DATA FOR

PROPOSED PILOT WATER FLOOD PROJECT

WILLIAM A. RAMSAY "A" LEASE

EUMONT AND SOUTH EUNICE OIL POOLS

LEA COUNTY, NEW MEXICO

OIL CONSERVATION COMMISSION HEARING

NOVEMBER 2, 1960

CASE NO. 2111

Gulf Oil Corporation
Roswell District

WATER FLOOD DATA FOR HEARING BEFORE
OIL CONSERVATION COMMISSION OF NEW MEXICO

OPERATOR Gulf Oil Corporation DATE November 2, 1960

LEASE William A. Ramsay "A"

POOLS Eumont Oil and South Eunice Oil COUNTY Lea

RESERVOIR Queen

Other operators injecting into this reservoir in these pools None

I. Reservoir and Fluid Characteristics

A. Information on entire reservoir

1. Name of reservoir Queen
2. Composition Gray, fine-grained, shaly sandstone interbedded with tan and gray fine to medium crystalline dolomite and anhydrite.
3. Structure Generally west dipping sand beds with minor local anticlines.
4. Type drive during depletion Solution gas drive.
5. Original reservoir pressure 1,450 psig.

B. Information on Proposed Project Area

1. Number of productive acres in project area to be flooded The initial project area will include 680 acres as shown on the area plat.
2. Average depth to top of pay 3,700 feet.
3. Estimated average gross thickness 150 feet.
4. Estimated average effective thickness 13 feet.
5. Estimated average effective porosity 14.1%.
6. Average horizontal permeability 5 Mds. Range 0 - 58 Mds.
7. Estimated connate water content 35%.
8. Gravity of oil 35.6° API.

II. Primary Production History and Present Status of Project Area

1. Date first well completed October 30, 1937

2. Oil and water production history by months since date of first well completion to present time See Table I and Production Performance Curve.

3. Stage of depletion of project area Late

4. Number of producing wells in project area 28, six of which will be converted to water injection.

5. Average daily oil production per well at present time 13.5 barrels

6. Cumulative oil production to October 1, 1960 from area to be flooded 1,248,081 barrels

III. Injection

1. Source of injected water Water to be injected will be that produced from the Arrowhead, Eumont, Eunice, and South Eunice Oil Pools by Gulf wells producing into a commingled automatic battery located approximately in the center of the project area and from a battery located on our H. T. Mattern "E" Lease in the SW/4 of Section 1, T-22S, R-36E, about 1 mile southeast of the project area. Approximately 4,340 barrels per day will be available from these two batteries which will be more than enough water required.

2. Type of water Brackish - Injection system will be corrosion-proof.

3. Treatment of injected water None - analysis of a representative sample indicates no treatment will be necessary.

4. Pattern and spacing 80-acre 5 spot patterns as shown on the area plat.

5. Initial injection pressure to be used Unknown, but anticipate about 300 psi initially. Maximum pressure will be 1,000 psi.

6. Estimated initial per well rate of injection 500 barrels per day.

7. Additional injection and producing wells to be drilled None

IV. Results Expected

It is expected that this pilot project will provide sufficient data to evaluate the floodability of the Queen formation underlying the William A. Ramsay "A" Lease.

V. Recommendations and Reasons Therefor

The Eumont and South Eunice Oil Pools produce by solution gas drive mechanism and as a result, a considerable quantity of oil will remain at the end of the primary depletion unless some type of fluid injection project is inaugurated to increase the ultimate oil recovery.

Production from those wells in the area outlined in yellow on the plat, which comprise the major portion of our property in the Eumont and South Eunice Oil Pools and which ultimately we hope to have under water flood, has declined such that the average daily oil production is only 14.1 barrels per well. At the existing rate of decline these properties have only a few years remaining to produce prior to depletion and abandonment. Therefore, in order to prolong the productive life of these wells and to increase the ultimate recovery, some type of secondary recovery project should be inaugurated. The available data indicate that the Queen formation underlying this area would be susceptible to water flood and that the proposed plan should increase ultimate recovery.

