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GRAND JUNCTION OFFICE

PRODUCTION EVALUATION DIVISION

THE DISCOVERY AND DEVELOPMENT OF URANIUM IN THE GRANTS MINERAL BELT, NEW MEXICO

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UNEDITED MANUSCRIPT

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PREFACE

The historical material contained in this report was compiled by Ray J. Holmquist from information in the files of the U. S. Atomic Energy Commission's Grants Field Office. Much of the data was collected by Ingles M. Gay, pioneer AEC mining engineer at Grants.

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William L. Chenoweth
August 1981

Page	Subject
1	Introduction
	SANDSTONE MINES
7	Hogback 4
8	Largo, Diamond 2
10	Foutz Mine
11	U Mine
12	Rem Uranium
13	Westwater No. 1
14	Church Rock Mine
17	NE Church Rock, UNC
19	Mac No. 1 Mine
20	Black Jack No. 2
21	Mac No. 2 Mine
22	Black Jack No. 1
24	Moe No. 5
26	Silver Bit
27	Alta Group
27	Francis Group
28	Evelyn Mine
29	Silver Spur
30	Black Rock, Pat or Dakota
31	Blue Peak Adits
33	Isabella
34	Spencer Mine
35	Gossett Mine
36	Poison Canyon Mine
37	Beacon Hill Mine
38	Davenport Incline
38	Mesa Top Mine
39	Malpais Shaft
40	Dog and Flea Mines
41	Doris and west Extension
42	Hogan Mine
43	Rialto, Chill Wills Mine
44	Marquez Mine
46	San Mateo Mine
49	Kermac, 10,14-10
51	Homestake-Sapin, 15,14-10
53	Kermac, 22,14-10
55	Mary No. 1, Dysart III
57	Dysart I
59	Dysart II
61	Dysart Sec.12, SW/4
62	Buckey Mine
64	Homestake-Sapin, 23,14-10
66	Kermac, 24,26, 14-10
68	Homestake-Sapin, 25, 14-10
70	VCA Mine, 36, 14-10
71	Kermac, 17,18,20, 14-9
74	Kermac, 30,14-9
76	Kermac, 30,14-9 West
77	Kermac, 19, 14-9
78	Homestake-Sapin, 32, 14-9
81	Ann Lee Mine
84	Kermac, 33, 14-9
87	Sandstone Mine
90	United Nuclear, 27, 14-9
92	Kermac, 35, 14-9, Elizabeth
93	Cliffside Mine
97	Keradamex, Lee Ranch
98	Jackpile Mine
100	Paguate Mine
102	Woodrow Mine
103	M-6, Climax Mine
	LIMESTONE MINES
105	Federal Incline
106	Federal Uranium Corp, 24,13-11
106	Haystack Mt Dev Co, 19,13-10
107	Haystack Mt Dev Co, 25, 13-10
109	Barbara J No. 2, Dalco
110	Barbara J No. 1
111	Barbara J No. 3
113	Roundy Lease, Rimrock 1,2,3
115	Flat Top Mine
116	Faith Mine
118	Vallejo Mine
119	Moe No. 4, 32, 13-9
121	Sec. 4, 12-9
122	Anaconda, 9, 12-9
122	Lajara, Zia
123	Anaconda, F-33

INTRODUCTION

The uranium industry in Grants, New Mexico started after 1950 when a local man found uranium minerals in a limestone outcrop near Bluewater, New Mexico. The discovery was made in Section 19, T13N, R10W on Santa Fe railroad land. The railroad company started exploration work and soon developed considerable reserves of the shallow ores.

To provide a means of making a marketable product from the ores, the Anaconda Company constructed a carbonate leach uranium mill near Bluewater, New Mexico in 1953 to process the ore. While processing custom ores from a wide area in New Mexico and Arizona the Company conducted exploration work also. During this time the production in the Grants area was from shallow limestone ores and from some of the shallow sandstone mines such as the Alta, Evelyn and Silver Spur in the area between Grants and Gallup. The Mesa Top deposit was also discovered about this time and was developed by the first vertical shaft in the district.

The first large sandstone uranium deposit to be discovered in this area was found by Anaconda using aerial prospecting on the Laguna Reservation about 32 miles east of Grants and about 8 miles north of Highway 66. The Jackpile deposit outcropped at one small place near the south end of a lar mesa. This discovery probably influenced other large companies to investigate the Grants area for important deposits of uranium. In the spring of 1955 ore was discovered in the Ambrosia Lake area, by drilling, at a depth of 300 to 400 feet. This deep exploration was probably prompted by the knowledge that the area was underlain by the Morrison formation that contains many of the vanadium-uranium deposits on the Colorado Plateau.

The initial discovery was made by Louis Lothman on Stella Dysart's Section 11, T14N,R10W in McKinley County, New Mexico. Miss Dysart had acquired the mineral rights on several tracts of ground in the vicinity of Ambrosia Dome for oil exploration.

By July 1955 ore had been discovered in Section 10,15,22,23,24 and 36 of T14N,R10W by drilling, with ore intercepts ranging from 2 feet of 2.5% U_3O_8 to 70 feet of .20% U_3O_8 and the district was being recognized as an important discovery. By the latter part of 1955 important discoveries had been made in T14N,R9W at depths ranging from 200 to 1200 feet depth. There were 35 to 40 drills operating, exploring the Morrison sandstone in the Ambrosia Lake locality and about 60 other drills were busy in Valencia and McKinley Counties in a strip 15 to 20 miles wide adjacent to Highway 66 on the north for a distance of 100 miles from Laguna to Gallup.

In the early stages much of the ground had been acquired by individuals and small groups that did not have the finances to pay for an extensive drilling program to explore the ground. Finances had to be obtained by consolidating with groups that could put up $200,000 to $500,000 for a drilling program. When an important ore discovery had been made, then the capital to develop a mine and build a mill must be found which necessitated the consolidation with such companies as Kerr-McGee Oil Industries, Homestake Mining Company and Phillips Petroleum Company. In most cases the original mineral lessees had drilled their ground enough to indicate an orebody and were able to interest large companies to take over and explore sufficiently to determine whether a mine and mill would be justified. Although the original major orebodies in Ambrosia Lake were confined to less than 20 sections of land there was extensive exploration in double or triple that number of sections. Drilling in the Ambrosia Lake area and elsewhere

continued at a rapid pace and new discoveries were being made from time to time until November 24, 1956 when the Atomic Energy Commission announced that they would not guarantee a market for any ores discovered after that date. At this point most wildcat drilling ceased but drilling to delineate known orebodies continued for several years.

Anaconda's carbonate leach mill circuit started taking ore in August 1953. An acid mill circuit was later constructed that went into use in December 1955 to treat ore from the Jackpile mine. Construction of the Homestake-New Mexico Partners mill was started in April 1957 and processing of ore was started in February 1958. Grading for the Phillips mill site was started in September 1957 and the first drum of yellowcake was produced on August 15,1958. The Kermac mill site was selected in September 1957 and the mill started treating ore on November 28, 1958. The Homestake-Sapin mill was under construction in September 1957 and the first yellowcake was produced August 14, 1958.

Up to May 1959 Anaconda operated both the carbonate leach and the acid leach mills, then the Company shut down its limestone operations at Sec. 33,34, 12-9 and closed the carbonate leach mill and discontinued purchasin limestone ores from custom shippers. The acid circuit had been constructed to treat the sandstone ores from the Jackpile and Paguate mines.

In November 1961 Homestake-Sapin Partners and Homestake New Mexico Partners were consolidated, with Homestake-Sapin Partners the surviving compan As a result the New Mexico Partners mill was shut down April 14, 1962 and all feed treated at the Homestake-Sapin Partners mill. Some of the crushin and sampling facilities and also the Pachucas at the New Mexico Partners mill are still used by the Homestake-Sapin mill. Sabre-Pinon Uranium Corp.

and United Nuclear Corp. merged on March 29, 1962 with United Nuclear becoming the new corporate title. United Nuclear Corp. was an eastern company with plants to process uranium into fuel rods and cores for nuclear reactors. They were also listed on the New York Stock Exchange. Phillips Petroleum sold all their uranium interests in the Grants area to United Nuclear effective March 28, 1963. The Phillips mill was shut down and the United Nuclear ore was tolled through the Homestake-Sapin mill.

On November 17, 1962 the Atomic Energy Commission proposed to the millin contractors that they defer part of their 1-1-63 balance of pounds of U_3 in their contracts that were to expire 1-1-67 and market the deferred pounds in 1967-1968. For all deferred pounds the Commission would provide a market for an additional pound for each pound deferred and these pounds would be purchased in 1969-1970. This proposal was made to sustain the uranium industry during the years 1966-1970 when it was hoped that a commercial market would develop. Of 27 mills originaly built, 11 agreed to the stretch out terms.

The first Ambrosia Lake Mine, Dysart No. 1, was in dry, firm ground which permitted trackless, on ore level mining similar to the practice in the potash mines in the Carlbad area. When Kermac's Section 22 and 30 mines were opened they were designed for trackless, on-level operation. Except for the mines in the vicinity of the Dysart No. 1 Mine all of the Ambrosia Lake mines have proven to be wet and the sandstone too soft to support openings without timbering or bolting. Trackless roadways could not be maintained and the mixture of water and sand created abrasive conditions that made the maintenance of equipment prohibitive. Homestake-Sapin started all their wet mines with below-ore tracked drifts but Kerr-McGee and Phillips tried on-ore trackless development. After designing and equipping

the mines for trackless equipment it was found that underground haulage would have to be on steel rails with haulage drifts below the ore levels so the ore bodies could be drained before mining. The changeover caused a delay in production startup of several months and in the meantime the mil had been completed and were waiting for ore.

During 1960-1961, when most of the large mines were getting into production, numerous fatal accidents occurred. Most were caused by falls of unsupported ground. At the insistence of the State Mine Inspecto office a code of safety regulations were adopted to govern underground ac ivity and the fatality rate dropped remarkably.

The present, 1965, ore reserves in the Ambrosia Lake district are a little more than sufficient to fill the 1970 uranium purchase contracts now in effect. There are several areas in the district where ore has been indicat ed but not explored sufficiently to be classed as ore reserves. It would be safe to predict that over half of the original Ambrosia Lake uranium has either been mined, developed or explored. On the borders of the district to the east and north there are probably important undiscovered ore bodies that would be too deep to be economic under the present price for uranium and a limited market. The sudden termination of exploration of a wildcat nature in 1958 has undoubtably left important uranium resources undiscovered.

What follows is a brief history of each of the mines that produced a significant amount of ore in the area embraced in a strip of land about 100 miles long extending from Gallup to Laguna and about 6 miles wide roughly following U.S. Highway 66. With only one exception all of the mines discussed lie north of Highway 66. The ores are found in the northward dippin

limestone and sandstones that were tilted as a result of the Zuni Uplift which produced the Zuni Mountains that lie south and about parallel to th trend of the mineralized zone.

The sandstone mines included in this historical sketch are roughly arranged geographically from west to east starting near the town of Gallup, N. and ending at the Jackpile area near Laguna. The limestone mines, which a confined to the Grants area, are arranged in a separate group following th sandstone mines but also in geographical sequence from west to east. The list includes 57 sandstone mines and 21 limestone mines for a total of 78. At the present, 1965, there are about 27 operating mines. Most of the closures have been caused by the depletion of reserves.

HOGBACK No. 4

Production started from shallow pits on the west side of the Hogback rid After the profitable ore had been mined the property was shut down in la 1953. In 1955 several exploration holes were drilled from the west side of the Hogback to test the downward extension of the ore-bearing strata and some holes intersected ore. A.W. Hyde, the owner, started an incline shaft. By October 1955 the incline was 155 feet deep and a level was sta ed at 150-foot depth. Calumet and Hecla Mining Co. leased the property i March or April 1956 and drilled 26 holes of which 7 hit ore and 16 were mineralized. Calumet and Hecla then gave Bob Mathis of Silver City a contract to mine the ore. Mathis sank the incline to 285 feet and started a drift to some ore that had been located by drilling. The ore was badly o of equilibrium, both low and high radiometrically. Some black shales in the mine were found to be highgrade and this ore was used to blend the low-grade to make a .20% ore. In March 1958 Calumet and Hecla withdrew their support of the operation and gave Mathis a lease on the property. Mathis then shipped some ore to the Shiprock mill. In March of 1959 the S Tee Mining Co. of Grants took over but abandoned the project in the fall for lack of ore. In June 1960 Jess Windsor of Gallup reopened the mine, mined about 900 tons and closed down. Total production from the mine has been 6250 tons of .19% ore.

LARGO, DIAMOND No. 2. Section 33, 15-17

This property occupies the N/2 and NE/4 of Sec. 33, 15-17 and is fee[illegible]. The first ore produced was marketed in the spring of 1953. More drillin was done in March 1954 and 12 holes were reported to have cut ore 12 fe thick of 1% grade. The original operator was Agee Dodge Enterprises whi later became known as General Uranium Corp.

In May 1955 Four Corners Uranium took over the property and started deep ening the incline that had been started by the original operator. The in was 350 feet deep in June 1955. In August 1955 the incline was 400 feet deep with nine men employed and production was 200 tons for the month. The marketing point was changed from Bluwater mill to the Shiprock mill in November 1955. The incline was at a depth of 450 feet by December 195 In April 1956 the shaft was 485 feet deep and the bottom level at 450 fe Production was about 1000 tons per month of .20 to .22% ore. In August 1956 the marketing point was changed to the Grants buying station. By Ja 1957 the shaft had been deepened and the bottom was reported to be 550 f More ore was found northwest of the incline by drilling in August 1956 a by Feb. 1957 the 550 level was out 1100 feet northwest of the shaft dev- eloping the ore found by the latest drilling.

In May 1957 production was 1500 tons per month of .24% ore. The 500 level was out 1400 feet northwest of the shaft and some ore was coming from the Becenti, a neighboring lease. At this time a raise was started to reach the surface but this project was later abandoned. About 6 months supply of ore was estimated in Dec. 1957. Some ore was drilled below the 500 level but the ground was wet and the dip of the strata flattened. In Ma 1958 there were 14 men on two shifts above the 500 level and the drift ha

been driven 1500 feet northwest from the shaft. The 1965 ore reserve was in scattered pillars and blocks above the 500 level. Four Corners Uranium Corp. shut down production in March 1959. Production had been continuous from July 1955. Total production through March 1959 had been 47,000 tons of .23% ore. During April, May and June of 1959 a longholing project was conducted but no ore of consequence was found so the mine was strippe of equipment and abandoned.

Ivor Adair was dealing for a lease on the mine in May 1964 and started to repair and reopen the mine in Aug. Ore was coming from pillars and blocks left by the previous operator. Adair operated the mine for short interval taking ore from old pillars above the bottom level. In Jan. 1969 Roger Benton of Nucla, Colo. reopened the mine and shipped about 180 tons of .11% material about midyear. Shiprock Ltd of Grand Junction, Colo. then obtained a lease and did some surface drilling to locate ore downdip from the bottom level. Apparently the drilling did not find significant ore as it did not result in deeper mine development.

Production to 1-1-70 has been 55,440 tons of .23% ore.

FOUTZ MINES 1,2, and 3 Sec. 4,5, 15-16

There is not much history available about the Foutz mines but Andre Semautovitch was producing ore in Jan. 1954 and the property was later sold to Four Corners Uranium Corp. Foutz No. 1 mine was composed of 20 unpatented claims in the N/2 of Sec. 4, 15-16. Most of the mining was done in 1954 and 1955. Foutz No. 2 occupied the NE/4 of Sec. 5, 15-16 which is patented rail road land. Foutz No. 3 or Yellow Jacket occupied the SE/4 of Sec. 31, 16-16 and was also patented rail road land. This property was developed by about 300 feet of drifts and stopes. The entry was an adit driven in from the rim.

The total production of the Foutz mines has been 2628 tons of .21% ore.

U MINE Section 4 15-16

The property consists of 20 unpatented claims that occupy the south half of Sec. 4. The claims were located by George Christensen and wife and were leased to Williams and Reynolds. Frontier Uranium had a lease for a short time and then Rem Uranium Co. obtained a lease. The mine was shut down in Aug. 1955 and reopened in March 1958 by W.C.T. Engineering who marketed a few tons of low-grade. Part of the mining was through an incli and the balance through an adit driven in from the rim. There is reportec to be about 1000 feet of workings in the mine.

Total production has been 2560 tons of .17% ore.

REM URANIUM Sec. 3, 15-16

Section 3 is railroad land that was leased to Dan Christensen and later subleased to Rem Uranium Co. The mine is developed by an adit driven in from the rim about 100 feet below the top of the mesa.

All production, consisting of 324 tons averaging .28% U_3O_8, was shipped during 1957. The ore is a black carbonaceous material, or lignite, that was not amenable to the local mill circuits.

WESTWATER No. 1 Section 2, 15-16

Section 2 is State land leased to the Westwater Corp. The orebody was dis covered by drilling 8000 feet of hole in 45 holes. The ore strata is 140 to 170 feet deep and was developed and mined through an adit driven in from the rim. The first ore was shipped in Dec. 1957. During 1958 shipmen were less than 100 tons per month due to the erratic nature of the ore bu a new, lower adit was driven in from the rim to develop ore found by dril ing and as a result shipments during 1959 were 200 tons per month. The last of the ore was shipped in early 1960 and by April the property was abandoned.

Total production was 4714 tons of .28% ore.

CHURCH ROCK MINE Sec. 8,17, 16-16

Section 17 is leased from the Santa Fe Railroad and Section 8 is cove by unpatented claims located by Quinta Corp. Phillips Petroleum Corp. held a partial assignment on the property and put up the money for explor ation and development.

The deposit was discovered by 308,000 feet of drilling in 300 holes.

In April 1959 Philli asked for bids on a 10-foot diameter circular concreted shaft, 815 feet deep. Centennial Development Co. was awarded a shaft contract in July and the surface plant was erected. Shaft sinking started in Aug. 1959 using a Cryderman shaft mucker. A drilled shaft, 52 inches in diameter was startec near the main shaft and was cased to 42 inches. The shaft was drilled 12 inches on the first pass, then reamed to 28 inches and finally to 52 inche

The main shaft entered the Dakota formation at 380 feet depth in Nov. 1959. The first level was started at 489 feet depth to mine ore at the Dakota formation and also drift to connect with the vent hole. The ore was hoisted through the vent hole and sinking continued in the main shaft. Production started in March 1960 and by monthend 2400 tons of .22% ore had been shipped to make the deadline of March 31, for the initial production bonus.

