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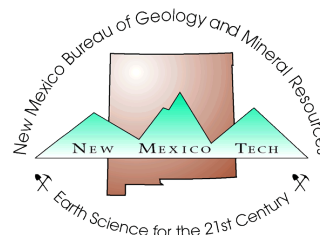
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Oil and gas activities in New Mexico in 1995

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Introduction

Drilling for oil and natural gas in New Mexico remained steady in 1995. A total of 1,261 wells were completed in 1995, a decrease of 3% from the 1,298 wells completed in 1994. In the Permian Basin, southeast New Mexico, 854 wells were completed in 1995, up from 793 wells completed in 1994. In the San Juan Basin, northwest New Mexico, 407 wells were completed in 1995, down significantly from the 503 wells completed during 1994. In addition, 32 wells were drilled to develop carbon-dioxide resources in the Bravo dome field of Union County.

During 1995, there was significant exploratory activity in the producing Permian and San Juan Basins. There was also significant exploratory activity in presently nonproductive frontier areas such as the Albuquerque Basin, the Tucumcari Basin, and on Chupadera Mesa of east Socorro and west Lincoln Counties. Rank wildcat wells were drilled in the Albuquerque and Tucumcari Basins and exploratory activities continued into 1996 in these areas.

The locations of significant wildcat wells completed in 1995 are shown in Fig. 1. Table 1 summarizes the significant wildcat discoveries, and Table 2 summarizes significant, but unsuccessful, wildcat wells. Table 3 lists significant wildcat wells that were being drilled or were held "tight" at the end of 1995 or were scheduled to be drilled in early 1996. Each well is designated by a number in parentheses that refers to its location in Fig. 1 and its description in Tables 1, 2, or 3.

Permian Basin, southeast New Mexico

Drilling activity increased in 1995 in the three geologic subdivisions of the Permian Basin: the Delaware Basin, the Central Basin platform, and the Northwest shelf; 854 wells were completed in this area in 1995, an increase of 8% from the 793 wells completed during 1994; 640 of these wells were completed as oil producers and 123 were completed as gas producers while 91 were dry and abandoned, resulting in a success rate of 89%. In addition, 43 other wells were drilled in southeast New Mexico in 1995; these other wells include injection wells for waterfloods and salt-water disposal wells. Drilling activity was concentrated in Permian reservoirs on the Northwest shelf and Central basin platform and in the Delaware Basin.