The proposed project area contains 28 wells, 21 of which are producing from the Queen formation of the Eumont Oil Pool and 3 wells are producing from the Queen formation of the South Eunice Oil Pool. Of the remaining 4 wells, 1 is completed as a Eumont gas well, though having formerly produced from the Eumont Oil Pool, and 3 wells are temporarily abandoned in the Eumont Oil Pool. As shown on the project area production

curve, the capacity of these wells is on decline and in September, 1960, the average daily oil production was only 13.5 barrels per well. At the existing rate of decline, it is estimated that the project area, which we feel will yield results that should be representative of the entire area under consideration, has a future life of about 4 years. The area is approximately 80% depleted and in order to evaluate this method of fluid injection in a reasonable period of time a pilot water flood project should be inaugurated now. We anticipate that approximately one year will elapse before any appreciable response is obtained from this project after which an additional period of time will be required to determine the feasibility of applying this type of secondary recovery to a fieldwide basis.

The 150 gross feet of reservoir oil column is roughly divisible into six major sand zones. Relatively dense dolomite, containing streaks of shale and anhydrite, having limited vertical permeability exists between these more porous sand zones so that vertical communication within the reservoir is limited. Therefore, the injection of extraneous fluids below the water-oil contact for the purpose of maintaining reservoir pressure to increase ultimate oil recovery does not appear feasible. In addition, within the major porous sand zones, extensive inter-fingering of porosity exists. For this reason, injection of extraneous fluids on the periphery does not appear to be a feasible method of increasing oil recovery. The nature of the reservoir rock indicates that a pattern type water injection project will be the most efficient and therefore required if maximum ultimate oil recovery is to be obtained. Therefore, in the interest of conservation and in order to achieve maximum oil recovery for this reservoir, a pilot water flood project should be inaugurated on the William A. Ramsay "A" Lease to determine the feasibility of this type

fluid injection project for fieldwide application. Gulf Oil Corporation respectfully requests that the Oil Conservation Commission authorize the installation of a pilot water flood on the William A. Ramsay "A" Lease, Lea County, as outlined in red on the area plat.

Gulf proposes in the installation of this project to convert six producing wells, Nos. 14, 24, 27, 32, 35 and 48, to injection wells and utilize two existing wells, Nos. 30 and 33, located equidistant from the injection wells, as center producers in the project, and use 20 adjacent wells as offset or diagonally offset producers in the pilot area.

If the project indicates this type of fluid injection to be feasible, Gulf requests authority to expand the water flood area in accordance with the administrative procedure outlined in Paragraph 5 of New Mexico Oil Conservation Commission Rule 701 (E).

EX. 2

TABLE I

PRODUCTION HISTORY - PROPOSED PROJECT AREA
WILLIAM A. RAMSAY "A" LEASE
EUMONT AND SOUTH EUNICE OIL POOLS
LEA COUNTY, NEW MEXICO

