACTERISTICS: F Fractured L Laminated FG, MG, CG Type Grain Size S Stylolitic V Vuggy
PROBABLE PRODUCTION: O Oil W Water G Gas T Transitional

SAMPLE NUMBER	DEPTH FEET	PERMEABILITY MD * = Horizontal Perm Plug HORIZONTAL MAX. 90°	POROSITY %	RESIDUAL SATURATION % PORE SPACE OIL	RESIDUAL SATURATION % PORE SPACE TOTAL WATER	
		WHOLE-CORE ANALYSIS				
1	9655.0-56.9	<0.1	<0.1	2.6	0.0	87.5 F
1A		<0.1	<0.1			
2	9656.9-58.5	<0.1	<0.1	3.1	0.0	71.2 F
3	58.5-60.2	<0.1	<0.1	1.7	0.0	96.5 S
3A		<0.1	<0.1			
4	9660.2-61.5	<0.1	<0.1	1.7	1.2	46.7 S
5	61.5-63.0	<0.1	<0.1	2.6	7.7	40.3 SV
5A		0.4	0.4			
6	9663.0-64.2	0.5	0.3	5.0	11.6	36.0 FV
7	64.2-65.4	1035	1035	7.9	8.8	53.1 FV
7A		241	38			
8	9665.4-66.6	28	17	6.8	6.0	48.2 FV
9	66.6-68.0	0.2	0.2	2.1	6.3	57.0 SV
10	68.0-69.4	0.7	0.6	3.0	8.6	33.8 V
11	69.4-70.9	183	46	5.1	8.5	39.7 FV
11A		27	17			
12	9670.9-72.1	59	24	6.6	7.7	50.8 FV
13	72.1-73.7	<0.1	<0.1	1.7	1.2	61.2 FVS
13A		<0.1	<0.1			
14	9673.7-75.4	<0.1	<0.1	1.0	9.0	73.2 VS
15	75.4-76.7	<0.1	<0.1	0.8	0.0	94.8 S
15A		<0.1	<0.1			
16	9676.7-78.2	<0.1	<0.1	1.8	0.0	97.9 S
17	78.2-80.0	<0.1	<0.1	1.0	0.0	79.4 S
17A		<0.1	<0.1			
18	9680.0-81.5	0.4	0.3	2.7	7.4	29.5 VS
19	81.5-83.3	3.0	0.5	2.9	5.8	55.2 FV
19A		2.3	0.7			
20	9683.3-85.0	<0.1	<0.1	1.4	0.0	74.0 S
20A		<0.1	<0.1			



TOTAL WATER PERCENT PORE SPACE 75 50 25
OIL SATURATION PERCENT PORE SPACE 25 50 75

Case 2139

Comparison of Rock and Fluid Properties
of the
Allison, Bluitt, and South Prairie-Pennsylvanian Pool

EXHIBIT No. 9

	Allison	Bluitt	So. Prairie-Penn.
Rock Properties			
Average Permeability - md.	107.2	508	131
Range of Permeability - md.		.6 to 6,620	.1 to 1035
Average Porosity - %	5.15	5.93	6.9
Average Interstitial Water Saturation - %	25E	15	26
Fluid Properties			
Gravity of Stock tank oil - °API	48	47	46.7
Saturation pressure - psi	3150	3027	2987
Formation volume factor at sat. press. - Res bbl/STB	1.821	1.762	1.841
Viscosity of reservoir oil at sat. press. - cp	.19		.165
Dissolved gas-oil ratio at sat. press. - CFPB	1517	1517	1490
Reservoir temperature - °F	156	155	157

Case 2139

EXHIBIT No. 10

Net Pay By Wells
South Prairie-Pennslyvanian Pool
Roosevelt County, New Mexico

Operator, Lease and Well	Net Pay, Feet
Cosden Petroleum Corporation	
Federal C #1	11
Federal D #1	18
Lone Star Producing Company	
New Mexico Federal "NM" #1	7

Arithmetic Average Thickness - 12'

SUMMARY
Recovery and Economic Calculations
Solution Gas Drive
South Prairie-Pennsylvanian Pool

Case 2139

EXHIBIT No. 11

	40 Acres	80 Acres
Gross recovery of original oil in place	29,027 Bbl	58,054 Bbl
Gross gas recovery	131,783 MCF	263,565 MCF
Total gross revenue less severance taxes	$ 84,130	$168,256
Total costs	204,322	206,644
Total profit or loss	($120,192)	($ 38,388)

VOLUMETRIC CALCULATIONS
For Oil In Place - 40 Acre Tract
South Prairie-Pennsylvanian Pool
Roosevelt County, New Mexico

EXHIBIT No.

$$N_1 = \frac{7758 \times \emptyset \times (1-Sw) \times h \times A}{B_o}$$

$$= \frac{7758 \times 0.069 \times (1-0.26) \times 12 \times 40}{1.834}$$

= 103,668 barrels

A recovery factor of 28% is believed to be reasonable for the South Prairie-Pennsylvanian Pool which would result in a recovery of:

Recoverable Oil = $0.28 \times N_1$
= (0.28)(103668)
= 29,027 barrels

Definition of Symbols:

N_1 - Original oil in place per 40 acre tract, stock tank barrels

$\emptyset$ - Porosity as a fraction, 0.069

Sw - Interstitual water saturation, fraction of pore space - 0.26

h - Net pay thickness, feet - 12

A - Area for which oil in place is being calculated - 40 acres

B_o - Original oil formation volume factor, barrels of reservoir space per barrel of stock tank oil - 1.834

7758 - Number of barrels per acre-foot

Economics of Drilling One Well Per 40 Acres
In South Prairie-Pennsylvanian Pool

EXHIBIT No.

Revenue		
Oil		
29,027 (1-0.125)($3.01) =	$ 76,451	
Less severance taxes at $0.1397/BO	3,548	
Gross oil revenue less severance taxes		$ 72,903
Gas		
(29,027)(1-0.125)(4540)($0.10)	$ 11,531	
Less severance taxes at 0.0264 of value	304	
Gross gas revenue less severance taxes		$ 11,227
Total Gross Revenue Less Severance Taxes		$ 84,130
Costs		
Development		
Drilling and completion	$172,000	
Pumping equipment	30,000	
Total development costs		$202,000
Operating		
($0.08)(29,027)		2,322
Total Costs		$204,322
Loss per 40-Acre well		($120,192)

Conditions

Recoverable oil in place per 40 acres	29,027 bbls
Average gas-oil ratio throughout life	4,540 CFPB
Oil price	$3.01/Bbl
Casinghead gas price	$0.10/MCF
Operating costs	$0.08/Bbl
Royalty	1/8
All wells completed at same time	

VOLUMETRIC CALCULATIONS
For Oil In Place - 80 Acre Tract
South Prairie-Pennsylvanian Pool
Roosevelt County, New Mexico

EXHIBIT No.

$$N_1 = \frac{7758 \times \phi \times (1-Sw) \times h \times A}{B_o}$$

$$= \frac{7758 \times 0.069 \times (1-.26) \times 12 \times 80}{1.834}$$

= 207,336 barrels

Using the recovery factor of 28%, the recovery would be:

Recoverable Oil = $0.28 \times N_1$

= $0.28 \times 207,336$

= 58,054 barrels

The symbols used are the same as those used in determining the recovery for a 40-acre tract.

Economics of Drilling One Well Per 80 Acres
In South Prairie-Pennsylvanian Pool

EXHIBIT No.

Revenue		
Oil		
(58,054)(1-.125)($3.01)	$152,399	
Less severance taxes at $.1397/BO	7,096	
Gross oil revenue less severance taxes		$145,803
Gas		
(58,054)(1-.125)(4540)($.10)	$ 23,062	
Less severance taxes at .0264 of value	609	
Gross gas revenue less severance taxes		$ 22,453
Total Gross Revenue Less Severance Taxes		$168,256
Costs		
Development		
Drilling and completion	$172,000	
Pumping equipment	30,000	
Total development costs		$202,000
Operating		
($.08)(58,054)		4,644
Total Costs		$206,644
Loss per 80-acre well		✓ ($ 38,388)

$40,000 drive.

SUMMARY
Recovery and Economic Calculations
Water-Drive
South Prairie-Pennsylvanian Pool

EXHIBIT No. 12

	40 Acres	80 Acres
Gross recovery of original oil in place	51,840 Bbl	103,680 Bbl
Gross gas recovery	77,760 MCF	155,520 MCF
Total gross revenue less severance Taxes	$136,820	$273,642
Total costs	206,147	210,294
Net loss or profit per well	($ 69,327)	$ 63,348

Avg wells making water
cost of disp well

VOLUMETRIC CALCULATIONS
For Oil in Place
South Prairie-Pennsylvanian Pool
Roosevelt County, New Mexico

EXHIBIT No.

$$N_1 = \frac{7758\ \phi\ (1-Sw)\ h}{B_o}$$

$$= \frac{7758 \times .069 \times (1-.26) \times 12}{1.834}$$

= 2592 barrels per acre

40 Acres

40 x 2592 = 103,680 barrels

80 Acres

80 x 2592 = 207,360 barrels

For a water-drive, a recovery factor of 50% is believed to be reasonable for the South Prairie-Pennsylvanian Pool. This would result in a recovery for:

40 Acres

Recoverable Oil = .50 x N_1 x 40

= .50 x 2592 x 40

= 51,840 barrels

80 Acres

Recoverable Oil = .50 x N_1 x 80

= .50 x 2592 x 80

= 103,680 barrels

Definition of Symbols:

N_1 - Original oil in place per acre, stock tank barrels
ϕ - Porosity as a fraction, 0.069
Sw - Interstitial water saturation, fraction of pore space - 0.26
h - Net pay thickness, feet - 12
A - Area for which oil in place is being calculated - 40 acres and 80 acres
B_o - Original oil formation volume factor, barrels of reservoir space per barrel of stock tank oil - 1.834
7758 - Number of barrels per acre-foot

Economics of Development
South Prairie-Pennsylvanian Pool
Roosevelt County, New Mexico

EXHIBIT No.

40 Acres

Revenue

Oil		
(51,840)(1-.125)($3.01)	$136,533	
Less severance taxes at $.1397/BO	6,337	
Gross oil revenue less severance taxes		$130,196
Gas		
(51,840)(1-.125)(1500)($.10)	$ 6,804	
Less severance taxes at .0264 of value	180	
Gross gas revenue less severance taxes		$ 6,624
Total Gross Revenue Less Severance Taxes		$136,820

Costs

Development		
Drilling and completion	$172,000	
Pumping equipment	30,000	$202,000
Operating		
($.08)(51,840)		4,147
Total Costs		$206,147
Loss per 40-acre well		($ 69,327)

80 Acres

Revenue		
Oil		
(103,680)(1-.125)($3.01)	$273,067	
Less severance taxes at $.1397/BO	12,674	
Gross oil revenue less severance taxes		$260,393
Gas		
(103,680)(1-.125)(1500)($.10)	$ 13,608	
Less severance taxes at .0264 of value	359	
Gross gas revenue less severance taxes		$ 13,249
Total Gross Revenue Less Severance Taxes		$273,642
Costs		
Development		
Drilling and completion	$172,000	
Pumping equipment	30,000	$202,000
Operating		
(.08)(103,680)		8,294
Total Costs		$210,294
Profit per 80-acre well		$ 63,348

Conditions	40 Acres	80 Acres
Recoverable oil in place	51,840 Bbl	103,680 Bbl
Average gas-oil ratio throughout life	1,500 CFPB	1,500 CFPB
Oil price	$3.01/bbl	$3.01/Bbl
Casinghead gas price	$.10/MCF	$.10/MCF
Operating costs	$.08/Bbl	$.08/Bbl
Royalty	1/8	1/8
All wells completed at same time		

Economic Comparison
Bluitt and South Prairie-Pennsylvanian Pool

EXHIBIT No.

Bluitt Pool	40 acres	80 Acres
Average cost per well	$190,000	$190,000
Average net revenue per well	140,482	280,963
Profit or loss per well	($ 49,518)	$ 90,963
South Prairie-Pennsylvanian Pool		
Average Cost per well	$202,000	$202,000
Average net revenue per well	$132,673	$265,348
Profit or loss per well	($ 69,327)	$ 63,348

SPECIAL RULES AND REGULATIONS FOR THE
SOUTH PRAIRIE-PENNSYLVANIAN POOL

RULE 1. Each well completed or recompleted in the South Prairie-Pennsylvanian Pool or in the Pennsylvanian formation within one mile of the South Prairie-Pennsylvanian Pool, and not nearer to nor within the limits of another designated Pennsylvanian pool, shall be spaced, drilled, operated, and prorated in accordance with the Special Rules and Regulations hereinafter set forth.

RULE 2. Each well completed or recompleted in the South Prairie-Pennsylvanian Pool shall be located in a unit containing 80 acres, more or less, which consists of the S/2, N/2, E/2, or W/2 of a single governmental quarter section; provided, however, that nothing contained herein shall be construed as prohibiting the drilling of a well on each of the quarter-quarter sections in the unit.

RULE 3. The initial well on any 80-acre unit in said pool shall be located within 150 feet of the center of either the SW/4 or the NE/4 of the quarter section on which the well is located. Any well which was drilling to or completed in the South Prairie-Pennsylvanian Pool prior to September 1, 1959, is granted an exception to the well location requirements of this Rule.

RULE 4. For good cause shown, the Secretary-Director may grant exception to the requirements of Rule 2 without notice and hearing when the application is for a non-standard unit comprising a single quarter-quarter section or lot or when the application is for the purpose of joining fractional lots not exceeding 20.49 acres each with a standard unit. All operators offsetting the proposed non-standard unit shall be notified of the application by registered mail and the application shall state that such notice has been furnished. The Secretary-Director may approve the application if, after a period of 30 days, no offset operator has entered an objection to the formation of such non-standard unit.
The allowable assigned to any such non-standard unit shall bear the same ratio to a standard allowable in the South Prairie-Pennsylvanian Pool as the acreage in such non-standard unit bears to 80 acres.

RULE 5. An 80-acre proration unit (79 through 81 acres) in the South Prairie-Pennsylvanian Pool shall be assigned an 80-acre proportional factor of 4.77 for allowable purposes, and in the event there is more than one well on an 80-acre proration unit, the operator may produce the allowable assigned to the unit from the wells on the unit in any proportion.

Mr Summers

Testimony Rough.

Then I will send the Exhibit with the testimony, use them where he reads.

6 — Mon

6-4

Case #2139

COSDEN PETROLEUM CORPORATION

Federal "C" No. 1

T.D. 9,900'
Csg. 5-1/2" @ 9,890'
Perf. 9653'-72'

Completion: 9-18-60 - Acidized with 1000 gal MCA, let acid set on perfs 1 hr. - Max. treating press. 5400 psi Min. treating press. 2,000 psi, treated at 2 BPM at 2200 psi. Swabbed 6 times and well kicked off and began flowing.

Potential Test:
9-19-60 - Flowed 282 BO & no water in 6 hrs., 28/64" Ch. T.P. 750# psi, C.P. pkr - GOR 1650 CFPB

Federal "D" No. 1

T.D. 9,760'
Csg. 5-1/2" @ 9,760'
Perf. 9700'-05'

Completion: 11-13-60 Spotted 200 gallons MCA opposite perf. There is some doubt that any acid reached the producing formation because during the completion of the well by swabbing, raw unspent acid was recovered. After swabbing well kicked off and began flowing.

Potential Test:
11-17-60 Flowed 190 BO & no water in 12 hrs, 24/64" Ch. T.P. 750 psi, C.P. pkr, GOR 1190 CFPB

Flare

RESERVOIR DATA
South Prairie-Pennsylvanian Pool
Roosevelt County, New Mexico

EXHIBIT No. 7

1. **Physical Properties of Reservoir Rock**

   a. Average Porosity (Core & Log Calc.) - 6.9%

   b. Average Permeability (Core) - 131 md. (Range 0.1-1035)

   c. Average Interstitial Water Saturation - 26%

   d. Average Net Thickness - 12 ft

2. **Lithology**

   Grey to tan, very fine crystalline fosiliferous limestone with pin-point to large vugs, intercrystalline porosity, and some fracturing.

3. **Structural Features of Reservoir**

   The structure appears to be a northwest-southeast trending anticline. No original gas cap was present and the oil-water contact has not been determined.

4. **Characteristics of Reservoir Fluids**

   a. Gravity of Stock Tank Oil - 46.7° API

   b. Saturation Pressure - 2987 psig

   c. Formation Volume Factor - 1.841 @ Sat. Press.

   d. Viscosity of Reservoir Oil - 0.165 cp @ Sat. Press.

   e. Dissolve Gas-Oil Ratio - 1490 CFPB @ Sat. Press.

