STATE OF NEW MEXICO
ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT
OIL CONSERVATION COMMISSION

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

De Novo
Case No. 11996
Order No. R-11133-A

APPLICATION OF PENDRAGON ENERGY PARTNERS, INC. AND J. K. EDWARDS ASSOCIATES, INC. TO CONFIRM PRODUCTION FROM THE APPROPRIATE COMMON SOURCE OF SUPPLY, SAN JUAN COUNTY, NEW MEXICO.

ORDER OF THE COMMISSION

BY THE COMMISSION:

This case came on for hearing at 9:00 a.m. on August 12, 1999, at Santa Fe, New Mexico, before the New Mexico Oil Conservation Commission ("Commission") and continued on August 13, 19, 20 and 21, 1999.

NOW, on this 26th day of April, 2000, the Commission, a quorum being present and having considered the record,

FINDS THAT:

(1) Due public notice has been given and the Commission has jurisdiction of this case and its subject matter.

(2) The applicants, Pendragon Energy Partners, Inc. and J. K. Edwards Associates, Inc. (hereinafter referred to as "Pendragon"), pursuant to Rule (3) of the Special Rules and Regulations for the Basin-Fruitland Coal Gas Pool set forth in Oil Conservation Division (hereinafter referred to as "the Division") Order No. R-8768, as amended, seek an order confirming that the following described wells, completed within the vertical limits of the WAW Fruitland Sand-Pictured Cliffs Gas Pool ("Pendragon Chaco and Chaco Limited Wells") or the Basin-Fruitland Coal Gas Pool ("Whiting Fruitland Coal Wells"), are producing from the appropriate common source of supply and for such further relief as the Commission deems necessary:

Pendragon Chaco and Chaco Limited Wells

Operator	Well Name & API Number	Well Location
Pendragon Energy Partners, Inc.	Chaco No. 1 (API No. 30-045-22309)	1846' FNL & 1806' FWL, Unit F, Section 18, T-26N, R-12W

Pendragon Energy Partners, Inc.	Chaco No. 2R (API No. 30-045-23691)	1850' FSL & 1850' FWL, Unit K, Section 7, T-26N, R-12W
Pendragon Energy Partners, Inc.	Chaco No. 4 (API No. 30-045-22410)	790' FNL & 790' FWL, Unit D, Section 7, T-26N, R-12W
Pendragon Energy Partners, Inc.	Chaco No. 5 (API No. 30-045-22411)	790' FSL & 790' FEL, Unit P, Section 1, T-26N, R-13W
Pendragon Energy Partners, Inc.	Chaco Limited No. 1J (API No. 30-045-25134)	1850' FSL & 1750' FWL, Unit K, Section 1, T-26N, R-13W
Pendragon Energy Partners, Inc.	Chaco Limited No. 2J (API No. 30-045-23593)	790' FNL & 1850' FEL, Unit B, Section 1, T-26N, R-13W

Whiting Fruitland Coal Wells

Operator	**Well Name & API Number**	**Well Location**
Whiting Petroleum Corp.	Gallegos Fed 26-12-6 No. 2 (API No. 30-045-28898)	886' FSL & 1457' FWL, Unit N, Section 6, T-26N, R-12W
Whiting Petroleum Corp.	Gallegos Fed. 26-12-7 No. 1 (API No. 30-045-28899)	2482' FSL & 1413' FWL, Unit K, Section 7, T-26N, R-12W
Whiting Petroleum Corp.	Gallegos Fed. 26-13-1 No. 1 (API No. 30-045-28881)	828' FNL & 1674' FEL, Unit B, Section 1, T-26N, R-13W
Whiting Petroleum Corp.	Gallegos Fed. 26-13-1 No. 2 (API No. 30-045-28882)	1275' FSL & 1823' FWL, Unit N, Section 1, T-26N, R-13W
Whiting Petroleum Corp.	Gallegos Fed. 26-13-12 No. 1 (API No. 30-045-28903)	1719' FNL & 1021' FEL, Unit H, Section 12, T-26N, R-13W

(3) Whiting Petroleum Corporation and Maralex Resources, Inc. (hereinafter referred to as "Whiting") appeared at the hearing in opposition to the application. Whiting claimed that the Pendragon Chaco and Chaco Limited Wells are producing:

a) gas from a sandstone interval located within the Fruitland Coal formation; and

b) coal gas from the Basin-Fruitland Coal Gas Pool because of the establishment of communication between the Basin-Fruitland Coal and WAW Fruitland Sand-Pictured Cliffs Gas Pools.