Month and Year	Oil Bbls.	Water Bbls.
1937		
Nov.	441	
Dec.	3,188	
1938		
Jan.	2,001	
Feb.	1,938	
March	2,085	
April	1,942	
May	1,618	
June	2,472	265
July	3,429	574
Aug.	3,784	242
Sept.	3,109	325
Oct.	3,564	354
Nov.	3,252	327
Dec.	5,112	4,993
1939		
Jan.	4,600	4,107
Feb.	4,771	5,175
March	5,085	4,855
April	4,665	4,468
May	5,110	5,507
June	4,550	4,893
July	4,884	5,411
Aug.	3,256	3,840
Sept.	3,376	4,125
Oct.	4,536	6,647
Nov.	4,782	5,151
Dec.	3,754	4,501
1940		
Jan.	3,314	3,237
Feb.	3,096	3,322
March	3,763	5,209
April	3,375	4,340
May	3,489	3,108
June	2,225	2,305
July	3,587	3,399
Aug.	4,100	6,198
Sept.	3,178	5,971
Oct.	2,938	2,440
Nov.	3,134	2,869
Dec.	3,560	3,697
1941		
Jan.	3,498	5,513
Feb.	3,459	6,437
March	4,899	11,600
April	3,685	12,467
May	4,499	8,302
June	3,161	5,097
July	3,330	4,137
Aug.	3,052	18,727
Sept.	4,511	28,439
Oct.	4,436	28,330
Nov.	3,632	23,608
Dec.	4,770	24,939
1942		
Jan.	3,754	24,039
Feb.	3,442	12,420
March	4,604	13,462
April	2,618	16,716
May	2,291	16,525
June	2,590	16,300
July	2,510	18,600
Aug.	3,144	30,400
Sept.	3,277	30,330
Oct.	3,360	27,467
Nov.	3,336	17,370
Dec.	3,435	33,266
1943		
Jan.	3,236	29,470
Feb.	3,416	23,260
March	3,593	26,940
April	3,258	24,770
May	3,952	25,445
June	3,625	25,960
July	3,841	24,460
Aug.	2,953	25,210
Sept.	3,765	23,380
Oct.	4,257	27,350
Nov.	4,099	19,605
Dec.	3,297	16,373
1944		
Jan.	3,842	21,115
Feb.	3,950	26,160
March	4,251	26,440

TABLE I (Cont'd)

PRODUCTION HISTORY - PROPOSED PROJECT AREA
WILLIAM A. RAMSAY "A" LEASE
EUMONT AND SOUTH EUNICE OIL POOLS
LEA COUNTY, NEW MEXICO

Month and Year	Oil Bbls.	Water Bbls.
1944 cont.		
April	3,889	22,150
May	3,658	17,290
June	3,620	28,190
July	3,552	27,422
Aug.	3,334	25,660
Sept.	3,520	27,680
Oct.	3,422	23,170
Nov.	3,711	31,820
Dec.	3,249	29,450
1945		
Jan.	2,997	13,470
Feb.	2,917	15,820
March	3,362	25,900
April	3,092	33,910
May	3,320	35,040
June	3,378	18,728
July	2,950	23,019
Aug.	3,289	19,400
Sept.	3,031	25,500
Oct.	2,912	30,400
Nov.	2,548	23,850
Dec.	3,083	21,195
1946		
Jan.	2,763	18,300
Feb.	2,571	30,900
March	2,644	37,560
April	3,741	25,810
May	2,344	32,290
June	3,400	34,800
July	3,305	26,040
Aug.	2,848	28,640
Sept.	2,096	34,310
Oct.	3,012	19,235
Nov.	2,741	29,280
Dec.	2,833	18,710
1947		
Jan.	2,709	33,830
Feb.	1,957	34,810
March	3,115	44,280
April	2,602	37,000
May	2,685	40,694
June	2,857	39,960
July	3,845	42,530
Aug.	2,786	36,520
Sept.	2,796	37,120
Oct.	3,446	35,640
Nov.	1,900	22,760
Dec.	2,611	43,540
1948		
Jan.	3,093	41,160
Feb.	2,174	39,560
March	2,399	41,800
April	2,872	41,520
May	3,221	43,180
June	2,858	27,540
July	2,028	31,040
Aug.	2,136	17,860
Sept.	2,004	53,680
Oct.	2,055	50,240
Nov.	2,206	46,080
Dec.	2,630	53,080
1949		
Jan.	1,703	46,600
Feb.	1,859	44,120
March	3,079	53,215
April	2,304	51,040
May	2,571	52,120
June	1,544	50,240
July	2,213	51,985
Aug.	2,284	47,960
Sept.	1,643	51,360
Oct.	2,362	53,320
Nov.	2,186	49,360
Dec.	1,580	51,480
1950		
Jan.	2,258	48,530
Feb.	1,831	47,860
March	2,161	52,360
April	1,427	49,805
May	2,428	53,085
June	2,117	51,600

TABLE I (Cont'd)