5. **Pressures and Temperatures**

   a. Reservoir Pressure (-5540) - 3159 psig (10-1-60)

   b. Reservoir Temperature - 157°F

   c. Productivity Index - 7.22 BOPD/psi draw-down
   (Cosden-Fed "C" No. 1 10-1-60)

Form F-11B

CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS, TEXAS

Page 1 of 1 File WP-3-1579
Well New Mexico Federal "NM" No. 1

CORE SUMMARY AND CALCULATED RECOVERABLE OIL

FORMATION NAME AND DEPTH INTERVAL: Bough 9655.0-9685.0

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FEET OF CORE INCLUDED IN AVERAGES		13.9	AVERAGE CONNATE WATER SATURATION: PER CENT OF PORE SPACE	(c)	44.4
AVERAGE PERMEABILITY: MILLIDARCYS	Max. 90°	83 61	OIL GRAVITY: °API	(e)	42
PRODUCTIVE CAPACITY: MILLIDARCY-FEET	Max. 90°	1154 848	ORIGINAL SOLUTION GAS-OIL RATIO: CUBIC FEET PER BARREL	(e)	1600
AVERAGE POROSITY: PER CENT		4.5	ORIGINAL FORMATION VOLUME FACTOR: BARRELS SATURATED OIL PER BARREL STOCK-TANK OIL	(e)	1.92
AVERAGE RESIDUAL OIL SATURATION: PER CENT OF PORE SPACE		7.8	CALCULATED ORIGINAL STOCK-TANK OIL IN PLACE: BARRELS PER ACRE-FOOT		101

Calculated maximum solution gas drive recovery is barrels per acre-foot, assuming production could be continued until reservoir pressure declined to zero psig. Calculated maximum water drive recovery is barrels per acre-foot, assuming full maintenance of original reservoir pressure, 100% areal and vertical coverage, and continuation of production to 100% water cut. (*Please refer to footnotes for further discussion of recovery estimates.*)

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FEET OF CORE INCLUDED IN AVERAGES		AVERAGE CONNATE WATER SATURATION: PER CENT OF PORE SPACE	
AVERAGE PERMEABILITY: MILLIDARCYS		OIL GRAVITY: °API	
PRODUCTIVE CAPACITY: MILLIDARCY-FEET		ORIGINAL SOLUTION GAS-OIL RATIO: CUBIC FEET PER BARREL	
AVERAGE POROSITY: PER CENT		ORIGINAL FORMATION VOLUME FACTOR: BARRELS SATURATED OIL PER BARREL STOCK-TANK OIL	
AVERAGE RESIDUAL OIL SATURATION: PER CENT OF PORE SPACE		CALCULATED ORIGINAL STOCK-TANK OIL IN PLACE: BARRELS PER ACRE-FOOT	

Calculated maximum solution gas drive recovery is barrels per acre-foot, assuming production could be continued until reservoir pressure declined to zero psig. Calculated maximum water drive recovery is barrels per acre-foot, assuming full maintenance of original reservoir pressure, 100% areal and vertical coverage, and continuation of production to 100% water cut. (*Please refer to footnotes for further discussion of recovery estimates.*)

(c) Calculated (e) Estimated (m) Measured (*) Refer to attached letter.

These recovery estimates represent theoretical maximum values for solution gas and water drive. They assume that production is started at original reservoir pressure; i.e., no account is taken of production to date or of prior drainage to other areas. The effects of factors tending to reduce actual ultimate recovery, such as economic limits on oil production rates, gas-oil ratios, or water-oil ratios, have not been taken into account. Neither have factors been considered which may result in actual recovery intermediate between solution gas and complete water drive recoveries, such as gas cap expansion, gravity drainage, or partial water drive. Detailed predictions of ultimate oil recovery to specific abandonment conditions may be made in an engineering study in which consideration is given to overall reservoir characteristics and economic factors.

CORE LABORATORIES, INC. *Petroleum Reservoir Engineering*

COMPANY LONE STAR PRODUCING COMPANY — FILE NO WF-3-1579
WELL NEW MEXICO FEDERAL "EN" NO. 1 — DATE 11-13-60 — ENGRS BOOKS
FIELD UNDESIGNATED — FORMATION DOUGH — ELEV 4121' DF
COUNTY ROOSEVELT — STATE NEW MEXICO — DRLG FLD WATER BASE MUD* — CORES DIAMOND 3 1/2"
LOCATION SEC. 20-T8S-R36E — REMARKS SAMPLED AS DIRECTED BY CLIENT
*-9% OIL ADDED

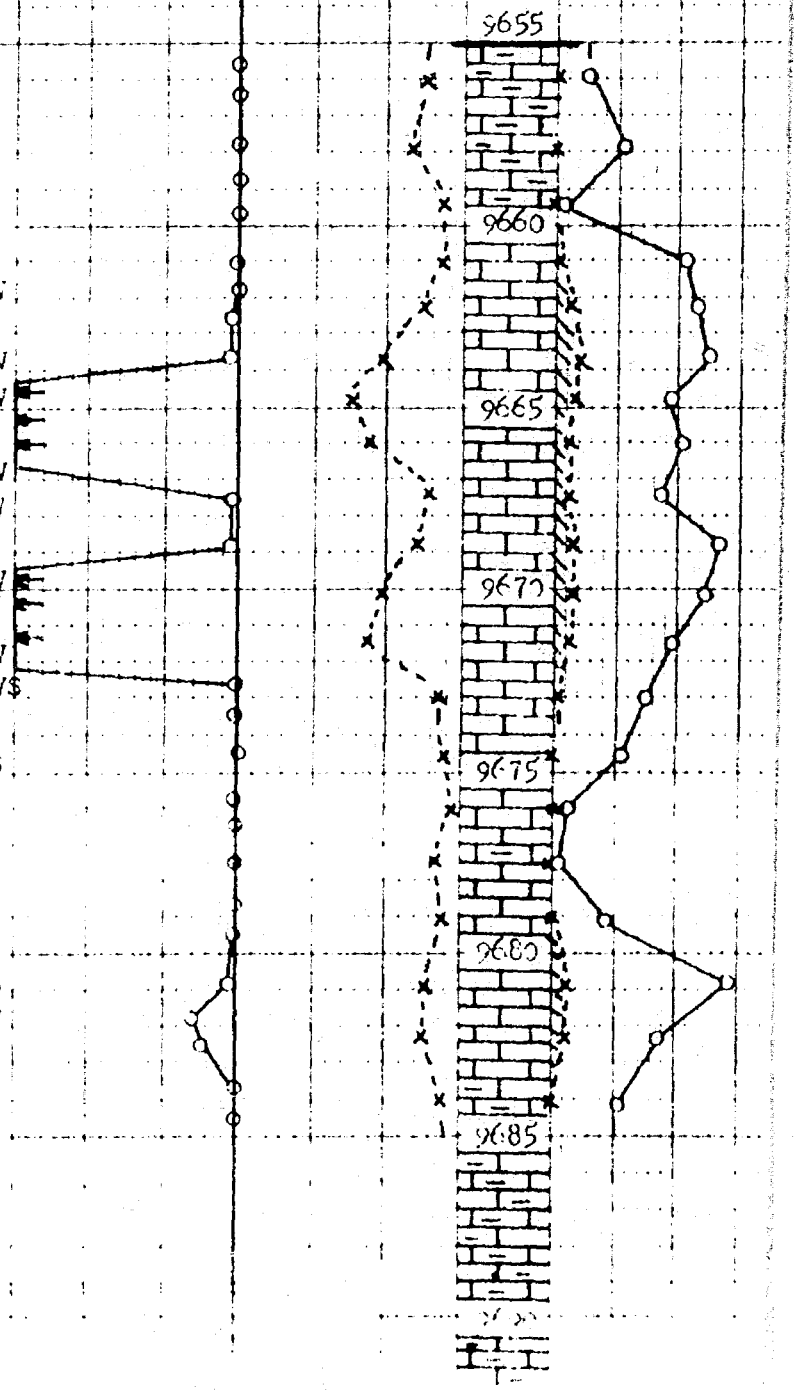
COMPLETION COREGRAPH

SAND SHALE LIMESTONE DOLOMITE CONGLOMERATE OOLITES CHERT ANHYDRITE

SAMPLE CHARACTERISTICS
F Fractured L Laminated FG MG CG Type Grain Size S Stylolitic V Vugular

PORE SPACE FLUID SATURATION
O Oil W Water G Gas I Irreducible

SAMPLE NUMBER	DEPTH FEET	PERMEABILITY MILLIDARCIES Horizontal Perm Plug HORIZONTAL Max. 90°	POROSITY %	RESID. SATURATION % PORE SPACE OIL	RESID. SATURATION % PORE SPACE TOTAL WATER	
		WHOLE-CORE ANALYSIS				
1	9655.0-56.9	<0.1	2.6	0.0	87.5	F
1A		<0.1				
2	9656.9-58.5	<0.1	3.1	0.0	71.2	F
3	58.5-60.2	<0.1	1.7	0.0		
3A		<0.1				
4	9660.2-61.5	<0.1	1.7	1.2	46.7	
5	61.5-63.0	<0.1	2.6	7.7	60.3	SV
5A		0.4				
6	9663.0-64.2	0.5	5.0	11.6	36.0	FV
7	64.2-65.4	1035	7.9	8.8	53.1	FV
7A		241				
8	9665.4-66.6	28	6.8	6.0	48.2	FV
9	66.6-68.0	0.2	2.1	6.3	57.0	SV
10	68.0-69.4	0.7	3.0	8.6	33.8	V
11	69.4-70.9	183	5.1	8.5	39.7	FV
11A		27				
12	9670.9-72.1	59	6.6	7.7	50.8	FV
13	72.1-73.7	<0.1	1.7	1.2	61.2	FVS
13A		<0.1				
14	9673.7-75.4	<0.1	1.0	0.0	73.2	VS
15	75.4-76.7	<0.1	0.8	0.0	94.8	
15A		<0.1				
16	9676.7-78.2	<0.1	1.8	0.0	97.9	
17	78.2-80.0	<0.1	1.0	0.0	79.4	
17A		<0.1				
18	9680.0-81.5	0.4	2.7	7.4	29.5	VS
19	81.5-83.3	3.0	2.9	5.8	55.2	FV
19A		2.3				
20	9683.3-85.0	<0.1	1.4	0.0	74.0	
20A		<0.1				



Comparison of Rock and Fluid Properties
of the
Allison, Bluitt, and South Prairie-Pennsylvanian Pool

EXHIBIT No.

	Allison	Bluitt	So. Prairie-Penn.
Rock Properties			
Average Permeability - md.	107.2	508	131
Range of Permeability - md.		.6 to 6,620	.1 to 1035
Average Porosity - %	5.15	5.93	6.9
Average Interstitial Water Saturation - %	25%	15	26
Fluid Properties			
Gravity of Stock tank oil - °API	48	47	46.7
Saturation pressure - psi	3150	3027	2987
Formation volume factor at sat. press. - Res bbl/STB	1.821	1.762	1.841
Viscosity of reservoir oil at sat. press. - cp	.19		.165
Dissolved gas-oil ratio at sat. press. - CFPB	1517	1517	1490
Reservoir temperature - °F	156	155	157

Net Pay By Wells
South Prairie-Pennsylvanian Pool
Roosevelt County, New Mexico

EXHIBIT No. 10

Operator, Lease and Well	Net Pay, Feet
Cosden Petroleum Corporation	
Federal C #1	11
Federal D #1	18
Lone Star Producing Company	
New Mexico Federal "BB" #1	7

Arithmetic Average Thickness - 12'

SUMMARY
Recovery and Economic Calculations
Solution Gas Drive
South Prairie-Pennsylvanian Pool

EXHIBIT No.

	40 Acres	80 Acres
Gross recovery of original oil in place	29,027 Bbl	58,054 Bbl
Gross gas recovery	131,783 MCF	263,565 MCF
Total gross revenue less severance taxes	$ 84,130	$168,256
Total costs	204,322	206,644
Total profit or loss	($120,192)	($ 38,388)

VOLUMETRIC CALCULATIONS
For Oil In Place - 40 Acre Tract
South Prairie-Pennsylvanian Pool
Roosevelt County, New Mexico

EXHIBIT No. 1

$$N_1 = \frac{7758 \times \phi \times (1-Sw) \times h \times A}{B_o}$$

$$= \frac{7758 \times 0.069 \times (1-0.26) \times 12 \times 40}{1.834}$$

$$= 103,668 \text{ barrels}$$

A recovery factor of 28% is believed to be reasonable for the South Prairie-Pennsylvanian Pool which would result in a recovery of:

$$\text{Recoverable Oil} = 0.28 \times N_1$$
$$= (0.28)(103668)$$
$$= 29,027 \text{ barrels}$$

Definition of Symbols:

N_1 - Original oil in place per 40 acre tract, stock tank barrels

ϕ - Porosity as a fraction, 0.069

Sw - Interstitual water saturation, fraction of pore space - 0.26

h - Net pay thickness, feet - 12

A - Area for which oil in place is being calculated - 40 acres

B_o - Original oil formation volume factor, barrels of reservoir space per barrel of stock tank oil - 1.834

7758 - Number of barrels per acre-foot

Economics of Drilling One Well Per 40 Acres
In South Prairie-Pennsylvanian Pool

EXHIBIT No. 3

Revenue		
Oil		
29,027 (1-0.125)($3.01) =	$ 76,451	
Less severance taxes at $0.1397/BO	3,548	
Gross oil revenue less severance taxes		$ 72,903
Gas		
(29,027)(1-0.125)(4540)($0.10)	$ 11,531	
Less severance taxes at 0.0264 of value	304	
Gross gas revenue less severance taxes		$ 11,227
Total Gross Revenue Less Severance Taxes		$ 84,130
Costs		
Development		
Drilling and completion	$172,000	
Pumping equipment	30,000	
Total development costs		$202,000
Operating ($0.08)(29,027)		2,322
Total Costs		$204,322
Loss per 40-Acre well		($120,192)

Conditions

Recoverable oil in place per 40 acres	29,027 bbls
Average gas-oil ratio throughout life	4,540 CFPB
Oil price	$3.01/Bbl
Casinghead gas price	$0.10/MCF
Operating costs	$0.08/Bbl
Royalty	1/8
All wells completed at same time	

VOLUMETRIC CALCULATIONS
For Oil In Place - 80 Acre Tract
South Prairie-Pennsylvanian Pool
Roosevelt County, New Mexico

EXHIBIT No. 11

$$N_1 = \frac{7758 \times \phi \times (1-Sw) \times h \times A}{B_o}$$

$$= \frac{7758 \times 0.069 \times (1-.26) \times 12 \times 80}{1.834}$$

$$= 207,336 \text{ barrels}$$

Using the recovery factor of 28%, the recovery would be:

$$\text{Recoverable Oil} = 0.28 \times N_1$$

$$= 0.28 \times 207,336$$

$$= 58,054 \text{ barrels}$$

The symbols used are the same as those used in determining the recovery for a 40-acre tract.

Economics of Drilling One Well Per 80 Acres
In South Prairie-Pennsylvanian Pool

EXHIBIT No. 11

Revenue		
Oil		
(58,054)(1-.125)($3.01)	$152,899	
Less severance taxes at $.1397/BO	7,096	
Gross oil revenue less severance taxes		$145,803
Gas		
(58,054)(1-.125)(4540)($.10)	$ 23,062	
Less severance taxes at .0264 of value	609	
Gross gas revenue less severance taxes		$ 22,453
Total Gross Revenue Less Severance Taxes		$168,256
Costs		
Development		
Drilling and completion	$172,000	
Pumping equipment	30,000	
Total development costs		$202,000
Operating		
($.08)(58,054)		4,644
Total Costs		$206,644
Loss per 80-acre well		($ 38,388)

SUMMARY
Recovery and Economic Calculations
Water-Drive
South Prairie-Pennsylvanian Pool

EXHIBIT No. 12

	40 Acres	80 Acres
Gross recovery of original oil in place	51,840 Bbl	103,680 Bbl
Gross gas recovery	77,760 MCF	155,520 MCF
Total gross revenue less severance Taxes	$136,820	$273,642
Total costs	206,147	210,294
Net loss or profit per well	($ 69,327)	$ 63,348

VOLUMETRIC CALCULATIONS
For Oil in Place
South Prairie-Pennsylvanian Pool
Roosevelt County, New Mexico

EXHIBIT No.

$$N_1 = \frac{7758\ \phi\ (1-S_w)\ h}{B_o}$$

$$= \frac{7758 \times .069 \times (1-.26) \times 12}{1.834}$$

$$= 2592 \text{ barrels per acre}$$

40 Acres

40 x 2592 = 103,680 barrels

80 Acres

80 x 2592 = 207,360 barrels

For a water-drive, a recovery factor of 50% is believed to be reasonable for the South Prairie-Pennsylvanian Pool. This would result in a recovery for:

40 Acres

Recoverable Oil = .50 x N_1 x 40

= .50 x 2592 x 40

= 51,840 barrels

80 Acres

Recoverable Oil = .50 x N_1 x 80

= .50 x 2592 x 80

= 103,680 barrels

Definition of Symbols:

N_1 - Original oil in place per acre, stock tank barrels
ϕ - Porosity as a fraction, 0.069
S_w - Interstitual water saturation, fraction of pore space - 0.26
h - Net pay thickness, feet - 12
A -- Area for which oil in place is being calculated - 40 acres and 80 acres
B_o - Original oil formation volume factor, barrels of reservoir space per barrel of stock tank oil - 1.834
7758 - Number of barrels per acre-foot

Economics of Development
South Prairie-Pennsylvanian Pool
Roosevelt County, New Mexico

EXHIBIT No.