(4) All eleven wells that are the subject of this application are located within an area (hereinafter referred to as the "Subject Area") that comprises:

TOWNSHIP 26 NORTH, RANGE 12 WEST, NMPM
Section 6: W/2
Section 7: W/2
Section 18: NW/4

TOWNSHIP 26 NORTH, RANGE 13 WEST, NMPM,
Section 1: All
Section 12: N/2

(5) The Subject Area is located within the horizontal boundaries of the Basin-Fruitland Coal Gas Pool created by Division Order No. R-8768 dated October 17, 1988. The vertical limits of this pool, as defined by Ordering Paragraph (1) of Order No. R-8768, encompass:

> ... all coal seams within the equivalent of the stratigraphic interval from a depth of approximately 2,450 feet to 2,880 feet as shown on the Gamma Ray/Bulk Density log from Amoco Production Company's Schneider Gas Com "B" Well No. 1 located 1110 feet from the South line and 1185 feet from the West line of Section 28, Township 32 North, Range 10 West, NMPM, San Juan County, New Mexico.

(6) The Subject Area is also located within the horizontal boundaries of the WAW Fruitland Sand-Pictured Cliffs Gas Pool. The vertical limits of this pool encompass all of the Pictured Cliffs Formation (Order No. R-4260 dated February 22, 1972) and all the sandstone intervals of the Fruitland Coal Formation (Order No. R-8769 dated October 17, 1988).

(7) Pendragon and Whiting received assignments of oil and gas leases in the Subject Area from common grantors, Robert Bayless ("Bayless") and Merrion Oil and Gas Corporation ("Merrion"), during the period from 1992 through 1994.

a) The assignments of rights, in pertinent part, to Whiting are as follows:

Operating rights from the surface of the earth to the base of the Fruitland (Coal Gas) Formation subject to the terms and provisions of that certain Farmout Agreement dated December 7, 1992 by and between Merrion Oil & Gas et al., Robert L. Bayless, Pitco Production Company, and Maralex Resources, Inc.

b) The assignment of rights to Pendragon, in pertinent part, are as follows:

Leases and lands from the base of the Fruitland Coal Formation to the base of the Pictured Cliffs Formation.

(8) A brief history of the Pendragon Chaco and Chaco Limited Wells follows:

a) Merrion and Bayless drilled the Chaco Well No. 1 in February 1977 to test the Pictured Cliffs Formation. The well was perforated and completed in the Pictured Cliffs Formation from a depth of 1,113' to 1,139'. The well initially tested in this interval at a rate of approximately 342 MCFGD, 0 BOPD and 0 BWPD. In January, 1995, J. K. Edwards & Associates, Inc. ("Edwards") became operator of the well. In January, 1995, the well was fracture stimulated in the perforated interval. In January, 1996, Pendragon became operator of the well.

b) Merrion and Bayless drilled the Chaco Well No. 2R in October 1979 to test the Pictured Cliffs Formation. The well was perforated and completed in the Pictured Cliffs Formation from a depth of 1,132' to 1,142'. The well initially tested in this interval at a rate of approximately 150 MCFGD, 0 BOPD and 0 BWPD. In January, 1995, Edwards became operator of the well. In January, 1995, the well was fracture stimulated in the perforated interval. In January 1996, Pendragon became operator of the well.

c) Merrion and Bayless drilled the Chaco Well No. 4 in April 1977 to test the Pictured Cliffs Formation. The well was perforated and completed in the Pictured Cliffs Formation from a depth of 1,163' to 1,189'. The well was initially tested in this interval at a rate of approximately 480 MCFGD, 0 BOPD, and 0 BWPD. In January, 1995, Edwards became operator of the well. In January, 1995, the well was acidized with 500 gallons 7 ½ percent HCl. In May 1995, the well was re-perforated in the interval from 1,163' to 1,189' and fracture stimulated in this interval. In January 1996, Pendragon became operator of the well.

