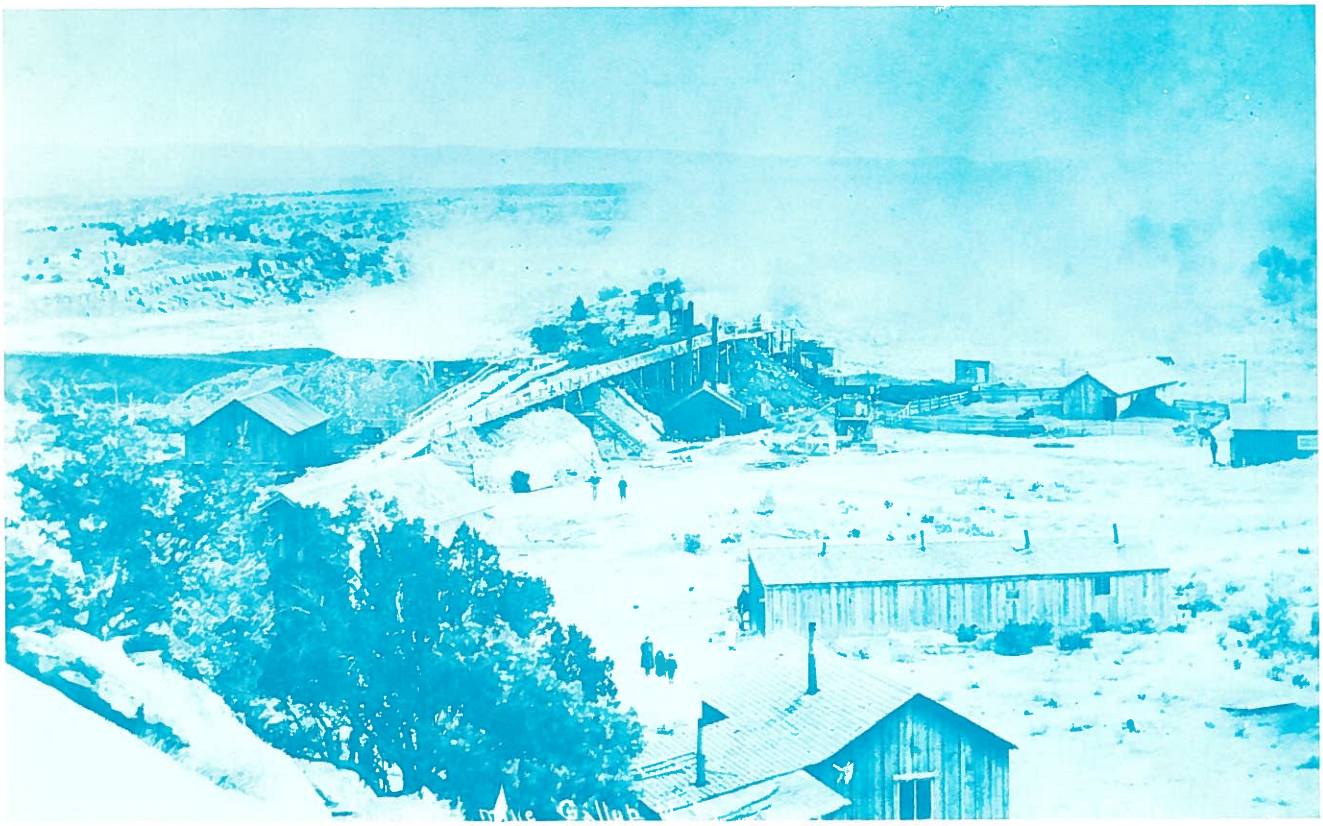
One hundred years of coal mining in the San Juan Basin, New Mexico

by Howard B. Nickelson



BULLETIN 111 New Mexico Bureau of Mines & Mineral Resources 1988

A DIVISION OF
NEW MEXICO INSTITUTE OF MINING & TECHNOLOGY

Bulletin 111

New Mexico Bureau of Mines & Mineral Resources

A DIVISION OF
NEW MEXICO INSTITUTE OF MINING & TECHNOLOGY

One hundred years of coal mining in the San Juan Basin, New Mexico

by Howard B. Nickelson

1209 Bryan Circle, Carlsbad, NM 88220
Formerly (now retired) Mining Engineer, U.S. Geological Survey

SOCORRO 1988

Original Printing 1988

Published by Authority of State of New Mexico, NMSA 1953 Sec. 63–1–4
Printed by University of New Mexico Printing Plant, March 1988

Available from New Mexico Bureau of Mines & Mineral Resources, Socorro, NM 87801

Preface

One hundred years of coal mining in the San Juan Basin was written to record the role that coal played in the history of the territory and state of New Mexico. Until now there has been no compilation of information on coal mines in New Mexico. Inevitably, as the years go by, more and more data relating to the century plus of coal mining in New Mexico are lost or destroyed. I have considered it important to compile and make available, both for the reader and for the record, this history of coal mining in the San Juan Basin. It is dedicated to the memory of the men who were crippled or who lost their lives in and about the coal mines of the state.

An invaluable contribution to this project was the Abandoned Mine Lands field work, conducted from April through November 1979 by H. B. Nickelson and Karl Frost, Geologist. In early March of that year the New Mexico Bureau of Mines and Mineral Resources entered into a cooperative agreement with the Department of the Interior's Director of Region V (Reclamation and Enforcement, Office of Surface Mining), which involved visiting the abandoned coal mines of New Mexico and developing plans to mitigate any dangerous conditions existing at those mines. I was contacted and agreed to examine the mine sites, locate the openings on suitable maps, photograph the sites, write memoranda of the findings, and make recommendations, if needed, for proper abandonment. With the help of field assistants Karl A. Frost and Marjory A. Nickelson, the project was completed, and the final reports were submitted in November 1979. The locations of many of the openings found are shown on USGS quadrangle maps in the text; observations made at the sites and some of the photographs taken are also included. Approximately 400 mines were examined; this number represents an estimate of more than 95% of the coal mines in the state. A great deal of historical information was collected for all the coal fields in the state, but because of practical considerations I decided that this bulletin would be a history of coal mining in the San Juan Basin only. It is hoped that this volume will be of use to the coal mining industry, federal, state, and local agencies, geologists, engineers, historians, and other readers.

Acknowledgments

This bulletin has been made possible through funding for its research, writing, and publication provided by the New Mexico Bureau of Mines and Mineral Resources, Dr. Frank E. Kottlowski, Director; this funding is gratefully acknowledged.

Before retirement from the Mining Branch, Conservation Division, of the U.S. Geological Survey in early 1978, I saw the need to compile and preserve coal mining records in one volume. This idea was discussed with Dr. Kottlowski, who was in agreement and authorized the project. The information on coal accumulated in the files, and the library of the New Mexico Bureau of Mines and Mineral Resources was made available to me, with Stephen J. Frost as Bureau Coordinator.

This project was discussed also with my supervisor, Al Czarnowski, Mining Supervisor of the Albuquerque office, USGS, and Andrew Bailey, Chief of the Mining Branch, USGS, Reston, Virginia, who generously allowed me to use the coal files that the USGS has kept since 1921 concerning coal on government and Indian lands. The compiling of this information began in early spring, 1978.

Operating coal companies contributed photos and historical information, and I wish to thank specifically Jim Olsen and R. C. Diederich, Utah International, Inc., at Fruitland; Charles McKinney, Pittsburg and Midway mine at Gallup; and Frank Mraz, Carbon Coal Company at Mentmore. Thanks are due also to Librarians Octavia Fellin, Gallup Public Library, and Orlando Romero, Southwest Resources, New Mexico State Library at Santa Fe, for their special help. Utah International, Inc., reviewed and corrected the manuscript for the Navajo mine and also provided a great deal of information concerning the San Juan mine. Appreciation is expressed to that organization. Thanks go also to Consolidation Coal Company for reviewing the report on their Burnham mine. I wish to thank James Hager, formerly of the USGS, for reviewing my manuscript, Gretchen Roybal for carefully updating portions of the text, and Deborah Shaw for the many hours she spent editing the manuscript.

This history would not have been written without the encouragement and hard work of Marjory A. Nickelson. She spent a great deal of time organizing the writer's handwritten script and typing the original manuscript; she deserves special thanks.

About the author

The author was born August 17, 1917, at Livingston, Montana. His early education was at a rural school, and he graduated from Park County High School at Livingston in 1935. He began college at Montana School of Mines at Butte, Montana, in the fall of 1936. Because of financial problems and World War II, graduation was delayed until the spring of 1948 when he received a B.S. in Geological Engineering. After graduation he spent two years with a small manganese mining company at Philipsburg, Montana, and one year sampling for the Anaconda Mining Company at Butte. In 1952 he began work as a geologist for the U.S. Geological Survey, under the Defense Minerals Exploration Administration (DMEA) program at Spokane, Washington. By 1957 this program had accomplished its purpose and was phased out so he moved to the Mining Branch of the USGS Conservation Division in Carlsbad, New Mexico. The Mining Branch administered leasable minerals on public lands and advised the Bureau of Indian Affairs on all minerals on Indian lands. The writer became familiar with potash, coal, and uranium in New Mexico and Arizona during his 20 years with this office; much of this work involved coal. In January 1978 the author retired from the USGS. He was accepted as a part-time consultant by the New Mexico Bureau of Mines and Mineral Resources to write this volume.

—Howard B. Nickelson
October 1986

Contents

Tables

Figures

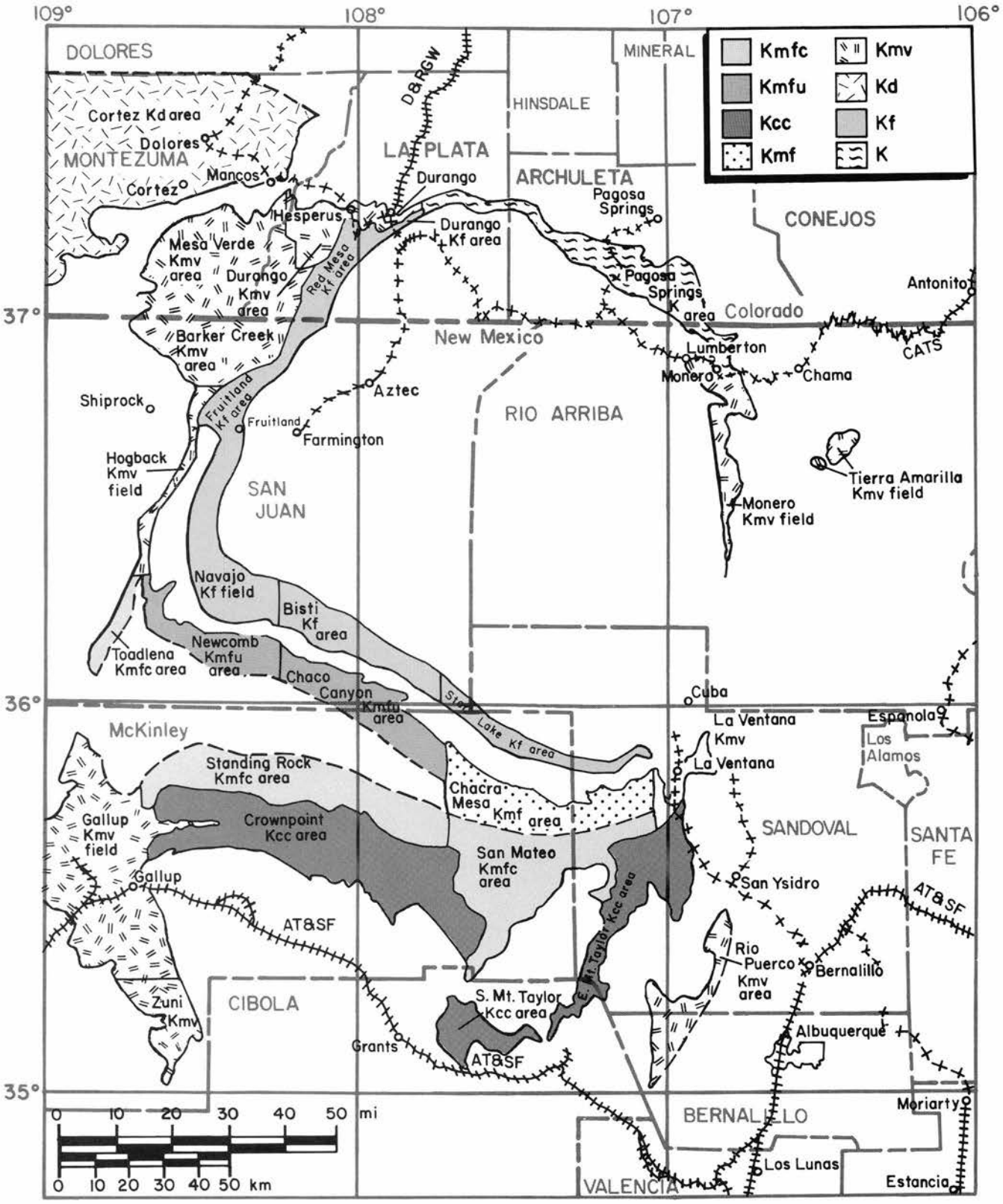


FIGURE 1—Coal fields of the San Juan Basin (after Shomaker et al., 1971). The railroads are explained in Figure 2. Legend: **Kmfc,** Cleary Member of the Menefee Formation; **Kmfu,** "upper part" of the Menefee Formation; **Kcc,** Crevasse Canyon Formation; **Kmf,** Menefee Formation; **Kmv,** Mesaverde Group; **Kd,** Dakota Sandstone; **Kf,** Fruitland Formation; **K,** Cretaceous rocks from Pagosa Springs.

Introduction

Coal was one of the reasons for the construction of the early railroads in New Mexico, providing in an unusual cycle both fuel to propel the engines and a sizable portion of the freight. Coal from New Mexico provided energy for the two World Wars. It attracted to the state fine, hard-working people of many nationalities whose families are now some of our best citizens. The growth and prosperity of the cities of Raton, Gallup, and Farmington stem partly from nearby coal mines. The coal industry provides a considerable amount of income to the state in the form of taxes and royalties (Table 1).

The first official documents concerning coal mining in New Mexico date from the 1880's, the decade of the advent of the railroads. Information on mines before the early 1890's was obtained from brief references in old U.S. Geological Survey (USGS) bulletins and government reports; the text reflects the paucity of data available then.

In 1892 the Territorial Mine Inspectors (TMIs) began their examinations of the coal mines in the territory, and their first published report was written for fiscal year (FY) 18941895. Recently, an unpublished TMI report, written by John C. Spears for FY 1892-1893, was found. The TMI reports continued until 1912, when the territory became a state. New Mexico then appointed State Inspectors of Mines (or State Mine Inspectors—SMI's), who have continued issuing annual reports to the present time. Information for this volume was compiled from TMI reports, SMI reports, USGS coal files, other federal and state government reports, company files, library research, search of pertinent literature, work in the coal fields, and interviews with individuals familiar with coal mining.

The statistics in this volume have been compiled from the annual reports of the TMIs and SMIs and from USGS coal files. Data concerning fatalities have been excerpted from the TMI and SMI records; the names of the deceased and the dates and causes of death are listed with the mine where the fatalities occurred. (t indicates at least one recorded fatality at a given mine.) Fatality records before 1892 were not found.

It was desired that information for each coal field include location and history, and that each mine location include name(s) of operator(s), dates of operation, mine maps, production, coal thicknesses, coal analyses, and photographs. Search of the literature has, of course, frequently yielded only small amounts of this information. A brief discussion of the railroads, which were vitally important to the coal industry, has been included in this introduction.

Fayette A. Jones provided both information on early dates in New Mexico coal history and an unusual description of the black substance. In his book *New Mexico mines and minerals*, Jones says (1904, p. 210):

> A lump of coal may be regarded as a receptacle in which a definite amount of energy from the sun has been effectually bottled up, throughout an indefinite period of time. In other words, a piece of coal may with propriety, be termed "a parcel of stored sunbeams."

According to Jones, the first mention of the existence of coal in New Mexico was in 1803, at which time Governor Chacon of the territory said, ". . . copper is abundant and apparently rich, though no mines are worked, though there is much coal of good quality" (Jones, 1904, p. 211). Jones (1904) stated that the first vein of coal opened in the state was in 1863 in the Carthage field at the "Government mine," so called because coal from it was hauled to Fort Craig during the Civil War. The second coal mined was in 1869 at Madrid in the Cerrillos field. In 1870 coal was known to exist at several other places, and approximately 400 tons were produced in New Mexico that year (Jones, 1904, pp. 211-212). Probably some of this production was used by blacksmiths in early-day settlements. It was possible for them to use charcoal in their forges, but they preferred blacksmith coal because of its greater heat; therefore small mines could have supplied this need if coal beds were nearby.

TABLE 1—Income generated from state coal leases and acreage of coal leases in New Mexico, 1976–1986.

	Income from state coal leases	Overall income in taxes from coal production	Acreage of state leases
1976	233,166	896,838	37,603
1977	323,344	3,237,739	43,626
1978	389,205	6,023,121	43,626
1979	387,028	8,084,657	43,626
1980	351,867	12,402,345	43,626
1981	408,569	19,974,876	60,414
1982	1,253,337	20,792,729	71,647
1983	2,359,868	21,308,978	71,647
1984	3,792,594	24,340,668	71,647
1985	910,266	26,308,891	68,022
1986	1,878,743	25,561,330	68,022

Mention is made several times in early literature of coal deposits known to exist in the San Juan Basin. J. L. LeConte, in his 1868 notes on the survey for the extension of the Union Pacific Railway from Kansas to the Rio Grande, reported coal at Tierra Amarilla and in the Rio Puerco field (Lee and Knowlton, 1917, p. 19). Jones (1904, p. 212) stated that in 1870 coal in the basin was known to be at the Rio Puerco, in the San Mateo Mountains, and several places west of Fort Wingate.

In his book, *New Mexico*, Elias Brevoort (1874) gave the location of other deposits in the basin; the most westerly deposit was near Pescado Springs, 15 mi east of Zuni. Three seams were found in the "Sarciño Cation," about 30 mi west of the Rio Grande. Interestingly, the cannel coal, which occurred near Acoma, was used by Indians for jet ornaments. Brevoort (1874, p. 90) also located coal at San Jose, 7 mi west of Cubero; on the San Felipe line, near Gavilan Pass, 20 mi from El Rito; near San Pedro, 60 mi west of the Rio Grande (again cannel coal); at Agua Azul; near Jemez; and near Fort Defiance, immediately west of the Sierra Madre.

Railroads and coal

It was not until the early 1880's and the coming of the railroads that the coal of the Gallup and Monero fields was developed. It then became important not only for its fuel but also as an item of freight, and in the case of the Santa Fe Railroad Company, extensive coal ownership was also involved. A brief history of the railroads affecting coal mining in the Gallup field from *Transportation and communications in New Mexico* (Boatright, 1966, pp. 4-5) follows.

> By an Act of Congress approved July 27, 1866, the Atlantic and Pacific Railroad Company was authorized to construct a line from Springfield, Missouri via Albuquerque, thence to the Colorado River and to the Pacific. A right-of-way two hundred feet in width was granted through all public lands, together with sufficient ground for station buildings, switching yards and shops. This right-of-way was to be exempt from taxation in all territories through which the road passed. The company was also granted every odd-numbered section of public land to the extent of twenty alternate sections per mile on each side of the line through the territories, and ten alternate sections per mile on either side through any state.

> The Atlantic and Pacific sold bonds and built some lines in Missouri, but in 1875 they defaulted the interest on their bonds and were forced into bankruptcy. Their holdings were sold to a group representing the bond holders, which lead (sic) to the organization on September 11, 1876, of a new corporation, the St. Louis and San Francisco Railroad Company. On December 6, 1879 the Santa Fe and the St. Louis and San Francisco Railroad Company entered into an agreement to jointly build a line from Albuquerque to California under the original Atlantic and Pacific Charter of 1866. Construction was started at Isleta, New Mexico during the summer of 1880, and by September 1881, 236 miles of track had been laid and the road was well into Arizona.
>
> By January 1882, Collis P. Huntington, who dominated the Southern Pacific, and Jay Gould, who controlled and was president of the Texas Pacific Railroad, had gained control of the St. Louis and San Francisco Railroad Company. These men realized that the Atlantic and Pacific, with the combined Santa Fe—St. Louis and San Francisco lines, would compete with the Huntington—Gould combination, and were determined to keep the Atlantic and Pacific out of California. Being in control of the St. Louis and San Francisco, they proposed that the Santa Fe abandon its plan to build into California and allow the Southern Pacific to construct a road from its main line at Mojave, California to the Colorado River near Needles, California, where a connection would be made with the Atlantic and Pacific. The Santa Fe was not agreeable to this proposal but was forced to accept it. Four weeks later the Santa Fe purchased the Sonora Railroad, which line extended from Nogales to Guaymas, Mexico, and on October 25, 1882 connection was made at Nogales with the New Mexico and Arizona Railroad which gave the Santa Fe a Pacific port outlet at Guaymas.
>
> The Atlantic and Pacific completed the line to Needles, and the Southern Pacific built from Mojave to Needles where connection of the two lines was made. This provided direct rail service between central and northern New Mexico and the Bay Area in northern California.
>
> The Atlantic and Pacific was sold on May 3, 1897 under foreclosure, and was acquired June 24, 1897 by the Santa Fe Pacific Railroad Company, a wholly owned subsidiary of the Santa Fe. The railroad property, not including land grants, was transferred to the Atchison, Topeka and Santa Fe Railway Company on July 1, 1902. The Santa Fe still holds the stock of the Santa Fe Pacific Railroad Company, and the latter company still owns the unsold land grants and the mineral rights involved in those which were sold.

After the railroads were laid across the coal fields of the San Juan Basin, large markets for coal became available. The commodity was sold as fuel for the rail lines and was shipped to other buyers for the operation of steam power units at base metal mines and mills, for steam turbines at electric powerplants, for steam engines at saw mills, and for domestic uses. The Gallup coal field immediately became important because it was the westernmost source of coal on the Atlantic and Pacific line that connected with other railroads encompassing a large area of potential customers.

Development of the many Gallup coal mines began, and during the past 100 years the railroad, now the Santa Fe, has transported coal from this field. In 1980, the coal shipped on the line from the McKinley mine and the Carbon Coal Company mine exceeded 4,000,000 tons per year. In 1984 Carbon's Mentmore mine produced 674,341 tons, and the McKinley mine produced 5,109,674 tons. In 1986 the Mentmore mine produced 401,399 tons, and the McKinley mine produced 4,798,744 tons. The Santa Fe Railroad Company, as has been noted, is the owner of a large land grant, which originally included about 13 million acres with 3.67 million acres in New Mexico, including the coal and iron mineral rights, which were given by Congress to the Atlantic and Pacific Railroad Company. This is the only land grant railroad in New Mexico.

The railroad, which was vital to coal mining in the Monero field, was discussed by Boatright (1966, p. 9):

> The Denver and Rio Grande Railroad constructed a narrow guage (sic) line from Alamosa, Colorado to Espanola, New Mexico in 1880. They also built from Antonito, Colorado to Chama, New Mexico in 1880, and continued this line to Durango, Colorado in 1881. The narrow guage (sic) line from Espanola to Santa Fe was started in 1882 but not completed into Santa Fe until 1886. The reason for the delay in constructing this line into Santa Fe is not known, but it was no doubt finances. In 1905 a standard guage (sic) line was built from Carbon Junction, near Durango, to Farmington, New Mexico, and in 1923 this line was converted to narrow guage (sic). Initially it was the vision of the promoters of the Denver and Rio Grande Railroad to create an international railroad from Denver, Colorado, through the Territory of New Mexico, to Mexico City, but they were diverted from this objective by the discovery and development of extensive ore bodies and other resources in many parts of western Colorado; eventually the management became more interested in a western connection to the Pacific coast.

The Denver and Rio Grande Railroad (DRGR), also commonly called the Denver Rio Grande and Western Railroad, to Farmington cut across the outcrop of the Fruitland Formation, but no coal of importance was ever shipped over the line from New Mexico. This line was constructed into New Mexico primarily to haul timber and livestock resources, and although needed as railroad fuel, coal played only a minor role in the freight shipped.

The Monero field was mined for more than 80 years, first at the village of Amargo from 1881 to 1894 and then at Monero from 1884 to 1963. The coal was of excellent quality, both for locomotive fuel and for domestic use, but competition was keen because of the availability of coal from other locations along the line in Colorado.

The La Ventana field also interested several railroad companies, which caused the impetus for coal mining in that area for a few years. Boatright (1966, p. 11) wrote about these companies and the railroad they built into this area; a portion follows.

> On August 16, 1920 the Santa Fe Northwestern Railroad Company was organized to construct a line from Bemalillo, New Mexico to La Ventana, New Mexico, a distance of 55 miles. The road was built to Porter, New Mexico only, a distance of 41 miles. Later the White Pine Lumber Company constructed a line from Porter to Deer Creek, 6 miles, and leased it to the Santa Fe Northwestern Railroad.
>
> On August 11, 1923 the Santa Fe Northern Railroad was organized and was to build a line from San Ysidro, New Mexico, where it was to connect with the Santa Fe Northwestern, to Cuba, New Mexico, a distance of 44 miles. This line was only built to a point two miles north of Tilden, New Mexico, a distance of 33 miles. This company finally went into bankruptcy and was sold under court order on September 5, 1928. On December 19, 1928 the Santa Fe, San Juan and Northern Railroad Company was organized to take over the Santa Fe Northern, and was to complete the line to Cuba.
>
> The Santa Fe Northwestern operated at a loss over the years and on February 8, 1933 applied to the Reconstruction Finance Corporation for a loan of $228,824 to rehabilitate the line. On April 4, 1933 the Santa Fe, San Juan and Northern also applied to the R.F.C. for a loan of $50,000. Both of these loans were denied. The Santa Fe, San Juan and Northern was abandoned and dismantled in the late 1930's, and the Santa Fe Northwestern was torn up in 1941.

Figure 2 shows the railroads that operated in New Mexico

from 1880 to 1963. The large reserves of coal in the Fruitland Formation far exceed fuel requirements for both present and projected powerplants, and a rail line into the area is needed to transport this commodity to outside markets. Two lines have been proposed from the main line of the Santa Fe, but to date both have been held up for right-of-way and/or political reasons. In 1985 problems of right-of-way across Navajo lands still posed a major stumbling block to building the Star Lake railroad. Then-Governor Anaya created a Transportation Authority Board that year, which was formed to promote construction of rail lines; however, nothing has come out of the board to date.

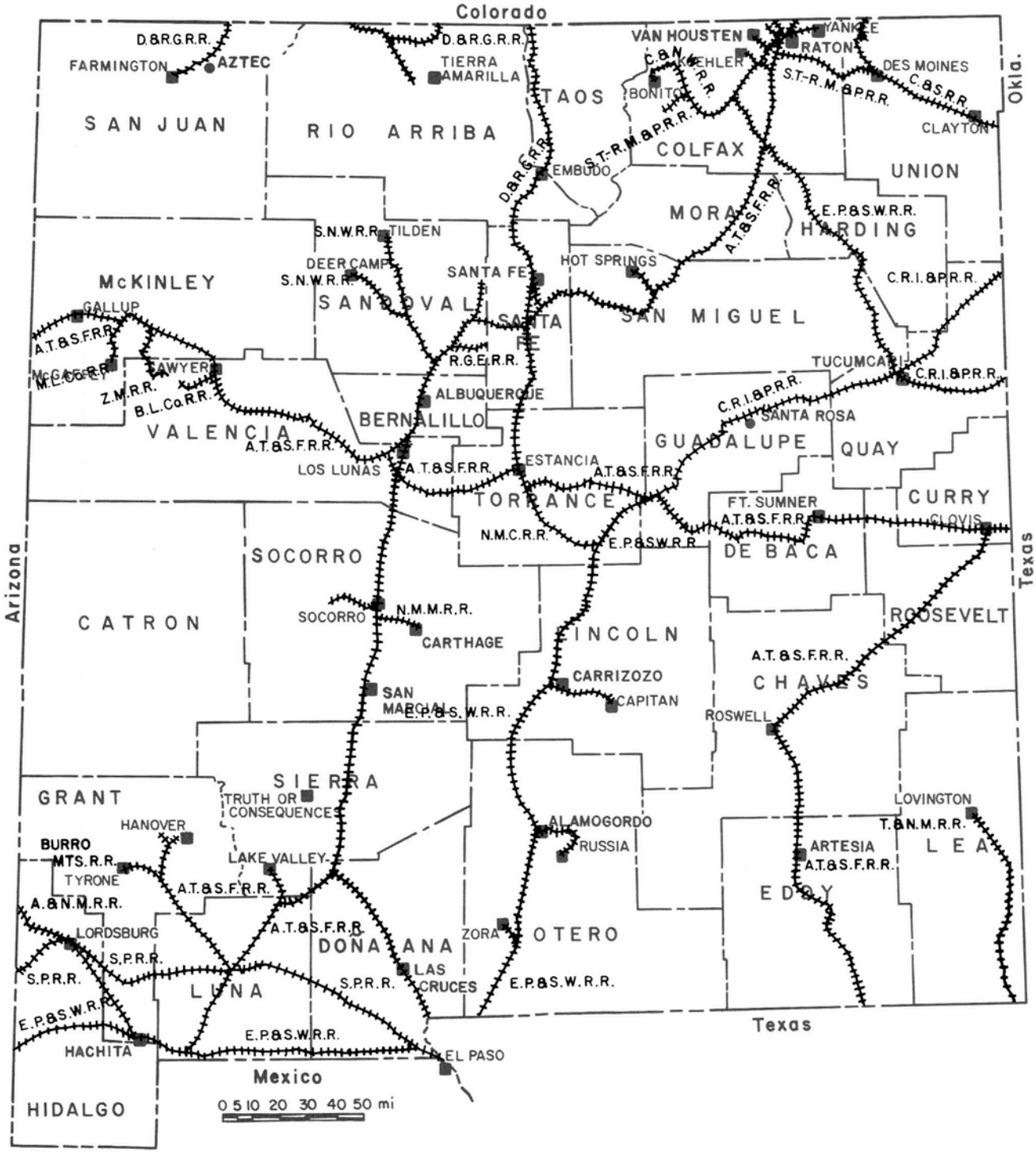


FIGURE 2—Railroads that operated in New Mexico from 1880 to 1963 (after Boatright, 1966). **A.&N.M.R.R.** = Arizona and New Mexico Railroad; **A.T.&S.F.R.R.** = Atchison, Topeka and Santa Fe Railroad; **B.L.Co.R.R.** = Bluewater Lake Company Railroad; BURRO MTS. R.R. = Burro Mountains Railroad; **C.&N.W.R.R.** = Cimarron and Northwestern Railroad; **C.&S.R.R.** = Colorado and Southern Railroad; **C.R.I.&P.R.R.** = Chicago, Rock Island and Pacific Railroad; **D.&R.G.R.R.** = Denver and Rio Grande (Western) Railroad; **E.P.&S.W.R.R.** = El Paso and Southwestern Railroad; **M.L.Co.R.R.** = McGaffey Lumber Company Railroad; **N.M.C.R.R.** = New Mexico Central Railroad; **N.M.M.R.R.** = New Mexico Midland Railroad; **R.G.E.R.R.** = Rio Grande East Railroad; **S.N.W.R.R.** = Santa Fe Northwestern Railroad; **S.P.R.R.** = Southern Pacific Railroad; **S.T.–R.M.&P.R.R.** = St. Louis, Rocky Mountain and Pacific Railroad; **T.&N.M.R.R.** = Texas and New Mexico Railroad; **Z.M.R.R.** = Zuni Mountain Railroad.

Obtaining coal lands

The right to mine coal from New Mexico lands has been obtainable in several ways. The first individual ownership of coal lands was made when Spain and later Mexico granted tracts of land, now known as Spanish land grants, to individuals or groups of individuals. These grants were protected by the Treaty of Guadalupe Hidalgo concluding the peace with Mexico, proclaimed on July 4, 1848. The treaty put more than 500,000 mil under control of the United States. Under terms of the treaty and purchase, the obligation to protect titles of land acquired under Spanish and Mexican rule was imposed on the government of the United States, and a land right valid before the cession was equally valid afterward. Registration and proof of these claims were covered by acts of July 22, 1854, February 28, 1861, and February 24, 1863 (Peele, 1941 sec. 24-03). The mineral and coal rights were retained by the owners of the grants. The Maxwell grant and several other grants were underlain with coal beds, and later important mines were developed on these lands.

The greatest area of coal in New Mexico is under public domain lands, which are administered by the various agencies of the federal government. The coal under these lands was first governed by a law approved on March 3, 1873 (17 Stat., 607), incorporated into the Revised Statutes as sections 2347-2352. George Otis Smith (1913, p. 27) explained this law and its amendments:

> Any qualified person [a citizen or one that is about to become a citizen] may purchase an area of coal land not exceeding 160 acres on payment of not less than $10 an acre if the land is more than 15 miles from a railroad and not less than $20 an acre if the land is within 15 miles of a railroad. An association of persons severally qualified may purchase 320 acres. An association of four or more persons who have opened and improved a coal mine upon the public lands and have expended not less than $5,000 in working and improving it may enter an area not exceeding 640 acres. No person may make more than one coal entry, either individually or as a member of an association, and no association, any member of which has previously exhausted his coal right, may purchase coal land. A person or association opening a mine on the public lands is entitled to a preference right of entry for the lands on which the mine is situated, provided that a "coal declaratory statement" is filed within 60 days from the initial date of actual possession and the commencement of improvements upon the land. This preference right is good for one year only. The operation of the law is restricted to surveyed lands, which must not be valuable for their content of gold, silver, or copper.
>
> For over 30 years after the passage of this law all coal lands were sold at the minimum prices of $10 and $20 an acre prescribed by the statute. Since 1907 the selling prices have been fixed by the [U.S.] Geological Survey and have ranged from the minimum prices up to $600 an acre.

The 1873 law had several disadvantages. One was that a 20-ft bed of coal could be obtained for the same price as a 3-ft bed of coal, and another was that land with no or only marginal coal could be obtained and then put to uses other than coal mining. It became evident that the government needed to retain control of the land and regulate and govern its uses.

On June 25, 1910, a law was approved entitled "An act to authorize the President of the United States to make withdrawals of public lands in certain cases" (36 Stat., 847; Smith, 1913, p. 43). The law was a confirmation of the right of the Executive Department to make land withdrawals; previously they had been made for coal, oil, phosphate, and power sites by the Secretary of the Interior without specific authorization by Congress. Immediately after enactment of this law large tracts of land in New Mexico and other western states were withdrawn by the President as valuable for coal. These withdrawals reserved the coal rights for the government regardless of any subsequent surface transaction. For example, homesteads and allotted Indian lands acquired after the withdrawals received surface but not coal rights.

The Leasing Act of 1921 allowed a qualified person or persons to acquire public domain coal lands in two ways. If the land was known to contain coal in workable quantities, competitive lease was involved. In this procedure the prospective lessee made application for a competitive lease to the Land Office, and a lease sale date was set; sealed bids were then submitted, and the highest bidder obtained a lease that gave him the right to mine coal from the land. The minimum bonus was generally set at $1.00/acre/year; and rent was usually $1.00/acre/year, credited to the royalty, which was 10-20 cents/ton. Except for great increases in money stipulations in the early 1970's, the competitive lease procedure remains approximately the same.