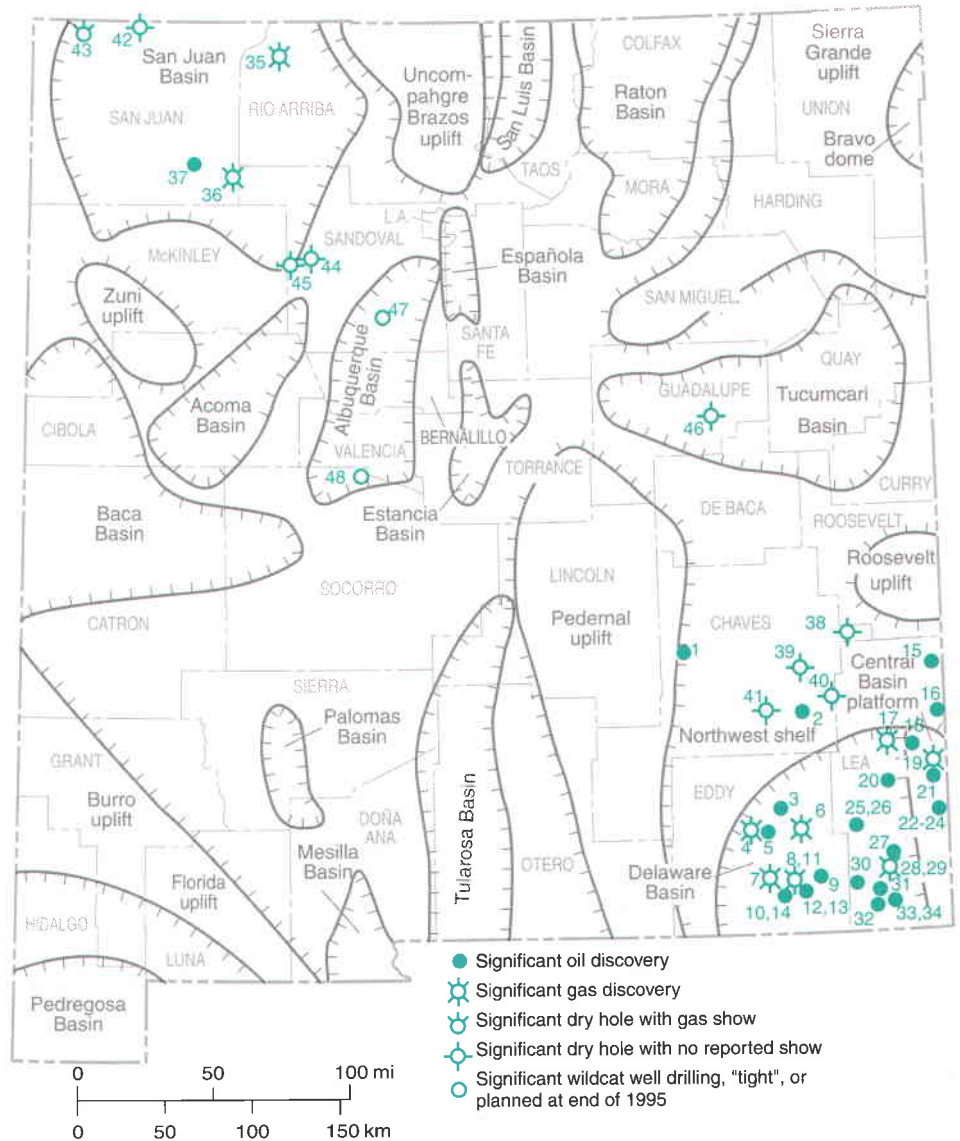


FIGURE 1—Significant oil and gas discoveries, dry holes, and frontier wildcat wells drilled in New Mexico in 1995. Major geologic features are from Broadhead and King (1988), Cather and Johnson (1984), Kelley (1978), Kottowski and Stewart (1970), Meyer (1966), Molenaar (1977), Thompson and Jacka (1981), and Woodward et al. (1978).

Upper Guadalupian reservoirs

Shallow (2,000–4,000 ft) oil and associated gas reservoirs of the Yates and Queen Formations (Permian: Upper Guadalupian) were primary targets of development drilling in 1995. Approximately 120 wells were completed in these zones. Drilling was primarily for development in mature fields on the Central Basin platform in Lea County. Activity was widespread, with significant numbers of development wells completed in Yates and Queen reservoirs in the Rhodes, Langlie–Mattix, Jalmat, and

Eumont pools of Lea County and in the Queen Formation in the Shugart pool of Eddy County. Although exploration for hydrocarbons in Upper Guadalupian reservoirs was limited, two especially noteworthy discoveries were made. Oil was discovered in Yates sands in the LBO New Mexico No. 1 Tiffany (22) in east-central Lea County east of the main productive Yates trend on the Central Basin platform. Oil was discovered in the Stevens & Tull No. 3 DW State (27) on the west margin of the Yates productive trend in central Lea County.

TABLE 1—Significant wildcat discoveries in New Mexico in 1995; the term formation is used in an informal sense. **BOPD**, bbls oil per day; **MCFGPD**, thousand ft³ gas per day; **BCPD**, bbls condensate per day; **BWPD**, bbls water per day; **IPP**, initial potential pumping; **IPF**, initial potential flowing; **NR**, not reported; **owwo**, old well worked over.