40 Acres

Revenue

Oil		
(51,840)(1-.125)($3.01)	$136,533	
Less severance taxes at $.1397/BO	6,337	
Gross oil revenue less severance taxes		$130,196
Gas		
(51,840)(1-.125)(1500)($.10)	$ 6,804	
Less severance taxes at .0264 of value	180	
Gross gas revenue less severance taxes		$ 6,624
Total Gross Revenue Less Severance Taxes		$136,820

Costs

Development		
Drilling and completion	$172,000	
Pumping equipment	30,000	$202,000
Operating		
($.08)(51,840)		4,147
Total Costs		$206,147
Loss per 40-acre well		($ 69,327)

80 Acres

Revenue		
Oil (103,680)(1-.125)($3.01)	$273,067	
Less severance taxes at $.1397/BO	12,674	
Gross oil revenue less severance taxes		$260,393
Gas (103,680)(1-.125)(1500)($.10)	$ 13,608	
Less severance taxes at .0264 of value	359	
Gross gas revenue less severance taxes		$ 13,249
Total Gross Revenue Less Severance Taxes		$273,642
Costs		
Development Drilling and completion	$172,000	$202,000
Pumping equipment	30,000	
		8,294
		$210,294
Operating (.08)(103,680)		$ 63,348
Total Costs		
Profit per 80-acre well		

Conditions	40 Acres	80 Acres
Recoverable oil in place	51,840 Bbl	103,680 Bbl
Average gas-oil ratio throughout life	1,500 CFPB	1,500 CFPB
Oil price	$3.01/bbl	$3.01/Bbl
Casinghead gas price	$.10/MCF	$.10/MCF
Operating costs	$.08/Bbl	$.08/Bbl
Royalty	1/8	1/8
All wells completed at same time		

Economic Comparison
Bluitt and South Prairie-Pennsylvanian Pool

EXHIBIT No. 13

	40 acres	80 Acres
Bluitt Pool		
Average cost per well	$190,000	$190,000
Average net revenue per well	140,482	280,963
Profit or loss per well	($ 49,518)	$ 90,963
South Prairie-Pennsylvanian Pool		
Average Cost per well	$202,000	$202,000
Average net revenue per well	$132,673	$265,348
Profit or loss per well	($ 69,327)	$ 63,348

14

SPECIAL RULES AND REGULATIONS FOR THE
SOUTH PRAIRIE-PENNSYLVANIAN POOL

RULE 1. Each well completed or recompleted in the South Prairie-Pennsylvanian Pool or in the Pennsylvanian formation within one mile of the South Prairie-Pennsylvanian Pool, and not nearer to nor within the limits of another designated Pennsylvanian pool, shall be spaced, drilled, operated, and prorated in accordance with the Special Rules and Regulations hereinafter set forth.

RULE 2. Each well completed or recompleted in the South Prairie-Pennsylvanian Pool shall be located in a unit containing 80 acres, more or less, which consists of the S/2, N/2, E/2, or W/2 of a single governmental quarter section; provided, however, that nothing contained herein shall be construed as prohibiting the drilling of a well on each of the quarter-quarter sections in the unit.

RULE 3. The initial well on any 80-acre unit in said pool shall be located within 150 feet of the center of either the SW/4 or the NE/4 of the quarter section on which the well is located. Any well which was drilling to or completed in the South Prairie-Pennsylvanian Pool prior to September 1, 1959, is granted an exception to the well location requirements of this Rule.

RULE 4. For good cause shown, the Secretary-Director may grant exception to the requirements of Rule 2 without notice and hearing when the application is for a non-standard unit comprising a single quarter-quarter section or lot or when the application is for the purpose of joining fractional lots not exceeding 20.49 acres each with a standard unit. All operators offsetting the proposed non-standard unit shall be notified of the application by registered mail and the application shall state that such notice has been furnished. The Secretary-Director may approve the application if, after a period of 30 days, no offset operator has entered an objection to the formation of such non-standard unit.
The allowable assigned to any such non-standard unit shall bear the same ratio to a standard allowable in the South Prairie-Pennsylvanian Pool as the acreage in such non-standard unit bears to 80 acres.

RULE 5. An 80-acre proration unit (79 through 81 acres) in the South Prairie-Pennsylvanian Pool shall be assigned an 80-acre proportional factor of 4.77 for allowable purposes, and in the event there is more than one well on an 80-acre proration unit, the operator may produce the allowable assigned to the unit from the wells on the unit in any proportion.

COPY

HERVEY, DOW & HINKLE, ATTORNEYS
ROSWELL, NEW MEXICO

Case 2139

November 22, 1960

Re: Application of Cosden Petroleum Corporation for the Promulgation of Special Rules and Regulations Governing the South Prairie-Pennsylvanian Pool embracing the NE¼ of Section 20, T. 8 S., R. 36 E., N.MP.M., Roosevelt County, New Mexico

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

Dear Mr. Porter:

Cosden Petroleum Corporation hereby requests that a hearing be scheduled by the New Mexico Oil Conservation Commission at the earliest possible date.

It is requested that the hearing be called for the purpose of promulgating special rules and regulations to govern the South Prairie-Pennsylvanian Pool comprising the NE¼ of Section 20, T. 8 S., R. 36 E., N.M.P.M. It is requested that the special rules and regulations issued provide for 80-acre spacing and proration units to consist of either the E½, W½, N½, or S½ of each governmental quarter-quarter section.

It is further requested that an 80-acre proration unit be assigned an 80-acre proportional depth factor for allowable purposes in accordance with the statewide rule.

It is requested that the above matter be set down for hearing at the earliest available date, either before an Examiner or before the full Commission at your discretion.

Very truly yours,

COSDEN PETROLEUM CORPORATION

By _____
Hervey, Dow & Hinkle
P. O. Box 547
Roswell, New Mexico

Attorneys for Applicant, Cosden Petroleum Corporation

HCB:db

COPY

HERVEY, DOW & HINKLE, ATTORNEYS
ROSWELL, NEW MEXICO

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It is further requested that an 80-acre proration unit be assigned an 80-acre proportional depth factor for allowable purposes in accordance with the statewide rule.

It is requested that the above matter be set down for hearing at the earliest available date, either before an Examiner or before the full Commission at your discretion.

Very truly yours,

COSDEN PETROLEUM CORPORATION

By _____
Hervey, Dow & Hinkle
P. O. Box 547
Roswell, New Mexico

Attorneys for Applicant, Cosden Petroleum Corporation

HCB:db

Comparison of Rock and Fluid Properties
of the
Allison, Bluitt, and South Prairie-Pennsylvanian Pool

EXHIBIT No. 9

	Allison	Bluitt	So. Prairie-Penn.
Rock Properties			
Average Permeability - md.	107.2	508	131
Range of Permeability - md.		.6 to 6,620	.1 to 1035
Average Porosity - %	5.15	5.93	6.9
Average Interstitial Water Saturation - %	25%	15	26
Fluid Properties			
Gravity of Stock tank oil - °API	48	47	46.7
Saturation pressure - psi	3150	3027	2987
Formation volume factor at sat. press. - Res bbl/STB	1.821	1.762	1.841
Viscosity of reservoir oil at sat. press. - cp	.19		.165
Dissolved gas-oil ratio at sat. press. - CFFB	1517	1517	1490
Reservoir temperature - °F	156	155	157

Net Pay By Wells
South Prairie-Pennsylvanian Pool
Roosevelt County, New Mexico

EXHIBIT No. 9

Operator, Lease and Well	Net Pay, Feet
Cooden Petroleum Corporation	
Federal C #1	11
Federal D #1	18
Lone Star Producing Company	
New Mexico Federal "BH" #1	7

Arithmetic Average Thickness - 12'

SUMMARY
Recovery and Economic Calculations
Solution Gas Drive
South Prairie-Pennsylvanian Pool

EXHIBIT No. 11

	40 Acres	80 Acres
Gross recovery of original oil in place	29,027 Bbl	58,054 Bbl
Gross gas recovery	131,783 MCF	263,565 MCF
Total gross revenue less severance taxes	$ 84,130	$168,256
Total costs	204,322	206,644
Total profit or loss	($120,192)	($ 38,388)

VOLUMETRIC CALCULATIONS
For Oil In Place - 40 Acre Tract
South Prairie-Pennsylvanian Pool
Roosevelt County, New Mexico

EXHIBIT No.

$$N_1 = \frac{7758 \times \phi \times (1-Sw) \times h \times A}{B_o}$$

$$= \frac{7758 \times 0.069 \times (1-0.26) \times 12 \times 40}{1.834}$$

$$= 103,668 \text{ barrels}$$

A recovery factor of 28% is believed to be reasonable for the South Prairie-Pennsylvanian Pool which would result in a recovery of:

$$\text{Recoverable Oil} = 0.28 \times N_1$$
$$= (0.28)(103668)$$
$$= 29,027 \text{ barrels}$$

Definition of Symbols:

N_1 - Original oil in place per 40 acre tract, stock tank barrels

ϕ - Porosity as a fraction, 0.069

Sw - Interstitual water saturation, fraction of pore space - 0.26

h - Net pay thickness, feet - 12

A - Area for which oil in place is being calculated - 40 acres

B_o - Original oil formation volume factor, barrels of reservoir space per barrel of stock tank oil - 1.834

7758 - Number of barrels per acre-foot

Economics of Drilling One Well Per 40 Acres
In South Prairie-Pennsylvanian Pool

EXHIBIT No.

Revenue		
Oil		
29,027 (1-0.125)($3.01) =	$ 76,451	
Less severance taxes at $0.1397/BO	3,548	
Gross oil revenue less severance taxes		$ 72,903
Gas		
(29,027)(1-0.125)(4540)($0.10)	$ 11,531	
Less severance taxes at 0.0264 of value	304	
Gross gas revenue less severance taxes		$ 11,227
Total Gross Revenue Less Severance Taxes		$ 84,130
Costs		
Development		
Drilling and completion	$172,000	
Pumping equipment	30,000	
Total development costs		$202,000
Operating		
($0.08)(29,027)		2,322
Total Costs		$204,322
Loss per 40-Acre well		($120,192)

Conditions

Recoverable oil in place per 40 acres	29,027 bbls
Average gas-oil ratio throughout life	4,540 CFPB
Oil price	$3.01/Bbl
Casinghead gas price	$0.10/MCF
Operating costs	$0.08/Bbl
Royalty	1/8
All wells completed at same time	

VOLUMETRIC CALCULATIONS
For Oil In Place - 80 Acre Tract
South Prairie-Pennsylvanian Pool
Roosevelt County, New Mexico

EXHIBIT No.

$$N_1 = \frac{7758 \times \phi \times (1-S_w) \times h \times A}{B_o}$$

$$= \frac{7758 \times 0.069 \times (1-.26) \times 12 \times 80}{1.834}$$

= 207,336 barrels

Using the recovery factor of 28%, the recovery would be:

Recoverable Oil = $0.28 \times N_1$

= 0.28 x 207,336

= 58,054 barrels

The symbols used are the same as those used in determining the recovery for a 40-acre tract.

Economics of Drilling One Well Per 80 Acres
In South Prairie-Pennsylvanian Pool

EXHIBIT No.

Revenue		
Oil		
(58,054)(1-.125)($3.01)	$152,899	
Less severance taxes at $.1397/BO	7,096	
Gross oil revenue less severance taxes		$145,803
Gas		
(58,054)(1-.125)(4540)($.10)	$ 23,062	
Less severance taxes at .0264 of value	609	
Gross gas revenue less severance taxes		$ 22,453
Total Gross Revenue Less Severance Taxes		$168,256
Costs		
Development		
Drilling and completion	$172,000	
Pumping equipment	30,000	
Total development costs		$202,000
Operating		
($.08)(58,054)		4,644
Total Costs		$206,644
Loss per 80-acre well		($ 38,388)

SUMMARY
Recovery and Economic Calculations
Water-Drive
South Prairie-Pennsylvanian Pool

EXHIBIT No. 12

	40 Acres	80 Acres
Gross recovery of original oil in place	51,840 Bbl	103,680 Bbl
Gross gas recovery	77,760 MCF	155,520 MCF
Total gross revenue less severance Taxes	$136,820	$273,642
Total costs	206,147	210,294
Net loss or profit per well	($ 69,327)	$ 63,348

VOLUMETRIC CALCULATIONS
For Oil in Place
South Prairie-Pennsylvanian Pool
Roosevelt County, New Mexico

EXHIBIT No.

$$N_1 = \frac{7758\ \phi\ (1-S_W)\ h}{B_o}$$

$$= \frac{7758 \times .069 \times (1-.26) \times 12}{1.834}$$

$$= 2592 \text{ barrels per acre}$$

<u>40 Acres</u>

$40 \times 2592 = 103,680$ barrels

<u>80 Acres</u>

$80 \times 2592 = 207,360$ barrels

For a water-drive, a recovery factor of 50% is believed to be reasonable for the South Prairie-Pennsylvanian Pool. This would result in a recovery for:

<u>40 Acres</u>

Recoverable Oil $= .50 \times N_1 \times 40$

$= .50 \times 2592 \times 40$

$= 51,840$ barrels

<u>80 Acres</u>

Recoverable Oil $= .50 \times N_1 \times 80$

$= .50 \times 2592 \times 80$

$= 103,680$ barrels

Definition of Symbols:

N_1 - Original oil in place per acre, stock tank barrels
ϕ - Porosity as a fraction, 0.069
Sw - Interstitual water saturation, fraction of pore space - 0.26
h - Net pay thickness, feet - 12
A - Area for which oil in place is being calculated - 40 acres and 80 acres
B_o - Original oil formation volume factor, barrels of reservoir space per barrel of stock tank oil - 1.834
7758 - Number of barrels per acre-foot

Economics of Development
South Prairie-Pennsylvanian Pool
Roosevelt County, New Mexico

EXHIBIT No.

40 Acres

Revenue

Oil		
(51,840)(1-.125)($3.01)	$136,533	
Less severance taxes at $.1397/BO	6,337	
Gross oil revenue less severance taxes		$130,196
Gas		
(51,840)(1-.125)(1500)($.10)	$ 6,804	
Less severance taxes at .0264 of value	180	
Gross gas revenue less severance taxes		$ 6,624
Total Gross Revenue Less Severance Taxes		$136,820

Costs

Development		
Drilling and completion	$172,000	
Pumping equipment	30,000	$202,000
Operating		
($.08)(51,840)		4,147
Total Costs		$206,147
Loss per 40-acre well		($ 69,327)

80 Acres

Revenue

Oil		
(103,680)(1-.125)($3.01)	$273,067	
Less severance taxes at $.1397/BO	12,674	
Gross oil revenue less severance taxes		$260,393
Gas		
(103,680)(1-.125)(1500)($.10)	$ 13,608	
Less severance taxes at .0264 of value	359	
Gross gas revenue less severance taxes		$ 13,249
Total Gross Revenue Less Severance Taxes		$273,642

Costs

Development		
Drilling and completion	$172,000	
Pumping equipment	30,000	
		$202,000
		8,294
		$210,294
Operating		
(.08)(103,680)		
Total Costs		$ 63,348

Profit per 80-acre well

Conditions	40 Acres	80 Acres
Recoverable oil in place	51,840 Bbl	103,680 Bbl
Average gas-oil ratio throughout life	1,500 CFPB	1,500 CFPB
Oil price	$3.01/Bbl	$3.01/Bbl
Casinghead gas price	$.10/MCF	$.10/MCF
Operating costs	$.08/Bbl	$.08/Bbl
Royalty	1/8	1/8
All wells completed at same time		

Economic Comparison
Bluitt and South Prairie-Pennsylvanian Pool

EXHIBIT No. 13

Bluitt Pool	40 acres	80 Acres
Average cost per well	$190,000	$190,000
Average net revenue per well	140,482	280,963
Profit or loss per well	($ 49,518)	$ 90,963

South Prairie-Pennsylvanian Pool		
Average Cost per well	$202,000	$202,000
Average net revenue per well	$132,673	$265,348
Profit or loss per well	($ 69,327)	$ 63,348

SPECIAL RULES AND REGULATIONS FOR THE SOUTH PRAIRIE-PENNSYLVANIAN POOL

RULE 1. Each well completed or recompleted in the South Prairie-Pennsylvanian Pool or in the Pennsylvanian formation within one mile of the South Prairie-Pennsylvanian Pool, and not nearer to nor within the limits of another designated Pennsylvanian pool, shall be spaced, drilled, operated, and prorated in accordance with the Special Rules and Regulations hereinafter set forth.

RULE 2. Each well completed or recompleted in the South Prairie-Pennsylvanian Pool shall be located in a unit containing 80 acres, more or less, which consists of the S/2, N/2, E/2, or W/2 of a single governmental quarter section; provided, however, that nothing contained herein shall be construed as prohibiting the drilling of a well on each of the quarter-quarter sections in the unit.

RULE 3. The initial well on any 80-acre unit in said pool shall be located within 150 feet of the center of either the SW/4 or the NE/4 of the quarter section on which the well is located. Any well which was drilling to or completed in the South Prairie-Pennsylvanian Pool prior to September 1, 1959, is granted an exception to the well location requirements of this Rule.