The second method of obtaining coal on government land was by prospecting permit—preference right lease. If the existence of coal on the land was not known, or if its workability was in question, an application could be made to the State Land Office requesting the right to prospect. If, after the permit was issued, prospecting showed the existence of coal in workable quantities within 2 years, an application could be submitted for a preference right lease; if further exploration was needed, the permit could be extended for an additional 2 years. After issuance of a lease, rent and royalty were assessed similar to those in a competitive lease.

Under the acts and regulations governing the classification of coal lands, the government retained the coal rights; mine facilities could be built on the land and access and egress were assured regardless of the surface ownership. The Conservation Division of the USGS, which is now part of the BLM, was made responsible for collecting the royalties and rents and for administrating the terms of the lease. These terms were readjusted every 20 years. There was no requirement regarding the operation of the lease, but the minimum production royalty and the rent had to be paid.

These are still the laws and regulations that govern coal on public domain, but in actuality all coal lands are now subject to competitive lease sale. Since the early 1970's few leases, either preference right or competitive, have been granted, and issuance has been and still is pending on applications for preference right leases on thousands of acres of coal land, including about 76,000 acres in New Mexico.

Some competitive lease sales have been held, but unpublished minimum bonuses have been so high that the sealed bid offers fell far short of the amounts recommended by the USGS and the BLM. Safety laws enacted in 1969 closed the small truck mines soon after enactment because the owners could not afford to abide by the requirements and fines, but large strip mines continued to operate. Since 1972 no new mines on public domain lands in New Mexico have been opened. There has been a moratorium on federal leasing since 1971. The moratorium was lifted from January 1981 to September 1983, but has been reinstated (Anderson and Wolberg, 1987).

The acquisition of government lands by states began when the Continental Congress declared in about 1785 that each state created out of the public domain would be given a certain portion of each township in the state. The proceeds from those portions were to fund public education. By precedent, section 16 became the common state school section, but one or all of sections 2, 32, and 36 may also be state land. In addition, the states can acquire indemnity lands as the need arises (Smith, 1913, p. 29). The lands given were generally nonmineral, but if minerals were found after the

state acquired the land, the mineral rights went with the land.

On coal-bearing lands, the state of New Mexico generally has the same rights on state sections, and the lands are available for lease by individuals or companies. Before about 1968 terms of the leases were negotiable if competitive interest was not shown, but since that time the lands have been leased through competitive bid sales. Income from state coal leases and acreage of the leases are shown in Table 1 for the years 1976-1986.

Coal mining on Indian lands, which was originally under the auspices of the Bureau of Indian Affairs (BIA), supplied fuel for the early-day schools, offices, and related facilities. Subsequently, individual coal permits were granted to Indians to open small wagon or truck mines to furnish coal locally. Coal and mineral rights were granted to the Indians on all reservations. In New Mexico, there is a large minable reserve of coal on the Navajo Reservation, a small amount of minable coal on the Zuni Reservation, and occurrences of coal on the Jicarilla and Acoma Reservations.

In the late 1950's the Navajo Tribe began the procedure of negotiating with industry about prospecting or drilling permits on the tribe's coal lands, and options were granted for the acquisition of negotiated leases with the approval of the Secretary of the Interior through the BIA. Two of the largest strip mines in New Mexico, the Navajo and the McKinley, are in operation as a result of negotiated leases.

The mine inspectors

With the coming of the railroads to the territories in the West, numerous coal mines were opened along the routes to fuel the engines. The need arose, consequently, for protection of the miners' safety and regulation of the operation of the mines.

Therefore, on March 3, 1891, federal legislation was enacted to provide for the hiring of Territorial Mine Inspectors by the Secretary of the Interior. The duties of these officials, who were men well experienced in the operation of coal mines, were: 1) to inspect the mines for safety, 2) to make safety regulations and enforce compliance with them, 3) to determine the causes of injuries and fatalities, 4) to compile production and employment statistics, and 5) to submit annual reports to the Department of the Interior.

John C. Spears was the first of these men to advise the industry on the protection of the mines and the safety of coal miners in the territory of New Mexico. He began his duties on September 5, 1892, and on August 31, 1893, he submitted a report of his findings to Governor W. T. Thornton in Santa Fe. No reports could be located for FY 189394.

The next inspector, John W. Fleming, established his office in Silver City and published a territorial mine inspection report for FY 1894-95. Fleming traveled by train to the towns nearest the coal fields of New Mexico and then, hiring a horse and buggy, continued his journeys to the mine sites. He stayed either in accommodations at the mines or in hotels in nearby towns. A dedicated and highly respected civil servant, Mr. Fleming served the industry well until June 30, 1900.

Jo. E. Sheridan became the next Territorial Mine Inspector. He also served with dedication, writing excellent annual reports, describing the mines, and providing many statistics. Mr. Sheridan served the coal mines in the territory from 1900 to 1912, when the newly created state of New Mexico hired Rees H. Beddow as State Inspector of Mines (or State Mine Inspector—SMI).

Mr. Beddow moved the office to Gallup, and he began the practice of ending the report year on October 31 instead of on June 30. During his term of office, an explosion at the Stag Canon No. 2 mine at Dawson on October 22, 1913, killed 261 men. Mr. Beddow was able to determine the cause of the explosion, and he wrote a detailed account of this catastrophe. Mine Inspector Beddow served until 1915.

W. W. Risdon was then appointed by Governor W. C. McDonald, and the office was moved to Albuquerque. Mr. Risdon served until March 17, 1919, when Jo. E. Sheridan, formerly a Territorial Mine Inspector, was appointed by the Governor to be State Mine Inspector. His tenure was brief because he died suddenly on July 15, 1920, and Mr. Risdon was returned to the position.

During 1920 and 1921 the coal companies experienced hard times because of a severe postwar slump in the market. Also, changes were taking place in the industry. Many of the European miners were quitting; they were replaced by untrained Mexican workers or by mining machines. Improved safety devices and methods were being tried; schools were established to train inexperienced miners, and permissible explosives, rock dusting, and electric cap lights were being used. New safety laws and regulations, the administration of which was the responsibility of the mine inspector, were established.

Another serious mine explosion occurred at the No. 1 mine at Dawson on February 8, 1923, at 2:30 a.m. It killed 120 men. Mr. Risdon helped take charge of the rescue operations and determined the cause of the explosion.

Mr. Risdon served through fiscal year 1924, and Warren Bracewell was then appointed State Mine Inspector. By 1925 most of the large companies were using permissible explosives, and they were rock dusting their mines. Mr. Bracewell served 2 years, and Mr. Risdon was again appointed Mine Inspector. The industry was commended at this time. According to the U.S. Bureau of Mines and prominent mining engineers and mine officials, the coal mines in New Mexico ranked with the best in the country in safety and first aid training, and many of the state's mining practices were adopted by mines elsewhere. Mr. Bracewell was again appointed as Mine Inspector in 1930. During the depression there were many miners out of work, and some of these men opened small wagon or truck mines to provide a living for themselves and their families.

In 1933 the state of New Mexico passed laws prohibiting the publication of the valuation and production of individual mines. On September 12, 1933, the State Mine Inspectors were also made responsible for safety at mineral mines. Miners were required to take examinations to qualify them for positions as foremen, assistant foremen, mine examiners, and shot firers. Gassy and nongassy mines were to be classified according to the new mining laws enacted that year.

Mr. Bracewell served as State Mine Inspector through fiscal year 1945, and John Anthony Garcia succeeded him. In the 36th annual report, for the period ending June 30, 1947, Mr. Garcia provided information on a new method of roof support being used with success at the Koehler mines in Colfax County; it consisted of drilling uniformly spaced holes in the roof and placing specially designed bolts in the holes to form a bridge of rock across the openings to support the overlying strata.

William H. Hays succeeded Mr. Garcia as State Mine Inspector in 1958. By that time coal production in the state had fallen to a record low of 85,512 tons per year, and most of the mine inspector's work was in the state's metal and nonmetal mines. By fiscal year 1962 coal production had risen to 593,000 tons, and the following year production reached 2,261,000 tons. The era of the great strip mines had begun. Mr. Hays' report for 1963 included the last 6 months of 1962 and all of 1963, and since then reports have been made for each calendar year.

The Mine Safety Act, passed by the federal government in 1969, proved so harsh that all of the small truck mines

in New Mexico were closed by the early 1970's; the operators could not afford the expensive safety equipment required and the fines assessed for noncompliance. In view of the safety record of these small truck mines over the years, it was an eminently unfair law.

Mr. Hays suffered ill health, and his Deputy, Joe D. Longacre, was made State Mine Inspector in 1973. He held this position until his retirement in 1981, when Felix Carrasco was appointed. Manuel Duran was appointed State Mine Inspector in 1984. The office was moved to Socorro in 1987 when Desi Apodaca was appointed to the position.

The reports of the Territorial Mine Inspectors contained a wealth of information, as did those of the State Mine Inspectors until about 1920. At that time there began a marked decrease in the amount of data given, especially concerning small mines. Tonnage figures quoted during the period when New Mexico law prohibited the publication of production records from individual mines (1933-present) were taken from other sources. The historical information concerning mines on fee (private) and state lands from about 1930 to the 1970's was obtained almost entirely from State Mine Inspector annual reports; these reports listed the operator's name and address, labor statistics, fatalities, and county and state production figures. Consequently, reports on the mines during these 40 or so years are not as descriptive as those concerning earlier mines.

After the Leasing Act of 1921, which designated leasable minerals of which coal was one, the U.S. Geological Survey, Mining Branch, Conservation Division, was formed to administer permits and leases on federal lands and to collect royalties due the government. U.S. Bureau of Mines Safety Inspectors also periodically inspected coal mines operating under federal leases and made safety recommendations to the mining engineers of the USGS. The Mining Branch kept excellent files on each coal lease or coal prospecting permit, and production figures for most of the mines on federal land in New Mexico are given in this volume.

Economics

The economics of coal mining from the 1880's to the late 1960's were rather simple; they followed the principles of supply and demand and availability of transportation. The cardinal rule of mining was followed with successful operations: coal sold had to make a profit.

By the late 1960's these simple economics were changing. That period, which included public concern for the environment and demand for more stringent safety rules by labor groups, encouraged both the federal and the state governments to impose restrictive laws and regulations on coal mining. These, combined with increased taxes, put the small independent truck miner out of business. And the era of the million-tons-or-more-per-year mines began.

Past economics of the coal industry are discussed herein, but predictions for the future are politically complicated. Large strippable reserves in New Mexico contain enough coal to last, at the projected rate of mining, for more than another 100 years, and deep underground reserves could be mined for many additional years. The ever-increasing demand for energy will tend to soften the restrictive era of the 1970's and enable coal mining to have a viable future as one of the important industries in New Mexico.

Mine headings

Considerable information is given (in bold-face type) after the mine name(s) in each chapter. An example of a heading for a mine on fee (private) lands follows.

Mulholland-Casna and Diamond-Allison mine+ Gus Mulholland, 1895-1899
Andrew Casna, 1900-1902
F. J. Allison and W. A. Patching, 1907-1910
Diamond Coal Company, 1910-1939
Mulholland-Casna-5,200 ft NL, 3,300 ft EL, sec. 18, T15N, R18W (GW-45, Fig. 15)
Diamond-Allison-4,400 f+ NL, 3,000 ft EL, sec. 18, T15N, R18W (GW-46, Fig. 15)

The chapter heading contains the name(s) of the mine used during its productive life. A cross after the heading informs the reader that at least one fatality occurred at the mine. Listed next are owners or lessees, followed by date(s) of ownership. The location(s) of the main entry or entries is (are) given next, generally in feet from the north line (NL) and feet from the east line (EL) of the section, followed by township and range. If the mine location(s) is (are) shown on a map in the text, the appropriate designation(s) and figure number(s) are given in parentheses at the right side of the heading (GW-45, Fig. 15).

A chapter heading for a coal mine on federal land is somewhat different; an example follows.

Black Star-Mutual mine

SF 056206 8-2-28 Permit
9-22-33 Lease
Peter Pavioni, Gallup
S1/2 sec. 30, T15N, R18W
Paul D. Henderson, Gallup
SE1/4, NE1/4SW1/4 sec. 30, T15N, R18W
Black Star Coal Company, Gallup
S1/2 sec. 30, T15N, R18W
Mutual Coal Company, Gallup
S1/2 sec. 30; W1/2NE1/4, SE1/4NW1/4 sec. 31; W1/2, SE1/4 sec. 32, T15N, R18W, 920 acres
3,300 ft NL, 3,600 ft EL, sec. 30 (TB-1 and 2, Fig. 15)

After the mine name(s) are letters and a number, the date(s) of issuance, and the designation of permit or lease. The letters and number represent the case number given to the permittee or lessee when application was made for the permit or lease. These cases are still filed under this designation at the Bureau of Land Management (BLM). (Coal permits and leases are not the only case numbers; the land office gives numbers to all land transactions consecutively as applications are filed.) The letters SF or LC represent Santa Fe or Las Cruces, depending on where the land office was located at the time of issuance. Later, when the land office came under the direction of the BLM, the letters NM were used. Names and addresses of permittees or lessees are given in the heading next, usually followed by descriptions of the lands under the permit or lease. The location(s) of the main entry or entries and a reference to a map in the text (TB-1, Fig. 15) are given when available in the last line.

There are a few mines described in the text that are state leases. State leases are designated by the letter M and a number. Names, dates, and locations are given as described above for fee and federal mines. The information regarding state leases was obtained from the federal coal files on state lands contiguous to federal lands held under coal lease.

TABLE 2—Production and employment in the San Juan Basin by county; production and employment totals for the San Juan Basin; and production and employment totals for the state of New Mexico, 1882–1986. The county figures do not add up correctly in the totals given because many of the published figures for coal were calculated on a calendar-year basis. However, the Territorial Mine Inspector's reports were made on a June–July fiscal year and, after 1912, some of the State Mine Inspectors used an October–September fiscal year. Also, the coal was weighed as it came out of the mine at the tipple. Some of that coal was used at the mines to run them; therefore, some of the coal counted in the production figures was actually burned on site and never sold. Company sales usually do not equal the production totals. **NA,** not available; **NM,** no mining; ***,** mine under development, no production.

Year	McKinley County (tons)	People employed	Rio Arriba County (tons)	People employed	San Juan County (tons)	People employed	Sandoval County (tons)	People employed	San Juan Basin production totals (tons)	People employed	New Mexico (tons)	People employed
1882	33,373	220	12,000						45,373		164,000	485
1883	42,000		17,240						59,240		211,000	600
1884	62,802		11,203						74,005		221,000	600
1885	97,755	700	14,953						112,728		306,000	700
1886	106,530		7,000						113,530		271,000	750
1887	275,952		11,000						286,000		508,000	995
1888	300,000		12,000						312,000		626,665	850
1889	233,059		14,000		600				248,000		486,943	1,090
1890	181,647	375	12,000		600				194,000	375	420,000	827
1891	77,000										462,328	806
1892	249,000		21,000		200				270,000		661,330	1,083
1893	279,000	372	15,500						295,000		665,094	1,011
1894	248,172	526	22,793	33					271,000	559	597,196	985
1895	277,429	515	20,852	25					298,000	545	653,260	1,659
1896	287,879	611	4,370	22					292,000	630	666,619	1,442
1897	275,937	567	21,400	23	1,825				299,000	590	733,539	1,323
1898	372,611	927	22,500	45					395,000	972	858,583	1,858
1899	444,569	942	39,000	45	810	6	NM		484,000	993	1,049,034	1,880
1900	548,150	971	35,306	63	500	3	NM		583,000	1,034	1,187,334	2,015
1901	531,215	1,047	51,600	66	425	5	NM		583,000	1,118	1,217,530	1,870
1902	561,436	727	50,600	51	1,500	3	NM		614,000	781	1,132,944	1,682
1903	539,910	610	39,100	61	1,800	5	NM		581,000	675	1,359,530	2,341
1904	537,812	700	42,000	58	1,840	8	970	20	582,000	766	1,638,041	1,972
1905	461,780	645	42,523	64	4,750	27	1,500	16	509,000	736	1,534,298	2,132
1906	548,149	617	46,000	54	2,147	3	1,000	3	596,000	674	1,794,228	2,354
1907	615,847	701	45,623	72	2,492	5	2,618	14	664,000	778	2,302,062	3,059
1908	581,547	901	22,022	76	3,850	8	5,000	10	607,000	985	2,567,210	3,765
1909	627,376	807	9,779	29	3,145	14	1,000	5	640,000	850	2,781,089	3,231
1910	737,925	686	13,850	46	3,198	14	NM		755,000	746	3,293,487	2,861
1911	725,767	824	8,500	20	3,200	10	NM		737,000	854	3,378,018	3,563
1912	236,844		NA		600	2	NM				3,537,000	
1913	691,551	957	NA		900	2	NM		692,000	959	3,634,217	4,025
1914	741,156	1,039	9,000	15	3,656	9	NM		750,512	1,063	3,826,885	4,021
1915	758,559	1,098	7,207	12	4,400	21	NM		763,666	1,100	3,858,554	4,609
1916	755,262		3,960		NA		NM		759,222		3,893,185	4,064
1917	689,283		5,000		3,050		NM		694,333		4,113,544	5,505
1918	751,789		16,000		9,500		NM		777,289		4,037,726	4,873
1919	742,102	1,018	8,727	20	5,768	19	500	6	757,097	1,063	3,272,129	3,450
1920	770,348	1,110	12,996	19	783	2	NM		784,127	1,148	3,511,720	4,367
1921	565,327	1,220	11,044	24	3,500	13	NM		579,871	1,257	2,697,840	4,325
1922	613,194	1,247	31,327	75	3,500	15	NM		648,021	1,337	3,132,430	4,524
1923	853,501	1,386	24,985	75	7,500	15	NM		885,968	1,476	3,636,616	4,671
1924	862,395	1,330	15,000	70	6,000	NA	NM		883,395	1,400	2,777,655	3,795
1925	811,142	1,211	30,000	40	7,000	NA	13,666	92	861,808	1,343	2,616,855	3,833
1926	778,216	1,003	33,000	41	9,000	NA	7,557	30	827,773	1,074	2,792,360	3,299
1927	803,408	1,004	31,481	69	5,000	28	23,215	46	863,104	1,147	2,949,891	3,403
1928	774,193	1,082	36,706	81	10,000	25	20,000	40	840,899	1,213	2,834,989	3,522
1929	905,959	1,116	30,000	90	8,000	20	16,349	35	960,308	1,261	2,632,165	3,107
1930	801,047	1,829	18,456	24	5,375	13	9,696	26	840,878	1,954	2,083,073	3,479
1931	595,922	1,073	25,000		4,000		15,000	37	639,922	1,110	1,613,414	2,652
1932	507,430	943	13,940	36	4,000	14	11,890	29	535,370	1,023	1,312,565	2,353
1933	441,435	832	18,845	38	2,803	9	2,456	19	465,539	898	1,198,266	2,211
1934	437,794	875	20,908	46	3,214	12	2,898	30	464,818	963	1,256,023	2,258
1935	462,805	873	23,584	45	1,615	8	7,257	34	495,261	960	1,307,052	2,280
1936	560,281	935	28,064	55	3,576	11	7,702	20	599,623	1,021	1,522,989	2,311
1937	686,329	1,136	20,754	41	2,400	5	3,711	19	713,194	1,201	1,750,999	2,512
1938	447,145	963	44,115	31	1,868	5	3,191	NA	496,319	999	1,239,716	2,345
1939	428,051	875	15,668	35	4,298	15	5,137	23	458,654	962	1,235,980	2,276
1940	367,141	754	17,899	41	1,024	7	2,315	12	391,287	828	1,069,000	1,992
1941	476,504	781	28,733	60	1,233	6	2,100	10	511,894	874	1,190,280	1,746
1942	586,835	812	16,205	43	1,437	13	1,694	5	609,514	886	1,578,718	1,830
1943	552,112	755	23,024	34	1,887	13	7,966	31	588,901	838	1,804,872	1,890
1944	484,442	650	20,719	47	1,182	4	11,493	33	521,075	740	1,753,500	1,752
1945	214,977	356	18,200	51	1,490	6	10,438	37	245,105	450	1,397,414	1,334
1946	187,349	296	20,110	32	2,174	8	5,063		263,077		1,315,199	1,378
1947	143,407	256	20,563	34	5,000	8	3,118	15	172,088	313	1,430,532	1,320
1948	161,878	286	24,964	37	11,301	18	4,676	18	202,819	359	1,416,099	1,350
1949	163,709	259	25,470	42	4,326	11	9,280	23	202,785	335	1,390,032	1,371
1950	90,002	216	23,973	48	4,057	13	5,854	19	125,328	300	735,405	1,036
1951	80,377	196	22,973	38	3,036	7	6,744	9	114,218	252	769,839	833
1952	74,819	121	19,351	34	3,849	11	3,315	12	102,885	182	844,095	768

TABLE 2, continued

Year	McKinley County (tons)	People employed	Rio Arriba County (tons)	People employed	San Juan County (tons)	People employed	Sandoval County (tons)	People employed	San Juan Basin production totals (tons)	People employed	New Mexico (tons)	People employed
1953	47,616	72	15,677	35	3,507	12	2,098	5	70,157	129	676,709	719
1954	34,794	70	13,749	29	2,980	9	2,579	9	58,012	121	255,399	360
1955	43,226	43	14,996	31	2,334	7	2,813	9	63,684	90	143,216	174
1956	45,780	40	16,361	25	3,700	10	3,459	11	69,615	86	153,416	189
1957	28,315	31	16,352	28	420	4	2,645	12	47,732	75	128,354	192
1958	32,325	29	14,888	26	1,214	10	2,499	5	50,926	70	85,512	203
1959	38,094	40	10,151	33	1,393	8	1,306	10	50,944	91	113,046	248
1960	35,858	36	8,881	18	1,236	4	1,188	4	47,163	62	235,068	238
1961	31,671	21	6,675	16	2,206	5	2,069	6	42,621	48	279,021	201
1962	207,913	60	6,319	16	3,190	5	2,059	9	214,232	90	592,869	276
1963	488,229	65	3,848	14	1,200,763	68	1,903	6	1,688,992	153	2,260,303	315
1964	NA	40	NA	7	NA	92	NA	4	2,639,898	143	3,354,917	280
1965	NA	41	NA	5	NA	104	NA	4	2,785,183	154	3,519,265	287
1966	NA	38	NA	2	NA	112	NA	3		155	2,933,757	287
1967	NA	38	NA	1	NA	114	NA	3	2,766,124	156	3,596,488	298
1968	NA	39	NA	1	NA	124	NA	3	2,665,069	167	3,358,793	304
1969	440,808	40	NA	1	NA	191	NA	5	4,104,064	237	5,130,653	391
1970	385,400	43	NM	1	NA	256	NM	NA		300	7,643,319	447
1971	421,005	40	NM	NA	6,665,000	325	NM	NA	7,086,005	365	8,175,059	576
1972	397,020	37	NM	NA	6,816,000	361	NM	NA	7,213,020	398	8,248,745	643
1973	463,289	51	NM	NA	7,676,000	448	NM	NA	8,139,289	499	9,350,156	761
1974	609,417	68	NM	NA	7,050,688	449	NM	NA	7,660,105	517	9,668,700	839
1975	468,000	96	NM	NA	7,318,449	468	NM	NA	7,785,449	564	9,559,920	982
1976	914,338	93	NM	NA	7,979,906	511	NM	NA	8,894,294	604	9,980,322	1,051
1977	1,529,200	124	NM	NA	9,265,447	587	NM	NA	10,794,647	711	11,895,411	1,099
1978	3,132,958	299	NM	NA	8,713,038	644	*	NA	11,845,996	943	12,783,152	1,384
1979	4,088,462	530	NM	NA	9,203,534	488	4,466	NA	13,296,462	1,018	14,635,972	1,527
1980	5,636,041	556	NM	NA	12,323,829	878	15,748	NA	17,980,820	1,434	19,480,820	1,964
1981	5,960,900	599	NM	NA	11,223,145	825	NA*	18	17,520,666	1,424	18,793,666	2,090
1982	6,416,400	592	NM	NA	12,369,880	829	37,000	4	18,823,176	1,421	20,133,534	1,857
1983	5,281,545	489	NM	NA	14,518,558	801	21,125	NA	19,821,228	1,307	20,436,228	1,646
1984	6,074,257	644	NM	NA	13,753,697	818	NM	NA	19,837,920	1,462	21,222,803	1,838
1985	7,503,716	740	NM	NA	12,325,600	907	NM	NA	19,829,316	1,647		1,993
1986	6,725,728	720	NM	NA	12,871,155	875	NM	NA	19,596,913	1,595	21,289,906	1,901

Gallup coal field

The existence of coal beds near Fort Wingate is mentioned by R. W. Raymond in his 1870 publication, *Statistics of mines and mining in the states and territories west of the Rocky Mountains.* Certainly other early records may exist because outcrops are visible in many places. The main source of information that has been located concerning coal mining in the state between 1888 and 1893 is *History of New Mexico*, published in 1907. Beginning in 1893 and continuing until the present time, official mine inspector reports, first territorial and then state, are available. The area covered by the Gallup coal field is shown in Figure 1.

The Atlantic Pacific Railroad (later acquired by Santa Fe Railroad) was in the Gallup area by 1881, and by 1885 the Dye, Patten, Bell, Black Diamond, and Gallup mines were, or had been, in operation. Records show that 220 miners produced 33,373 tons of coal during 1882; most of this coal was for the railroad. Within 3 years coal tonnages had almost tripled; the coal came mainly from three companies: Gallup Coal Company, Bell and Company, and W. A. Maxwell. In 1885 about 700 miners had produced 97,755 tons of coal. By 1888 most of the production of about 300,000 tons came from the same properties, but the Aztec Coal Company had replaced Bell and Company, and the Maxwell mine was operated by the Black Diamond Coal Company. The Gallup mines had surpassed those of Colfax County in production 2 years earlier because of poor sales to the Santa Fe Railroad, which bought much of its coal in Colorado. California proved to be a good market for domestic coal, and the Atlantic Pacific Railroad and metal mines in northern Arizona were all users of Gallup coal.

Great changes took place beginning about 1888. Previous mining and exploration had proved the potential of the Gallup field, and capital was attracted for the improvement of existing mines and the beginning of new ones. Alexander Bowie, Mariano S. Otero, Neil B. Field, M. D. Thatcher, John Stewart, and others formed the Caledonian Coal Company and opened three mines: the Otero, Caledonia, and Thatcher. The Aztec Coal Company, organized by John A. Lee, E. S. Stover, Charles Marriner, and others, after purchasing the property of Bell and Company, opened the Catalpa mine south of Gallup, and the Crown Point Coal Company opened a shaft mine north of Gallup. In spite of new activity, a sizable decrease in production from the Gallup field occurred between 1889 and 1892 (Table 2; McKinley County). A labor strike at major mines in Gallup in 1891 and a large increase in production from the development of new mines in Colfax County may have been responsible for this decline.

The independent coal operators began to talk about consolidating their operations under one company so that centralized departments of mining, management, sales, and maintenance would be able to serve all their mines. Plans culminated in the formation of the Crescent Coal Company by the Gallup Coal Company, the Aztec Coal Company, and the Black Diamond Coal Company. This organization was formed on January 16, 1892. In 1893 the Crescent Coal Company was operating four mines: the Gallup, the Black Diamond, the Sunshine, and the Crown Point. As capital became available the company was able to improve the old mines and begin new ones, and it became the largest producer of coal during the 1890's. In 1894 production reached about 250,000 tons, and the Crescent Coal Company held its position of prominence until 1900, when its holdings were purchased by the American Fuel Company.

The economy of the country was affected by a great depression from 1893 until 1897, but the 1890's "Go West, Young Man" philosophy resulted in great industrial growth in the territories, and the effects of the depression were minimal in the coal-mining industry of the Gallup area. In addition to the mines of the Crescent Coal Company, also in operation between 1893 and 1895 were the Caledonia, Otero, Beacon Hill, Mulholland, Canavan and Bailey, and Rocky Cliff mines.

In 1893 or 1894 the Los Angeles Coal Company, under the direction of A. H. Braly, President, and F. W. Smith, Mine Superintendent, began the Beacon Hill mine. In 1898 the Union Coal Company became the owner, and the mine was renamed the Union. In 1905 it again changed hands, to ownership by the Gallup Fuel Company (later Gallup Southwestern Coal Company). A British gentleman named Samuel Atherton invested heavily in the mine, but its fortunes did not proceed well because of bad management. In 1912 Mr. Atherton met and hired Sharp Hanson, who was experienced in mining coal. As General Manager Mr. Hanson was able to make the operation profitable. Production at the mine, renamed the Atherton, increased from fiscal year 1915 to fiscal year 1930 to at least 60,000 tons per year; a high of 85,000 tons was reached in fiscal year 1923. By 1921 Mr. Hanson and associates had purchased the company stock and paid Mr. Atherton both his investment and a profit. The mine was then named the Southwestern mine, and its operation continued until 1947.

In 1895 Gus Mulholland began a small mine to furnish coal for the Atlantic Pacific Railroad. The mine, which was also worked for various short periods by Andrew Casna, F. J. Allison, and W. A. Patching, was obtained by 1910 by the Diamond Coal Company and eventually, as the Diamond mine, became a major producer. The Diamond Company developed and improved the mine and the surface facilities and built the town of Allison, where people are still living in the original homes today. Coal production reached 240,000 tons in 1918, and from 1914 through 1930 exceeded 100,000 tons per year. The mine closed in 1939 or early 1940.

The Rocky Cliff mine, opened in 1893 by Frank Dugan and sold 4 years later to Stephen Canavan, maintained a small production until its closure in 1905. In 1896 Senator W. A. Clark of Montana began several mines on his 1,200-acre holdings to supply coal for his copper mines in Arizona. The Clark mines operated until 1907 when the land was sold to the American Fuel Company, which closed them the following year.

A mine begun by William Stewart in the Black Diamond bed on land leased from the railroad was active until about 1903 and then again for some time after 1920. In the 1890's the Navajo Indian Agency started several small mines on the west side of the Gallup Basin to provide fuel for agency schools and administration buildings. Other small mines in the same area supplied the fuel needs of missions and schools under the charge of Catholic brothers and sisters. Some of these small mines were operated until the 1960's.

In 1899 the Colorado Fuel and Iron Company from Denver City opened the Weaver mine, which was operated until 1924. This famous Gallup mine was served by the town of Gibson. On April 1, 1900, this company and its subsidiary, the American Fuel Company, purchased the properties of the Cresent Coal Company and acquired other coal lands. The first decade of the 1900's was known as the era of the American Fuel Company. During this period the great mines of Gallup were operating; in addition to the Weaver, the Heaton was begun in 1903 and the Navajo No. 1 in 1906. Incorporators of the American Fuel Company were Julian A. Kebler, Alfred C. Cass, and John L. Jerome from Denver City. John T. Kebler was the first General Superintendent, a position held later by W. M. Weaver, formerly General Manager of the Crescent Coal Company. The most modern

equipment was purchased, and according to the Territorial Mine Inspectors these mines were rated with some of the best in the United States. Total production by the American Fuel Company was 3.2 million tons. During this time mines were also begun by new independent operators. In 1904 the Canavan-Bartlett mine was opened by two shafts, and in 1908 Brown and McVickers started operation of the Enterprise mine.

This 10-year period was also a time of closure for several marginal mines because sufficient production could be maintained from the new large operations. In addition to the previously mentioned Rocky Cliff and Clark mines, the Crown Point and Sunshine mines were closed in 1900; the Catalpa, in 1902; the Gallup (because of fire), in 1904; and the Otero, in 1908.

From 1900 to 1910 production from McKinley County mines averaged between 500,000 and 600,000 tons per year, and employment averaged from 600 to 800 men. During years of expansion, in 1901 and 1908, these figures were exceeded (Table 2). Production was lowered by 20% in fiscal year 1904-1905 because in the fall of 1904 floods washed out hundreds of miles of railroad track and roadbed, and rail transportation was not available during September, October, and November, at a time when domestic and railroad coal should have been stockpiled.

In 1909 the American Fuel Company was reorganized and became the Victor American Fuel Company. By this time the Weaver mine had been developed to a depth of 5,000 ft, and the Heaton and Navajo No. 1 mines were ready to produce coal. From 1910 through 1920 production by Victor American Fuel Company exceeded 700,000 tons per year, except for 1913 and 1917, when it was reduced because of labor problems.

New Mexico became a state in 1912, and the State Mine Inspection office at Gallup was organized with Rees H. Beddow as State Coal Mine Inspector. The state regulations were approved on June 13, 1912, but the inspector did not take office until September 20. A brief hiatus in statistics occurs at this point; presumably, the Territorial Mine Inspector did not submit a report for a fiscal year ending in June of 1912 because of the impending change to statehood. The production records given subsequently do not represent fiscal year figures as previously shown because the State Inspector began reporting the fiscal year as ending on October 31 instead of June 30 (see Table 2).

In 1913 wages were raised five cents per ton of coal mined and 10 cents per day for company work, and hours were reduced from 10 to eight per day. The same year the Coal Basin mine, a shaft mine located 1.5 mi northwest of Gallup, was begun by the Coal Basin Fuel Company. By 1918 it was producing 60,000 tons, and a maximum of 83,000 tons was mined in 1919. The mine operated until 1929.

During 1914 precautions involving the use of rock dust and humidifiers were started to protect the mines from coal dust explosions. The Victor American Fuel Company, the Diamond Coal Company, and the Gallup Southwestern Coal Company all made extensive improvements. In 1914 the Bartlett mine was closed because the bed became unworkable, but new wagon mines begun during the previous two seasons included the Independent-Carretto, the Baudino, and the Golino. Also in 1914 the Enterprise mine was begun west of Gallup by the Enterprise Coal Company; this mine was closed by 1920. In 1915 owners of the Direct Line mine near Defiance Station put in a 4,000-ft spur to their tipple and made other improvements.

On July 1, 1917, the Gallup American Coal Company acquired the holdings of the Victor American Fuel Company. The following day a strike was called against the company even though the United States was at war with Germany. Consequently, the Weaver, Navajo, and Heaton mines were open for operation only about 205 days that year. In addition, the main entries of the Navajo No. 2 mine were started in 1917.

Beginning about 1917 the Defiance (later Mentmore) mine started production, but tonnages mined were low until G. A. Kaseman became owner in 1919; production then increased, and it reached over 100,000 tons per year from 1922 through 1929. The mine continued operation until 1952.

During 1918 the coal industry at Gallup had a banner year. Wages were up, the demand for coal was unlimited, and there was good cooperation from the railroads. The companies improved housing and other conditions for the miners in company towns. New machinery was installed and mine improvements were made for greater efficiency in mining. The Mutual (originally Keeper) mine in the center of Gallup was put into operation that year, and it eventually became an important producer, lasting until 1938. The Richards coal mine, located west of Gallup, was also begun in 1918, and in its 10 years of existence production totaled 100,000 tons. In 1919 production was down in the field; the contributing factors were the end of World War I and labor unrest.

By the early 1920's the Gallup American Coal Company's Weaver, Heaton, Navajo No. 1, and Navajo No. 2 mines were becoming depleted of reserves, and the Weaver was on fire. In anticipation of this depletion the company had begun preliminary planning for the sinking of shafts for its Navajo No. 5 mine, through which the remaining pillars in the above mines could be recovered and development and mining down the dip could be accomplished. Exploration and development work began in 1920, and by 1923 entries had been driven to connect to the Navajo No. 5 mine, the Navajo Nos. 1 and 2 mines, and the Weaver mine. By 1924 more than 400,000 tons of coal per year were being mined through the No. 5 shafts, and the older mines were closed.

