Case 612 Continental Testimony 5-10-54 Report to Mooney

Exhibit 1 is a contour map on the top of the Yates in Township 19 South through Township 26 South and Ranges 35 East through 38 East, inclusive. Starting at the south along the dividing line between Ranges 36 and 37 East, and extending in a northerly direction to Section 6, Township 22 South, Range 36 East is a long, narrow ridge. This general ridge is broken up into a number of small local highs. We believe this ridge to be the approximate eastern limit of Capitan reef development in the area. From south to north, the Eaves, Cooper-Jal and the west half of the South Eunice Pool lie on this ridge. Oil production is found chiefly on the west flank of the ridge. Producing formations consist of the Yates and Seven Rivers in the south and Queen, and possibly upper Grayburg, in the north. Porosity and permeability in the lower Yates, Seven Rivers and Queen formations are found mainly in dolomite. The upper Yates, which is in general less productive than the others, contains chiefly gas which appears to be contained in the sands.

Approximately six miles to the east, and roughly paralelling the ridge previously described, there is a second general high running through Townships 23, 24, 25, and 26, South. On the west flank of this high, and extending into the trough area between the reef high in Townships 24 and 25, South, lies the Langlie Mattix oil pool. After crossing the ridge going eastward, the dolomites of the Seven Rivers formation lose their porosity and permeability rapidly. The lithology of the formation likewise changes and numerous sand lenses are found. Oil production in the Langlie Mattix is found in the sands of the Queen and lower Seven Rivers formation. The Yates and upper Seven Rivers contain chiefly gas. In a few places, notably the Falby Yates oil pool as presently designated, oil is found in the middle Yates. The structure map where these accumulations are found indicate low spots.

In Townships 21 and 22 South, Range 37 East, there is a broad general high on which lies the Penrose-Skelly Pool. Production in the Penrose-Skelly Pool is chiefly from Queen sands in the south and sandy dolomites of the Grayburg formation in the north. To the west of this, and connected to it by a saddle, is the Arrowhead Pool. This pool produces oil from the Grayburg formation. Gas has been found in some of the wells in the Yates, Seven Rivers and Queen formations.

In Township 21 South, Range 36 East may be seen the southern end of the Eunice Monument high. It extends into the eastern half of Township 20 South, Range 36 East and the western half of Township 20 South, Range 37 East, and the southeastern portion of Township 19 South, Range 36 East, and southwestern portion of Township 19 South, Range 37 East. Oil production in the southern portion occurs chiefly in the Grayburg formation with a few wells along the south and west flanks producing from the Queen and Seven Rivers formations. In the high portions of the Monument end of the field, oil production is found in the

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San Andres with the remainder producing from the Grayburg. In the higher wells the Grayburg contains gas which is gas cap gas. The Queen contains gas over most of the structure. The Yates and Seven Rivers are gas productive in the southwestern portion of Township 21 South, Range 36 East, and in the higher parts of the Monument Pool.

Exhibit No. 2 is a map of Townships 19 through 26 South and Ranges 35 through 38 East. This is a key map for most of the cross sections to be introduced. The east-west sections are labeled with the Township through which they pass.

Exhibit Nos. 3 through 12 are east-west cross sections through each Township from 19 South through 25 South.

Exhibit No. 3 is an east-west cross section through Township 19 South. Exhibit No. 4 is an east-west section through Township 20 South and Exhibit No. 5 is an east-west section through Township 21 South. The top of only the Yates and Queen are shown. The Queen in this area is approximately 250 feet thick. Using this interval, it can be seen that the oil wells, with three exceptions at the west end of the Township 21 South section, are producing from below the top of the Grayburg.

Exhibit No. 6 is an east-west section across the north end of Township 22 South. This section has sample logs and electrical and radioactivity surveys on a few wells. The top of the Yates and the top of the Queen are shown. Using a thickness of 250 feet for the Queen, it indicates Grayburg oil production in the Penrose-Skelly Pool at the east end and in the Arrowhead Pool in the central portion. To the west is the South Eunice Pool producing chiefly from the Queen with the extreme west wells producing from the Seven Rivers.

Exhibit No. 7 is an east-west cross section through the northern portion of Township 23 South and southern portion of Township 22 South. Exhibit No. 7 shows Queen oil production from the southernmost end of the Penrose-Skelly Pool on the east, gas from the Yates-Seven Rivers formations in center, and oil from the Seven Rivers, plus gas in Yates, on the extreme west.

Exhibit No. 8 is a portion of the west end of Exhibit No. 7 with radioactivity logs of the six westernmost wells. It shows the change in the section in going across the reef ridge. The increase in sand in the Seven Rivers between Meyer B-33 No. 1 and No. 2 can be seen as can the difference through the Yates in the three west wells from the three east wells. The lack of permeability in Meyer B-33 No. 2 through the Seven Rivers as compared to Meyer B-33 No. 1 as evidenced by drill stem tests can also be seen. (Meyer B-33 No. 1 tested 2,480 MCF on drill stem test in Seven Rivers and the No. 2 tested dry). The Meyer B-33 No. 2 was finally completed as a Yates oil well after shooting the Yates with 195 quarts of Nitro.

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Exhibit No. 9 is an east-west cross section through Township 23 South. On the eastern portion of Exhibit No. 9 are shown Langlie Mattix Pool wells producing from the Queen and lower Seven Rivers. Farther west are gas wells producing from the Yates and Seven Rivers. On the west is shown a well, now plugged and abandoned, which produced oil from the Seven Rivers.

Exhibit No. 10 is a section with radioactivity logs of five of the wells on Exhibit No. 9. The exhibit again shows the sandy character of the Seven Rivers to the east of the reef high.