RULE 4. For good cause shown, the Secretary-Director may grant exception to the requirements of Rule 2 without notice and hearing when the application is for a non-standard unit comprising a single quarter-quarter section or lot or when the application is for the purpose of joining fractional lots not exceeding 20.49 acres each with a standard unit. All operators offsetting the proposed non-standard unit shall be notified of the application by registered mail and the application shall state that such notice has been furnished. The Secretary-Director may approve the application if, after a period of 30 days, no offset operator has entered an objection to the formation of such non-standard unit.
The allowable assigned to any such non-standard unit shall bear the same ratio to a standard allowable in the South Prairie-Pennsylvanian Pool as the acreage in such non-standard unit bears to 80 acres.

RULE 5. An 80-acre proration unit (79 through 81 acres) in the South Prairie-Pennsylvanian Pool shall be assigned an 80-acre proportional factor of 4.77 for allowable purposes, and in the event there is more than one well on an 80-acre proration unit, the operator may produce the allowable assigned to the unit from the wells on the unit in any proportion.

Similar to [illegible] rules
except for #5 above.

Form F-11B

CORE LABORATORIES, INC.
Petroleum Reservoir Engineering
DALLAS, TEXAS

8

Page 1 of 1 File WP-3-1579
Well New Mexico Federal "NM" No. 1

CORE SUMMARY AND CALCULATED RECOVERABLE OIL

FORMATION NAME AND DEPTH INTERVAL: Bough 9655.0-9685.0

FEET OF CORE RECOVERED FROM ABOVE INTERVAL		30.0	AVERAGE TOTAL WATER SATURATION: PER CENT OF PORE SPACE		44.4
FEET OF CORE INCLUDED IN AVERAGES		13.9	AVERAGE CONNATE WATER SATURATION: PER CENT OF PORE SPACE	(c)	44.4
AVERAGE PERMEABILITY: MILLIDARCYS	Max. 90°	83 61	OIL GRAVITY: °API	(e)	42
PRODUCTIVE CAPACITY: MILLIDARCY-FEET	Max. 90°	1154 848	ORIGINAL SOLUTION GAS-OIL RATIO: CUBIC FEET PER BARREL	(e)	1600
AVERAGE POROSITY: PER CENT		4.5	ORIGINAL FORMATION VOLUME FACTOR: BARRELS SATURATED OIL PER BARREL STOCK-TANK OIL	(e)	1.92
AVERAGE RESIDUAL OIL SATURATION: PER CENT OF PORE SPACE		7.8	CALCULATED ORIGINAL STOCK-TANK OIL IN PLACE: BARRELS PER ACRE-FOOT		101

Calculated maximum solution gas drive recovery is barrels per acre-foot, assuming production could be continued until reservoir pressure declined to zero psig. Calculated maximum water drive recovery is barrels per acre-foot, assuming full maintenance of original reservoir pressure, 100% areal and vertical coverage, and continuation of production to 100% water cut. *(Please refer to footnotes for further discussion of recovery estimates.)*

FORMATION NAME AND DEPTH INTERVAL:

FEET OF CORE RECOVERED FROM ABOVE INTERVAL			AVERAGE TOTAL WATER SATURATION: PER CENT OF PORE SPACE		
FEET OF CORE INCLUDED IN AVERAGES			AVERAGE CONNATE WATER SATURATION: PER CENT OF PORE SPACE		
AVERAGE PERMEABILITY: MILLIDARCYS			OIL GRAVITY: °API		
PRODUCTIVE CAPACITY: MILLIDARCY-FEET			ORIGINAL SOLUTION GAS-OIL RATIO: CUBIC FEET PER BARREL		
AVERAGE POROSITY: PER CENT			ORIGINAL FORMATION VOLUME FACTOR: BARRELS SATURATED OIL PER BARREL STOCK-TANK OIL		
AVERAGE RESIDUAL OIL SATURATION: PER CENT OF PORE SPACE			CALCULATED ORIGINAL STOCK-TANK OIL IN PLACE: BARRELS PER ACRE-FOOT		

Calculated maximum solution gas drive recovery is barrels per acre-foot, assuming production could be continued until reservoir pressure declined to zero psig. Calculated maximum water drive recovery is barrels per acre-foot, assuming full maintenance of original reservoir pressure, 100% areal and vertical coverage, and continuation of production to 100% water cut. *(Please refer to footnotes for further discussion of recovery estimates.)*

(c) Calculated (e) Estimated (m) Measured (*) Refer to attached letter.

These recovery estimates represent theoretical maximum values for solution gas and water drive. They assume that production is started at original reservoir pressure; i.e., no account is taken of production to date or of prior drainage to other areas. The effects of factors tending to reduce actual ultimate recovery, such as economic limits on oil production rates, gas-oil ratios, or water-oil ratios, have not been taken into account. Neither have factors been considered which may result in actual recovery intermediate between solution gas and complete water drive recoveries, such as gas cap expansion, gravity drainage, or partial water drive. Detailed predictions of ultimate oil recovery to specific abandonment conditions may be made in an engineering study in which consideration is given to overall reservoir characteristics and economic factors.

CORE LABORATORIES, INC. CORE LAB *Petroleum Reservoir Engineering*

COMPANY LONE STAR PRODUCING COMPANY
WELL NEW MEXICO FEDERAL "NEW" NO. 1
FIELD UNDESIGNATED
COUNTY ROOSEVELT STATE NEW MEXICO
LOCATION SEC. 21-T8S-R36E

DATE 11-13-60
FORMATION DOUGH
DRLG. FLUID WATER BASE MUD*
REMARKS SAMPLED AS DIRECTED BY CLIENT
*-9% OIL ADDED

FILE NO WF-3-1579
ENGRS BOONE
ELEV 4121' DF
CASING 5 1/2"

COMPLETION COREGRAPH

SAND SHALE LIMESTONE DOLOMITE CONGLOMERATE COALITES CHERT ANHYDRITE

SAMPLE DESCRIPTION F Fractured L Laminated FG. MG. CG Type Grain Size S Sylvatic V Vugular

DESCRIPTION O Oil W Water G Gas T Tight Zone

SAMPLE NUMBER	DEPTH FEET	PERMEABILITY MILLIDARCYS Horizontal Perm Plug HORIZONTAL Max. 90°	VERTICAL FRACTURE PERMEABILITY	RESIDUAL SATURATION % PORE SPACE OIL	RESIDUAL SATURATION % PORE SPACE WATER	PERMEABILITY ○—○ MILLIDARCYS 10 5	POROSITY X---X PERCENT 10 5	TOTAL WATER ○---○ PERCENT PORE SPACE 75 50 25	OIL SATURATION X---X PERCENT PORE SPACE 25 50 75
		WHOLE-CORE ANALYSIS							
1	9655.0-56.9	<0.1	<0.1	2.6	0.0	87.5	F		
1A		<0.1	<0.1						
2	9656.9-58.5	<0.1	<0.1	3.1	0.0	71.2	F		
3	58.5-60.2	<0.1	<0.1	1.7	0.0	[illegible]			
3A		<0.1	<0.1						
4	9660.2-61.5	<0.1	<0.1	1.7	1.2	46.7			

9655
9660

CORE LABORATORIES, INC. — *Petroleum Reservoir Engineering*

COMPANY	LONE STAR PRODUCING COMPANY		FILE NO. WF-3-1579
WELL	NEW MEXICO FEDERAL "EE" NO. 1	DATE 11-13-60	ENGRS. BOONE
FIELD	UNDESIGNATED	FORMATION DOUGH	ELEV. 4121' DF
COUNTY	ROOSEVELT STATE NEW MEXICO	DRLG. FLUID WATER BASE MUD*	CORES DIAMOND 3 1/2"
LOCATION	SEC. 23-T5S-R36E	REMARKS SAMPLED AS DIRECTED BY CLIENT *-9% OIL ADDED	

COMPLETION COREGRAPH

SAND · LIMESTONE · CONGLOMERATE · CHERT · SHALE · DOLOMITE

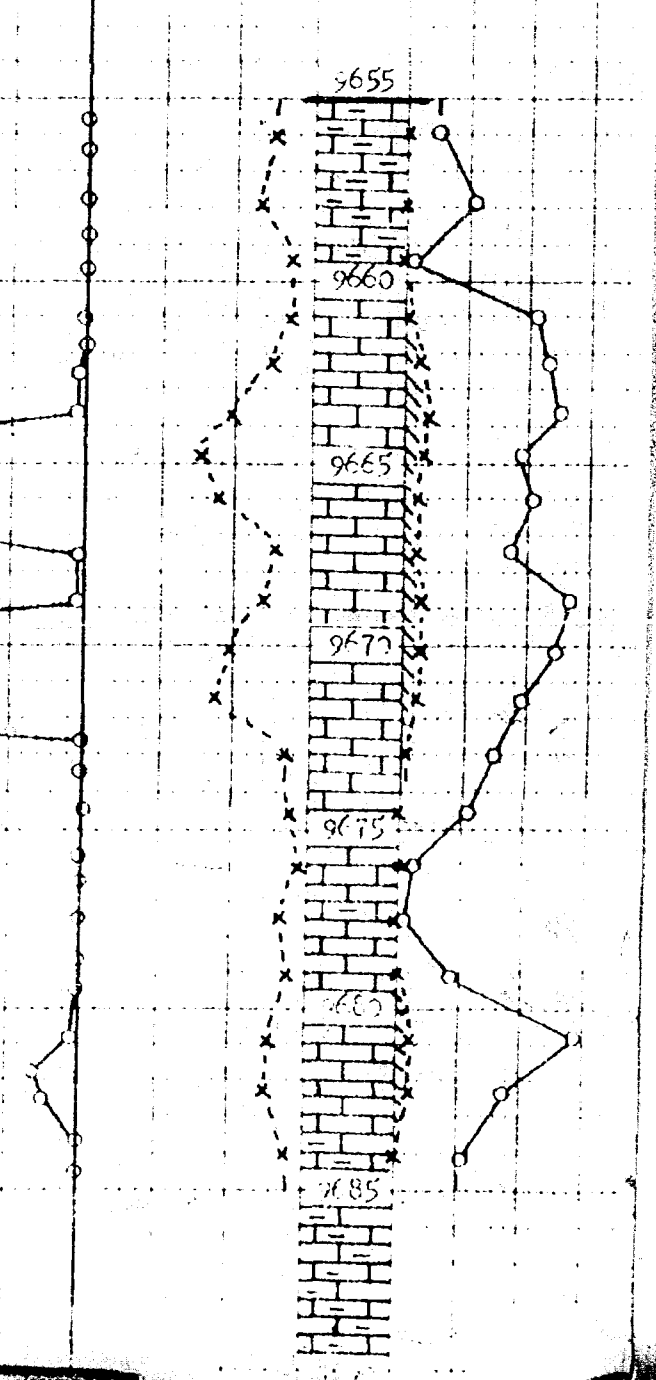
SAMPLE DESCRIPTION: F Fractured L Laminated FG MG CG Fine Medium Coarse Grain Size S Stylolite V Vugular

CORE DESCRIPTION: O Oil W Water G Gas T Tight Streak

SAMPLE NO.	DEPTH FEET	PERMEABILITY MILLIDARCYS Horizontal Perm Plug HORIZONTAL MAX. 90°	VERTICAL	RESIDUAL SATURATION % PORE SPACE OIL	WATER	PERMEABILITY ○—○ MILLIDARCYS 10 5	POROSITY X---X PER CENT 10 5	DESCRIPTION
		WHOLE-CORE ANALYSIS						
1	9655.0-56.9	<0.1	<0.1	2.6	9.0	87.5		F
1A		<0.1	<0.1					
2	9656.9-58.5	<0.1	<0.1	3.1	9.9	71.2		F
3	58.5-60.2	<0.1	<0.1	1.7	9.3	76.3		
3A		<0.1	<0.1					
4	9660.2-61.5	<0.1	<0.1	1.7	1.2	46.7		
5	61.5-63.0	<0.1	<0.1	2.6	7.7	60.3		SV
5A		0.4	0.4					
6	9663.0-64.2	0.5	0.3	5.0	11.6	36.9		FV
7	64.2-65.4	1035	1035	7.9	8.8	53.1		FV
7A		242	38					
8	9665.4-66.6	28	17	6.8	6.9	48.2		FV
9	66.6-68.0	0.2	0.2	2.1	6.3	57.9		SV
10	68.0-69.4	0.7	0.6	3.0	8.6	33.8		V
11	69.4-72.9	183	46	5.1	8.5	39.7		FV
11A		27	17					
12	9670.9-72.1	59	24	6.6	7.7	50.8		FV
13	72.1-73.7	<0.1	<0.1	1.7	1.2	61.2		FVS
13A		<0.1	<0.1					
14	9673.7-75.4	<0.1	<0.1	1.0	9.0	73.2		VS
15	75.4-76.7	<0.1	<0.1	0.8	9.0	94.8		
15A		<0.1	<0.1					
16	9676.7-78.2	<0.1	<0.1	1.8	9.3	97.9		
17	78.2-80.0	<0.1	<0.1	1.0	9.3	79.4		
17A		<0.1	<0.1					
18	9680.0-81.5	0.4	0.3	2.7	7.4	29.5		VS
19	81.5-83.3	0.5	0.5	2.9	5.8	55.2		FV
19A		0.8	0.7					
20	9683.3-84.9	<0.1	<0.1	1.4	9.0	74.0		
20A		<0.1	<0.1					

TOTAL WATER ○---○ PER CENT PORE SPACE 75 50 25

OIL SATURATION X---X PER CENT PORE SPACE 25 50 75



Case 2139
Heard 12-12-60
12-15-60

1. Recommend that South Prairie Penn. Pool be spaced on 80 acres

2. I believe the Rules as written for the Bluitt-Penn Pool should be applicable to this Pool. Order R-1472 (Byram page 77)

3. 80 Acre plats should be filed by Jan. 15, 1961 in order to get an 8 a.a. on Feb. 1, 1961. File with Hobbs Office.

Ernest A. Mechem.

No. 3[illegible]-60

DOCKET: EXAMINER HEARING, MONDAY, DECEMBER 12, 1960

Oil Conservation Commission - 9 a.m., STATE LAND OFFICE BUILDING, SANTA FE, NM

The following cases will be heard before Elvis A. Utz, Examiner, or Oliver E. Payne, attorney, as alternate examiner:

CASE 2136: Application of Byard Bennett for a non-standard gas proration unit and for an unorthodox gas well location. Applicant, in the above-styled cause, seeks the establishment of an 80-acre non-standard gas proration unit in the Jalmat Gas Pool consisting of the E/2 NW/4 of Section 24, Township 25 South, Range 36 East, Lea County, New Mexico, said unit to be dedicated to the Ascarte-Federal Well No. 1, located at an unorthodox location at a point 330 feet from the North line and 2310 feet from the West line of said Section 24.

CASE 2137: Application of Caulkins Oil Company for a non-standard gas proration unit. Applicant, in the above-styled cause, seeks the establishment of a 320-acre non-standard gas proration unit in the Basin-Dakota Pool, San Juan and Rio Arriba Counties, New Mexico, comprising the SE/4, S/2 NE/4 and S/2 SW/4 of Section 16, Township 26 North, Range 6 West. Said unit is to be dedicated to the D-268 well located in the SE/4 NE/4 of said Section 16.

CASE 2138: Application of Skelly Oil Company for permission to commingle the production from two separate pools. Applicant, in the above-styled cause, seeks permission to commingle without separately measuring the production from the Penrose Skelly and Drinkard Pools from all wells presently completed on its Baker "B" Lease consisting of the SW/4 and the W/2 SE/4 of Section 10, Township 22 South, Range 37 East, Lea County, New Mexico.

CASE 2139: Application of Cosden Petroleum Corporation for the promulgation of special rules and regulations governing the South Prairie-Pennsylvanian Pool, Roosevelt County, New Mexico, including a provision for 80-acre oil proration units.

CASE 2140: Application of Humble Oil & Refining Company for approval of the North Kirtland Unit Agreement. Applicant, in the above-styled cause, seeks approval of the North Kirtland Unit Agreement, which unit embraces 11,478 acres of Federal and State land in Township 30 North, Range 14 West, San Juan, New Mexico.

CASE 2141: Application of Honolulu Oil Corporation for approval of a unit agreement. Applicant, in the above-styled cause, seeks approval of its McKittrick Canyon Unit Agreement, which unit is to embrace 6708 acres of Federal, State and fee lands in Township 22 South, Ranges 25 and 26 East, Eddy County, New Mexico.

CASE 2145: Application of Oil Development Company of Texas for off-lease storage of oil. Applicant, in the above-styled cause, seeks an order authorizing it to store the East Crossroads-Devonian production from its Santa Fe Pacific Railroad Lease (S/2 SW/4 of Section 19, Township 9 South, Range 37 East) in a separate tank battery to be located on its Santa Fe Pacific Railroad Lease, Crossroads-Devonian Pool (NE/4 of Section 26, Township 9 South, Range 36 East) both in Lea County, New Mexico.