Mining of Dakota ore continued on the 489 level but the ore was highly fractured and hard to manage. Steel sets were used to try to control the ground and it is likely that some ore was lost. In July 1960 the shaft was 640 feet deep and a second station had been cut at 640 feet depth. The con-

crete shaft lining was placed in 12-foot lifts using 1½ yards of concrete per foot of shaft. The 489 level was making 60 gpm, the 640 level, 90 gpm and the shaft 180 gpm for a total of 330 gpm for the mine.

The shaft was bottomed at 862 feet and a 2-foot concrete plub was poured in the bottom in August 1960. Work on the third level station was about complete in Sept. 1960, the second level was started in Jan. 1961 and retreat mining was under way on the top level. At this time drilling was started on the mesa north of the mine, an area that is now known as the NE Church Rock. Drifting on the middle or 640 level was getting into soft difficult ground and low grade ore.

On May 15, 1961, Phillips sold their equity to Quinta Corp. and Centennial took over as operator or "fee agent". Development of the middle level was pushed in July and Aug., then Sabre-Pinon took over the mine on Aug. 23, 1961. The top, or 489-level, was mined out in Nov. 1961 and all work was concentrated on the 640-foot level.

In Dec. 1961, drifting was still in progress on the 640 level but the ground was heavy and the ore spotty and low grade. Phillips had a contract to buy the ore, and paid Circular 5 prices.

The mine was making about 1000 gpm.

The mine closed May 10, 1962.

In July 1963 United Nuclear acquired the Quinta interest in the Church Rock Mine through an exchange of stock.

Wildcat drilling found "good ore" in NE Church Rock near the NE corner of T16N,R16W. The pumps in the Church Rock shaft were shut down on Sep 18, 1963 and the mine allowed to flood. In Aug. 1964 the headframe and hoist were sold and shipped to Bayard, New Mexico. The water in the shaft stood at 150 feet below the collar.

Total production from the mine has been 77,965 tons averaging .19% U_3O_8.

NE CHURCH ROCK, UNC Sec. 35, 17-16

During the 1950s Phillips Pet. Corp. acquired a large tract of land in the Church Rock district and developed the Church Rock mine on Sec. 17, 16-16. The property later came under the control of the Quinta Corp. and was later taken over by United Nuclear Corp. on Aug. 23, 1961 known at that time as Sabre-Pinon Corp.

Some ore was reported discovered in the NE part of T16N,R16W in July 1962. Drilling continued in this area at various intervals, extending the orebody and on Sept. 26, 1967 the decision was made to start a shaft on the south half of Sec. 35, 17-16 about 300 feet south of the Navajo Reservation fence.

In Nov. 1967 shaft sinking was stopped at 100 feet to erect the headframe and install the sinking hoist. The first water in the shaft was reported in March1968 at 450-foot depth, a flow of 2 gpm. The shaft was 1279 feet deep in Aug. 1968 and a pump station was started at 1233 feet depth. In Oct. 1968 the shaft was 1325 feet deep with a water flow of 25 gpm and in Dec. it was 1516 feet deep with 500 gpm. At this time UNC was drilling a Dakota orebody about .6 miles NE of the old Church Rock shaft. The NE Church Rock shaft was reported to be 7092.45 feet above sea level.

In Jan. 1969 the shaft was 1570 feet deep and a station was being cut at the 1536-foot level. Water volume was 960 gpm. In March 1969 a drill was set up south west of the shaft to drill a vent hole. After cutting the 1536 station sinking of the shaft was resumed on May 12, and 400 tons of .20% ore was removed from the 1536 level drift where the ore had extended down to the drift level along a fault. The shaft was bottomed at 1793

feet depth on July 13. Water flow was 2000 gpm.

In Sept. 1969 the vent hole was 1500 feet deep when the bottom of the hole lost water into the mine. The drill was operating in a flooded hole and the cuttings were discharged through the drill pipe with an air lift The bit was 84 inches in diameter. When the pressure on the bottom of th bit was relieved the hydrostatic head on the top of the bit was so great the bit was forced to the bottom of the hole with such force it was not possible to turn or raise the bit. The drill stem was cut off near the bit with a sand blast and the hole was then cased down to a point near th bit. A drift from the 1500 level was driven to the hole bottom and the bit was taken out through the mine in Dec. 1969.

Mac No. 1 Mine Sec. 12, 15-14

United Nuclear-Homestake Partners obtained a lease on an Indian Allotment in the SE/4 of Sec. 12, 15-14 in 1958 to run for ten years. Unless production was obtained during the ten year lease term the lease could not be renewed. To comply with the production requirements a shaft was started in Dec. 1967. In March 1968 the shaft was 260 feet deep and 10 gpm was coming into the shaft. The shaft was stopped at 400 feet to get out some ore before the May 21 deadline stipulated in the lease. In May 1968 sinking was resumed and a station was started at the 430-foot level. In June 1968 the shaft was bottomed at 515 foot depth and a second level was started at 485 feet. The lower level was designed to be the below-ore haulageway but it was in the Brushy Basin shale and the small quantity of water at the Brushy Basin-Poison Canyon contact caused the below-ore haulageway to become so boggy it was impossible to make timber hold or maintain a roadbed. By Aug. 1968 the futility of the bottom level was realized and all equipment was moved to the sandstone ore horizon and the bottom level was abandoned.

First production was 418 tons in May 1968 but production did not exceed 1000 tons per month until April 1969. The ore intervals in the Poison Canyon sandstone are quite highgrade but dilution in mining brings the grade down to .20% to .25% grade.

As of 1-1-70 the mine had produced 25,000 tons of .22% ore.

BLACK JACK No. 2, Section 18, 15-13

The property consists of four Indian Allotments of 160 acres each that occupy all of Sec. 18. The property was leased to Black Jack Corp. and later assigned to the Lance Corp.

Ore was discovered by drilling on March or April 1959. There was reported to be several feet of ore in some holes of 1% grade or more. There was 79,000 feet of hole drilled in 227 holes during the initial drilling project.

A 1½ compartment shaft was started in May 1959 that was sunk to 330 feet and a station was cut at 280 feet.

The shaft was complete and drifting on the ore was started in Feb. 1960. The Lance Corp. was taken over by United Nuclear on March 29, 1962. By May 1962 the north drift from the shaft was out 2600 feet and into the most northerly orebody. Retreat from the north end of the mine was started in Dec. 1962 and by the following March retreat operations were half way back to the shaft. In July 1963 the stopes south of the shaft were unwatered and pillar extraction started. In this area sectional roof bolts up to 28 feet long were used to reach solid rock to make secure anchorage. The last of the ore was mined in Sept. 1964 and the shaft filled. One drill hole was left open to supply water for the Indians.

To 1-1-70 mill liquidations from the Black Jack 2 have been 246,000 tons averaging .23% grade.

MAC No. 2 MINE Sec. 18, 15-13

The Mac No. 2 mine is an Indian Allotment in Sec 18 and the shaft was sunk near the Sec. 17 line so some ore in Sec. 17 could be mined from the same shaft. The mine had to be in production by May 1968 or the lease would be forfeited.

A shaft was started on Feb. 14, 1968. It was a timbered shaft with one and one half compartments to accomodate a small skip and a ladder and pipe compartment. In March 1968 the shaft was 196 feet deep and making 2 gpm. One section of the shaft had to be concreted because the ground was too poorly consolidated to hold timber. In April shaft sinking was stopped at 278 feet to produce some ore to satisfy the terms of the lease. The shaft was completed to 288 feet depth in May 1968.

The Mac No. 2 ore is in the Poison Canyon sandstone and for the most part the formation was dry and ground problems and dilution could be held to a minimum. By Oct. 1968 all of the deposit had been developed and pillar extraction had started. In the latter part of Nov. 1969 the mine was worked out and closed. The shaft was covered over and all the surface plant was moved away.

The operator reported production of 39,200 tons of .14% ore of which 4660 tons of .14% came from Sec. 17.

BLACK JACK No. 1 Section 12, 15-13

The property is four Indian Allotments of 160 acres each that occupy all of Sec. 12. The property was leased to Black Jack Corp. and the lease then assigned to Lance Corp. The deposit was discovered by 141,530 feet of drilling in 185 holes. The ore is 680 feet deep and averages 9.3 feet thickness and is in dry ground.

A three compartment shaft was collared in Feb. 1959 and concreted the first 50 feet. Regular sinking operations were started on April 9, 1959. Four drill rigs continued to block out the orebody. In Aug. 1959 the shaft was bottomed at 802 feet in dry ground and a station and level was started at 712-foot depth. First ore was produced in Sept. 1959.

On May 21, 1960 a fire, caused by a light bulb in the first aid box, burned 3 sets below and 10 sets above the station. The fire burned from 11 AM to 7 PM and was smothered by cutting off the air.

The main orebody extends east and west but at the east end a trend to the south extended about 1000 feet. Development of the south trend started in Sept. 1960. Calcium chloride, that cost 3½¢ per pound was used in the drifts to settle the dust and stabilize the roadways for the rubber-tired equipment that was used for underground transportation.

In March 1962 retreat mining started at the west and east ends of the east-west trend but mine development still continued in the south trend at the east end of the mine.

Sabre-Pinon had absorbed Lance Corp. and Sabre-Pinon was merged with Unitc Nuclear by a vote of the stockholders on March 29, 1962 and the new compar assumed the name, United Nuclear.

In June 1962 a vent hole in the south part of the mine was contracted for per foot. A 4-inch hole was reamed to 13 inches by upreaming. In Dec. 1962 all known ore had been developed and retreat had started but longholing continued to find more ore and by Sept. 1963 half of the production was from development. New ore had been found above the workings in the south trend and in Oct. new ore had been found just east of the workings by surface holes. In Nov. 1964 the operator estimated there was 500,000 tons left to mine after 1,006,000 tons had been produced. This was the same reserve tonnage that had been estimated before the shaft was started.

By May 1965 all stope development had been done and all production was fro pillar extraction. In early 1967 some low-grade ore was discovered south of the shaft and by March this ore had been developed and retreat had started. In Sept. the last ore was mined and the mine shut down. Some ore pillars were left near the shaft to protect it for future use.

As of 1-1-70 1,399,842 tons of .23% ore had been milled and 41,300 tons of .14% ore was still in a stockpile at the mill making a total production of 1,441,142 tons of .224% ore containing 6,448,000 pounds of U_3O_8.

MOE No. 5, Section 32,33, 15-11

The deposit lies partly in Sec. 32 and partly in Sec. 33. Drilling started in early 1957 but it was Nov. 1959 before E.P. Moe obtained a mining contract from Kermac Nuclear Fuels,as Kerr-McGee Corp. was then known, and an incline started. The incline was completed to a slope depth of 810 feet in June 1960. It cut a vertical section of 52 feet of Mancos shal and 81 feet of Dakota sandstone before reaching the Brushy Basin shale. The ore was in the Poison Canyon sandstone a short distance below the top of the Brushy Basin shale.

The hoist and hoist house burned on May 13, 1960 when the incline was 500 feet deep and burned again in Feb. 1961 after the mine was in production.

The deposit was dry but the ore was overlain by a layer of soft shale that had to be timbered solid to keep it from sloughing. A large front-end loader was used that required a drift about 10 feet wide in which to operate so the overlying shale was exposed over greater widths than could be supported by timber. Parts of some pillars were lost during retreat mining.

By March 1962 most of the ore from the thick part of the deposit had been mined and work was started on some thinner ore east of the bottom of the incline with picks and shovels and wheelbarrows. This was probably the most profitable part of the project for operating costs went down and the grade of the ore increased and production was more uniform. The last of the developed ore was mined in May 1963 and all equipment removed in June. and the portal of the incline was covered over.

Kermac dropped their leases on the property which were later picked up by E.P. Moe, the former operator. In May 1964 Moe was drilling in the area surrounding the incline. The incline was reopened in the summer of 1964 and production was resumed in Sept. A new drift was driven from the bottom of the incline, skirting the old workings on the west, to get to some ore southwest of the old stopes. Moe's lease and marketing arrangements allowed him to market lower grade ore than under his previous arrangements.

In May 1965 the new drift was in ore southwest of the old workings and a limited amount of ore was mined. In April of 1966 a Mr. Goode of Shiprock New Mex. started operations at the mine but in June Moe was again operating the property. After several periods of mine development, production was resumed in June 1967. In Aug. 1968 a new vent hole was drilled in the new part of the mine to reduce radon and in March the operator started to convert the vent hole to a hoisting shaft. In June the conversion to a shaft was complete and the old incline was used only for ventilation.

During the latter part of 1969 Devilliers Nuclear purchased control of the property from Moe and produced some ore.

The records show a total production to 1-1-70 of 33,089 tons of .22% ore.

SILVER BIT Section 10, 14-12

Some ore was shipped in Oct. 1955 from rim stripping along the sandstone outcrop by a party named G.W. Fields. In the summer of 1957 United Western had control of the property and were exploring for ore pods. The last activity reported was in Oct. 1957.

Total production was 268 tons of .59% ore.

Alta Group Section 5,6, 14-11

The property consists of four unpatented claims lying in Sec. 5 and 6. All of the production came from the part of Alta No. 1 claim that lies in Sec. 5.

Henry E. Andrews located the claims and leased them to Anaconda Co. who contracted the operation to Farris Bros. and Merle Burns. The initial operation was carried on with 3 or 4 miners and a mule for tramming and extended from April 1954 to Aug. 1956 when production stopped for lack of ore. The mine was reopened in Dec. 1956 to mine some ore discovered by drilling but was again closed after a small tonnage was mined.

In May 1961 Lloyd Sutton reopened the mine to develop some ore found by drilling and shipped about 1400 tons and shut down again in Oct. 1961.

Jesse Fay and Henry Andrews reopened the mine in Sept. 1964 to drive an adit to some ore holes drilled several years before. This operation resulted in the production of 38 tons of .24% ore.

FRANCIS GROUP Section 8, 14-11

Henry E. Andrews is the royalty holder on all the claims, Francis 1-35 that cover the entire Sec. 8 . Andrews located only the Francis 1-14 and Anaconda Co., the lessee, located claims Francis 15-35. Production from the mine was 755 tons of .14% ore that was mined late in 1954 and early 1955.

EVELYN MINE Section 9, 14-11

The Evelyn Mine consists of one section of patented land. The land was granted to Santa Fe Railroad and later passed through several hands and is presently owned by W.C. Andrews. The mineral rights were leased to Anaconda Co.

Development started in the summer of 1954 and production was under way in early 1955. The mining was done by Strong and Harris of Silver City, N.M. An adit into the mesa cut ore that had been discovered in a drill hole. The operation continued with some interruptions until Nov. 1956 when it was closed for lack of ore.

Sometime during 1966 or 1967 Farris Bros. obtained a lease on the Evelyn and other properties controlled by Andrews. There was some production starting in Dec. 1966 and continuing at intervals until Aug. 1968.

On Sept. 21, 1968 all of the Farris mine holdings except the Vallejo Mine were sold to Smith Development Co. which included 9500 acres in 25 tracts.

Early in 1969 Smith Dev. Co., also known as Petrodyne or Petrodynamics started drilling the Evelyn and outlined a small orebody. Later in 1969 two men started mining ore but were soon closed down for lack of sufficient ventilation.

Total production to 1-1-70 is reported to be 9034 tons of .24% ore.

SILVER SPUR Section 31, 14-10

Section 31 was granted to the Santa Fe Railroad and then sold to W.A. Berryhill in 1946. The section was then leased to Duane Berryhill and L. Elkins in 1952. The grant from the U.S. Government was vague on whether the grant included the mineral rights but it was later determined that the mineral rights, except coal, oil and gas were a part of the grant.

Exploration drilling started in late 1953 and several small ore pods were found. In Jan. 1955, 45 holes had been reported drilled with three of them in ore. In April 1955 Holly Uranium Co. did some rim stripping with more drilling planned. After a few shipments of ore and more drilling the property was turned back to the owners. In Dec. 1956 Farris Bros took a lease and started a new adit from the rim and found a limited tonnage of good ore. Production continued from Sept. 1958 until May 1959 when the mine was closed.

Total production was 5930 tons of .25% ore.

BLACK ROCK, PAT OR DAKOTA Section 4, 13-10

The mine is on the Martinez Indian Allotment that covers the NE/4 Sec. 4, 13-10 and was leased to the Dakota Mining Co.

Dunn Bros were exploring the property in Oct. 1955 and some drilling was done from time to time. Farris Bros shipped some ore in Nov. 1956.

Black Rock Mining Co. took a lease in March 1959 and drifted 600 feet to some ore holes drilled several years before. The ore proved to be high radiometrically and low in U_3O_8 content. Black Rock closed the mine in Sept. 1959.

Farris Bros leased the property in June 1962 and operated through the 550-foot incline adit driven by Black Rock. Farris Bros. continued operating until Dec. 1962 when they shut down for the winter. Before spring the uranium mills had ruled that they would not accept ore below .20% grade and as a result there was no market for the low-grade Dakota ore.

Total production was 5015 tons of .13% ore.

BLUE PEAK ADITS N/2 Section 24, 13-10

This property consists of the unpatented claims named Garcia 1-5, Red Top 1-10 and Blue Peak 1-7.

Blue Peak Mining Co. began operations in 1951. In 1952 the property was leased to Shattuck-Denn Mining Co.. Some surface drilling was done from a bench above the ore strata. By Aug. 1953 ore had been produced from seven adits driven in from the rim and about 7000 feet of the rim had been stripped. The production grade was low, .10% to .12% and most of the better grade ore was near the outcrop.

In Jan. 1955 Brown and Wallace of Aztec, N.M. shipped 55 tons of .06 material to the mill. In April 1955 St Micheals College of Santa Fe, N.M. bought the property and drilled 11 holes, 4 of which showed mineral. By July 1955 they had drilled 100 holes none of which were ore grade. In Dec. 1955 Colohoma Mining Co. started work in one of the adits but there was very little ore in sight to work on and by June 1956 the work was discontinued.

In Dec. 1956 White, Green and Addison Assoc., Inc. of Denver established a trailer camp near the mine and started to develop the mine. There is little record of their work, but in Sept. 1957 the Three Jacks Mining Co. took over and shipped a little ore from the higher grade pockets in the mine. The Three Jacks Mining Co. abandoned the property in Feb. 1958 and Farris Bros. started work in March 1959 and shipped 430 tons of .18% ore to Kermac. After several shipments of .15% to .18% ore the Farris Bros. relinquished the property and Lloyd Sutton Jr. took over in Oct. 1960 and shipped 633 tons of .21% ore to the Kermac mill. This material came from

rim stripping. In Oct. 1963 Lee Garcia, part owner, repaired the road to the mine and started production from the old adits. Garcia did some drilling in the mine yard but none of this work was productive and the project was abandoned late in 1963.