Number on Fig. 1	Location (section-township-range, county)	Operator, well number, and lease	Completion date (mo/yr)	Total depth (ft)	Formation at total depth	Producing formation	Producing interval (ft)	Initial potential	Oil gravity (degrees API)
1	4-9S-22E, Chaves	Yates Petroleum No. 5 Blackwater Unit	1/95	3,686	Precambrian	Abo (Permian)	3,350–3,541	IPP 1 BOPD + 5 BWPD	
2	26-13S-29E, Chaves	Manzano Oil No. 1 McClellan Federal	10/95	9,862	Devonian	Devonian	9,847–9,862	IPF 25 BOPD + 250 BWPD	
3	11-19S-28E, Eddy	Chi Operating No. 1 Millman State	8/95	6,630	Bone Spring (Permian)	Bone Spring (Permian)	6,315–6,462	IPP 8 BOPD + 221 MCFGPD + 215 BWPD	42
4	26-20S-26E, Eddy	Maralo Inc. No. 1 DS Federal 26	2/95	10,588	Morrow (Pennsylvanian)	Morrow (Pennsylvanian)	10,286–10,290	IPF 2,812 MCFGPD	
5	29-20S-27E, Eddy	Ray Westall No. 2 Federal Z (owwo)	5/95	10,807	Mississippian	Bone Spring (Permian)	6,200–6,400	IPP 10 BOPD + 75 MCFGPD + 1 BWPD	
6	27-20S-29E, Eddy	Yates Petroleum No. 1 Zinnia Federal	3/95	12,550	Morrow (Pennsylvanian)	Strawn (Pennsylvanian)	10,956–10,988	IPF 153 MCFGPD + 36 BCPD	
7	30-23S-27E, Eddy	Maralo Inc. No. 1 State DD 30	9/95	12,218	Morrow (Pennsylvanian)	Wolfcamp (Permian)	9,547–9,679	IPF 195 MCFGPD + 23 BCPD	45
8	35-23S-28E, Eddy	Hallwood Petroleum No. 1 Williams 35 (owwo)	8/95	13,100	Morrow (Pennsylvanian)	Strawn (Pennsylvanian)	11,470–11,476	IPF 510 MCFGPD + 1 BCPD + 6 BWPD	
9	30-23S-30E, Eddy	Maralo Inc. No. 1 Gold Rush 30 Federal	3/95	14,200	Atoka (Pennsylvanian)	Delaware (Permian)	7,094–7,109	IPF 126 BOPD + 300 MCFGPD + 176 BWPD	41
10	35-24S-27E, Eddy	Hallwood Petroleum No. 1 Harkey 35 (owwo)	3/95	12,920	Morrow (Pennsylvanian)	Bone Spring (Permian)	8,210–8,284	IPP 19 BOPD + 62 MCFGPD + 3 BWPD	47
11	5-24S-29E, Eddy	Maralo Inc. No. 1 Cochita 5 Federal (owwo)	7/95	12,340	Atoka (Pennsylvanian)	Wolfcamp (Permian)	1,1460–11,586	IPF 1,999 MCFGPD	
12	6-24S-29E, Eddy	Texaco No. 1 Malaga–Harroun 6 (owwo)	12/95	13,300	Morrow (Pennsylvanian)	Bone Spring (Permian)	6,598–6,630	IPP 3 BOPD + 17 MCFGPD + 58 BWPD	43
13	21-24S-29E, Eddy	Pogo Producing No. 1 Mitchell 21 Federal	9/95	8,900	Bone Spring (Permian)	Bone Spring (Permian)	8,670–8,700	IPP 68 BOPD + 104 MCFGPD + 138 BWPD	
14	3-25S-27E, Eddy	TMBR & Sharp Drilling No. 1 State 3	11/95	5,892	Bone Spring (Permian)	Delaware (Permian)	5,498–5,654	IPP 22 BOPD + 58 MCFGPD + 180 BWPD	43
15	14-10S-37E, Lea	Manzano Oil No. 1 Sundown SV State	4/95	12,174	Devonian	Devonian	12,140–12,174	IPP 237 BOPD + 22 BWPD	42
16	20-13S-38E, Lea	Maralo Inc. No. 1 Lowe 20	9/95	12,537	Devonian	Wolfcamp (Permian)	9,754–9,861	IPF 683 BOPD + 900 MCFGPD + 729 BWPD	
17	7-15S-35E, Lea	Great Western Drilling No. 1 Cleveland Glenn (owwo)	5/95	13,036	Morrow (Pennsylvanian)	Morrow (Pennsylvanian)	12,916–12,984	IPF 303 MCFGPD	
18	35-15S-36E, Lea	Lynx Petroleum No. 1 Dean State (owwo)	8/95	13,727	Devonian	Atoka (Pennsylvanian)	11,708–11,785	IPF 8 BOPD + 30 MCFGPD	40
19	33-16S-38E, Lea	An-Son Corp. No. 1 Mary 33	7/95	13,212	Devonian	Devonian	13,107–13,127	IPF 267 MCFGPD + 375 BCPD + 93 BWPD	52
20	33-17S-35E, Lea	Marathon No. 10 Warn State A/C-3 (owwo)	4/95	8,435	Abo (Permian)	Blinbry (Permian)	6,684–7,196	IPP 102 BOPD + 78 MCFGPD + 103 BWPD	
21	3-17S-37E, Lea	Mallon Oil No. 1 Simmons Estate (owwo)	4/95	11,685	Atoka (Pennsylvanian)	Atoka (Pennsylvanian)	11,602–11,613	IPP 25 BOPD + 10 BWPD	44