CASE 2146: Application of Humble Oil & Refining Company for an oil-oil dual completion. Applicant, in the above-styled cause, seeks an order authorizing the dual completion of its D. H. Crockett Well #1, located in Unit C, Section 21, Township 15 South, Range 36 East, Lea County, New Mexico, in such a manner as to permit the production of oil from the Caudill-Wolfcamp Pool and the production of oil from the Caudill-Devonian Pool through the annulus between strings of 5½-inch casing and 2½-inch tubing and through 2½-inch tubing, respectively.

BEFORE THE OIL CONSERVATION COMMISSION
OF THE STATE OF NEW MEXICO

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

CASE No. 2139
Order No. R-1846

APPLICATION OF COSDEN PETROLEUM CORPORATION FOR AN ORDER ESTABLISHING SPECIAL RULES AND REGULATIONS FOR THE SOUTH PRAIRIE-PENNSYLVANIAN POOL, ROOSEVELT COUNTY, NEW MEXICO, TO PROVIDE FOR 80-ACRE PRORATION UNITS.

ORDER OF THE COMMISSION

BY THE COMMISSION:

This cause came on for hearing at 9 o'clock a.m. on December 12, 1960, at Santa Fe, New Mexico, before Elvis A. Utz, Examiner duly appointed by the Oil Conservation Commission of New Mexico, hereinafter referred to as the "Commission," in accordance with Rule 1214 of the Commission Rules and Regulations.

NOW, on this 21st day of December, 1960, the Commission, a quorum being present, having considered the application, the evidence adduced, and the recommendations of the Examiner, Elvis A. Utz, and being fully advised in the premises,

FINDS:

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

(2) That the applicant, Cosden Petroleum Corporation, seeks the promulgation of special rules and regulations for the South Prairie-Pennsylvanian Pool in Roosevelt County, New Mexico, to provide for 80-acre proration units.

(3) That the applicant has proved by a preponderance of the evidence that the South Prairie-Pennsylvanian Pool can be efficiently and economically drained and developed on 80-acre proration units.

(4) That to require development of the South Prairie-Pennsylvanian Pool on 40-acre proration units might cause the drilling of unnecessary wells.

(5) That the evidence presented indicates that it is uneconomical to drill wells on 40-acre proration units in the South Prairie-Pennsylvanian Pool and to remain on such a spacing pattern might impede further development in said pool.

(6) That 80-acre proration units should be established in the South Prairie-Pennsylvanian Pool.

IT IS THEREFORE ORDERED:

That special rules and regulations for the South Prairie-Pennsylvanian Pool in Roosevelt County, New Mexico, be and the same are hereby promulgated as follows, effective December 31, 1960.

SPECIAL RULES AND REGULATIONS FOR THE SOUTH PRAIRIE-PENNSYLVANIAN POOL

RULE 1. Each well completed or recompleted in the South Prairie-Pennsylvanian Pool or in the Pennsylvanian formation within one mile of the South Prairie-Pennsylvanian Pool, and not nearer to nor within the limits of another designated Pennsylvanian pool, shall be spaced, drilled, operated, and prorated in accordance with the Special Rules and Regulations hereinafter set forth.

RULE 2. Each well completed or recompleted in the South Prairie-Pennsylvanian Pool shall be located on a unit containing 80 acres, more or less, which consists of the N/2, S/2, E/2, or W/2 of a single governmental quarter section; provided, however, that nothing contained herein shall be construed as prohibiting the drilling of a well on each of the quarter-quarter sections in the unit.

RULE 3. The initial well on any 80-acre unit in said pool shall be located within 150 feet of the center of the quarter-quarter section on which the well is located. Any well which was drilling to or completed in the South Prairie-Pennsylvanian Pool prior to December 31, 1960, is granted an exception to the well location requirements of this Rule.

RULE 4. For good cause shown, the Secretary-Director may grant exception to the requirements of Rule 2 without notice and hearing when the application is for a non-standard unit comprising a single quarter-quarter section or lot. All operators offsetting the proposed non-standard unit shall be notified of the application by registered mail, and the application shall state that such notice has been furnished. The Secretary-Director may approve the application if, after a period of 30 days, no offset operator has entered an objection to the formation of such non-standard unit.

The allowable assigned to any such non-standard unit shall bear the same ratio to a standard allowable in the South Prairie-Pennsylvanian Pool as the acreage in such non-standard unit bears to 80 acres.

RULE 5. An 80-acre proration unit (79 through 81 acres) in the South Prairie-Pennsylvanian Pool shall be assigned an 80-acre proportional factor of 4.77 for allowable purposes, and in the event there is more than one well on an 80-acre proration unit, the operator may produce the allowable assigned to the unit from the wells on the unit in any proportion.

IT IS FURTHER ORDERED:

That operators who propose to dedicate 80 acres to a well in the South Prairie-Pennsylvanian Pool must file an amended Commission Form C-128 with the Hobbs District Office of the Commission by January 15, 1961, in order that the well may be assigned an 80-acre allowable on the February proration schedule.

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

STATE OF NEW MEXICO
OIL CONSERVATION COMMISSION

JOHN BURROUGHS, Chairman

MURRAY E. MORGAN, Member

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

esr/

DRAFT

RSM/esr
December 16

BEFORE THE OIL CONSERVATION COMMISSION
OF THE STATE OF NEW MEXICO

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

CASE No. 2139
Order No. R- 1846

APPLICATION OF COSDEN PETROLEUM CORPORATION FOR AN ORDER ESTABLISHING SPECIAL RULES AND REGULATIONS FOR THE SOUTH PRAIRIE-PENNSYLVANIAN POOL, ROOSEVELT COUNTY, NEW MEXICO, TO PROVIDE FOR 80-ACRE PRORATION UNITS.

ORDER OF THE COMMISSION

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NOW, on this _____ day of December, 1960, the Commission, a quorum being present, having considered the application, the evidence adduced, and the recommendations of the Examiner, Elvis A. Utz, and being fully advised in the premises,

FINDS:

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

(2) That the applicant, Cosden Petroleum Corporation, seeks the promulgation of special rules and regulations for the South Prairie-Pennsylvanian Pool in Roosevelt County, New Mexico, to provide for 80-acre proration units.

(3) That the applicant has proved by a preponderance of the evidence that the South Prairie-Pennsylvanian Pool can be efficiently and economically drained and developed on 80-acre proration units.

(4) That to require development of the South Prairie-Pennsylvanian Pool on 40-acre proration units might cause the drilling of unnecessary wells.

(5) That the evidence presented indicates that it is uneconomical to drill wells on 40-acre proration units in the

South Prairie-Pennsylvanian Pool and to remain on such a spacing pattern might impede further development in said pool.

(6) That 80-acre proration units should be established in the South Prairie-Pennsylvanian Pool.

IT IS THEREFORE ORDERED:

That special rules and regulations for the South Prairie-Pennsylvanian Pool in Roosevelt County, New Mexico, be and the same are hereby promulgated as follows, effective December 31, 1960.

SPECIAL RULES AND REGULATIONS FOR THE SOUTH PRAIRIE-PENNSYLVANIAN POOL

RULE 1. Each well completed or recompleted in the South Prairie-Pennsylvanian Pool or in the Pennsylvanian formation within one mile of the South Prairie-Pennsylvanian Pool, and not nearer to nor within the limits of another designated Pennsylvanian pool, shall be spaced, drilled, operated, and prorated in accordance with the Special Rules and Regulations hereinafter set forth.

RULE 2. Each well completed or recompleted in the South Prairie-Pennsylvanian Pool shall be located on a unit containing 80 acres, more or less, which consists of the N/2, S/2, E/2, or W/2 of a single governmental quarter section; provided, however, that nothing contained herein shall be construed as prohibiting the drilling of a well on each of the quarter-quarter sections in the unit.

RULE 3. The initial well on any 80-acre unit in said pool shall be located within 150 feet of the center of ~~either the NW/4 or the SE/4 of~~ the quarter section on which the well is located. Any well which was drilling to or completed in the South Prairie-Pennsylvanian Pool prior to December 31, 1960, is granted an exception to the well location requirements of this Rule.

RULE 4. For good cause shown, the Secretary-Director may grant exception to the requirements of Rule 2 without notice and hearing when the application is for a non-standard unit comprising a single quarter-quarter section or lot. All operators offsetting the proposed non-standard unit shall be notified of the application

by registered mail, and the application shall state that such notice has been furnished. The Secretary-Director may approve the application if, after a period of 30 days, no offset operator has entered an objection to the formation of such non-standard unit.

The allowable assigned to any such non-standard unit shall bear the same ratio to a standard allowable in the South Prairie-Pennsylvanian Pool as the acreage in such non-standard unit bears to 80 acres.

RULE 5. An 80-acre proration unit (79 through 81 acres) in the South Prairie-Pennsylvanian Pool shall be assigned an 80-acre proportional factor of 4.77 for allowable purposes, and in the event there is more than one well on an 80-acre proration unit, the operator may produce the allowable assigned to the unit from the wells on the unit in any proportion.

IT IS FURTHER ORDERED:

That operators who propose to dedicate 80 acres to a well in the South Prairie-Pennsylvanian Pool must file an amended Commission Form C-128 with the Hobbs District Office of the Commission by January 15, 1961, in order that the well may be assigned an 80-acre allowable on the February proration schedule.

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

Case 3139

J. M. HERVEY 1874-1953
HIRAM M. DOW
CLARENCE E. HINKLE
W. E. BONDURANT, JR.
GEORGE H. HUNKER, JR.
HOWARD C. BRATTON
S. B. CHRISTY IV
LEWIS C. COX, JR.
PAUL W. EATON, JR.
CONRAD E. COFFIELD

LAW OFFICES
HERVEY, DOW & HINKLE
HINKLE BUILDING
ROSWELL, NEW MEXICO

TELEPHONE MAIN 2-6510
POST OFFICE BOX 547

November 22, 1960

Re: Application of Cosden Petroleum Corporation for the Promulgation of Special Rules and Regulations Governing the South Prairie-Pennsylvanian Pool embracing the NE¼ of Section 20, T. 8 S., R. 36 E., N.MP.M., Roosevelt County, New Mexico

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

Dear Mr. Porter:

Cosden Petroleum Corporation hereby requests that a hearing be scheduled by the New Mexico Oil Conservation Commission at the earliest possible date.

It is requested that the hearing be called for the purpose of promulgating special rules and regulations to govern the South Prairie-Pennsylvanian Pool comprising the NE¼ of Section 20, T. 8 S., R. 36 E., N.M.P.M. It is requested that the special rules and regulations issued provide for 80-acre spacing and proration units to consist of either the E½, W½, N½, or S½ of each governmental quarter-quarter section.

It is further requested that an 80-acre proration unit be assigned an 80-acre proportional depth factor for allowable purposes in accordance with the statewide rule.

It is requested that the above matter be set down for hearing at the earliest available date, either before an Examiner or before the full Commission at your discretion.

Very truly yours,

COSDEN PETROLEUM CORPORATION

By _____
Hervey, Dow & Hinkle
P. O. Box 547
Roswell, New Mexico

Attorneys for Applicant, Cosden Petroleum Corporation

12-5-60

HCB:db

6-A

COSDEN PETROLEUM CORPORATION

Federal "C" No. 1

T.D. 9,900'
Csg. 5-1/2" @ 9,890'
Perf. 9653'-72'

Completion: 9-18-60 - Acidized with 1000 gal MCA, let acid set on perfs 1 hr. - Max. treating press. 5400 psi Min. treating press. 2,000 psi, treated at 2 BPM at 2200 psi. Swabbed 6 times and well kicked off and began flowing.

Potential Test:
9-19-60 - Flowed 282 BO & no water in 6 hrs., 28/64" Ch. T.P. 750# psi, C.P. pkr - GOR 1650 CFPB

Federal "D" No. 1

T.D. 9,760'
Csg. 5-1/2" @ 9,760'
Perf. 9700'-05'

Completion: 11-13-60 Spotted 200 gallons MCA opposite perf. There is some doubt that any acid reached the producing formation because during the completion of the well by swabbing, raw unspent acid was recovered. After swabbing well kicked off and began flowing.

Potential Test:
11-17-60 Flowed 190 BO & no water in 12 hrs, 24/64" Ch. T.P. 750 psi, C.P. pkr, GOR 1190 CFPB

GOVERNOR
JOHN BURROUGHS
CHAIRMAN

State of New Mexico
Oil Conservation Commission

LAND COMMISSIONER
MURRAY E. MORGAN
MEMBER

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

P. O. BOX 871
SANTA FE

December 21, 1960

Mr. Howard Bratton
Hervey, Dow & Hinkle
Box 547
Roswell, New Mexico

Re: Case No. 2139
Order No. R-1846
Applicant:
Cosden Petroleum Corporation

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

Other Jack Campbell - Roswell, New Mexico

GOVERNOR
JOHN BURROUGHS
CHAIRMAN

State of New Mexico
Oil Conservation Commission

LAND COMMISSIONER
MURRAY E. MORGAN
MEMBER

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

P. O. BOX 871
SANTA FE

December 22, 1960

Mr. Joe Ramey
District Supervisor
Oil Conservation Commission
P. O. Box 2045
Hobbs, New Mexico

Dear Joe:

Enclosed herewith is revised Page 2 of Order No. R-1846, dated December 21, 1960.

We would appreciate it if you would substitute this Page 2 for the original Page 2 which was mailed to you on December 21st, and acknowledge receipt of the revised page.

Very truly yours,

DANIEL S. NUTTER
Chief Engineer

DSN/esr
Enclosure

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

February 22, 1961

Mr. Howard Bratton
Hervey, Dow & Hinkle
P. O. Box 547
Roswell, New Mexico

Dear Mr. Bratton:

On December 22, 1960, we wrote you, enclosing two copies of revised Page 2 of Order No. R-1846, dated December 21, 1960, which we requested that you substitute for the original Page 2 of the order which was mailed to you on December 21. We also requested that you acknowledge receipt of the revised page.

To date we have not heard from you regarding this matter. Please advise us as to whether the revised pages were received.

Very truly yours,

DANIEL S. NUTTER
Chief Engineer

DSN/esr

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

COPY

February 22, 1961

Mr. Jack M. Campbell
P. O. Box 766
Roswell, New Mexico

Dear Mr. Campbell:

On December 22, 1960, we wrote you, enclosing one copy of revised Page 2 of Order No. R-1846, dated December 21, 1960, which we requested that you substitute for the original Page 2 of the order which was mailed to you on December 22. We also requested that you acknowledge receipt of the revised page.

To date we have not heard from you regarding this matter. Please advise us as to whether the revised page was received.

Very truly yours,

DANIEL S. NUTTER
Chief Engineer

DSN/esr

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

Byram acknowledged receipt of revised P. 2

December 22, 1960

COPY

Mr. R. W. Byram
R. W. Byram & Company
Capitol Station
Drawer M
Austin, Texas

Dear Mr. Byram:

Enclosed herewith is revised Page 2 of Order No. R-1846, dated December 21, 1960.

We would appreciate it if you would substitute this Page 2 for the original Page 2 which was mailed to you on December 21st, and acknowledge receipt of the revised page.

Very truly yours,

DANIEL S. NUTTER
Chief Engineer

DSN/esr
Enclosure

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

COPY

December 22, 1960

Mr. Howard Bratton
Hervey, Dow & Hinkle
Box 547
Roswell, New Mexico

Dear Mr. Bratton:

Enclosed herewith is revised Page 2 of Order No. R-1846, dated December 21, 1960.

We would appreciate it if you would substitute this Page 2 for the original Page 2 which was mailed to you on December 21st, and acknowledge receipt of the revised page.

Very truly yours,

DANIEL S. NUTTER
Chief Engineer

DSN/esr
Enclosure

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

COPY

December 22, 1960

Mr. Jack Campbell
P. O. Box 766
Roswell, New Mexico

Dear Mr. Campbell:

Enclosed herewith is revised Page 2 of Order No. R-1846, dated December 21, 1960.

We would appreciate it if you would substitute this Page 2 for the original Page 2 which was mailed to you on December 21st, and acknowledge receipt of the revised page.

Very truly yours,

DANIEL S. NUTTER
Chief Engineer

DSN/esr
Enclosure

LAW OFFICES OF
CAMPBELL & RUSSELL
J. P. WHITE BUILDING - P. O. BOX 766
ROSWELL, NEW MEXICO

TELEPHONES
MAIN 2-4641
MAIN 2-4642

JACK M. CAMPBELL
JOHN F. RUSSELL

February 28, 1961

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

ATTN: Mr. Daniel S. Nutter
Chief Engineer

Dear Mr. Nutter:

Receipt is hereby acknowledged of one copy of revised page 2 of Order No. R-1846 dated December 21, 1960, substituted for the original page 2 of the order previously received.

Very truly yours,

CAMPBELL & RUSSELL

John F. Russell

JFR:np

J. M. HERVEY, 1874-1953
HIRAM M. DOW
CLARENCE E. HINKLE
W. E. BONDURANT, JR.
GEORGE H. HUNKER, JR.
HOWARD C. BRATTON
S. B. CHRISTY IV
LEWIS C. COX, JR.
PAUL W. EATON, JR.
CONRAD E. COFFIELD

LAW OFFICES
HERVEY, DOW & HINKLE
HINKLE BUILDING
ROSWELL, NEW MEXICO

TELEPHONE MAIN 2-6510
POST OFFICE BOX 10

February 27, 1961

Mr. Daniel S. Nutter
Chief Engineer
Oil Conservation Commission
P. O. Box 871
Santa Fe, New Mexico

Dear Mr. Nutter:

This will acknowledge receipt of your letter to Mr. Bratton dated February 22, 1961.