A total of 11,960 tons averaging .18% U_3O_8 was produced.

ISABELLA Section 6,7, 13-9

Section 7 is leased from the Santa Fe Railroad and the E/2 of Sec.6 is leased from the Navajo Tribe. Food Machinery Co. leased Sec. 7 and obtained a DMEA loan to drill 4300 feet in 22 holes. The drilling did not discover ore. Later a private drilling project of 66,000 feet in 203 holes discovered 35,000 tons of ore. The ore was 270 feet deep and averaged 7 feet thick.

Boyles Bros. took a contract to sink a 1½ compartment shaft 285 feet deep and started sinking in April 1959. The shaft collar was concreted to a dep of 28 feet with 60 yards of concrete. The shaft was completed to 285 feet on June 16, 1959.
Control of Sec. 7 passed to Phillips Pet. Co. who also obtained a lease on the E/2 of Sec. 6. Phillips operated the mine until April 5, 1961 when the work was contracted to K.S.N. Mining Co.

Phillips paid Buck Wilcoxson per month to haul ore across his land but K.S.N. refused to pay the fee and had to haul their ore another more lengthy route to the mill. K.S.N. closed the mine June 16, 1962 after all ore except a small block near the shaft had been mined. In Oct. 1962 K.S.N. did some drilling west and south of the shaft and hit some .15% ore. The headframe was sold and removed from the property in July 1964.

The mine produced 76,700 tons of .15% ore.

SPENCER MINE Section 8, 13-9

Some drilling was started in April 1954. By Sept. 1954 several well-mineralized holes had been drilled but no ore reserves had been calculated.

The ore was known to be low-grade but the deposi was not excessively deep, 250 feet, and the ground was dry. Most of Sec. 8 was drilled with widely spaced holes but the latest drilling was closely spaced to outline the orebody.

Colomar Corp. started the drilling and then sold out to United Western who contracted the mining to Centennial Development Corp.

A road to the shaft was started in June 1958 and sinking commenced in July 1958. The shaft was 4'X 9' inside with a 4'X4' pipe and manway compartment and a 4'X 5' skip compartment. The shaft was bottomed at 274 feet in Oct. 1959 with a station at 261 foot depth.

The first ore was shipped in Nov. 1959. Centennial had completed mining and removed their equipment in Aug. 1959.

In Oct. 1959 Spencer and Marshall took a lease on the property and mined some ore from the edges of old stopes. The shipped about 700 tons of .20% ore. Cosper and Hyde, the owners, reopened the mine in Feb. 1961 and shipped 150 tons of .15% ore. During June 1963 Homestake-Sapin did some lon hole drilling in the mine but quit without doing any development work. In Sept. 1964 W.D. Tripp of Cortez, Colo. obtained a lease and produced some ore.

Total production to 1-1-70 has been 47,800 tons averaging .17% U_3O_8.

GOSSETT MINE Section 16, 13-9

Up to April 1959 a small tonnage of medium grade ore had been discovered by drilling and about mid-April E.P. Moe started and incline to develop the orebody. The first ore was marketed in Oct. 1958 and mining continued through Feb. 1959. The mine was closed for three months and reopened in June 1959 and was closed again in Aug. when a large stoping area caved. K.S.N. gained control in Oct. 1959 and started replacing equipment. Shipments were made during the first five months of 1960 and the mine was again closed. K.S.N. started reopening the mine in July 1960 after finding a mistake in the drill hole locations. About 1700 feet of drilling was done from the surface to check some old drill holes but the results were unfavorable and the property was abandoned.

Farris Bros. obtained a lease and started moving in equipment in Sept. 1962 Some production started in Dec. and the first shipment was made in Jan. 1963. The closure of the Phillips mill eliminated the market for ores assaying less than .20%. The Farris Bros. opened the mine again in Dec. 1965 after a surface drilling program and were again producing low-grade ore for sale under an AEC allocation program.

In 1966 there was 6419 tons of .14% ore marketed and in 1967, 6008 tons of .11% ore. The last production was in Nov. of 1967.

The total all time production from the Gossett was 30,987 tons of .15% ore.

POISON CANYON MINE Section 19,13-9

A small orebody was found on Sec. 19 in Aug. 1954 and an open pit was started on the shallower ore. Surface drilling continued and by the summer of 1955 enough ore had been discovered to keep the mine going at a rate of about 150 tons per day. Underground mining started in the fall of 1955 but production from open pits continued until the summer of 1959. Haystack Mt. Dev. Co. (subsidiary of Santa Fe R.R.) had operated the mine up to this point but ceased operations in Nov.1959. Farris Bros. started operat- tions in Feb. 1960 to mine underground. Mining extended 3000 feet north to the section line and retreat operations were started in Jan. 1961. Operations were nearing the end in Aug. 1962 and to fill their mill circuit the Phillips mill purchased a considerable tonnage of .09% material that had been set aside for protore. Farris Bros. had stopped production and was removing equipment in Sept. 1962.

Since closing the mine Farris Bros. have made at least two attempts to locate more ore by surface drilling but both attempts have been unsucessful.

Total production from the mine has been 217,066 tons averaging .23% U_3O_8. This includes 6178 tons of protore averaging .09%.

BEACON HILL MINE Section 20, 13-9

Drilling discovered ore in 1954 and in Nov. 1955 a -45 degree incline was started. The incline was sunk to a length of 240 feet and a station established at 200 feet. Production started in Feb. 1956 which was in high-grade ore but many of the surface holes that indicated ore were found to be waste when explored underground. The mine was shut down in Dec. 1956.

Farris Bros. obtained a lease and an AEC allocation on the property in 1965. A surface drilling program found several good grade intercepts and they started reopening the mine in Feb. 1966. The first ore was marketed in Sept. 1966 and production continued until July 1967 when the mine was shut down.

Total production has been 8367 tons of .45% ore.

DAVENPORT INCLINE Sec. 20, 13-9

E.P. Moe leased two claims from A.W. Hyde and started a -16 degree incline. The incline was completed to a length of 430 feet in Dec. 1956 and first production came in Jan. 1957. Small scale production continued intermittently for several months and was finally closed in Oct. 1959 for lack of ore.

Total production was 7517 tons of .19% ore.

MESA TOP MINE Section 20, 13-9

The property consists of 16 unpatented claims located by A.W. Hyde and leased to Lea Exploration Co. In July 1954 drilling had indicated 45,000 tons of .25% ore and the first vertical shaft in the district was started. In Sept. the shaft reached the ore horizon at 170 feet and production was started. Holly Uranium Co. purchased the operation in Jan. 1955 and increased production from 40 tons per day to 60 tons per day and then to 75 tons per day. By Dec. 1956 production began to decline for lack of ore but in Jan. 1957 a new orebody was discovered and production was increased.

The Mesa Top shaft was closed in Nov. 1959 and production was hoisted through the nearby Malpais shaft. Retreat mining started in Feb. 1961 and production was stopped in May 1961. See Tee Mining Co. was the last operator and after the mine closed down they drilled 25 holes near the old workings but only two of them hit mineralization.

Total production from the Mesa Top was 108,261 tons of .24% ore.

MALPAIS SHAFT Sec. 20, 13-9

Underground arrangements at the Mesa Top shaft were never good and when operations had extended some distance to the east a raise was driven to the surface in April 1959 and called the Malpais shaft. Some of the early Malpais production was mined through the Dog incline and later in 1960 a contract was given to Four Corners Exploration Co. to mine a block of the Malpais ore through the Dog incline.

Total production credited to the Malpais and the East Malpais is 72,400 tons of .24% ore.

DOG AND FLEA MINES Section 20,13-9

Section 20 had been withdrawn from mineral entry but was reopened on Aug. 31, 1956 and the Dog Group was then located. There were several property conflicts that were settled in court and Four Corners Exploration was awarded the Dog 11-15 and half of Dog 7 and part of Dog 10. A.W. Hyde was awarded a 10% royalty and Arthur Bibo a 3% royalty as a result of the court action.

Exploration drilling costing proved a 20,000-ton orebody and an incline was started on May 16, 1957. The minus 30 degree, 300-foot incline was completed in Aug. 1957.

The first production was in Sept. 1957.

In Feb. 1962 the Flea incline was started about 2000 feet E-SE of the Dog incline to develop the southeasterly part of the property. The Flea incline was completed in April 1962 at a length of 380 feet on an incline of about -30 degrees. The Flea workings were holed to the Doris West Extension in Jan. 1963 for safety exit and ventilation and was also connected to the Dog workings in the spring of 1966.

In June 1966 a drift north from the Dog workings was started into the B-G claims to recover the ore in this property. The Flea mine was mined out and closed down in March 1969.

The total production of the Dog, Flea and B-G mines to 1-1-70 is 231,650 tons of .18% ore.

DORIS AND WEST EXTENSION Section 21, 13-9

The minerals in Section 21 are owned by the Santa Fe Railroad. The lease called for $1 per acre for the first year and a sliding scale royalty thereafter. The Marquez family, who own the surface rights, collected a 2% royalty on production.

Westvaco, a subsiiary of Food Machinery Co. obtained a lease and during July 1955 to Nov. 1955 drilled 200 holes for a total footage of 56,000 feet. The drilling outlined an orebody 100 feet deep and 5 feet thick. An incline was started in March 1958 to extend 200 feet to the orebody. Farris Bros. mined the first ore in Sept. 1958. In Nov. 1958 an incline was started on the West Extension ore body and the first production from here was in Feb. 1959. K.S.N. Mining Co. was organized to take over the operation from Westvaco. The Doris and West Extension were shut down on Nov. 24, 1959 and the property subleased to Fife and Bailey in April 1960. and production continued until Feb. 1961.

Total production from the Doris and West Extension was 31,950 tons of .18% ore.

HOGAN MINE Section 14, 13-9

The property consists of 18 unpatented claims covering the south 3,000 feet of Sec. 14. The ownership is as follows:

United Western	5/16
San Jacinto	5/48
Whitney	5/48
White Weld and Co.	5/48
4 Corners Explor.	3/8

An S. Paul Dooley received a royalty for an interest in the property.

The ore was discovered by 55,000 feet of drilling in 160 holes. Drilling started in Feb. 1957 and continued with interruptions until the summer of 1958. Homestake did some core drilling during Dec. 1957 but later relinquished their interest. Four Corners started a shaft on Oct. 8, 1958 with two 5' X 5' compartments using a "baby" Cryderman mucker. The shaft was complete and some ore was hoisted in Feb. 1959. Production varied from 3,000 to 5,000 tons per month.

In May 1961 the operation was cut to one shift per day and the final retreat to the shaft was begun. Production was reduced to 50 tons per day. The mine was closed in Jan. 1962 and the last ore was shipped in Feb. 1962.

Total production was 129,551 tons of .26% ore.

RIALTO, CHILL WILLS Section 24, 13-9

The property consists of a 160-acre homestead leased to Farris Bros. and subleased to Rialto Mining Co. Exploration drilling consisted of 30,000 feet in 60 holes.

A 5'X 9' shaft was started in April 1959 that was sunk to 88 feet when loose land made sinking so difficult that the location was abandoned and a new site selected about 275 feet SW of the original site. Blow sand and moisture at the top of the Mancos shale had caused the trouble. A shaft station was cut at 450 feet in Nov. 1959. First ore was shipped in Dec. 1959. The ore was very wet and the mill charged $1 extra for handling it. The mine was closed down in April to repair the shaft and try to develop a system to mine the ore more economically.

See Tee Mining Co. took over the mine in Aug. 1960 and changed the name of the mine to Chill Wills to honor a movie star by that name who had probably put money into the venture. See Tee did repair work and exploration in the mine and shipped about 1,800 tons of ore and shut down in Feb. 1961. In July 1961 Fife and Bailey took over the operation with Farris Bros. furnishing supplies and some cash. After several months of unprofitable work the mine was again shut down because it was impossible to coordinate the drill hole maps with the drill holes found in the mine. Farris Bros. planned to keep the mine unwatered and do some surface drilling to locate more ore but the shaft caved and the power to the pumps was cut off allowing the mine to flood. The surface plant was removed in Oct. 1963 and the shaft filled.

The mine produced 10,950 tons of .17% ore.

MARQUEZ MINE Section 23,24, 13-9

Section 23 is patented Railroad land and Sec. 24 is fee land belonging to Nabor Marquez and wife.

Calumet and Hecla Mining Co. obtained a lease on the property and started exploratory drilling in Sept, 1955. Drilling extended into Sec. 13 and the Roadside orebody was discovered. An attempt was made to discover enough ore for a mill proposal. In June 1957 the surface plant installion was started and a 15'X 10' incline was started on a -10 degree slope on Aug. 11, to extend 1780 feet to the ore horizon. The incline hit ore in Feb. 1958. The ore was in the Poison Canyon sandstone with Brushy Basin shale above and below.

The west orebody was thick and high-grade and before retreat was started the workings started to cave and some good ore was lost. The shale below the ore absorbed water and swelled into the workings crushing pillars and breaking timber. Some high-grade ore was lost as a result. The workings were extended into Sec. 24 and some ore was mined. Retreat from the north and east parts of the mine were started in Sept. 1962. By mid-1963 it became evident that there was more than enough ore in the mine to fill the property allocation. The allocation for Sec. 13 and 18 (Roadside orebody) were asked to be substituted and mined from the Marquez. The request was granted which extended the market and life of mine for several months. The last ore in the allocation was mined on March 6, 1964 and the mine closed. C and H claimed there was 50,000 tons of .20%ore left in the mine. United Nuclear obtained a lease on Sec. 23 and started to prepare for production in the fall of 1964. United Nuclear started rehabilitating the mine in Jan. 1965 and started production in Feb. In Aug. 1965 the operator esti-

mated two more months of operations but in Oct. they found two new ore leads near the bottom of the incline and had seven drifts in ore. In Jan. 1966 there was one man left on clean-up work and the mine shut down on March 3, 1966.

To discover and explore the Marquez orebody 250,000 feet of hole was drilled in 765 holes which indicated 300,000 tons of .25% ore. The ore was 250 feet deep and averaged 8.5 feet thick.

Production to 1-1-70 was 723,000 tons of .26% ore of which 10,120 tons of .17% ore came from Sec. 24.

SAN MATEO MINE Section 30, 13-8

The property consists of 80 claims but 35 of them cover all of the known mineralization. Rare Metals branch of El Paso Gas Co. controlled 81½% of the property and was also the operator.

The deposit was discovered and explored by 275,000 feet of drilling in 250 holes.

Drilling on the property started in the spring of 1957 and in Jan. 1958 a three compartment shaft was started. Centennial Dev. Co. was the contractor and used a Riddell shaft mucker. The shaft was dry past the 450-foot depth but there was 30 gpm at 700-foot depth in the lower Mancos shale. The Mancos shale caved into the shaft between 250 and 350-foot depths so this section was concreted. At 840 feet the Dakota sandstone was making 60-70 gpm with a total flow in the shaft of 130 gpm. In July 1958 the shaft was at 860 feet in the Dakota sandstone. The water flow was 400 gpm. Sinking was stopped and an attempt was made to seal off the flow. A 40-foot plug of concrete was poured in the bottom of the shaft and the surrounding ground was grouted through holes from the surface and other holes drilled from the shaft. By Sept. the flow was cut to 50 gpm and the concrete plug was removed and sinking resumed in Oct. A station was being cut at the 1043 level in Feb. 1959 and by June the station and slusher trenches were complete and drifting to the ore had started. In Aug. 1959 drifts were being driven NW and SE on the shaft orebody and the first ore was shipped to the Kermac mill on Sept. 21.

The ore is in the Poison Canyon sandstone with Brushy Basin shale above and below. The shale is impervious and dry but when water is allowed to

get into it, swelling results and the shale develops great pressure, in some cases enough to break timbers and completely fill a drift. One third of the crew was needed to keep the workings open after they were driven. A vent hole and excapeway was drilled about the time the shaft was being sunk and a second vent hole was completed in Dec. 1959. It was 1060 feet deep, cased to 33 inches. In Feb. 1960 the mine was making 670 gpm. On March 6 the shaft caved badly enough to halt all work until June 1960. The original level was at 1043-foot depth in Brushy Basin shale. About 630 cubic yards of concrete was poured in the shaft bottom and station to stabilize the ground and a new station was cut in the Poison Canyon sandstone 35 feet above the old station level. All future drifts were designed to stay in the Poison Canyon sandstone. Nearly all of the equipment in the mine was salvaged and repaired and put back in service

The plant for sand filling was being installed in Jan. 1961 and was put in operation in April. In the NW drift one crew was used to advance the drift and two crews were used to keep the drift open due to the swelling shale. In July 1961 a 20-inch vent hole was drilled into the "C" zone and cased.

In Sept. 1962 the Rare Metals Co. was dissolved and the operation became a part of the El Paso Gas Co. The company started to stockpile their ore in July 1963. United Nuclear was now the ore buyer and they paid 90 to 95% of the market value of the ore as it was put in the stockpile. As of Aug. 1, 1963 the mine had sold 1,050,000 pounds of U_3O_8 with 1,200,000

pounds of allocated market remaining. The NW "A" zone had been mined out by Jan. 1964 and more active development of the east "A" and "B" zones started. The east "B" zone contained much more ore than was expected. A drift across the trend indicated ore 300 feet wide and 10 to 20 feet thick.

It was reported in June 1964 that United Nuclear had purchased the San Mateo mine. United Nuclear cut the operation to one shift per day from three shifts and cut the crew to 43 men. Development was under way in an area north of the east end of the "A", or shaft, trend in Sept. 1964. Surface drilling had proved more ore in the area between the east end of the shaft trend and the orebody northeast of the shaft. In May 1965 a new incline was started in the east part of the mine to develop the ore that had recently been drilled NE of the shaft. The incline was run on -8 degrees and started 200 feet east of the shaft and was driven 1000 feet. By Jan. 1966 the incline had been finished and development had started to the north from the bottom of the new incline. The last of the El Paso Gas Co. stockpile was shipped in Dec. 1966.

In Nov. 1967 the orebody north of the incline was all developed and retreat had started. The east limit of the mine is determined by a series of NE trending faults. In July 1968 some holes east of the fault zone hit ore about 600 feet deeper than the ore in the east end of the mine. A new vent hole was drilled south of the shaft in the summer of 1969. Water inflow from the hole where it cut the Dakota was 100 gpm or more. When the casing was being grouted the casing collapsed for about 100 feet at the 700-foot depth as a result of pouring in too much grout without letting it set. The grout job consumed 200 cubic yards of cement. Mine production to 1-1-70 was 785,000 tons of .17% ore.