Exhibit No. 11 is an east-west cross section through Township 24 South. On the east it shows Langlie Mattix oil wells producing from the Queen and lower Seven Rivers. The highest well on the east side, the Gulf Bertha Knight No. 1, is a Queen gas well. The Continental Jack A-21 No. 1 is now recompleted as a Yates gas well. There are two gas wells shown close to the center of the section. The Western Gas Company Harrison No. 2 originally completed as a Seven Rivers gas well, and the Continental Jack B-30 No. 1 completed in the Yates and upper Seven Rivers. The section crosses the Falby Yates Pool. These wells produce oil from the Yates. Drill stem tests on the Amerada Falby No. 2 indicates dry gas in the lower Yates or upper Seven Rivers with oil in the middle and upper Yates.

The extreme west portion of the section shows Cooper-Jal oil wells producing mainly from the Seven Rivers. The data on these is original completion data. Many of the wells in this vicinity have been recompleted or plugged. Between the Cooper-Jal oil wells and the Falby Yates Pool is shown a gas well producing from the Yates and Seven Rivers.

Exhibit No. 12 is an east-west cross section through Township 25 South. On the west it shows first a Yates oil well and next a Yates-Seven Rivers oil well that is now plugged. The third well was originally completed as a Seven Rivers oil well. After several recompletions it is now a small gas well in the upper Yates. The fourth well is a Seven Rivers oil well, and the fifth a Yates gas well. The next three wells were originally completed as Yates gas wells. One of them is now producing oil. Continuing east, there are four Yates oil wells, a Yates gas well, three Queen oil wells and a Queen gas well. The last well is a deep dry hole. Oil is found in the low areas.

Exhibit No. 13 is a north-south cross section starting in the south end of the Eunice Pool and running through the South Eunice, Cooper-Jal and Eaves Pools. Oil production at the north end in the Eunice Pool is from the Grayburg, with the southernmost

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Eunice Pool wells producing oil from the Queen. The Queen then goes below the water table between the Eunice and South Eunice Pools. The section then shows South Eunice wells producing oil from the Queen. The Queen goes below the water table immediately south of the Continental State E-17 No. 6. Production further south consists of oil and gas from the Yates and Seven Rivers formations.

Exhibit No. 14 is a north-south cross section up the reef ridge and follows the same general trend as Exhibit No. 13. The two exhibits show essentially the same information; however, Exhibit No. 14 has radioactivity or electrical logs of the wells which makes it possible to study the trend in greater detail. The southernmost log is a Continental well in the Henrietta Pool, Winkler County, Texas. The change in the stratigraphy between the South Eunice and Eunice Pools can be seen by comparing the logs of Continental Lockhart B-31 No. 4 and State E-17 No. 5 with the wells to the north. To the south the stratigraphy of the Yates and Seven Rivers remains the same the length of the section.

Referring again to Exhibits Nos. 9 and 10, this long strip of continuity as shown in Exhibit No. 14 should be compared with the discontinuity of the east-west sections. The Seven Rivers and Yates zones can be traced approximately 50 miles north and south, but in one or two locations to the east the lithology of the formations has changed.

Exhibits Nos. 15, 16 and 17 are a three piece north-south cross section from the north end of the Monument Pool to the south end of the Rhodes Pool. The section is approximately midway between the eastern and western limits of the shallow oil production.

Exhibits Nos. 18, 19 and 20 are a three piece north-south cross section from the north end of Monument Pool south to the Leonard Pool. This section runs to the east of one shown on Exhibits 15, 16 and 17.

The San Andres formation is oil productive in the area under consideration in this case only in the center portion of the Monument Pool. In a few of the highest wells, the upper portion is above the gas oil contact.

The Grayburg formation produces oil in the Eunice Pool and in the edges of the Monument Pool. In the higher portions of the Monument Pool, the entire Grayburg formation is above the gas-oil contact and is gas productive. The upper portions of it contain gas throughout most of the Monument Pool. The Grayburg is also oil productive in the Skaggs and Arrowhead and north portion of the Penrose-Skelly Pool.

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The Queen formation contains chiefly gas under the Eunice Monument structure except as previously mentioned along the south and west edges of the Eunice Pool. The north end of the South Eunice Pool also produces some oil and some gas in the Queen formation. The southern portion of the Penrose-Skelly and the Langlie Mattix Pools produce oil from the Queen. Also, there are some wells in the Langlie Mattix area which have only gas in the Queen formation.

The Seven Rivers along the reef ridge produces chiefly oil from the west flank with gas in the higher wells. At the extreme north end, the Seven Rivers dolomites contain almost all gas. To the east of the ridge in the lower wells, the bottom portion of the Seven Rivers contains some oil, while the rest of the formation contains gas. Gas is also found in the Seven Rivers in the south and west portions of Township 21 South, Range 36 East. The sands in the Seven Rivers back of the reef area appear to be lenses with the longest dimensions north and south. Most of the sands pinch out as the top of the back reef high is approached. The Seven Rivers also produces gas in the central portion of the Monument Pool.

The Yates formation produces oil in some of the lower wells west of the reef ridge. In the higher wells along the reef ridge, it contains gas. Back of the reef, with the exception of several small lows, it contains gas. Production in the Eunice and Monument Fields from the Yates appears to be limited to the same general area as that which produces from the Seven Rivers. In general, along the reef ridge, the lower Yates is more prolific than the upper Yates.

Studies and work in southeastern Lea County by Continental Oil Company indicate the pay horizons to be either lensed or zoned in most of the producing formations. By this it is meant that the producing formations consist of a series of permeable layers separated by impermeable layers within the formation. These layers in practically all cases follow the structure. Initially, the water-oil contact in all formations varied from approximately -275 feet subsea at the south end to approximately -325 feet at the north end. Likewise, the gas-oil contact in all formations was approximately 100 feet above the water-oil contact. Apparently, over geologic times fluids have reached a state of equilibrium throughout all the shallow formations with the exception of the oil accumulations in low spots in the Yates. During the producing life of the fields, however, these various zones have performed as separate reservoirs.