TABLE 1—continued

Number on Fig. 1	Location (section-township-range, county)	Operator, well number, and lease	Completion date (mo/yr)	Total depth (ft)	Formation at total depth	Producing formation	Producing interval (ft)	Initial potential	Oil gravity (degrees API)
22	26-19S-38E, Lea	LBO New Mexico No. 1 Tiffany (owwo)	9/95	7,700	Abo (Permian)	Yates (Permian)	3,015–3,086	IPF 48 BOPD + 240 MCFGPD + 14 BWPD	36
23	27-19S-38E, Lea	LBO New Mexico No. 1 Alyssa (owwo)	8/95	7,750	Abo (Permian)	Seven Rivers (Permian)	3,000–3,150	IPP 42 BOPD + 240 MCFGPD + 2 BWPD	
24	35-19S-38E, Lea	Drum Energy No. 1 Frances Evelyn (owwo)	4/95	6,200	Blinbry (Permian)	San Andres (Permian)	4,317–4,497	IPP 15 BOPD + 195 MCFGPD + 35 BWPD	
25	30-20S-33E, Lea	Hallwood Petroleum No. 1 Bass Federal (owwo)	11/95	13,600	Morrow (Pennsylvanian)	Wolfcamp (Permian)	11,400–11,425	IPF 19 BOPD + 36 MCFGPD	
26	31-21S-33E, Lea	Pogo Producing No. 1 Tomahawk Unit	11/95	9,100	Bone Spring (Permian)	Delaware (Permian)	8,520–8,593	IPP 15 BOPD + 5 MCFGPD + 197 BWPD	
27	6-22S-35E, Lea	Stevens & Tull No. 3 DW State	6/95	4,050	Seven Rivers (Permian)	Yates (Permian)	3,738–3,874	IPP 41 BOPD + 60 MCFGPD + 84 BWPD	34
28	5-23S-34E, Lea	Amerada Hess No. 2 North Bell Lake Federal	5/95	17,710	Ellenburger (Ordovician)	Ellenburger (Ordovician)	17,260–17,290	IPF 3800 MCFGPD + 204 BWPD	
29	18-23-35E, Lea	Yates Petroleum No. 1 San Simon Unit	12/95	14,200	Morrow (Pennsylvanian)	Morrow (Pennsylvanian)	13,688–13,711	IPF 3200 MCFGPD	
30	6-24S-32E, Lea	Santa Fe Energy No. 8 Mesa Verde 6 Federal	7/95	8,740	Bone Spring (Permian)	Bone Spring (Permian)	8,538–8,564	IPF 278 BOPD + 459 MCFGPD + 88 BWPD	40
31	25-24S-33E, Lea	Meridian Oil No. 1 Madera Ridge 25 Federal (owwo)	11/95	15,750	Morrow (Pennsylvanian)	Bone Spring (Permian)	12,218–12,330	IPF 33 BOPD + 100 MCFGPD + 34 BWPD	
32	15-25S-33E, Lea	Enron Oil & Gas No. 1 Ochoa Federal (owwo)	2/95	16,335	Morrow (Pennsylvanian)	Bone Spring (Permian)	12,190–12,266	IPP 55 BOPD + 64 BWPD	
33	14-25S-34E, Lea	Enron Oil & Gas No. 1 Fairview 14 Fee (owwo)	1/95	17,501	Silurian	Bone Spring (Permian)	12,390–12,430	IPF 26 BOPD + 80 MCFGPD + 28 BWPD	
34	17-25S-34E, Lea	Enron Oil & Gas No. 1 Javelina 17 Federal (owwo)	2/95	15,825	Atoka (Pennsylvanian)	Bone Spring (Permian)	12,264–12,290	IPF 34 BOPD + 56 MCFGPD + 42 BWPD	
35	7-30N-4W, Rio Arriba	Meridian Oil No. 2 Carson (owwo)	10/95	8,347	Gallup (Cretaceous)	Gallup (Cretaceous)	7,099–7,512	IPF 514 MCFGPD	
36	10-22N-8W, San Juan	T H McElvain No. 1 Warner Federal (owwo)	7/95	5,855	Morrison (Jurassic)	Chacra (Cretaceous)	1,480–1,590	IPF 142 MCFGPD + 18 BWPD	
37	23-23N-11W, San Juan	Dugan Production No. 2 Pierre	2/95	1,600	Menefee (Cretaceous)	Menefee (Cretaceous)	1,339–1,393	NR	

TABLE 2—Significant wildcat dry holes in New Mexico in 1995; the term formation is used in an informal sense. **D&A**, dry and abandoned; **DST**, drill-stem test; **rec**, recovered; **perf**, perforated; **acid**, acidized; **SGCW**, slight gas-cut water; **SWCM**, slight water-cut mud.

Number on Fig. 1	Location (section-township-range, county)	Operator, well number, and lease	Completion date (mo/yr)	Total depth (ft)	Formation at total depth	Status	Comments
38	28-8S-32E, Chaves	Apache Corp. No. 1 State 28	6/95	11,186	Fusselman (Silurian)	D&A	
39	18-10S-29E, Chaves	Primero Operating No. 1 Moriah	1/95	8,770	Devonian	D&A	
40	36-12S-31E, Chaves	Strata Production No. 1 Faisan State	5/95	12,026	Devonian	D&A	
41	11-13S-27E, Chaves	Marbob Energy No. 1 Havasu Federal	6/95	7,575	Montoya (Ordovician)	D&A	DST 7,132–7,158 ft (Siluro-Devonian), rec 1,382 ft water; perf & acid 1,726–1,820 ft (San Andres) with no reported shows.
42	18-32N-14W, San Juan	Meridian Oil No. 26 Ute	5/95	8,906	Barker Creek (Pennsylvanian)	D&A	Pennsylvanian test
43	10-31N-18W, San Juan	Harken Southwest No. 1 North Chimney Rock	5/95	7,568	Pinkerton Trail (Pennsylvanian)	D&A	DST 6,781–6,980 ft (Ismay), rec 4,050 ft SGCW + 1,102 ft SWCM
44	7-17N-3W, Sandoval	Foster Brown Production No. 1 Franklin	9/95	800	Mancos	D&A	Drilled to test Point Lookout Sandstone (Cretaceous)
45	17-17N-4W, Sandoval	High Plains Petroleum No. 1 Hermana	3/95	4,094	Entrada (Jurassic)	D&A	Perf 3,816–3,884 ft (Summerville); 3,746–3,758 ft, 3,432–3,474 ft (Morrison); 3,066–3,086 ft (Dakota); 2,655–2,675 ft (Lower Mancos); 1,998–2,016 ft (Gallup); 940–963 ft (Upper Mancos); 96–300 ft (Menefee) with no reported shows.
46	32-7N-23E, Guadalupe	Labrador Oils No. 1 State Jones	6/95	16,923	Precambrian	D&A	No reported shows.

TABLE 3—Significant wildcat wells being drilled, held “tight”, or scheduled to be drilled at the end of 1995.