KERMAC SECTION 10, 14-10

Stella Dysart located 30 claims in the NW/4 and S/2 of Sec. 10, 14-10. There were 202 holes totaling 115,000 feet drilled of which 20% were cored The ore was 400 feet deep and 8 feet thick. Dunn Bros were the original lessees. Drilling by Mid-Continent and Dunn Bros started in the summer of 1955. By Aug. an orebody was blocked out.

Drilling continued until April 1956 when Kerr-McGee got contr of the property and decided to sink a shaft. Kerr-McGee was planning to pool their reserves with Anderson Dev. Co. and Pacific Uranium to make a proposal to the AEC for a mill.

In Nov. 1956 a three compartment shaft was started near the east edge of Sec. 10. A station was cut at 448 feet and the shaft was completed to 510 feet in April 1957. Underground development continued until Sept. before any ore was produced. In Oct., 2600 feet of drift had been driven and 1500 tons of .05% ore produced. In Dec. 1957 production was at a rate of 400 tons per day but it was apparent that the reserves were grossly exaggerated and the small tonnage of ore was in small blocks tilted in all directions. In Dec. 1957 a 36-inch ventilation hole was completed.

The Kerr-McGee, or Kermac, mill started feeding ore on Nov. 28, 1958 when the Sec. 10 mine was in the clean-up stages and the operators were predicting 125,000 tons total production.

Kermac closed the mine in March 1959 and planned to get lessees to take

over for the final clean-up. In Sept. 1959 Spahr and Allmon leased the mine to recover some remaining remnants of ore. The lessees drove an incline below the bottom level to mine some ore discovered by drilling and in 31 months of operation had shipped 24,265 tons of .23% ore. The mine was closed in March and the last ore was shipped in April 1962. In July 1963 it was reported that control of Sec. 10 had reverted to Stella Dysart. Homestake-Sapin gained control about June 1964 and shipped 2322 tons of protore stockpiles.

Total production was 130,767 tons of .20% ore.

American Metals Corp, had the first option to purchase the Sabre-Pinon properties including a proposed milling contract but declined because they did not feel there was time to meet the AEC deadline. Homestake-Sapin picked up the option.

Section 15 is Santa Fe Railroad land that was leased to R.D. Bokum II. The lease was later assigned to Sabre-Pinon Corp. A final assignment was later made to Homestake-Sapin Partners. Homestake Mining Co. loaned Sabre-Pinon to pay off a debt of that amount to American Metal Co. Sabre-Pinon put up the property for security and was to repay the debt at a rate of per ton of production. Homestake-Sapin agreed to expend on the development of the mines (Sec. 15,23,25) and make tests for a mill. Homestake-Sapin was also to supply the equipment for the mines and provide the working capital. Profits were to be divided 75% to Sabre-Pinon and 25% to Homestake Mining Co.

Sabre Uranium Co. started drilling on Sec. 15 about July 1955 and in 20 holes had 2 holes in mineralization and one hole with several feet of high grade ore. In Sept. there were 15 holes averaging 22 feet of .29% ore.

In Nov. 1956 Homestake-Sapin was check drilling Sec. 15 and in Jan. 1957 decided there was sufficient ore grade material to warrant development. A shaft location was staked on Sec. 15 in July 1957. Shaft sinking was started on Nov. 1, 1957. A station was cut at 536 feet and the shaft was completed on Feb. 10, 1958 at 622 feet depth. When finished the shaft was making 4 gpm but for the most part sinking was done in dry ground. A slusher pocket was cut 27 feet below the level and two

finger raises cut to the level above to transfer ore to the slusher trench

By Aug. 1959 there were 50 men employed at the mine producing 800 tons per day.

The ore near the Sec. 22 line was up to 70 feet thick and was mined by caving it into draw points. In March 1968 the stopes in this area caved to the surface. To recover more of the pounds in this part of the mine holes were drilled from the surface into the caved stopes and water introduced to act as a uranium solvent. A deep well pump was put in a hole at the lowest point in the mine to recover the uranium-rich water.

Early in 1969 a new orebody was discovered near the E/4 Sec. corner of Sec. 15 and in April a drift was started to develop it. In mid-1969 ore was discovered just south of the center of Sec. 15 and by Nov. 1969 it was considered to be good enough to develop.

To 1-1-70 1,161,000 tons of .15% ore had been milled and there was 1200 tons of .16% ore in stockpile at the mine.

KERMAC SECTION 22, 14-10

Section 22 was acquired by locating 112 claims. Four of the claims have been patented. The ore deposit was discovered by drilling 600 holes with a total footage of 450,000 feet.

The ore is 360 feet deep and 24 feet thick.

Drilling started in the summer of 1955. There was a dispute over property ownership and Kermac and United Western were drilling the same ground at the same time. The dispute was later settled leaving Kermac in control. Drilling still continued in Sept. 1956 and drill tests for mill water were started. On Nov. 18, a shaft site was staked on Sec. 22 and sinking started later in the month. A nine inch hole was drilled near the shaft site to help drain the ground. In July 1957 when the shaft was 470 feet deep at the bottom of the Dakota sandstone a labor dispute forced the shaft contractors to quit and another contractor was brought in to finish the job. A station was cut at 630 feet depth. The water inflow was 50 gpm. A warehouse for a proposed mill was being constructed about this time on Sec. 31, 14-9. Kermac and Phillips Pet. Co. agreed to finance a power line from Albuquerque to their mills in Nov. 1957.

The shaft was bottomed at 830 feet on Jan. 21, 1958 with a water flow of 110 gpm. Stations were started at 630, 680 and 730-foot depths. The lower part of the shaft was in Recapture shale and this part was concreted. The permenant hoist and skips were in place in June 1958 and rock was being hoisted but it was mostly development waste. Ore production in Feb. 1959 was 14,000 tons. The top, or 6450 level was dry and the 6400 level was drying out. The levels in this mine are designated by their elevation

above sea level. In April the hoisting rate was 1000 tons per day and 700 to 800 feet of drifts were being driven each week. By June the min was making 450 gpm and the workings had connected with Homestake's Sec. 15 mine.

Several methods were considered, or tried, to mine the thick "stacked" ore. The most sucessful method proved to be the scram drift with finger raises up to the orebody so the ore could be blasted with long holes and then drawn off through the finger raises and scram drift. This method did not allow for the support of the mined ground so sand filling from the surface had to be used. The sand tailing from the mill was deslimed and hauled to the mine and run underground into the stopes as a slurry. Before this practice was adopted two of the stoped area had caved to the surface producing holes up to 60 feet deep. To develop ore below the bottom level an incline in the SE part of the mine was started and completed in Dec. 1962. Drifts from the bottom of the incline developed a large area in the south part of the mine.

Sec. 22 produced its two millionth ton of ore in Sept. 1966, the first mine in the district to do so.

Centennial Dev. Co. started cutting a new station on the shaft at the 6300 level in June 1969. The workings from the bottom of the incline were later connected to the new station so rock could be trammed directly to the shaft without being hoisted up the incline.

Production to 1-1-70 was 2,969,000 tons of .19% ore.

MARY No. 1 NW/4 Section 11,14-10 (Dysart III)

Santa Fe Railroad owned the original land and mineral patent and later sold it to F. Sarracino who in turn sold 4/5 to Stella Dysart and 1/5 to Sam Dazzo. The property was leased to Entrada Corp. who made a contract with Boyles Bros. to develop and mine the deposit.

The deposit was discovered by drilling 230 holes for a total footage of 120,000 .

Drilling started in the fall of 1955 and a shaft was collared in Feb. 1959. The shaft was bottomed at 630 feet in June 1959 and stations cut at 460 and 560 feet depth. The first production was in July 1959.

Boyles Bros. closed the mine after mining 136,400 tons of .17% ore.

Entrada took over operations and resumed production in Nov. 1961 at a much lower production rate and a lower ore grade. Ralph T. Brengle loaned money to Entrada for a drilling program that was started south of the shaft to find enough ore to make the operation profitable. Drilling was stopped on May 6, 1962 after drilling 100 holes totaling 45,000 feet with very mediocre results. In Feb. 1963 Miss Dysart started a suit to break the Entrada lease charging unminerlike operations. In the last half of 1963 production was about 5,000 tons per month and the grade about .10% which was very likely a losing proposition. Entrada ceased operations on Dec. 20 and See Tee Min-

ing Co. (Dysart) bought the equipment and took over the mine. See Tee had a special market for low-grade ore at the Homestake-Sapin mill.

Homestake-Sapin took over the operation on June 12, 1964 and started setting up for 12,000 to 13,000 tons per month operation. They had asked to have the remaining allocated pounds substituted to the other Homestake mines but the AEC ruled that the profitability of the mine be demonstrated. Production for the first seven months of 1965 was 84,400 tons of .085% ore or about 12,000 tons per month. Figured on an incremental basis this volume and grade of ore was judged to be profitable and the substitution was granted. The mine was shut down Aug. 4, 1965.

Total production to 1-1-70 was 357,300 tons of .11% ore.

DYSART 1, SW/4 Section 11,14-10

Section 11 is owned by Santa Fe Railroad who leased it to Fidel Romero who in turn subleased to Dysart. Dysart leased to Mid-Continent Uranium Co. and they granted a mining contract to Dunn Bros. who would have 40% interest in the profits after royalty. Dunn Bros made a deal for Rio de Oro (Buffalo Kennedy & Assoc.) to mine the ore. Dunn Bros later sold their 40% interest to Rio de Oro.

A major uranium discovery was reported on Sec. 11 in May 1955 after Dunn Bros of Dallas and Mid-Continent Explor. Co. hit important ore bodies at 320 to 370-foot depth. The ore was found near the Brushy Basin-Westwater contact. Dunn Bros. started sinking a shaft near the center of the orebody in May and when the shaft was at 100 feet depth Dunn Bros. sold out to Rio de Oro. In Nov. 1955 a station was being cut at 350 foot depth and production was expected in Jan. In Dec. 1955 the shaft was bottomed at 396 feet, in dry ground, and four skip pockets were completed. A 5-ton mill test lot was shipped to Grand Junction, Colo. The permenant hoist and headframe were in place and in use by Feb. 1956. Two good ore holes were drilled one half mile east of the shaft that was thought to be the same orebody. Ore production was started on March 15. An air raise to the surfac was started in Oct. 1956 and completed in March 1957. Ray Schultze took over as superintendent in March and plans were made to increase production. In Sept. 1959 production was at a rate of 560 tons per day with 45 men on the payroll and 34 of that number were in the mine on a two shift per day basis. Production was 600 tons per day in Feb. 1958 with 64 men in the mine. A development heading was driven 900 feet east of the shaft. The ore was being stockpiled at the Homestake-New Mexico Partners mill.

In Jan 1959 Rio de Oro agreed to sell 100,000 tons of ore to the Phillips mill. The same number of pounds of U_3O_8 to be returned later to Homestake New Mexico Partners mill at 3500 to 9000 tons per month between July 1960 and March 1962. In May 1959 the hoisting rate was 1200 tons per day and the most production for one day of that month was 1400 tons. The record day was June 29, 1959 when 1600 tons of ore was hoisted. Much of the ore was in two strata. Both ore strata would be cut into pillars, then the upper pillars would be pulled first and then the lower pillars. The waste between them would be allowed to cave.

Total production was 891,922 tons of .21%.

Retreat mining started in Nov. 1959 with only a minor part of the deposit still to be developed. The surface had subsided two to three feet over some of the thicker stoped areas. The mine shut down in April 1961.

DYSART II, SE/4 Section 11, 14-10

The property is the SE/4 of Sec. 11 but consists of 381 tracts ranging in size from 1/8 acre to one acre. The owners of the lots receive a share of the 17½% royalty.

Mid-Continent had the original control but sold 70% to Rio de Oro and 30% to Phillips Pet. Co.

The deposit was discovered by 143,000 feet of drilling in 263 holes.

The ore was 480 feet deep and 6 feet thick, in dry ground. A 12-foot circular concrete shaft was collared in May 1959.

The shaft and station pockets were completed in Oct. 1959 and lateral development work started soon after. The shaft is 550 feet deep and the only level is at 490 feet.

The Atlas Corp. experimented with an upgrader. The feed was .09% and the concentrate .22% but the recovery was only 20% of the values. Rio de Oro requested a lease on the adjacent section 12 and drove a drift to the section line. When the lease was obtained Rio de Oro developed and mined an orebody about 1300 feet long in Sec. 12.

Mining was in the retreat phase in Dec. 1961 with about 3 to 5 months production left. The last ore was hoisted on April 11, 1962. The shaft was to be turned over to See Tee Mining Co. to mine the ore left in the

SW/4 of Sec. 12. Production from Sec. 12 by Rio de Oro started in Oct. 1960 and after mining 111,000 tons of .16% ore they closed the Sec. 12 workings at the end of 1961.

Total production from the SE/4 of Sec. 11 was 237,600 tons of .19% ore.

DYSART SECTION 12, 14-10

Sec. 12 was controlled by Stella Dysart. Columex Co. started drilling in July 1955 and hit some mineralization. Anderson Bros. were drilling on Sec. 12 in Jan 1956 and by May had outlined an orebody and leased it to Rio de Oro to be mined through Dysart II shaft on Sec. 11. After Dysart I closed See Tee took over the shaft and proceeded to mine the rest of the ore in the rest of the SW/4 of Sec. 12. Production started on Aug. 13, 1962 and continued until May 24, 1963.

The ore strata dipped slightly to the east and the ore was expected to dip below the water table about 2500 feet east of the west section line. The ore was low grade, 14% to .16%, but the workings stood well and the ore was quite uniform so mining costs could be kept down. The water table was reached in Feb. 1963 and retreat mining started in March. The last of the equipment was hoisted on June 17, 1963.

See Tee mined 63,132 tons of .126% ore from Sec. 12 bringing the total production for Sec. 12 to 174,100 tons of .15% ore.

BUCKEY MINE Section 14,14-10

The property covers the entire Sec. 14, obtained by locating Jeep Nos. 1-36 claims staked by Buck Wilcoxson, 50% and D.J. Elkins and Norman Rombo 50%. The claims were leased to Holly Uranium

A 5' X 10' shaft was sunk 380 feet in dry ground, A station was cut at 345 feet depth. The deposit was discovered with 68,000 feet of drilling.

The ore was 90 feet above ground water level.

Holly Uranium Corp. started drilling in the summer of 1955 but in July 1956 drilling was stopped while a market for the ore was investigated. The first plan for a shaft was to drill a 36-inch hole and then raise a two compartment shaft to the surface but later it was decided to sink the shaft in the conventional way. The shaft was started in Dec. 1956 but in Jan the shaft contractor quit and Holly took over the job and finished it. The shaft and skip pockets were completed in April and drifts were started to the orebody and some ore was produced in the latter part of April. The mine operated continuously until Jan. 1960 when the operation was taken over by See Tee Mining Co. See Tee was purchased from Central Transformer Co. by Stella Dysart and Rodney Devilliers.

In Aug. 1960 a crosscut was driven to the south orebody and drilling located an orebody in the SW part of the Section near the Section 15 Mine Stopes and a drift was started to develop it. The SW orebody was found in Dec. 1962 about 3500 feet west of the shaft. In March 1963 the Buckey workings were within 800 feet of the Section 15 stopes and in good ore.

The Buckey workings holed into Homestake's Sec. 15 stopes in July 1963. The extreme west end of the mine had been mined out and abandoned by Dec. 1963 and some ore north of the west drift near the center of the section was being mined. Drilling had proved some ore north of the shaft and a drift was started to develop it in Oct. 1964. Some exploration work was done in the orebody by drifting but it was found to be too low-grade to pay on a Circular 5 market so the mine was abandoned in April 1965 after producing 161,600 tons of .24% ore.

HOMESTAKE SAPIN Section 23, 14-10

Sec. 23, owned by Santa Fe Railroad, was leased to R.D. BokumII who later transferred his interest to Pinon Uranium Co. The orebody was discovered and partially outlined by 155,250 feet of drill hole in 230 holes. Drillir started in July 1955 and continued until May 1956.

Sabre Uranium and Pinon Uranium companies merged in the early part of 1956 and planned to take American Metal Co. in as a partner to mine and mill the ore. After testing for mill water and testing the orebody with drill holes, American Metal Co. dropped their option as they did not feel they could meet the deadline for getting a mill into operation. Homestake Mining Co. was brought in as a partner and a shaft was started in April 1957. The headframe was being erected and the hoist being assembled in 1957. A central power plant with lines to Sec. 15 and Sec. 25 was installed in Oct. The shaft was 47 feet deep in Nov. and a Cryderman mucker was installed, the first in the district.

The shaft was sunk with a Homestake crew

At 570 feet the shaft was in Brushy Basin shale. The shale was hard to handle because of a 1gpm flow of water. In April 1958 the shaft was at 710 feet and a station was being cut at 650 feet. The water flow was 130 gpm. In Sept. sinking was stopped to install larger pumps. The water flow then was 500 gpm. The first ore production came in Jan. 1959 and drifts were being driven to drain the orebodies. In June 1959 a "Whup-de-Whup" slusher train was tried in development drifts but it did not work well in the crooked drifts. Water flow reached a peak of 1250 gpm in June. In Jan. 1960 a 10'X 6' air raise to the surface was completed. The mine was

shut down in April to repair the shaft. The sets had squeezed and had fallen out down to the 470-foot bearer. The first 200 feet of the shaft was bolted with wire mesh and the sets reblocked in place and the wire mesh cemented with gunite.

In a thick section of ore just west of the shaft the top part of the ore body was mined and the back bolted with wire and the rest of the ore to the bottom, about 70 feet, was blasted and removed. A 13-inch hole was drilled from the surface to the top of the stope and surface sand was scraped in to fill the stope. Adjoining the filled stope on the west a timbered top slice stope was started to recover the rest of the thick ore at this point. The stope was designed to cave from the top and timber mat was used to keep the waste from the back from diluting the ore under the mat. By Oct. 1961 the main ore trend had been developed the length of the section from east to west.

In Feb. 1963 the 726, or bottom level drift was started to run from the shaft in a SSE direction and then to turn east to go to the section line to develop ore along a trend south of the main trend.

As of 1-1-70 the mine had produced 2,272,700 tons of .20% ore.

KERMAC SECTION 24,26, 14-10

Section 24 was located by Bert and Jean Roundy with 36 claims. Section 26 was located by other parties with 116 claims. The Sec. 24 claims were leased to Devon Const. Co. and subleased to Pacific Uranium Co. and then were assigned by Pacific to Kermac. Sec. 26 was acquired by Kermac in a separate transaction but the royalty from both sections was pooled and divided in a fixed ratio to the owners of each section to make it unnecessary to keep the ores from the two sections separate. The ore in Sec. 24 was discovered by 225,000 feet of drilling in 300 holes.