Initially, bottomhole pressure of the Eunice Pool is believed to have been approximately 1,450 psi. The average bottomhole pressure of 55 Grayburg oil wells taken in August of 1955, was 541 psi. There were a total of 47 gas wells in the Eunice

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part of the Eumont gas field carried on the February, 1954 proration schedule. Shut in pressures taken in October, 1953 were obtained on 27 of these wells. The average shut in pressure was 1,039 psi, or a difference of 488 psi above that of the average pressures for the oil wells in the Eunice Pool. Sulfur content on nine Continental gas wells completed in the Yates, Seven Rivers or Queen in the area covered by the Eunice oil pool show an average sulfur content of 69 grains per 100 cubic feet. Sulfur contents of seven oil wells producing from the Grayburg in the Eunice Pool show an average content of 753 grains per 100 cubic feet. We believe these two facts prove a separation between the Grayburg oil and the Yates-Seven Rivers-Queen gas formations in this area.

In the Langlie Mattix Pool, the Continental Oil Company Jack A-21 No. 1 had a shut in bottomhole pressure in the Queen formation of 210 psi in 1945. It has since been recompleted as a dry gas well in the Yates and upper Seven Rivers. The latest pressure, taken during 1953, was 903 psi.

Similarly, in 1943, the Continental Jack A-29 No. 5 had a bottomhole pressure in the Queen and lower Seven Rivers of 340 psi. It has since been recompleted as a gas well with shut in pressure during the latter part of 1953 showing 851 psi. These pressures were taken from 1939 to 1950. Shut in gas well pressures, most of which were taken in October, 1953, are shown on Exhibit 31. Exhibit 32 is a section drawn through Continental's State J-2 lease in Section 2, Township 22 South, Range 36 East. On it are shown tracings of the radioactivity surveys run in conjunction with workovers on six of the twelve wells on the lease. These wells are all producing from the Grayburg formation. The remedial work was done on these wells to shut off water production. In every case, after the workover, the water production was eliminated or substantially reduced.

State J-2 No. 11, for example, was producing 22 barrels of oil, 254 barrels of water, per day from open hole, with 5½" pipe set at approximately 3,710 at a total depth of 3,852. A packer was set at 3,638 and the interval below the packer was acidized with 1,000 gallons. Following the workover, the well produced from below the packer 122 barrels oil, 8 barrels water per day, flowing through an 11/64" choke.

Well No. 7, prior to the workover, tested 22 barrels oil, 350 barrels water, in 24 hours from open hole, with 5½" casing set at approximately 3,720 and the total depth at 3,781. The well was deepened to 3,825 and a liner cemented on bottom. The liner was perforated from 3,803 to 3,812 and 3,819 to 3,822 and the well acidized with 500 gallons. It was recompleted for an IP of 211 barrels of oil, no water, in 24 hours, flowing through 20/64" choke. Similar experiences were had with the other wells.

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This evidence, to our minds, shows that the various permeable zones within the Grayburg formation in that area performed during the course of production like separate reservoirs. It definitely shows that there must be some impermeable barriers within the Grayburg formation in the Arrowhead Pool.

Exhibit 23 is a log of the Continental Ida Hendricks No. 1 in the Hendricks Pool of Winkler County, Texas. The Hendricks Pool is a southern extension of the reef ridge on which lie the Eaves, Cooper-Jal, etc., Pools. The well was originally completed in 1938 at a total depth of 3,000, for an IP of 240 barrels of oil per day from open hole between 8¼" casing at 2,316 and a total depth of 2,980. In August, 1950, the well tested 30 barrels oil, 1,500 barrels water, per day. During the month it was deepened to 2,973 and 7" casing set at 2,870. After the work, the well tested 300 barrels oil, no water, per day.

Exhibit 24 is a log comparison of six wells in Sections 29 and 32, Township 22 South, Range 36 East, and Section 5, Township 23 South, Range 36 East. These wells indicate reversals of the normal sequence of fluids to be expected in reservoirs. In the Continental Meyer A-29 No. 4 the well was completed through perforations 3636-3648 for an IP of 314 barrels of oil, 35 barrels of water, per day. These perforations are immediately below an interval in which a drill stem test recovered 720 feet sulfur water and 120 feet of mud.

The Continental State A-32 No. 3 was perforated from 3,526 to 3,540, and after being acidized, tested 8,510 MCF gas per day. A retainer was set at 3,510 and the well then perforated from 3,470 to 3,490. After being acidized, it was completed for an IP of 322 barrels of oil per day with a gas-oil ratio of 598.

The data on these six wells, plus the Continental Hendricks, indicates that there must be impermeable barriers within the Yates and Seven Rivers formations. I believe that the formations, Yates, Seven Rivers, Queen, Grayburg and San Andres, were separate reservoirs in their initial conditions, although they were probably one accumulation.

At the April, 1951 hearing of the New Mexico Oil Conservation Commission, Continental Oil Company presented testimony and a recommendation for delineation of four shallow gas pools in southeastern Lea County, New Mexico. Prior to presenting the testimony, engineers for Continental, and for three other companies in partnership with Continental in certain acreage in the area, made a study of the area which continued over a period of some six or eight months. A number of cross sections were made which have been presented in evidence at the present hearing; also, a

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structure map of the area which was presented as Exhibit I in April of 1951, and again at this hearing, and a map showing shut in pressures and sulfur contents as obtained from the El Paso Natural Gas Company similar to Exhibit 21 in this case were studied.

In studying these various items, it appeared that in crossing the reef ridge there was a major change in stratigraphy in the Seven Rivers formation and that in the Yates formation the individual sand lenses did not appear to be continuous. There was, also, at that time a differential pressure of approximately 200 pounds between wells in what is now designated as the Langmat Pool and wells in what is now designated as the Jalco Pool. There was, in general, a difference in sulfur contents, the wells in Langmat running less than one grain per 100 cubic feet, while wells in the Jalco ran up to 300. The change in pressure, sulfur contents and stratigraphy appeared to follow rather closely the low spot immediately behind the reef ridge and the boundary line between the Langmat and Jalco Pools was placed on the combination of structure, sulfur content and gas well pressures.