PRODUCTION HISTORY - PROPOSED PROJECT AREA
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LEA COUNTY, NEW MEXICO

Month and Year	Oil Bbls.	Water Bbls.
1950 cont.		
July	1,480	52,480
Aug.	2,472	53,320
Sept.	2,006	50,000
Oct.	1,792	50,020
Nov.	2,514	46,600
Dec.	1,876	60,400
1951		
Jan.	2,125	67,080
Feb.	2,196	56,100
March	2,632	68,500
April	2,674	59,040
May	2,496	69,420
June	2,260	44,200
July	1,381	62,460
Aug.	2,622	66,520
Sept.	2,275	68,200
Oct.	2,636	72,900
Nov.	2,465	72,000
Dec.	1,499	62,352
1952		
Jan.	2,184	49,630
Feb.	2,194	59,450
March	2,506	57,900
April	1,296	57,540
May	1,616	47,135
June	1,524	44,931
July	1,387	63,300
Aug.	1,660	31,835
Sept.	1,318	36,996
Oct.	1,694	45,560
Nov.	1,513	39,583
Dec.	1,747	51,708
1953		
Jan.	1,410	41,402
Feb.	1,190	36,011
March	1,825	36,452
April	1,392	41,388
May	1,615	46,809
June	1,715	42,671
July	1,560	40,310
Aug.	1,481	27,812
Sept.	1,661	25,836
Oct.	1,240	30,938
Nov.	1,730	27,624
Dec.	1,270	26,374
1954		
Jan.	1,126	28,000
Feb.	1,179	82,025
March	841	68,015
April	926	12,866
May	1,130	13,268
June	675	12,034
July	827	12,807
Aug.	783	12,655
Sept.	1,123	12,532
Oct.	1,345	12,366
Nov.	669	12,765
Dec.	851	9,040
1955		
Jan.	1,225	13,834
Feb.	909	9,981
March	913	10,957
April	1,205	54,136
May	1,316	54,698
June	1,023	52,994
July	2,063	16,816
Aug.	1,664	16,545
Sept.	1,391	13,216
Oct.	971	18,630
Nov.	957	16,844
Dec.	1,234	45,838
1956		
Jan.	1,050	53,058
Feb.	1,055	40,641
March	734	7,013
April	298	3,336
May	310	3,127
June	434	4,635
July	2,422	5,535
Aug.	3,218	4,997
Sept.	4,861	5,603
Oct.	6,099	3,394
Nov.	8,682	4,965
Dec.	8,589	4,534

TABLE I (Cont'd)

PRODUCTION HISTORY - PROPOSED PROJECT AREA
WILLIAM A. RAMSAY "A" LEASE
EUMONT AND SOUTH EUNICE OIL POOLS
LEA COUNTY, NEW MEXICO

Month and Year	Oil Bbls.	Water Bbls.
1957		
Jan.	11,589	4,469
Feb.	10,656	7,123
March	11,381	3,949
April	10,861	4,482
May	11,933	8,749
June	11,791	8,321
July	12,927	6,857
Aug.	15,721	7,312
Sept.	15,912	6,545
Oct.	18,105	13,908
Nov.	17,350	9,457
Dec.	19,600	9,736
1958		
Jan.	21,431	7,718
Feb.	17,957	6,733
March	18,694	7,141
April	17,861	6,677
May	19,338	7,495
June	18,236	6,418
July	18,328	6,578
Aug.	17,574	5,717
Sept.	17,507	5,365
Oct.	16,348	11,880
Nov.	16,169	12,026
Dec.	15,372	9,575
1959		
Jan.	15,471	9,754
Feb.	13,716	8,901
March	14,367	11,083
April	13,777	10,868
May	13,658	12,766
June	12,707	10,415
July	12,831	10,380
Aug.	12,147	10,432
Sept.	10,895	292
Oct.	11,440	9,190
Nov.	10,533	8,438
Dec.	10,827	6,613

Month and Year	Oil Bbls.	Water Bbls.
1960		
Jan.	11,251	9,103
Feb.	10,018	7,935
March	12,101	12,421
April	10,554	8,997
May	10,023	10,937
June	9,068	9,907
July	10,264	10,230
Aug.	10,545	11,019
Sept.	9,528	8,488