d) Merrion and Bayless drilled the Chaco Well No. 5 in April 1977, to test the Pictured Cliffs Formation. The well was perforated and completed in the Pictured Cliffs Formation from a depth of 1,165' to 1,192'. The well initially tested in this interval at a rate of approximately 1029 MCFGD, 0 BOPD and 0 BWPD. In May 1979, the well was fracture stimulated in this interval. In January, 1995, Edwards became operator of the well. In January 1995, the well was re-perforated in the interval from 1,165' to 1,192' and was

fracture stimulated in this interval. In January 1996, Pendragon became operator of the well.

e) The Chaco Limited Well No. 1J was drilled by Merrion and Bayless in April 1982 to test the Pictured Cliffs Formation. The well was perforated and completed in the Pictured Cliffs Formation from a depth of 1,200' to 1,209'. The well initially tested in this interval at a rate of approximately 10 MCFGD, 0 BOPD and a trace of water. In January, 1995, Edwards became operator of the well. In January, 1995, the well was acidized with 500 gallons 7 ½ percent HCl. In January 1996, Pendragon became operator of the well.

f) The Chaco Limited Well No. 2J was drilled by Merrion and Bayless in September 1979 to test the Pictured Cliffs Formation. The well was perforated and completed in the Pictured Cliffs Formation from a depth of 1,186' to 1,202'. The well initially tested in this interval at a rate of approximately 208 MCFGD, 0 BOPD and 4 BWPD. In October, 1979, the well was fracture stimulated in this interval. In January, 1995, Edwards became operator of the well. In January, 1995, the well was acidized with 500 gallons 7 ½ percent HCl. In January 1996, Pendragon became operator of the well.

(9) A brief history of the Whiting Fruitland Coal Wells follows:

a) Maralex drilled the Gallegos Federal 26-12-6 No. 2 in December 1992 to test the Basin-Fruitland Coal Gas Pool. The well was perforated and completed in the Fruitland Coal Formation from a depth of 1,138' to 1,157'. The well was subsequently fracture stimulated in this interval. In September 1995, Whiting became operator of the well.

b) Maralex drilled the Gallegos Federal 26-12-7 No. 1 in December 1992 to test the Basin-Fruitland Coal Gas Pool. The well was perforated and completed in the Fruitland Coal Formation from a depth of 1,131' to 1,150'. The well was subsequently fracture stimulated in this interval. In September 1995, Whiting became operator of the well.

c) Maralex drilled the Gallegos Federal 26-13-1 No. 1 in December 1992 to test the Basin-Fruitland Coal Gas Pool. The well was perforated and completed in the Fruitland Coal Formation from a depth of 1,158' to 1,177'. The well was subsequently fracture

stimulated in this interval. In September 1995, Whiting became operator of the well.

d) Maralex drilled the Gallegos Federal 26-13-1 No. 2 in December 1992 to test the Basin-Fruitland Coal Gas Pool. The well was perforated and completed in the Fruitland Coal Formation from a depth of 1,047' to 1,208'. The well was subsequently fracture stimulated in this interval. In September 1995, Whiting became operator of the well.

e) Maralex drilled the Gallegos Federal 26-13-12 No. 1 in December 1992 to test the Basin-Fruitland Coal Gas Pool. The well was perforated and completed in the Fruitland Coal Formation from a depth of 1,178' to 1,197'. The well was subsequently fracture stimulated in this interval. In September 1995, Whiting became operator of the well.

Geologic Issues
Fruitland Sand vs. Pictured Cliffs Sand

(10) Related geologic issues are raised by the application: the proper means for determining the limits of the pools and formations at issue, and the effect on this analysis, if any, of integration or interfingering of different rock types.

