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TEXT

INTRODUCTION

Union Oil Company of California d/b/a/ Unocal herein applies for deproration of the South Blanco Pictured Cliffs Pool, which extends into Rio Arriba, Sandoval, and San Juan Counties, New Mexico. At this time, the reservoir is in an advanced stage of depletion and therefore has low productivity. With this in mind, deproration will not create waste or impair correlative rights or create market supply problems.

Exhibit 1 is a location map with the major Pictured Cliffs Pools highlighted. Of interest in this report are the Blanco, Tapacito, Aztec, Ballard, Fulcher Kutz, and West Kutz Pools. The Blanco Pictured Cliffs Pool has never been prorated, the Tapacito Pictured Cliffs Pool is the only other Pictured Cliffs to be prorated besides South Blanco, and the remaining four pools were prorated until 1974. Exhibit 2 is a structure contour map on the Huerfanito Bentonite Marker. The distance from the top of this marker to the top of the Pictured Cliffs is several hundred feet, however the structures are similar.

A list of the current operators in this pool is presented in Exhibits 3A and 3B. Part A is sorted alphabetically by operator name, and part B is sorted by the percentage of wells operated. This list was extracted from the most recent proration schedule (April - September 1992) available. A survey of these operators was taken to determine if they were in support or objected to deproration. All respondents were in favor of deproration, and represent over 70% of the operated wells in the South Blanco Pool.

PRORATION HISTORY

The South Blanco Pictured Cliffs Pool was created in May 1952, by order No. R-156. In December 1954, R - 565 was enacted which developed special pool rules to prorate the Aztec, Fulcher Kutz, and South Blanco Pools. The West Kutz Pool began proration one year later in March 1955, and the Ballard Pool began proration in July 1956. The Oil Conservation Division (OCD) in May 1960 established R - 1670 which consolidated the rules for the Pictured Cliffs and Blanco Mesaverde prorated gas pools in Northwest New Mexico.

An important amendment to R-1670 was the deproration of Aztec, Ballard, Fulcher Kutz, and West Kutz pools by order R-1670-R effective April 1974. For convenience, attached is a copy of this order. (Exhibit 4) A "Pictured Cliffs Proration Committee", appointed by the Commission, unanimously recommended the elimination of prorationing in

the previously mentioned pools. The evidence presented to support this claim was the low productivity of the wells. Specifically, production had declined to less than 100 mcfd per well and a majority of the wells in each of these pools averaged less than 3000 mcf per month for the last nine months of 1973. The OCD in its decision found that due to the low productivity of the wells, gas prorationing should be discontinued; and that elimination of gas prorationing will not cause waste nor impair correlative rights.

The Pictured Cliffs Proration Committee also evaluated South Blanco and Tapacito Pools but decided not to recommend them for deproration. From the transcript of the hearing (Case No. 5154), these two pools were omitted because "certain parties on the committee objected .... for the reason there were unequal pipeline pressures between the increasing pipelines in those pools and thought that eliminating prorationing might possibly result in non-rateable takes." Today, the low pressured Pictured Cliffs reservoirs can only produce into the "low pressure" gathering systems of the various pipeline companies. These systems average 150 psi line pressure.

Another significant order was written in July 1982 (R-7029), which was an attempt to combine the Blanco and South Blanco Pools and prorate as one pool; subsequently prorating the Blanco Pool. The OCD denied the request based on: (1) engineering evidence demonstrating that drainage was not occurring between pool boundaries, (2) no evidence of waste was presented if said pools were not consolidated, and (3) insufficient evidence was presented to prove consolidation was necessary to protect correlative rights.

In March 1986, R-8170 was executed which rescinded R-1670. This order updated and amended the general and specific rules for all prorated gas pools.

PERFORMANCE ANALYSIS

Two sets of evidence were investigated to show the low productivity and advanced depletion of the South Blanco Pictured Cliffs Pool. The low productivity will be described by a series of rate vs time plots, comparing the seven major Pictured Cliffs pools. The degree of depletion will be shown through shutin wellhead pressure vs cumulative gas production plots, also for the seven pools.