Number on Fig. 1	Location (section-township-range, county)	Operator, well number, and lease	Comments
47	3-13N-2E, Sandoval	Davis Petroleum No. 1-Y Tamara	Albuquerque–Belen Basin. Spud 12/95, drilled to total depth of 8,732 ft in Chinle (Triassic). “Tight” hole.
48	19-4N-1E, Socorro	Davis Petroleum No. 1 Angel Eyes	Albuquerque–Belen Basin. Spud 3/96, drilled to more than 9,000 ft. “Tight” hole.

San Andres and Grayburg reservoirs

Oil and associated gas reservoirs in the shallow (2,000–5,000 ft) San Andres and Grayburg Formations (Permian: lower Guadalupian) were primary targets of development drilling in 1995. Approximately 200 wells were completed in these zones. Drilling was primarily for development of mature fields on the south part of the Northwest shelf in north Eddy and Lea Counties. Activity was widespread with wells drilled in 21 pools. Drilling was concentrated in the Grayburg–Jackson pool of Eddy County where more than 100 wells were drilled. Major development also took place in the Red Lake pool of north Eddy County and in the Maljamar and Vacuum pools of north Lea County. Although exploration along the mature San Andres and Grayburg trends was limited, one significant discovery was made.

The Drum Energy No. 1 Frances Evelyn (24) established production from the San Andres Formation in east-central Lea County midway between the Hobbs and House pools.

Delaware Mountain Group sandstones

Basinal sandstone reservoirs of the Delaware Mountain Group (Permian: Guadalupian) continued to be one of the most active plays in southeast New Mexico. During 1995, approximately 150 wells were drilled in search of oil in these reservoirs in the Delaware Basin. Depth to production typically ranges from 5,000 to 8,000 ft but can be as shallow as 2,000 ft in the north part of the Delaware Basin. Exploration was more subdued than in previous years, with only six exploratory wells drilled. Development was mostly by infill drilling and conservative stepouts

from known production; the development success rate of Delaware reservoirs exceeded 90% in 1995. Development wells were drilled in 44 oil pools. The Red Tank West, Ingle Wells, and Lea Northeast pools were the most intensely developed Delaware reservoirs in 1995. As in the past few years, most of drilling was for oil in the Brushy Canyon Formation, the lowermost of the three sandstone-bearing formations that constitute the Delaware.

Three significant discoveries of oil in the Delaware were made during 1995. Oil was discovered in lower Brushy Canyon sandstones in the Maralo No. 1 Gold Rush 30 Federal (9) in southeast Eddy County and in the TMBR & Sharp No. 1 State 3 (14) in south-central Eddy County. Oil was also discovered in lower Brushy Canyon sandstones in the Pogo Producing No. 1 Tomahawk Unit (26) along the east edge of the Delaware play in Lea County.

Bone Spring basinal sediments

Basinal allochthonous carbonates and sandstones of the moderately deep (6,000–10,000 ft) Bone Spring Formation (Permian: Leonardian) were intensely drilled in 1995. Approximately 80 wells were drilled for oil in these reservoirs in the Delaware Basin. The Bone Spring play had been relatively inactive for the past few years as shallower targets in the Delaware Mountain Group were given preference for exploration and development drilling. Development wells were drilled in 23 oil

pools in east Eddy and west Lea Counties. Drilling activity was most intense in the Red Hills pool of southernmost Lea County and in the Red Tank pool of west-central Lea County. Fifteen development oil wells were successfully completed in the Red Hills pool. Generally, oil pools in the south part of Lea and Eddy Counties have been relatively small; most have only 1 to 3 wells. The establishment of Red Hills as a relatively large pool indicates that significant accumulations of hydrocarbons may exist in the Bone Spring in this area.

Exploration for hydrocarbons in Bone Spring reservoirs surged in 1994 and this exploratory activity continued into 1995. In most cases, Bone Spring discoveries were made by reentering older wells that had produced from deeper reservoirs and subsequently had been abandoned in those deeper reservoirs; very few new wildcat wells were drilled for the purpose of finding hydrocarbons in the Bone Spring. Along the west edge of the play, oil was found in the Bone Spring in two wells, the Ray Westall No. 2 Federal Z (5) and the Hallwood Petroleum No. 1 Harkey 35 (10). In the south-central part of the Bone Spring play, oil was found in the Texaco No. 1 Malaga-Harroun 6 (12) and in the Pogo Producing No. 1 Mitchell 21 Federal (13). In the southeast part of the play, oil was found in five wells (30-34), all but one of which were workovers of deeper existing wells.

Yeso shelf sediments

Shallow shelf carbonate reservoirs of the Yeso Formation (Permian: Leonardian) were actively drilled in 1995. Sixty-six development wells were drilled in 19 pools on the Central Basin platform in south Lea County. Production was obtained from all three members of the Yeso (descending): Blinebry, Tubb, and Drinkard members. In many of the pools, production from two or all three of these zones is commingled. In some pools, Yeso production is commingled with oil production from underlying Abo (Permian: Wolfcampian) carbonates. Pools with the most drilling activity in 1995 were the Blinebry pool, the Justis Drinkard-Tubb pool and Dollarhide Drinkard-Tubb pool of southeast Lea County.