(11) In its Chaco Wells No. 1, 4 and 5 and its Chaco Limited Well No. 2J, Pendragon is producing from two separate sandstone intervals, hereinafter referred to as the Upper Sandstone and Lower Sandstone intervals. In its Chaco Well No. 2R and Chaco Limited Well No. 1J, Pendragon is producing only from the Lower Sandstone interval. It is the position of Pendragon that the top of the Pictured Cliffs Formation occurs at or above the top of the Upper Sandstone.

(12) The perforated intervals in each of the Pendragon Chaco and Chaco Limited Wells are as follows:

Well Name & Number	"Upper Sandstone" Perforations	"Lower Sandstone" Perforations
Chaco Well No. 1	1,113'-1,119'	1,134'-1,139'
Chaco Well No. 4	1,163-1,166'	1,173'-1,189'
Chaco Well No. 5	1,165'-1,169'	1,174'-1,192'
Chaco Limited Well No. 2J	1,186'-1,188'	1,200'-1,202'
Chaco Well No. 2R	None	1,132'-1,142'
Chaco Limited Well No. 1J	None	1,200'-1,209'

(13) Whiting agrees that the Lower Sandstone interval is within the Pictured Cliffs Formation; however, it contends that the top of the Pictured Cliffs Formation is the top of the Lower Sandstone interval and the Upper Sandstone is within the Fruitland Coal Formation. It is on this basis that Whiting contends that Pendragon is producing from perforations in the Fruitland Coal Formation in its Chaco Wells Nos. 1, 4 and 5 and its Chaco Limited Well No. 2J.

(14) The parties have stipulated that the Pictured Cliffs Formation was deposited in a marine environment and the Fruitland Coal Formation was deposited in a non-marine or terrestrial environment.

(15) In its Order No. R-8768, the Division defined the vertical limits of the Basin Fruitland Coal Gas Pool as all coal seams within the equivalent of the stratigraphic interval from a depth of approximately 2450 feet to 2880 feet as shown on the well log from the Amoco Schneider Gas Com "B" Well No. 1. The pick for the base of the pool in Order No. R-8768 is the top of the Pictured Cliffs Formation. The pick is also the break between marine and non-marine sediments. It is undisputed that the coal or shale layers occurring below the stratigraphic pick set forth in Order No. R-8768 would not be included in the Basin Fruitland Coal Gas Pool or in the Fruitland Coal Formation.

(16) For the reasons set forth below, we find that the preponderance of the geologic evidence establishes that the Pendragon Chaco and Chaco Limited Wells are completed in the Pictured Cliffs Formation.

(17) The preponderance of the geologic evidence establishes that the Upper Sandstone is marine in origin and thus appropriately considered a part of the Pictured Cliffs Formation. The Upper Sandstone in the Subject Area cannot be differentiated from the main body of the Pictured Cliffs Formation.

(18) In the late Cretaceous period in what was to become the San Juan Basin, sediments were deposited contemporaneously in various environments. The Lewis Shale represents muds and storm-carried sands offshore of the barrier-beach setting. The Pictured Cliffs formation accumulated in primarily a barrier-beach setting. The Fruitland Coal formation accumulated on a coastal plain with swamps and bogs and the Kirtland Formation accumulated in an alluvial plain. As the ancient shoreline moved to the northeast, each of the environments of deposition shifted. At a single location a wellbore presents the familiar vertical sequence of Formations.

(19) Pendragon's isopach map of the Upper Sandstone, Exhibits 50 and 63, show this barrier-bar marine littoral environment with sandstone along the ancient shoreline trending in a northwest to a southeast direction. Pendragon's Exhibits 50 and 63 also show that the Upper Sandstone occurs in a continuous sheet that coalesces into the main body of the Pictured Cliffs Formation as it trends from the shoreline environment on the southwest toward the center of the San Juan basin to the northeast.

(20) In the Subject Area, tongues of Pictured Cliffs sandstone thin in a landward direction and thicken in a seaward direction and ultimately merge with the main body of the Pictured Cliffs Formation. These tongues "interfinger" or integrate with other rock types in the Subject Area.