The ore was 630 feet deep and averaged 11 feet thick. An 848-foot shaft cost with the stations and pockets. At the end of 1955 a large orebody of unknown grade and tonnage had been located by drilling. In Aug. 1955 Ranchers Exploration Co. had drilled some holes and found ore. Pacific Uranium had several drills operating at the end of 1955. Phillips was also drilling the section in May 1956.

Kermac started a shaft in the SW/4 of Sec. 24 in Nov. 1957 and completed it in Sept. 1958. The shaft extended 40 feet into the Recapture formation and the main or bottom level was cut at 750 feet to develop the ore in Sec. 26. A level 55 feet above was established to drive drifts north into the Sec. 24 orebodies. When the shaft was completed there was a water flow of 300 gpm. In Sept. 1960 production was 1000 tons per day and water flow was 1200 gpm. Some of the ore NW of the shaft, up to 80 feet thick, was mined by blasting the ore with long holes into slots where slushers were used to drag the ore to the chute. In Nov. 1960 a 92" vent hole was drilled north of the shaft and the hole lined with a 72" casing. A plus 30 degree incline was driven in the north part of Sec. 24 to develop ore on the south flank of Ambrosia Dome. The ore was dropped through an ore pass to

the main level.

The drifts into Sec. 26 are about 50 feet below the orebodies and long-holing was used to explore their boundaries and drain them. The results showed low-grade ore but raises up to the ore was started in April 1962 and production started in Sept. In Feb. 1963 all work was cut off in Sec. 26 and Sec. 24 was cut to one shift per day. The mine crew was cut from 175 to 50 men. The curtailment was necessary to bring production in line with the 1970 stretch-out proposal. In Oct. 1963 a drift SE from the top of the incline was started in the north part of Sec. 24 to develop some Poison Canyon ore in the central part of the Section. Numerous narrow trends of ore were developed on the level at the top of the incline. Most of the Sec. 24 production came from the thick ore in the west part of the mine. In Aug. 1964 automatic controls were being installed on the hoist so the skips and cages could be operated from the cage or from the station in the mine.

In Sept. 1965 drilling had discovered ore in the NW part of the mine which could be developed from the top of the incline in Sec. 24. About this time the ore cutoff grade was lowered to .15% to .12% to provide more pounds for an expanded market provided by the sales to private industry for nuclear reactors. In the latter part of 1965 some of the protore piles at the mine were moved to a point near the mill and put in a pile to leach with solutions from the mill. The results were not profitable and the experiment was terminated. Mine water is pumped into the caved stopes to pick up uranium values that would otherwise be lost.

Production to 1-1-70 was 2,073,000 tons of .18% ore.

HOMESTAKE-SAPIN Section 25, 14-10

Section 25 was patented to Santa Fe Railroad in 1917 and the mineral right were leased to Homestake-Sapin Partners via a lease from Santa Fe to Sabre Pinon. Drilling started in the fall of 1955 and by Nov. the drilling had indicated a major orebody. While Sabre-Pinon held the lease, American Meta Co. obtained an option and did some check drilling and water testing for a mill but later relinquished the option when they felt they could not meet certain deadlines that were specified in the option. Sabre-Pinon refused to extend the deadline.

In March 1957 Utah Const. Co. started a 4-compartment shaft on the property and started building a surface plant. In June 1957 the shaft was at 450 feet and a flow of 50 gpm was coming from the Dakota. The walls of the shaft were sloughing badly at 600 feet in Aug. 1957. At 745 feet the shaft was making 540 gpm. A pump sump was put in at 745-foot depth. The shaft bottomed at 813 feet on Nov. 23, 1957. Water flow was 500 gpm. In Jan. 1958 the headframe and hoist were about ready for use.

The hoist is a double drum, 150 HP electric Nordberg with 700 fpm cable speed using 3-ton skips. The first ore was produced in Nov. 1958. Level development was under way in March 1959 and portions of the drifts in Recapture shale were giving trouble . Some drift bottoms had to be concreted to control swell. Water flow had increased to 1000 gpm.

In May 1959 part of the shaft was being concreted to control heavy ground. Total water flow in the mine was 1250 gpm. Production was about 50 tons per day with 115 men on the payroll. The station and slusher trenches were concreted in Aug. 1959. The mine was making 1600 gpm. By Feb. 1960 the workings had developed ore up to 100 feet thick assaying .22%. This was the first really profitable ore developed. The mine started paying expenses

in May 1960. In June a 6'X 8' raise was started to the surface. A hoist on the surface and a cable down a drill hole was used to hoist and lower the working platform.

Pillar mining was started in March 1962 with some improvement in grade. In Aug. 1962 the mine shut down to concrete the upper part of the shaft for 180 feet from the collar slab down to the top of the Mancos shale. The headframe had started to tilt as a result of caving up under the collar slab. By April the shaft had been concreted down to the Dakota. There were 70 men on the payroll.

A few ore holes had been drilled in the NE part of the Section before the mine was developed. In early 1968 a slope was started from a point near the shaft to run NE to get under the ore and drain it. Longholing from the drift proved that the ore holes had cut narrow trends and the tonnage of ore was much less than expected. As in the Sec. 23 mine large areas of ore had been left in pillars to be extracted at a later date. In the meantime the pillars had taken so much weight it was impossible to recover some of them clean enough to make ore. Radon from these large areas of pillars has also caused problems from radon contamination.

Total production to 1-1-70 was 1,604,700 tons of .19% ore.

VCA MINE, Section 36, 14-10

Sec. 36, 14-10 is owned by the State of New Mexico and was leased to Andre Senutovitch who in turn assigned the lease to United Western Minerals who then reassigned the lease to Vanadium Corp. of America.

United Western drilled some of the first holes on the property in Aug. 1955 and hit some mineralization. One drill hole was reported in ore in June 1956 and bids were asked for sinking a small shaft in Oct. In July 1957 VCA obtained an assignment of the lease from United Western and started sinking a 2-compartment 5'x 9' timbered shaft which was bottomed in dry ground at 407 feet in Nov. 1957. The shaft is 345 feet SW of the NE corner of Sec. 36, 14-10. The first shipment of 20 tons assayed .24% U_3O_8 and .40% V_2O_5. All of the production was trucked to VCA's mill at Durango, Colo. although the Kermac mill was less than a half mile distant.

The orebody was small and high-grade. One shipment of 400 tons assayed 1% U_3O_8 and another lot of 600 tons assayed .80%. By March 1958 drifts had been driven to all of the orebodies. The ore was deposited along faults and occurs in the upper Morrison formation. VCA completed their mining in late 1958 and turned the lease back to United Western. The mine was then leased to Jordan and Marshall who produced 635 tons of .47% ore during the months of June through Sept. 1959 and the mine was again closed. Some surface drilling was done in early 1960 to locate more ore but the work was apparently unsucessful.

Total production from the mine was 5248 tons of .51% ore.

KERMAC Sections 17,18,20, 14-9

Section 17, where the Sec. 17 shaft is located is owned by Stella Dysart and others. Sec. 18 and 20 are owned by Ranchers Exploration and Dev. Co. and the lease assigned to Kerr-McGee. The Sec. 17 part of the property includes only the S/2 which is probably fee land. Sec. 18 and 20 were acquired by claim location. The history of the early exploration of the property is sparce but Monarch Explor. Co. was drilling on Sec. 18 as early as July 1955. Kerr-McGee was drilling a 1000-foot hole on Sec. 17 to test a shaft site in July 1958 and the Sec. 17 orebody was being traced into Sec. 18 and 20. On Nov. 7, 1958 a shaft was started on Sec. 17. It was a 3-compartment, 8'X 14' in size and timbered. The shaft entered the top of the Dakota at 625 feet in Jan. 1959 and the water flow was 40 gpm. In Feb. 1959 the shaft was 895 feet deep and making 370 gpm. A level was started at 878 feet. The total depth of the completed shaft was 938 feet. In Aug. 1959 the shaft, headframe and hoist were complete and the station and sluicer trenches were about done. The first production came in Nov. 1959 and 10,000 pounds of U_3O_8 had been mined by March when the bonus program ended.

In June 1960 development was under way in the south main trend in Sec. 17. Production was 300 tons per day with 80 men employed.

In Oct. 1960 production was 12,000 tons of .24% ore, 100 men were employed and the mine was making 700 gpm. A track was started into Sec. 20 in Feb. 1961 and mine production was scheduled at 600 tons per day. In June 1961 track drifts were active in both Sec. 18 and 20 but in Oct. of the same year all effort was on ore extraction with very little development work.

Shortly after production started the operator considered deepening the shaft about 70 feet but instead an incline was started in Oct. 1961

to get under a body of ore north of the shaft that dipped below the haulage level. In April 1962 the back of a stope in the main trend in Sec. 17 caved up to the Dakota sandstone and produced a flow of 150 to 200 gpm.

By June 1962 development in Sec. 18 and 20 was active and good ore was being developed in both places. In Dec. 1962 water flow from the stope that had caved to the Dakota was at pump capacity and more pumps were installed in Jan. Excessive water flow had restricted new development work and longholing for this work also adds to the water flow. The trend of ore being developed in Sec. 18 was found to be up to 150 feet wide. The ground in Sec. 20 had proved to be firm and easily controlled and the ore was good grade. Development work was being pushed in June 1963 to get ore development ahead of mining. In Oct. 1963 there were two parallel drifts about 1000 feet into Sec. 18 and the operator planned to go 500 feet farther. An incline was started in Sec. 20 in April 1964 to develop a higher horizon of ore. It was completed in Sept. and a drift was started to the south. All of the main orebodies in Sec. 17 had been mined with the exception of the ore below the level north of the shaft.

From the time the mines in Ambrosia Lake were started the water from the shafts was run in open ditches to the IX plant at the mill where uranium was extracted from the water. During 1969 Kerr-McGee extracted 62,500 pounds of U_3O_8 in this manner. In 1965 Kerr-McGee put in 12" pipe to carry mine water from the mines to the IX plant to prevent seepage into the ground.

In Nov. 1965 a drift in the SW/4 of Sec. 18 was run at a plus 30° incline to gain 50 feet in elevation to mine ore in an upper horizon. In Aug. 1966 drilling was started in the north half of Sec. 17 which resulted in the discovery of an ore trend. In March 1967 the operator started deepening a shaft 140 feet to establish a new level to develop the new ore trend in

the north half of Sec. 17.

In Dec. 1968 a fire started in the battery station on the upper level which shut down the mine for about two months.

Production up to 1-1-65 from Sec. 17 was 400,644 tons of .23% ore and from Sec. 18 and 20, 201,642 tons of .22% ore. At that time there was a stock-pile of 61,540 tons of .25% ore making a total of 663,826 tons of .23% ore. To 1-1-70 the mine had produced 1,382,700 tons of .20% ore.

KERMAC Section 30, 14-9

Anderson Bros., operating under the name of Mercury Uranium Co. was drill Sec. 30 in the spring of 1956. Of 36 holes totaling 25,000 feet, 18 were in ore that indicated a large tonnage of good grade ore. By Aug. 1956 it was apparent that an important discovery had been made. In Aug. and Sept. there were 13 drills operating on Sec. 30 with most of the holes showing good thicknesses of high-grade ore. In May 1957 a spot for a shaft was being sought that would not be in ore. A 5-compartment shaft was started in June 1957 with the collar concreted to a depth of 51 feet. Centennial Dev. Co. took over the sinking job using a Cryderman mucker.

The preliminary exploration work consisted of 420,000 feet of surface drilling in 600 holes.

The ore was 650 feet deep and averaged 10 feet thick. The shaft was dry to the Dakota at a depth of 275 feet and at the Brushy Basin-Westwater contact at 460 feet there was 5 gpm. The first station was cut at 600 feet where there was a flow of 100 gpm. The shaft bottomed at 762 feet in July 1958 and levels had been started at 480 feet, 546 feet, 654 feet and loading pocket at 688 feet. The first ore was hoisted in Jan 1959. Trackless equipment was tried at first but roadways were hard to maintain. The upper level in the Poison Canyon sandstone was continued as a trackless level after it had been drained by the second level but the second level had to be equipped for track haulage as most of the drifts were in a shale strata that swelled badly when it became wet. The shaft walls near the levels were grouted in an effort to cut down water flow.

The Poison Canyon ore on the top level was mined with trackless equipment and openings were made so large that the pillars would not support the

back. Ground subsidence extended to the surface and began to threaten the surface plant at the shaft. Surface holes were drilled into the stoped areas and mill tailing run in to stabilize the ground. Development was started on the 2-1, or bottom level, in Oct. 1961 and two drifts were started in to Sec. 29 on the top or 1-4 level in Jan. In April 1962 all the Kermac mines were producing 5200 tons per day of which Sec. 30 was producing 1400 tons per day. In Oct. 1962 a drift was started into Sec. 29 on the 2-1 level. Development on the 2-1 level was extended to the SW from the shaft and two raises were driven up to the ore in Jan. 1963 bu in Feb. all work was stopped on this level. Some stopes in Sec. 29 near th Sec. 30 line were developed and mined but the work did not extend into Sec. 29 more than a few hundred feet. During 1963 considerable drifting was done on the 1-5 level north west, west and south west of the shaft. Most of the drifts were in swelling shale in the west and north west part of the mine so maintenance work was more costly than the original drift work. By Nov. 1963 most of the ore south east of the shaft had been mined and the area was being filled. In the summer of 1964 the 2-1 level was re-opened and a drift to the north east was started to develop the north part of Sec. 29. The drift reached the Sec. 29 line in Oct. and was stopped.

Total production to 1-1-65 was 1,543,383 tons o .28% ore. Production to 1-1-70 was 2,671,500 tons of .27% ore.

KERMAC Section 30, 14-9 WEST

The original Sec. 30 shaft is located in the eastern part of the Section and the ore-bearing strata dips to the west. The bottom, or 2-1 level, developed ore west of the shaft to a point where the ore strata dipped into the 2-1 level. Although the idea was considered as early as 1960 it was not until the summer of 1966 that a shaft site was selected for the Sec. 30 West shaft. In Nov. 1966 a pilot hole was drilled at the shaft site to test the formation and in Feb. 1967 Centennial Dev. Co. was awarded a contract to sink a 12½-foot diameter circular concrete lined shaft 800 feet deep. The shaft was collared on March 21. In May 1967 the shaft was 56 feet deep and in Nov. 520 feet deep. The shaft was completed to 802 feet on March 22, 1968 and there was an inflow of 360 gpm. Centennial also took a contract to cut two stations on the shaft and construct other facilities in the shaft area. The shaft collar elevation is 6965 feet, the first level is 702 feet deep and the second level is 740 feet deep. The lining of the shaft required 4 cu. yds. of concrete per foot of shaft. During the station cutting work , water inflow increased to 600 gpm which hampered the work and increased the cost. In July 1969 Centennial had completed their work in the shaft area but in the meantime Kerr- McGee had started lateral development work.

The first ore production reported was in Dec. 1969 when 2118 tons of .136 ore was hoisted. The shaft was sunk in a graben where the ore strata had dropped about 35 feet. The lower level developed ore in the graben and the upper level ore outside of the graben.

KERMAC Section 19, 14-9

Sec. 19 was controlled by Stella Dysart and during the 1920s she sold off tracts, some as small as one acre, in an oil promotion scheme. Kermac started acquiring these tracts but in some cases the tracts were in litigation or divided among so many heirs it was impossible to gain control of them. Kermac sponsored a bill in the State Legislature to permit a unitization of the tracts so royalty could be credited to the tracts that Kermac did not control on an acreage basis. Royalties for the unknown owners would be put in an escrow fund.

In May 1969 a shaft site was selected near the center of Sec. 19 and a unique system of grouting started. The grout holes would be drilled to a water-bearing sandstone and then blasted with a special explosive charge. The blast served to fracture the sandstone so the grout could penetrate enough to seal out water and stabilize the ground. Three holes were drille and grouted around the perimeter of the proposed shaft site in this manner A four foot diameter pilot hole was started on the centerline of the shaft on Sept. 25, 1969 and on Oct. 20 a 16½-foot diameter bit was started to cut the shaft to its ultimate size. Air at 5 lbs per cu. inch and 36,000 cfm was forced into the hole to force the dry cuttings up the drill pipe. The grouting kept the hole dry but the shale part of the shaft kept caving on top of the bit and much time was consumed in blowing out the caved material. A hood was constructed over the collar of the hole to force the compressed air down the hole and out the drill pipe. At 1-1-70 the drilling had progressed to about 550 feet.

HOMESTAKE-SAPIN Section 32, 14-9

Sec. 32 is owned by the State of New Mexico. The mineral rights were leased to Andre Senotovitch and the lease then assigned to United Western Minerals Co. After the orebody was well delineated the lease was assigned to Homestake-New Mexico Partners, a partnership of Homestake Mining Co., United Western Minerals Co. and Rio de Oro Mining Co. United Western contributed the Sec. 32 ore body, Rio de Oro the S/2 of Sec. 11, 14-10 ore body and Homestake supplied the money to build the Homestake-New Mexico Partners mill and some money to develop the mines.

United Western started drilling in Oct. 1955 and in the first 10 holes one hole cut 16 feet of .52% ore. Of the next 19 holes, 10 were in ore. The holes were widely spaced and most were in the north part of the section. In Dec. 1955 after 35 holes had been drilled a DMEA drilling loan was applied for. DMEA drilling started in May 1956 and continued until July when all drilling was stopped. In Dec. 1956 Homestake-New Mexico Partners was formed and Centennial Dev. Corp. started a shaft in Jan. 1957. A 33" escape hole had been completed and cased in 1957. A Riddell mucker was used while sinking the main shaft. The shaft hit water at 440 feet in May 1957. Centennial's shaft sinking contract went on a cost-plus basis after the water level was reached. The shaft was bottomed at 650 feet in July 1957 and a station cut at 595 feet. The water flow was 85 gpm. The station and skip pocket were completed in Aug. and 50 feet of drift had been driven. Homestake took over the shaft from Centennial on Aug. 11. In Oct. 1957 drifts had been run 150 feet each way from the shaft and one raise had been driven up to low grade mineralization. Water flow had increased to 150 gpm. The sandstone strata was very soft and had to be timbered. By Feb. 1958 4000 feet of workings had been completed and water flow had increased to 425 gpm. Development at this point was quite disappoint-

ing. Several raises to ore had only found barren rock. In April 1958 it was evident that the ore reserve estimate was too high. The first ore was shipped in Dec. 1957.

In April 1959 there were 27 men on the payroll and production reached 200 tons per day.