Comparison of Rate-Time Data With Other P.C. Pools

A compilation of annual gas production vs time, using the New Mexico Annual Reports, was undertaken for Aztec, Ballard, Blanco, South Blanco, Fulcher Kutz, Tapacito, and West Kutz Pools.(Exhibits 5A-G) Also shown is the active

well count per year and labeled is the time of deproration of the four Pictured Cliffs Pools in 1974. A tabulation of all the data used from the New Mexico Annual Reports is given in Appendix A.

There are several key points to be made about these plots. First, notice that South Blanco and others have produced almost 40 years and have declined to far below past production. Also notice, the increased decline in production beginning in 1983 and dramatically falling in 1986. This drop coincides with two events, El Paso Natural Gas shutting in wells after the GLA lawsuits and with the decline in prices in 1986.

Even though the South Blanco Pool is the largest pool in cumulative production and in number of wells; productivity is low if compared to: (1) the sum of the deprorated pools and (2) the other Pictured Cliffs pools on a per well basis. Recall, in 1974 four smaller pools (Aztec,Ballard,Fulcher Kutz,West Kutz) were deprorated. Individually, none of these pools compares to South Blanco; but taken as a whole the production is greater than South Blanco. This is best illustrated by Exhibit 6, where the annual production from South Blanco is plotted vs the sum of the annual production from the four deprorated pools. For the second part, Exhibits 7A through 7F are plots of the daily production rate per well for each pool compared to South Blanco. Notice on a per well basis the South Blanco production rate is equal to or below the other pools. In 1973 the rate was 69 mcfd per well and in 1991 the rate had fallen to 24 mcfd per well. Exhibit 7G lists the daily rate per well for all pools in 1973 and 1991. It is important to realize that the productivity of the South Blanco Pool was not at issue in 1974 and in fact, the South Blanco Pool meets the criteria set forth in R-1670-R for low productivity. Since that time, production has declined both annually and on a per well basis where today a Pictured Cliffs well in the South Blanco is one of the lowest producers.

Comparison of Press-Cum Prod. Data With Other P.C. Pools

A second method of estimating depletion is to plot p/z vs cumulative production. Since the pressure data available is shutin wellhead pressure from deliverability tests, it was used as a measure of depletion. It is an approximation, but since the Pictured Cliffs is shallow and the reservoir pressure is low, this shutin pressure should give an accurate picture of depletion. Also, because average reservoir pressure is sought, a large database such as deliverability tests is required and not random shutin bottom hole pressure tests. Again, using data from the New Mexico Annual Reports (Appendix A), shutin wellhead pressure vs cumulative production was plotted and is shown in

exhibits 8A through 8G. Only, years where the percent of tested wells to active wells is greater than 50% is considered valid.

Notice in Exhibit 8H, the South Blanco Pictured Cliffs Pool is not over- or under- depleted, but is ranked in the middle of the list of pools. In 1973, the South Blanco Pool had recovered 39% of the gas in place, while the four pools which were deprorated averaged 38%. The other prorated pool, Tapacito, had recovered 38 % and the Blanco Pool was under developed, recovering only 11%. By 1991 the recoveries had increased for the South Blanco Pool to 61%, for the deprorated pools to 62%, for Tapacito to 58%, and for Blanco to 43%. Subsequently, two conclusions can be drawn from this data: (1) the South Blanco Pool is comparable to the other Pictured Cliffs Pools which were deprorated, and (2) the South Blanco Pool is in the latter stages of depletion.

Composite plots of the linear regression lines from each of the pools for shutin wellhead pressure vs cumulative production (Exhibit 8I) and for shutin wellhead pressure vs recovery of gas-in-place (Exhibit 8J), results in several interesting features. Highlighted on these plots are the reservoir pressure range at the time of deproration for Aztec, Ballard, Fulcher Kutz, and West Kutz Pools. Notice , the pressure in the South Blanco Pool, today, falls on the lower limit of this range.