(21) The interval between the top of the Upper Sandstone and the top of the main body of the Pictured Cliffs (the Lower Sandstone) is composed of a variety of rock types including marine sandstones, silt stones, shales, and thin coals. It has been the long-standing and accepted custom and practice of industry and the various regulatory agencies, including the Division in Order No. R-8768 and R-8769, to place this entire interval within the Pictured Cliffs Formation. This industry and regulatory agency practice conforms to the standards of the North American Stratigraphic Code and the International Stratigraphic Guide.

(22) The evidence presented by Pendragon establishes that over the years approximately 34 wells within approximately 2.5 miles of the Pendragon Chaco and Chaco Limited wells were actually perforated in the Upper Sandstone in conjunction with other Pictured Cliffs intervals and reported by the numerous different operators of those wells as Pictured Cliffs completions, consistent with the picks for the top of the Pictured Cliffs for the Chaco Plant No. 1 and the Pendragon Chaco and Chaco Limited Wells (Exhibit N-61). The evidence also establishes that those reported completions were accepted by the Division and the Bureau of Land Management and that industry and geologists have placed substantial reliance on those reported completions as Pictured Cliffs completions for nearly thirty years.

(23) In a written statement provided to the Commission during the hearing in this case, Merrion, the assignor of the interests in both the Fruitland Coal Formation to Whiting and Pictured Cliffs Formation to Pendragon, indicated it concurred with Pendragon in its identification of the Upper Sandstone interval and the historic recognition of that interval as Pictured Cliffs by Merrion and other operators in the area. (Exhibit N-43.) Merrion further stated that the Pendragon Chaco Wells are appropriately perforated in the Pictured Cliffs Formation and that it had no intention of conveying to Pendragon wells that were perforated in other zones. Merrion also stated that it never intended to farm-out to Whiting the rights to zones where the Pendragon Chaco Wells were perforated.

(24) Thus, identification and utilization of the Upper Sandstone tongues to establish the vertical boundaries of the Pictured Cliffs Formation by industry, governmental regulatory agencies and the parties or their predecessor-in-interest is a long-established custom and practice. Such custom and practice is to be accorded significant weight.

(25) Whiting asserted during the hearing of this matter that the Upper Sandstone interval was deposited in a non-marine, crevasse-splay deposit, resulting from a large, sediment-laden river breaking through its natural boundaries during a flood stage and spreading clean, well-sorted sand over an area more than sixteen-miles long and up to three-miles wide parallel to the shoreline. However, Whiting failed to establish by a preponderance of the evidence the existence of any crevasse splay or any depositional materials indicative of a sand-laden flood. Moreover, there is no evidence of the transporting river or river channel, the thinning of sand deposits in both directions at right angles to the river, adjacent deltaic deposits or any other non-marine mechanism with the capability of forming the thin, but areally extensive, sand of the dimensions seen in the Upper Sandstone.

(26) Whiting also asserted it was possible that the disputed interval was deposited as a washover fan. However, the washover fan depositional mechanism involves wave-dominated action, consistent with the accepted geologic definitions of a marine depositional mechanism. Such a theory also supports a conclusion that the Upper Sandstone was deposited in a marine environment.

(27) Pendragon presented aerial photographs of modern deposits of sands comparable in mode of deposition and areal extent to the Upper Sandstone located in the marine lagoonal areas behind barrier islands, thus demonstrating the validity of the depositional model. Pendragon demonstrated using these exhibits that these sands are wave and tidal-current dominated deposits, and further showed that the seaward beach of a barrier island is not to be confused with the true marine shoreline, which lies behind the island.

(28) The core analysis for the Lansdale Federal No. 1 located in the SE/4 of Sec. 7, T-26-N, R-12-W establishes that grain size and sorting throughout the Upper Sandstone is uniform, consistent with a marine depositional environment. The physical descriptions of the sand appearing in the Upper Sandstone and the Lower Sandstone are grey, fine-grained with little variation in clay content, consistent with a marine sand that has been laterally transported by currents and waves to the point where the energy available sorts the sand into uniform size. Sand-sorting characteristics of this sort are not consistent with a fluvial deposit with graded bedding coarsening downward.