The boundary between the Jalco and Eumont Pools, as originally recommended by Continental, was placed approximately at the boundary line between the Eunice and South Eunice Oil Pools. The area where it was drawn was comparatively undeveloped for gas at that time. There appeared to be also a division in the Queen formation in that area. A similar situation existed between the Eumont and Langmat Pools. Included in the Arrow Pool was an area of which little was known so far as gas possibilities was concerned.

In re-studying the area, it was decided that certain requirements were an absolute necessity: (1) that there should not be major pressure differentials between any of the formations included within any one pool; and (2) since the basic proration unit is a governmental quarter section, the boundaries should follow quarter section lines.

At the time of the original study, it was believed necessary, and it is still believed necessary, to segregate the Queen and lower Seven Rivers from the Yates and upper Seven Rivers in the vicinity of the Langlie Mattix oil pool because of the pressure differential previously testified to.

Designating the Langmat Gas Pool as the Yates and all but the lower 100 feet of the Seven Rivers, and the Langlie Mattix Oil Pool as the lower 100 feet of the Seven Rivers and all of the Queen, maintains the necessary segregation between the high pressure gas and the low pressure oil zones. The result is an oil pool with comparatively few gas wells, and a gas pool with a comparatively small oil productive area. From an administrative standpoint, it is believed that it would be easier to set up field rules for these two pools than for one big oil and gas pool.

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It was, and still is, believed the gas in the area designated as Jalco is primarily gas cap gas. There are numerous wells producing oil from the Yates, Seven Rivers and Queen formations. At least a portion of these formations has a water drive along the west flank and it is believed the water is coming from the west. A proration system in the pool should not allow gas wells to void more space than oil wells.

The designation as originally made is believed to have recognized the problems peculiar to each area and allows these peculiarities to be recognized in establishing field rules. This should help to prevent waste and permit equitable withdrawals.

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Continental (Homer Bailey)
Hearing Case 672
(5-10-54

Exhibit I is a contour map on the top of the Yates in Township 19 South through Township 26 South and Ranges 35 East through 38 East, inclusive. Starting at the south along the dividing line between Ranges 36 and 37 East, and extending in a northerly direction to Section 6, Township 22 South, Range 36 East is a long, narrow ridge. This general ridge is broken up into a number of small local highs. We believe this ridge to be the approximate eastern limit of Capitan reef development in the area. From south to north, the Eaves, Cooper-Jal and the west half of the South Eunice Pool lie on this ridge. Oil production is found chiefly on the west flank of the ridge. Producing formations consist of the Yates and Seven Rivers in the south and Queen, and possibly upper Grayburg, in the north. Porosity and permeability in the lower Yates, Seven Rivers and Queen formations are found mainly in dolomite. The upper Yates, which is in general less productive than the others, contains chiefly gas which appears to be contained in the sands.

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The Seven Rivers along the reef ridge produces chiefly oil from the west flank with gas in the higher wells. At the extreme north end, the Seven Rivers dolomites contain almost all gas. To the east of the ridge in the lower wells, the bottom portion of the Seven Rivers contains some oil, while the rest of the formation contains gas. Gas is also found in the Seven Rivers in the south and west portions of Township 21 South, Range 36 East. The sands in the Seven Rivers back of the reef area appear to be lenses with the longest dimensions north and south. Most of the sands pinch out as the top of the back reef high is approached. The Seven Rivers also produces gas in the central portion of the Monument Pool.

The Yates formation produces oil in some of the lower wells west of the reef ridge. In the higher wells along the reef ridge, it contains gas. Back of the reef, with the exception of several small lows, it contains gas. Production in the Eunice and Monument Fields from the Yates appears to be limited to the same general area as that which produces from the Seven Rivers. In general, along the reef ridge, the lower Yates is more prolific than the upper Yates.

Studies and work in southeastern Lea County by Continental Oil Company indicate the pay horizons to be either leased or zoned in most of the producing formations. By this it is meant that the producing formations consist of a series of permeable layers separated by impermeable layers within the formation. These layers in practically all cases follow the structure. Initially, the water-oil contact in all formations varied from approximately -275 feet subsea at the south end to approximately -325 feet at the north end. Likewise, the gas-oil contact in all formations was approximately 100 feet above the water-oil contact. Apparently, over geologic times fluids have reached a state of equilibrium throughout all the shallow formations with the exception of the oil accumulations in low spots in the Yates. During the producing life of the fields, however, these various zones have performed as separate reservoirs.

Initially, bottomhole pressure of the Eunice Pool is believed to have been approximately 1,450 psi. The average bottomhole pressure of 55 Grayburg oil wells taken in August of 1935, was 541 psi. There were a total of 47 gas wells in the Eunice

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part of the Eumont gas field carried on the February, 1954 proration schedule. Shut in pressures taken in October, 1953 were obtained on 27 of these wells. The average shut in pressure was 1,039 psi, or a difference of 488 psi above that of the average pressures for the oil wells in the Eunice Pool. Sulfur content on nine Continental gas wells completed in the Yates, Seven Rivers or Queen in the area covered by the Eunice oil pool show an average sulfur content of 69 grains per 100 cubic feet. Sulfur contents of seven oil wells producing from the Grayburg in the Eunice Pool show an average content of 755 grains per 100 cubic feet. We believe these two facts prove a separation between the Grayburg oil and the Yates-Seven Rivers-Queen gas formations in this area.

In the Langlie Mattix Pool, the Continental Oil Company Jack A-21 No. 1 had a shut in bottomhole pressure in the Queen formation of 210 psi in 1943. It has since been recompleted as a dry gas well in the Yates and upper Seven Rivers. The latest pressure, taken during 1955, was 903 psi.