In the early 1920's a number of small truck mines were opened: the Winter, Red Hill, Kauzlarich, McDermott-Floyd, Boardman, Noce, and Cardo. Later in the same decade the Grenko, Liberty, and Juliana, also small truck mines, began. All of these mines were active for less than 10 years except for the Grenko, which operated from 1927 to 1956 and produced about 7,000 tons per year. The Black Star mine, which, like an earlier mine, was also renamed the Mutual, began in 1928 and between then and 1960 produced a total of 284,000 tons.

Available records show that during the depression years in the 1930's only two mines were started: the Chiaramonte and the Biava. They both closed in 1961. Between 1944 and 1951 eight or more small truck mines and prospects were opened, but none produced any sizable amount of coal.

In 1944 production from the Gallup field was 484,000 tons, and by 1952 it had dropped to 75,000 tons. Coal production during the late 1950's and early 1960's was between 30,000 and 40,000 tons per year, and in 1957 the lowest figure, 28,000 tons, was recorded. The only mines operating during the late 1950's and early 1960's were several small independent mines: the Roberts or Sundance; the Mutual, south of the airport; and the Window Rock on the west side of the basin. The era of underground mining had come to a close. The great mines in the Gallup field—the Gallup, Weaver, Heaton, Navajo, Southwestern, Defiance, Allison, Coal Basin, and Mutual mines—were history.

In 1962 a new era began in the mining of the Gallup field. Pittsburg and Midway began the McKinley strip mine to furnish coal for the Cholla Powerplant in Arizona, and production again rose to more than 200,000 tons. From 1962 to 1976 300,000-400,000 tons of coal per year were mined from the McKinley mine for the Cholla plant and independent customers. In 1976 the Cholla plant was enlarged to consume 3,000,000 tons of coal per year. Pittsburg and Mid-

way had to expand. A new loading facility was built, and three draglines and other equipment capable of mining an anticipated 5,000,000 tons per year were installed.

In 1976 Carbon Coal Company opened a strip mine west of Gallup in the Defiance area. The lands involved had previously been the properties of Gallup American Coal Company, which was largely owned by Kennecott Copper Company. In 1946 Gallup American Coal Company sold the properties to Gallup Gamerco Coal Company (Gamerco), a group of Gallup investors. By 1951 the Navajo No. 5 mine, their only operating mine, was closed. For several years after that Gamerco leased some land to small operators, and a few small mines were opened. When exploration indicated sufficient reserves for a strip mine, Gallup Gamerco Coal Company formed Gamerco Associates, Ltd. Lands were leased to Carbon Coal Company by Gamerco Associates, Ltd., and Carbon Coal opened the Mentmore mine. The company furnishes coal to the Arizona Electric Power Co-operative powerplant at Cochise, Arizona, near Benson.

The two strip mines produced more than 4,000,000 tons of coal in 1980. In 1985 production for Mentmore was 674,341 tons. By 1986 both of Carbon Coal Company's mines were closed. The contract with Arizona Electric Power (AEP) was lost because of the decrease in price of oil and gas. AEP decided that it was cheaper to use gas for their power station than to bring in coal from Gallup. The future of the Gallup field appears to be assured for at least 25 years at the current rate of mining, with strip mine production from these two mines projected at approximately 5,000,000 tons per year. Deep reserves in the middle of the field have not been explored, and the potential for deep underground mining is not known.

A few fatalities are mentioned here rather than under the appropriate chapter because the name of the mine was not recorded in official reports. In fiscal year 1919 there were 21 fatalities, but the names of the deceased and the locations of the accidents are not on record. In 1922 there were two fatalities in McKinley County: on May 26, Augustin Ramos was killed by a mine car, and on October 11, Sant Rapani was killed by falling rock. In 1928 there were three fatal accidents at Gallup American Coal Company; details are unknown because of a gap in the records.

Bell-Aztec mine

Bell and Company, 1885-1888
Aztec Coal Company, 1888-?
5,100 ft NL, 2,700 ft EL, sec. 16, T15N, R18W (GW-54, Fig. 3)

According to *History of New Mexico* (1907, p. 980), operations were begun in 1885 at the Bell mine by Judge Joseph Bell, Colonel Molineaux Bell, and E. S. Stover of Albuquerque, under the firm name of Bell and Company. Virtually nothing else is known about this mine except that in 1887 Alexander Bowie was Mine Manager. By 1888 operations in the Gallup field were growing more extensive, and new capital was attracted. One of the companies formed that year was the Aztec Coal Company, organized by John A. Lee, E. S. Stover, Charles Marriner, and others. This company, which also opened the Catalpa mine, purchased the Bell mine and renamed it the Aztec mine.

Sears (1925, pp. 33, 49) stated that the mine was opened with a slope on the Aztec bed and that near the mine the bed was 10 ft thick, including two partings. The bed dipped 25° to the west. The Aztec coal bed was named after this old mine. Bell and Company mined 43,300 tons in 1885 (Mineral Resources of the United States, Calendar Year 1885, p. 41).

The Territorial Mine Inspector's first annual report, for 1892-1893, which also gives production figures for 1892-1893, does not mention the Aztec mine; therefore, it must have been closed at some time between 1888 and 1893.

No evidence remains of the openings because they have been bulldozed away, and the ground has been leveled for construction of businesses. A graveyard now covers the mine workings.

New Aztec mine

Joe Plese, 1934-1944
1,800 ft NL, 2,500 ft EL, sec. 21, T15N, R18W (GW-48, Fig. 3)

The New Aztec mine was begun about 1934 on the Aztec or No. 2 bed of the Gibson Formation. It was opened by two slopes about 100 ft apart, which bear about N70°W. The coal bed, which was about 3.5 ft thick in the lower workings, dipped about 25° to the west at the portal but flattened a few hundred feet below the portals.

It is assumed that all coal produced was sold locally. The State Mine Inspector reports show only that two or three miners worked the mine for Joe Plese during its 10 years of operation.

Winter mine

Mr. Winter, 1920-?
2,500 ft NL, 2,500 ft EL, sec. 21, T15N, R18W (GW-47, Fig. 3)

Sears (1925, p. 49) reported that the Winter mine, a small wagon mine, was opened in 1920. Three slopes within a distance of 300 ft were driven on the Aztec coal bed, which in this area was about 4 ft thick and dipped 25° to the west. In 1934 the New Aztec mine was opened about 300 ft to the north, and it is possible that the workings were connected. It is not known when the mine was closed.

Beacon Hill-Union-Kennedy-Atherton-Southwestern mines

Beacon Hill mine
Beacon Hill Coal Company, 1889-1894
Los Angeles Coal Company, 1894-1898
200 ft NL, 0 ft EL, sec. 28, T15N, R18W (GE-83b, Fig. 9)
Union mine
Union Coal Company, 1899-1905
500 ft NL, 100 ft EL, sec. 28, T15N, R18W (GE-83a, Fig. 9)
Gallup Fuel Company, 1906-1907
Kennedy mine
John Kennedy, 1907-1908
Union mine
Gallup Southwestern Coal Company, 1908-1913
Atherton mine, 1913-1921
2,900 ft NL, 750 ft EL, sec. 21 (GE-13a, b, Fig. 3)
Southwestern mine No. 1 (previously Atherton) mine, 1921-1947
Fiori Bombardieri mine-Southwestern No. 1 mine, 1948-1950
Landovazo Brothers mine, 1950-1953

The mines under land in sec. 28; E'/2 sec. 21; and W1/2SW^{1}/4 sec. 27, T15N, R18W, are discussed under one heading because during the 50-60 years they existed either their workings or their histories were intricately interconnected. During compilation of this chapter much information was excerpted from "Gallup Southwestern Coal Company," an unpublished manuscript by Herbert C. Stacher.

According to the 1892-1893 report of John C. Spears, Territorial Mine Inspector, the Beacon Hill mine was opened in the spring of 1889 by the Beacon Hill Coal Company. The coal bed was about 6 ft thick. The coal was hoisted by horse-powered whim, and the mine was ventilated by a furnace.

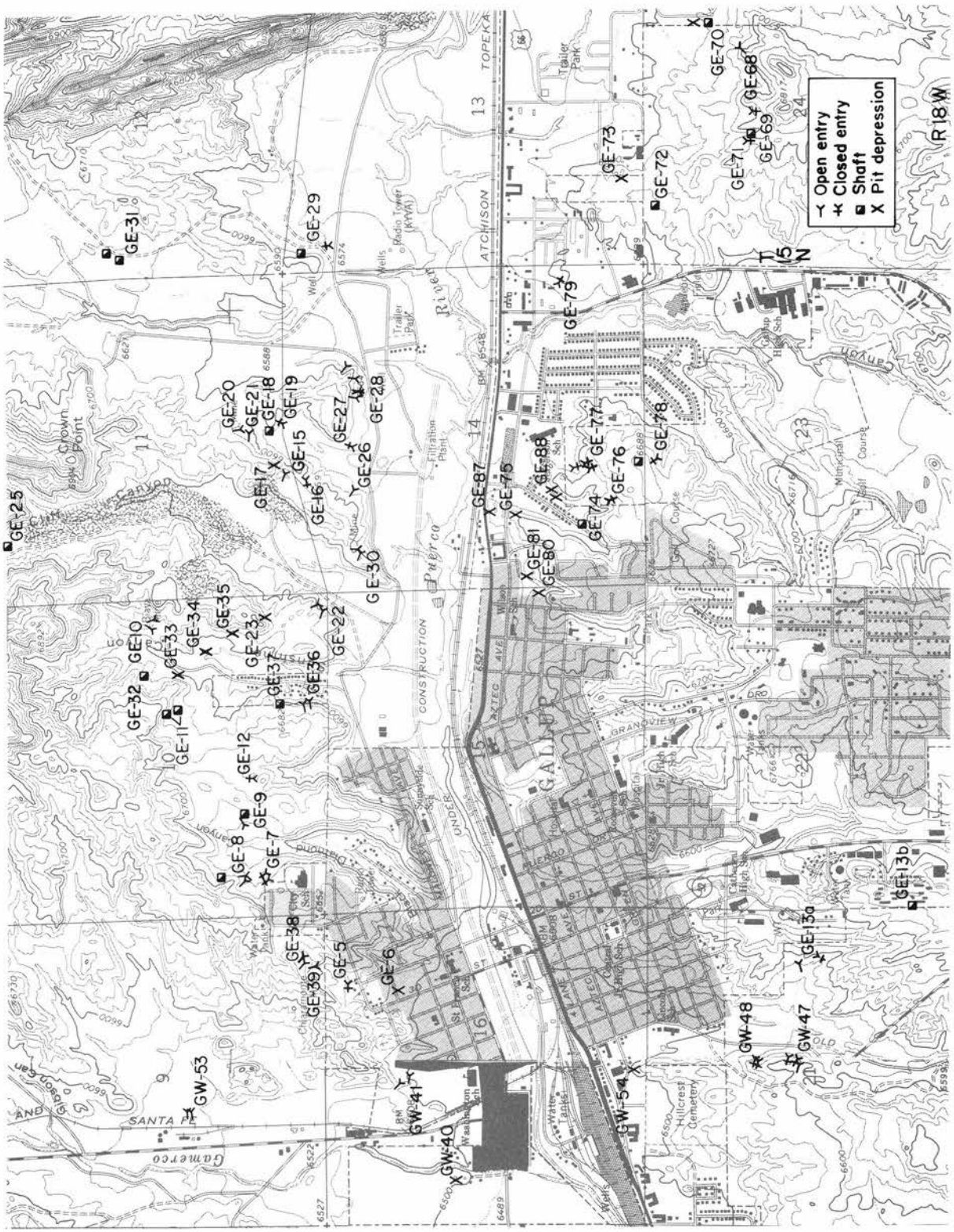


FIGURE 3—The mines north of and within Gallup on the Gallup East and Gallup West 7½-min quadrangles (see key to right).

When Mr. Spears visited the mine the main entry had reached 500 ft in length. Operations were carried on during the winter months when the price was better. Gus Mulholland was Superintendent and Matt Graffius was Pit Boss.

The Los Angeles Coal Company acquired the mine about 1894. A. H. Braly of Los Angeles was President, and E W. Smith was Superintendent of the mine. The location of the mine is believed to have been about 200 ft south of the northeast corner of sec. 28 because there is an indication of an old mine working there. In his annual New Mexico Territorial Mine Inspection report for 1895 John W. Fleming stated that a 500 ft slope was driven along the 6-ft-thick Black Diamond coal bed. Six miners and three company men produced about 20 tons of coal per day in February of that year. The coal was hauled by wagon to the Atlantic Pacific Railroad dock and shipped to Los Angeles. The mine, which was kept in good condition, was capable of producing about 50 tons per day. In April of that year the mine was not operating.

Apparently the Los Angeles Coal Company survived until about 1898. A group of men acquired the land then, formed the Union Coal Company, and named the mine the Union. They began production in November 1899, and they incorporated their company in May 1900, with the following officials: J. C. Spears, President; T. A. Farbro, Vice President; William McVickers, Superintendent; D. Clarke, Secretary; and William Kilpatrick and H. Brown, Stockholders.

The old Beacon Hill slope was apparently used as the main haulageway, and the coal was hoisted by a steam hoist to the surface. A new air shaft was connected to the mine workings by March of 1900, and ventilation and mine conditions were good. The slope was 1,000 ft long and dipped 14° westerly. A new slope, believed to have been 500 ft NL, 100 ft EL, sec. 28, was started, and by the end of the fiscal year it reached a depth of 600 ft. The workings off this slope were ventilated by a furnace. By the end of fiscal year 1901-1902 the slope had reached a depth of 700 ft. Short demand that year lowered coal production to 6,390 tons; in addition, the necessity of using wagons to haul the coal to the railroad loading docks limited the potential production.

In late 1901 the hoisting plant burned. It was rebuilt, but burned again in early 1902, and production was not resumed until November 1904. The mine operated that winter under the direction of Samuel Dean.

By late 1905 the mine had changed hands again, and the Gallup Fuel Company became the owner. William McVickers was General Manager and John Kennedy was President. Mr. Kennedy, a thrifty Irishman who owned and operated a dry goods store in Gallup, bought as investments the 80 acres in sec. 28 occupied by the Union mine and the 40 acres of coal in sec. 16, which later became the Keepers mine. John Sharp was made Mine Superintendent at the Union. The transportation system was improved, but it still involved excessive handling of the coal after it was hauled up the main haulage slope. A 42 horsepower locomotive hauled the coal from the mine to a newly built tipple constructed over a new rail spur. These improvements cost $7,200. During fiscal years 1906-1907 and 1907-1908 the mine, under the direction of Samuel Dean, operated only a short time each year. In fiscal year 1907-1908 John Kennedy obtained possession of the Union mine and again the name was changed, to the Kennedy mine.

Money was desperately needed to continue mine operations. In 1908 an angel appeared in the form of Samuel Atherton of England, who had come to Gallup looking for an investment. He found Samuel Dean, who was operating the Kennedy mine sporadically and who owned an adjoining 160 acres ($S^1/2NE^1/4N^1/2SE^1/4$ sec. 28) south of the Kennedy tract ($N^1/2NE^1/4$ sec. 28). As a citizen of England Mr. Atherton could not be one of the incorporators of a U.S. mining company, but he contributed to the venture, and the Gallup Southwestern Coal Company was formed. Incorporators were Francis E. Wood, an Albuquerque attorney, Samuel Dean, and John Kennedy. Capital stock of 500 shares with a par value of $100 each was authorized. The application was approved by the Territorial Secretary on December 12, 1908.

Unfortunately the mine, under the leadership of Samuel Dean, continued to lose money. Mr. Atherton sent money himself and raised money from others in England many times; one of those he persuaded to help was Harry Lauder, the famous English entertainer, who invested $5,000. At various times Mr. Atherton, his agent, William Wallwork, and his accountant, a Mr. Smart, came from England to assist in the attempt to make the mine a profitable venture, but without success. On May 23, 1912, however, attorney Samuel Bushman was able to accomplish one favorable action on behalf of the Gallup Southwestern Coal Company: a lease was obtained from the Victor American Fuel Company for the SE1/4 sec. 21. Under the lease terms Gallup Southwestern agreed to pay to Victor American 12.5¢ per ton by the 15th of each month for the coal removed from the leased land during the preceding calendar month.

On November 17, 1912, Mr. Atherton made yet another trip to Gallup, this time with the intention of closing the mine and declaring the company bankrupt. While in Gallup, however, he learned of a mining man named Sharp Hanson and changed his mind. Mr. Hanson, who had emigrated from England and become a United States citizen, had worked in coal mines in Illinois and at Madrid, New Mexico. He was stationed at Mentmore at that time, having been sent from Madrid by George Kaseman to drive an entry over the hill from the Mentmore mine. Mr. Atherton offered Mr. Hanson a job as General Manager to operate the Gallup Southwestern mine, and the last advance needed, $3,000, was deposited for operating expense.

Mr. Hanson got Anton George, his father-in-law, and James T. McDermott, Foreman of the Navajo mine, to join him. They drove a new slope entry located 2,900 ft NL, 750 ft EL, sec. 21, on the land obtained by lease from the Victor American Fuel Company. This was called the Atherton mine. The tipple over the railroad spur was rebuilt to accommo-

Key to Figure 3.

GE–5—Sharp and Fishburn and McDermott and Floyd mines
GE–6—Keeper–Mutual mine
GE–7—Kauzlarich mine
GE–8—Black Diamond mine
GE–9—Enterprise–Brown and McVickers mine
GE–10—Biava No. 3 mine
GE–11—Sunshine mine
GE–12—Bubany mine
GE–13a, 13b—Gallup Southwestern et al. (previously Atherton) mines
GE–15, 26—Otero mine
GE–16—Unknown entry
GE–17—Unknown entry
GE–18, 19, 27—New Otero mine
GE–20, 21—Biava No. 1 mine
GE–22, 23, 34, 35—Rocky Cliff mine
GE–24, 25—Crown Point mine
GE–28—Wood and Stewart mine
GE–29—Thatcher mine
GE–30—Unknown (Biava?) mine
GE–31—Noce mine
GE–32, 33—Biava No. 2 mine
GE–36, 37—Unknown mine
GE–38—Chiaramonte mine
GE–39—Stewart–Black Diamond mine
GW–40—Unknown shaft
GW–41—Summit–Graveyard mine
GW–47—Winter mine
GW–48—New Aztec mine
GW–53—Unknown mine
GW–54—Bell–Aztec mine
GE–68—Red Hill mine
GE–69—Liberty mine
GE–70—Cardo mine
GE–71—Golino mine
GE–72—Juliana prospect shaft
GE–73—Juliana mine
GE–74—Unknown shaft
GE–75—Soper mine
GE–76—Unknown mine
GE–77—Independent–Carretto mine
GE–78—Grenko No. 1 mine
GE–79—Boardman mine
GE–80—Bevan prospect
GE–81—Unknown mine
GE–87, 88—Fellin prospect entries

date the new mine, and production costs were lowered. New machinery and equipment were purchased, and new housing facilities for the mine and new residences for the officials and miners were built. For the first time in 4 years the mine began to make a profit, and surplus funds were accumulated. Production increased from 21,000 tons in 1912 to 81,000 tons in 1917. As money became available in the next few years Hanson, George, and McDermott purchased stock certificates to increase their ownership of the company. On January 20, 1919, Anton George was killed in the mine, leaving his wife Mary and eight children. Mr. Hanson purchased his mother-in-law's 68 shares of stock on June 20, 1921. On August 26, 1921, Mr. Hanson purchased all of Samuel Atherton's stock, and the latter finally recouped his American investment of $26,300 and, in addition, he realized a good profit of $39,450 in cash dividends. Mr. Hanson was made President and General Manager of the Gallup Southwestern Coal Company, and Mathew M. Plese was made Mine Foreman. The name of the mine was changed to the Southwestern mine.

In 1922 James T. McDermott quit the company. He and Arthur Floyd formed a partnership and leased half of the 40 acres in sec. 16 that had been purchased from John Kennedy in 1911. Their lease was for the N1/2 of the NW1/4NE1/4; the S1/2 of these 40 acres contained a small mine operated by George Keepers, which later became part of the Mutual Coal Company lands.

Little has been said about the coal bed that was opened in 1889. The mines were on the Black Diamond bed, which averaged about 6 ft in thickness throughout the mining areas. The bed was opened from the outcrop along the limb of the north-south-trending monocline that passes through Gallup. The coal bed on the outcrop dipped about 26° to the west, but as the coal was mined down the dip to the west the dip decreased to 5° at about 2,000 ft from the main portal. The Black Diamond bed typically had one parting. An analysis of a sample from 275.9 tons of coal taken by the Bureau of Mines in 1933 follows:

Moisture	10.0%
Volatile matter	40.4%
Fixed carbon	52.5%
Ash	7.1%
Sulphur	0.8%

Entries were apparently driven at an angle to the strike, but the rooms followed the direction of the strike.

The Atherton mine was opened by a double main and double secondary entry system, with the rooms driven along the strike of the coal bed. Natural ventilation from numerous openings was used, but a fan was installed in case the need for it arose. Modern equipment was purchased and used in the mining operation to keep production per man high. In 1917 water seeped into the workings, and a pump was installed; three mining machines were purchased in 1918. By 1918 the haulage slope, mainly under sec. 28, was 3,500 ft long. By 1925 the length of the slope was 5,200 ft, and by 1927 it was 6,000 ft. The employees were treated generously, and bonuses were given for work well done. Christmas pocketbooks were stuffed with money. The employment policy was very liberal, and no request for employment was ever turned down if it was possible to find something for the man to do.

On November 16, 1922, Herbert C. Stacher, who was to become an increasingly important figure in the history of the mine, was employed as mine clerk in charge of the office and all the records. Mathew M. Plese was made Mine Boss. On March 10, 1926, Mr. Stacher bought all the stock owned by James T. McDermott, and he became the second largest stockholder.

In 1932 the demand for coal from the Gallup district, as elsewhere, began declining because oil and electricity were cheaper and far more efficient. At the same time labor troubles developed. President Franklin D. Roosevelt promised protection to labor unions and created the National Labor Relations Board, which was staffed with pro-union people. Union recruiters were sent to the New Mexico coal districts to organize the coal miners, and in many cases strong-armed the miners to join the union against their will. According to H. C. Stacher (1978), this was the case at the Southwestern mine. The company was forced to sign a contract with the union because 50% of the miners had signed applications. Management was required to collect union dues, initiation fees, and assessments, and to send these monies to the union office in Denver. A union wage was established, but it was lower than the wage the company was already paying. The company, however, was not allowed to lower wages to the union scale, and the miners found their take-home pay smaller than before because of union dues and assessments. This was a hard time both for the miners, who in many cases had been forced into the union, and for the company, which was down to working only one or two days per week because of the limited demand for coal.

On July 1, 1917, the Gallup American Coal Company had bought the Victor American Fuel Company. Gallup Southwestern had a lease contract with Victor American Fuel Company dating back to 1912, and early in the 1920's Gallup Southwestern and Gallup American negotiated an additional sales and lease contract. Under its terms 12.5¢ per ton continued to be paid by Gallup Southwestern for coal mined on the leased lands (both old and new), and 20¢ per ton was paid to Gallup American for coal sold for Gallup Southwestern. The contract was beneficial to both companies, but on May 31, 1932, at the height of the depression, the contract expired. Gallup American refused to renew and notified the mining company that it had to remove improvements from the leased land within six months. To avoid being forced out of business, Gallup Southwestern filed a lawsuit in District Court on June 1, 1932, to condemn a right-of-way through and over the land that was being used to transport coal from its mine to the tipple on the railroad spur track. The District Court ruled in favor of the plaintiff, and the company paid the appraised value, $114.60, for a 13.9-acre right-of-way. The case was appealed to the New Mexico Supreme Court, which reversed the decision, stating that a right-of-way was for public transportation such as a highway or railroad and that an individual could not condemn land for that purpose. Request for the formation of a railroad company was then submitted to the State Corporation Commission. The Gallup and Southern Railway Company was formed and chartered with 250,000 shares of common stock, which were issued on July 8, 1935, and the right-of-way was obtained.

While the mine was shut down, maintenance and supervisory men were kept on the payroll to keep the water pumped and the mine maintained. Mr. Hanson and Mr. Stacher traveled into towns in New Mexico and Arizona to contact local dealers for domestic coal sales. Large metal enameled signs like the one in Figure 4 were furnished to

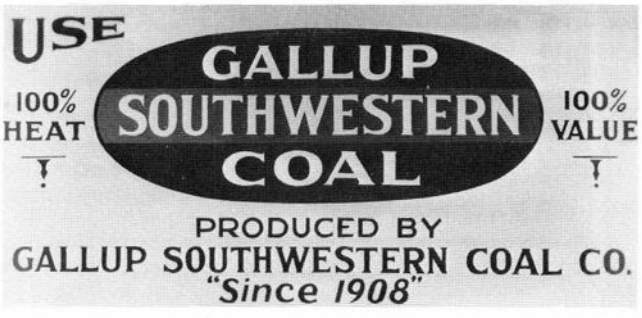


FIGURE 4—The larger coal companies had this type of logo to advertise their product. *Donated by H. C. Stacher.*

all dealers selling domestic coal from the Southwestern mine. Some orders were obtained, and the mine continued with limited production. Figures 5, 6, 7, and 8 show facilities and personnel at the Southwestern mine in 1933.

In October 1935, Gallup American and Gallup Southwestern renegotiated leases and a sales contract. Gallup Southwestern was to keep supplying its domestic coal dealers and could market through Gallup American only 9.5% of the latter's total sales. It was also agreed that $2,000 be paid to Gallup American for use of that company's land since the expiration of the previous lease in May 1932. Coal demand was depressed, but the company was able to operate two days per week in the mine, producing about 800 tons, and the miners then worked two days at odd jobs in and about the mine. Some of the employees made and sold adobe bricks on company property on their days off. This period of limited production continued for several years.

Because there was no further need for the railroad company, it was dissolved on August 15, 1938. By June of 1942 the family of Herbert C. Stacher had purchased all the stock of the company, and Mr. Stacher was President and General Manager. Mr. Hanson requested and received title to the surface and an upper coal bed on sec. 28 to protect the rights of Frank George, who was mining from that bed. Gallup Southwestern retained title to the lower beds of coal, those being worked in the company mine.

Because of failing health, Mr. Hanson decided to retire. On a trip to California he took ill, was hospitalized, and died on June 15, 1943, in San Bernardino. Mr. Stacher operated the company from 1942 to 1947. These years were profitable because during World War II the demand for coal was greater than during the depression years. After the war, the demand decreased to the point where all the coal companies were barely surviving. The Gallup American Coal Company was sold to the Vidal and Rollie families of Gallup, who formed another corporation called the Gallup Gamerco Coal Company. On December 24, 1946, Mr. Stacher requested that the new company renew the lease and sales agreement made with the Gallup American Coal Company in 1942 beyond the approaching March 31, 1947, deadline. He was informed that the Gallup Gamerco Company, which was operating much below its capacity, was reluctant to renew the sales and lease agreements under the depressed conditions. Work was continued as long as possible in the futile hope that the decision would be changed. Because it was not, and because Gallup Southwestern could not operate without the agreements, the mine was closed on March 31, 1947.

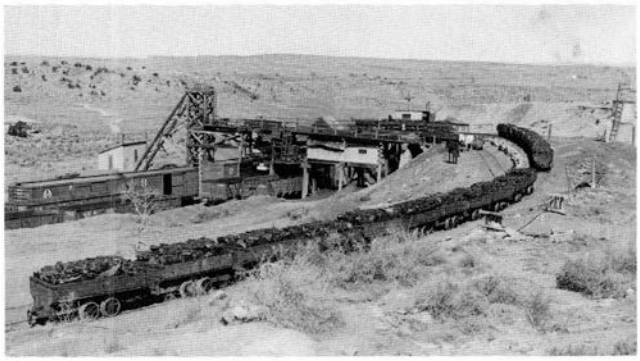


FIGURE 5—The loading facilities at Southwestern mine. The loaded cars in the foreground were each uncoupled, weighed on a scale, and dumped in a small bin over the shaker screens. The dumping procedure consisted of placing the car on the dumping mechanism, opening the front of the car, and releasing the dump so the car would tip, unloading the coal onto the screens. The shaker screens sized the coal in lump, engine coal, and slack, and it was then loaded directly into railroad cars. The boxcars on the left track received the lump coal; engine coal was loaded on the middle track, and slack coal was loaded over the near track, both in open cars. *Photo by H. C. Stacher, April 5, 1933.*

The equipment and improvements, which had to be removed within six months, were sold to Tony Yurcic, who was operating the Gallup Machine Works. For property that had cost over $400,000 he paid $18,000 and realized $50,000 on resale. Mr. Stacher was not so fortunate. He was able to buy the land on Southwestern Hill, which saved the residential dwellings, including his home. The money he received from Mr. Yurcic and from the Santa Fe Railroad for the rails and ties in the spur track all went to settle nuisance disability compensation claims dreamed up for the miners by outside lawyers. For 25 years of work, an expenditure of $48,500 for company stock and another of $4,000

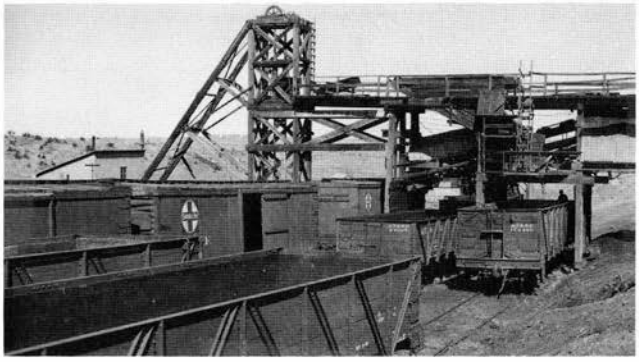


FIGURE 6—This view of Southwestern mine shows in greater detail the loading of the coal, which is described in Fig. 5. *Photo by H. C. Stacher, April 5, 1933.*

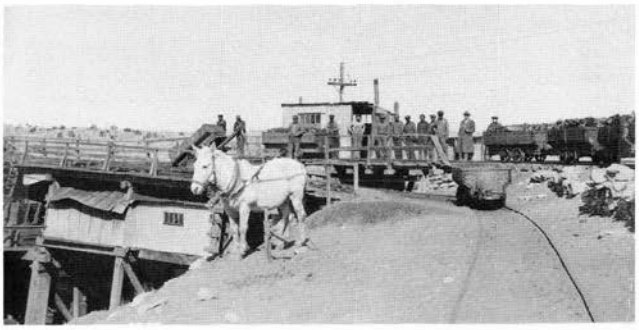


FIGURE 7—The white mule is waiting to pull empty cars back to the mine entrance of the Southwestern mine where they will be coupled to the main haulage rope to be lowered back into the underground for reloading by the miners. *Photo by H. C. Stacher, April 5, 1933.*

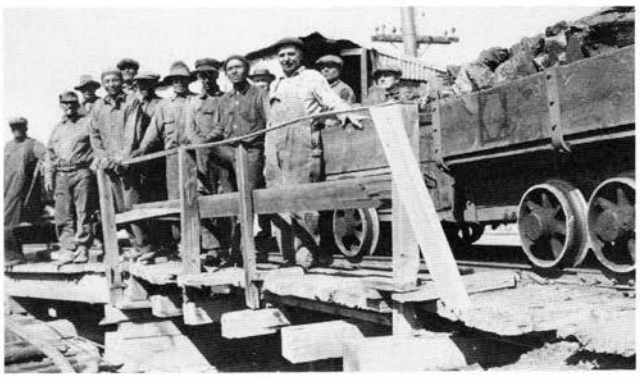


FIGURE 8—Tipple crew at Southwestern mine, with President and General Manager Sharp Hansen. Mr. Hansen, who is in the center of the photograph, is wearing a white shirt and has his hand on the mine car. *Photo by H. C. Stacher, April 5, 1933.*

TABLE 3—Land acquisitions of the Gallup Southwestern Coal Company. *This land was never mined (Stacher, 1978, p. 17).

Location in T15N, R18W	Date	Method of acquisition
80 acres, N½NE¼ sec. 28	1–2–1911	Purchased from John Kennedy
40 acres, NW¼NE¼ sec. 16	1–2–1911	Purchased from John Kennedy
160 acres, S½NE¼, N½SE¼ sec. 28	12–1–1912	Purchased from Samuel Dean
80 acres, N½SW¼ sec. 28	12–19–1916	Purchased from Henry H. Holbert
80 acres, S½SE¼, S½SW¼ sec. 28	1–13–1920	Purchased from John Shauer
160 acres, SE¼ sec. 21	5–23–1912	Renewable lease obtained from Victor American Fuel Co.; later leased from Gallup American Coal Co., purchaser of Victor American
160 acres, SW¼ sec. 21	Early 1920's	Leased from Gallup American Coal Company
500 ft strip along the S½ of the NE½ of sec. 21	Early 1920's	Leased from Gallup American Coal Company, for surface use only, for office and residential buildings
80 acres, W½SW¼ sec. 27	Early 1920's	Leased from Gallup American Coal Company
*160 acres, NW¼ sec. 28	1–17–1931	Purchased from John Massing and Miller Bros.

TABLE 4—Production and employment record of the Beacon Hill-Union-Kennedy-Atherton-Southwestem mines, 1894-1953. *In 1933 state law prohibited publication of production records in the State Mine Inspector's annual report.

Year	Production (tons)	Employment				Days operated
		Miners	Boys	Top men	Boys	
1889	Opened					
1892–1893		6		3		
1893–1894		12				
1894–1895	824	6		3		
1895–1896	500	5		2		90
1896–1897	Not reported					
1897–1898	600	2		1		110
1898–1899	0					
1899–1900	3,000	7	1	4		160
1900–1901	8,000	10	2	2		250
1901–1902	6,390	8	1			150
1902–1903	Hoisting plant burned in 1901 and again in 1902					
1903–1904	Plant not replaced					
1904–1905	4,715					157
1905–1906	10,000	12				285
1906–1907	No record; operated for a short period					
1907–1908	Operated for a short period; reopened December 5, 1908					
1908–1909	2,800	14		4	1	90
1909–1910	11,260	15		7		220
1910–1911	16,403	17		7		225
1911–1912		9		7		
1913	21,065	17		7		
1914	37,957	37		7		
1915	60,100	45		7		
1916	76,380	57		7		
1917	80,960	61		12		289
1918	72,562	65		16		284
1919	59,256	58		15		288
1920	74,205	85		20	2	273
1921	48,558	93	2	18	2	120
1922	59,414	117		20		130
1923	85,868	96		20	1	173
1924	68,383	105		23		129
1925	68,741					125
1926	56,586	66		14		161
1927	65,172	82		14		164
1928	61,758	95		16		138
1929	78,565	106		18		172
1930	62,277	109		20		114
1931	37,233	110		18		50
1932	19,936	94		17		30
1933*		Total of 76 employees				
1934		58		14		
1935		58		14		
1936		71		16		
1937		96		17		
1938		102		17		
1939		88		17		82
1940		72		16		59
1941		65		14		107
1942		43		12		155
1943		45		12		
1944		31		10		
1945	23,803	25		9		
1946						
1947	Ceased operation March 31, 1947					
1948–1950	Leased to Fiori Bombardieri					
1950–1953	Leased to Landovazo brothers, 2–6 employees; ceased operation April 30, 1953					

for the rocky hill, Mr. Stacher got his home and nine rental dwellings. On January 30, 1948, the Gallup Southwestern Coal Company was issued a certificate of dissolution ending its 40 years of existence. Mr. Stacher secured a job at Wingate Ordnance Depot and worked there until his retirement in October 1969.