(29) Pendragon presented evidence that the Spontaneous Potential ("SP") readings on electrical logs are much greater in the Pictured Cliffs Formation, which was deposited in a marine setting, than in the Fruitland sands, which were deposited in a fluvial, fresh water environment. Pendragon demonstrated that the SP readings for the Upper Sandstone were comparable or identical to those of the Lower Sandstone and were much greater than those of the Fruitland sands.

(30) The SP map of the Pictured Cliffs Formation introduced by Whiting, Exhibit WA-9, showed 40 to 80 millivolt SP development in the Chaco area. The cross-section exhibit demonstrated that the disputed interval also showed 40 to 80 millivolts SP, even though it was interpreted by Whiting to be Fruitland sandstone, and all other Fruitland sands on his cross-section showed only zero to less than 10 millivolts. Additional testimony established that 40 to 80 millivolts is a significantly higher range than is typically associated with SP development in a fresh-water depositional environment and is more characteristic of the SP development in the Pictured Cliffs intervals observed on the well logs and cross-sections for the Pendragon Chaco Wells.

(31) Whiting contends that the top of the first "massive" sandstone below the lowermost coal of the Fruitland Coal Formation should be the basis for picking the top of the Pictured Cliffs formation. Whiting contends that the operators of approximately one hundred additional wells outside the Subject Area identified the top of the massive Pictured Cliffs Sandstone as the vertical boundary between the Pictured Cliffs and Fruitland Coal Formations. However, Whiting failed to present evidence establishing that the Upper Sandstone interval was present in any of the wells identified. Similarly, Whiting failed to show that any operator identified the top of the Pictured Cliffs sandstone as the massive sand in those areas where tongues of the Pictured Cliffs are known to exist. The geologic testimony and evidence shows that such a definition has little support in the geologic literature and that the arbitrary and undefined term "massive" makes its application impractical.

Engineering Issue

(32) Whiting, the owners and operators of the Whiting Fruitland Coal Wells, and Pendragon, the owner and operator of the Pendragon Chaco and Chaco Limited Wells, each contend that the other's well stimulation treatments established communication between their separately owned formations. Both parties contend that, as a result, their wells are experiencing interference and that gas is being produced out of zone.

(33) The preponderance of the engineering evidence established that the fracture stimulation treatments performed on both the Pendragon Chaco Wells by Pendragon and the Whiting Fruitland Coal Wells by Whiting established communication between the Fruitland Coal Formation and the Pictured Cliffs Formation.

(34) The treatment performed on the Whiting Fruitland Coal Wells after they were drilled created near-wellbore communication channels between the Fruitland Coal and Pictured Cliffs Formations. At the time, the gas in the Pictured Cliffs Formation was nearly depleted and very little gas could escape to the Fruitland Coal Formation, unless the Whiting Fruitland Coal Wells were operated under extremely low pressures. On the other hand, the adsorbed gas in the Fruitland Coal Formation stayed within the coal matrices until the pressure was lowered enough through the dewatering process for the gas to desorb.

(35) After the dewatering process, substantial amounts of adsorbed gas escaped from the coal matrices, especially in the near-wellbore region where pressure was lowest. As a result, the Whiting Fruitland Coal Wells began their commercial gas production. The desorbed gas moving toward the Whiting Fruitland Coal Wells may have migrated to the Pictured Cliffs Formation through the communication channels near the Whiting Fruitland Coal Wells if the local pressure in the Pictured Cliffs Formation was lower than that in the Fruitland Coal Formation. Gas in the Pictured Cliffs Formation may have migrated to the Fruitland Coal Formation through the communication channels if the production pressures at the Whiting Fruitland Coal Wells were low. However, these possible gas migrations were not significant, as evidenced by steady gas production from the Pendragon Chaco Wells.

(36) In 1995, after three years of the dewatering process, the region in which decreased pressures allowed gas to desorb from the coal matrices had grown toward the Pendragon Chaco Wells. At the edge of the resulting gas bubble, the gas pressure in the Fruitland Coal Formation was probably higher than the adjacent pressure in the Pictured Cliffs Formation. In the area of this relatively high-pressure contrast, the thin capillary barrier may have been broken, allowing gas migration between the two zones.