More interesting is the increasing trend of pressure with increasing depth of the pool. Notice on the structure contour map (Exhibit 2) that increasing depth of the Pictured Cliffs pools corresponds exactly with the increasing pressure trend seen in Exhibits 8I and 8J. This trend extends from the shallower West Kutz Pool where the reservoir pressure is lowest, to the deeper Tapacito Pool where the pressure initially was highest. Further, from the daily rate per well vs time plots (Exhibit 7), production characteristics are similar between adjacent pools. Using South Blanco as a reference, notice how the production characteristics, especially the decline rate, are similar between the offset pools. The production rate in Aztec Pool, to the northwest of South Blanco (See Exhibit 1), matches exactly with South Blanco. Similarly, the decline in the other adjacent offset pools parallels South Blanco; Ballard being lower, Blanco higher, and Tapacito coinciding with South Blanco. Fulcher Kutz and West Kutz pools, which are furthest away from South Blanco, have production behavior which is different.

It appears that these pools are of one common reservoir. The gas pressure gradient accounts for the difference in shutin pressures. Thus the deeper the pool, the higher the reservoir pressure. Since several Pictured

Cliffs pools have a common boundary, their production rates exhibit similar declines. The best example is the comparison between Aztec, South Blanco, Blanco, Ballard, and Tapacito Pools.

PROTECTION OF CORRELATIVE RIGHTS

One of the concerns about deproration is the protection of correlative rights. It is believed deproration will not adversely effect the correlative rights between wells or between the producers. To support this claim is the overwhelming evidence of low productivity and advanced depletion of the South Blanco Pictured Cliffs Pool. The OCD had previously recognized (in R-1670-R) that low production will not impair correlative rights.

The 1982 hearing for proration of the Blanco Pool with the South Blanco Pool, demonstrated that drainage was not occurring across the pool boundaries. Earlier evidence showed these two pools are of a common reservoir (agreeing with the Geologic evidence in 1982); therefore the lack of interference or drainage by another well is a reflection of the reservoir's characteristics. Specifically, the low permeability and the current low reservoir pressure are the dominant parameters, which prohibit drainage across the 160 acre spacing units. The Pictured Cliffs has been recognized by the OCD and the BLM as a low permeability reservoir and has been designated as such throughout the basin. Portions of Ballard, Blanco, and South Blanco Pictured Cliffs Pools are included in this designation.

PREVENTION OF WASTE

A second concern about deproration is the prevention of physical waste. As demonstrated in R-1670-R, where deprorating low productivity pools will not create waste, and in R-7029, where no evidence was presented to show waste if the Blanco Pool was not prorated; the deproration of South Blanco will not create waste. In fact, deproration may stimulate activity in the South Blanco Pool and hence promote more efficient depletion of the reservoir.

The addition of compression is a possible enhancement project for Pictured Cliffs wells. Unfortunately, the curtailment of production by proration and the unfavorable deliverability testing procedures, discourage such projects from ever becoming a reality. Exhibit 9A presents for the three major prorated gas pools (South Blanco, Basin Dakota, and Blanco Mesaverde), the ratio of the flowing wellhead pressure to shutin wellhead pressure (Pt/Pc) to the ratio of the deliverability to the test flow rate (D/Q). These curves were derived from the deliverability equation as defined in the Gas Well Testing Manual for Northwest New Mexico, OCD, 1987 using the given values for the exponent n

and the designated deliverability pressure Pd. Notice the sharp decrease in the pressure ratio at smaller D/Q ratios. The effect of compression is to lower the flowing wellhead pressure, subsequently lowering the Pt/Pc ratio. This decrease translates into a decrease in the D/Q ratio or in other words, less deliverability. The result is less of a percentage of gas allowed to deliver. For example, from the South Blanco Pictured Cliffs curve at a Pt/Pc ratio of .60 the deliverability is equal to the flow rate (D/Q = 1). If compression is installed, the Pt/Pc ratio is reduced, for example to .40, and then the deliverability is only 80% of the tested flow rate (D/Q = .80). The incremental production, which is decreased due to the deliverability testing method ; is further curtailed by the allowable system of prorationing, and therefore make such projects as compression not viable.