The mine did not quite succumb. Fiori Bombardieri secured a lease in 1948 from Gallup Gamerco Coal Company to mine the chain pillars from the old Atherton main entries. He relaid the track, installed a small hoist, built a truck loading chute, and sold his production locally for domestic coal. He operated for a couple of years, and then in 1950 the mine was leased to the Landovazo brothers, who mined the rest of the pillars. The last coal produced from these mines was taken on April 30, 1953.

Many interesting vignettes of mine and company history are included in Herbert C. Stacher's unpublished manuscript. One such story concerns John Kennedy, the "thrifty Irishman who owned and operated a dry goods store in Gallup," and who purchased some coal lands as investments and briefly owned the Kennedy mine. Mr. Kennedy lived in the back of his store, and one night a gunman dashed in demanding Kennedy's money or his life. Kennedy said, "You can take my life but not my money." He dropped to his knees and began praying in a loud voice for the Lord God to forgive his sins and accept his soul into heaven. Unnerved, the would-be robber turned and fled.

Mr. Stacher stated that Sharp Hanson, whose acumen and ability first made the mine economically sound, was one of the outstanding coal mine operators of his time. He was also active in community affairs and served as town treasurer, county commissioner, and state senator. After the death of Anton George, Mr. Hanson and his wife Grace took care of and educated the George children.

The liberal policy of the mine officials has been mentioned. One time Gallup Southwestern was sued by a woman lawyer from Santa Fe who claimed that her client suffered pain caused from an old injury at the mine. Because company records showed the details of the accident, the treatment given, the amount of compensation paid, and a release signed by the injured man, the District Court Judge ordered the case dismissed. But at the request of the company attorney, the lawyer was paid $150 by the company to cover her expenses because she had received nothing for all her work and time (Stacher, 1978, p. 29).

Another time a man sued Mr. Stacher, owner of the company, for $10,000 further compensation, claiming that the treatment for his broken leg had been faulty. He had been seen walking around town in a normal way, but after instruction by his lawyers used crutches and hopped on one foot; on the day of the trial he was ostentatiously helped into the court house. The judge ruled against the plaintiff,

TABLE 5—Fatalities at the Beacon Hill–Union–Kennedy–Atherton–Southwestern mines.

Name	Date	Cause
Joe Barrell	May 15, 1911	Fall of rock
Reyes Carrera	January 14, 1918	Unknown
Anton George	January 20, 1919	Unknown
Jose Garcia	April 2, 1921	Empty trip
Dominic Cicci	September 5, 1923	Mine car
Joe Kostlich	October 12, 1923	Fall of coal
John Kabut	August 13, 1925	Fall of coal
Tony Milanovich	January 27, 1926	Fall of rock
Antonio Avila	June 23, 1930	Unknown
Mike Marincell	February 18, 1933	Fall of coal
Romulo Casillos	November 24, 1944	Fall of rock

who then got up and walked out of the courtroom, leaving his crutches. He returned to work the next week, and nothing more was said of the lawsuit (Stacher, 1978, pp. 29-30).

A list of land acquisitions for the Beacon Hill-Union-Kennedy-Atherton-Southwestern mines is shown in Table 3; production and employment figures are shown in Table 4; and a record of fatalities is shown in Table 5.

Crescent mine

Crescent Coal Company(?), 1888(?)-1892(?)
2,500 ft NL, 600 ft WL, sec. 27, T15N, R18W (GE-89, Fig. 9)

It is assumed from the name of the mine that it was opened by the Crescent Coal Company, which was formed by independent coal operators in the late 1880's. The mine probably closed before 1893 because there is no mention of it in the Territorial Mine Inspector's annual reports, which began in 1892. Sears (1925) reported that the Crescent mine was near the Union mine. No other information about the Crescent mine has been found in the literature. During the field examination of the Abandoned Mine Lands study, evidence of an old mine working was found at the above location. There is also dump material at location 1,600 ft NL, 400 ft WL, sec. 27, which may be part of the Crescent mine.

Schauer-George-Williams mine

Mr. Schauer, before 1919
Pete and Frank George, owners, 1938
John B. Williams, lessee and owner, 1945-1963
4,100 ft NL, 1,000 ft EL, sec. 28, T15N, R18W (BS-6, Fig. 9)

Sears (1925, p. 49) reported that the Schauer mine was located in the $SE^{1}/4$ of the above section and that a slope was driven along the Aztec bed, which was about 4 ft 7 inches thick. The mine was abandoned before 1919, the year Sears and his party examined the region. During the Abandoned Mine Lands project in 1979 this area was examined carefully, and evidence of only one mine was found. It is therefore assumed that the Schauer workings were reopened at a considerably later date and that the SchauerGeorge-Williams operations constitute one mine.

The records of the State Mine Inspector show that in 1938 a mine in the above-mentioned section was operated by Pete George. It is believed that the George family obtained the lands and operated the mine themselves and then leased or sold it to John B. Williams. A record of these transactions follows:

1938 Operated by Pete George
1939-1945 Operated by Frank George
1945-1949 Leased to John B. Williams
1949-1955 John B. Williams purchased the mine and operated it under Williams Coal Company.
1955-1961 The mine reverted to George family ownership with Frank as Manager. Apparently the George family owned and operated the Gallup Brick and Tile Company and used the coal to fire their products. Seemingly there was little activity during this period because no record of it could be found.
1961-1963 The mine was again operated by the Williams Coal Company.

The George Coal Company employment figures include eight to 10 miners, five company men, and one to three top men. Under Mr. Williams three to five miners, five company men, and one to three top men were working. There is no record of tonnage produced. The mine site is marked by an air shaft, covered with a squirrel-cage-type fan, old hoist foundations about 700 ft to the east, two old tin buildings, and scattered dump material.

Catalpa mines'

James Maloney and Pat Kennedy, 1887-1891
Catalpa Coal Company, 1891-1892
2,600 ft NL, 5,100 ft EL, sec. 35, T15N, R18W (BS-4, Fig. 9)
Crescent Coal Company, 1892-1900 American Fuel Company, 1900-1902
1,800 ft NL, 900 ft EL, sec. 34, T15N, R18W (BS-5, Fig. 9)

Information on the first Catalpa mine was given by John C. Spears, the first Territorial Mine Inspector. His first report, for fiscal year 1892-1893, stated that in the fall of 1887 the mine at the first location noted above was opened by James Maloney and Pat Kennedy. In 1891 this operation was sold to the Catalpa Coal Company, and on January 16, 1892, it passed into the control of the Crescent Coal Company. The Catalpa mine was worked for only a short time after this last ownership change and was closed before Spears became inspector. The mine was capable of producing 300 tons per day from a 5.5-7-ft-thick coal bed. A railroad spur to the mine site had been built. C. W. Kennedy was General Manager.

In 1897 the Crescent Coal Company began its Catalpa mine (BS-5, Fig. 9) about 1,200 ft northwest of the original Catalpa mine. The mine was opened by a slope on the Thatcher bed of the Dilco Coal Member. The bed, which dipped 8° westerly, was about 6 ft thick. By 1899 production was almost 60,000 tons per year and employment totaled more than 100. The slope had reached a depth of 1,000 ft, and the mine was connected with the Santa Fe Railroad via a 3-mi spur. The coal produced was sold in New Mexico, Arizona, and California.

The following year (1900) a 12-ft McCrimmon fan was installed to improve ventilation, which had previously been accomplished by furnace, and the main slope was driven to a depth of 2,000 ft. On April 1, 1900, the American Fuel Company, a subsidiary of Colorado Fuel and Iron Company of Denver, was incorporated by Julian L. Kebler, Alfred C. Cass, and John C. Jerome. The new company purchased the properties and mines of the Crescent Coal Company.

Within the next 2 years, under the direction of Superintendent Thomas Ramsey, development and production were increased, and the Catalpa mine was kept in good shape and well ventilated. The Crown Point bed, a 6-ftthick bed that overlies the Thatcher bed, was also developed. A fire boss was hired because a small amount of methane was found in the mine workings, a rare occurrence in the history of the Gallup coal mines. By mid-1901 the slope was 2,100 ft deep, and a new tipple, which cost $8,000, was installed. At that time the mine camp, which consisted of 75 comfortable dwellings, several boarding houses, a large store, a company office, and storerooms, was a village of considerable pretensions. Other improvements in 1901,

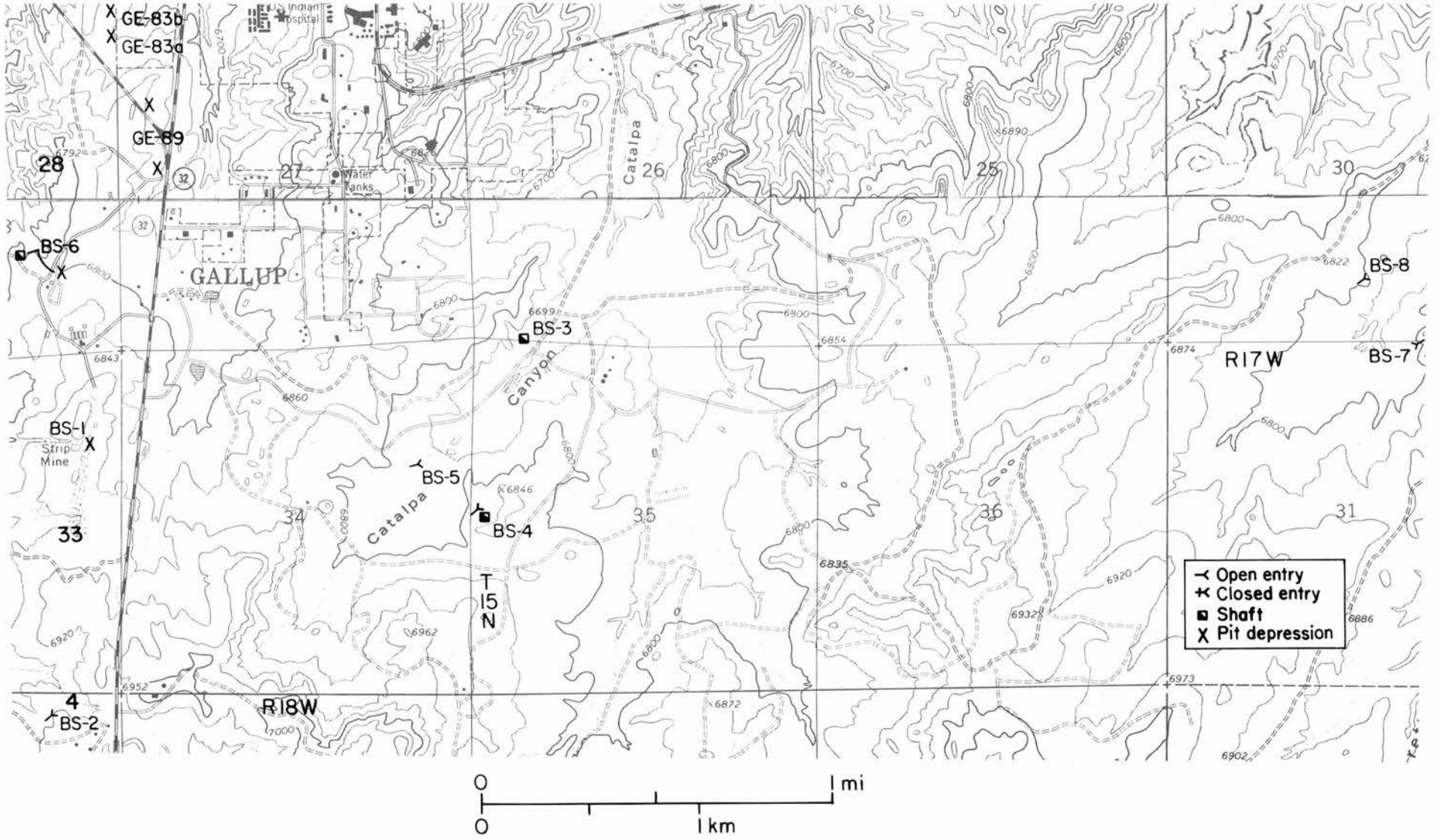


FIGURE 9—The mines south of Gallup on the Bread Springs and Gallup East 7½-min quadrangles.

BS–1—Carbonaceous shale strip mine
BS–2—Bombardieri prospect
BS–3—Unknown shaft
BS–4, 5—Catalpa mines
BS–6—George et al. mine
BS–7—Navajo Jim mine
BS–8—Unknown prospect
GE–83a—Union mine
GE–83b—Beacon Hill mine
GE–89—Crescent mine

the cost of which totaled $60,000, included another new tipple, chutes, screens, 25 pit cars, a new boiler-engine room, and 20 more dwellings. By the end of the year the main slope had reached a depth of 2,400 ft.

After this considerable expenditure of funds, it was decided by the company that the Weaver mine was capable of supplying the coal demand. On February 14, 1902, the Catalpa mine was put on stand-by in case it was needed to augment production. In fiscal year 1903-1904 a few men were employed to keep the entries timbered and the mine maintained, but no coal was mined. During the following fiscal year the equipment, houses, and etc. were moved to the Heaton mine, and the Catalpa was never reopened. The shaft at BS-3 (0 ft NL, 4,400 ft EL, sec. 35, Fig. 9) must be a prospect shaft because it does not appear to connect with the old workings of the Catalpa mine.

According to available records total coal production from the Catalpa mine was 278,659 tons. The production and employment record is shown in Table 6. There were two fatalities at the Catalpa mine: Anton Vicich was killed by a pit car on April 7, 1900, and Antonio Tafolla was killed by falling timber on March 14, 1901.

TABLE 6—Production and employment record of the Catalpa mine. *A strike reduced the number of days operated.

Year	Production (tons)	Employment			Total employees	Days operated
		Miners	Boys	Top men		
1897–1898	Mine was opened					46
1898–1899	58,061	100		5	105	236
1899–1900	80,000	100	2	10	112	285
1900–1901*	78,384	125	5	20	150	250
1901–1902	62,214	100	4	20	124	170
Total	278,659					

Carbon No. 2 mine

Carbon Coal Company 11-30-82 Permit
Secs. 34, 35, T15N, R18W

Carbon Coal Company, a subsidiary of Hamilton Brothers Petroleum Corporation, began exploration in secs. 34-36, T15N, R18W and secs. 2 and 3, T14N, R18W in 1980 to determine potential reserves for surface mining. The surface and minerals were leased from Gamerco Assoc. Ltd., Santa Fe Pacific Minerals Corp., and private interests. In November 1981 Carbon Coal Company submitted a mine plan for the Carbon No. 2 mine for T15N, R18W, secs. 34 and 35 to the state of New Mexico. The mine area, which consists of 675 acres, would be mined in 10 years starting near the northwest corner of sec. 35 and trending toward the southeast corner of the same section (Carbon No. 2 mine surface mining permit application, 1981).

The Carbon Coal No. 2 mine is in the Dilco Member of the Crevasse Canyon Formation. It contains five minable seams in the permit area. There are two main seams that range from 4 to 10 ft thick. These coals are subbituminous C in rank, with a Btu range of 9,800-10,190 Btu/lb. The ash content is quite high (12.47-20.18%), and the coal requires washing. The sulphur content varies from 0.53 to 0.98%, which is average for New Mexico coals.

The mine is to be an open pit operation for the first 7 years and an underground mine for the last 3 years of operation. The coal from Carbon No. 2 would be transported by truck to the wash plant and Carbon Coal Company's Mentmore mine, which is west of Gallup. From there the coal would be transported by railway to Arizona Electric Power Cooperative at Cochise, Arizona.

The Carbon Coal Company No. 2 mine began production in January 1985 with 84 employees. Estimated production for the first year was 650,000 short tons (Anderson and Reddy, 1986). Actual production for 1985 from Carbon No.

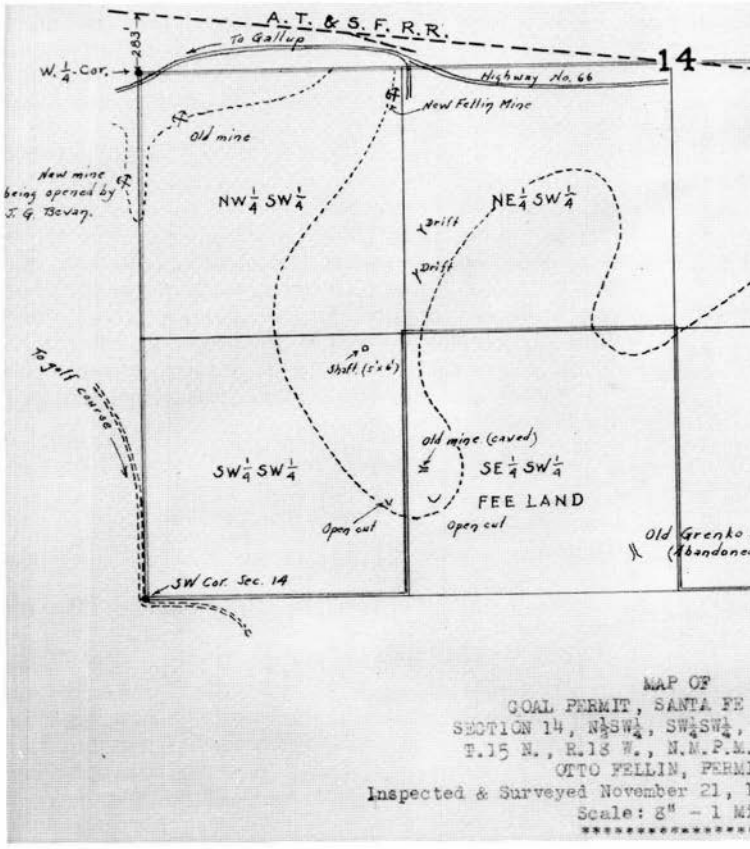


FIGURE 10—Map showing the prospect pits, entries, and coal outcr

2 was 324,374 tons. All of Carbon Coal Company's operations were put on standby in early 1986, and by July 1986 the company was laying off workers and keeping only a "skeleton" crew to maintain facilities.

Bombardieri prospect

SF 077223 3-8-44 Permit
Fiori Bombardieri, Gallup
Lots 1 and 2, S1/2NE1/4 sec. 4, T14N, R18W; 159.45 acres
400 ft NL, 1,100 ft EL (BS-2, Fig. 9)

The prospect land is 3.5 mi south of Gallup near the Zuni-Gallup highway (NM-32). Mr. Bombardieri made several cuts on lot 1 but was unable to find a bed of coal thick enough to warrant opening it by underground methods. Near the top of a hill, at location BS-2 (Fig. 9), he started a slope on a 4-ft bed of coal. The slope was driven 110 ft S27°W, and the bed dipped 5°S60°W. A 160-ft trestle and a small tipple and chute were constructed on the property. Unfortunately, the coal mined from the slope proved to be soft and unsalable. The permittee applied for a preference right lease but later withdrew the application because of the difficulty of hiring miners. The permit expired by law, with no production from the property.

Bevan mine

J. G. Bevan, 1932
3,600 ft NL, 200 ft EL, sec. 15, T15N, R18W (GE-80, Fig. 3)

An entry was opened by J. G. Bevan at the above location in 1932. No other information can be found in the records. A dump is evident on the ground, but no openings were located.

Unknown mine

3,400 ft NL, 5,100 ft EL, sec. 14, T15N, R18W (GE-81, Fig. 3)

This mine must have been opened on the Dilco bed before 1920 because Sears (1925, p. 49) reported it as abandoned. Evidence of the dump was found during field work, but the location of the opening had been covered by a house built over the area.

Fellin prospect

SF 054967 7-18-28 Permit
SF 066409 7-12-33 Permit
Otto Fellin, Gallup
N1/2SW1/4, SW1/4SW1/4, W1/2SE1/4, SE1/4SE1/4, sec. 14, T15N, R18W
4,200 ft NL, 3,800 ft EL (GE-88, Fig. 3)
3,000 ft NL, 4,000 ft EL (GE-87, Fig. 3)

Two beds of coal occur on the property, and Mr. Fellin opened numerous cuts along the outcrop to determine a place to test one of the beds underground. He selected a site from which to explore the upper bed and drove an opening S25°E for 197 ft to determine the quality and thickness of the coal. The coal was brownish black, 3 ft 4 inches thick, soft, and not of commercial quality. The prospect was abandoned, and a 70-ft drift was driven along the lower bed S48°E. The coal section near the face of this drift measured 2 ft 2 inches of coal, 3 inches of dirt, and 5 inches of coal, with a shale floor and roof.

J. J. Bourquin, District Mining Engineer, mapped the prospect drifts, and at a later date, while inspecting the property under permit SF 066409, he mapped the area by

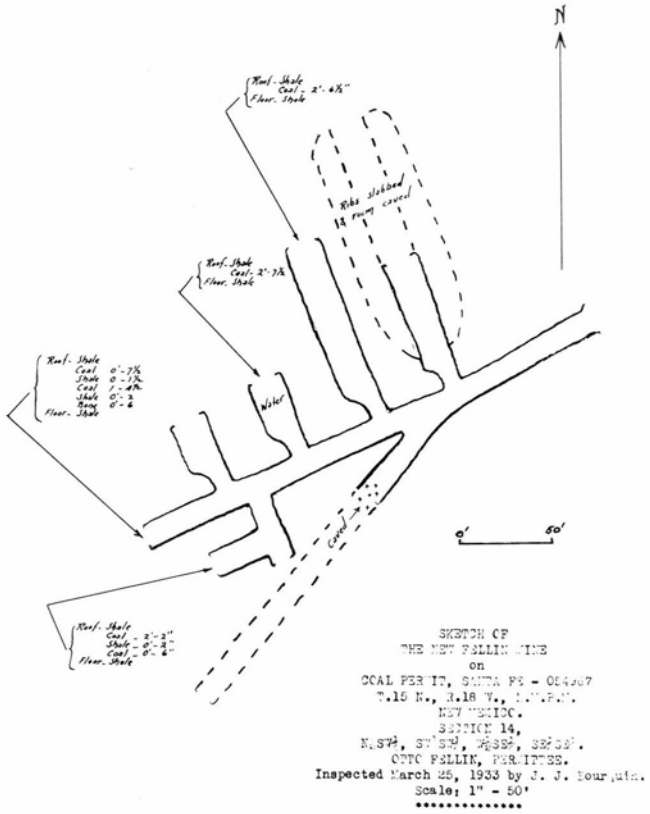


FIGURE 11—Map of the New Fellin mine.

Brunton compass and pacing. He located these two entries near the SW corner of the NE1/4SW1/4 of sec. 14 (Fig. 10).

Some equipment was purchased to mine the lower bed of coal, which appeared to be of good quality. A small tipple was constructed, and a hoist was installed to pull the cars from the mine. Apparently Mr. Fellin did not continue this operation, but opened what is referred to as the New Fellin mine on the Otero coal bed in the northeast corner of the NW1/4SW1/4. The extent of these workings is shown on the New Fellin mine map (Fig. 11).

Permit SF 054967 expired on July 17, 1932, and before that date Mr. Fellin had applied for a preference right lease. It was denied, so an application for a second permit was made and permit SF 066409 was granted on July 12, 1933. Mr. Bourquin inspected and mapped the mine on March 25, 1933, and at that time a miner who operated the mine for Mr. Fellin reported that operations were not going to continue because the coal as produced was very dirty and could not be sold. There was no production under permit SF 066409, and only 82 tons were produced under permit SF 054967.

Soper prospect

SF 077301 4-10-44 Permit
John E. Soper, Gallup
N1/2SW1/4,SW1/4SW1/4,W1/2SE1/4,SE1/4SE1/4sec. 14, T15N, R18W, 240 acres
3,500 ft NL, 4,000 ft EL (GE-75, Fig. 3)

Mr. Soper, owner of Soper's Super Market in Gallup, acquired the surface rights to the above land, which incidentally is now within the city of Gallup, and found a bed of coal. He then applied for a prospecting permit, but before it could be issued he had to find workers. Manpower regulations during the World War II years stated that one could not begin a new mine if it would take men from already

existing mining jobs, and Mr. Soper therefore had to find men to work who could qualify under those restrictions. He found two miners who would not be hired by other mines because of physical disabilities, but who were able to do a limited amount of work. The permit was then issued.

In April and May of 1944 Mr. Soper drove a short slope 50 ft long to the coal bed, then extended the slope an additional 50 ft. An air shaft 2.5 x 2.5 ft was sunk to connect the workings. These workings were on the NW1/4SW1/4 of sec. 14, a short distance south of the old Fellin openings. The coal bed was 2 ft 6 inches thick. No other work was done, and by April 1945 the openings were all caved. The permit expired by law on May 10, 1946.

Unknown shaft

4,600 ft NL, 4,200 ft EL, sec. **14, T15N, R18W (GE-74, Fig. 3)**

A sketch map found in the Fellin file, SF 054967 (Fig. 10), shows a 5 x 6 ft shaft at the above location. The shaft, now sealed, was used before 1932, the date of the map. It probably served as an aircourse for mines located about 1,0001,200 ft to the northwest.

Unknown mine

5,100 ft NL, 3,900 ft EL, *sec.* 14, T15N, R18W (GE-76, Fig. 3)

This mine must have been opened before 1920 because it is marked as a prospect on the Sears' (1925) map. The entry bears S22°E.

Independent-Carretto mine

Independent Coal Company, Dominic Carretto, owner, 1912-1922
5,000 ft NL, 3,200 ft EL, sec. 14, T15N, R18W (GE-77, Fig. 3)

The Independent mine was begun about 1912 by the Independent Coal Company, of which Dominic Carretto was owner and operator. The mine was originally opened by a double entry with single-cross entries and room-and-pillar system on the Otero bed of coal about 3.5 ft thick. Later a lower bed was opened by a slope and ventilated with an air shaft. The two upper entries bear about S22°E and are 110 ft apart. The main entry was reported to have reached a depth of 1,000 ft and ventilation was by furnace through an air shaft. The mine operated as a wagon mine when orders were received.

The mine on the lower bed was opened through a slope bearing S50°E and a shaft that served as an aircourse. The coal was hoisted by means of a tail block anchored in the hill opposite the portal, and the hoist was over the slope.

In 1922 Mr. Carretto leased the mine to John Gregorio.

TABLE 7—Production and employment record of the Independent–Carretto mine.

Year	Production (tons)	Miners	Company men	Days operated
1912		10	2	
1913	No records available			
1914	2,919	9	2	
1915	5,100	8	1	
1916	4,500	6		140
1917	6,137	8	3	155
1918	No records available			
1919	3,400	3	1	275
1922	Leased to John Gregorio; no records available after this date.			

No additional information was found concerning the operation of this mine. A record of production and employment is shown in Table 7.

Grenko mine

John and Tony Grenko, 1925; abandoned before 1932
200 ft NL, 3,200 ft EL, sec. 23, T15N, R18W (GE-78, Fig. 3)

This small truck mine, which was first reported in September 1925, was operated for a time by John and Tony Grenko. A. U.S. Geological Survey engineer labeled the Grenko mine abandoned on his 1932 map of the Fellin prospect (SF 054967; Fig. 10). The mine was opened by a slope about 1,000 ft long bearing N40°W. A Goodman miner was used to cut the coal, and rope haulage and mules were used to transport it. In 1925 900 tons of coal were produced by two miners. A small dump exists at the site.

Boardman mine

Boardman Coal Company, Boardman Brothers, owners and operators, 1921-1925; 1934-1950
4,600 ft NL, 250 ft EL, sec. 14, T15N, R18W (GE-79, Fig. 3)

The Boardman mine, owned by Henry Boardman, General Manager, Ernest Boardman, and Thomas Boardman, was begun in 1921. It was opened by a slope 500 ft long on the Otero coal bed. The mine operated until 1925 when pillars were pulled and the mine was abandoned. Under the direction of Henry Boardman, who was Manager at that time, a drilling program was undertaken to find additional coal, but the mine remained closed for 9 years.

In 1934 new openings were driven into new reserve on the same bed. William Boardman was then Manager, and George Sanford became Manager in 1944. In 1948 the mine was sold to Milkie Mason and William Kimer, and they leased it to Joe Spanberger, who allowed the mine to flood. Operations ceased in 1950.

There were five openings to the mine when work ended. All the coal to the east, west, and south was worked out or flooded. All openings except one were bulldozed during the mid-1970's to provide industrial building sites. One opening, bearing S60°E, is located behind the T. C. Noe Auto Repair Shop in Gallup. A record of production and employment is shown in Table 8.

TABLE 8—Production and employment record of the Boardman mine. *In 1933 state law prohibited publication of production records in the State Mine Inspector's annual report.

Year	Production (tons)	Employment			Days operated
		Miners	Company men	Top men	
1921	2,375	8	1	2	120
1922	4,000	6	1	2	150
1923	2,000	6	2	1	
1924–1933	No record, ceased operation				
1933*	No record				
1934		2			
1935		3	1	2	
1936–1937		2	1	2	
1938		3	1		
1939		2			180
1940		4	1	1	63
1941		3	2		199
1942		4		2	240
1943		none			
1944		3	1	1	
1945		3	3	1	
1946–1950	No record				

Juliana mine

Angel B. Juliana, late 1920's-1937
Vicinity of 5,400 ft NL, 3,700 ft EL, sec. 13, T15N, R18W **(GE-73, Fig. 3)**

The Juliana mine was opened by an entry on the Otero coal bed on patented land, the SW1/4SW1/4 sec. 13. The entry was driven southerly, and an air shaft was sunk for mine ventilation. U.S. Geological Survey records state that Angel B. Juliana was operating the mine in the late 1920's (see Juliana prospect, SF 063678). State Mine Inspector records first mention the mine in 1932 and show operation through 1937 with employment of from four to 10 men.

In 1931 Mr. Juliana started a long entry from his mine toward a prospect shaft that he had sunk in sec. 24. He hoped to develop the Otero coal bed from his mine, but because of thinning and erosion of the coal bed the work was stopped. None of the old openings could be found, but remains of the old dumps are in the vicinity of the above location. Production is not known.

Juliana prospect

SF 063678 **6-4-31** **Permit**
Angel B. Juliana, Gallup
SE1/4NE1/4, NE1/4NE1/4, N1/2NW1/4, W1/2SW1/4, E1/2SE1/4, sec. 24, T15N, R18W
200 ft NL, 4,200 ft EL **(GE-72, Fig. 3)**

The permit land was contiguous to patented land in sec. 13 on which Mr. Juliana was operating the Juliana mine in the late 1920's.

Mr. Juliana wanted to prospect the Otero coal bed on the permit land and, if it proved to be of commercial thickness, develop the bed from the Juliana mine. Before exploring the bed from the Juliana mine, Mr. Juliana sank a 4 x 5 ft prospect shaft 1,000 ft east and 250 ft south of the NW corner of sec. 24. The test shaft was sunk 76 ft; it cut two thin beds of coal. A cross section of the shaft follows:

0-11'	Sandstone
11'-30'10"	Alternate beds of shale and sandstone
30'10"-44'10"	Sandstone
44'10"-46'10"	Ironstone, red
46'10"-49'10"	Sandstone
49'10"-50'2"	Coal 4" 50'2"-52'8" Shale
52'8"-53'8"	Coal 1'
53'8"-70'8"	Shale
70'8"-72'2"	Coal 1'6"
72'2"-73'	Shale
73'-73'7"	Coal 7"
73'7"-74'6"	Shale
74'6"-74'11"	Coal 5"
74'11"-76'6"	Shale

According to J. J. Bourquin, District Mining Supervisor, the Otero coal bed was one of the thin beds cut in the shaft.

Mr. Juliana started a long entry from the Juliana mine toward the shaft, but the coal bed thinned, and the working was stopped. Mr. Bourquin reported that the bed was eroded and was occupied stratigraphically by stream-wash gravels and coarse sand both in the shaft and in the entry. The permit expired by law with no production from the permit land.

Golino mine

Mr. Golino, 1914-?
1,800 ft NL, 3,100 ft EL, sec. 24, T15N, R18W **(GE-71, Fig. 3)**

The State Mine Inspector reported that the Golino mine, a small wagon mine, was opened 2.5 mi east of Gallup in 1914. It was opened by double entry with room-and-pillar system, and an air shaft connected with the back entry. Four rooms were driven off these entries, and the inspector estimated that the mine produced 1,500 tons that year. There is no mention of this mine in ensuing years.

Sears (1925, p. 48) located a mine on his map 2.5 mi east of Gallup and reported it as a small unknown wagon mine that was operating in 1920. The location of this mine in the literature is vague, but during the Abandoned Mine Lands project done in 1979 a mine with an entry and an air shaft was found at the location given in the heading above; it is believed that this is the Golino mine. The mine site is on allotted Indian land.

Liberty mine

SF 054998 **3-22-28** **Permit**
7-26-29 **Lease**
Frances E. Nixon, Santa Fe
SE1/4NW1/4, E1/2SW1/4, W1/2SE1/4, sec. 24, T15N, R18W, 200 acres
1,800 ft NL, 2,700 ft EL **(GE-69, Fig. 3)**

Mrs. Frances E. Nixon, a bonded abstractor, and three associates formed the Liberty Coal Company. The Liberty mine, which was 2.5 mi east of Gallup, was operated by this company.

Mrs. Nixon applied for a prospecting permit, which the government issued on March 22, 1928. By November 1928, when C. L. Duer inspected the permit land, two main entries had been driven southerly for a distance of 362 ft, and from one of them two short entries had been turned right to develop a room system. The portals were located approximately 450 ft south and 100 ft west of the NE corner of the SE1/4NW1/4 sec. 24 (Fig. 12). Surface facilities at this time consisted of a tipple equipped with screens to make lump, nut, and slack coal, three cabins, an office building, and a powder house. Two trucks were purchased to haul the coal to the Atchison, Topeka and Santa Fe Railroad, which was about 1 mi from the mine. A. B. Juliana was the mine manager.

A coal section and a sample of the coal were sent to the U.S. Bureau of Mines at Pittsburgh, Pennsylvania, for analysis. A cross section of the coal bed 160 ft inby the portal showed the following:

Roof	Shale
5"	Bony
2'8"	Coal
51/2"	Shale
4'/2"	Coal
1[1]/2"	Bony coal
	Coal
Floor	Shale

The bed was nearly horizontal. The analysis showed the following content:

Moisture	10.8%
Volatile matter	35.0%
Fixed carbon	44.2%
Ash	10.0%
Sulphur	0.7%
BTU	11,170

At that time lump coal sold for $4.25 per ton, nut coal for $3.00 per ton, and slack for $1.25 per ton. The miners were paid $1.00 per ton for digging the coal. The coal, which was hard, black, and shiny, withstood shipment well.

Mrs. Nixon made application for a preference right lease, and it was granted on July 26, 1929. The officials of the Liberty Coal Company believed that their operations were on the Diamond coal bed, one of the important minable beds in the Gallup area; they also thought that a better bed of coal, the Otero, some 40 ft lower in elevation, would prove more favorable. A drill hole was started near the main

portal of the mine and was drilled to a depth of 240 ft, but no bed of workable thickness was found. The company officials then decided that the operations were in the Toltec bed, the basal bed of the Mesaverde Formation. A drill log follows:

0-5'	Alluvium
6'-10'	Oxidized coal
10'-45'	Shale
45'-57 1/2'	Sandstone
57 1/2'-90'	Shale
90'-127'	Alternate beds of sandstone and shale
127'-151'	Shale
151'-152'6"	Coal
152'6"-165'	Shale
165'-170'	Sandstone
170'-200'	Shale
200'-218'	Pink sandstone
218'-223'	Shale
223'-230'	Pink sandstone

The drill hole was developed into a water well that provided an abundant supply of good water for the camp. The water established a level at 90 ft from the surface.