(37) Pendragon performed fracture stimulation treatments on the Pendragon Chaco Wells in 1995. The post-treatment gas production from the Pendragon Chaco Wells indicates that the stimulation work performed by Pendragon successfully broke into some high-pressure gas compartments.

(38) The production history of the Pendragon Chaco and Chaco Limited Wells is summarized as follows:

Well No.	Initial Production (Original Completion)	Pre-Acidization or Fracture Stimulation Production	Post-Acidization or Fracture Stimulation Production	Last Production
Chaco No. 1	80 MCF/D	0 MCF/D	250 MCF/D	165 MCF/D
Chaco No. 2R	70 MCF/D	0-15 MCF/D	90 MCF/D	120 MCF/D
Chaco No. 4	200 MCF/D	0 MCF/D	425 MCF/D	200 MCF/D
Chaco No. 5	190 MCF/D	0 MCF/D	370 MCF/D	210 MCF/D
Chaco Ltd. 1J	11 MCF/D	0-10 MCF/D	0-10 MCF/D	0-10 MCF/D
Chaco Ltd. 2J	30 MCF/D	0-10 MCF/D	0-10 MCF/D	0-10 MCF/D

(39) One possibility is that the hydraulic fractures were extended upward to the Fruitland Coal Formation and generated a gas highway to the gas bubble. Pendragon's experts vigorously denied this possibility. Instead, they asserted that an additional gas compartment, the so-called "third bench," exists below the perforations in the Pendragon Chaco Wells. The evidence does not support this assertion. No "third bench" has been reported previously throughout the San Juan region, and there is no geological evidence of this kind of formation. Furthermore, there is no scientific basis for believing that fractures moved downward into the "third bench" but not upward into the Fruitland Coal

Formation. Therefore, the most reasonable explanation of the sudden significant increases in production following the fracture stimulation treatments on the Pendragon Chaco Wells was that the hydraulic fractures penetrated into the gas bubble established in the Fruitland Coal Formation.

(40) Pendragon also asserted that the fracture stimulation treatments increased production in the Pendragon Chaco Wells by counteracting the effects of reservoir damage caused by (a) scale precipitation, (b) water blockage, and (c) migration of clay fines. As the original Pictured Cliffs gas was relatively dry, however, it is unlikely that the Pendragon Chaco Wells suffered from significant reservoir damage of this type.

(41) The BTU analysis of the gas from the Pendragon Chaco Wells supports the conclusion that the fracture stimulation treatments of these wells in 1995 established communication with the Fruitland Coal Formation. Whiting showed that the hydrocarbon liquids content of the gas from the Pendragon Chaco Wells was slightly reduced from 1988 to 1995 and significantly reduced from 1995 to 1997.

(42) Expert witnesses for both Pendragon and Whiting presented their opinions on the effects of the fracture stimulation treatments in the Whiting Fruitland Coal Wells and the Pendragon Chaco Wells based on their own theories and models. Many input values for key parameters were questionable. Both simulators used in their testimony have a good reputation for assisting in the design of fracturing jobs, but it is easy to manipulate them incorrectly. In a case like this, their results are too exaggerated to be reliable.

(43) The acid stimulation treatments performed by Pendragon on the Chaco Limited Wells No. 1J and 2J in 1995 did not alter these wells' rates of production. These treatments did not establish communication between the Pictured Cliffs Formation and the Fruitland Coal Formation.

(44) The gas now capable of production from the Pendragon Chaco Wells No. 1, 2R, 4, and 5 is: (1) gas originally in place in the Pictured Cliffs Formation; (2) gas from the Fruitland Coal Formation that has migrated to the Pictured Cliffs Formation through fractures around the
Pendragon Chaco Wells; and (3) gas from the Fruitland Coal Formation that has migrated to the Pictured Cliffs Formation through fractures around the Whiting Fruitland Coal Wells.