Similarly, in 1943, the Continental Jack A-29 No. 3 had a bottomhole pressure in the Queen and lower Seven Rivers of 340 psi. It has since been recompleted as a gas well with shut in pressure during the latter part of 1953 showing 851 psi. These pressures were taken from 1939 to 1950. Shut in gas well pressures, most of which were taken in October, 1953, are shown on Exhibit 21. Exhibit 22 is a section drawn through Continental's State J-2 lease in Section 2, Township 22 South, Range 36 East. On it are shown tracings of the radioactivity surveys run in conjunction with workovers on six of the twelve wells on the lease. These wells are all producing from the Grayburg formation. The remedial work was done on these wells to shut off water production. In every case, after the workover, the water production was eliminated or substantially reduced.

State J-2 No. 11, for example, was producing 22 barrels of oil, 254 barrels of water, per day from open hole, with 5½" pipe set at approximately 3,710 at a total depth of 3,852. A packer was set at 3,838 and the interval below the packer was acidized with 1,000 gallons. Following the workover, the well produced from below the packer 122 barrels oil, 8 barrels water per day, flowing through an 11/64" choke.

Well No. 7, prior to the workover, tested 22 barrels oil, 356 barrels water, in 24 hours from open hole, with 5½" casing set at approximately 3,720 and the total depth at 3,781. The well was deepened to 3,825 and a liner cemented on bottom. The liner was perforated from 3,808 to 3,812 and 3,819 to 3,822 and the well acidized with 500 gallons. It was recompleted for an IP of 211 barrels of oil, no water, in 24 hours, flowing through 20/64" choke. Similar experiences were had with the other wells.

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This evidence, to our minds, shows that the various permeable zones within the Grayburg formation in that area performed during the course of production like separate reservoirs. It definitely shows that there must be some impermeable barriers within the Grayburg formation in the Arrowhead Pool.

Exhibit 23 is a log of the Continental Ida Hendricks No. 1 in the Hendricks Pool of Winkler County, Texas. The Hendricks Pool is a southern extension of the reef ridge on which lie the Eaves, Cooper-Jal, etc., Pools. The well was originally completed in 1929 at a total depth of 2,880, for an IP of 240 barrels of oil per day from open hole between 8¼" casing at 2,316 and a total depth of 2,880. In August, 1930, the well tested 30 barrels oil, 1,500 barrels water, per day. During the month it was deepened to 2,975 and 7" casing set at 2,870. After the work, the well tested 300 barrels oil, no water, per day.

Exhibit 24 is a log comparison of six wells in Sections 29 and 32, Township 22 South, Range 36 East, and Section 5, Township 23 South, Range 36 East. These wells indicate reversals of the normal sequence of fluids to be expected in reservoirs. In the Continental Meyer A-29 No. 4 the well was completed through perforations 3636-3648 for an IP of 314 barrels of oil, 35 barrels of water, per day. These perforations are immediately below an interval in which a drill stem test recovered 720 feet sulfur water and 120 feet of mud.

The Continental State A-32 No. 3 was perforated from 3,526 to 3,540, and after being acidized, tested 6,510 MCF gas per day. A retainer was set at 3,510 and the well then perforated from 3,470 to 3,490. After being acidized, it was completed for an IP of 322 barrels of oil per day with a gas-oil ratio of 598.

The data on these six wells, plus the Continental Hendricks, indicates that there must be impermeable barriers within the Yates and Seven Rivers formations. I believe that the formations, Yates, Seven Rivers, Queen, Grayburg and San Andres, were separate reservoirs in their initial conditions, although they were probably one accumulation.

At the April, 1951 hearing of the New Mexico Oil Conservation Commission, Continental Oil Company presented testimony and a recommendation for delineation of four shallow gas pools in southeastern Lea County, New Mexico. Prior to presenting the testimony, engineers for Continental, and for three other companies in partnership with Continental in certain acreage in the area, made a study of the area which continued over a period of some six or eight months. A number of cross sections were made which have been presented in evidence at the present hearing; also, a

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structure map of the area which was presented as Exhibit I in April of 1951, and again at this hearing, and a map showing shut in pressures and sulfur contents as obtained from the El Paso Natural Gas Company similar to Exhibit 21 in this case were studied.

In studying these various items, it appeared that in crossing the reef ridge there was a major change in stratigraphy in the Seven Rivers formation and that in the Yates formation the individual sand lenses did not appear to be continuous. There was, also, at that time a differential pressure of approximately 200 pounds between wells in what is now designated as the Langmat Pool and wells in what is now designated as the Jalco Pool. There was, in general, a difference in sulfur contents, the wells in Langmat running less than one grain per 100 cubic feet, while wells in the Jalco ran up to 300. The change in pressure, sulfur contents and stratigraphy appeared to follow rather closely the low spot immediately behind the reef ridge and the boundary line between the Langmat and Jalco Pools was placed on the combination of structure, sulfur content and gas well pressures.

The boundary between the Jalco and Eumont Pools, as originally recommended by Continental, was placed approximately at the boundary line between the Eunice and South Eunice Oil Pools. The area where it was drawn was comparatively undeveloped for gas at that time. There appeared to be also a division in the Queen formation in that area. A similar situation existed between the Eumont and Langmat Pools. Included in the Arrow Pool was an area of which little was known so far as gas possibilities was concerned.

In re-studying the area, it was decided that certain requirements were an absolute necessity: (1) that there should not be major pressure differentials between any of the formations included within any one pool; and (2) since the basic proration unit is a governmental quarter section, the boundaries should follow quarter section lines.

At the time of the original study, it was believed necessary, and it is still believed necessary, to segregate the Queen and lower Seven Rivers from the Yates and upper Seven Rivers in the vicinity of the Langlie Mattix oil pool because of the pressure differential previously testified to.