In 1929 the company was unusually successful in establishing a market for its coal. A 4,000-9,000-ton 3-year contract was negotiated with an El Paso concern; a 7,000-ton market existed in Albuquerque; the slack coal was bought for the Gallup city powerplant; and there was a good domestic trade as far west as Winslow, Arizona. The company employed 17 miners, one driver, and three surface men. The mine was operated well, and the recovery of the coal was remarkably complete.

Coal was also mined from fee (private) land owned by the Liberty Coal Company. This land, the SW1/4NE1/4 sec. 24, was contiguous to the leased land and was mined through the same workings. According to J. J. Bourquin, District Mining Engineer, old workings were encountered, and these workings were holed into and used for ventilation. These workings were sketched on the mine map (Fig. 12).

Successful operation of the mine continued until early December 1931, and at that time it was closed. C. C. Mather, Associate Mining Engineer, was uncertain as to the reason for the closure because in October 1930, 20 men were employed and the coal sales, although off some, were still very favorable. Leo Bonaquidi, one of the investors, had taken over the management of the property, and it was he who had ordered the mine closed. It was later learned that the finances of the company had been mismanaged and that several thousand dollars were owed to miners for wages and to local businessmen for supplies and materials. All of the structures and portable equipment were sold at a tax sale on July 1, 1932. J. J. Bourquin estimated that not more than 50% of the commercial coal on the leased land had been mined. The land delineated within the solid and dot-

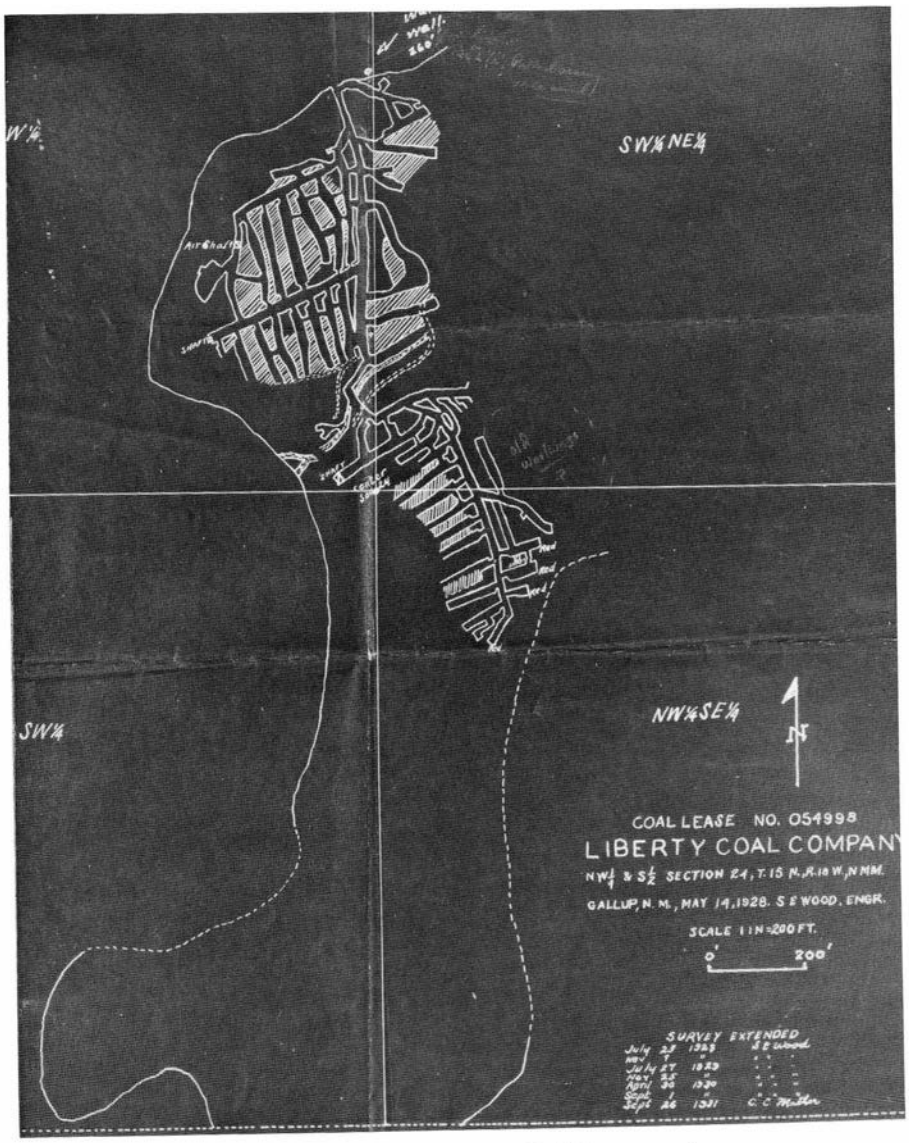


FIGURE 12—Map of the Liberty Coal Company mine.

ted line south of the mine workings on Fig. 12 represents the reserve.

During his inspection on November 22, 1932, Mr. Bourquin found an active fire in the mine and extinguished it. At that time considerable evidence of trespass was found, and it was imperative that the mine opening be sealed to prevent further trespass. Mrs. Nixon could not be located immediately, but when contacted later she had Mr. Juliana erect seals in the portals and abandon the mine properly. The abandonment was finally completed to the satisfaction of the government on April 27, 1934, and the lease was cancelled on June 25, 1934. Mrs. Nixon had requested cancellation on August 26, 1932. The mine produced 20,115 tons from October 1928 to December 1931.

Red Hill-Morelli-Zarnadi-Liberty Coal Company mine

Mr. Morelli, 1920-?
Pete Zamadi and Sons, 1926-1928
Liberty Coal Company, 1928-1931
1,600 ft NL, 1,600 ft EL, sec. 24, T15N, R18W (GE-68, Fig. 3)

Information is slight regarding the Red Hill mine. Sears (1925, p. 48) reported that in 1920 a Mr. Morelli was producing about 25 tons of coal per day for sale in Gallup. The mine was opened on the Black Diamond bed of the Dilco Coal Member. A coal section taken in the adjoining Liberty mine, which operated in 1928 and 1929, shows that the bed had 3 ft 7 inches of coal with two partings totaling 7 inches.

It is not known when Mr. Morelli closed the mine, but in 1925 it was operated by Pete Zarnadi and Barney Endice, who produced about 70 tons per month for local trade. In 1926 Mr. Endice was no longer involved with the mine, and Mr. Zarnadi and his sons were in charge. They mined 720 tons that year, and during 1927 they sold 400 tons. The mine closed in 1928.

The Liberty Coal Company of Santa Fe, under the management of Mrs. Frances E. Nixon, acquired the property soon afterward and operated it through and as a part of the Liberty mine. Some coal was mined from the old Red Hill workings, and, additionally, those workings served as an aircourse for the Liberty mine. Unfortunately, bad management was responsible for the closing of the Liberty mine in 1931 (see previous chapter).

Cardo mine†

SF 045237 **7–24–23** **Lease**
Joseph Cardo, Gallup
NE¼NE¼ sec. 24, T15N, R18W
800 ft NL, 1,200 ft EL **(GE–70, Fig. 3)**

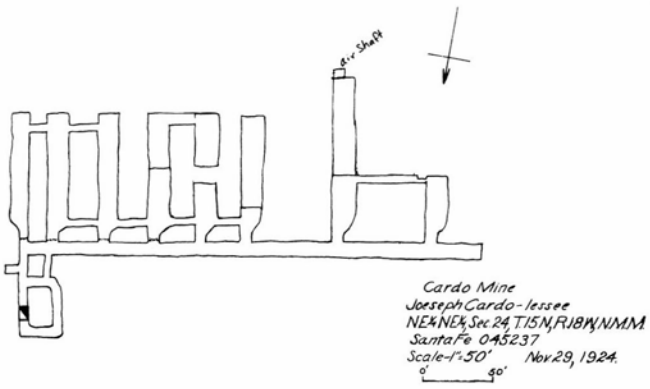


FIGURE 13—Map of the Cardo mine, showing the extent of the mine workings; the shaft was 25 ft deep.

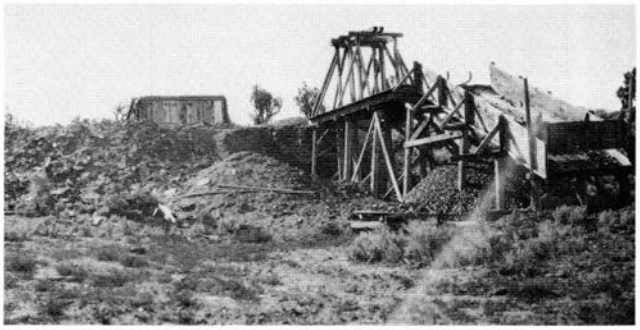


FIGURE 14—The shaft and the coal chute at the Cardo mine about 1924. The building served as a hoist house, shop, and tool storage shed. The coal on the ground is slack. *Photo by engineers from U.S. Geological Survey.*

Mr. Cardo applied for a coal prospecting permit and upon the advice of his lawyer began work immediately on the land. He sank a shaft 25 ft to the coal bed and began to drive entries and rooms from the shaft. The permit was delayed, and Mr. Cardo was charged with unintentional trespass. These problems were resolved, and he paid the going royalty rate for coal produced from prospecting permits. Because the mine was already in production, the above lease, SF 045237, was issued instead of a permit. The mine was developed as shown on the Cardo mine map (Fig. 13).

A coal cross section taken in the No. 4 room was recorded as follows:

Sandstone	**10'** to 12'
Soapstone	1' to 2'
Fire clay	0' 6"
Bone	0' 4"
Coal	0' 7'
Bone	0' 6"
Coal	1' 9"
Bone	0' 6"
Coal	0' 3"
Shale	Hard

Mr. Cardo, while working alone, was killed by a fall of roof on October 7, 1924. He was undercutting the coal bed, and apparently the soapstone roof, which contained many slips, fell without warning. Joseph Peretti, a son-in-law of Mr. Cardo, tried to keep the mine operating after Mr. Cardo's death, but because he ran a dairy, he could work only intermittently at the mine. Production stopped by October 1926, and the lease was relinquished March 2, 1929. Approximately 721 tons of coal were produced during the life of the lease, and 300 tons were produced during the time the property was unintentionally in trespass (Fig. 14).

A housing project has been built over the mine area, and the locations of the openings are difficult to determine. Some dump material remains to mark the general area.

Grenko mine (No. 2)+

John and Marion Grenko
Julian Grenko
C. A. Harround, lessee
1927-1956
1,900 ft NL, 3,500 ft EL, sec. 30,
T15N, R18W **(GW-49 and 50, Fig. 15)**

The larger of the Grenko mines was opened in 1927 by John and Marion Grenko. They drove a slope about due east on one of the lower Gibson coal beds, which averaged about 3 ft thick and had a good sandstone roof. By 1928 the slope was 500 ft long. A coal cutter was in use, a coal tipple and chute were constructed, and a new $1,500 generator was purchased.

Under the direction of Marion Grenko, the mine continued operation, producing 7,000-8,000 tons per year, until November 22, 1943, when he was killed by a fall of rock in an abandoned section of the mine. Frank Turak was then made General Manager, and he was in charge until 1949, when Julian Grenko became owner and operator. The mine was leased to C. A. Harround from 1951 to 1956, when the operation ceased.

During the Abandoned Mine Lands field work two ventilation shafts were found, one near the slope portal and the other about 1,100 ft to the northeast. The underground workings covered most of the SE1/4NW1/4 of sec. 30. There was a railroad spur within a few hundred feet of the mine site that extended to the new Mutual mine in the SW1/4 of the section. A record of production and employment is shown in Table 9.

TABLE 9—Production and employment record of the Grenko mine (No. 2). *In 1933 state law prohibited publication of production records in the State Mine Inspector's annual report.

Year	Production (tons)	Employment			Days operated
		Miners	Company men	Top men	
1927	2,000	4		1	
1928	7,049	10		2	300
1929	7,200	9		1	
1930	6,980	10	1	4	
1931	7,000	10	2	4	
1932	No record				
1933*		9			
1934		6			
1935		3		2	
1936		6		2	
1937		7	1		
1938		8	1		
1939		14	1		
1940		14	2	2	
1941		22	1	1	231
1942		13	1	1	283
1943		12	2	3	
1944	No record				
1947–1950		2–6			
1951–1956		2			
	Ceased operation in 1956				

Black Star—Mutual mine

SF 056206 8-2-28 Permit
9-22-33 Lease

Peter Pavioni, Gallup
S1/2 sec. 30, T15N, R18W

Paul D. Henderson, Gallup
SE1/4, NE1/4SW1/4 sec. 30, T15N, R18W

Black Star Coal Company, Gallup
S1/2 sec. 30, T15N, R18W

Mutual Coal Company, Gallup
S1/2 sec. 30; W1/2NE1/4, SE1/4NW1/4 sec. 31; W1/2, SE1/4 sec. 32, T15N, R18W, 920 acres
3,300 ft NL, 3,600 ft EL, sec. 30 (TB-1 and 2, Fig. 15)

The permit lands are 2.5 mi southwest of Gallup and 1.5 mi south of Allison. The first operator, Peter Pavioni, opened portals on the SW1/4 of sec. 30. By the time J. J. Bourquin, District Mining Supervisor, made his first inspection on October 19, 1929, considerable development work had been done underground, and surface improvements consisted of two frame houses, a blacksmith shop, a tool house, a powder magazine, and a tipple with a hoist (Fig. 16). The development work showed the coal bed to dip 8°S80°E. The coal was of good quality. The roof was sandstone, and the coal bed generally had a rock parting near the middle, but the bed averaged 3 ft in thickness.

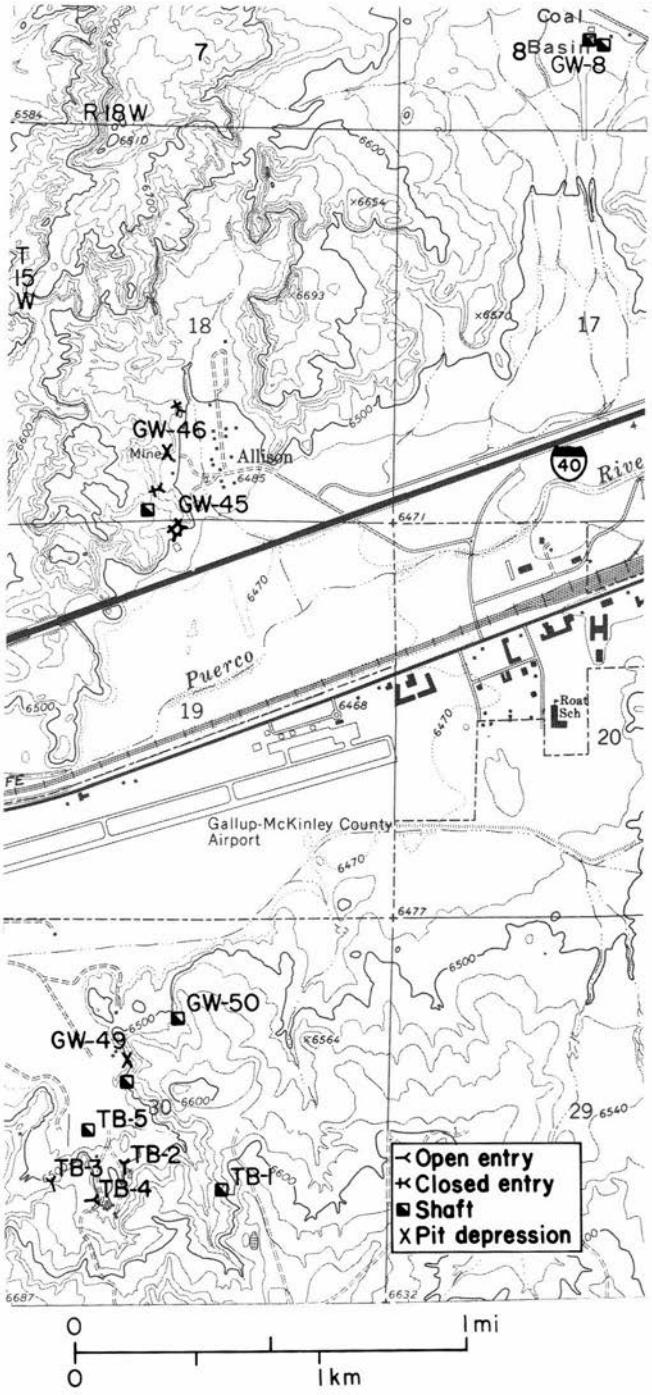


FIGURE 15—Some mines on the Gallup West and Twin Buttes 7½-min quadrangles.

GW–8—Coal Basin mine
GW–45—Mulholland–Casna mine
GW–46—Diamond–Allison mine
GW–49, 50—Grenko mine No. 2
TB–5—Unknown shaft
TB–1, 2—Black Star–Mutual mine
TB–3, 4—Unknown prospects

Mr. Pavioni continued to develop the mine (Fig. 17) and sell some coal, but he realized that he could not finance the improvements necessary for the mine to reach its potential, so he offered to sell. Paul D. Henderson, who operated the Henderson Lumber Company of Gallup, agreed to purchase the operation. The permit was about to expire, so Mr. Pavioni made application for a preference right lease and

FIGURE 16—The tipple and coal chute, constructed by Peter Pavioni, at the Black Star mine. *Photo by J. J. Bourquin about 1931.*

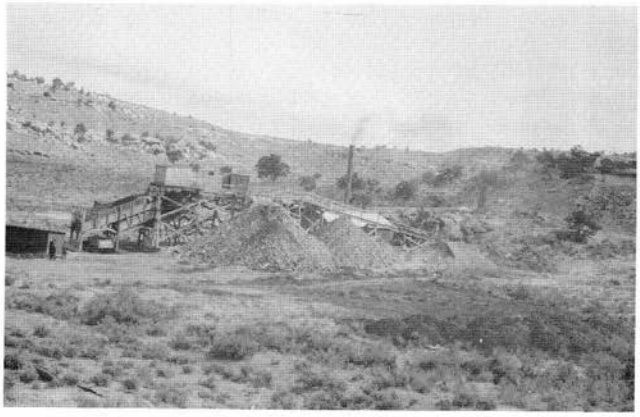


FIGURE 18—Black Star mine surface facilities. *Photo by F. W. Calhoun, about 1937.*

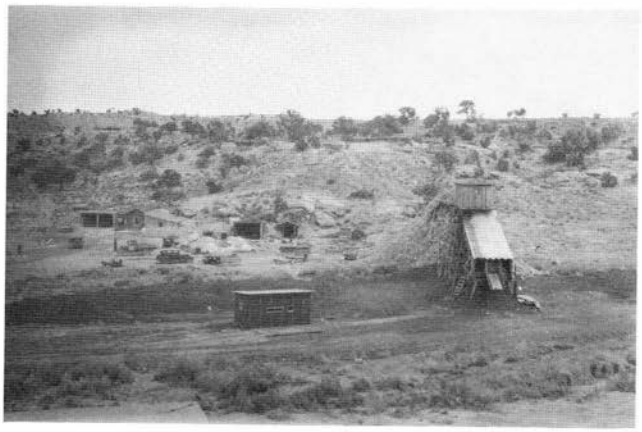


FIGURE 17—Black Star mine surface facilities, which were constructed by Peter Pavioni. *Photo by J. J. Bourquin, March 26, 1933.*

FIGURE 19—Water tank and the building that housed the steam engine and generator at the Black Star mine. *Photo by F. W. Calhoun, about 1937.*

assigned the lease to Mr. Henderson. The lease was approved on September 22, 1933.

Under new management the mine progressed rapidly, and a Goodman electric coal-cutting machine with a 6-ft cutter bar was purchased to expedite the work of driving rooms and entries. Numerous rock rolls slowed mine development somewhat and influenced the mine plan.

By 1935 the cutter had been discontinued because the generating facilities were too small to provide current to the coal faces, which had been extended considerably since the machine was purchased. A new boiler and a 250 V.D.C. generator were purchased, and an air shaft to the surface was provided to improve ventilation. By 1937 the generator had been installed and the cutter, pumps, and hoist were powered by it (Figs. 18 and 19). A water well was drilled between the main portal and aircourse to provide water for the camp and boiler and for fire protection. A condensed log of the well, drilled in 1936, follows.

0'-189' Sandstone and shale
189'-192' Brown shale and coal
192'-268' Sandstone and shale
268'-272' Gray sandstone, coal, and shale
272'-418' Sandstone and shale-45 gal/min water at 295' to 298'
418'-423' 5' of good coal
423'-453' Sandstone and shale
453'-461' 8' of good coal
461'-488' Sandstone and shale
488'-500' 12' of good coal
500'-522' Shale and sandstone
522'-526' 4' of good coal
526'-542' Shale
542'-547' Coal and shale; 3' of coal
547'-667' Shale and sandstone

Water was found at 618 to 667 ft; casing was set from 0 to 607 ft; water backed up in the pipe to within 50 ft of the surface.

Considerably later, in 1943, when the mine was under different management, a test well was drilled 11 ft west of the water well to check the coal beds found in the water well. The coal intervals were as follows:

2' at 10'	5' at 397'
3' at 22'	7'2" at 408'
1' at 211'	

From 415 to 442 ft the hole caved, which is probably the interval where 8 ft of coal were reported in the water well. The hole bottomed at 475 ft.

Mr. Henderson assigned the lease to the Black Star Coal Company and requested that the lease include the S1/2 of sec. 30. The Black Star Coal Company, which took charge of the mine during March of 1938, was reported to have been incorporated for $24,000. Sharp Hanson, president of Gallup-Southwestern Coal Company, purchased a $6,000 note from the First State Bank of Gallup and became one-third owner and president of the company. Mr. Henderson and Dan Brunetta each owned one-third interest, and they were secretary and mine manager, respectively. The company purchased all the mine equipment from a mine that was being abandoned by the Mutual Coal Company, extended the railroad siding to the Black Star mine, and increased the capacity of the mine to several hundred tons daily. A powerline was completed by June 1938 from Gal-

lup, which required changing from DC to AC for the electrical equipment on hand. The company also negotiated a 1,000-ton-per-month contract with the Atchison, Topeka and Santa Fe Railroad for engine fuel. The largest portion of the coal produced was sold for domestic fuel. The new lease of the Black Star Coal Company was formally approved on February 12, 1939. Before 1939, George Bubany, a businessman in Gallup, had also joined the company as one of its owners.

By 1939 a new tipple was built that had the distinction of being the only tipple on federal lands that loaded the coal directly into railroad cars. A 6-ton storage battery motor was used for haulage from the entry to the working faces. The estimated cost for the spur track from the main line of the Atchison, Topeka and Santa Fe Railroad was $17,500, exclusive of the cost of the rails. The Black Star Coal Company had invested $40,000 during the previous year for equipment, machinery, and buildings. Fiori Bombardieri was hired as mine foreman, and under his directions the miners were required to wear hard hats, but because the mine was nongassy they continued to use carbide lights. Production at this time was about 1,000 tons per month.

On October 26, 1938, R. D. Reeder, Deputy Mining Supervisor, cut two 1,000-lb tipple samples from + 1 1/2 inch coal and —1 1/2 inch coal. The following analyses were received:

	+1 1/2 sample	—1 1/2 sample
Moisture	13.6%	13.1%
Volatile matter	36.6%	35.2%
Fixed carbon	43.5%	43.0%
Ash	6.3%	8.7%
Sulphur	0.5%	0.7%
BTU	11,270	10,960
Softening temperature of the ash	2,310°F	2,270°F

The Black Star Coal Company requested that additional lands be added to the lease, namely the SE1/4NW1/4, W1/2NE1/4 of sec. 31, T15N, R18W, and that the name of the company be changed to the Mutual Coal Company. The lease revision was approved by the government on December 10, 1940, and the mine's name was changed.

By 1941, additional coal cutters had been purchased as well as two Mancha motors: one 4-ton and one 6-ton rating. The motors replaced the mules that had been used to pull coal cars to the parting. In 1942, employees included 38 miners, two machine men, two machine helpers, two motormen, two nippers, two shot firers, one track and timberman, one foreman, and seven men on the surface. These men mined about 2,500 tons per month. Figure 20 shows railroad coal loading facilities in 1942. By late 1943 production had increased to 3,000 tons per month under the direction of Dan Brunetta, General Manager.

The Mutual Coal Company again requested additional land, namely the W1/2, SE1/4 of sec. 32, be added to their lease, and the request was approved by the government on August 4, 1943.

By 1945 most of the coal had been mined and virtually none remained to be developed. The company was attempting to reach the coal in sec. 32 through the NE1/4NE1/4 sec. 31, which had been purchased, but this new development proved unfeasible because of the distance from the portal to sec. 32 (Fig. 15).

On December 12, 1947, the company requested that 480 acres be dropped from the lease and relief granted on the minimum royalty provision of the lease because much of the land was either inaccessible or mined out. The Bureau of Land Management (BLM) approved the request on March 25, 1949.

In 1949 there was a great deal of interest in the use of carbonaceous shale as a soil conditioner, and some production occurred adjacent to the Mutual mine. The company officials asked R. H. Allport, Mining Supervisor, for advice about leasability and consent to mine. There were no definitive answers, but the officials were advised to file coal prospecting permits on lands to protect their interests.

By 1950 the company was having difficulty because of the high costs of operations, the requirements of the contract with the United Mine Workers, and the poor showing encountered by the entries driven toward sec. 32. Mutual Coal Company was approached by a group of seven men, including some of their employees and the Grenko brothers, who operated an adjoining property; the group proposed to operate the mine on a partnership basis. The New Mutual Coal Company was later formed by these men. The mine, managed by Raymond Kauzlarich, General Manager, and Julian Grenko, General Superintendent, began work in early 1952 under an operating agreement, which was filed with the BLM on December 11, 1951, and approved, belatedly, on April 24, 1953, after the Mutual Coal Company threatened closure of the mine. Stump pillars and chain pillars were left to mine, and this coal would have been lost if the mine had been closed. The partners in the New Mutual Coal Company were all experienced men who were capable of mining the pillars and making it a profitable venture, and by early 1953 the mine was on full retreat. Figure 21 is a map showing the extent of the underground workings when the mine closed.

On the night of October 18, 1953, the tipple caught fire, and the tipple and the box car loading facility were destroyed. The loss was partly covered by insurance, and a smaller tipple with vibrating screens was built the following summer.

The mine continued to operate sporadically, and after the pillars were pulled the Mutual Coal Company resumed control of the property. The company became interested in the carbonaceous shale along the coal outcrops both as a soil conditioner and as a lubricant in oil-well drilling mud. R. S. Fulton, Regional Mining Supervisor, reported that the mine opening had been properly sealed and that the lease could be relinquished if the lessee desired, but because at that time carbonaceous shales from the coal outcrops on the leased land were being stripped, the company wished to retain the lease. The last carbonaceous shale was mined during the third quarter of 1960. The lease was cancelled on January 31, 1966. It was held for this period of time because the Mutual Coal Company owned the railroad spur that the Atchison, Topeka and Santa Fe Railroad was using for car storage. The railroad company paid a fee for this privilege.

Holding the lease for 6 years after mining ceased created a problem on the NE1/4SW1/4 sec. 30, with an Indian allottee, Tom Et-Sit-I-Chu, who owned the surface rights. The Bureau of Indian Affairs took up the allottee's problem of

FIGURE 20—Mutual mine railroad loading dock. *Photo by R. H. Allport, October 26, 1942.*

not being able to enjoy his rights to the land surface, but was informed that as long as the lease was in effect the coal lessee had the right to use any reasonable portion of the land necessary for the operation.

Production from the mine from the date of the permit (1928) to 1960 when the mine ceased operation was 289,345 tons, of which 5,284 tons were carbonaceous shale. The employment record of the mine is shown in Table 10.

TABLE 10—Employment record of the Black Star–Mutual coal mine. *In 1933 state law prohibited publication of production records in the State Mine Inspector's annual report.

Year	Miners	Company men	Top men	Total
1933*				6
1934	7	1	2	10
1935	3	2		5
1936	4			4
1937	9	1	3	13
1938	26	1		27
1939	20	4	4	28
1940	24	2	5	31
1941	28	3	5	36
1942	32	8	8	48
1943	38	10	10	58
1944	33	7	8	48
1945	32	9	7	48
1946	No record			
1947	32	6	8	46
1948	25	20	6	51
1949	20	3	4	27
1950	14	4	3	21
1951	11	3	1	15
1952	10	3	2	15
1953	11	3	2	16
1954		4	1	5

The mine closed in 1954; the lease was held until 1966 because annual rent was paid until then.

Leyba mine

Mirabel Coal Company, 1916
Leyba Coal Company, 1917
Lawrence Coal Company, 1918-1920
3,000 ft NL, 1,200 ft EL, sec. 34, T15N, R19W

In 1916 the Mirabel Coal Company opened a small wagon mine under the direction of E. Leyba. That year 14 men were employed, and 4,800 tons of coal were produced. The coal was hauled by wagon 3 mi to a rail siding, and $4,000 was spent for development and equipment. Because of a land title dispute with the government it became necessary to close the mine temporarily. In 1917 Mr. Leyba organized the Leyba Coal Company and operated the mine.

The original opening, located at 3,000 ft NL, 1,200 ft EL, sec. 34, was driven as a double entry to a depth of 400 ft on the uppermost bed of the Dilco Coal Member. Natural ventilation was used. Mr. Leyba drove a second entry lo-

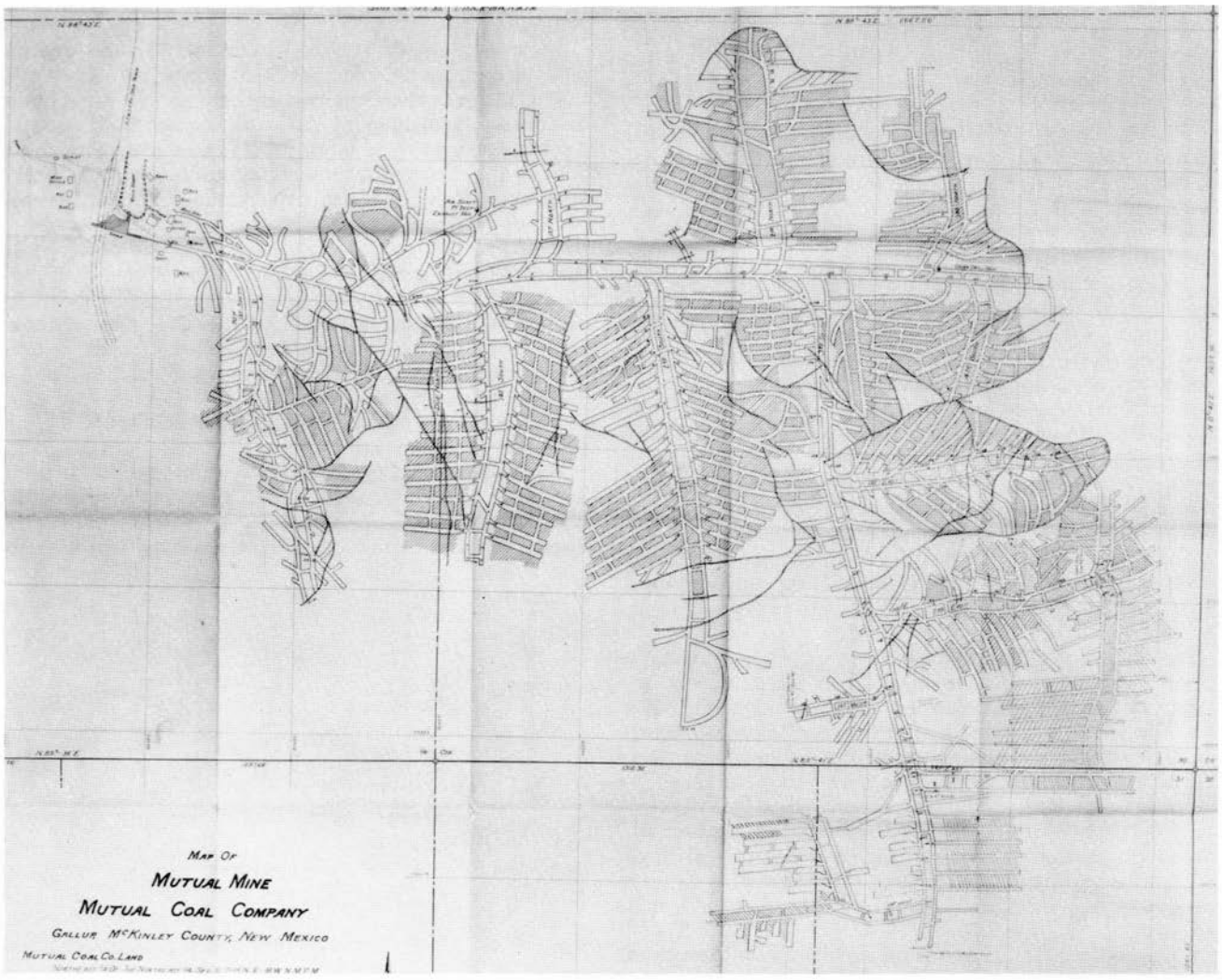


FIGURE 21—Map of the Mutual mine.

cated at 3,300 ft NL, 900 ft EL, sec. 34, probably for ventilation, and in 1917 16 men were employed; they worked 240 days and mined 4,675 tons of coal.

In 1918 Mr. F. Lawrence invested money in the mine and formed the Lawrence Coal Company with Mr. Leyba as Superintendent. A third opening, located at 2,200 ft NL, 1,600 ft EL, sec. 34, was made to the original mine. That year the company spent $1,500 in development work and $3,000 on dwellings; 20 employees produced 2,160 tons of coal.

There is no information in the records concerning operation in 1919. In 1920 F. Lawrence was Manager, and Sears (1925, p. 47) reported that the mine was then owned and operated by C. C. Manning. The mine was not mentioned in the records after 1920, and no figures of total production are available.

According to state inspection reports the mine was in sec. 4, T14N, R19W, but the inspection team for the Abandoned Mine Lands study done in 1979 found all three openings in the E1/2 of sec. 34, T15N, R19W.

Burrola prospect

SF 078232 2-3-47 Permit
William M. Burrola, Gallup
Valentin N. Burrola, Gallup
Lots 1 and 2, E1/2NW1/4 sec. 18, T14N, R19W

The prospect land is about 15 mi southwest of Gallup. Mr. William Burrola and his son opened an entry about 300 ft long on a course N15°W and drove a parallel entry about 100 ft long to the right. Several small rooms were opened near the face of the main entry. A side entry to the left 65 ft inby the portal was driven 90 ft to serve as an aircourse, but it did not hole through to the surface.

The coal section at the face of the main entry exposed a bed of coal 3 ft 1 inch thick with a shale roof and floor. A short entry was also driven on a bed of coal 15 ft below; the bed measured 3 ft 4 inches.

The permit expired by law on February 3, 1951, after production of only 417 tons of coal from the prospect. During the Abandoned Mine Lands study in 1979, the examiners could not find the workings. The above land description is probably incorrect.