(45) The Pendragon Chaco Wells depleted the Pictured Cliffs Formation prior to the fracture stimulation treatments performed on the wells in 1995.

(46) Pendragon Chaco Wells No. 1, 2R, 4, and 5 have already produced their fair share of the gas in the Pictured Cliffs Formation.

IT IS THEREFORE ORDERED THAT:

(1) Pursuant to the application of Pendragon Energy Partners, Inc., and J. K. Edwards Associates, Inc., it is determined that the following described wells are perforated within the Pictured Cliffs Formation, WAW Fruitland Sand-Pictured Cliffs Gas Pool. It is further determined that the following described wells are producing from both the WAW Fruitland Sand-Pictured Cliffs Gas Pool and the Basin-Fruitland Coal Gas Pool, San Juan County, New Mexico:

Operator	Well Name & API Number	Well Location
Pendragon Energy Partners, Inc.	Chaco No. 1 (API No. 30-045-22309)	1846' FNL & 1806' FWL, Unit F, Section 18, T-26N, R-12W
Pendragon Energy Partners, Inc.	Chaco No. 2R (API No. 30-045-23691)	1850' FSL & 1850' FWL, Unit K, Section 7, T-26N, R-12W
Pendragon Energy Partners, Inc.	Chaco No. 4 (API No. 30-045-22410)	790' FNL & 790' FWL, Unit D, Section 7, T-26N, R-12W
Pendragon Energy Partners, Inc.	Chaco No. 5 (API No. 30-045-22411)	790' FSL & 790' FEL, Unit P, Section 1, T-26N, R-13W

(2) It is further determined that the following described wells are perforated within and producing solely from the Pictured Cliffs Formation, WAW Fruitland Sand-Pictured Cliffs Gas Pool:

Operator	Well Name & API Number	Well Location
Pendragon Energy Partners, Inc.	Chaco Limited No. 1J (API No. 30-045-25134)	1850' FSL & 1750' FWL, Unit K, Section 1, T-26N, R-13W
Pendragon Energy Partners, Inc.	Chaco Limited No. 2J (API No. 30-045-23593)	790' FNL & 1850' FEL, Unit B, Section 1, T-26N, R-13W

(3) It is further determined that the following described wells are producing from both the Basin-Fruitland Coal Gas Pool and the WAW Fruitland Sand-Pictured Cliffs Gas Pool:

Operator	Well Name & API Number	Well Location
Whiting Petroleum Corp.	Gallegos Fed 26-12-6 No. 2 (API No. 30-045-28898)	886' FSL & 1457' FWL, Unit N, Section 6, T-26N, R-12W

Whiting Petroleum Corp.	Gallegos Fed. 26-12-7 No. 1 (API No. 30-045-28899)	2482' FSL & 1413' FWL, Unit K, Section 7, T-26N, R-12W
Whiting Petroleum Corp.	Gallegos Fed. 26-13-1 No. 1 (API No. 30-045-28881)	828' FNL & 1674' FEL, Unit B, Section 1, T-26N, R-13W
Whiting Petroleum Corp.	Gallegos Fed. 26-13-1 No. 2 (API No. 30-045-28882)	1275' FSL & 1823' FWL, Unit N, Section 1, T-26N, R-13W
Whiting Petroleum Corp.	Gallegos Fed. 26-13-12 No. 1 (API No. 30-045-28903)	1719' FNL & 1021' FEL, Unit H, Section 12, T-26N, R-13W

(4) Pendragon is hereby ordered to shut-in its Chaco Wells No. 1, 2R, 4 and 5 until such time as the Division approves a method for either putting them back into production or plugging them.

(5) Inasmuch as Whiting's wells may produce only minor amounts of gas from the already depleted WAW Fruitland Sand-Pictured Cliffs Pool, Whiting's wells are not to be shut-in.

(6) Jurisdiction is hereby retained for the entry of such further orders as the Commission may deem necessary.

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

STATE OF NEW MEXICO
OIL CONSERVATION COMMISSION

JAMI BAILEY, Member

ROBERT L. LEE, Member

LORI WROTENBERY, Chairman

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