Geologic Report

Proposed Deer Canyon Unit

Eddy County, New Mexico

PURPOSE:

The purpose of this report is to present the geologic reasons for forming a 10,620.45 acre Federal Unit in which an 8700' wildcat well will be drilled to test the Pennsylvanian Morrow formation in or near section 14, T-20-S, R-21-E, Eddy County, New Mexico.

ENCLOSURES:

Exhibit 1 - Regional Atoka-Morrow Isopachous Map (Morrow Production Indicated) - Horizontal Scale 1" = 8000'.

Exhibit 2 - Structure Map - Base Pennsylvania (w/superimposed Isopachous Map Atoka-Morrow) - Horizontal Scale 1" = 4000'.

Exhibit 3 - Regional Cross Section AA' - (Hung stratigraphically-Top Abo)

Exhibit 4 - Regional Cross Section BB" - (Hung Stratagraphically-Base Strawn)

Exhibit 5 - Plat Regional Topographic Map.

DISCUSSION:

Regional subsurface relationships indicate that the Deer Canyon Prospect is located favorably to encounter well developed gas bearing Morrow sands. The prospect area located on the northwest flank of the Delaware Basin is on depositional trend with established production and is structurally high on a regional basis. This wildcat prospect encompassing 16 sections affords an excellent opportunity to establish a large reserve of gas.

GENERAL DISCUSSION:

The Deer Canyon Unit Prospect encompasses 16 sections in Township T-20-S, R-21-E in extreme western Eddy County, New Mexico. The unit is located approximately 18 miles south of the town of Hope and is approximately 25 miles southwest of the city of Artesia. The unit area which includes sections 1-4, 9-16, and 21-24 has a total of 10,620.45 acres within the unit boundry. The arid climate hill and arroyo topography of the area has been determined by the denditic drainage pattern superimposed on the eastward regional dip of outcropping upper Permian carbonates. See Exhibit 5. The prospect area encompasses an area of rolling hills and intervening arroyos which produce relief of 100 to 200 feet. The area is accessible by ranch roads leading from Hope to the north or from roads leading westward from the Artesia-Carlsbad Highway (US 283). The initial well in the unit will be drilled in the vicinity of the common corner of sections 10, 11, 14 & 15 at an estimated surface elevation of 4200'. The location area is accessible from ranch roads in the arroyos.

REGIONAL GEOLOGIC SETTING:

The Deer Canyon Unit is located on the northwest flank of the Delaware Basin. See Exhibit I. Regional isopachous of the Atoka-Morrow interval illustrates the general despsitional configuration of the area during early Pennsylvanian time. The unit area occurs near the up-dip limits of deposition of Morrow age sediments and is located in an embayment. The embayment is formed where regional despositional strike changes from a northeast-southwest alignment to a general southeast-northwest alignment. It is postulated that the axis of the embayment situated between the positive feature to the south and broad positive shelf area to the north is an area where a concentration of clastics occurs. Clastics derived from the positive source areas should have been transported into the structurally low areas during time of deposition. Well developed clastic deposits should be preserved in that area.

Based on the assumption that the isopachous of the Atoka-Morrow interval is indicative of depositional strike the Deer Canyon Unit is on general strike with Morrow sands which have well developed reservoir character and are productive. The Atoka-Morrow interval represents a sequence of deposition that transgressed from the southeast toward the northwest. The near-shore high energy clastic facies of succeeding time intervals shifted onto the shelf area in stages. The isopachous values generally conform to strike of various time units. During particular stages (as indicated by particular isopachous values) thicker, more porous, more areally extensive reservoirs were developed than in other periods. Those trends with the better reservoir development have yielded better production. The Deer Canyon prospect is indicated to occur within the trend of a particular time unit in which good reservoir development occurs. See Exhibit I.

Due to regional eastward tilt of the northwest flank of the Delaware Basin, the Morrow interval will be encountered at a regionally high position in the Deer Canyon Unit Area.

Within the area of the Deer Canyon Unit, approximately 11,000 feet of sedimentary section occurs. Permian San Andres dolomites outcrop at the surface. the 8700' test in the unit will penetrate the Permian and the entire Pennsylvanian interval. The test will be drilled to 8700', or top of the Barnett shale (upper Miss.). See Exhibit 3. Regional Cross Section AA (exhibit 3), a stratigraphic section, depicts the stratigraphic column that will be penetrated below the top of the Abo. Although the Morrow unit is considered the primary target in the area, secondary possibilities for production are afforded by bedded carbonates and clastic zones in the Wolfcamp and upper Pennsylvanian interval. A prognosis of formation tops to be encountered in the subject well is as follows:

Surface Elevation 4200 ±	DEPTH	DATUM
San Andres	outcrop	
T. Glorieta sd.	1600 ±	(+2600)
T. Abo	3600 ±	(+ 600
T. Wolfcamp	5000 ±	(- 800)
T. Upper Penn.	6600 ±	(-2400)
T. Strawn	7200 ±	(-3000)
T. Atoka	7800 ±	(-3600)
T. Morrow	8100 ±	(-3900)
Base Morrow - T. Barnett	8400 ±	(-4200)
TD	8700 ±	

DRLINEATION OF THE DEER CANYON UNIT:

The Deer Canyon Unit encompasses 16 sections in Township T-20-S, R-21-E, in which productive Morrow age sands are indicated to occur. The unit outline generally includes the area in which 550 to 700' of Atoka-Morrow interval occurs. Please refer to Exhibit 2. Based on regional control, the optimum development of Morrow sands occurs locally along the Northwest Flank of the Delaware Basin within the genetic unit defined by the 400 - 700' isopachous interval. Based on the sparse control directly related to the unit area, the optimum thickness of the Atoka-Morrow is 550 - 700' based on the relationships indicated in the Cass Ranch area (Sec. 2, T-20-S, R-23-E). The Tom Brown #1 Kewanee blew out from a Morrow sand unit encountered in the interval 8570' - 8625'. Please refer to Exhibit 4. That well was completed in November, 1963 and subsequently produced 0.23 BCF gas before abandonment in 1971. The productive well had 557' of Atoka-Morrow interval. Offset wells drilled in sections 34 and 35 Township 19-S, 23-E had 512' and 525' of gross interval, respectively. Morrow sands in those wells were tight and poorly developed. Based on the relationship in this area, a 550' value for Atoka-Morrow thickness is considered a realistic updip limit for productive sands in the Morrow in the prospect area. The loss of porosity and permeability due to loss of sand development provides the critical trapping relationship for the local area.

Intrepretation of structural control indicates that the Morrow interval will be structurally high to the Cass Ranch production (Sec. 2, T-20-S, R-23-E).

Production established from Morrow Sands in the Rocky Arroyo Area (Sec. 33, T-21-S, R-22, Sec. 8 & 17, T-21-S, R-22-E) and shows from sands encountered in section 16, T-21, R-22-S further indicated that the genetic unit anticipated in the Deer Canyon Unit has regional extent and continuity along the defined trend.