There was limited exploration for hydrocarbons in Yeso reservoirs. One significant discovery was made. Oil was found in Blinebry sandstones in the Marathon No. 10 Warn State (20) on the southeast margin of the Northwest shelf. This discovery is located along the northwest margin of the Yeso play in areas where Yeso production is sparse.

Abo sandstone and carbonate reservoirs

Development of sandstone reservoirs in the Pecos Slope and Pecos Slope West gas

pools continued slowly in 1995 with only 18 development wells completed in these "tight" gas reservoirs. One significant wildcat discovery was made in this play by the Yates Petroleum No. 5 Blackwater Unit (1), drilled two miles south of the Pecos Slope West pool. Perhaps surprisingly, this well is reported to have encountered oil in the Abo red beds, which are productive of gas elsewhere in the play. There was only limited development of Abo shelf-margin carbonate reservoirs on the south edge of the Northwest shelf with 10 wells drilled in six reservoirs.

Wolfcamp carbonates

Moderately deep (9,000-11,000 ft) carbonate reservoirs in the Wolfcamp Group (Permian: Wolfcampian) were developed at a limited pace in 1995. Five development oil wells and four development gas wells were completed successfully in seven pools in north and central Eddy County and in south and central Lea Counties. However, exploration for Wolfcamp hydrocarbons was vigorous and four significant exploratory discoveries were made during 1995. In Eddy County, gas was discovered in the Wolfcamp in the Maralo, Inc. No. 1 State DD (7) and in the Maralo, Inc. No. 1 Cochita 5 Federal (11). Oil was discovered in the Wolfcamp in Lea County in the Maralo, Inc. No. 1 Lowe 20 well (16), which had an impressive initial potential of 683 bbls oil per day from 107 ft of gross pay, and in the Hallwood Petroleum No. 1 Bass Federal well (25).

Upper Pennsylvanian carbonates

Moderately deep (7,000-10,000 ft) Cisco and Canyon (Upper Pennsylvanian) carbonate reservoirs continued to be developed aggressively in 1995. Sixty-eight development wells were successfully completed in nine reservoirs. Activity was concentrated in the Dagger Draw North pool where 37 development oil wells were successfully completed and in the Dagger Draw South pool where 22 development oil wells were successfully completed. The Dagger Draw North and Dagger Draw South pools are examples of underdeveloped reservoirs that produced minor volumes of oil for almost 20 years. Upon realization that substantial oil resources remained unproduced in these reservoirs, drilling programs were instituted to tap into those resources. The result was an immediate increase in production and Dagger Draw North and Dagger Draw South quickly became two of the most productive oil pools in southeast New Mexico. In 1992, they provided approximately 10% of the state's total oil production (Fig. 2).

Strawn reservoirs

Development of moderately deep (10,000-12,000 ft) Strawn (Middle Pennsylvanian) reservoirs continued at a slow pace in 1995. Development of existing reservoirs was slow, with only 13 development wells completed in nine pools. Exploration for oil and gas in Strawn carbonate reservoirs was vigorous, however. Gas was found in the Strawn in the Yates Petroleum No. 1 Zinnia Federal (6) in the central part of the Strawn play. Along the southeast margin of the play, gas was discovered in the Strawn in the Hallwood Petroleum No. 1 Williams 35 (8), a reentry of an older well that had produced from the Atoka.

Atoka and Morrow "deep gas" reservoirs

The deep (10,000-14,000 ft) gas reservoirs in the Atoka and Morrow Groups saw limited development with only 29 development gas wells completed successfully in 26 pools in 1995. Exploratory drilling was also limited, but several discoveries were made. Exploration was for gas in Morrow reservoirs (wells 4, 17, and 29) and also for oil in the shallower Atoka reservoirs (wells 18, 21). Although the Atoka produces gas throughout most of southeast New Mexico, an oil play of modest size has emerged in the Atoka during the past few years in northeast Lea County.

Devonian, Silurian, and Ordovician reservoirs

Exploration for oil in seismically defined structural traps in the lower Paleozoic section was strong on the Central Basin platform and on the Northwest shelf. Many traps in the lower Paleozoic are formed by fault-bounded anticlinal closures. In the east part of the Delaware Basin, gas was discovered in Ellenburger (Ordovician) dolostones in

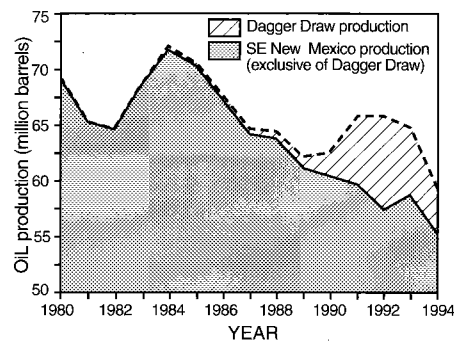


FIGURE 2—Historical annual oil production from Dagger Draw Pennsylvania pool, and oil production for all of southeast New Mexico, showing impact of full development of the Dagger Draw pool on oil production in southeast New Mexico.

the Amerada Hess No. 2 North Bell Lake Federal (28). Near the north margin of the Devonian play on the Roosevelt uplift, oil was discovered in Devonian reservoirs in the Manzano Oil No. 1 Sundown SV State (15). Four exploratory wells were drilled unsuccessfully on the Northwest shelf (wells 38–41) and seven others were drilled unsuccessfully in Roosevelt and Lea Counties. Exploration for structural traps in the Devonian, Silurian, and Ordovician sections is expected to remain strong through 1996. Better definition of the relatively small structures that form traps in the lower Paleozoic has been recently made possible by new and affordable 3-D seismic techniques, although this new technology has not yet been used to define such factors as seal integrity or migration pathways. These factors are important when considering entrapment of hydrocarbons in the lower Paleozoic section on the Northwest shelf.