Navajo Jim mine

Operator and date unknown
0 ft NL, 1,500 ft EL, sec. 31, T15N, R17W (BS-7, Fig. 9)

The Navajo Jim mine is shown on Sears' (1925) map; therefore, the mine was operated at some time before 1919-1920, the years that Sears conducted his field work. The mine was opened by two entries. One bears N66°E, and the bearing of the other cannot be determined because the portal, although exposed in the bank, has been bulldozed. There is another entry in the vicinity across the valley to the west, located at 4,200 ft NL, 2,300 ft EL, sec. 30, T15N, R17W. No information concerning the history of these small mines can be found in the literature.

Heiner-Roberts project

Claude P. Heiner, Salt Lake City, Utah
Earl Roberts, Gallup

NM 046329 (Roberts) 9-4-59 Permit
W1/2, SE1/4 sec. 16, T14N, R17W, 480 acres

NM 075024 (Heiner) 3-18-60 Permit
Secs. 28 and 30, T14N, R17W; secs. 12 and 24, T14N, R18W, 2,563 acres

NM 075127 (Roberts) 7-5-60 Permit
E1/2, SE1/4 sec. 8; all of sec. 18; N1/2, SE1/4 sec. 20, T14N, R17W, 1,599 acres

NM 0107694 (Heiner) 8-31-60 Permit
Secs. 14, 26, and 34; NE1/4, S1/2 sec. 28; W1/2NE1/4, NW1/4NW1/4, NW1/4SE1/4 sec. 35, T14N, R18W, 2,560 acres

The permittees entered into an agreement with Pittsburg and Midway Coal Mining Company to drill the lands of the above permits in conjunction with the adjoining Santa Fe Railroad land. No coal of commercial quantity was found, and the permits either were relinquished or expired. Two of the company's drill logs are presented below.

Pittsburg and Midway Coal Company drill log no. 836

3,280 ft NL, 750 ft EL, sec. 8, T14N, R17W; drilled 8/24/60

0'-12'	Shale, trace coal at 8'
12'-14' 6"	Sandstone
14' 6"-17' 6"	Shale
17' 6"-18' 2"	Coal
18' 2"-24'	Shale, trace coal at 23'
24'-29'	Sandstone
29'-41'	Shale, 6" of coal at 31 and 39'
41'-45'	Sandstone
45'-47'	Shale
47'-47' 8"	Coal
47' 8"-47' 10"	Shale
47' 10"-48' 9"	Wet coal
48' 9"-49'	Shale
49'-50' 10"	Coal
50' 10"-51' 1"	Shale
51' 1"-52' 5"	Wet coal
52' 5"-53' 7"	Shale
53' 7"-71'	Sandstone
71'-73' 6"	Dark shale
73' 6"-74' 3"	Coal
74' 3"-77' 6"	Shale
77' 6"-78' 1"	Coal
78' 1"-86'	Shale
86'-88'	Rash
88'-98'	Shale
98'-98' 6"	Coal
98' 6"-100'	Shale
100'-100' 5"	Coal
100' 5"-117'	Shale and sandstone with traces of coal, at 101', 108', 112', and 113'
117'-178'	Sandstone
178'-202'	Sandstone with shale
202'	Total depth

Pittsburg and Midway Coal Company drill log no. 846

4,280 ft NL, 2,500 ft EL, sec. 30, T14N, R17W

0'-24'	Shale
24'-40'	Sandstone
40'-45'	Shale
45'-55'	Sandstone
55'-58'	Shale
58'-70'	Sandstone
70'-84'	Sandy shale
84'-116'	Wet sandstone
116'-120'	Shale and water
120'	Total depth

Roberts-Sundance-Amcoal mine

Roberts Coal Company, 1950-1963
Sundance Coal Company, 1963-1975
Amcoal, Inc., 1975-1981
Sec. 9, T14N, R17W

In 1950 Earl Roberts, who was from Gallup, secured a lease on the above land, and the following year he began

work to open a small strip mine. In 1952 Phil Breedlove became his partner, and they formed the Roberts and Breedlove Coal Company. Four men were employed in 1952, eight in 1953, and 10 in 1954. In 1954 ownership changed again. Mr. Roberts became the sole owner and manager of the Roberts Coal Company, and he employed six men through 1956. In 1958 Mr. Roberts and K. R. Griffith became co-owners with Roberts continuing as general manager. They employed four or five men until 1960, at which time the mine ceased operation. When I visited the mine in the late 1950's the coal bed was about 6-8 ft thick. The shallow overburden was removed by dozer and ripper to a hard stratum, which in turn was drilled, blasted, and removed down to the coal bed. After being blasted the coal was loaded on trucks and then onto railroad cars for shipment to the west coast; there it was loaded onto a ship bound for Japan. Considerable planning and effort were required to fill a ship and meet its sailing date.

At some time before June of 1963 David C. Jones acquired the Roberts mine and changed its name to Sundance. He applied for a prospecting permit on the federal lands adjoining his lease (see next chapter). Application for a preference right lease, which at that time would undoubtedly have been granted, was not made. Subsequent developments showed this to be an unfortunate omission.

The Sundance mine began operation in about 1962 or 1963 with five employees. The Sundance Coal Company, under the direction of the Jones family, operated the mine until 1973 with four to six employees. In 1973 changes were made in the company. Earl Crist, Jr., became General Manager and Robert Holmberg became Mine Manager; the company headquarters were based in Albuquerque, but the Sundance Mining Company name was retained. Two pits were opened and from 14 to 23 men were employed. Operations ceased in 1974.

In October 1975, Amcoal, Inc., acquired the lands from the Great National Corporation, who apparently had been the titleholder for the past several years. Amcoal, Inc., which is a wholly owned subsidiary of Amcord, Inc., of Riverside, California, made the purchase to provide coal for a cement-manufacturing company in Phoenix, Arizona, which is owned by Amcord, Inc. Foreseeing the complete depletion of reserves by about 1980, the mining company applied on December 8, 1975, for a coal competitive lease on sec. 8, T14N, R17W. The government determined that commercial coal existed on only part of the eastern half of the section. The surface was controlled by Navajo Indians, and the coal belonged to the federal government. Politicians, environmentalists, Navajos, and restrictive regulations all played a part in the lease issuance decision. The eventual outcome was that Amcoal's lease application was denied in 1983.

I believe that this is conservation of natural resources at its worst because these reserves will probably never be utilized. The reserves are now too small (1 + million tons) to justify the capital to open a mine, but Amcoal was willing at the time of lease application to continue its mining operation for as long as 10 years if the lease had been issued. Amcoal lost. The state lost a business that would have employed a number of people, some of them Indians. Also lost were state taxes and federal government royalties and fees. As a result Amcoal, Inc. reclaimed the land and left the state.

In 1977 the company mined 160,000 tons. The company produced about 100,000 tons per year from 1978 until 1981, when the reserves were depleted. Figure 22 shows the area mined and the proposed lease covering the strip coal area. Given the estimate that about 320 acres were mined and that the bed averaged 6 ft thick, it is believed that 3.3 million tons were mined during the 30-year life of the mine.

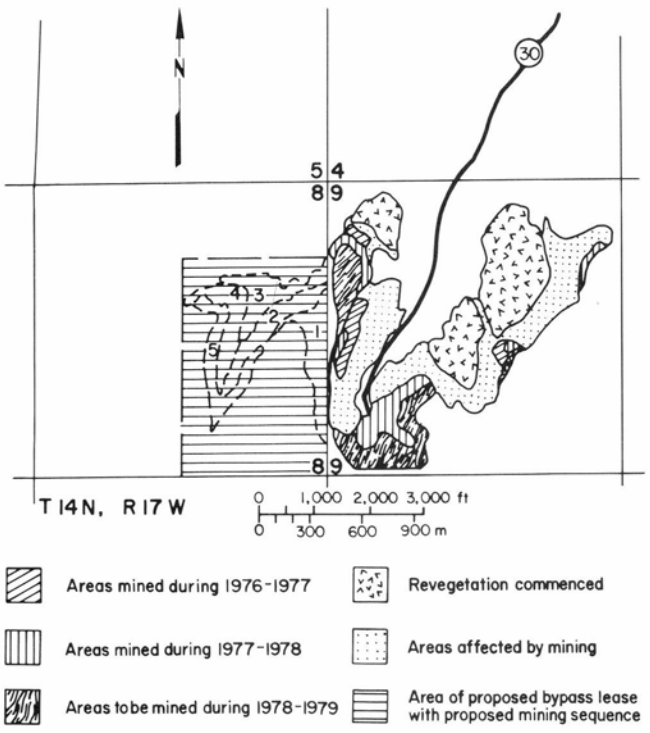


FIGURE 22—Amcoal mine plan map, submitted with the 1978 application for a federal competitive lease; scale 1:24,000.

Sentry Royalty-Jones Sundance project

NM 349974 5-1-63 Permit
David C. Jones, Gallup
W1/2 sec. 4; W1/2, SE1/4 sec. 16; N1/2 sec. 20; and all of secs. 6 and 8, T14N, R17W, 2,398 acres

NM 0556019 5-1-65 Permit
Sentry Royalty Company, St. Louis, Missouri
E1/2 sec. 4; W1/2 sec. 10; W1/2 sec. 22, T14N, R17W
Lots 2, 3, and 4, S1/2NE1/4, SE1/4NW1/4, E1/2SW1/4, SE1/4 sec. 30; NE1/4, E1/2NW1/4, SW1/4, N1/2SE1/4, SE1/4SE1/4 sec. 32, T15N, R17W, 1,795 acres

State of New Mexico lands, David C. Jones Lease

In the early 1960's David C. Jones operated the Sundance Coal mine on fee (private) land in sec. 9, T14N, R17W and also obtained a permit on the lands listed above under NM 349974, part of which are adjacent to the Sundance mine lands. During these years Peabody Coal Company of St. Louis, Missouri, was actively engaged in acquiring lands throughout coal fields of western states. Sentry Royalty Company, a land and exploration company wholly owned by Peabody Coal Company, applied for a permit on lands adjacent to Mr. Jones' permit lands. Most of the land ownership in this area south and east of Gallup comprises federal and Santa Fe Railroad sections in a checkerboard pattern.

Mr. Jones did not have the money to drill on his lands, and an agreement was made between him and the Sentry Royalty Company for the company to drill the area. The drilling, which took place in May 1965 was under the direction of John Organ, Coal Geologist. The company did not submit drill logs, but they did furnish the locations of the holes and the coal intercepts, which are reproduced below (T.D. = total depth).

Hole 44, federal land, Jones permit
Location: 400 ft NL, 150 ft WL, sec. 4, T14N, R17W
50.6'-1' Dirty coal
111.0'-1.3' Coal
120' T.D.

Hole 34, federal land, Jones permit
Location: 500 ft WL, 1,400 ft SL, sec. 4, T14N, R17W
45.7'-1.5' Coal
0.2' Shale
0.4' Coal
0.8' Carbonaceous shale with coal streaks
0.8' Coal
0.3' Carbonaceous shale with coal streaks
0.4' Coal
1.2' Carbonaceous shale with coal streaks
2.2' Coal
0.2' Bone
0.5' Coal
84.9'-2.1' Coal
130.2'-1.4' Coal
141' T.D.

Hole 32, federal land, Jones permit
Location: 1,650 ft SL, 200 ft EL, sec. 8, T14N, R17W
40.6'-0.7' Coal
0.2' Shale
1.4' Coal
0.5' Shale
2.1' Coal
0.5' Shale
1.7' Coal
81.6' T.D.

Hole 35, federal land, Jones permit
Location: 850 ft NL, 900 ft EL, sec. 8, T14N, R17W
46.6'-1.0' Shaly coal
0.2' Shale
2.4' Coal
0.9' Shale with coal streaks
3.2' Coal
60.8' T.D.

Hole 36, federal land, Jones permit
Location: 1,300 ft NL, 2,650 ft WL, sec. 8, T14N, R17W
121.7'-1.7' Coal
145.6'-0.3' Coal
0.9' Dark shale with coal streaks
1.0' Coal
0.8' Dark shale with coal streaks
1.3' Coal
200.8' T.D.

Hole 37, federal land, Jones permit
Location: 550 ft EL, 2,350 ft SL, sec. 8, T14N, R17W
16.0'-1.5' Coal 26.1'-1.5' Coal 66.9'-1.0' Coal 93.0'-1.0' Coal, shaly
112.0'-0.9' Coal, shaly
0.2' Shale
2.2' Coal
0.1' Tone
3.4' Coal
120.5' T.D.

Hole 41, federal land, Jones permit
Location: 750 ft EL, 2,200 ft SL, sec. 6, T14N, R17W
180.5' T.D. No coal

Hole 39, state land, Sentry Royalty Company lease
Location: 2,400 ft NL, 1,250 ft EL, sec. 16, T14N, R17W 39,6'-1.0' Coal
78.4'-4.2' Coal
163.8'-2.1' Coal, dirty
200.7' **T.D.**

Hole 15, state land, Sentry Royalty Company lease
Location: 400 ft WL, 200 ft NL, sec. 2, T14N, R18W
185.3'-1.0' Coal
200.7' T.D.

Hole 9C, state land, Sentry Royalty Company lease
Location: 100 ft NL, 2,120 ft WL, sec. 2, T14N, R18W 54.2'-3.1' Coal
72.1'-1.0' Coal
100.2'-5.6' Coal—Black Diamond bed
121.7'-2.5' Coal
151.2'-1.1' Coal
158.7'-2.4' Coal
166.1'-1.3' Coal
200.8' T.D.

Hole 8C, state land, Sentry Royalty Company lease
Location: 820 ft EL, 100 ft NL, sec. 2, T14N, R18W
64.1'-6.0' Coal—Black Diamond bed
75.7'-1.3' Coal
100.6'-2.0' Coal
176.7'-1.4' Coal
200.5' T.D.

Hole 11, state land, Sentry Royalty Company lease
Location: 1,000 ft EL, 1,420 ft SL, sec. 2, T14N, R18W 113.7'-1.0' Coal
200.9' T.D.

Hole 12, state land, Sentry Royalty Company lease
Location: 200 ft SL, 1,450 ft EL, sec. 2, T14N, R18W
180.7' T.D. No coal

Hole 13, state land, Sentry Royalty Company lease
Location: 240 ft SL, 2,200 ft WL, sec. 2, T14N, R18W 180.8' T.D. No coal

Hole 1, state land, Sentry Royalty Company lease
Location: NE corner sec. 36, T15N, R18W
70.2'-1.0' Coal
93.3'-1.3' Coal
200.4' T.D.

Hole 2, state land, Sentry Royalty Company lease
Location: 1,050 ft NL, 1,470 ft EL, sec. 3, T15N, R18W 22.0'-1.7' Coal
117.1'-1.1' Coal
206.8'-1.3' Coal
260.6' T.D.

Hole 3, state land, Sentry Royalty Company lease
Location: 1,800 ft EL, 1,810 ft SL, sec. 36, T15N, R18W 25.1'-1.9' Coal
63.0'-2.5' Coal
220.1' T.D.

Hole 4, state land, Sentry Royalty Company lease
Location: 500 ft SL, 2,050 ft WL, sec. 36, T15N, R18W 60.9'-1.7' Coal
118.7'-1.8' Coal, dirty
157.0'-2.0' Coal
220.8' T.D.

Hole 5, state land, Sentry Royalty Company lease
Location: 550 ft WL, 1,750 ft SL, sec. 36, T15N, R18W
7.8'-3.3' Coal—Black Diamond bed
22.0'-1.0' Coal
62.0'-1.1' Coal
125.1'-1.7' Coal
143.9'-1.2' Coal
163.5'-1.0' Coal
176.5'-1.7' Coal
1.1' Shale
1.4' Coal
220.1' T.D.

Hole 6, state land, Sentry Royalty Company lease
Location: 1,600 ft NL, 1,900 ft WL, sec. 36, T15N, R18W
75.4'-1.2' Coal, dirty
146.2'-4.0' Coaly zone
200.0' T.D.

Hole 7, state land, Sentry Royalty Company lease
Location: 100 ft NL, 1,900 ft WL, sec. 36, T15N, R18W 48.2'-1.2' Coal 80.9'-1.5' Coal 143.3'-2.2' Coal
200.3' T.D.

Hole 14, state land, Sentry Royalty Company lease
Location: 100 ft WL, 1,170 ft SL, sec. 36, T15N, R18W

27.7'-4.0' Coal, dirty—Black Diamond bed
38.4'-1.4' Coal
95.1'-1.0' Coal
116.1'-2.7' Dirty coal
138.5'-1.2' Coal
150.0' T.D.

Hole 46, federal land, Sentry Royalty Company permit
Location: 2,340 ft SL, 2,110 ft EL, sec. 30, T15N, R17W

21.9'-1.6' Coal
27.5'-2.8' Coal
54.1'-1.3' Coal
60.0'-1.0' Coal
72.8'-2.1' Coal
160.5' T.D.

Canavan and Bailey-Summit-Graveyard mine

Canavan and Bailey, 1894-1895
Summit Coal Company, 1895-1898
1,400 ft NL, 2,400 ft WL, sec. 16, T15N, R18W (GW-41, Fig. 3)

The first report of this mine, which was 1 mi northwest of Gallup, is from a visit to it in October 1894 by John W. Fleming, Territorial Mine Inspector. He stated that Stephen Canavan and Isaac Bailey, Owners and Operators, had just started the mine, and a slope about 50 ft long had been driven along a 4.5-ft bed of coal. By June of 1895 the main slope had reached a depth of 250 ft, and Isaac Bailey, General Manager, employed 11 men who produced about 50 tons per day. The coal was hoisted from the mine by a two-horse whim, then loaded on railroad cars for shipment to the United Verde Coal Company at Jerome, Arizona.

A later inspection, in December 1895, revealed that the mine had not been worked for several months and a new company, the Summit Coal Company, had been formed. Officials were C. E. Van Fossen, General Manager, and Isaac Bailey, Superintendent. A second opening had been driven north for ventilation, a new tipple erected, and a new hoisting plant installed, and operations were to begin within a few days. The slope, then 400 ft long, was driven west on a 4.5-ft bed of coal that dipped 24-26° west. This bed is now known as the Aztec bed in the Gibson Coal Member. The name of the mine was probably changed at that time to the Summit mine, and because it was located about 200 yards from the town graveyard, it was also known as the Graveyard mine (Fig. 23). During fiscal year 1897-1898, under the direction of Thomas Cross, General Manager, the mine was worked 65 days, and 800 tons of coal were mined by six miners and two outside men. The slope was 650 ft long, and the aircourse needed to be timbered and cleaned up. The mine closed during the latter part of 1898.

The old dump has been leveled to surface the Washington School yard in Gallup. Remnants of a tramline bearing west that connected with the railroad are still evident.

FIGURE 23—Site of the graveyard near the Canavan and Bailey–Summit–Graveyard mine. The last of these names was used by many people because of the proximity of the site to this old, neglected graveyard, where many early-day miners, who were killed in the Gallup mines, are buried. The mine, about 200 yards west of the graveyard, was located at the road shown in the center of the photo. *Photo by H. B. Nickelson, 1979.*

Keeper-Mutual mine+

Mutual Coal, Light and Power Company
United Verde Extension Company 1918-1938
1,400 ft NL, 1,200 ft EL, sec. 16, T15N, R18W (GE-6, Fig. 3)

In 1918 the Keeper (later Mutual) mine was begun near the above location by the Mutual Coal, Light and Power Company, of which George Keeper was Secretary and Treasurer. A slope was opened on the Black Diamond bed of coal in the Dilco Formation. The bed, 3.5-6 ft thick in this area, lies along the west limb of an anticline. At the surface the dip was 26° to the west, but it flattened to about 5° at the bottom of the mine. The Otero coal bed above the Black Diamond bed was also developed and mined.

By 1919 the slope, which bore S70°W, was 960 ft long, and the mine was ventilated through a shaft that was 156 ft deep. Under Thomas Layden, Superintendent, plans were being developed to open a new long slope and to convert the original slope to an aircourse. It is believed that the new portal, which was within a stone's throw of Main Street in Gallup, was opened at this time, but in 1920 the mine was closed temporarily. In 1921 it was leased to Robert Wyper, and for 2 or 3 years tonnage produced was low, ranging from 1,000 to 3,000 tons per year.

By 1924 the mine was under new management; the Mutual Coal, Light and Power Company was owned by the United Verde Extension Company with R. D. Leisk as General Manager. Apparently the new company followed the original plans of development; it also retained the name Mutual mine. The main slope soon reached a depth of 1,400 ft, and production gradually increased. In 1924 production was 15,000 tons; 2 years later it was more than twice that amount. The mine was wet, and as it was developed bigger pumps were needed. Natural ventilation was used. H. F. Mills, who was Mine Superintendent in 1926, was made General Manager in 1928, retaining the latter position until the mine closed.

The company had a land problem. The coal lands that it owned were not contiguous. The workings of the Mutual mine were in the $W^1/2NE^1/4$ of sec. 16. The company also owned part of the $W^1/2NW^1/4$ sec. 16, but the intervening land, the $E^1/2NW^1/4$, was owned by the Gallup American Coal Company, which was called the Victor American Fuel Company until July 1, 1917. Thus, expansion into the $W^1/2NW^1/4$ was blocked. Under the direction of Mr. Mills and officials of both companies, an easement to allow driving slopes across the land of the Gallup American Coal Company was negotiated. Information available, however, indicates that the Diamond bed was never mined on the $E1/2N^W1/4$.

The highest production from the Mutual mine, 68,341 tons, was in 1930, and from then until the mine closed, average employment was about 75 men. By 1932 the main slope had reached a length of 3,154 ft and the mine was then the deepest in the Gallup Basin, some 800 ft below the surface. There is occasional mention in the records of ven-

tilation problems. When the upper level was being mined, the Mutual holed into the McDermott mine, which was then used for ventilation.

Section 16 is located within the city limits of Gallup, and the Mutual mine workings underlie a good deal of the city. It is fortunate that the steep dip of the coal bed and a strong overlying sandstone bed formed a combination that protected the area from surface subsidence. Further control of subsidence was exerted because the coal bed was never mined to the surface because of oxidation to a depth of 200-300 ft.

Because the reserves were depleted, the mine ceased operation in 1938. Production, with an estimate for the years not recorded, totals approximately 627,000 tons. The coal was marketed in California, Arizona, and New Mexico. It is assumed that part of the production was used for fuel at metal mines also owned by the United Verde Extension Company.

There is very little evidence today that a mine existed in the area. Only some mine dump material and a piece or two of concrete foundation too difficult to remove remain. Records of production, employment, and fatalities are shown in Tables 11 and 12.

Sharp and Fishburn mine

John Sharp and Mr. Fishburn, 1903-1905
400 ft NL, 1,100 ft EL, sec. 16, T15N, R18W **(GE-5, Fig. 3)**

TABLE 11—Production and employment record of the Keeper–Mutual mine. *In 1933 state law prohibited publication of production records in the State Mine Inspector's annual report.

Year	Production (tons)	Employment			Days operated
		Miners	Day men	Top men	
1918	5,000				
1919	4,000	12	2	3	200
1920	12,893				
1921	1,000				
1922	3,000				
1923		13			
1924	15,000				
1925	26,744	20	7		
1926	37,997	38	3	6	299
1927	38,033	35	5	5	274
1928	44,355	46	8	6	237
1929	52,729	44	12	6	271
1930	68,341	50	12	8	252
1931	58,591	52	12	8	192
1932	65,144	54	15	8	186
1933*	No record				
1934		53	10	10	
1935		54	12	11	
1936		55	10	8	
1937		53	10	10	
1938	No record; mine closed				

TABLE 12—Fatalities at the Keeper–Mutual mine.

Name	Date	Cause
Jose Maria Padilla	March 26, 1920	Killed by going back on a shot
Ismael Escaryza	November 24, 1923	Struck by a trip that was coming out of the mine
Charles Ramach	December 29, 1933	Fall of rock
Joe Morelli	September 23, 1935	Electrocuted
Joe DePomazio	September 23, 1935	Electrocuted

John Sharp and a Mr. Fishburn opened the mine that bears their names in about 1903. Mr. Sharp was Superintendent of the Black Diamond Coal Company, but this small operation was an individual effort. It is believed that the portal was about 150 ft SL, 900 ft EL, sec. 9, T15N, R18W, because an opening is still evident there. The old Stewart mine is nearby.

The workings in the Sharp and Fishburn mine, which in the literature is also called the New Black Diamond mine, were on the Black Diamond bed; at this location the bed is 5 ft thick and dips 18°. The mine slope was extended to 700 ft in length, and during fiscal year 1903-1904 16 employees produced 10,000 tons. The mine failed the following year, and there is no record of further production.

McDermott and Floyd mine

J. E. McDermott and C. A. Floyd, 1920-1931
400 ft NL, 1,100 ft EL, sec. 16, T15N, R18W (GE-5, Fig. 3)

In 1920 J. E. McDermott and C. A. Floyd leased land in sec. 9, probably the $S^1/2SE^1/4$, from the Gallup American Coal Company and began mining, apparently from the old Sharp and Fishburn entries. The partners later obtained other land in sec. 16, possibly the N1/2N1/2NE1/4, and a new entry at the location given in the heading above was driven due west. During the life of the mine this slope reached a depth of 1,900 ft. Mining was from the Diamond bed, which was 3.5-5 ft thick and dipped about 27° to the west. The coal was hauled to the railroad by wagon or sold locally.

In 1925 an entry was driven to connect this mine with the Mutual mine. In 1927 ownership changed partially, and J. Chenowith became a partner with J. E. McDermott; McDermott remained General Manager. Trucks were bought in 1930 to replace the wagons that had hauled the coal to the railroad loading dock. The mine ceased operation in 1931.

The only evidence of the mine remaining today is some dump material. Production as listed in State Mine Inspector's records, including an estimate for the 2 years no records were received, totaled about 105,000 tons. A record of production and employment is shown in Table 13.

TABLE 13—Production and employment record of the McDermott and Floyd mine; *estimated by State Mine Inspector.

Year	Production (tons)	Employment			Days operated
		Miners	Day men	Top men	
1920	13,000	10			288
1921	990	4	1	2	55
1922	10,000*				
1923	No record				
1924	11,700	10	1	3	283
1925	No record				
1926	8,156	8	1		
1927	8,747	8	1	2	209
1928	9,456	8	1	2	280
1929	9,178	8	1	2	265
1930	9,047	8	1	2	230
1931	7,115	8		1	161

Stewart-Black Diamond mine

William Stewart, 1898-1900
Black Diamond Coal Company, 1901-1903
5,100 ft NL, 800 ft EL, sec. 9, T15N, R18W (GE-39, Fig. 3)

The first of several mines along the Black Diamond bed in the SE1/4 of sec. 9 was opened by William Stewart on

July 1, 1898, under a lease obtained from the Santa Fe and Pacific Railroad.

Two slopes about 400 ft long were driven along the 5-6-ft bed of coal down the 18° dip. Ventilation of the mine was by furnace. The coal was hauled by wagon to the railroad loading dock for shipment and sale in New Mexico and Arizona. A small amount of the production, which averaged from 5,000 to 6,000 tons per year, was sold locally.

In fiscal year 1901-1902 the Black Diamond Coal Company began operating the mine under the direction of John Sharp, Superintendent. That year the slope reached a depth of 1,200 ft. Ventilation was natural, through an air shaft. In 1903 the mine changed hands, and John Sharp and Mr. Fishbum operated it until 1905 (see Sharp and Fishburn mine).

At some time during the next few years the land was obtained by the Gallup American Coal Company, which in 1920 leased it to J. E. McDermott and C. A. Floyd. They reopened the Sharp and Fishburn entries and also opened a new mine in sec. 16 adjoining the above workings (see McDermott and Floyd mine). They ceased operations in 1931, and the Chiaramonte mine was opened in 1932 through the old Stewart workings (see Chiaramonte mine). A record of production and employment of the Stewart-Black Diamond mine is shown in Table 14.

TABLE 14—Production and employment record of the Stewart–Black Diamond mine.

Year	Production (tons)	Employees	Days operated
1898–1899	2,000	9	200
1899–1900		18	200
1900–1901	6,000	12	300
1901–1902	5,000	12	180
1902–1903	5,000	12	180

Chiaramonte mine+

Chiaramonte family, 1932-1961
4,900 ft NL, 600 ft EL, sec. 9, T15N, R18W (GE-38, Fig. 3)

The Chiaramonte family opened the mine with their name through the old workings of the Stewart mine. Two parallel entries were driven about N57°W for a distance of about 1,700 ft on the Diamond coal bed in the Dilco Formation. The coal bed, which had a sandstone roof, averaged about 3.5 ft in thickness. Tony Chiaramonte was General Manager until 1943 when Vincent Chiaramonte and Sons operated the property. In 1949 Joe and Carmelo Chiaramonte assumed operation of the mine and were in charge until it closed in 1961.

During the Abandoned Mine Lands field work in 1979 the mine slope was found to be open but screened with railroad rail. The city of Gallup had diverted drainage water into the mine with the hope of recharging the city water aquifer. Early in 1980 the Office of Surface Mining provided money to seal the entry and beautify the dump area.

There were two reported fatalities, both caused by a fall of rock: Enaco Rodriqis on November 19, 1934, and Sebastian Pelraza on January 6, 1936. Records of production are not available, but the employment record is shown in Table 15.

Kauzlarich mine

Louis Kauzlarich, 1920(?)
4,400 ft NL, 4,700 ft EL, sec. 10, T15N, R18W (GE-7, Fig. 3)

Louis Kauzlarich leased a small acreage from the Gallup American Coal Company near the above location and opened two entries bearing northwesterly on the Black Diamond coal bed in the Dilco Coal Member. Sears (1925, p. 47) mentioned that this wagon mine was producing from 30 to 40 tons per day during periods of operation in 1919 or 1920.

FIGURE 24—Black Diamond miners at the portal of the Black Diamond mine during
New Mexico, is from the archives of the Gallup Public Library.

TABLE 15—Employment record of the Chiaramonte mine. *In 1933 state law prohibited publication of production records in the State Mine Inspector's annual report.

Year	Employment		Days operated
	Miners	Top men	
1932			
1933*	9 employees		
1934	5	2	
1935	6	2	
1936	4	2	
1937	7	2	
1938	7		
1939	9	4	
1940	8	10	205
1941	11	3	240
1942	20	6	295
1943	20	6	
1944	7	6	
1945	6	11	
1946			
1947	3	6	
1948	3	6	
1949	3	2	
1950–1961	2–3	1–2	

FIGURE 25—View looking N70°W of the old mine dumps from the Black Diamond et al. mines at Diamond gulch. The mine portals were all above this rim to the north. A trestle was built from the rim across the gulch; the coal bins and railroad loading dock were under the trestle, and the refuse was dumped from the trestle to form these dumps. Note the water tower on the horizon and the new school on the left. *Photo by H. B. Nickelson, 1979.*

The coal bed was 3.5 ft thick. The mine was adjacent to the Diamond mine, and Mr. Kauzlarich holed into this old mine. No further information is available.

Black Diamond mine+

Black Diamond Mining Company, 1885-1892?
Crescent Coal Company, 1892?-1896
675 ft WL, 1,250 ft SL, sec. 10, T15N, R18W (GE-8, Fig. 3)

The Black Diamond Mining Company was organized by W. A. Maxwell and others in 1885. A mine was opened by two entries driven northerly into the NW1/4S^{E}1/4 sec. 10, on a bed of coal 5 ft thick. In 1885 W. A. Maxwell mined 2,186 tons (Mineral resources of the United States, calendar year 1885, p. 41). The bed in the Dilco Coal Member, which was to become the most developed and the most productive in the vicinity of Gallup, was named the Black Diamond after this early-day mine. Some of the early-day miners posed for a photo at the portal of the Black Diamond mine (Fig. 24). W. A. Maxwell was Superintendent, and E. J. Curson was General Manager.

At some time in the late 1880's independent coal operators had explored and developed a large reserve of coal in the Gallup field, and they began to talk about consolidating their holdings. The Gallup Coal Company, the Aztec Coal Company, the Crown Point Coal Company, and the Black Diamond Coal Company formally combined and formed the Crescent Coal Company on January 16, 1892. This new company assumed control of the Black Diamond mine. A record of production from the Crescent Coal Company mines is shown in Table 16.

John C. Spears, Territorial Mine Inspector, inspected the mine on August 13, 1893, and found the company mining a bed of coal 4-6 ft thick with a predominant sandstone roof. The mine had a capacity of about 500 tons per day and was one of the most profitable in the district. C. W. Kennedy was General Manager, F. D. Douglas was Superintendent, and John Conn was Pit Boss. On May 11, 1893, Hugh Gammil was killed by a rock fall.

The mine was ventilated through a shaft with the aid of a furnace. A 1-mi spur from the Atlantic Pacific Railroad was built up Diamond Canyon to serve the mine marketing. The coal was trammed off the rim across a trestle to bins where it was stored ready to be loaded into railroad cars. The refuse was piled on the valley floor (Fig. 25). Remnants

TABLE 16—Production in tons from the Crescent Coal Company mines (started January 16, 1892), which were sold April 1, 1900, to the American Fuel Company; *includes Black Diamond mine production.

Year	Gallup mine	Black Diamond mine	Crownpoint mine	Sunshine mine	Catalpa mine	Total
1891–1892			Closed			
1892–1893						
1893–1894	107,786		Shafts were sunk	102,714*		210,500
1894–1895	107,727	44,721		78,255		230,703
1895–1896		Pillars pulled; mine closed				
1896–1897	No report					
1897–1898	141,145		61,194	48,450	4,353	255,142
1898–1899	151,525		45,490	27,723	58,061	282,799
1899–1900	180,000		40,000	Not operated	80,000	300,000
1900–1901	145,000		Closed April 3, 1900		78,384	223,384
1901–1902	80,732				62,214	142,946
1902–1903	None				Mine closed February 14, 1902	80,732
1903–1904	21,417 Closed 1904 (fire)					21,417

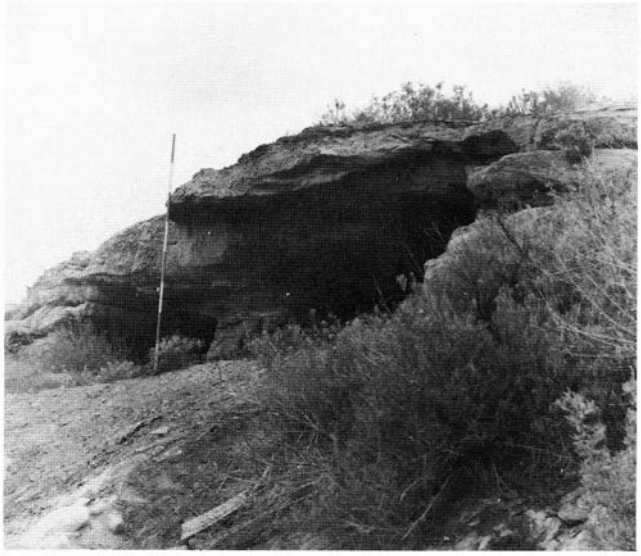


FIGURE 26—This photo shows where the early-day Black Diamond miners dug a living space under the rimrock above Black Diamond gulch. Pick marks show where they enlarged this space. Remnants of rock huts are still evident along the upper gulch walls. *Photo by H. B. Nickelson, 1979.*

of the miners' dwellings—some stone huts, some rude shelters under the sandstone ledges—are still evident along the mesa slopes near the mine (Fig. 26).