At the end of 1959 development was started to trends south of the shaft. In March or April 1961 a lease on a block of ground in Sec. 29, 14-9 was obtained from Kermac. The lease was directly north of the shaft and preparations were being made to drive into it in April. In Nov. 1961 65% of the work was being done in Sec. 29. The Sec. 29 ore proved to be larger and better grade than the operator expected. In June 1962 a 32 inch cased ventilation hole was drilled in Sec. 29 to improve ventilation. By Nov. 1962 only one stope with two men working was operating in Sec. 32 with the rest of the crew in Sec. 29.

Kermac controlled Sec. 29 and the agreement with Homestake-Sapin was for a maximum of 25,000 tons of ore per quarter. In Feb. 1964 a drift was started from a point east of the shaft to run NE and north to cross and develop the east end of the ore trends in the Sec. 29 lease. The drift apparently crossed east of the east end of the ore trends because very little ore was found from the drift. The grade and tonnage of ore mined in Sec. 29 lease exceeded the estimate arrived at from surface drill hole data. The Sec. 32 orebody was originally thought to be a large blanket deposit but mine development proved it to be a series of narrow trends.

In June 1965 15 sets in the shaft had to be replaced where the shaft cuts the Brushy Basin shale. The section was then concreted to support t timbers.

The lease in Sec. 29 ended in Nov. 1966 and all the crew was shifted to Sec. 32. In Jan 1968 the lease in Sec. 29 was renewed. The original cont restricted the contractor to the lower horizon of ore in the Westwater but the new contract made no such restriction and Homestake Partners min some of the upper ore they were not permitted to mine under the old agre ment.

Production to 1-1-70 is as follows:

Sec. 29 via 32	381,700 tons of	.26%
Sec. 32,14-9	420,000 tons of	.20%

ANN LEE Section 28, 14-9

Sec. 28 was located with 41 claims, several of which have been patented. Adrian Berryhill located the claims and leased them to Ranchers Exploration Co. who in turn subleased them to Phillips Pet. Co. Drilling was started in Nov. 1955 by Phillips on a farmout from Holly Uranium Co. and some ore was discovered in April 1956. There were six drill operating in June 1956 and an orebody had been discovered. A shaft site was selected in Sept. and a contract was let to Boyles Bros. in Dec. to sink a shaft. The shaft is 5 compartment, 18'X 9' in size. In June 1957 the shaft was down 485 feet. A pump station was installed at 400 feet depth and the water flow was 130 gpm. In Nov. 1957 a 46-inch hole was drilled south of the shaft to be used as an escapeway and vent hole. It was later cased to 36 inches. After the casing was set it collapsed at 150-foot depth after the mud was pumped out of it.

The shaft bottomed at 735 feet in Dec. 1957 and a station was cut at 660 feet depth. Drifting east and west from the shaft started in Feb. 1958 and a shipment of 433 tons of ore was sent to the Grants buying station. At this time there had been 800 feet of drifts driven and there were 36 men on the payroll working three shifts per day. The mine was making 475 gpm. In May 1959 sand filling was started as a means of controlling the mined areas. By Oct. 1959 development had reached the west section line and was within 1000 feet of the east line. Production was about 750 tons per day. In Feb. 1960 the operator estimated that 35% of the known ore had been mined. Retreat had progressed 600 feet back from the west section line and production was about 650 tons per day. Stoping had reached within 500 feet of the east section line.

As early as Feb. 1961 Phillips was trying to trade with Kermac to gain con-

trol of one of the Branson Sections in return for releasing their 20% equity in the rest of the Branson property.

In June 1961 an incline was started from the east end of the shaft to e: tablish a track level low enough to go to the east property line and ren below the level of the ore. Later the shaft was deepened and a drift ru to the new level which is 70 feet deeper than the 660-foot level. It was also used to develop the ore in the west part of Sec. 27.

On June 16, 1962 a mining contract was let to KSN Mining Co. to mine the Ann Lee ore.

The contract called for 300 feet of development work per month and the track drift to the east was to be driven 3000 feet. Except for mill test lots all of th KSN mined ore was stockpiled at the mine.

In Nov. 1962 the shaft was sunk 20 feet to allow for loading from the new level. In Jan. 1963 the shaft was concreted where it passed through the Brushy Basin shale and the slusher trench on the new level was also concreted.

On March 28, 1963 Phillips sold their Ambrosia Lake mines and mill to Uni ed Nuclear for a price reported to be $28,000,000. United agreed to honor the KSN contract at the Ann Lee but asked them to limit production to 5000 tons of ore per month. KSN reopened some of the old workings in the west end of the mine and recovered some of the pillars left by Phillips. Exploration south of the main trend near the shaft developed some import- and sources of ore. The mine went on a five shift per week basis on May 18, 1964. There were 60 men on the payroll and production was 6.5 tons pe: man shift.

KSN tried to find new ore trends north and south of the main trend and di

find some ore trends south of the main orebody but found no new ore north of the main trend. Some of the workings west of the shaft were reopened to mine lower grade ore left during the original work. Radon and bad grour was too much of a problem to make the effort profitable.

The main trend near the east section line became so spotty it was unprofit able to mine and a section of the main trend had to be left unmined. The KSN contract was terminated on Dec. 31, 1966 and United Nuclear took over.

The Ann Lee workings were extended into Sec. 27 to the east and the ore up to the fault was mined through the Ann Lee workings.

To 1-1-70 the Ann Lee Mine produced 1,065,700 tons of .23% ore.

KER MAC Section 33, 14-9

Sec. 33 is owned by the Branson Estate and leased to Ambrosia Lake Ur[illegible] Corp.* Kermac was the operating company with Phillips owning a 20% undivi ed interest in the property.

The surface drilling that discovered the ore consisted of 375,000 feet of hole in 500 holes.

The ore was 700 feet deep and 8 feet thick. A five compartment shaft was started in May 1958 and was completed to a depth of 848 feet in Jan. 1959. Centennial Dev. Co. did the sinking. They completed the ore and waste passes on July 1, 1959. The workings were making 120 gpm in July 19 First production came in Aug. 1959 from two places on the top level, ther were 60 men on the payroll working three shifts per day seven days per week.

A drift boring machine was set up on the lower level for experimental wor It had a 9-foot diameter cutting head that was fed into the face with hydrawlic pistons. It was reported capable of boring two feet of drift per hour. The cuttings were elevated to an overhead conveyor that took them t the back of the machine and discharged them into a car. The cutting head was fitted with roller cone bits. The statified and broken nature of the ground made it difficult to keep on grade. Slabs in the finished bore were a hazard to the machine and the men. The working place was wet which caused trouble in the electrical equipment. After making about 100 feet of drift the machine was moved to the surface and discarded.

In May 1962 mine development was nearly to the west property line. More drilling was being done in the SE part of the Section 29,14-9 that woul be developed from Sec. 33 shaft. A drift was started into Sec. 29 in July

1962. In Jan 1963 work was started in some of the early stopes to recover the lower grade ore that was left during the original work, when only high-grade ore was mined. Scram drifts and long hole drilling was used to recover the low-grade halos around the old stopes. Finger raises were driven up under some of the old stopes to pull broken ore that was not taken during the original work because it was too low grade. The track drift to Sec. 29 entered the section in March 1963 and in June the drift was under the Sec. 29 orebody and raises were spotted to develop the ore. In Aug. the first raise reached ore but it was very low grade, .13%. At this time a 16-inch hole was cased to 13 inches to provide ventilation in this area. A ten-acre tract was leased from United Nuclear in the SW corner of Sec. 28,14-9 and a drift was started into it.from the Sec. 29 workings.

By Nov. 1963 the west 300 feet of the main trend in Sec. 33 was mined out and allowed to cave. Development of ore south of the main trend still continued near the Sec. 32 line. In July a new skip pocket was put in the shaft to keep the Sec. 28 ore separate. The first ore from Sec. 28 arrived at the shaft on Sept. 16. There was still some stoping on the bottom level in Sec. 33. In Dec. 1964 10% of the ore was coming from Sec. 33 and Sec. 28 and the rest was coming from Sec. 29.

After mining the ore in the SE corner of Sec. 29 a drift to the NW was started to develop ore up to the cener of Sec. 29. The operator plans to be tramming up to two miles when the most remote ore is developed.

In early 1967 a body of low-grade ore just north of the shaft was under development. Although the grade was only .10 to .11% the proximity to the shaft and lack of water problems made it economic to mine.

As of 1-1-70 Sec. 33 and Sec. 29 via Sec. 33 had produced 1,441,100 tons of .17% ore.

* Ambrosia Lake Uranium Co. was made up of the following partners:

Kerr McGee	20%
Anderson Dev. Co.	20%
Pacific Uranium Co.	20%
Phillips Pet. Co.	20%
Branson Estate	20%

SANDSTONE MINE Section 34, 14-9

Adrian Berryhill located Sec. 34 with 45 claims. Through leases and assignments the property passed from Berryhill to Ranchers Exploration and Dev. Co.(Redco), to Holly Uranium Corp., to Phillips Pet. Co.

Phillips drilled 400,000 feet of hole in 420 holes and discovered an estimated 2,200,000 tons of .20% ore. The ore was 875 feet deep and averaged 6½ feet thick. The shaft is a 12-foot diameter, circular concrete lined shaft 980 feet deep.

The shaft is equipped with one skip on guides 4 feet 8 inches apart and the service cage is on guides 9 feet 4 inches apart. There is a pipe compartment on one side of the skip and a manway on the other side. The service cage takes up half of the shaft cross-section.

Exploration drilling started in early 1956 and in Feb. 1957 there was one drill operating outlining the orebody. In Jan. 1958 bids for a shaft were advertised and in March and April the surface plant was under construction and shaft sinking started in April. The shaft was dry to 425 feet but there was some water in the lower Mancos shale at 490 feet. A pump station was made at 407 feet. At 560 feet in Aug. the shaft was making 120 gpm. At this time a 46-inch vent hole was being drilled NE of the shaft. It was cased with 7/8" steel, 32¼" ID.

The shaft was bottomed on March 10, 1959 and part of the slusher trench and pocket were complete. Water flow was 350 gpm. Phillips took over from Boyle's Bros., the shaft contractors, in July 1959. In Dec. the track drift was 1000 feet west of the shaft and production was 250 tons per day. The mine was originally equipped for on ore, trackless equipment but was later changed over to below ore track equipment.

In Feb. 1960 a large tonnage was added to the reserves by surface drillir that discovered a large orebody north of the shaft. It was later found th the drill holes hit some of the best ore and the reserves were calculatec too high. The main ore trend was found to be a series of narrow trends ir stead of one large blanket deposit.

In April 1961 there were 75 men on hourly rate, production was 12-13,000 tons per month or 6 tons per manshift. In May a 54-inch vent hole was com pleted. In Oct. production was 400 tons per da with 120 men on three shifts. The track drift reached the west section li in Sept. 1962. In Nov. raises were started to the high ore west of the graben in the west part of the mine. On Dec. 16, 1962 the mine was floode to the back of the station when the cage ruptured the pump column. The stopes in the west end were holed to the Sec. 33 stopes in Jan. 1963. The 200-foot service raise to the upper ore in the west end was completed in March 1963 and an automatic hoist and cage were being installed. In Ma the crew was cut from 180 men to 30 men and the work week reduced to 40 hours.

About this time the completed stopes in the north part of the mine caved up to a water-bearing formation increasing the flow from that part of the mine to 1000 gpm.

On Aug. 20, 1963 the cable broke at the hoist drum with the skip in dumping position. The skip went to the bottom of the shaft tearing out a few guides on the way. Both hoist cables were then replaced. The break was caused by kinking the cable some time in the past. In Nov. 1963 the Churc Rock pumps were installed in the mine to increase capacity. In May 1964 the men and materials cage in the west part of the mine was put in use.

All production was shut down on July 1, 1964 and most of the crew was moved to the San Mateo mine. In Aug. the crew was increased from 14 to 27 men and production resumed in the west end of the mine.

In Aug. 1965 the west end pillars were being pulled and some small ore bodies south of the main trend were being developed. In Nov. 1965 a track drift was started northward to the Sec. 27 line. This drift was later connected to a 36-inch cased shaft that was drilled on the ore trend in Sec. 27.

Mine production to 1-1-70 was 1,002,600 tons of .18% ore.

UNITED NUCLEAR Section 27, 14-9

The Branson Estate owned the mineral rights on Sec. 27, 29, 33, 35 an parts of Sec. 25 and 31, 14-9. The properties were leased to Kerr-McGee 80% and to United Nuclear via Phillips, 20%. In Oct. 1968 Bokum Corp. pur chased the Branson royalty rights for $5 million and later traded the Bokum 80% interest in Sec. 27 for the 20% United Nuclear interest in the rest of the above-named sections. After UNC gained control of Sec. 27 pr parations were made to get it into full production. In April 1966 a pilo hole was started that was later reamed to 6½-foot diameter. The 6½ foot drill was started on Aug. 15, 1966. The hole was lost at 250 feet and a new hole was started nearby. The hole was completed Oct. 1. The five foo casing was floated into the flooded hole but it stuck 19 feet above the bottom and was there cemented in place. The first ore was hoisted through the new shaft in Sept. 1967. The drift east from the new shaft was run on a -2½% grade to keep the drift under the ore strata that dipped to the east. In June 1969 a new shaft was started about 1000 feet east of the drilled shaft. It was constructed by drillir a hole into the mine workings and then reaming it upward to about 4½ feet diameter and then casing it to 42". The cased hole was then enlarged to 12 feet ID by blasting the hole to that size and letting the muck go down the hole to be taken out through the mine. As the work progressed the 42" casing was cut off in 10 to 12-foot sections and hoisted out of the hole to expose the walls of the hole for enlarging. In Nov. 1969 the shaft was completed to 860 feet depth.

The drift from the Sandstone mine connected with the Sec. 27 workings in Dec. 1966 and the water from the Sec. 27 mine flowed to the Sandstone sha to be pumped to the surface.

A fault crosses Sec. 27 in a N-S direction about 1000 feet east of the Ann Lee line that drops the east side 50 feet or more. The ore west of th fault was mined through the Ann Lee mine.

A description of the Branson property is as follows:

Sec. 25	N/2 and SE/4
Sec. 27	S/2 100%, N/2 50%
Sec. 29	All
Sec. 31	NE/4, E/2 E/2 NW/4, NW/4 NE/4 NW/4, N/2 NW/4 NW/4 10%
Sec. 33	All
Sec. 35	All

Production from Sec. 27 to 1-1-70 has been 447,700 tons of .22% ore.

KERMAC Section 35, 14-9, Elizabeth

In early 1967 the company was working up plans for the development of the 35. In Nov. bids were asked for a 14-foot diameter concrete lined shaft in March 1968 Boyles Bros. was selected for the job. Several grout holes were drilled in the shaft area to the ultimate depth of the shaft. Grout was pumped into the holes but for the most part very little grout could be forced into them. Unless the hole intersected a fracture the formation would be almost impermeable.

Shaft sinking started in May 1968 and in June the shaft sinking plant was complete and the shaft was 98 feet deep. At the end of July the shaft was 262 feet deep, the end of Aug., 438 feet and at the end of Nov., 982 feet deep near the bottom of the Mancos shale. Here a concrete plug was poured in the bottom of the shaft to prepare for grouting the Dakota sandstone. Holes drilled into the Dakota showed pressures up to 250 lbs per sq. in. After grouting, sinking continued and in Jan. 1969 the shaft was 1042 feet deep near the bottom of the Dakota and the shaft was making 220 gpm. Chemical grout was used to try to cut the water inflow . By grouting through the shaft lining the flow was cut from 230 gpm to 30 gpm. In March 1969 the shaft was at 1200 feet in an upper Morrison sand with 25 gpm coming into the shaft. The upper level was started at 1190 feet depth and the second level at 1260 feet. The bottom level is at 1350-foot depth. The shaft was completed to a depth of 1398 feet on July 22, 1969. The water inflow then was 230 gpm.

Boyles Bros. contract included 5000 feet of work in stations, ore passes, pump stations, etc which is expected to be completed late in 1970.

CLIFFSIDE MINE Section 36, 14-9

Sec. 36 is a State section that was leased to James H. Russell of Santa Fe who then assigned the lease to Andre Senutovitch. The lease was reassigned to Reserve Minerals and then assigned again to Moki Oil and Rare Metals Co. Phillips Pet. Co. obtained an 80% interest in the property and Moki Oil retained 20%.

Exploration drilling was under way in April 1957 which was concentrated in the SW part of the section where the main orebody was located. Drilling was stopped in July 1957. Bids for shaft sinking were called for in Jan. 1958. The surface plant was under construction in March 1958 and a shaft was collared on April 28, 1958. In July the shaft was 358 feet deep and dry but water was later found in the lower Mancos shale. The shaft is circular, concrete lined, 12 feet 2 inches inside diameter and similar to the Sandstone shaft. Boyles Bros. was the contractor.

Some grouting was done to control the water in the Mancos. In March 1959 the shaft was at the Dakota sandstone and grout holes were drilled below the shaft bottom and grouted to seal off the water in the Dakota. When the shaft was 1145 feet deep an inflow of water from the Dakota flooded the 800 level pump station. After the shaft was pumped out the Dakota was grouted again from the shaft. The Dakota water was under control by May 1959 but when the shaft entered the Brushy Basin shale the shaft flooded again up to the 800 level pump station.

In May 1959 the shaft was flooded with a flow of 1600 gpm from the upper Brushy Basin shale and the shaft was plugged with concrete at 1200 feet and the surrounding area grouted. By June had been spent on gro ing in the Dakota and Brushy Basin. The water flow had decreased from 16 gpm to 400 gpm. In July 1959 the contact of the Dakota and Brushy Basin 1193 to 1203 feet had been sealed off with the shaft lining. In Sept. 19 a station was being cut at 1417 feet and the shaft bottom was 1470 feet. The shaft was completed to 1495 feet in early 1960 and a drift was start to a nearby vent hole. The water flow was up to the capacity of the pump Phillips took over from Boyles Bros. in May 1960. The water inflow from the Dakota was 450 gpm and from the mine level, 350 gpm. When the shaft a station were complete and a connection with vent hole had been made.

The ore in the central part of the main orebody was thick and high grade. Several methods of stoping were tried. Extra expense was justified to recover as much of the high grade ore as possible. In the thickest ore, up to 70 feet in places, a slot about 10 to 12 feet wide was cut across the width of the ore and the slot was then timbered with square sets. The sl at full height was advanced across the orebody and when the far side was reached the timbers were reinforced with light cable and the sets lined with lagging and burlap and sand fill was run in from the surface. The posts, caps and girts were all six feet in length. After a timbered slot was filled another slot would be started next to it.

In Sept. 1961 production was 9000 tons of .73% ore, there was a flow of 1150 gpm from the level and 500 gpm from the Dakota in the shaft.