Designating the Langmat Gas Pool as the Yates and all but the lower 100 feet of the Seven Rivers, and the Langlie Mattix Oil Pool as the lower 100 feet of the Seven Rivers and all of the Queen, maintains the necessary segregation between the high pressure gas and the low pressure oil zones. The result is an oil pool with comparatively few gas wells, and a gas pool with a comparatively small oil productive area. From an administrative standpoint, it is believed that it would be easier to set up field rules for these two pools than for one big oil and gas pool.

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It was, and still is, believed the gas in the area designated as Jalco is primarily gas cap gas. There are numerous wells producing oil from the Yates, Seven Rivers and Queen formations. At least a portion of these formations has a water drive along the west flank and it is believed the water is coming from the west. A proration system in the pool should not allow gas wells to void more space than oil wells.

The designation as originally made is believed to have recognized the problems peculiar to each area and allows these peculiarities to be recognized in establishing field rules. This should help to prevent waste and permit equitable withdrawals.

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Case 673

SOUTHERN CALIFORNIA PETROLEUM CORPORATION

905 McCLINTIC BLDG. . . . . MIDLAND, TEXAS

PHONE 4-8044

May 20, 1954

Mr. R. R. Spurrier, Secretary
Oil Conservation Commission
State of New Mexico
Santa Fe, New Mexico

Re: CASE NO (673) Written statement filed in lieu of oral statement at hearing on May 10 and 11, 1954, due to insufficient time after introduction of prepared evidence and testimony

Gentlemen:

Southern California Petroleum Corporation would like to state that we consider the Yates-Seven Rivers and Queen as distinct and separate reservoirs in the Langlie-Mattix, Cooper-Jal and Falby-Yates Fields. It is our opinion that the practice of producing all these zones from the same bore hole without separation is inefficient and will result in reduced recoveries from these reservoirs, thereby causing waste of our oil and gas resources. Our operations in southeastern New Mexico are confined chiefly to this area, and we are particularly concerned with the Falby-Yates Field, which was set apart only a few months ago by the New Mexico Oil Conservation Commission after hearing strong evidence substantiating the Yates-Seven Rivers and the Queen as separate reservoirs.

Subsequent drilling by Southern California Petroleum Corporation within the area of the Falby-Yates Field further emphasizes the desirability of separating Yates and Queen reservoirs. The bottom-hole pressure of the Queen in our Thomas No. 5 well was 978 p.s.i. compared to 1260 p.s.i. taken in the Yates on a drill stem test in the same bore hole. This was the first of three Queen producers completed on our 160-acre Thomas lease in Section 24, Township 24 South, Range 36 East, which has four old Yates oil producers completed between September 1949 and April 1950. This high residual Yates pressure is interesting, since the pressures on the four-year old Yates wells, only 825 feet and 990 feet away from Thomas No. 5, were only 338 p.s.i. and 476 p.s.i., respectively, on September 29, 1953.

Bottom-hole pressures at a datum of -250 feet below sea level on new Queen producers in the Falby-Yates area completed to date are as follows:

WELL	DATE	BHP, p.s.i.
Thomas No. 5	3/5/54	978
" " 6	4/8/54	946
" " 7	5/19/54	917
Phillips No. 3	"	866
" " 4	"	867
Dunn No. 4		934

These Queen wells potential for 137 to 480 barrels per day, flowing with 200 to 500 p.s.i. surface pressures. This type of production indicates that the few old wells in the area which are producing from the Queen zone with bottom-hole pressures as low as 240 p.s.i. certainly have not drained off much of the original Queen reservoir pressure.

A significant difference in gravity of the oil produced on our Thomas lease is noted: Yates, 34-36° API, Queen, 36-38° API.

Our experience indicates that producing gas-oil ratios of Yates wells in this area are characteristically high - of the order of 8500-35,000 cubic feet per barrel, with some much higher, while the Queen wells are generally much lower - approximately 2000-6000 cubic feet per barrel.

We have found no evidence of open fractures which would allow communication between the Yates-Seven Rivers and Queen reservoirs in this area. The Seven Rivers dolomite was cored in the above-mentioned Thomas No. 5 well, and core analysis showed an average porosity of 2.5% and effective permeability of less than 0.01 md. The Queen was also cored in this well and showed an average porosity of 17.0% and an average permeability of 18.6 md. This analysis contrasts with cores analyzed from the Yates section in our Thomas No. 6 well, which showed an average porosity of 21.1% and an average permeability of 37.0 md.

We are proceeding with the development of Queen production in the Falby-Yates area in good faith as a result of the formation of the Falby-Yates Field last January, with the expectation of receiving separate allowables for Yates-Seven Rivers wells and Queen wells on the same 40-acre tracts. We are also continuing remedial work to separate, where practicable, Yates-Seven Rivers production from Queen production in wells previously completed with all three zones open.

Respectfully submitted,

SOUTHERN CALIFORNIA PETROLEUM CORP.

J. A. Warren
Division Engineer

SOUTHERN CALIFORNIA PETROLEUM CORPORATION
905 McCLINTIC BLDG. . . . . MIDLAND, TEXAS
PHONE 4-8044

May 20, 1954

Mr. R. R. Spurrier, Secretary
Oil Conservation Commission
State of New Mexico
Santa Fe, New Mexico

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Respectfully submitted,

SOUTHERN CALIFORNIA PETROLEUM CORP.

J. A. Warren
Division Engineer

GULF OIL CORPORATION

SUGGESTED REVISION OF GAS PRORATION RULES
AS SET FORTH IN ORDERS NO. R-368-A TO R-376-A, INCLUSIVE

(Underlining indicates changes in the present Rules)
May 10, 1954

SPECIAL RULES AND REGULATIONS
FOR THE _____ GAS POOL
LEA COUNTY, NEW MEXICO

WELL SPACING AND ACREAGE REQUIREMENTS

RULE 1. Any well drilled a distance of one mile or more outside the boundary of the _____ Gas Pool shall be classified as a wildcat well. Any well drilled less than one mile outside the boundary of the _____ Gas Pool shall be spaced, drilled, operated and prorated in accordance with the Regulations in effect in said Pool.