Mr. Bratton is out of town, but I have informed him of your letter, and he asked me to advise you that we did receive the revised Page of Order No. R-1846 which you sent him in December.

Sincerely yours,

Betty L. Cleaver

(Miss) Betty L. Cleaver

BEFORE THE
OIL CONSERVATION COMMISSION
SANTA FE, NEW MEXICO
DECEMBER 12, 1960

IN THE MATTER OF:

CASE 2139 Application of Cosden Petroleum Corporation for the promugation of special rules and regulations governing the South Prairie-Pennsylvanian Pool, Roosevelt County, New Mexico, including a provision for 80-acre oil proration units.

BEFORE:

Elvis A. Utz, Examiner.

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

MR. UTZ: Case 2139.

MR. MORRIS: Case 2139. Application of Cosden Petroleum Corporation for the promulgation of special rules and regulations governing the South Prairie-Pennsylvanian Pool, Roosevelt County, New Mexico, including a provision for 80-acre oil proration units.

MR. BRATTON: Howard Bratton, appearing on behalf of Cosden. We will have two witnesses.

(Witnesses sworn)

MR. UTZ: Any other appearances in this case?

MR. CAMPBELL: Mr. Examiner, Jack Campbell of Campbell & Russell, Roswell, appearing on behalf of Lone Star Producing Company.

MR. UTZ: Any others? You may proceed (off the record)

ROBERT WARFIELD,

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

DIRECT EXAMINATION

BY MR. BRATTON:

Q Will you state your name, by whom you are employed and in what capacity?

A My name is Robert Warfield. I am employed by Cosden Petroleum Corporation as an exploration geologist.

Q Have you previously testified before this Commission, Mr. Warfield?

A No, I have not.

Q Will you exploit briefly as to your educational and professional background?

A Bachelor's and Master of Science Degree from the University of Iowa, and have been employed by -- in Midland, Texas for six and a half years. Five and a half of that was with Texaco and approximately the last year with Cosden Petroleum. Four years of that time has been work concerned with New Mexico geology.

Q Have you studied the area in question in this hearing?

A Yes, sir, I have.

Q You are familiar with the application in this case?

A Yes.

MR. BRATTON: Are the witness' qualifications acceptable?

MR. UTZ: Yes, sir, they are.

Q (By Mr. Bratton) Mr. Warfield, in this case Cosden is asking for promulgation of special rules and regulations for the South Prairie-Pennsylvanian in Roosevelt County, New Mexico, is that wat we are asking --

A Yes.

Q -- including a provision for 80-acre proration units?

A That is correct.

(Whereupon, Applicant's Exhibit No. 1 marked for identification)

Q Will you refer to your Exhibit No. 1 on the board, Mr. Warfield, and explain what it is, and what it shows?

A Exhibit No. 1 here is an ownership plat from our company files which shows ownership of the land in the area of the South Prairie-Pennsylvanian Field. This is the discovery well, the Cosden No. 1 "C" Federal.

Q Where is that located?

A It is located 1980 from the North and East lines of Section 20, Township 8 South, Range 36 East, Roosevelt County, New Mexico.

Q All right, sir.

A The area outlined in green comprises the northeast quarter of Section 20, and is the area designated by the Commission as the present pool limits of the South Prairie-Pennsylvanian Pool.

Q That is the area that was on the nomenclature for the des-

ignation as South Prairie-Pennsylvanian Pool, is that correct?

A Correct.

Q Is there anything else reflected on that Exhibit that you care to point out, Mr. Warfield?

A I believe not, unless someone has a question of the ownership of any particular area.

(Whereupon, Applicant's Exhibit No. 2 marked for identification)

Q All right, then, refer to Exhibit No. 2.

A Exhibit No. 2 is a structural contour map of the South Prairie-Pennsylvanian, based on the subsurface control afforded by the three wells that are presently producing in the field.

Q Those are the three wells. Do you have red colors around them?

A Yes, it is the three wells circled in red.

Q All right, sir.

A This plat also shows the locations of wells presently drilling and wells that we believe have been, will be drilled, or have been announced.

Q There are three producing wells in the pool, three completed wells?

A Yes, that is correct.

Q How many drilling wells or announced locations are there?

A There are presently three drilling wells and possibly four. There are two wells in Section 21 presently being drilled

by Lone Star Producing Company. There is a well in the northwest offset of the discovery well presently being drilled by Ohio Drilling Company which at this time is very close to the sxpected pay and Cosden Petroleum is preparing to spot, or possibly has spotted a southwest offset this morning.

Q Mr. Warfield, when you refer to those particular wells, for the purpose of the record, will you identify them by name and location in quarter-quarter sections?

A You mean go through them all now?

Q No, whenever you refer to additional wells, for the purpose of the record, if you would, please.

Q What else is reflected on that contour map, Mr. Warfield?

A We have colored acreage owned in full or in part by Cosden Petroleum Corporation. In yellow we have designated the ownership, both working interest and royalty interest, on this map, and we have designated an outline which we believe from the geological information available at this time would represent the probable limits of the field with the information we have right now.

Q That, of course, is very tentative, Mr. Warfield?

A Yes, that could be larger or smaller.

Q All right, sir. Do you have designated on there a cross-section AA Prime, is that correct?

Q That is right. Cross-section AA Prime is a subsequent exhibit, which is a structural cross-section extening through the

three presently producing wells.

Q From north to south through the three completed wells?

A North to south.

Q All right, sir. Is there anything else you care to point out about that Exhibit?

A I believe not except I might mention that the three wells indicate a possible area of closure in which we know there is porosity and productive oil pay.

(Whereupon, Applicant's Exhibit No. 3 marked for identification)

Q Will you refer to your Exhibit 3, which is your cross-section AA Prime?

A Exhibit 3 is a structural cross-section which has been designated in Exhibit 2, extending from the discovery well, the Cosden No. 1 "C" Federal, through the Lone Star No. 1 Federal N M to the Cosden Petroleum No. 1 Federal"D". This is a north to south cross-section. The vertical scale on this upper section is one inch to one hundred feet. Vertical scale on the lower section is one inch to forty feet. The log at the top is the starred lateral log. The one at the bottom is on the same well and it is the microlateral log, a more detailed log. The purpose of this section was to show both the correlation and continuity of the producing bed and another prominent marker bed which we call the three Brothers sone. The detailed section also shows the continutiy and correlation of the productive bed and the continuity of the porous zones

which are responsible for the oil production. We have also put on both sections the intervals which have been perforated.

Q Mr. Warfield, the zone to which you are referring is the Bough C line which is the formation in question and the productive formation in the South Prairie Pennsylvanian Pool?

A That is right.

Q And your cross-section does reflect the continuity of that pay through the three wells with a north-south dip in the formation?

A Yes, it does. The correlation of the Bough "C" zone and of the other beds in the areas is very clear and very definite.

Q Exhibit 3 reflects continuity and structure?

A Yes, it does.

Q All right, sir. Is there anything else you would care to point out with relation to this Exhibit?

A No, I believe not.

(Whereupon, Applicant's Exhibit No. 4 marked for identification)

Q All right. Refer to your Exhibit No. 4, if you would, Mr. Warfield.

A Exhibit No. 4 is a structural contour map which covers a larger area of Roosevelt and Lea Counties. It is intended to show the geographic relationship of the discovery area to other producfields in the area. The map is contoured on the top of the Bough "C" lime which is the productive zone in the South Prairie zone,

and also is Bluitt Field and the North Allison Field, the same zone producer in the Bough Field and Milne Sand Field.

Q Does that reflect the blanket -- a blanket formation in the Bough "C" lime throughout this area?

A It does. The Bough"C" lime can be clearly correlated as a single bed throughout the entire area of this map with the exception of possibly the very north part where we come up on a granite feature which is a feature of it. The entire area is a blanket lime deposit known as Bough "C" lime which is productive pay in all of those fields.

Q Does your map indicate that in your opinion the South Prairie-Pennsylvanian is a substantially identical pool to the Bluitt and the Allison Pools?

A Yes, it does.

Q You have reflected on that map a cross-section, is that correct?

A That is correct.

Q And you also have reflected another correlation, I believe, in yellow or green?

A Yes. The cross-section we have designated A.B., and extends from South Prairie to Bluitt Field to the Allison Field. We have also designated in green four wells, the Cosden 1 "C" Federal, the well in the Allison Field and two wells in Bluitt Field and these four wells will be a later exhibit.

Q Is there anything else you would care to point out in connection with that Exhibit?

A No, I don't believe so.

Q I might ask, I think it's the Bough Field down in the lower portion of that Exhibit, that is an old field, is it not?

A Yes, it is.

Q One that was discovered and substantially drilled in the late 1940's, I believe?

A Yes.

Q All right, sir, and in the Milne Sand Field is the Bough "C" the principally producing formation, or does it produce from the other zones, for instance?

A It also produces from other zones, the "C" zone is one of the productive zones.

Q The South Prairie-Pennsylvanian, then, in time of discovery and drilling and in productive formation would be substantially similar to the Bluitt and Allison Fields?

A Yes, it would, particularly the Bluitt Field.

Q Is there anything else you would care to point out in connection with that Exhibit?

A No, sir.

(Whereupon, Applicant's Exhibit No. 5 marked for identification)

Q If you will refer to your Exhibit No. 5, please.

A Exhibit No. 5 is a cross-section designated in Exhibit 4

as A B. This section is on the minus 55 datum. It is not a true structural cross-section, but the horizontal distance between wells has been approximated in order to facilitate laying out of wells because of the great distance between the Cosden 1 "C" Federal and the French No. 1 Well. The purpose of this section is to show again the good correlation of the Bough "C" lime throughout the area and to show the correlation again of the Three Brothers zone which lies immediately above. This cross-section also shows the perforations in the Bough "C" lime in the wells in all three fields.

Q All right, sir. Do you further substantiate that correlation, I believe your Exhibit No. 6 is also shown on your contour map, is it not?

(Whereupon, Applicant's Exhibit No. 6 marked for identification)

A Yes, Exhibit No. 6 includes that Cosden No. 1 "C" Federal discovery well of the Prarie Field; Shell No. 1 Mattus and Ohio No. 1 D in the Davis Field are the two wells in the Bluitt Field and the Cactus 2 "A" Sunray State are the wells in the Allison Field.

Q This is not a structural section, it is a section on which the top of the Bough "C" lime is the correlative point. It shows the perforations in three of the wells from the open hole interval in which the third well is completed. The main purpose of this section is to show the continuity of the porous zones throughout these three fields, which we believe it does very clearly.

Q Those logs were selected because you could obtain excel-

lent logs in those wells?

A They were, we believe, the microlateral logs show the porosity and the correlation well and they were selected because there are microlateral logs available on these wells.

Q Is there anything else you would care to point out in connection with that Exhibit?

A No, I don't believe so.

Q Would you care to state anything, Mr. Warfield, about the lithology of the Bough "C" discovered in the South Prairie-Pennsylvanian Pool?

A We did not core the Bough "C" zone. We drilled it, and the samples were examined and the Bough "C" lime is a white to tan crystal limestone which has vuggy, v-u-g-g-y, the geologic term for a large cavernous type porosity. We believe the porosity in the pay is a reault of solution along fraced lines. Then there is also inter crystal line porosity. For the information of the Commission there is a sample of another well in the area.

A I believe this is a part of the core from the Lone Star No. 1 Federal N M which the Lone Star geologist provided us.

Q We will hand that to the Commission, not as an exhibit, but just for information. Were Exhibits 1 through 6 prepared by you or under your supervision?

A They were prepared under my supervision, yes.

Q All right, sir. Is there anything else you would care to

state in connection with this case, Mr. Warfield?

A No. sir.

MR. BRATTON: We would offer in evidence Exhibits 1 through 6, and we have no further questions of Mr. Warfield.

MR. UTZ: Exhibits 1 through 6 will be accepted into the record.

(Whereupon, Applicant's Exhibits 1 through 6 received in evidence)

MR. UTZ: Any questions of the witness?

CROSS EXAMINATION

BY MR. PAYNE:

Q Mr. Warfield, what is the depth of the discovery in the South Prairie-Pennsylvanian?

A The total depth or the actual depth of the Bough "C" lime?

Q No. the total depth of that well.

A The total depth of the Cosden No. 1 Federal "C" is 9899.

Q And what disposition is being made of the oil that is being produced in this area?

A The Cosden No. 1 Federal "C" is a flowing well. It's been on production about two months, I am not sure who is taking the oil.

Q It appears that two of these wells are not in the pool as yet, is that right, the pool as designated?

A Yes, as designated. No, they are not.

Q Your exhibits are designed to show the continuity of the

sand are they not?

A Of the Bough "C" limit it is limestone, but that is one of their primary purposes.

Q They don't actually reflect the area that one well can drain, do they?

A No, they do not. We will have reservoir data to support that later.

Q How far, Mr. Warfield, from the South Prairie to the Buitt?

A To the edge of the Buitt Field is approximately four and a half miles.

Q How far is it from the Bluitt to the Allison?

A To the Allison Field is also about four miles. It would be about two and a half to the presently designated North Allison.

Q That actually doesn't give you the type of controls as a geologist would like to have, does it?

A Well, I think the controls is adequate. In fact, considering the distance involved from the South Prairie well to these other wells, the correlation on the logs is excellent. I don't feel any more control would be needed.

MR. PAYNE: Thank you.

MR. UTZ: Any other questions?

MR. CAMPBELL: Mr. Examiner, I have a few questions I would like to ask.

MR. BRATTON: Mr. Campbell, before you ask that, the Commission was asking, or the Examiner was asking a question about the completion of the Cosden Well, and in order not to throw our exhibits out of order, we have designated one as Exhibit 6-A, which is the completion data on that well. I will ask Mr. Warfield is that the, that completion on the discovery well in the pool, actually it covers both the Federal "C" and Federal "D", doesn't it?

A To my knowledge, this is correct.

BY MR. CAMPBELL:

Q Mr. Warfield, in you capacity as geologist for Cosden, are you called upon to evaluate and make recommendations as to well locations?

A Yes, I am.

Q As I understand it, you are suggesting here that the rules adopted in this pool if they are adopted by the Commission be essentially the same as rules in the Bluitt-Pennsylbanian Pool, is that correct?

A Yes.

Q And that would involve locations of the wells either in the southwest or the northeast quarter of each quarter section with a zone area around the center of that 40-acre tract, in other words, fixed pattern spacing is what you are suggesting here, is that right?

A I think that would be brought up later by Mr. Summers,

the actual spacing.

Q Well, assuming that is the case, I would like to ask you a few questions with regard to well locations in the event the Commission did adopt a fixed pattern spacing. The wells being situated in the northeast quarter and the southwest quarter of quarter section and refer you to your Exhibit No. 2.

A Yes.

Q You have completed your Federal Well in the northeast quarter of the northeast quarter of Section 29. If the order entered by the Commission were to require the drilling of the second well in that quarter section in the southwest quarter of the northeast quarter of Section 29, as distinguished have the possibility of permission to drill the second well as allocated, selected by the operator, would you have more hesitancy on the basis of your present recommendation, your present understanding of the geology here representing a well to be drilled as diagonal offset or direct offset to your Federal "D" Well?

A With present information, it would be my opinion that a direct south offset to this well would be safer at this time. However, there are other wells being drilled on standard pattern which, with their control, would help make that decision for us.

Q It could help make the decision in either way, I presume it would make your diagonal offset even a greater risk than less risk, depending on what you discover as to how the field is developed?

A That is right.

Q In regard to the northwest area of this Exhibit No. 2, I will refer you to the southwest quarter of Section 17, which is not within your suggested pool limits, but is within a mile area and would be covered by pool rules. The Ohio Well No. 1 in Section 20, you say, is about to be completed, is that correct?

A Yes, it was drilling about 9200 feet last week-end, I believe.

Q The information from that well would have, would it not, bearing upon a determination by Lone Star as to the best possible location for a well in the southwest quarter of Section 17, is that not correct?

A Yes, it certainly would.

Q And if it were necessary under pool rules to drill that well either in the northeast of the southwest or the southwest of the southwest, those on your present information, at least, would be moving toward the outer boundaries of the possible pool limits, would they not?

A That is right.

Q Would you feel, as a geologist, that you would proceed with more confidence in recommending well locations on the exterior boundaries of this pool if you had some leaway with regard to the location of the wells rather than being required to locate them at specific locations?

A I believe the Field certainly will come to that point.

Whether it's at that point is debatable.

MR. CAMPBELL: That is all.

MR. UTZ: Any other questions? (No response)

Q (By Mr. Utz) Mr. Warfield, do you have the top of the Bough zone for discovery well Federal "C" No. 1?

A The minus datum on that well?

Q Yes, sir.

A It's minus 5528.

Q What is the elevation?

A The elevation is 4124.

Q Do you have the ground elevation?