The first record of inspection was of a visit to the area in October 1894 by the Territorial Mine Inspector, who reported that production was coming from drawing pillars. For fiscal year 1893-1894 production from the Black Diamond mine combined with that of the Sunshine mine was 102,714 tons (Table 16). During fiscal year 1894-1895, 44,721 tons were produced at the Black Diamond mine by about 50 employees under the direction of Superintendent Hugh McGinn, General Manager C. W. Kennedy, and Pit Boss James Richards. The mine was abandoned in June 1896. The total production is not known.

An interesting footnote was added in later years to the history of the mine. At midnight on January 8, 1938, State Mining Inspector Warren C. Bracewell was notified by phone that a man had gone into an old mine and failed to come out, and that two others had lost their lives trying to rescue him. Mr. Bracewell arrived at Gallup three hours later to take charge. He found that a man had been arrested on suspicion of theft and while in jail confessed his guilt. He said the goods had been hidden in "an old hole" and offered to accompany a deputy sheriff there; the hole proved to be the long-abandoned Black Diamond mine. When they arrived at its portal, smoke was issuing, which the man said had not been the case when he hid the loot. He went in but soon came back out for a flashlight. He did not come out a second time. The sheriff's office and fire department were notified, and two firemen entered the mine. Suffering from smoke inhalation, they exited, and the sheriff told all to stay out until he got experienced men with oxygen helmets from the Gamerco mine. Two other men went in anyway, with firemen's gas masks and a life line; they were found dead when the helmet crew from Gamerco came.

The Mining Inspector decreed that no further efforts be made until complete safety could be assured. A blower fan, lumber, brattice, and other materials were furnished by nearby companies, and the light company ran a powerline about a mile so a fan could be operated. At 4:00 p.m. on January 9 the remaining body was found near an old air shaft. In his report Mr. Bracewell laconically stated that the deaths "were not charged against the mining industry."

Enterprise-Brown and McVickers mine

Hutchinson Brown and William McVickers, 1907-1913
3,900 ft NL, 3,800 ft EL, sec. 10, T15N, R18W (GE-9, Fig. 3)

The mine was opened on the Black Diamond coal bed in 1907 by Hutchinson Brown, Owner, and William McVickers. A slope of about 3° dip was eventually extended to 1,300 ft on 4-6 ft of coal, and the mine was ventilated with a furnace. The coal produced was sold in El Paso, Texas, and San Francisco, California.

During fiscal year 1910-1911 the workings broke into the old Sunshine and Black Diamond mines, and black damp was forced into the Enterprise mine. The entries had to be sealed at about 700 ft from the portal, and by 1913 the pillars were pulled back to the portal and the mine was abandoned. Sears (1925, p. 46) reported in 1920 that Louis Kauzlarich owned the mine then and was operating it as a small wagon mine, probably through his adjoining mine workings.

During the Abandoned Mine Lands field study in 1979 the mine slope and shaft, which are now sealed, were found. Pillar remnants were on fire near the outcrop. A record of production and employment is shown in Table 17.

TABLE 17—Production and employment record of the Enterprise–Brown and McVickers mine; *estimated.

Year	Production (tons)	Employment		Days operated
		Miners	Top men	
1907–1908	1,364	10	2	106
1908–1909	6,256	15	4	240
1909–1910	4,166	10	1	154
1910–1911	4,166*	10	1	154*
1911–1913	5,600	5		

Bubany mine

Bubany brothers, 1920
4,100 ft NL, 3,000 ft EL, sec. 10, T15N, R18W (GE-12, Fig. 3)

Sears (1925, p. 46) reported that in 1920 the Bubany brothers were conducting intermittent operations at this small wagon mine on the Black Diamond coal bed. The mine workings had broken into the old Sunshine mine.

No record of the Bubany mine can be found in State Mine Inspector reports. It was probably opened to recover coal near the outcrop of the bed or pillars left from previous mining. During Abandoned Mine Lands field work in 1979 one entry bearing N12°E, driven on about 3 ft of coal, was found at the above location, which is about 800 ft east of the Enterprise-Brown and McVickers mine.

Unknown mine

5,000 ft NL, 1,800 ft EL,
sec. 10, T15N, R18W (GE-36 and 37, Fig. 3)

No information was found on this mine except that it is on the Otero coal bed and probably is within the city limits of Gallup. The old openings, which bear about west, are one-third of the way up the slope along the west rim in Sunshine Canyon. Two sealed slopes and a depression 300 ft to the north, which marks the air shaft, give evidence of the old mine. There is no dump, but a tram road follows the contour of the hill to the south.

Sunshine mine

Michael Kennedy, Edward McCauley, and William Curran, 1889-1892
Crescent Coal Company, 1892-1899
2,700 ft NL, 1,900 ft EL, sec. 10, T15N, R18W (GE-11, Fig. 3)

According to the 1892-1893 report of John C. Spears, the first Territorial Mine Inspector, the Sunshine mine was opened during the summer of 1889 by Michael Kennedy, Edward McCauley, and William Curran. They subsequently sold the mine to the Crescent Coal Company, which owned and operated it in 1892. The coal bed was 4-6 ft thick. F. 0. Douglas was Superintendent, and C. W. Kennedy was General Manager.

In fiscal year 1893-1894 the Black Diamond mine and the Sunshine mine together produced 102,714 tons of coal (Tables 16 and 18), according to the records of the Territorial Mining Inspector for that year. The Crescent Coal Company was then operating the Sunshine mine with General Manager C. W. Kennedy, Superintendent Hugh McGinn, and Pit Boss Richard Coe in charge. The 2,000-ft slope was driven northerly along the Thatcher coal bed, which was about 5 ft thick at the first location above. The Black Diamond bed, about 4 ft thick, which lies below the Thatcher, was also mined from this slope. The Black Diamond workings were used as an aircourse, and the Crown Point mine was connected to the Sunshine mine via a 33-ft raise that served as an escapeway through the Sunshine mine. A 12-ft fan was used to assure positive ventilation. All three of these mines were owned by the Crescent Coal Company.

In fiscal year 1894-1895 the company drove a 420-ft slope to connect with old workings, and a 1.5-mi rail spur was built to the Atlantic Pacific Railroad Company main track. Other mine improvements were made at a total cost of $31,019. Surface facilities of the Sunshine mine are shown in the cover photograph of this book.

Operations continued until February 15, 1899, when the mine was closed, probably because of depletion of the minable reserves. On April 1, 1900, the Crescent Coal Company and its holdings were sold to the American Fuel Company, a subsidiary of the Colorado Fuel and Iron Company in Denver.

Old maps studied indicate that an entry was driven at GE-10 (Fig. 3; 2,400 ft NL, 400 ft EL, sec. 10, Biava No. 3 mine), probably for ventilation and access to the eastern part of the Sunshine mine. A record of production and employment is shown in Table 18.

TABLE 18—Production and employment record of the Sunshine mine; *includes Black Diamond mine production and employees.

Year	Production (tons)	Employment			Days operated
		Miners	Boys	Top men	
1889	Mine opened				
1891–1892	No record				
1892–1893		7 employees			
1893–1894*	102,714	234 employees			
1894–1895	78,255	165		15	
1895–1896	89,310	145	5	30	247
1896–1897	No record				
1897–1898	48,450	110	3	12	231
1898–1899	27,723	120		5	154
	Mine closed February 15, 1899				

Biava No. 2 and No. 3 mines

John Biava
Biava No. 2, ?-1949, 2,800 ft NL, 1,200 ft EL, sec. 10, T15N, R18W (GE-32 and 33, Fig. 3)
Biava No. 3, 1949-1957 or 1958, 2,400 ft NL, 400 ft EL, sec. 10, T15N, R18W (GE-10, Fig. 3)

After the Biava No. 1 mine (see next chapter) in sec. 11 had been worked out, John Biava began the Biava No. 2 mine at the above location in sec. 10. The main entry was a shallow incline bearing westerly to intersect the Thatcher or Black Diamond coal bed or both (date of opening unknown). A shaft about 600 ft north was used for ventilation. It was reported that the east side of this mine was flooded when the old workings of the Sunshine mine were intersected. The Biava No. 2 was closed in 1949.

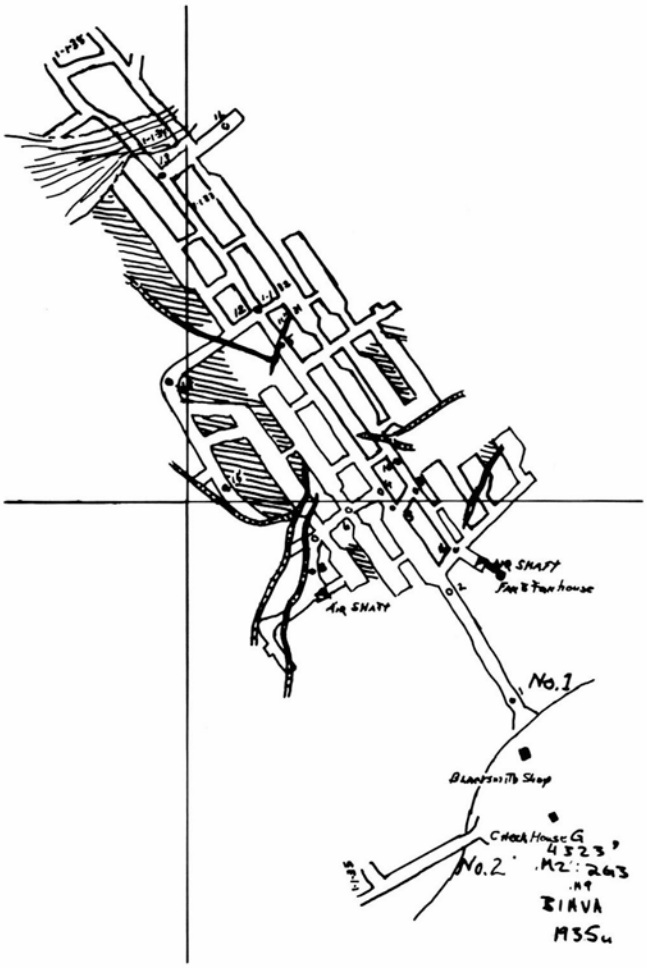


FIGURE 27—Map of the Biava No. 1 and No. 2 mines, made in 1935.

Another small mine, the Biava No. 3, was then opened by two entries trending northerly. It is reported that during this operation a small block of coal and pillars left in the old Sunshine mine was recovered. The Biava No. 3 mine was closed in 1957 or 1958, but according to the New Mexico State Mine Inspector's Inactive Coal Mine file the Leyba Coal Company operated the Biava No. 3 mine from 1957 to 1961. Sisto Leyba was in charge, and four to eight men were employed.

From 1933 to 1942 Mr. Biava employed from four to seven men, and during the war years the number of miners ranged from 11 to as many as 20. From 1949 until operations ceased, from six to 12 men were working.

The last mine operated, the Biava No. 3, was on fire in 1979. Pillars near the portal of the two old entries had burned, and the fire was gradually working deeper underground. A map of the Biava No. 1 and No. 2 mines is shown in Figure 27. There is no record of production from the three Biava mines. The beds were 3-4 ft thick. Mr. John Biava passed away in June of 1982.

Biava No. 1 mine

John Biava, 1933—?
4,200 ft NL, 2,500 ft EL, sec. 11, T15N, R18W (GE-20 and 21, Fig. 3)

The Biava No. 1 mine was first reported in 1933 in the annual report of the State Mine Inspector. The land was owned by the Gallup American Coal Company and was leased by S. E. Woods, who subleased it to John Biava.

The main entry, bearing about N25°W, was opened along the Brown coal bed; it was 3 ft 8 inches thick, on top of the Dilco Coal Member. The aircourse was 120 ft southwest of the main entry. Records indicate that the main slope reached about 800 ft in length (Fig. 27). From four to six men were employed, and Mr. Biava mined about 15 acres of coal. Neither production data nor a termination date is known.

Rocky Cliff mine+

Frank Dugan, 1893-1897
Stephen Canavan, 1897-1906
Zambarelon brothers, 1920-?
5,200 ft NL, 200 ft EL, sec. 10, T15N, R18W (GE-22 and 23, Fig. 3)
3,600 ft NL, 600 ft EL, sec. 10, T15N, R18W (GE-34 and 35, Fig. 3)

The Rocky Cliff coal mine was begun about 1893 by Frank Dugan, Superintendent and Owner. It was opened on the Otero coal bed, 4.5 ft thick, by two slopes that dipped about 3% northerly. The mine was ventilated by a furnace. The coal was hauled by mules underground and then transported by wagon to a loading dock on the Crown Point Railroad spur for shipment to Jerome, Arizona.

Production of 3,000-4,000 tons yearly continued under the operation of Mr. Dugan until 1897, when the property was sold to Stephen Canavan. Under the direction of Mr. Canavan and William Steward, Pit Boss, production was increased to about 22,000 tons. The main slope was lengthened to 900 ft and $4,300 was spent for improvements. In fiscal year 1900-1901 sales contracts were obtained with Colorado Fuel and Iron Company for the coal mined. During the same year operations were suspended for five months because of a strike. Two years later J. R. Brown was named Superintendent. After fiscal year 1904-1905 no production was recorded, and it is assumed that the depletion of minable reserves was responsible for the closing of the mine in 1905.

According to Sears (1925, p. 49) the property was reopened in 1920 by the Zambarelon brothers, who had obtained a lease from the Gallup American Coal Company. He stated that they produced 20 tons per day, which they hauled to the railroad by wagon. No records concerning this operation were found in State Mine Inspector's reports. This operation may have had two workings, which were found during field work done in 1979 for the Abandoned Mine Lands survey at the second location given above. The employment and production records of the Rocky Cliff mine and a list of fatalities are shown in Tables 19 and 20.

TABLE 19—Production and employment record of the Rocky Cliff mine.

Year	Production (tons)	Employment			Days operated
		Miners	Boys	Top men	
1893–1894	No production recorded				
1894–1895	2,721	7		2	
1895–1896	3,970	11	2	3	108
1896–1897	No records				
1897–1898	22,000	32		3	250
1898–1899	5,000	8		2	200
1899–1900	28,100	46		4	175
1900–1901	26,400	65		3	132
1901–1902	26,400	40		2	240
1902–1903	24,000	30		2	280
1903–1904	18,000	20		1	260
1904–1905	16,000	20		2	200
1905–1906	Closed				

TABLE 20—Fatalities at the Rocky Cliff mine.

Name	Date	Cause
Edward Canning	July 2, 1895	Fall of coal
Manuel Torrez	February 13, 1900	Blast

Crown Point mine

Crown Point Coal Company, 1888-1892
Crescent Coal Company, 1892-1900
0 ft NL, 4,300 ft EL, sec. 11, T15N, R18W (GE-24 and 25, Figs. 3 and 33)

The Crown Point mine was probably the first shaft mine opened in the Gallup field. A shaft on or near the south line of sec. 2 (Fig. 33) was sunk by the Crown Point Coal Company, which organized about 1888, and some coal was mined by that company before 1892. In that year the mine was closed by the Territorial Mine Inspector because it did not comply with a regulation that required two openings to underground workings. About the same time the Crown Point Coal Company was merged with other companies (see Table 16) into the Crescent Coal Company. The mine remained idle until fiscal year 1894-1895 when, under the new operating company, the second shaft, 6 x 7 ft, was sunk. It was 150 ft from the working shaft, which had two compartments and extended to a depth of 225 ft. By June of 1895 a new Crawford and McCrimmon fan capable of producing 40,000 ft^3/min was installed. A spur line 0.5 mi east of Gallup Station connected the mine to the Atlantic and Pacific Railroad Company.

The mine was developed along the Crown Point coal bed, which dipped about 4% to the north, in the Dilco Coal Member. According to Sears (1925, p. 29) this bed reached a thickness of 3-5 ft in a localized area near the Crown Point and Otero mines and then thinned both to the east and to the west. A 33-ft shaft for ventilation and an escapeway connected this mine to the Sunshine mine, which also used the Black Diamond mine workings for the same purposes. The Sunshine and the Black Diamond mines were both on the Black Diamond coal bed. All of these contiguous mines were owned by the Crescent Coal Company (see Table 16). Hugh McGinn was Superintendent of the company. In fiscal year 1895-1896 Robert Brown was Pit Boss at the Crown Point mine, and 2 years later Archie Black was listed in that position. The mine was generally kept in good condition.

On April 1, 1900, the Crescent Coal Company properties were sold to the American Fuel Company. Two days later the new company closed the mine, giving no reason for its action. A production and employment record is shown in Table 21.

Unknown mine

700 ft NL, 4,600 ft EL, sec. 14, T15N, R18W (GE-30, Fig. 3)

This small truck mine on the Otero coal bed was reportedly opened by John Biava, but because that report cannot be confirmed, the mine is listed here as an unknown. It was opened by two entries about 50 ft apart, one bearing N2°E and the other bearing N80°W. Apparently production was from a small block of coal that was faulted and was left from the old Otero workings.

TABLE 21—Production and employment record of the Crown Point mine.

Year	Production (tons)	Employment			Days operated
		Miners	Boys	Top men	
1892	Opened				
1892–1893	Closed				
1893–1894	No record				
1894–1895	Sinking shaft				
1895–1896	34,960	70		15	206
1896–1897	No record				
1897–1898	61,194	140	4	12	231
1898–1899	45,490	110	3	10	239
1899–1900	40,000	35	2	7	
	Mine closed April 3, 1900				

Otero-New Otero-Wood and Stewart mines+

Caledonian Coal Company, 1895-1905 American Fuel Company, 1906 Rees-Beddow Company, 1906-1908 Wood and Stewart, 1925-1926 Otero mine-900 ft NL, 3,600 ft EL, sec. 14, T15N, R18W **(GE-26, Fig.** 3)
New Otero mine-1,100 ft NL, 2,900 ft EL, **sec. 14, T15N, R18W** **(GE-27, Fig.** 3)
Wood and Stewart mine-1,300 ft NL, 2,000 ft **EL, sec. 14, T15N, R18W** **(GE-28, Fig.** 3)

The Otero mine was started in June 1895 by the Caledonian Coal Company to help supply the Atlantic and Pacific Railroad Company, the Santa Fe Pacific Railroad Company, the Santa Fe, Prescott and Phoenix Railroad Company, and markets in California. At that time all of these railroads connected with each other, and Gallup coal mines supplied most of the coal to fuel the engines. On June 17, 1895, the Territorial Mine Inspector reported that the main slope had reached a depth of 86 ft. There were four beds of workable coal of which the company eventually developed three: the Crown Point, the Thatcher, and the Otero; apparently, the Diamond bed was not worked. The average mining thickness of the beds was as follows: Crown Point, 4.5 ft; Thatcher, 4.5 ft; and Otero, 5 ft.

Shaler (1907) measured a coal section through the lower Mesaverde Formation (Dilco Coal Member) at the Otero mine, which follows:

	Ft.	Inches
Coal, Crown Point bed	3	5
Shale		8
Coal	1	5
Sandstone	11	
Coal, Thatcher bed	4	
Shale and sandstone	6	
Shale	9	
Coal, Black Diamond bed	1	6
Sandstone and shale	88	
Coal	1	2
Shale		9
Coal, Otero bed	3	2
Shale(?)		

Analyses of samples taken from the Otero mine are as follows (Sears, 1925, p. 39):

Crown **Point coal bed**	
Moisture	9.1%
Volatile matter	40.8%
Fixed carbon	40.2%
Ash	9.9%
Sulphur	1.27%
BTU	
Thatcher coal bed	
Moisture	9.7%
Volatile matter	41.4%
Fixed carbon	40.8%
Ash	8.1%
Sulphur	1.55%
BTU	11,620
Otero coal bed	
Moisture	10.8%
Volatile matter	40.3%
Fixed carbon	42.8%
Ash	6.1%
Sulphur	1.06%
BTU	

In fiscal year 1895-1896 a new tipple was under construction with a siding spur (Fig. 28). The Atlantic and Pacific Railroad Company had previously built a 2.25-mi spur from Gallup Station to the mine. There are no records available for 1896-1897. Production, which was 12,000 tons in 18951896, increased to over 90,000 tons by fiscal year 1897-1898. The mine was ventilated through a shaft aided by a furnace and was kept in good condition.

By fiscal year 1898-1899 the slope had reached a length of 1,400 ft, and 96,473 tons were mined by 170 employees. The Caledonian Company was under the direction of General Manager Alex Bowie, Superintendent John Stewart, and Mining Engineer James W. Bowie. Production was down during fiscal year 1899-1900, although the number of employees increased by 10. A new Crawford and McCrimmon fan was installed for positive ventilation, and five steam engines provided the power needs of the mine.

By fiscal year 1900-1901 depressed coal sales lowered coal production to 25,338 tons; the mine operated 130 days with 80 employees and was apparently closed during the summer. The following year production doubled to 51,556 tons, but in 1902-1903 production decreased to 25,053 tons. This production rate was maintained until the early part of 1906 when the company sold its properties to the American Fuel Company, which suspended operations. The developed portions of the mine had been practically exhausted of minable reserves. The main slope had reached a depth of 1,250 ft. The records indicate that some coal was sold to Mexican railroads, but the major portion was used to fuel the railroads across Arizona.

In fiscal year 1906-1907 the Rees-Beddow Company leased the property from the American Fuel Company. The lessees mined pillars and available coal from the old workings, producing about 56,000 tons through the spring of 1908, when the mine was closed. John Beddow was in charge of the mine and fired all the shots.

The Gallup American Coal Company, which acquired the

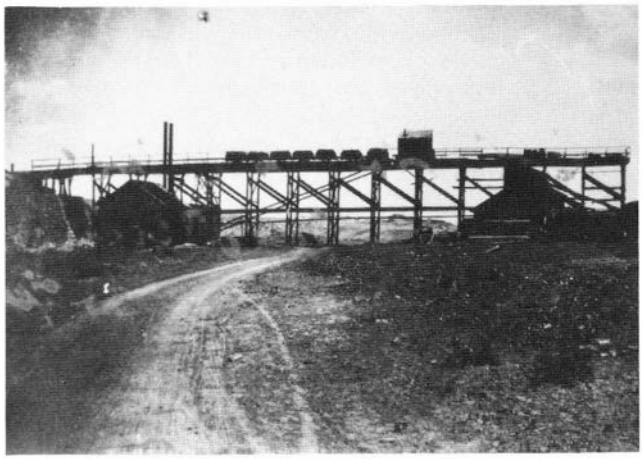


FIGURE 28—The Otero mine surface facility. The engine house is on the left, and the trestle and tipple can be seen in the center of the photo. The tipple was built about 1896. *Photo, date unknown, is from the archives of the Gallup Public Library.*

land in 1917, leased the old mines to S. E. Wood and John Stewart about 1925. They opened up some of the old workings on the Thatcher coal bed to extract pillars left from previous operations. There is no record of their mining operations after that year.

In 1933 John Biava subleased the land over the Biava No. 1 mine from S. E. Wood. Mr. Biava mined on the Brown bed of coal, probably an upper bed in the Dilco Coal Member. This bed was reported to be 3 ft 8 inches thick in the mine.

During the Abandoned Mine Lands field study in 1979 numerous openings were found. The original Otero mine entries (GE-26, 27, and 28, Fig. 3) were confined to the outcrop except possibly for one or two ventilation shafts or slopes. The other openings (Fig. 3) probably were driven after 1930 to recover pillars and small areas of coal left from the mines that operated from 1895 to 1908. Their locations and my correlation of these openings and the mines are presented below.

The main portal of the first Otero mine is 900 ft NL, 3,600 ft EL, sec. 14 (GE-26, Fig. 3). The slope trended about N20°W and was about 1,700 ft deep. Apparently only the Otero coal bed was mined from this slope. The other main entry to the Otero mine was at 1,100 ft NL, 2,900 ft EL, sec. 14 (GE-27, Fig. 3). This was the larger of the two mines and is sometimes referred to as the New Otero mine, but the territorial reports do not distinguish between the two. This entry trended N16°E and reached a depth of 2,400 ft. The ventilation shaft previously mentioned was found at 4,600 ft NL, 2,500 ft EL, sec. 11 (GE-18, Fig. 3). There are two entries at 200 ft NL, 3,400 ft EL, sec. 14 (GE-16, Fig. 3) where some coal, probably pillars, was mined. Just 300 ft to the north of the above location is what appears to be a main entry on one of the upper beds (GE-15, Fig. 3). One of these entries, probably GE-15, could have been a second entry for the original Otero mine. There was a small depression in the ground at 4,600 ft NL, 3,100 ft EL, sec. 11 (GE-17, Fig. 3). At 4,200 ft NL, 2,500 ft EL, sec. 14 (GE-20, 21, Fig. 3) are the two Biava No. 1 mine entries. At 0 ft NL, 2,500 ft EL, sec. 11 (GE-19, Fig. 3) is an entry from which coal was mined and trammed to the vicinity of the New Otero entries where an old foundation supported a loading facility. The old tram road is evident. At 1,300 ft NL, 2,000 ft EL, sec. 14 (GE-28, Fig. 3) are five entries, two of which were opened by Wood and Stewart to remove pillars in the upper bed, probably the Thatcher bed. The other three openings probably date from the Otero mining period. A small mine at 700 ft NL, 4,600 ft EL, sec. 14 (GE-30, Fig. 3) is reported to have been opened by John Biava on a block of coal faulted from the main Otero bed to the northeast. Mr. Biava's opening of this mine was not confirmed; consequently the mine is listed as an unknown mine (see previous chapter). A partial record of production and employment and a list of fatalities are shown in Tables 22 and 23.

TABLE 22—Production and employment record of the Otero mine.

Year	Production (tons)	Employment				Days operated
		Miners	Boys	Top men	Boys	
1894–1895	Began operation in June 1895					
1895–1896	11,997	20	1	6		201
1896–1897	No record					
1897–1898	90,366	150	2	25		248
1898–1899	96,473	139		31		
1899–1900	80,000	150	3	30		280
1900–1901	25,338		80 employees			130
1901–1902	51,556	61		23		178
1902–1903	25,053	35		8		215
1903–1904	26,054	40		10		
1904–1905	27,546	30		18		182
1905–1906	15,000					100
1906–1907	24,123	30	4	4	2	210
1907–1908	30,636	36		6	1	240
1908–1909	Did not operate					

TABLE 23—Fatalities at the Otero mine.

Name	Date	Cause
Thomas F. McGrail	March 30, 1900	Fall of top coal
John Cominolo	April 24, 1900	Fall of top coal

Thatcher mine

Caledonian Coal Company, 1899-1905
600 ft NL, 4,800 ft EL, sec. **13, T15N, R18W** **(GE-29, Fig. 3)**

The first car of coal was shipped from the Thatcher mine on January 1, 1899, on a railroad spur newly completed from the Santa Fe Pacific Railroad mainline. Company officials of the mine, which was opened by the Caledonian Coal Company, were General Manager Alex Bowie, Superintendent John Stewart, and Mining Engineer James W. Bowie. By the end of fiscal year 1898-1899 the main slope was driven northeast into the SW1/4 of sec. 12 for a distance of 1,100 ft, and the tipples were connected with a rail spur extension from the Otero mine 0.25 mi west. In fiscal year 1899-1900 a 12-ft Crawford and McCrimmon fan was installed over the air shaft for positive ventilation. The Thatcher coal bed and the Black Diamond coal bed, both 4.5 ft thick, were mined.

By fiscal year 1900-1901 the mine was modernized, and among other improvements was the installation of six steam engines for various power needs (Fig. 29). Under the direction of James W. Bowie, Superintendent, 80 men were employed underground. The mine could produce in excess of 40,000 tons per year, but because the demand for coal was down the mine was worked for only 183 days.

By fiscal year 1901-1902 the 8° slope had been extended to 1,800 ft, but because of diminishing coal sales the mine was not worked again until fiscal year 1903-1904, when it operated only 55 days. It was essentially closed then, al-

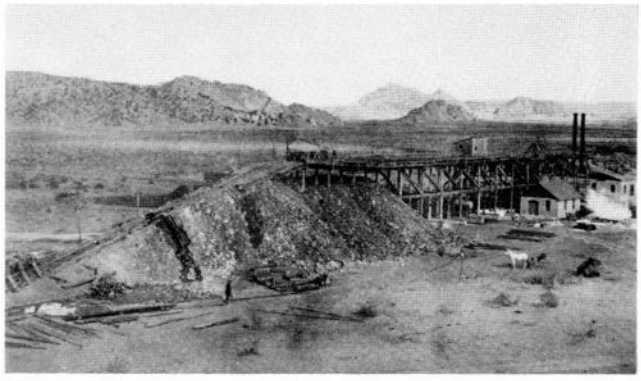


FIGURE 29—West view of the Thatcher mine, showing the mine slope and tipple. Note the Hogback monocline in the background. The railroad track under the tipple appears to be between the two stone houses. The white cloud to the right of the first house is steam. The structure between the house on the tipple and the two smoke stacks is the gallows frame and sheave wheel. The hoist house is in the complex with the two smoke stacks. The point where the rails flatten between the slope and the tipple is called the knuckle. This particular tipple was built with a slight incline toward the hoist just beyond the knuckle to prevent a loose car from running uncontrolled down the slope. *Photo was copied by Robert Nymeyer from the Territorial Mine Inspector's Report for 1899–1900 by J. W. Fleming.*

though it was kept in operating condition for several years. The bottom of the mine had reached the broken ground caused by the Hogback monocline a short distance to the east. The combination of the depressed coal demand and poor roof conditions rendered further mining operations at the Thatcher unprofitable. A record of production and employment and a list of fatalities are shown in Tables 24 and 25.

TABLE 24—Production and employment record of the Thatcher mine; *the mine ceased operation this fiscal year.

Year	Production (tons)	Employment			Days operated
		Miners	Boys	Top men	
1898–1899	11,311	26	1	6	Began January 1, 1899
1899–1900	32,000	75	2	12	280
1900–1901	37,813	80			183
1901–1902	Closed				
1902–1903	Closed				
1903–1904*	4,736	28		5	55

TABLE 25—Fatalities at the Thatcher mine.

Name	Date	Cause
John B. Lamour	July 20, 1899	Fall of coal
Conrad Johnson	November 16, 1899	Fall of rock

Noce mine

SF 042440 5-3-22 Permit
7-24-23 Lease

Joseph Noce, Gallup
NW¼, sec. 12, T15N, R18W
2,400 ft NL, 4,800 ft EL (GE-31, Fig. 3)

The Noce mine, operating first under a permit and later under a lease, was started by the sinking of a 200-ft shaft to explore and mine two well known coal beds, the Thatcher and the Diamond. It was a one-compartment timber shaft, and from it some workings were driven (Fig. 30) and some coal produced. A second shaft was needed for hoisting the coal and providing a ventilation circuit and a second escapeway. Mr. Noce hired two hard-rock miners and began a two-compartment shaft, 8 x 12.5 ft, with 8 x 8-inch timbers, on 4-ft centers. By November 29, 1924, the shaft was down to 40 ft, and by November 10, 1925, the shaft was completed to a depth of 210 ft at a cost of $9,000. The new shaft (Fig. 31) was located approximately 400 ft east and 500 ft north of the W¼ corner, sec. 12 (Fig. 3). Workings were driven off the shaft station; the workings eventually completed in the mine are shown on the Noce mine map (Fig. 32). The Heaton spur of the Atchison, Topeka and Santa Fe Railroad was within 1,200 ft of the mine, and a connection to the mine was contemplated but never built.

The second shaft cut both the Thatcher and the Diamond coal beds. The Thatcher was mined from the first and second shafts, and the Diamond bed was cut at the bottom of the second shaft. A cross section of the coal beds in the No. 2 shaft showed the following:

4' 0" Sandstone
3' 0" Shale to soapstone 3'
10" Coal, Thatcher bed 0'
10" Bony coal
3' 4" Shale
4' 0" Coal, Diamond bed

The beds dipped slightly to the northeast.

A sample of coal 4 ft 3 inches thick taken at the face of room 4, No. 2 east entry, 500 ft from the No. 2 shaft, contained the following:

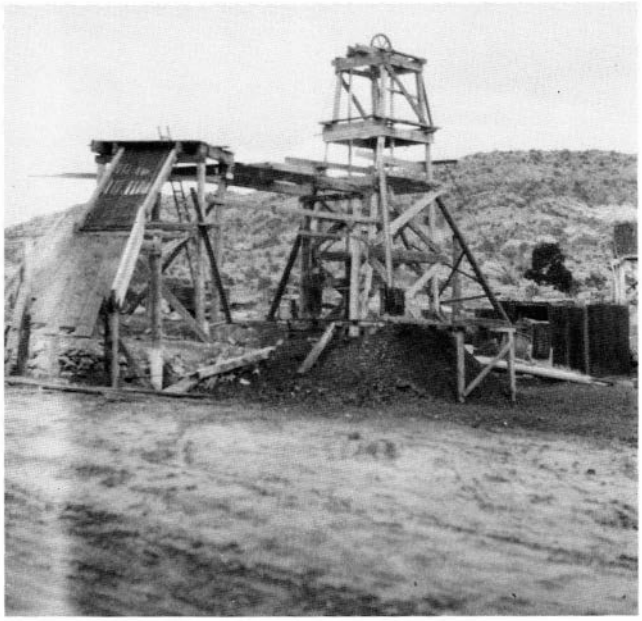


FIGURE 30—The first shaft of the Noce mine in about 1922. This shaft was later used for an air shaft and escapeway.

Moisture	10.0%
Volatile matter	37.3%
Fixed carbon	46.3%
Ash	6.4%
Sulphur	1.4%
BTU	11,890

By the end of 1926 problems began to develop that eventually closed the mine. Many faults were encountered that added expense to keep the haulage system on grade, increased timber costs, and disrupted the planned system of mining.

C. L. Duer, District Mining Supervisor, brought out another cause of financial problems in his cost analysis in his December 7, 1926, field inspection report, which gave costs of operation and prices received for coal. The coal was screened, and the percentage of the coal size and the sales prices FOB (free on board) railroad cars were given as follows:

Prices

Lump coal +3"	30%	$5.50 per ton
Engine coal -3"+ 1"	20%	$3.60 per ton
Slack -1"	50%	$2.00 per ton

Costs

Wagon haulage ¼ mi to railroad	50¢ per ton
Miners paid	900 per ton
Entry men paid $1.02 to $2.20 per yard for brushing	
Hoistman	$6.00 per day
Tippleman	$4.00 per day
Driver	$6.20 per day
Mule feed	50¢ per day

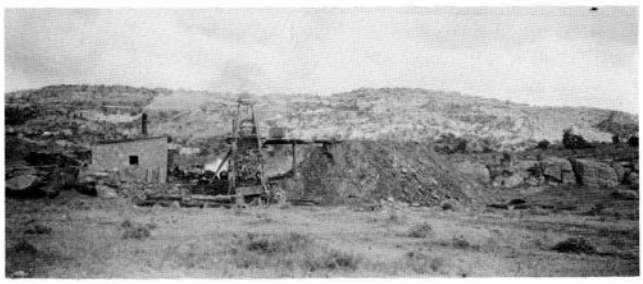


FIGURE 31—The main shaft and surface facilities of the Noce mine in about 1925. Note the steam engine, which was used as a hoist and to provide steam for the water pumps.