RULE 2. Each well drilled or recompleted within the _____ Gas Pool shall be located on a standard or non-standard proration unit as herein defined.

RULE 3. Each well drilled within the _____ Gas Pool shall not be drilled closer than 660 feet to any outer boundary line of the tract nor closer than 330 feet to a quarter-quarter section or subdivision inner boundary, nor closer than 1320 feet to a well drilling to or capable of producing from the same pool.

RULE 4. The Secretary of the Commission shall have authority to grant exception to the requirements of Rule 3 without Notice and Hearing where application has been filed in due form and the necessity for the unorthodox location is based on topographical conditions or is occasioned by the recompletion of a well previously drilled to another horizon.

Applicants shall furnish all operators within 1320 foot radius of the subject well a copy of the application to the Commission, and applicant shall include with his application a written stipulation that all operators within such radius have been properly notified. The Secretary of the Commission shall wait at least 20 days before approving any such unorthodox location, and shall approve such unorthodox location only in the absence of objection of any offset operators. In the event an operator objects to the unorthodox location the Commission shall consider the matter only after proper notice and hearing.

RULE 5. The provision of Statewide Rule 104 Paragraph (k) shall not apply to the _____ Gas Pool located in Lea County, New Mexico.

GAS PRORATION

RULE 6. (a) The Commission, after notice and hearing, shall consider the nominations of gas purchasers from the _____ Gas Pool and other relevant data and shall fix the allowable production of said pool, and shall allocate production among the gas wells in said pool upon a reasonable basis with due regard to correlative rights.

(b) Gas allowable shall be allocated on the basis of 100 per cent acreage.

PRORATION UNITS

RULE 7. (a) For the purpose of gas allocation in the _____ Gas Pool, a standard proration unit shall consist of between 158 and 162 contiguous surface acres substantially in the form of a square which shall be a legal subdivision (quarter section) of the U. S. Public Lands Surveys, provided, however, that a gas proration unit of less than 158 acres or more than 162 acres may be formed after notice and hearing by the Commission or as outlined in Paragraph (d) of this rule. Any standard proration unit consisting of between 158 and 162 contiguous surface acres shall be considered as containing 160 acres for the purpose of computing allowables.

(b) Any proration unit containing less than 158 acres or more than 162 acres shall be a non-standard unit and its allowable shall be decreased or increased in the proportion that the standard proration unit allowable bears to the number of acres contained therein.

(c) Non-standard units shall meet the following requirements:

1. Shall contain not more than 640 acres, the overall length or width of which shall not exceed 5,280 feet, except in instances where the formation of a unit comprising four quarter sections results in a total acreage in excess of 640 acres; and in such event, the unit will be considered to be only 640 acres for proration purposes.

2. All acreage assigned a non-standard unit shall be adjacent or contiguous to the acreage on which the well on said unit is located.

3. All acreage included shall reasonably be presumed to be productive of gas.

(d) The Secretary of the Commission shall grant exceptions to Rule 7 (a) without notice and hearing where the following facts exist and the following provisions are complied with:

1. Application for non-standard unit has been filed in due form with the Secretary of the Commission.

2. Applicant has submitted satisfactory evidence that all operators of offset acreage have been furnished with a copy of the application for the unit.

3. There is no objection, in writing, to the formation of the non-standard unit received by the Secretary of the Commission from any offset operator within twenty (20) days after date of receipt of application by the Secretary of the Commission.

GAS ALLOCATION

RULE 8. At least 30 days prior to the beginning of each gas proration period the Commission shall hold a hearing after due notice has been given. The Commission shall cause to be submitted by each gas purchaser its "Preliminary Nominations" of the amount of gas which each in good faith actually desires to purchase within the ensuing proration period, by months, from the _____ Gas Pool. The Commission shall consider the "Preliminary Nominations" of purchasers, actual production, and such other factors as may be deemed applicable in determining the amount of gas that may be produced without waste within the ensuing proration period. "Preliminary Nominations" shall be submitted on a form prescribed by the Commission.

RULE 9. Each month, the Commission shall cause to be submitted by each gas purchaser its "Supplemental Nominations" of the amount of gas which each in good faith actually desires to purchase within the ensuing proration month from the _____ Gas Pool. The Commission shall hold a public hearing between the 15th and 20th days of each month to determine the reasonable market demand for gas for the ensuing proration month, and shall issue a proration schedule setting out the amount of gas which each well may produce during the ensuing proration month. Included in the monthly proration schedule shall be a tabulation of allowable and production for the second preceding month together with an adjusted allowable computation for the second preceding month. Said adjusted allowable shall be computed by comparing the actual allowable assigned with the actual production. In the event the allowable assigned is greater than the actual production, the allowables assigned the top allowable units shall be reduced proportionately, and in the event the allowable assigned is less than the production then the allowables assigned the top allowable units shall be increased proportionately. "Supplemental Nominations" shall be submitted on a form prescribed by the Commission.

The Commission shall include in the proration schedule the gas wells in the _____ Gas Pool delivering to a gas transportation facility, or lease gathering system, and shall include in the proration schedule of the _____ Gas Pool any well which it finds is being unreasonably discriminated against through denial of access to a gas transportation facility, which is reasonably capable of handling the type of gas produced by such well. The total allowable to be allocated to the pool each month shall be equal to the sum of the supplemental nominations together with any adjustment which the Commission deems advisable. The allocation to a pool remaining after subtracting the capacities of marginal units shall be divided and allocated ratably among the non-marginal units in the proportion that the acreage contained in each unit bears to the total acreage allotted to such non-marginal units.