San Juan Basin, northwest New Mexico

Drilling activity decreased markedly during 1995 in the San Juan Basin. There were 407 completions during the year, a decrease of 19% from the 503 completions in 1993. The success rate was 97%, with 344 wells completed as gas producers, 51 wells completed as oil producers, and 12 wells plugged and abandoned. Drilling concentrated on development of gas reservoirs in the Fruitland coals (Cretaceous), Pictured Cliffs and other Mesaverde sandstones (Cretaceous), and Dakota sandstones (Cretaceous).

Fruitland coalbed methane reservoirs

Gas reservoirs of the Fruitland Formation (Upper Cretaceous) continued to be aggressively developed in 1995, but at a lower rate than previous years. More than 70 wells were completed in the Fruitland; most of these wells were drilled in coalbed-methane reservoirs of the giant Basin pool in east San Juan and west Rio Arriba Counties. Substantial activity was also seen in the Aztec Fruitland pool of San Juan County.

Pictured Cliffs Sandstone

Gas reservoirs in the Pictured Cliffs Sandstone (Upper Cretaceous) were major targets for exploratory and development drilling in 1995. More than 40 wells were completed in these reservoirs. Development drilling was concentrated in the Kutz West and Fulcher Kutz pools of northeast San Juan County. Exploration for gas in Pictured Cliffs sandstones was limited in 1995 with most exploratory drilling concentrated on developing and extending previously discovered gas.

Mesaverde sandstones

Development of gas reservoirs in Mesaverde sandstones (Upper Cretaceous) remained strong during 1995 with more than 150 development gas wells completed. Almost all of these wells were in the Blanco pool of northeast San Juan and northwest Rio Arriba Counties. Many of the wells were completed as dual producers from gas reservoirs in Mesaverde sandstones and in Dakota sandstones. Exploration for gas in the Mesaverde was minimal in 1995.

Gallup Sandstone

Oil reservoirs in the Gallup Sandstone (Upper Cretaceous) saw a mild resurgence in development activity during 1995. Approximately 30 development wells were completed in eight reservoirs. Most wells were drilled in the Lybrook and Devils Fork pools. One significant wildcat discovery was also made; gas was discovered in the Gallup in the Meridian Oil No. 2 Carson well (35). This discovery is northeast of the main Gallup oil-producing trend and is in an area where the Gallup produces from scattered, isolated gas pools.

Dakota sandstones

Oil and gas reservoirs in sandstones of the Dakota Group (Upper Cretaceous) were developed at an aggressive pace in 1995, but drilling was somewhat reduced from 1994. Thirteen oil wells and 17 gas wells were completed in Dakota reservoirs. Drilling for gas was concentrated in the giant Basin pool of northeast San Juan and west Rio Arriba Counties. Oil drilling was concentrated in the Lindrith West pool of Sandoval County as well as in the Basin pool. In many of these wells, production from the Dakota is commingled with production from Gallup and Graneros sandstones (Upper Cretaceous).

Entrada Sandstone

There was limited exploration for hydrocarbons in the Entrada Sandstone (Jurassic) in northwest New Mexico during 1995. In the south part of the San Juan Basin, the High Plains Petroleum No.1 Hermana (45) was drilled to a total depth of 4,094 ft to test the Entrada. The well tested several zones including Summerville and Morrison Sandstones (Jurassic), the Dakota and Gallup Sandstones (Cretaceous), the lower and upper parts of the Mancos Shale (Cretaceous), and the Mesaverde sandstones (Cretaceous), but production was not established.

Four horizontal wells were successfully drilled in three Entrada oil pools: the Papers Wash pool in northeast McKinley County, the Snake Eyes pool in southeast

San Juan County, and the Eagle Mesa pool in northwest Sandoval County. These wells were completed in the uppermost part of the Entrada and presumably are designed to minimize water coning and reduce the amount of water produced from each well. Vertical Entrada wells typically produce high volumes of water after just two or three years of production, and production becomes uneconomic in some of these wells because of the high cost of water disposal.

Pennsylvanian carbonates

Exploration for hydrocarbons in Pennsylvanian carbonate reservoirs increased during 1995. Two development gas wells and one extension were successfully completed in the Barker Creek field of northwest San Juan County. Two exploratory tests (42, 43) were drilled unsuccessfully in search of Pennsylvanian hydrocarbons. The Harken Southwest No. 1 North Chimney Rock (43) reportedly recovered gas-cut water during a drill-stem test in Ismay (Pennsylvanian) carbonates. Although moderate production of oil and gas is obtained from Pennsylvanian reservoirs on the west flank of the San Juan Basin, the Pennsylvanian section has been tested by relatively few wells throughout most of the basin and remains a promising exploratory target.