By May 1962 the workings had extended to a point where the pumping facilities would not handle the water gathered by the various drifts and stopes so work on a new pump station was started. All new development work had to be stopped in the meantime as each foot of work added to the water supply. The original pump station was working at its capacity of 1500 gpm. In Oct. 1962 there were 135 men employed, production was 10,000 tons per month and production per man shift was about 3 tons. There was only one slusher trench at the shaft so waste and ore was handled in the same cars, trench and skip. The ore was so gigh grade it was impossible to get waste to the surface without salting it to such an extent that it had to be classed as ore by the time it reached the surface. By using separate waste cars in the mine and cleaning the slusher trench and skip before handling waste it was possible to get some barren drift rock to the surface assaying less than .07% U_3O_8.

The new pump station was put in operation in Oct. 1962 which made it possible to resume track drifting to the SE orebody. On March 28, 1963 the crew was reduced to 96 men from 150 and the shifts per day reduced to two. In Aug. 1963 the operator reported that half of the estimated reserves had been mined. Production records show that 292,100 tons of .48% had been mined at that time. United Nuclear took over control of the Phillips holdings in Ambrosia Lake about April 1, 1963.

In the summer of 1964 the track drift to the SE orebody was started and in Aug. two raises had been driven up to the ore zone, about 80 feet

above the track drift. This orebody was reported to be six feet thick, 60 feet wide and of undetermined length. The grade was estimated to be .60%. Near the end of 1966 UNC was dealing with Kerr-McGee and National Lead, 50-50 owners, to mine the Cliffside orebody that extended into Sec. 1, 13-9. Production from Sec. 1 started in June 1967.

When the Cliffside mine was developed Phillips held an 80% interest and Moki Oil a 20% interest. Phillips sold their interest to UNC in violatic of an agreement with Moki that the 80% interest be offered to Moki first. Moki sued but the case was settled out of court. UNC relinquished their 80% interest in return for payment for the equipment on the property. Moki took over operation of the mine June 1, 1968. None of the ore from Sec. 1 was milled until Jan. 1969 and in the meantime the stockpile had grown to about 1 million pounds of U_3O_8.

After Moki gained control of the property on June 1, 1968 they started some exploration drilling on the Cliffside property and discovered an orebody about 800 feet north of the shaft. Late in 1969 this orebody was under development.

To 1-1-70 the Cliffside mine had produced 703,100 tons of .41% ore.

KERADAMEX-LEE RANCH

The Keradamex Fernandez Joint Venture is composed of Kerr-Addison Mines, Ltd, 26%, Noranda Mines Ltd., 25%, and Amerada-Hess Corp. 49%.

In 1968 the Joint Venture leased the Lee Ranch, part of which lies in the east part of Township 13-8. In May 1969 ore grade material was penetrated by drilling and by July 1969 a significant reserve was estimated at a depth of 2700 to 3100 feet deep.

As of 1-1-70 the property was still being explored.

JACKPILE MINE Section 35, 11-5

The Jackpile property, covering 799 acres, is composed of contiguous tr[illegible]t on 5 sections as follows:

Sec. 1	T10N,R5W	120 acres
Sec. 2	" "	159 "
Sec. 34	T11N,R5W	80 "
Sec. 35	" "	320 "
Sec. 36	" "	120 "

The property is owned by the Laguna Indian Tribe. The original lease was made on March 27, 1952.

The Jackpile was discovered with an airborne radiation detector. The orebody was found to outcrop about 120 feet below the top of a large mesa. Some ore was shipped from the outcrop and then two adits were driven from near the top of the mesa. The first ore was produced in 1952. Most of the early drilling at the Jackpile was done with core drills so assays could be made chemically. The techniques for probing and probe evaluation had no reached their present state of perfection. A new road from Highway 66 to the mine was completed in Feb. 1954 and by April production was about 300 tons per day of .25% ore. Fifteen men were employed at the mine.

In June 1954 another part of the Jackpile orebody was discovered about one half mile farther north on the same mesa. Later the two discoveries were found to be the same deposit. By Dec. there were four rotary and six core drills working in the area outlining the orebody. Stripping was started on the north orebody in early 1955 and in April they were down to ore. Anaconda completed a 4½ mile rail spur from the Santa Fe main line to the Jackpile in Oct. 1955. In Sept. production was 3000 tons per week and the Company was putting in an ore crusher and conveyor belt for loading railroad cars. In Dec. 1955 production was increased to 4800 tons per week and the acid plant for treating Jackpile ore was being put into operation.

In May 1956, 2000 tons per week was being treated in the mill and the rest of the mine production was being stockpiled at the mine. There were 600 employees at the mill, 100 at the mine and 75 at the general office for a total of 775. The Anaconda Co. quit buying ores from the AEC in June 1956. The Isbell Const. Co. finished their stripping contract at the Jackpile in Oct. 1954. In March 1958, 83,014 tons of .23% ore was shipped to the mill and stripping on the high mesa on the north side of the Jackpile pit was started in June 1958.

In Aug. 1958 an Eberline truck scaler was installed in the Jackpile pit. The scaler was used to determine the value of each truck load as it came from the pit so the ore could be seregated by grade into separate stockpiles and the protore and waste could be sent to the appropriate piles. Production was cut back to 80,000 tons per month in June 1959 to be more in line with lower mill feed needs. Mill operation was cut to 6 days per week. There were 162 employees laid off at the mill but no personnel cuts were made at the mine. The primary stripping at the Jackpile was completed in March 1961 and mining was stopped in April 1962 with mill feed coming from the mine stockpiles. In June 1963 mining was resumed at the Jackpile to obtain pounds for the 1970 stretch-out. About 1000 tons per day of .18% ore was being recovered in July 1963. In Nov. 1964 clean-up of odds and ends was under way and the bottom of the pit was being drilled to explore for any remaining pods of ore.

To 1-1-65 production from the Jackpile Mine was 7,283,442 tons of .22% ore. There was still a modest tonnage under the pit rims and some pods of ore remained in the bottom of the pit. A large tonnage of remains in the unstripped areas west and north of the present pit. No more ore had been mined from 1-1-65 to 1-1-70.

PAGUATE MINE Section 33,34, 11-5 and Sec. 5, 10-5

The Paguate lease consists of 1720 acres of Laguna Indian land contained in an irregular-shaped tract in the south part of T11N, R5W and in the north part of T10N, R5W.

The early activity on the Paguate tract was kept secret by the operator and little information was available but drilling was observed on the ground in Oct. 1956. Some of the holes were close spaced and were probably outlining an orebody. In Jan. 1957 the drilling seemed to be confined to an area one mile long east and west and one third mile north and south. By Aug. 1958 drilling had indicated an orebody about two miles long and open at both ends.

Stripping started in Jan. 1961 with a bull dozer and in March an electric shovel and several trucks were moved in. In May 1962 the Company reported that their stripping ratio was 8 to 1. Some ore was being mined, most of which went to stockpiles. Some ore was shipped to the mill from time to time to check amenability, and the grade and tonnage as estimated at the mine. In Oct. 1962 stripping was reduced from two shifts per day to one shift on a five day per week schedule. Ore production stopped in June 196. but stripping continued. All the pounds for the 1970 AEC contract had been stripped by early 1964. There were 92 hourly employees at the mine in contrast to 250 employees two years before.

As of 1-1-65 45,384 tons of .24% ore had been milled and 557,232 tons of .38% ore was in stockpiles for a total production of 602,616 tons of .37% ore.

Anaconda was one of the first local companies to announce a uranium sale contract to private industry. In March 1966 a contract with a Swiss Com-

pany was announced to supply uranium for a power plant to be built by Westinghouse.

In 1967 Anaconda started a drilling program in an area south and southwest of the pit where some scattered holes had indicated ore. The ore was 300 to 500 feet deep.

To 1-1-70 the Paguate had produced 1,939,900 tons of .32 ore.

WOODROW MINE Section 36, 11-5

The Woodrow deposit is in a cylindrical pipe of sandstone in which ur-ium and other minerals were deposited. The ore that outcropped on the surface was detected by an airborne instrument. The mine was named after the pilot who was flying the plane when the discovery was made about mid-195

Some ore was mined through a shaft sunk in the outcrop. A calyx hole was drilled near the pipe which was then enlarged to a 2-compartment shaft. The shaft was 230 feet deep and a crosscut was driven through the pipe on the 200-level. A raise was then started up through the center of the pipe from the 200-level crosscut. In May 1956 the raise was up 50 feet and in ore. The raise holed the 100 level in June and stoping was started. Stoping was also started on the fourth floor above the 200 level. A miner was killed by a fall of ground in July 1956 and the mine was closed shortly after. Some ore is left in the mine. The shaft is kept open for a source of water for Indian livestock.

Production to 1-1-70 has been 5326 tons of 1.26% ore.

M-6 CLIMAX MINE Section 29,30,11-4

The property consists of the N/2 of Sec. 30 owned by the trustees of the Seboyta Land Grant and leased to Lee Hanosh and subleased to Bibo Mining Co. The original discovery was made on Sec. 30 and later Sec. 29 was added when ore was found on that section.

The early records indicated that some shallow ore was found and mined from open pits. In early 1954 deep drilling had indicated an orebody of 10,000 tons of .22% ore which was later increased to 20,000 tons of .24%.

In Dec. 1954 76,000 feet of hole had been drilled and the operator planned to drill up to 200,000 feet. Drilling continued during 1955 and most of 1956 and in Oct. 1956 a 3-compartment 18'X 7½' shaft was started. In Jan. 1957 the shaft was down to 192 feet and a water flow of 2½ gpm had been developed.

A station was being cut on the 260 level in Feb. 1957. The shaft was completed to 298 feet in March. By June 1957 225 feet of drifts had been run and the first ore production came in July. The ore was found to be not amenable to the Homestake-New Mexico Partners mill and by March there was a stockpile of 2600 tons of ore and no market. In April 1958 the mine was shut down to repair the hoist but pumping continued. In Aug. 1715 tons of .23% ore was shipped but the records do not state the destination. Production was resumed and in March 1959 3000 tons of ore was shipped to the Phillips mill. In April there were 12 men on each of two shifts per day and production was 120 tons per day. The ground above the ore strata was too soft to hold rock bolts so timber cribs were used to support the back. The ore had to be dried in the mine yard to reduce the moisture content to 8% before the mill would accept it.

In Nov. 1959 the mine was making 10 gpm, there were 40 men on the payroll

with 32 men in the mine. The workings were out 600 feet north of the sha and 500 feet northwest. The south area was mined out and caved. Oct. 195 production was 3400 tons of .20% ore. The mill penalty for over 10% mois ture was $1 per ton. By June 1960 all ore had been developed and retreat had started. During the summer and fall of 1960 production was 3000 to 4 tons per month of .18% to .20% ore. The last ore was mined in Oct. 1960 and the mine closed down. By Feb. 1961 the headframe and hoist had been removed and the shaft lagged over.

Total production from the mine was 78,556 tons of .20% ore.

LIMESTONE MINES

FEDERAL INCLINE Section 18, 13-10 SW/4

The SW/4 of Sec. 18 is patented land owned by Brown Vandever and leased to Glen D. Williams and J. D. Hutton. The first mention of the property was in June 1954 when the Front Rango Uranium Co. was planning a drilling program. Santa Fe Uranium Co. mined some ore from an open pit and then sank an incline. Federal Uranium Corp. gained control of the property sometime in early 1956 and mined ore through the incline until late summer of 1957 when the mine was abandoned. Surface drilling revealed another ore body about 1000 feet NE of the incline. A new incline was started in Dec. 1957 to develop the new orebody.

The incline was completed in Feb. 1958 and production started in March. Operations continued until Feb. 1959 when mining was stopped for lack of ore.

The property remained idle until April 1963 when Mesa Mining Co. obtained a lease and discovered some ore by surface drilling. Faye and Ortmayor made an agreement to mine the ore and started reopening Incline No.2 in Sept. 1963. Production started in Nov. 1963 and continued until Sept. 1964. The ore came from the edges of old stopes and from ore near the old workings that had been discovered by drilling. Production prior to 1-1-60 mined by Santa Fe Co. and Federal U. Corp. totaled 22,509 tons of .20%. Production during 1963 and 1964 totaled 2809 tons of .15% ore. Total production from the property was 25,318 tons of .19% ore.

FEDERAL URANIUM CORP. Section 24, 13-11

Federal Uranium Co. operating as Santa Fe Corp. operated on Sec. 24 d 1954 and 1955 mining shallow limestone ores in open pits. About four pit were stripped and mined by the end of 1957 when the work was terminated. Production totaled 24,638 tons of .22% ore.

HAYSTACK MT. DEVELOPMENT CORP. Section 19, 13-10 (Santa Fe R.R. Co.)

Sec. 19 belongs to the Santa Fe Railroad. When uranium was discovered he in 1950, Santa Fe organized the Haystack Mt. Dev. Corp. to explore and mine the property. The new road from the Bluewater mill to this Todilto Bench area was completed in Sept. 1954. The Bluewater mill had started processing limestone ore in Sept. 1953.

Haystack did considerable shallow drilling on closely spaced centers and managed to keep production at 150 to 200 tons per day until Feb. 1956 whe the operation turned to cleanup work. Some ore was mined from adits drive in from the edges of the old pits. Henri Dole obtained a lease on several Santa Fe sections to explore for and mine the remaining ore obtainable from open pits and he also recovered some ore that had been discarded in the waste piles.

Total production from Sec. 19 has been 137,310 tons of .20% ore. The firs production was in the 4th quarter of 1951.

HAYSTACK MT. DEV. CO. Section 25, 13-10

The surface and mineral rights to Sec. 25 were deeded to Santa Fe R.R. in 1917. Production from open pits started near the middle of 1951 from shallow open pits near the outcrop of the Todilto limestone. During 1956, 1957 and 1958 production from open pits averaged about 800 to 900 tons of ore per week. During this time, drilling on 50 to 100-foot centers progressed down dip exploring the Todilto limestone at greater depths. In Oct. 1958 a shaft was started and completed to a depth of 100 feet in Feb. 1959 Production through the shaft was started in March 1959 and all open pit work on Sec. 25 was leased to Henri Dole for clean-up. The Bluewater mill quit taking limestone ore on April 25, 1959 and Haystack ore was diverted to the Phillips mill.

The first production from the shaft came from stopes south and west of the shaft. Drilling indicated ore as much as 1600 feet east of the shaft and in Feb. 1960 the east drift had been driven 1200 feet to develop the ore. The operator planned to raise a shaft to the surface in the east end but later decided to drive an incline from the surface about 2500 feet east of the shaft. After sinking about 200 feet the blowsand they were working in caused so much trouble the incline was abandoned and filled. A drift from the shaft was driven to develop the east-end ore. By Nov. 1960 the drift to the east orebody was complete, a distance of 2600 feet from the shaft, and four underground trucks were used to haul ore to the shaft.

Production was about 4000 tons per month

The east ore pod was mined out by Feb. 1961 and after some remants in the shaft area had been mined Haystack shut down in June and sealed the shaft.

Farris Bros. started dealing for a lease on the underground ore at Sec. 25 shaft and Henri Dole continued his operations in the open pits. Farri Bros. started reopening the shaft in April 1963 and began production fro the shaft shortly thereafter. The reopening of the east drift revealed o in several places in the sides of the drift and longholing and surface drilling found moderate sized ore bodies both north and south of the dri Perhaps the only occurrence of pitchblende in the Grants area was found i a fissure that crossed the drift in a NW-SE direction.

In the latter part of 1965 surface drilling located ore adjacent to an o pit at the west end of the mine. An incline from the open pit was used t develop and mine the ore. These workings later connected with the stopes that were mined from the shaft. Surface drilling in the area north and north-east of the easternmost workings had discovered a rather large ton of ore that has never been developed.

As of 1-1-70 Sec. 25 has produced a total of 221,589 tons of .21% ore.

BARBARA J No. 2 (Dalco) Section 30, 13-9

The Dalco property was staked by Mid-Continent Uranium Corp. and leased to E.E. Lewis Mining Co., then subleased to Dalco Uranium Co. Dalco drille 50 holes to outline the deposit with a total of 10,000 feet of hole. The White Cap claims were contiguous on the west where Four Corners Uranium Co. drilled 70 holes for a total footage of 20,000 feet. Dalco started a 6' by 5' elliptical shaft in March 1957. Gene Bishop contracted the shaft.

The shaft was lined with concrete with steel wallplates and wood lagging. A station was cut at 160 feet in April 1957 when the shaft was 175 feet deep. The second station was cut at 230 feet in Entrada sandstone in May 1957. The shaft was completed at 280 feet in June and a drift was started north to the ore. Production started in Aug. 1957 at a rate of 20 tons per day. There was 551 tons produced in Aug. but the grade was only .11% and an attempt was made to raise the grade. Production in Sept. was 615 tons of .21% and 1242 tons of .20% in Oct. In Jan 1958 production was 250 tons per week of .23% ore with 9 men working, mining in the north part of the mine.

In Nov. 1958 the west cross-cut was in White Cap ground and in ore at 490 feet. The ore was high-grade but thin and spotty. Retreat operations in the north stopes started in April 1960 with 4 men in the mine on a single shift basis. The mine was shut down in Oct. and the equipment removed from the mine.

Dalco's mining project consisted of two leases, one lease was on the west part of the Barbara J Nos. 9-12 claims and the other lease was on the

White Cap Nos. 9-13 claims that joined the Barbara J lease on the west. The shaft was on the Barbara J. claims and the workings extended into th White Cap claims and ore was mined from both properties.

Dalco produced 29,580 tons of .19% ore and closed down for lack of a pro: itable operation. Of this total 5,070 tons of .18% ore came from the "hi Cap property. The mine was closed down until Dec. 1961 when Spahr and man started reopening the mine. Production started in Feb. 1962. Ore came from thin lenses left in the edges of the old stopes mined by the previou operator. In June 1963 a cross-cut was started to develop a body of ore discovered by drilling near the south boundary line. The ore in this area was later proven to be just small pods and not profitable to mine. Spahr and Allman closed the mine in Oct. 1964 after producing 16,680 tons of .22% ore.

BARBARA J. No. 1 Section 30, 13-9

The Barbara J. group of claims were staked by various parties but eventua came under the control of Mid Continent Uranium Co. In April 1956 Mid-Con tinent started a 3-foot circular shaft to go to 400 feet. In May 1956 pilot hole was drilled to 415 feet and was then reamed to 37 inches diam-

eter. The casing was on hand at this time but was not installed. The hole was making 50 gpm. The plan was to drill two holes, one to be used for hoisting rock and the other for men and materials. A 12-inch hole was to be used for the pump column and service lines. The bores for hoisting were started 10 feet apart but drifted an additional 50 feet apart in their downward course causing a delay in connecting the two at the 380-foot level. The first ore was shipped in Sept. 1956. Sudden large flows of water were experienced during stoping operations that delayed the work. In July 1957 the mine was abandoned and the surface plant removed later. Total production was 8691 tons of .20% ore.