BALANCING OF PRODUCTION

RULE 10. Underproduction: The dates 7:00 A.M., January 1 and 7:00 A.M., July 1, shall be known as balancing dates and the periods of time bounded by these dates shall be known as gas proration periods. The amount of current gas allowable remaining unproduced at the end of each proration period shall be carried forward to and may be produced during the next succeeding proration period in addition to the normal gas allowable for such succeeding period; but whatever amount thereof is not made up within the first succeeding proration period shall be cancelled. If, at the end of the first succeeding proration period, a greater amount of allowable remains unproduced than was carried forward as underproduction, the amount carried forward to the second succeeding period shall be the total underproduction less the amount carried forward to the first succeeding period.

If it appears that such continued underproduction has resulted from inability of the well to produce its allowable, it may be classified as a marginal well and its allowable reduced to the well's ability to produce.

RULE 11. Overproduction: A well which has produced a greater amount of gas than was allowed during a given proration period shall have its allowable for the first succeeding proration period reduced by the amount of such overproduction and such overproduction shall be made up within the first succeeding proration period. If, at the end of the first succeeding proration period, the well is still overproduced and has not been in balance since the end of the preceding proration period, then it shall be shut in and its current monthly allowable charged against said overproduction until the well is in balance. If, at any time, a well is overproduced an amount equaling six times its current monthly allowable, it shall be shut in until it is in balance.

The Commission may allow overproduction to be made up at a lesser rate than would be the case if the well were completely shut in upon a showing at public hearing after due notice that complete shut in of the well would result in material damage to the well.

GRANTING OF ALLOWABLES

RULE 12. No gas well shall be given an allowable until Form C-104 and Form C-110 have been filed together with a plat showing acreage attributed to said well and the locations of all wells on the lease.

RULE 13. Allowables to newly completed gas wells shall commence on the date of connection to a gas transportation facility, as determined from an affidavit furnished to the Commission (Box 2045, Hobbs, New Mexico) by the purchaser, or the date of filing of Form C-104 and Form C-110 and the plat described above, whichever date is the later.

REPORTING OF PRODUCTION

RULE 14. The monthly gas production from each gas well shall be metered separately and the gas production therefrom shall be submitted to the Commission on Form C-115 so as to reach the Commission on or before

the twentieth day of the month next succeeding the month in which the gas was produced. The operator shall show on such report what disposition has been made of the gas produced. The full production of gas from each well shall be charged against the well's allowable regardless of what disposition has been made of the gas; provided, however, that gas used on the lease for consumption in lease houses, treaters, combustion engines and other similar lease equipment shall not be charged against the well's allowable.

MISCELLANEOUS PROVISIONS

RULE 15. In the event an operator has a producing well on a non-standard proration unit as defined under Rule 7 (b), pending the approval of such unit by the Commission, the Proration Manager shall assign to the well an allowable based only on that acreage attributable to the operator's lease or leases lying within the quarter section upon which the well is located. If, on approval of the non-standard unit, additional acreage is attributed to the well, then the allowable assigned the well shall be adjusted retroactive to the first day of the proration period, or the first day on which the well produced into a gas transportation facility if subsequent to January 1, 1954.

DEFINITIONS

RULE 16. A gas well shall mean (a) a well which produces gas not associated with crude petroleum oil in the reservoir, or (b) a well which produces more than one hundred thousand (100,000) cubic feet of gas to each barrel of crude petroleum oil from the same producing horizon.

RULE 17. The term "gas purchaser" as used in these rules shall mean any "taker" of gas either at the well head or at any point on the lease where connection is made for gas transportation or utilization. It shall be the responsibility of said "taker" to submit a nomination.

The Commission may allow overproduction to be made up at a lesser rate than would be the case if the well were completely shut in upon a showing at public hearing after due notice that complete shut in of the well would result in material damage to the well.

GRANTING OF ALLOWABLES

RULE 11. (~~Previous Rule 12~~) No gas well shall be given an allowable until Form C-104 and Form C-110 have been filed together with a plat showing acreage attributed to said well and the locations of all wells on the lease.

RULE 12. (~~Previous Rule 13~~) Allowables to newly completed gas wells shall commence on the date of connection to a gas transportation facility, as determined from an affidavit furnished to the Commission (Box 2045, Hobbs, New Mexico) by the purchaser, or the date of filing of Form C-104 and Form C-110 and the plat described above, whichever date is the later.

REPORTING OF PRODUCTION

RULE 13. (~~Previous Rule 14~~) The monthly gas production from each gas well shall be metered separately and the gas production therefrom shall be ~~submitted~~ reported on Form C-115 to the Commission so as to reach the Commission on or before the twentieth day of the month next succeeding the month in which the gas was produced. The operator shall show on such report what disposition has been made

A new Paragraph

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DEFINITIONS

RULE 14. ~~(Previous Rule 15) A gas well shall mean a well producing gas or natural gas from a common source of gas supply from a gas pool determined by the Commission.~~ A gas well shall mean a well producing with a gas-oil ratio in excess of 100,000 cubic feet of gas per barrel of oil.

RULE 15. A well producing from the [illegible] Pool and not classified as a gas well as defined in Rule 14 shall be classified as an oil well.

RULE 16. The term "gas purchaser" as used in these rules, shall mean any "taker" of gas either at the wellhead or at any point on the lease where connection is made for gas transportation or utilization. It shall be the responsibility of said "taker" to submit a nomination.

RULE 17. No gas, either dry gas or casinghead gas, produced from the [illegible] Pool shall be flared or vented unless specifically authorized by order of the Commission after notice and hearing.

RULE 18. Oil wells producing from the Jalmat Pool shall be allowed to produce a volume of gas each day not exceeding the daily normal unit oil allowable multiplied by 6,000, provided, however, that such well shall not be allowed to produce oil in excess of the normal unit allowable as ordered by the Commission under the provisions of Rule 505.