Several examples were prepared to show the loss of deliverable gas due to the allocation system for wells where compression was added. Exhibits 9B through 9E show the effect of prorationing on the best producers within the pool. The first year (Apr 91 to Mar 92) is actual production and allocation figures, with there corresponding overage/underage and limit. In April 92, the production is an estimated capability from the individual wells if compression was added. As can be seen, the production of the good wells is far greater than the allocation, therefore creating an overage. Thus the planned production must account for the balancing of the Overage/Underage, the effect of change of status, and estimating peak winter demand and planning accordingly during the summer months.

Over a two year period the loss of deliverable gas from these four wells ranges from 50 to 117 mmcf. Subsequently, production from the best producers is greater than the allocation, causing a loss of deliverable gas. This loss is waste. Also, the benefits from compression as an enhancement project are illustrated by these examples. And last, from these examples one can see the complicated procedures and manpower time which could be eliminated by deprorationing.

EFFECT OF DEPRORATION

If deproration does go into effect then what production increase can be expected, and what effect, if any, would this increase have on the gas market? First, notice the annual production curves shown in Exhibits 5A-G. Of the four pools deprorated in 1974, i.e., Aztec, Ballard, Fulcher Kutz, and West Kutz, none of them show any substantial increase in production after deproration. Today, with South Blanco's current depletion status and low productivity, one can expect the same results.

If an increase in production is seen, it is likely to come from the overproduced, nonmarginal wells. Exhibit 10A illustrates the possible increase in production from this group of wells. The winter proration period was selected to give the maximum production rate. The anticipated increase or difference between the deliverability of the overproduced nonmarginal wells and their corresponding allowable is 2.71 mmcfd. To put this rate in perspective, the second portion of Exhibit 10A compares the production increase to the entire South Blanco Pool, to prorated Northwest New Mexico, and to the San Juan Basin. The increase due to deproration would amount to 7.0%, 0.3%, and 0.2%, respectively, to each area.

To put the production from the South Blanco Pictured Cliffs Pool in perspective, Exhibits 10B and 10C show a comparison with the production from the San Juan Basin. Over a period of 33 years the share of the San Juan Basin production from the South Blanco pool has steadily decreased. The range is from a high of 16% in 1959 to a current low of 2.3% in 1991. As a result, the effect of deproration and the consequences on supply and demand of such a small portion of the total San Juan Basin production are negligible.

SUMMARY

Evidence was given to show the South Blanco Pictured Cliffs Pool is a low productivity reservoir which is in advanced stages of depletion. Using this evidence, a comparison was made between South Blanco and the other pools which were deprorated in 1974. No difference could be ascertained between them.

In 1974 the South Blanco Pool was not deprorated due to "... unequal pipeline pressures between the increasing pipelines..." Today, the low reservoir pressure of South Blanco can only produce to low pressure gathering systems. Therefore, no inequality can exist between pipeline pressures since it is the reservoir which is restricting flow.

Current production statistics for marginal and nonmarginal wells again show the low productivity of this pool. The daily rates per well are low, the number of marginal wells is increasing as more and more nonmarginal wells are reclassified, and the production from the pool is typically under the allocation.

In the event of deproration and with the producing characteristics as mentioned above, waste will **not** be created, nor correlative rights impaired, nor market demand affected. This is similar to what was stated in the 1974 ruling for the deproration of Aztec, Ballard, Fulcher Kutz,

and West Kutz Pools, and confirmed from their production history after the ruling.

Four advantages to deproration are listed below.

(1). It would encourage future development or enhancement projects in the pool, and therefore prevent waste. This was clearly demonstrated for the case of adding compression.

(2). Due to the low production rates in this pool, prorationing unnecessarily curtails only a handful of wells. The entire pool averages less than 30 mcfd per well and less than 5% of all the wells make 100 mcfd.

(3). With the addition of more pipeline capacity and gas deregulation, marketing gas at a competitive price is no longer a problem. To meet demand in user areas, gas will be bought from wherever the supply is available; therefore any restrictions to production for a given pool will lose market share to some other source. Deproration will help in maintaining market share.

(4). Deproration will eliminate the wasted manpower by the producers, pipelines, and OCD on paperwork.

LIST OF EXHIBITS

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4. Order No. R-1670-R, Deproration of Aztec, Ballard, Fulcher Kutz, and West Kutz Pools

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APPENDIX