Albuquerque Basin

In central New Mexico, Davis Oil Corp. and Vastar Resources continued exploratory efforts in the Albuquerque–Belen Basin. This has resulted in drilling two wells with Davis Oil as the operator. The Vastar No. 1-Y Tamara 3 (47) was spudded in late 1995 in the north part of the basin. It was drilled to a total depth of 8,732 ft in the Chinle Formation (Triassic). The Davis Oil No. 1 Angel Eyes (48) was spudded in the south part of the basin in early 1996 and drilled to a reported total depth of more than 9,000 ft. Both wells are “tight”.

Exploratory interest in the Albuquerque Basin has been intermittent. The last exploration was in the early 1980s when Shell and UTEX Oil Company drilled eight wildcat wells in the basin in search of hydrocarbons in the Cretaceous section. Although production was not established by those wells, significant shows of gas were encountered, and analyses of drilling indicate that the necessary parameters for commercial production are present in the basin. Black (1982, 1989) has summarized the petroleum geology and the history of oil and gas exploration in the Albuquerque Basin.

Northeast New Mexico

Northeast New Mexico saw significant exploratory activity and plans for significant development in 1995. A petroleum

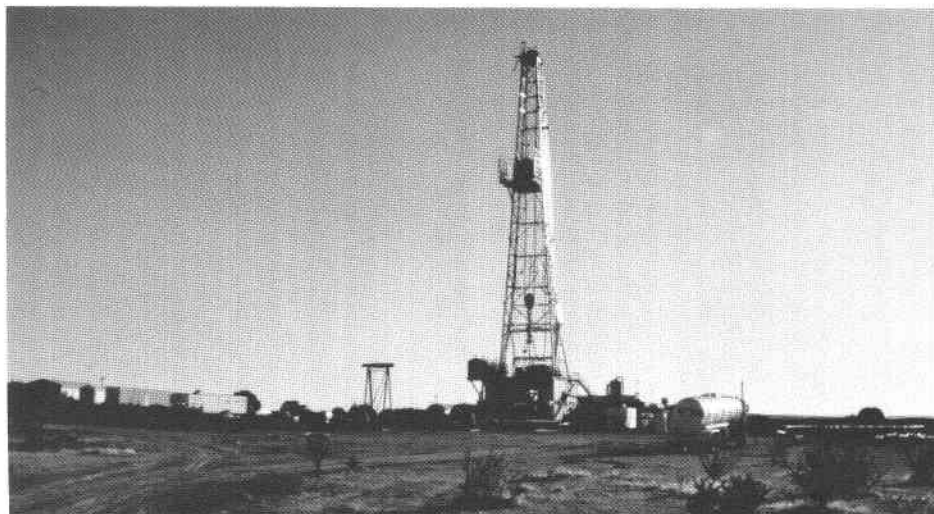


FIGURE 3—The Labrador Oil Co. No. 1 State Jones well drilling in the Tucumcari Basin, May 1995.

exploration well was completed in the Tucumcari Basin. Plans were made to further develop carbon dioxide resources on the Bravo dome. In addition, plans were considered to develop and produce coalbed methane in the Raton Basin.

In the Tucumcari Basin, the Labrador Oil Company No. 1 State Jones (46) was spudded in September 1994 and drilled to a depth of 10,502 ft by November of that year. A larger drilling rig was moved onto the location and the hole was deepened to a depth of 16,923 ft in Precambrian rocks (Fig. 3). The well subsequently has been plugged and abandoned and information has been held "tight". Commercial production of hydrocarbons has not been obtained from the Tucumcari Basin, but marginally commercial discoveries of both oil and gas made in the early 1980s (Broadhead and King, 1988) were never exploited. Primary objectives in the basin are Pennsylvanian sandstones and limestones and Lower Permian dolostones (Broadhead and King, 1988; Broadhead, 1990).

Pennzoil is still reported to be considering a program to develop and produce coalbed methane in the Vermejo Formation (Cretaceous) in the Raton Basin. From 1989 through 1991 Pennzoil drilled more than 30 wells as part of a pilot program to test and evaluate coalbed methane in the basin. Primary use of the gas, if developed and produced, will be for generation of electricity at a proposed power-generating plant in the city of Springer.

Elsewhere in northeast New Mexico, Amoco continued development of the Bravo dome carbon dioxide gas field of Union County. Amoco drilled 32 new

wells to enhance production. Almost all of the carbon dioxide produced from the Bravo dome field is transported through pipelines to the Permian Basin where it is used in enhanced oil recovery. Currently, most of these enhanced recovery projects are in the Texas part of the basin (Oil and Gas Journal, 1996). A minor amount is converted to dry ice and bottled, liquid carbon dioxide at small processing facilities in Union and Harding Counties.

Southwest New Mexico

No petroleum exploration wells were drilled in southwest New Mexico in 1995. However, a large lease play continued to be developed in the Chupadera Mesa area of east Socorro and northwest Lincoln Counties with exploratory work done on land leased during 1993 by independent Ben Donegan.

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