A No, sir, I do not.

Q Would it be about ten feet?

A According to the Schlumberger, I believe it's 12.4 feet. above ground level.

Q Would you, as a geologist, recommend the designation of any dry acreage to any well in this pool?

A No, I would not.

MR. UTZ: Any other questions of the witness? (no response)

Q (By Mr. Utz) Do you have any information as to the type of drive the pool has, at this time?

A Mr. Summers will present data, considerable data on that score, I believe. I do not, myself, except by comparison with the other fields.

Q Is Mr. Summers going to recommend the spacing pattern

also?

A Yes, he is.

Q MR. UTZ: Any other questions of the witness? You may be excused.

(Witness excused)

MR. UTZ: Call your next witness.

HAROLD V. SUMMERS

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

DIRECT EXAMINATION

BY MR. BRATTON:

Q Will you state your name, address and occupation?

A My name, Harold V. Summers. I am petroleum engineer for Cosden Petroleum Corporation at Big Springs, Texas.

Q Have you previously testified before this Commission?

A No, sir.

Q Will you state briefly your educational and professional background?

A I graduated from Texas A & M College in 1952. Have worked for Cosden Petroleum Corporation approximately four years as reservoir engineer.

Q Have you studied the area in question in the present application?

A Yes.

Q And you are in charge of this area for Cosden Petroleum

Corporation?

A The reservoir end of it, yes.

Q Then, you are familiar with the application and the subject case?

A Yes, sir.

MR. BRATTON: Are the witness' qualifications acceptable?

MR. UTZ: He is qualified, yes, sir.

Q (By Mr. Bratton) Mr. Summers, taking things out of order and going back to Exhibit 6-A, can you identify that as the datum on the two wells reflected thereon?

A Exhibit 6-A is the completion information with respect to Cosden Federal "C" No. 1 and Cosden "D" No. 1. We give the completion treatment as far as acidizing and the pressures that we used to acidize and complete the well. We also give potential. Potential on Federal "C" No. 1 was on 9/19/60, flowed 282 barrels and no water in 6 hours, 28/64 inch choke with tubing pressure of 750 pounds the casing packer GOR 1650 cubic feet per barrel. You will note on the Exhibit we acidized our "C" No. 1 with a thousand gallons of MCA acid. The Federal "D" No. 1 is 11/13/60 flowed 190 barrels of oil in 12 hours with no water. Choke was 24/64 choke with tubing pressure of 750 PSI, and we also have a packer in the hole there. Our GOR in this particular well was 1190 cubic feet per barrel. I would like to point out that on this particular well here we show this particular well was acidized with 200 barrels of MCA acid. We have reason to believe that the acid in this com-

pletion never reached the actual pay zone because the completion was swabbed with raw acid. We believe that the No. 1 was a completion without any assistance as far as acid is concerned.

Q Refer to your Exhibit No. 7.

(Whereupon, Applicant's Exhibit No. 7 marked for identification)

Q Refer to your Exhibit No. 7, Mr. Summers, which is a table of the reservoir data in the pool.

A Table No. 1 shows the average rock properties of the Bough "C" zone, and you will notice I show the average porosity as being 6.9 %, that is taken from calculations from the logs and one core analysis. The average permeability shows 131 millidarcies, ranges from 0.1 to 1035 taking from this one canal we will present this evidence later. The average interstitial water saturation 26 percent average net thickness, 12 feet. This is depicted from the lpgs from three completed wells in the area. I believe Mr. Warfield gave the declines of the lithology of it as shown here. Structural features are Exhibit 2 of Mr. Warfield's. The fourth part of this particular Exhibit shows the characteristics of the fluids. I would like to mention here these characteristics are similar to the fluids in the Bough, the Allison and the Bluitt Pools. Item 5 of this Exhibit shows a reservoir pressure of the Cosden Federal "C" No. 1 at minus 5540. That datum was picked because it was approximately the center of the perforation of that particular well. We ran, conducted a productivity in thic par -

ticular well which is whown at 7.22.

Q Mr. Summers, you show on that Exhibit No. 7 your reservoir pressure at 3159. That is the original reservoir pressure in the discovery well?

A That is a pressure measured after that particular well had produced 1673 barrels of oil.

Q All right, sir, and that was before any other wells were completed or producing?

A Yes, sir.

Q All right, sir. Now, subsequent to the time you gathered this data, have you obtained information as to pressures in the other two wells which are now completed and which are shown on Exhibit No. 2?

A Yes, sir. We have two more pressures. One is on the Cosden Federal "D" No. 1.

Q Which is that well?

A That particular well is the well located in the northeast quarter of the northeast quarter of Section 29.

Q All right, sir.

A That particular pressure, after forty-eight hour build-up on 12/1/60 was 3140 pounds and minus 5540

Q Now, had there been any production out of that well?

A Yes, sir. There had been approximately 1600 barrels.

Q So that's the same amount of production as there was out of the discovery well before that pressure of 3159 was taken?

A Yes, sir.

Q This well that you are referring to now is the southernmost well in the pool?

A Yes, sir. It's approximately 40, 4500 feet southeast of our discovery well, Cosden "C" No. 1.

MR. UTZ: What was that pressure again?

A 3141

Q (By Mr. Bratton) Do you have a pressure on the Lone Star Well, the middle well of the three wells?

A Yes, sir. I would like to add here, these two pressures were after forty-eight hour build-up to Cosden wells. I have a pressure on the Lone Star Federal No. 1 measuring less than 2560 at 52 hour build-up of corrected to minus data of 5440 this pressure is 3,029.

Q And that well is located where with reference to the discovery well?

A That is located approximately 1900 feet southeast of the Cosden Federal "C" No. 1.

Q So it is the closer of the two wells?

A Yes, sir.

Q And the drawdown pressure to it was accordingly larger?

A Yes, sir.

Q Nonetheless, it apparently had pressure drawdown clear down to the southern well in two months' time?

A Yes, sir.

MR. UTZ: Had that well produced any?

A It had produced, I would say, about, not over 200 barrels. This particular pressure was taken right after the well was completed. It produced some before that.

Q (By Mr. Bratton) This is Lone Star we are talking about?

A Yes.

Q But the Cosden produced about 1600 barrels?

A Yes.

Q Is there anything else you would care to point out in connection with your reservoir data?

A I would like to point out with respect to pressuring here, I believe the pressure show there is common or relatively so for good distance in the area. As I mentioned the Cosden "D" No. 1 is approximately 4500 feet from the discovery well which is "C" No. 1. And that shows a pressure of 18.5 pounds difference. The Lone Star Well which is closer was approximately 1900 feet and has approximately 130 pounds of pressure drop. So that would show that the well would be over good distances. Shows excellent communication for the reservoir.

Q Your average permeability, Mr. Summers, that a weighted average, that 131 millidarcies?

A This average weighted average permeability in excess of one-tenth millidarcies was taken from the core analysis that we will be presenting as Exhibit No. 8.

(Whereupon, Applicant's Exhibit No.

8 marked for identification)

Q Sir, I refer to your Exhibit No. 8, Mr. Summers.

A Exhibit No. 8 is the core graph of the Lone Star Federal No. 1 well and shows the analysis of Core Laboratories as far as the porosity and water saturation and the permeability are concerned. It also shows their calculated original oil in place, using some estimated values on that part.

Q Now, I notice the difference, Mr. Summers, in the both the permeability and the porosity of this one core analysis with this reservoir data that you have shown on Exhibit No. 7. Will you explain those differences?

A Like I said concerning the permeability, that weighted average of permeability is in excess of one-tenth millilarcy, and how Core Laboratory arrived at 83 as maximum I have been unable to determine. Their porosity is average the porosity I present is Gore plus calculation taken from logs run on the three completed wells. I feel that this particular core analysis is not necessarily a true representation of the rock properties. I feel like it's somewhat pessimistic as far as the average properties are concerned based on the logs that have been run in the three wells on the three operators.

Q Actually, if you go on the porosity shown in the Core Laboratories report, you need considerably more than 80-acre spacing?

A Yes, sir. We would probably need one well for the whole

area they have noted some figures in there which are timed estimated. We have some that measure.

Q Is there anything else you would care to state in connection with Core Laboratories analysis?

A No, sir.

(Whereupon, Applicant's Exhibit marked for identification)

Q All right, sir. Refer, then, to your Exhibit No. 9.

A Exhibit No. 9 is a comparison of the rock and fluid properties of Allison, Bluitt, South Prairie-Pennsylvanian Pool. The information for the Allison Bluitt were obtained from the hearings on those pools for spacing previously. The information it has for the South Prairie-Pennsylvanian has been presented earlier. As far as the fluid properties on the South Prairie-Pennsylvanian, they are obtained from the reservoir subsurface sample analysis on Cosden Federal "C" No. 1. This is to show the similarity of the three pools. You will notice that the porosity and the permeability are, even though they are not exactly equal, they were within range of each other.

Q Refer to that permeability shown for the Bluitt. Can you explain why it is considerably higher than shown for the Allison and Prairie-Pennsylvanian?

A I believe the average permeability as shown in the Bluitt was brought out in the hearing of that particular pool. It was brought out that one streaked a permeability up in the range of

6,620 millidarcies. That would raise the average permeability considerably. You move that the average would be down in the neighborhood of what it is presented for the other two pools.

Q You show a somewhat higher porosity in the South Prairie-Pennsylvanian above the Allison and Bluitt if you took the Core Laboratory average you would show a somewhat lower porosity?

A Yes, sir, according to the core averages it would be 14.5 present porosity.

Q So that your porosity could be roughly in the same range as the Allison?

A Yes, sir, it could. We recognize that the log calculations are not exact, and one other thing I would like to point out concerning the porosity here. Mr. Warfield mentioned the vuggy porosity in the particular rock, and in determining porosity from the rock it has vuggy porosity, and it's difficult to get the true values. The large porosity is due to the vugs.

Q Is there anything else you would care to point out in this comparative table, Mr. Summers?

A I would like to point out the similarity of the fluid properties that are presented here, they are very, very close. You will notice that the gravity of the stock tank oil for the three properties range from 48 to 46 or 47 degrees. Formation valume factor 1.821, 1.762 and 1.841. Dissolved gas-oil ratios are very close. 1517 to 1409.

(Whereupon, Applicant's Exhibit

No 10 marked for identification)

Q Refer to your Exhibit No. 10, now, please, Mr. Summers.

A Exhibit No. 10 shows a net pay for the three wells in the pool. These figures were obtained from the microlaterologs that were run on the wells in the pool. And I have picked 11 feet for the Cosden "C" No. 1, 1 feet for the Federal "D" No. 1; and 7 feet for the Lone Star N M No. 1, which gives a mathametic average of 12 feet.

Q Would you explain that 7 feet in the Lone Star Well. That Well is located between the two Cosden wells, isn't it?

A Yes, sir.

Q Would you refer to the log and explain that?

A Referring to Exhibit 3, the microlaterolog section of the Exhibit 3, you will notice that we have permeability streaks in the porosity in the lower part of the Cosden Federal "C" No. 1 Well, and also have that in the "D" No.1. The Lone Star Well here shows porosity streaks through the entire gross section of the pay, and I took these streaks and added them, and I arrived at 7 feet. You can see from this particular cross-section that this one appears to be more streaked, as far as the porosity is concerned, of the three wells.

(Whereupon, Applicant's Exhibit No. 11 & 12 marked for identification)

Q All right, sir. Refer, then, to your Exhibit No. 11, Mr. Summers, and I might ask. Exhibit No. 11 is an economic calculation

of a solution gas drive and Exhibit No. 12 is an economic calculation of a water drive, is that correct?

A Yes, sir.

Q So that you cover both aspects and just refer to one and then the other if you would, please.

A Exhibit No. 11 is a recovery calculation and economic calculation of solution gas drive field. The Summary Sheet shows recovery for 40 acres and 80 acres. And for 40 acres it shows approximately 29,000 barrels of gross oil; for 80 acres, 58,000 barrels. For gross gas, 40 acres approximately 132,000 MCF, and for 80 acres, approximately 264,000 MCF. The gross revenue less severance taxes for 40 acres is eighty-four thousand, one hundred thirty dollars and for 80, one hundred sixty-eight thousand, two hundred fifty-six dollars. Total cost taken for 40 acres, two hundred four thousand three twenty-two dollars, and 80 acres two hundred six thousand, six forty-four. So, for either 40 or 80 acres, we show a net loss for either well of its solution gas drive field. We have pages which will back up these summary sheets for recovery for a 40-acre tract and for an 80-acre tract, using an average thickness of 12 feet; porosity of 6.9 percent; water saturation of 26 percent; and proration of the original volume factor 1.834. This gives 40 acres of gross one hundred three thousand six hundred sixty-eight barrels of stock oil in place. For solution of gas recovery we assume that recovery as 28 percent, which I figure is reasonable for this pool, which will result in 40 acres of re-

coverable oil, twenty-nine twenty seven barrels. The next page will show the volumetric calculations of a 40-acre well. The gross oil revenue less taxes will be seventy-two thousand nine hundred and three dollars. Gas revenue would be eighty-four thousand one hundred thirty dollars.

Q You mean total revenue?

A Total revenue, eighty-four thousand one hundred thirty dollars total. The gas would be eleven thousand two hundred twenty-seven. I have included the drilling and completion costs for tank battery which would be prorated to each well, $172,000; and possible pumping equipment of thirty thousand dollars, which is total development cost of two hundred and two thousand dollars. The operating cost at eight cents a barrel would be two thousand and three twenty-two dollars this is considered operating cost and does not include any direct. The total cost of two hundred and four thousand three twenty-two dollars shows a loss of one hundred twenty-two and ninety-two dollars, per 40-acre well. The next page shows recovery on 80 acres, using the same rock properties, the same recovery factor, 28 percent, which results in recovery fifty-eight thousand five four gross barrels. The economic calculation for 80 acres is calculated similar as the 40 acres, and would show a net loss of thirty-eight thousand three hundred and eighty-eight dollars on 80 acres.

Q Now, you also calculated on Exhibit No. 12 the same computation based on water drive, Mr. Summers?

A Yes, sir.

Q Would you explain what that shows?

A Exhibit 12 shows recovery from 40 acres and 80 acres in the pool area. On this a recovery factor of 50 percent for water drive and shows gross oil recovery for 40 acres, fifty one thousand eight hundred forty barrels. 80 acres, one hundred three thousand six hundred eighty barrels. These are all gross figures, gross gas recovery of seventy-seven thousand seven hundred sixty MCF for 40 acres. For 80 acres, one hundred fifty-five thousand, five hundred twenty MCF. Total gross revenues less severence taxes, thousand eight hundred twenty dollars on 40 acres. For the 80 acres two hundred seventy-three six hundred and forty-two dollars. Total cost for 40 acres would be two hundred and six thousand, one forty-seven dollars. The 80, two ten thousand, two ninety-four dollars. For 40 acres, you show a net loss of sixty-nine thousand three hundred twenty-seven dollars, and for 80, show net profit of sixty-three thousand, three hundred forty-eight dollars. These figures are backed up by calculations similar to those for solution gas drive. Use the same recovery for water drive.

Q Your essential difference is in your recovery percentage?

A Yes, sir.

Q Now, one thing about these computations, Mr. Summers, they are, of course, computed on the basis that the pools are all drilled simultaneously and a well is drilled on every 80-acre tract in the pool, is that correct, or every 40 or 80 acre tract depending

on the computations?

A Yes, sir.

Q And, of course, it is realized that these are not the facts and that earlier wells will undoubtedly recover somewhat more than later wells?

A Yes.

Q And that the pool probably will not be drilled to one well to every tract?

A Yes, sir.

Q This would be similar to the situation in the Allison and Bluitt Pools, would it not?

A Yes, sir.

Q And you have made a comparison of the economic comparison with the Bluitt Pool, is that correct?

A Yes, sir, that is Exhibit No. 13. I might add that the reason for the two different recovery calculations is the fact that we feel that there is a possibility that it will be a water drive field because of the early estimates of development. We are not definitely sure of it.

(Whereupon, Applicant's Exhibit No. 13 marked for identification)

Q Will you refer to Exhibit 13 Mr. Summers?

A Referring to Exhibit No. 13 it shows a comparison of the economics of the Bluitt and South Prairie-Pennsylvanian Pools. The information from the Bluitt Pool is obtained from the hearing on

that particular pool and as you can see from 40 acres we show a net loss of forty-nine thousand five hundred and eighteen dollars. On 80 acres, ninety thousand nine hundred and sixty-three dollars net profit. For our South Prairie-Pennsylvanian Pool, you see we show a loss of sixty-nine thousand, three hundred twenty-seven dollars for 40 acres, and net profit of sixty-three thousand three hundred forty-eight dollars for the 80 acres. These are based on recovery of 50 percent. I might add that the cost figures for the Bluitt Pool do not include cost of development for pumping equipment. Cost figures for the South Prairie-Pennsylvanian do.

Q So if you had the pumping equipment out of your figures, they would be substantially identical to the Bluitt computation?

A Yes, sir.

Q And also in these computations you have used a water drive computation?

A Yes, sir.

Q That was what, in the making of the Bluitt calculation?

A Yes, sir.

Q Is there anything else you care to point out in connection with that Exhibit?