BARBARA J. No. 3 Section 30, 13-9

The Barbara J. claims, 1-24 occupied all of the NW/4 of Sec. 30,13-9 and the N/2 of the NE/4 of Sec. 30, 13-9. It was later agreed that the west 1500 feet of the NW/4 was occupied previously by the White Cap 9-13 and this portion of the NW/4 was relinquished by the Barbara J. owners. The Dalco mine occupied a tract 600 feet E-W and 1860 feet N-S lying along the east line of the White Cap claims and extending 1860 feet north from the south line of the NW/4 of Sec. 30. The Barbara J. Nos. 1 and 3 mines occupied the ground in the NW/4 and the N/2 of the NE/4 not covered by the White Cap and Dalco properties described above. The White Cap claims were located between Dec. 16, 1950 and April 3, 1951. The Barbara J. 7 to 14 and 22 to 24 were located Oct. 4, 1951. There was drilling on Sec. 30 as early as Dec. 1954 and in late 1957 a DMEA drilling project was started on the Barbara J. claims. In July 1958 a 7-foot diameter circular shaft was started in the N/2, NE/4 of Sec. 30 on the Barbara J. No. 22 claim. The shaft was steel lined to 50 feet and 6-inch concrete walls the rest of the way. In Nov. 1958 the shaft was at 415 feet with the ultimate depth to be 470 feet. The shaft entered Todilto limestone at 400 feet. The first ore

was hoisted in March 1959. In July 1959 there were 20 men on the job, p: duction was 3000 tons per month and the south drift was 350 feet out fro the shaft. The mine was making 5 gpm. An ore pod, 19 feet thick, assayi 1% U_3O_8 was found about 150 feet south of the shaft. In Oct. 1959 a mini 10° incline was started to the northeast to develop ore north of the shaft. In Aug. 1961 much of the known ore had been removed and the opera ion was cut to one shift of about 15 men. In May 1962 a surface drilling program was started and about 100 holes were drilled with no significant ore discoveries being made. Operations were stopped on Aug. 25, 1962 and all underground tools except the pumps were removed. In May 1963 the les Williams Partnership, removed the headframe and hoist. A new lessee, F.M Wright and Assoc. bought the Malpais hoist and headframe and set it up over the shaft and started to unwater the workings. After shipping about 540 tons of .18% ore the mine was shut down again in Sept. and allowed t flood. In April 1964 Fife and Bailey leased the mine and started unwat Water flow in the mine had normally been about 10 gpm but after the Faith Mine, about 3500 feet distant from the Barbara J. No. 3 shaft, shut down their pumps the water flow increased to 50 gpm and by July 1964 the water inflow had increased to such a volume the pumps could not handle it and t project was abandoned with no production.

Williams Partnership produced 101,585 tons averaging .24% U_3O_8. Total pro duction for the mine is 102,128 tons of .24% ore.

ROUNDY LEASE, RIMROCK Nos. 1,2,3. Section 30, 13-9

The Roundy Lease, operated by the Rimrock Mining Co., occupies all of Sec. 30, 13-9 with the exception of the NW/4 and the S/2 of the SE/4, or about 320 acres.

Surface drills were operating on the property in April 1955 and had drilled 34,000 feet of 200-foot holes. Skidmore Mining Co. drilled 15,000 feet of holes and outlined an orebody. Four Corners Exploration Co. started an open pit on the shallow ore near the south edge of the property and in July 1955 were producing 50 tons per day. In Sept. 1955 the No. 1 shaft was started, to develop ore in the Todilto limestone that was about 100 feet deep. The first ore from the shaft was shipped in Jan. 1956 and in the meantime production continued from open pits on the property. In Feb. 1956 the lease and operation of the mine was taken over from Four Corners by the Rimrock Mining Co. There was some delay in operations after this transaction was made while control within the Rimrock Co. was settled. Operations were resumed in March 1956 and production of 350 to 600 tons per month was made until July 1957 when the reserves were nearly gone. Surface drilling in the meantime had discovered a 30,000 ton orebody about 350 feet NW of the shaft and in Aug. a drift was started to develop it. In Feb. 1958 ore shipments were changed from the Anaconda mill to the Homestake-New Mexico Partners mill. All ore in shaft No. 1 had been mined by March 1960 and the timbers were stripped from the shaft to be used in Rimrock No. 2 shaft that would be sunk about 1200 feet to the east. Shaft No. 2 was sunk to 115 feet and a station made at 106 feet. The first shipment from Shaft No. 2 was in June 1960. The change from Shaft No. 1 to Shaft No. 2 took about two months.

In Aug. 1961 the Shaft No. 2 orebody had been mined and a new orebody had

been found east of the shaft and a drift was started to develop it. Production was suspended during Aug. and Sept. while new ore was being developed and again in May and June of 1962 production had to be suspended while a drift was run to a new orebody. Of the three orebodies mined from Shaft No. 2 the first one produced 11,287 tons, the second, 5986 tons and the third 8326 tons.

crew generally consisted of three miners and a superintendent. Drifting on a one shift per day basis made about 10 feet per day. The drifts were in solid limestone and required no timber. Mucking and hauling was done with trackless equipment.

The last ore from Shaft No. 2 was mined in Feb. 1963 and a new shaft was started about 1200 feet to the north. Shaft No. 3 was sunk 235 feet to the bottom of the Todilto limestone. There was 65 feet of alluvium at the shaft site.

Rimrock suspended operations in Sept. 1964 and left all equipment in place In Nov. 1964 Fife and Bailey obtained a lease on the property and started mining ore from the edges of old stope in Rimrock No. 3 mine and planned to run a drift several hundred feet east to develop a small orebody discovered by drilling . The drift was never driven because surface drilling did not discover ore along the planned drift route to help pay for the project.

Production from the Roundy Lease to 1-1-70 has been 90,400 tons of .26% ore.

FLAT TOP MINE Flat Top 1-5 claims Section 30, 13-9

The 80-acre tract in the SE/4 of Sec. 30 is covered by five claims called Flat Top 1-5. All of the claims were located by Vilatie Hyde. Claim Nos. 4 and 5 were leased to Four Corners Explor. Co. under a lease dated Aug. 4, 1953. Four Corners started mining Flat Top 4 and 5 and then sold the lease to Holly Minerals Co. Later on Flat Top Mining Co. leased all of the claims and discovered ore. First production from 4 and 5 was in the second quarter of 1955 which was shipped by Holly Minerals to Anaconda. First production from Flat Top 1,2, and 3 was in Oct. 1957, shipped by Flat Top Mining Co. from No. 3 claim. The claims were numbered from west to east.

In April 1955 Holly Uranium was cutting a pocket in the incline they had driven and started production of ore in May or June. Production continued at about 75 tons per day until Oct. 1 and was then shut down for lack of market. Production was resumed in Nov. 1955 and continued until May 1957 when the mine was closed for lack of ore. Harmac Mining Co. leased the property to mine ore in the Flat Top 1-3 claims and were active in Oct. 1957. In Feb. 1958 the marketing point was changed from the Anaconda mill to the Homestake-New Mexico Partners mill. In March 1961 the claims had reverted to the locators and were then leased to KSN Mining Co. They did some drilling but did not get into production. Fife and Bailey began drilling the claims in May 1962 and started cleaning out the incline in Jan. 1963. A hoist was set up in Feb. and production started in April 1963. Ore was exposed in several places in the mine and there were ore holes from the surface beyond the edges of the stopes that soon developed into profitable orebodies. Fife and Bailey closed the mine in Sept. 1965.

Total production from the Flat Top claims to 1-1-70 was 49,663 tons of .22% ore. Of this amount Fife and Bailey produced 11,246 tons of .20% ore.

FAITH MINE Section 29, 13-9

The mineral rights to Sec. 29, owned by Santa Fe Railroad, was leased to Westvaco, a subsidiary of Food Machinery Co. of Pocatello, Idaho. It later developed that Nabor and Isabel Marquez owned the surface rights and in consideration were granted a 2% overriding royalty in addition to the royalty paid to Santa Fe.

The ore deposit was discovered in the latter part of 1955 with the aid of a DMEA drilling project. In April 1957 the shaft collar was concreted and by Oct. the shaft was completed to a depth of 460 feet. Water pockets were encountered in the shaft that caused flooding and delayed the work. The shaft had two 5'X 5' compartments.

Water flow after mine development started was about 450 gpm but it later dropped to 125 gpm. In May the lease was sold to Phillips Pet. Co. for a price reported to be $3,000,000. The sale also included the nearby Doris Mine. In June 1959 Kirchman, Spencer and Norinne formed the KSN Mining Co. to operate the Faith and Doris mines. In Nov. 1959 a 36" hole was drilled and cased about 1500 feet south of the Faith shaft to serve as an air vent and escapeway. Later when most of the mining activity was in the area south of the shaft the escapeway was used to hoist the ore. The drilled shaft, cased to 32",

In 1962 ore was discovered south of the drilled shaft in the area of State Road 53. The main shaft caved in Oct. 1962 and the mine was shut down and shaft repair work was started. During the repair work in the winter and spring of 1963 a surface drilling project was started to explore undrilled areas near the shaft. Some ore was found but most orebodies were not large enough to stand development costs.

The pumps in the main shaft were put back into operation in March 1963 and the mine was unwatered. The shaft repair work was completed in May but it was found that the drift between the two shafts was blocked by a large cave so all rock was hoisted through the drilled shaft and the main shaft was used for pumping and ventilation.

The surface drilling had indicated enough ore to make the shaft repairs worth while but it was soon discovered that the ore bodies were too small to pay to develop. The remaining ore pillars were being removed in Jan. 1964 and various parts of the mine were being long-holed in an effort to find more ore.

The hoist house at the drilled shaft burned down on Feb. 25. Shortly after the removal of equipment started and the mine was abandoned. The headframe at the main shaft was sold and removed in Aug. 1964.

After the shaft repairs the mine produced 5500 tons of .19% ore. Total production from the Faith Mine was 66,327 tons of .19% ore.

VALLEJO MINE Section 34, 12-9

The property consists of six claims located by Farris Bros. called Farri 1-4, Double Jerry and Eddie.

Drilling on the property was in progress in Dec. 1955 and some ore was found. An incline was started in Feb. 1957 which hit ore in the Todilto limestone at 480 feet in May 1957.

At 500 feet the incline was in ore six feet thick assaying .45%. The Samson Oil Co. obtained a lease on the Vall ejo Mine from Farris Bros. in May or June of 1959. The new operator widen ed the incline and put in a larger skip and built an ore bin at the surfa They also drilled more holes from the surface in an effort to enlarge the reserves. After shipping 1340 tons of .19% ore Samson Oil Co. terminated operations and sold their equipment.

Five partners called Penta Mining Co. obtained a lease and started reop ing the mine. Some ore exposed in the workings led to a small orebody. A longhole drilling program was started to find more ore but the results wer negative and the project was abandoned after shipping 1800 tons of ore av- eraging .14%.

Total production from the Vallejo has been 6422 tons of .17% ore.

MOE NO. 4, Section 32, 13-9

Section 32, 13-9 is a State section that was leased to United Western. The Moe No. 4 lease included the S/2 of the NE/4 of Sec. 32.

Four Corners Explor. Co. drilled the property for an interest in the State lease. The property was leased to E. P. Moe on Sept. 1, 1959 with a 8½% royalty to United Western and others. Moe engaged Four Corners to do some more drilling. In Sept. 1959 a -26° incline was started to go 530 feet to the bottom of the ore. In Nov. 1959 the incline was down 175 feet in wet sand. In Jan 1960 the incline hit solid ground, probably Summerville sandstone, at 220 feet with some water. In March the Todilto limestone was reached at 520 feet. There was about 5 to 6 gpm at the Summerville-Todilto contact. After the Todilto was penetrated the water flow increased and an electric pump was installed in May 1960. The timber in the aluvial sand and the Summerville part of the incline began to fail so sinking was stopped and all effort was put on repair work. By June 1960 the incline was repaired to the bottom but little more was done until April 1961 when a party from Monticello Utah took a lease to complete the incline and mine the ore. With seven men on the job only 15 feet of incline was driven in six weeks so the lease was relinquished in July 1961. During the rainy season of Aug. 1961 the collar of the incline caved and closed the entrance. In June 1962 Lloyd Sutton started repairing the incline to get to the bottom and complete the sinking to the ore. There was still 30 feet to sink to the bottom of the orebody. The water flow was in excess of 100 gpm and the sinking had to be suspended several times to repair the incline and pumps.

Sutton reported the first production of 50 tons of .50% ore in Jan. 1963. The termination of the lease was March 1, 1963 but in Feb. the lease was

extended and the work continued. By March 1, about 250 tons of ore had been piled on the surface but no outlet for the ore had been established. In April 1963 the ore was being delivered to the Homestake-Sapin mill. The mine was closed in May 1963 and all equipment removed. The operator reported there was still ore left in the workings but the operating costs were so high due to the volume of water and the high cost of operating through an inadequate incline.

Some of the ore may have been marketed under the name of another property but 2407 tons of .20% ore was credited to the Moe No. 4.

The five Moe inclines in the Grants District were named after E. P. Moe who came to the district about 1955. Moe No. 1 is generally considered to be the "A", or first adit driven from the edge of the pit on Haystack's Poison Canyon Mine on Sec. 19,13-9. Moe No. 2 was the Davenport incline started by Moe in Sept. 1956. The Gossett incline started in April 1958 was Moe No. 3 and Moe No. 4 was the incline Moe sank on Sec. 32, 13-9. Moe No. 5 is on Sec. 33, 15-11 in the West Ranch area which was started in Nov. 1959.

SECTION 4, 12-9

Sec. 4 was staked by various parties and explored and operated by several different companies and individuals.

The Christmas Day property was composed of several claims by that name along the east edge of Sec. 4 and were controlled and operated for a time by the Colomar Corp. They started operations in the latter part of 1954 and were mining limestone ores both in open pits and underground. Colomar ended their operation on this property in March 1956. The records show a production of 2625 tons of .18% ore from the Christmas Day Group but all of this may not have been produced by the Colomar Corp.

The Red Bluff 2,4,7,8, and 10 claims were located on Sec. 4 and the first operator was reported to be E and F Mining Co. Ore was found in Feb. 1954 and shipments started in April. In Dec. 1954 E and F Mining Co. sold the Red Bluff 8 and 10 to Amuranium Co. who drilled and found ore and started stripping for an open pit. In July 1955 Bolivar Uranium Co. was operating in the vicinity but it is not clear which property they were working on. The Red Bluff claims were idle for some time until Homer Scriven took over in late 1962 or early 1963 and drilled into some ore on the Red Bluff 4 at a shallow depth and started stripping and mining ore. This production continued intermittently until the fall of 1965.

A claim group known as the UDC 1-5 was located on Sec. 4. The owners discovered some ore and were prepared to mine it when Holly Uranium obtained control and mined the known ore and moved out. UDC then sold out to Trans-National Uranium and Oil Co. of Dallas, Texas. Later UDC reorganized itself and changed the name to National Uranium and Oil Corp. of Dallas and produced some ore from the property during the summer of 1955. The UDC group is credited with a production of 927 tons of .17% ore.

The Blackhawk-Bunny Group on Sec. 4 was being mined in mid-1954 by Malcolm-Larson Const. Co. In 1956 Bolivar Mining Co. produced some ore and in la 1957 and early 1958 Lloyd Sutton Jr. mined some ore from the Black Hawk claim. W.C.T. Engineering, later known as Astro Enterprises, started work on the claims in mid-1960 and produced some ore and then moved out of the area in 1961.

The Blackhawk-Bunny claims are credited with a production of 13,155 tons of .27% ore. All of the production from Sec. 4, 12-9 is reported to be 61,651 tons of .21% ore.

ANACONDA Section 9,12-9

One of the earliest sources of ore in the district was from the shallow limestone pits on Sec. 9. Production was continued by Anaconda until the spring of 1958. To 1-1-60, 60,561 tons of .15% ore had been produced. Farris Bros took over in Aug. 1960 and mined from open pits until July 1961 when they ran a short incline down on a roll of ore and drifted underground on the roll for several hundred feet until the roll led them to the surface again. During Sept. and Oct. 1962 a little production came from open pits and then the operation was shut down. Farris Bros produced 3864 tons of .16% ore.

LA JARA, ZIA Section 15,12-9

Some of the earliest uranium exploration in the district was done on Sec. 15. The ore occured in small high-grade pods in the Todilto limestone. The ore was shallow, 10 to 20 feet in depth, and cheaply explored. Considerable wagon drilling and trenching was done to locate the pods. Some values were found in the underlying Entrada sandstone. Several operators had control of the property up to 1960 and produced 3463 tons of .45% ore.

In early 1960 another lessee shipped 110 tons of .18% ore.

The Cedar No. 1 Sec. 20, 11-9 was a small limestone occurence of uranium NE of Grants, N.M. and isolated from the rest of the district. This property was also located by the La Jara Group and then sold to Yucca Uranium Co. The work, starting in 1955 terminated before 1960. Total production was 3093 tons of .22% ore.

The Lone Pine property in Sec. 8, 11-9 was developed by an adit into the west side of the East Grants Ridge. The uranium values were scattered and lowgrade and the latest report on it was in 1955. Total production was 392 tons of .13% ore.

ANACONDA F-33 Section 33, 12-9

Some uranium mineralization outcropped on the west side of East Grants Ridge in the Todilto limestone. An adit was driven in April 1955 and at about 100 feet shipping grade ore was found. Some drilling was done back of the outcrop that confirmed the extension of the ore into the mesa. In May 1957 when the adit was in about 1200 feet from the portal a fault was intersected that tilted the ore bed about 14° east. An incline was started to keep the workings on the ore. At 1700 feet from the portal another faulted area was found and after some exploration ore was found on the east side of this fault.

Anaconda's carbonate leach mill circuit that treated the F-33 limestone ore was shut down on May 25, 1959 and the F-33 mine was closed at this time.

An incline from the surface north of the east end of the mine workings was started on a -14° incline to intersect the east end of the mine to provide natural ventilation to the workings. The incline was completed in

early 1962.

The ventilation incline cut good ore for about 40 feet along its course. Longhole drilling indicates it may be another parallel trend about 200 feet north of the developed trend.

The mine has produced 48,688 tons of .13% ore.

This AEC report gives
some historical information
on the Hagstaff mine and
the mines on Section 30, T13N R9W

Pages 104 - 115