A No, sir.

(Whereupon, Applicant's Exhibit No. 14 marked for identification)

Q I refer to your Exhibit No. 14, Mr. Summers. Those are proposed special rules and regulations for the South Prairie-Pen-

nsylvanian Pool?

A Yes, sir, they are rules that were submitted that are very similar to the rules for the Bluitt Pool with the exception of Rule 3, which locates the wells in different quarter sections because of the development in the South Prairie-Pennsylvanian Pool. I would like to point out that Rule 3 there, even though we have shown that we are requesting location for the wells, that doesn't necessarily mean that we would object to the Commission changing that.

Q You have just taken the Bluitt rules and changed them only as to the location, but otherwise you have submitted the identical rules?

A Yes, sir.

Q Actually, you have no preference, Mr. Summers, as to whether the Commission takes a fixed location or whether it leaves the location flexible, is that correct?

A That is correct.

Q All right, sir. Now, Mr. Summers, in summary, would you state that the reservoir information on which you have shown here reflects excellent communication in this pool?

A Yes, sir, as shown by the pressures here. For one, that we do have excellent communication across the area that the three wells that are not completed cover; and that we feel that the well will produce efficiently on 80-acre spacing and there is a chance they will recover on a larger spacing than 80 acres. We at this

time are only asking for 80-acre spacing and 80-acre proration units.

Q As a matter of fact, your request for 80-acre proration units in view of the economic calculations you have submitted is a very modest request, is it not, Mr. Summers?

A Yes, sir, that is the way we feel.

Q Were Exhibits 6-A through 14 prepared by you or under your supervision?

A Yes, sir.

MR. BRATTON: We will submit Exhibits 6-A through 14. We have no further questions of the witness at this time.

MR. UTZ: Exhibits 6-A through 14 will be accepted in the record.

(Whereupon, Applicant's Exhibits Nos. 6-A through 14 received in evidence)

MR. BRATTON: Mr. Summers, your request is in the nature of permanent rules. If the Commission would feel better about a temporary one year order, would you have any objection to that?

A No, sir, we would not because of the early life of the pool we feel that if the Commission sees fit to give us temporary rules we have no objection to it.

Q However, based on every indication, this pool is substantially identical to the Bluitt and Allison Pools, is that correct?

A Yes, sir.

MR. BRATTON: We have no further questions of this witness.

MR. UTZ: Are there any questions of the witness?

MR. PAYNE: Yes, sir.

CROSS EXAMINATION

BY MR. PAYNE:

Q Mr. Summers, referring to Core Laboratories report, which differs somewhat from the permeability that you have obtained by using both this report and the logs, isn't it true that the core summary is usually the best information?

A I would like to state that on log calculations its impossible to determine permeability, and I think I brought out that I was unable to determine how they arrived there at maximum average of 83.

Q Assuming they were correct, in answer to the question by Mr. Bratton, you stated if they are correct you probably need more 80 prorations units? That is based on the porosity and water saturation and would also be based on economics rather than drainability, wouldn't it?

A It would be on economics, yes, sir.

Q Now, referring to your Exhibit No. 11, which is your economic calculation, assuming the solution gas drive pool, could you tell me what the drive mechanism is in the Bluitt and Allison?

A At this time it is difficult to say for sure what it is. You can produce these wells if it's a water drive field, you can produce a solution gas drive field at a high enough rate. I would like to mention the Ball-Penn in Lea County was pretty well sub-

stantiated as being a water drive field, and the 4-Peales, excluding the South Prairie-Pennsylvanian are producing with a same aquafier so that I have reason to believe that if the Ball-Penn has water drive, there is a possibility of water drive in South Prairie-Pennsylvanian plus the fact of water drive definitely in the Allison and Bluitt.

Q As a matter of fact you'd better be correct or going to lose money on 80 acres?

A That is correct.

Q Have any of the wells in the South Prairie-Pennsylvanian Pool made any water as yet?

A On our "D" No. 1 we ran a drill stem test, it tested more than the Bough "C" zone. We did recover some water. We feel that its either from water from a lower zone or it could be filtering water.

Q The Bough "C" was developed on a 40-acre pattern?

A It was developed on 40-acre spacing, yes, sir.

Q Do you know if those wells ever paid out?

A The Bough Pool?

Q Yes, sir.

A I should think they would. One well produced over four hundred thousand. I couldn't say every one paid out.

Q With the comparison you made with the South Prairie with the Bough Pool, why would you expect wells in that pool to pay out and not pay out in the South Prairie Pool?

A I believe it was brought out in the testimony of the Bough Pool that for the Bluitt Pool -- I should correct myself -- in comparison with the Bluitt with Bough Pool drained at least in the neighborhood of the 30 acres.

Q Because the wells were drilled at different times?

A Well, it could, I believe that particular pool was developed reasonably the same time, with the exception of some of the southwest edge of the pool which was developed recently, and those wells produced over one hundred thousand dollars.

Q But it actually was developed on 40. How could it drain 30?

A The wells do not effect the acre drainage.

Q Each well got the reserves from the units 130 acres, even though there was one well on each 40 acres?

A That was the time that was presented.

Q I see. I notice that in your reserve calculation you double the 40-acre figure for the 80-acre figure in your recoverable reserves, is that right?

A Yes, sir.

Q So I take it you feel, then, that substantially the same amount of oil was recoverable with one well on the 80 as with two wells on the 80?

A Approximately the same.

Q You have made them identical for the purposes of your economic calculation?

A Yes, sir.

Q Mr. Summers, what is done with the gas flared from these wells?

A At the moment the gas is being flared we have no connections, but are talking with several different people to sell the gas.

Q But if your request is granted, there will be no casinghead gas flared since your allowable will be higher?

A Yes, sir.

Q Now, your economic calculation, assuming solution gas drive, I take it that is based solely on primary?

A Yes, sir.

Q What is the possibility of a secondary discovery program if it is a solution gas drive reservoir?

A I hadn't made a study of that. I couldn't answer that right at this moment.

Q That might change your economics if it were economic to substitute a secondary discovery program?

A It would change the economics, it would be down the line which is not expected as to immediately.

Q I notice you have casinghead gas price here of ten cents per MCF. That is based on the standard in the area even though you do not have contracts yet?

A That is correct. We feel we may get that for casinghead gas. It's not a set figure, just a figure we feel we might obtain

Q Now, Mr. Summers, would you give me the cost of the discovery well on this pool?

A I cannot give the exact figures, it's approximately one hundred sixty-five thousand dollars.

Q That is about the figures you used?

A Yes, sir. I added seven thousand for tank batteries.

Q Now, as I understand it, the oil is presently being trucked?

A Yes, sir.

Q What are you paying for trucking charges?

A Fifteen cents a barrel.

Q Now, referring to the exception you have proposed here, for Rule 3, would any exceptions be necessary at the present time or have all the wells been drilled in accordance with the pattern you have proposed?

A All the wells have been drilled according to that Rule and those that are established or been announced are drilling also on that or will be drilled on that pattern.

Q Do you feel requiring a well to be drilled in a certain quarter quarter section of the 80-acre unit as opposed to allowing the drilling of the well in either 40 of the 80 results in greater recovery, the same recovery, or less recovery?

A I think that the area developed on quarterly spacing would be a more efficient type of recovery, in other words, if you are going to base it on whether to drill on economics, that would have

to enter on where you would like to locate.

Q Economics are important factors in this particular pool, are they not?

A They surely are.

MR. PAYNE: Thank you.

MR. CAMPBELL: May I ask a question?

MR. UTZ: Go ahead.

BY MR. CAMPBELL:

A Mr. Summers, in the event this pool should turn out to be edge water drive as distinguished from a solution gas reservoir, do you believe that it is essential to the owners of properties on the outer edges of the pool that their properties be developed as early as possible in order they may recover their fair share of the oil in the reservoir?

A They will have to in order to.

Q And do you believe that the requirement for the drilling of wells at particular locations may have a bearing on the rapidity with which the exterior boundaries of the pool are determined?

A As stated, we have not necessarily not adhered to that particular rule there. We feel that 80-acre spacing will guide the development of the pool itself. As you approach the edge of the pool then the location of the pool will be critical.

Q And at that time, as you have indicated, all of the wells which have been drilled or which have been announced or are drill-

ing, are on the approaches to the top of the structure, are they not?

A As shown on the structure map, they are with exception of our Cosden "D" No. 1, they are right close to the top.

Q So far as to what presently appears to be the best producing area, it will be developed upon a uniform spacing pattern, will it not?

A Yes, sir.

MR. CAMPBELL: I believe that is all.

BY MR. UTZ Mr. Summers, in the event this pool should turn out to be a solution drive reservoir, how do you propose to protect yourselves against your calculated loss?

A Not drill, we couldn't. We feel that chances of it being non-solution gas recovery they are there and if it is, we will have to discontinue drilling.

Q How many wells have you drilled at this time?

A Two completed wells.

Q How many do yo hope to drill?

A That will depend on the limits. We have one that Mr. Warfield brought out that they are moving our equipment.

Q You are drilling, you are preparing to drill one more, then?

A Preparing to spud, yes, sir.

Q In other words, if you feel it's a solution drive reservoir?

A I wouldn't drive every 80-acre tract. We drill those that we feel are profitable.

Q In other words, you will drill those that you feel have better reservoir characteristics than your calculation is here?

A We wouldn't be able to tell whether it would be better reservoir characteristics. The only thing, if we were to complete a well, drill into water, then we would surely consider strongly our next step.

MR. UTZ: Any other questions?

MR. BRATTON: Yes, sir, I have one or two questions.

REDIRECT EXAMINATION

BY MR. BRATTON:

Q Mr. Summers, referring to the permeability in the reservoir, even assuming the Core Laboratory figure of eighty-three million dollars as being correct, in your opinion, is that enough permeability to provide an average on every an 80 tract?

A Yes, sir.

Q At least over the 80 tract?

A I might point out that even though we do not have a core analysis on your "C" No. 1, we did run a PI. It showed a PI of 7.22. And initially, as far as the logs are concerned, and as far as the porosity is concerned, it does show it does have good permeability characteristics, which would indicate good drainage radius.

Q And the information you have obtained as to the pressure drawdown was just a very limited amount of production as that is

the most significant information you have as to the drainage areas, is it not?

A At the moment, yes.

Q It indicates communication over what, approximately three-quarters of a mile?

A I had it about 4500 feet.

Q Referring to the Bough Pool, I believe the wells in that pool are shown on Exhibit No. 4, are they not?

A Yes, sir.

Q And doesn't that reflect that actually although the pool may have been spaced on 40's, it certainly wasn't drilled on 40's?

A No, sir. The way it appears, there was drilled on long 80's and they drill along the lease line offsetting.

Q And based on what information you have on it, is it not probably the same sitation as in the Allison Pool while some wells were drilled early and may have recovered tremendous amounts of oil; they couldn't have oil come from under the tract dedicated to them?

A That was brought out in one of the rehearings of the Allison. I think they showed some calculations to physically take all of the oil on the 40-acre tract.

Q With this thin pay section and the permeability you do have average over considerable area?

A Yes, sir.

MR. BRATTON: All right, sir. I believe that is all I have.

RECROSS EXAMINATION

BY MR. PAYNE:

Q Is the ownership of the entire yellow area identical, is that one lease to Cosden, or is that a number of leases?

MR. WARFIELD: That is a number of leases.

MR. SUMMERS: We have some leases with one percent owned and some of which we own part, a fraction of the working interest.

Q Is the ownership of the tract on which your No. 1 is located the same as the ownership of the tract on which your No. 2 Well is located?

A Well No. 1 was acreage with which we obtained our drilling cost and the other operator has the option of coming into operate with us, They have tracts of their working interest, but on the "S" which is in Section 29, they have their option of coming in as going in from the very beginning.

Q It is a party?

A It is a party.

Q Perhaps you might take a transfer as within your 1 and 2 shutting in 1 and transferring the allowable to the other?

A Yes, sir.

Q Do you have any present plans in the interest of gaining additional data?

A We do plan within six months to measure the pressure on our No. 1 and that if we see that the interference tests warrant, we will run it.

Q I see. Thank you.

MR. BRATTON: Actually, Mr. Summers, with the additional wells that are being drilled in the area, wouldn't you obtain considerable pressure information as those wells come in --

A Yes, sir, you should.

Q -- which would be in the nature of better interference?

A It would be but at a later time if we still think it will be necessary. We would go ahead and run our interference tests. We feel that right now that the way it is with the communication in that pool itself that subsequent drilling will show interference or communication with respect to locations.

Q Actually, Mr. Summersm with that thin section, if you were to proudce a double allowable out of one well, might you not be getting into some question of correlative rights?

A Well, that would depend, I imagine, on the royalty interest up there. However, I might mention that unless we obtain our costs and in our No. 1, the interest in our "C" No. 1 is different than our "D" No. 1, so therefore, that would have to be taken under consideration before we could run any tests.

Q You do have a well in between, the Lone Star, the Lone Star is in between the two wells?

A That is right.

Q So that under the circumstances in this pool it would probably be better, would it not, to depend on the information developed by the subsequent wells rather than try to work out an

interference test?

A At the moment that would be the best way to do.

MR. PAYNE: It is possible, Mr. Summers, to shut in a well and take an interference as between it and another well without transferring any allowable?

A Yes, you could.

MR. PAYNE: Thank you.

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

(Witness excused)

MR. UTZ: Are there statements in this case?

MR. CAMPBELL: I have a statement, Mr. Examiner. Lone Star Producing Company concurs with the Cosden Petroleum Corporation in their request for 80-acre spacing in this field, in that we feel it is necessary for economical development of the Bough "C" zone reservoir and for the greatest ultimate recovery of oil and gas from the reservoir. We do not favor the rigid spacing pattern which has been proposed by Cosden. They have also stated they have no objection to departing from it and we are in favor of a flexible spacing pattern in that we feel it will encourage a more rapid development of the reservoir and more adequate protection of correlative rights as to the acreage we own on what appears to be the edge of this reservoir. Lone Star Producing Company presently has one completed well and two drilling wells in the field and additional locations ready for drilling im-

mediately upon obtaining the necessary State and Federal approval of those wells are on the pattern which has been discussed here. The relatively rapid development of the Lone Star Company will be considerably different if the rigid spacing pattern is adopted. Since several of the remaining undrilled Lone Star locations would require a more lengthy and detailed study prior to taking the risk of drilling and in this case prior to deciding at what point we intend to drill wells to lose money. It is simply a matter of not only economics, but the protection of our correlative rights and particularly in the event this turns out to be edge water drive reservoir.

MR. UTZ: Any other statements?

MR. BRATTON: I would like to make a closing statement to more or less summarize our position, Mr. Examiner. We have requested permanent 80-acre spacing proration rules identical with those in the Bluitt and Allison Pools. Actually, we believe on the basis of the information available at this time that permanent rules are justified. We believe that we do have enough information here to justify placing this onpermanent 80 acres at this point. We feel as demonstrated by our economic calculations and those which have been made in the Allison and Bluitt that you can really run into an economic disaster if you did get this pool drilled on or anywhere near substantially drilled on 40-acre pattern. Actually, as pointed out, 80 acres is something of a calculated risk being, I might add, that a question be seriously raised and deter-

mined, requesting 160-acre spacing its been mentioned and we come to the Commission on the basis, we feel we have demonstrated that you have a practically identical pool to the Allison and Bluitt wells and we suggested the rules that were obtained there. Now, we realize that the Commission may at any time have reservations about pools in relatively early stages of development, and for that reason we say that if the Commission would feel we should have a temporary one-year rule, we would have no objection to that. I would like to urge the Commission that it not go into or consider the question of interference tests at this time, although I certainly agree with Mr. Payne under normal circumstances in many pools that is an ideal proof of it. I think we have already enough demonstrated in that line to show the Commission that you are going to have drainage over a wide area in this thin section. I believe that the additional wells as they come in and the pressure is obtainable from them they will furnish any information that might answer any questions in the Commission's mind. We believe that the things reflected we do have a practically identical situation to the Bluitt and Allison, and that the Commission should enter either a permanent or temporary 80-acre order on the fixed location. We merely copied the Bluitt rules and placed those as it was in there. We placed it near so we have no preference one way or the other. We thank you.

MR. UTZ: Any other statements? The case will be taken under advisement, and the hearing will be adjourned until one-thirty.

STATE OF NEW MEXICO)
) ss
COUNTY OF BERNALILLO)

I, LEWELLYN F. NELSON, Notary Public in and for the County of Bernalillo, State of New Mexico, do hereby certify that the foregoing and attached Transcript of Proceedings before the New Mexico Oil Conservation Commission was reported by me in Stenotype and reduced to typewritten transcript by me, and that the same is a true and correct record to the best of my knowledge, skill and ability.

WITNESS my Hand and Seal this, the 14th day of December 196 , in the City of Albuquerque, County of Bernalillo, State of New Mexico.

Lewellyn F. Nelson
Notary Public

My Commission Expires:

June 14, 1964

I do hereby certify that the foregoing is a complete record of the proceedings in the Examiner hearing of Case No. 2139, heard by me on Dec. 12, 1961.

Examiner
New Mexico Oil Conservation Commission