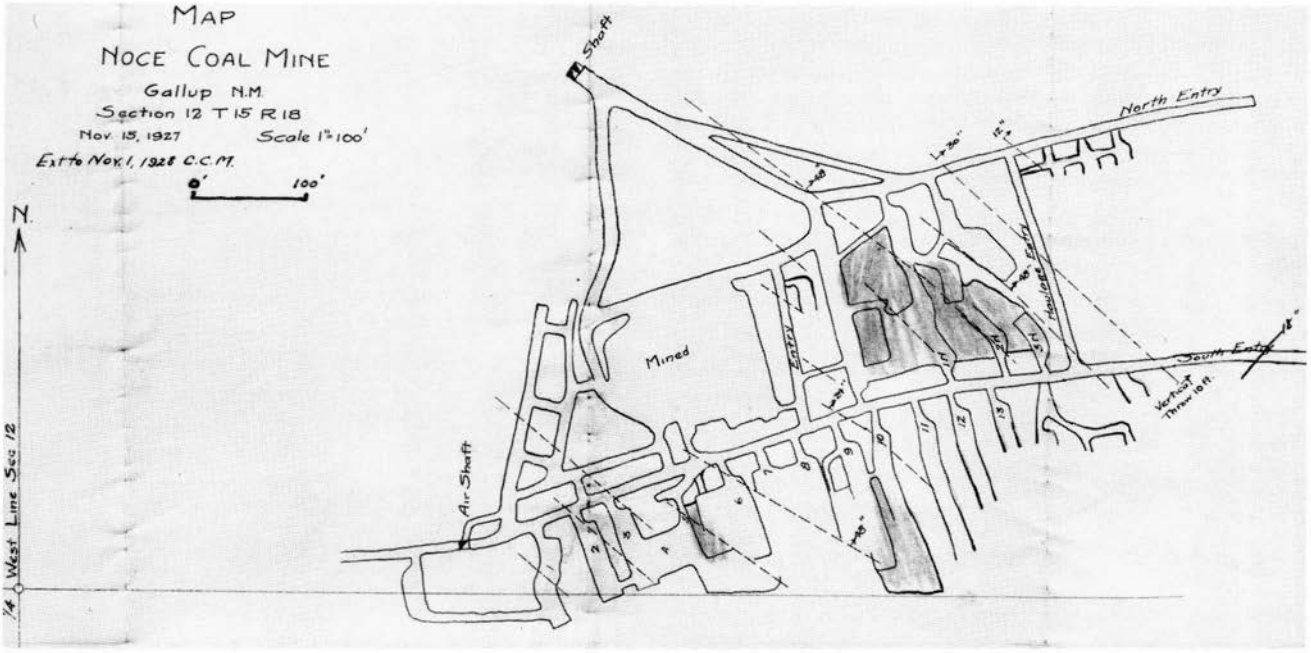


FIGURE 32—The underground workings of the Noce mine as of November 1, 1928. Less than 1,000 tons of coal were mined after this date; thus, the map essentially shows the extent of the workings. *Map was made by engineers from the U.S. Geological Survey.*

Nine miners were working, and at no time during the month of 26 working days did they average 20 tons in all per day. The mine produced approximately 2,000 gallons of water that was pumped daily, and the mine was non-gassy. Because of the bad mining conditions, the turnover of miners was high.

During the latter part of September 1928 the Heaton spur, constructed in 1894 to serve the Heaton and Thatcher mines, was badly damaged when a cloudburst undercut the bank of the Puerco River, which sloughed and damaged a row of pilings under the bridge. The Atchison, Topeka and Santa Fe Railroad (AT&SF) informed Mr. Noce that the spur would be abandoned and torn up. Mr. Noce appealed to the Corporation Commission of New Mexico for relief and was informed that instead of abandoning the spur the AT&SF planned to rebuild it. Because of this assurance, Mr. Noce obtained financing and had a powerline constructed by the Gallup Utility Power Company. He also purchased and installed a new electric hoist, replaced the temporary headframe with a steel headframe, poured concrete around the collar of the No. 2 shaft, and installed a new and modern cage in the No. 2 shaft.

One year later, November 19, 1929, the spur line had not been repaired, and the AT&SF informed the Noce Coal Company that $35,000 was needed to defray expenses incidental to the reconstruction of the three bridges destroyed in the floods. The Noce Coal Company could not furnish the money and therefore had to close. On January 28, 1930, Mr. Noce wrote the following statement for the Noce Coal Company: "I wish to state that the Noce Coal Company as Boning Out of Business There for do not mail any more Coal Forms Reports *[sic]*."

Action to relinquish the lease was started, but J. J. Bourquin, District Mining Engineer, was reluctant to process the relinquishment proceedings because the Mutual Coal Company of Gallup had invested $18,000 in the development of the mine, and they and other investors in the Noce Coal Company had a right to try to continue operations to recover their investment. H. F. Mills, Secretary of the Noce Coal Company, ably carried the company through this period, and through his efforts the relinquishment was postponed until June 22, 1932; at that time it was apparent that putting the mine back in operation was impossible, and the lease was cancelled as of that date. The mine produced 16,513 tons of coal.

It was reported that the old workings of the mine were flooded when the city of Gallup diverted flood water from a nearby arroyo into one of the shafts.

Unknown mine in the Heaton mine area

2,900 ft NL, 3,300 ft EL, sec. 35, T16N, R18W (GE-43, Fig. 33)

The mine was opened by an entry and a shaft 150 ft apart. Both bear about S48°W. A small dump about 150 ft long is present. The mine is probably on the No. 2 bed in the Gibson Coal Member.

Heaton mine+

American Fuel Company, 1904-1909
Victor American Fuel Company, 1909-1917
Gallup American Coal Company, 1917-1922
700 ft NL, 3,300 ft EL, sec. 35, T16N, R18W
(GE-44, 45, and 46, Fig. 33)

In June 1904 the American Fuel Company, which was already operating the Weaver mine in the Gallup area, began another large operation, the Heaton mine, 1.5 mi east of the town of Gibson. Two beds of the Gibson Formation, the No. 3'/2, 5 ft 7 inches thick, and the No. 3, 5 ft thick, were developed by slope or drift with double-entry rib-androom mining system. The roof and floor were generally sandstone.

The first drift was opened on the No. 3 bed and was driven N25°W on the dip of the bed, which ranged from 2 to 15°. During the first year of the mining operation this slope reached a depth of 1,537 ft. A 4-mi spur of the Santa Fe and Pacific Railroad Company was built up Heaton Canyon to connect the main line with the mine. By the end of fiscal year 1905-1906 the slope on the No. 3 bed was 2,182 ft long, and a slope begun 1,200 ft inby the portal and driven down through the intervening rock to mine the No. 3^1/2 bed was 1,500 ft long. The mine workings were ventilated

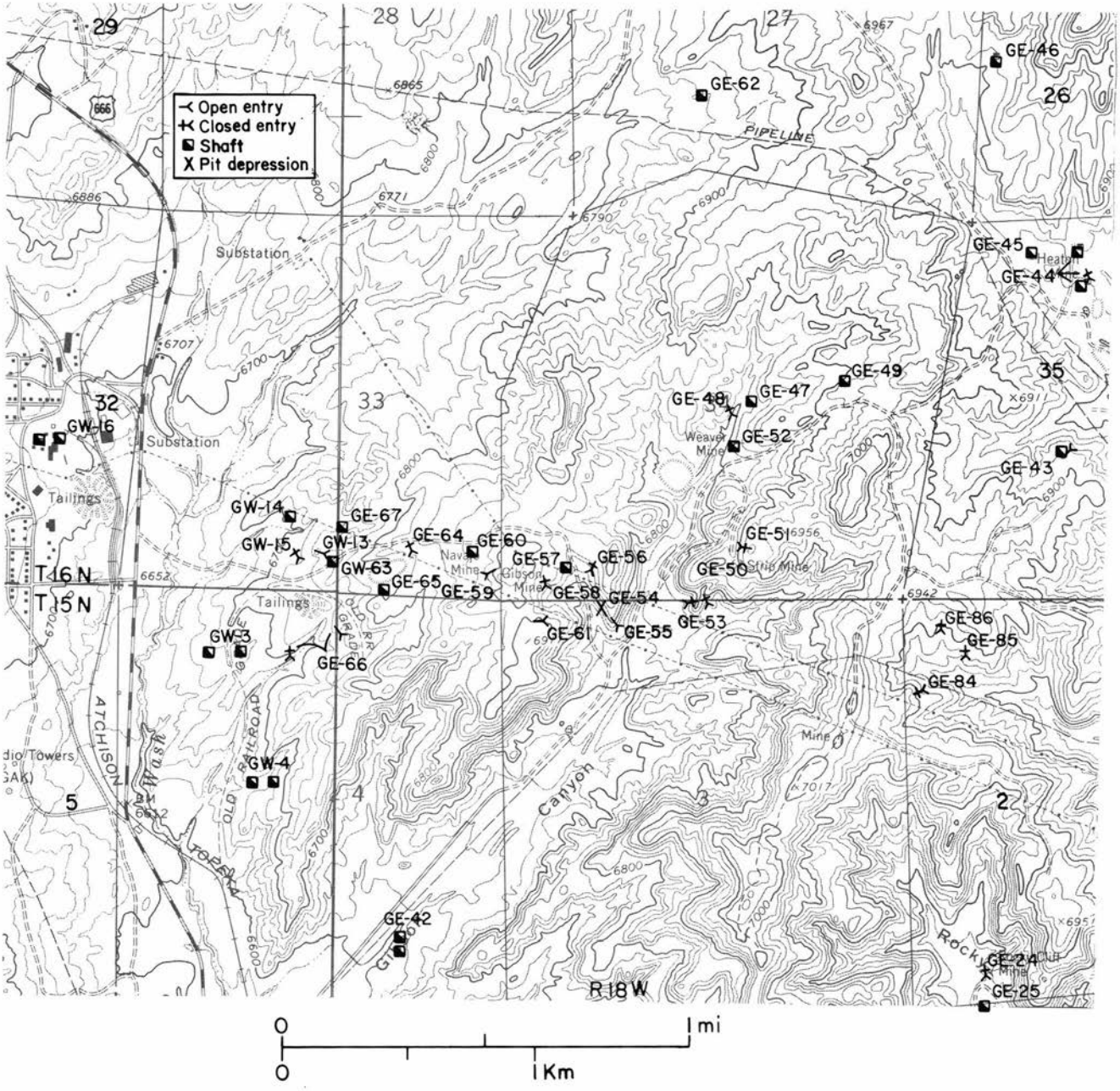


FIGURE 33—The Heaton, Weaver, Gallup, Navajo, and adjacent mines on the Gallup East and Gallup West 7½-min quadrangles.

GW–3—Baudino–Navajo No. 3 mine
GW–4—Caledonia mine
GW–13, 14, 15, 63—Navajo No. 2 mine
GW–16—Navajo No. 5 mine
GE–24, 25—Crown Point mine
GE–42—Bartlett mine
GE–43—Unknown mine
GE–44, 45, 46—Heaton mine
GE–47, 48, 49, 51, 52, 62—Weaver mine
GE–50—Peacock No. 1 and 2 mines
GE–53, 54, 55, 56, 57, 58, 61—Gallup–Gibson mines
GE–59—Navajo mine
GE–60, 64, 65, 67—Navajo No. 1 mine
GE–66—Unknown mine
GE–84—Prospect
GE–85, 86—Patten mine

by a propulsion fan, and a 50 HP hoist was used to pull and lower the pit cars from the mine (Fig. 34). About 20 mules were used to move the pit cars to the main entries. The coal mined was sold to the Santa Fe and Pacific Railroad Company and to markets in California, Arizona, and New Mexico. In 1907-1908 the price was $1.86 per ton.

By fiscal year 1908-1909 the main slope was 4,000 ft long. Sprinklers were installed throughout the mine workings. The next year a new slope was driven on the No. 2 bed for 1,200 ft and was then declined. The No. 3 and No. 3′/2 beds were mined off this slope. About 1913 a longwall system that worked well was developed in portions of the mine.

The year of 1917 was one of problems. During the latter part of April smoke was discovered escaping through surface cracks on the west side of the slope. In June a firewall was built at the old second west entry about 300 ft above the slope to the No. 2 bed, which apparently was burning at some distance from the slope. That bed was abandoned, and the fire and gases were sealed off from the active workings on the No. 3 bed. On July 2, immediately after the takeover of operations by the Gallup American Coal Company, the Heaton miners joined the miners of the other company mines (Weaver and Navajo mines) in a strike, which remained in effect until mid-October. By September the main air intake had squeezed and water had accumulated to within about 2 ft of the roof. The aircourse was

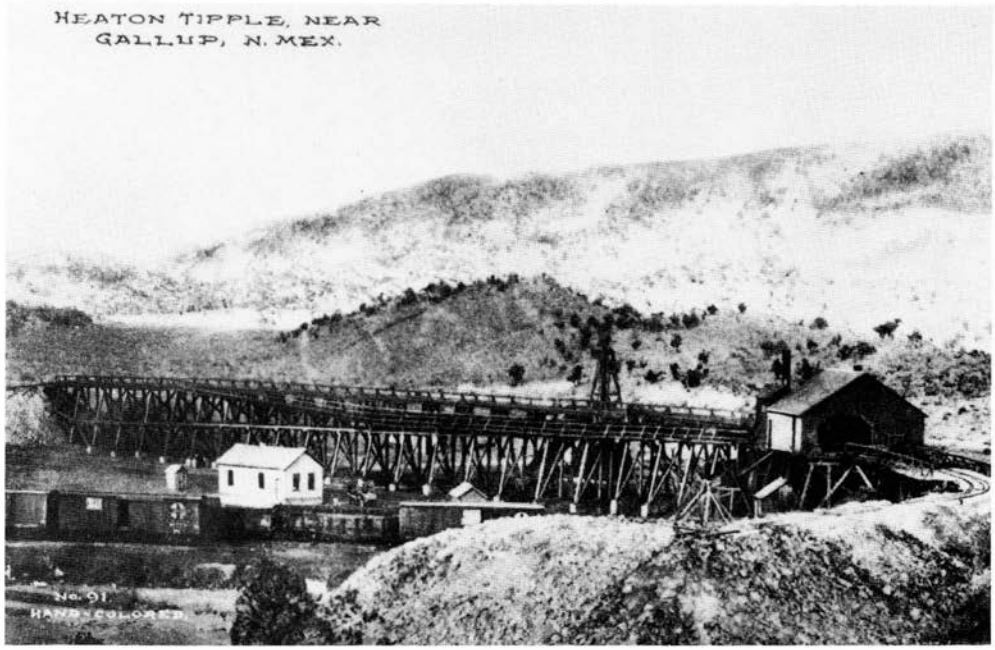


FIGURE 34—Heaton mine tipple. *Print made from hand-colored color postcard.*

reopened, and a pair of entries was driven to the Weaver mine before the miners were rehired. There was also a period of general cleanup.

On November 1, 1918, fire broke out again in the aircourse of the Heaton. The men were removed from the mine, and the fire was out on November 19. The control was only temporary, however, and on February 19, 1919, fire, fed by oxygen from surface cracks, again broke out of the firewalls in the aircourse. Water was poured into the fire area, and apparently the fire was stopped.

In 1921 the main entry of the mine was 6,500 ft long, bearing N30°W and dipping 8°, but production, which had been gradually dwindling since the high of 266,925 tons in 1910, was down to 53,973 tons (Table 26). The mine was closed permanently on February 28, 1922. Several factors influenced this decision: the Heaton mine was subject to fires; the coal market was depressed; and the Navajo No. 5 mine, capable of handling all orders, was being developed rapidly.

Production from the Heaton mine on record shows 1,473,000 tons; however, there is no record for 6 years. It is estimated that 2,100,000 tons were produced from the mine. The officials who operated the mine are listed under the Weaver mine chapter. A record of production and employment and a list of fatalities at the mine are shown in Tables 26 and 27. Production records from the American Fuel Company, Victor American Fuel Company, and Gallup American Coal Company mines are given in Table 28.

TABLE 26—Production and employment record of the Heaton mine.

Year	Production (tons)	Employment				Days operated
		Men underground	Boys	Men outside	Boys	
1904–1905	7,543	30	1	7		69
1905–1906	71,169	69		32		218
1906–1907	157,205	126	4	21	1	268
1907–1908	182,498	205	4	29	3	233
1908–1909	222,677	247	6	32	2	211
1909–1910	266,925	181	4	30	3	262
1910–1911	229,624	205	2	40	1	294
1911–1912	No report					
1913		135		28	1	
1914		179		27	1	
1915		144		24		
1916		118		20		
1917	95,011	109		14		
1918		107				296
1919	87,675	104		28		285
1920	82,401	96		18		288
1921	53,973	102		16		133
1922	16,402	106		14		45
Closed February 28, 1922						

TABLE 27—Fatalities at the Heaton mine.

Name	Date	Cause
Corbo Gallo	September 17, 1906	Fall of rock
Name not given	February 27, 1907	Mine car
George Pecorie	May 9, 1910	Fall of rock
Refugio Sanchez	September 29, 1910	Fall of rock
James Farolo	June 8, 1911	Fall of rock
Albert Kauzlowski	October 7, 1912	Delayed shot
Joe del Boca	February 13, 1913	Fall of rock
Albert Kowlasky	August 11, 1913	Delayed shot
John Mehilcich	January 7, 1914	Fall of rock
Pete Gegis	January 12, 1914	Fall of rock
Peter Scaramillo	July 1, 1916	Shot
Florian Blatnig	December 16, 1916	Fall of rock
Jim Koskinas	February 2, 1918	Fall of rock
Nick Kezele	February 2, 1918	Same rock fall
Frank Slavish	July 8, 1918	Mine car
Nick Sarris	November 20, 1921	Fall of rock

Dye mine

Thomas Dye, 1880-1884
Location unknown

Thomas Dye is credited with opening the first coal mine in the Gallup field *(History of New Mexico,* 1907, p. 980). The same source also stated that he found the first outcrop of coal in this field, but according to information given by Raymond (1870), coal was known in the Fort Wingate area in 1870 (Lee and Knowlton, 1917).

In 1880 Mr. Dye began the development of a small mine, the location of which is unknown, and sold coal from it to

the railroad company for about 2 or 3 years. No estimate of production is available.

Thomas Dye also owned a saloon and was a notorious character. Among others he reportedly killed his mother-in-law and sister-in-law at the same time; he claimed the killings happened by accident. He violated federal statutes by openly selling liquor to the Indians, and one day the U.S. Cavalry surrounded his place of business and arrested him. He was found guilty of selling liquor illegally and served 4 years in the penitentiary *(History of New Mexico,* 1907, p. 837).

Patten mine

Mr. Patten, 1881-1884
400 ft NL, 4,600 ft EL, sec. **2, T15N, R18W (GE-86, Fig. 33)**
700 ft NL, 4,300 ft EL, sec. 2, T15N, R18W (GE-85, Fig. 33)

Soon after Thomas Dye opened his small mine, a Mr. Patten found an outcrop that he developed and worked. He sold the coal to the railroad company. This mine was operated for 2 or 3 years *(History of New Mexico,* 1907, p. 980). Cessation of operations may have occurred because of the freight costs of haulage by wagon about 3 mi to the railroad.

The location of the abandoned Patten mine is given on a sketch map showing the Gallup area railroad spurs in the Territorial Mine Inspector's report for 1897-1898. During the Abandoned Mine Lands study in 1979 two mines about 500 ft apart, assumed to be the Patten operation, were found. Both entries were driven northerly. The mine site farther north (GE-86) showed evidence of a tipple and bin, and the site to the south (GE-85) showed considerable coal screenings. These two mines were probably related in some way, and possibly one of them was the Dye mine. Square nails were found at both sites, which suggests an operation from about 1890 or before. The mine workings were on the No. 3 bed of the Gibson Coal Member, which, according to Sears (1925, p. 32), was about 5 ft thick in this area.

Weaver mine+

Colorado Fuel and Iron Company, 1899-1902
American Fuel Company, 1902-1909
Victor American Fuel Company, 1909-1917
Gallup American Coal Company, 1917-1924
3,000 ft NL, 2,700 ft EL, sec. 34, T16N, R18W
(GE-47, 48, 49, 51, 52, and 62, Fig. 33)

The Weaver mine, destined to become one of the largest of the early coal mines in the Gallup Basin, was begun in fiscal year 1899-1900 by the Colorado Fuel and Iron Company of Denver. The mine was opened by a drift on a 3.5% grade bearing about S45°E in the No. 3'/2 bed of the Gibson Formation. Development was by a double-entry system with room-and-pillar system off the entries. The No. 3 bed also was developed off this drift.

In the area where the mine is located there are six coal beds in the Gibson Formation. The No. 3 bed, which had 3-6 ft of clean coal with a sandstone roof, came to be extensively worked in both the Weaver and the Gallup mines. The No. 3'/2 bed, a big producer at the Weaver, had from 2-8 ft of clean coal except near the outcrop, where a band of fire clay was present, but pinched out to the west. The youngest bed, the No. 1, which was thick and dirty and had streaks of bone and shale, was not mined. The No. 2 bed was worked very little; it varied in thickness from 2-5 ft of clean coal with a good sandstone roof. The No. 4 bed, which was 3-4 ft thick, was not widely mined. Although it was developed to some extent in the Weaver mine, the No. 5 bed (the lowest bed), which was 5-8 ft thick with a 4-20-ft fire clay roof, was worked more extensively in the Gallup mine. Except for the No. 1 bed, all the beds contained good domestic coal.

By early 1901 the drift was 1,000 ft long, and a tipple had been built 800 ft from the mouth of the mine. A company town, Gibson, which had been built to serve the Gibson and Gallup mines, was enlarged by the construction of 60 dwellings. The old town of Gibson was about 0.25 mi southwest of the Weaver mine portals, and at some time during the history of the mine a small group of miners' cottages was added several hundred yards northeast of the portals. Because of the increasing numbers of miners and their families, a new, 1,000-ft-deep water well was drilled to provide water not only for the people but also for the water needs of the mine complex. Bath houses with accommodations for 150 men were constructed, and new stables, a granary, an oil house, and a powder house were built. The ventilation fan for the mine was run by a 30 HP steam engine, and an 80 HP steam engine powered the screen and slack blower.

From early January until the middle of March 1901, the miners were on strike, and then shortly after work was resumed disaster struck. At midnight on March 29, 1901, an explosion occurred that killed three miners (shot firers) and did extensive damage to the mine. After several days of investigation Jo E. Sheridan, Territorial Mine Inspector, stated the following in his annual report:

> In conclusion the deceased miners were evidently trying to break too much coal with their shots, with the result that they produced blown-out shots, which in turn agitated the coal dust enough being thrown and held in suspension in the air to reach the point of ignition and explosion.

The original point of the explosion was in rooms 10, 11, and 12 on the No. 1 level, and a second explosion occurred in the No. 2 room on the same level. The explosions in these two places did not cause a great deal of damage, but the force of the two created a potentially explosive mixture of coal dust and explosive gases. The minor explosions in the rooms forced this mixture, which lacked sufficient oxygen for ignition, to the intersection of the No. 1 entry and the main drift where sufficient space and fresh air were present, and a violent explosion occurred. The straight entry to the surface, 285 ft long, received almost the full impact. The timber was completely blown down, and at the point of explosion from 6 to 15 ft of the hard sandstone roof on top of the entry was shattered. No methane was found. Because the job of the shot firers was to fire the charges

FIGURE 35—American Fuel Company's baseball team of 1909 at Gibson. The large coal companies promoted the sport and sponsored teams to provide summer recreation for people in coal-mining towns. *Photo from archives of the Gallup Public Library.*

after the shift left the mine, no other miners were in the mine. The Territorial Mining Inspector sent letters to all the operators in the territory warning them of the causes of dust explosions and instructing them about preventive measures. The mine was in operation again by June.

During one of Mr. Sheridan's inspections in 1902 he found Willie Fry, age 7 to 8, and Thomas Phillips, age 11, working in the mine. He instructed the management to fire the boys and not let them back in the mine until they were 12 years old. Most of the boys hired for underground work were called trapper boys, and they were used to open and close ventilation doors in main travel ways.

By 1903 the main drift to the southeast was 3,500 ft long, and that year the mine was the largest producer of coal in the history of New Mexico; almost 400 men and boys were employed, and 376,707 tons of coal were mined (Table 30). Gibson provided all the conveniences possible, among them electric lights and water for all the homes and daily garbage collection. The mine was also known for its fine baseball team (Fig. 35). This mine was one of the best equipped in the United States.

At the Weaver mine where the No. 3 bed was about 3 ft thick the company mined the No. 3 1/2 bed and pulled all the pillars as clean as possible, allowing the intervening 8 ft of sandstone to fall. The miners would then drive through the cave and mine the No. 3 bed without the use of timber or powder because the roof above the No. 3 bed, a strong sandstone, did not cave in. Areas as large as 80 x 100 ft were mined by this method.

Apparently in 1904 a second opening or slope in the No. 3 1/2 bed was developed down the dip bearing about northwest. By the latter part of the year this opening was connected through the mine workings to the original drift. In fiscal year 1906-1907 the Heaton mine was connected to the Weaver, but the Territorial Mine Inspector ordered the connection closed because an explosion in either mine could damage the other.

The first of the fires to plague the mine started along the outcrop in about fiscal year 1908-1909. Firewalls were built to keep the gases, heat, and fire from spreading into the mine. The walls became hot, and the inspector advised that steam and water be injected behind the wall to cool the immediate area. The following year five mine rescue helmets were purchased, together with other first aid equipment, and telephone communications from within the mine were connected to the main office. The fire on the outcrop always presented a danger to the upper workings of the mine, and to eliminate this hazard partly a new shaft was sunk 2,000 ft from the portal to provide an escapeway and

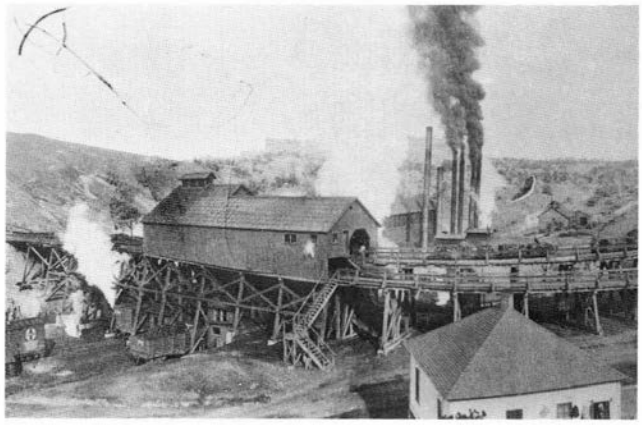


FIGURE 36—The Weaver mine showing the loading docks in the foreground and the powerplants beyond, about 1912. *Photo from archives of the Gallup Public Library.*

FIGURE 37—Stone and concrete structure at the Weaver mine. The structure, which enclosed a vent pipe, was used to take air samples to check the underground atmosphere in order to monitor the fire in the old mine workings. *Photo by H. B. Nickelson, 1979.*

to improve ventilation. The outcrop fires became active again, and new and additional firewalls were constructed. On March 6, 1910, the employees and company officials were reminded again of the seriousness of the practice of overloading blast holes when an overloaded hole caused an explosion. Fifty men were jeopardized, but fortunately only two men and two mules were injured.

In fiscal year 1909-1910 the mine ownership changed, and the Victor American Fuel Company began operating the American Fuel Company mines. In 1910 four beds of coal were being mined, the No. 3, the No. 3 1/2, the No. 2, and the No. 5, the last of which was slated to become a heavy producer.

During fiscal year 1910-1911 a modern powerplant was built near the mine site. The two 500 KW, 2,300-volt three-phase G.E. generators furnished sufficient power for the needs of the company's mines and towns and also part of what was needed in the town of Gallup (Fig. 36).

In 1913 improvements purchased were a 150,000-gallon water tank, $2,000; an air lift for deep wells, $6,800; a substation building, mining machines, 1500 KW turbine, and auxiliaries, $29,300; and two Parker boilers, $21,312. A new air shaft was started above the area of the active mine workings to provide an escapeway and better ventilation. The aircourse through the old mine workings had squeezed, restricting the amount of air to the working faces. The squeeze was probably caused by fire in the mine.

In December 1914 fire broke out into the No. 5 slope and the intake aircourse. Concrete stoppings were emplaced, a reinforced concrete arch was poured in the fire area, and a new aircourse was started. A 6-inch drill hole was put down from the surface so that water and sand could be forced into the fire area. This procedure cooled the area, and in 1915 the firewalls were holding.

A new shaft, 90 ft^2 in area and 347 ft in depth, was started in the spring of 1916. On September 13, 1916, fire broke out again and the mine was closed temporarily. New fire-walls were constructed to control the fire in the slope. A new slope was driven around the fire on a three-shift basis with 54 men working. The firewalls were holding and the

temperature was somewhat lower, but on July 24, 1917, a new fire was found. Immediate action for control was taken, and by September no heat was detected. The old fire remained under control.

The Gallup American Coal Company took charge of the company mines on July 1, 1917, and the following day the miners went on strike at the Weaver, Heaton, and Navajo mines. A period of general cleanup and improvements began during the approximately 3 months of down time and continued into the following year. Company houses were repaired and repainted, and a new amusement hall and a church were built at Gibson. The mines were re-equipped, main entries were cleaned up and retimbered, and drainage was improved. Up-to-date rescue equipment was purchased, and a new rescue station was built.

A new air shaft located 3,600 ft NL, 3,600 ft EL, sec. 27, about 4,000 ft from the portal (GE-62, Fig. 33), was sunk to the No. 5 bed by late 1922, and ventilation was reported to be the best since the mine was opened. In May of 1923 fire broke out in the slope, but it was walled off and cooled (Fig. 37). Unfortunately the fire broke out again in the main slope in September, and all of the mine below the arch 1,500 ft from the surface was lost. All of the machinery and the rails below the arch were removed, and a concrete wall was built across the slope a few feet below the upper end of the arch. Fifty men were employed to remove a block of coal lying outside of the fire area. A ventilating fan that had been installed in the air shaft, opened the previous year, was removed, and the shaft was sealed. The mine ceased operation in early 1924. In 1979 the surface outcrops near the old portals were on fire.

Coal from the Weaver mine was shipped via a railroad spur that was built up Gibson Canyon to the mine. A great deal of the coal was sold to power steam boilers for various railroad companies in the west, and the rest was sold for domestic and other uses in California, Arizona, and New Mexico.

Records show a production of 3,652,000 tons (Table 30). A small part of the tonnage was from the Gallup mine, which was closed in 1904 because of fire in abandoned mine workings; the Weaver operation recovered some of the Gallup reserves lost because of the fire. For 6 years no production figures were listed. I estimate a total production of 4,250,000 tons during the life of the mine from 1899 to 1923. Records of company officials, production, employment, and fatalities are shown in Tables 28-31.

TABLE 28—Production in tons from the American Fuel Company mines, the Victor American Fuel Company mines, and the Gallup American Coal Company mines. The American Fuel Company purchased the Crescent Coal Company in April 1900, operated their mines, and opened these mines. It reorganized to form the Victor American Fuel Company in 1909; that company sold the mines to the Gallup American Coal Company on July 1, 1917. The production totals from the company may not equal the sum of the production totals from the mines because company production is the amount sold and mine production is the tons produced. In addition, coal used for company heating and power needs and possibly inventory may account for differences. See Table 2 caption (p. 17) for further explanation. *estimated; **purchased by Victor American Fuel Company; ***purchased by Gallup American Coal Company.

Year	Weaver mine	Heaton mine	Canavan–Bartlett mine	Navajo No. 1 mine	Navajo No. 2 mine	Baudino–Navajo No. 3 mine	Navajo No. 5 mine	Company total
1899–1900	Opened							
1900–1901	50,000							50,000
1901–1902	191,093							191,093
1902–1903	323,805							323,805
1903–1904	376,707	Opened						376,707
1904–1905	280,816	7,543	Opened					288,359
1905–1906	339,980	71,169	7,000					411,149
1906–1907	344,047	157,205	7,500	Opened				501,252
1907–1908	265,269	182,498	19,600	33,964				481,731
1908–1909	264,948	222,677	42,000	85,344				572,969
1909–1910	272,845	266,925	49,000**	132,278				721,048
1910–1911	265,307	229,624	30,305	142,919				668,155
1911–1912	No report							
7/1/12–11/1/12								196,928
1913						Opened		506,839
1914			Closed		Opened	10,500*		506,839*
1915						2,533		462,598
1916						4,000		430,416
1917	107,429	95,011		101,432		None***		303,871
1918								376,090
1919	125,440	87,675		93,033	78,456	6,431		391,035
1920	141,772	82,401		85,072	80,433	Closed		389,678
1921	126,552	53,973		127,663			Opened	308,188
1922	114,173	16,402		155,572			Opened	286,158
1923	61,811	Closed		65,968			310,657	438,426
1924	Closed			Closed			479,413	479,413
1925							447,879	447,879
1926							443,937	443,937
1927							451,591	451,591
1928							413,818	413,818
1929								
1930							423,625	423,625
1931							318,300	318,300
1932							268,565	268,565
1933	Published production figures were prohibited by state law.							

TABLE 29—Officials and the companies that operated the Heaton, Weaver, and Navajo mines, 1898-1976.

1898-1899
Crescent Coal Company
W. M. Weaver, General Manager
Hugh McGinn, Superintendent

1899-1900
On April 1, 1900, the *Crescent Coal Company* was sold to the *Colorado Fuel and Iron Company* of Denver, Colorado, which organized the *American Fuel Company* to operate and develop the mines in Gallup. Julian A. Kebler, Alfred C. Cass, and John L. Jerome from Denver City, Colorado, were the incorporators, and John T. Kebler was made General Superintendent.

1900-1901
John T. Kebler, General Manager
W. M. Weaver, General Superintendent
Hugh McGinn, Mine Superintendent for the Gallup and Weaver mines

1901-1902
The *Colorado Fuel and Iron Company* apparently assigned the ownership of the coal lands to the *American Fuel Company.*
Thomas Pattison, Division Superintendent

1902-1905
George W. Bowen, President, Denver, Colorado
G. F. Bartlett, General Manager, Denver, Colorado

1906-1907
John Jennings, Mine Superintendent

1908-1909
Apparently the *American Fuel Company* was reorganized as the *Victor–American Fuel Company.*
W. J. Murray, General Manager of Mines
Wm. McDermott, Division Superintendent
George W. Bowen remained President.

1910-1911
W. S. Getchell, Division Superintendent

1911-1912
D. Summerville, General Superintendent
James Brown, Superintendent

1913
Edward Thomas, Superintendent

1914-1915
Thomas Husband, Superintendent

1916
W. J. Murray, General Manager in Denver
W. F. Murray, General Superintendent
Thomas Husband, Superintendent

1917-1923
On July 1, 1917, the *Gallup American Coal Company,* subsidiary of *Kennecott Copper Company,* purchased the mines and began operating them.
J. M. Sully, General Manager, Hurley
Horace Moses, General Superintendent, Gibson
R. R. Pollock, General Manager, Albuquerque
P. Westwater, General Superintendent, Allison
After 1917 Mr. Pollock and Mr. Westwater were not mentioned.

1924
James E. Haines, General Superintendent

1925-1928
Horace Moses, Manager

1929-1938
Horace Moses, General Manager
Thomas Husband, General Superintendent
Louis M. Kuhn, Safety Engineer

1939-1942
Thomas Husband, General Manager
C. E. Uhland, Assistant to General Manager

1943-1945
Robert Denard, General Superintendent

1946-1948
In 1946 the properties were sold to a group of local investors who formed the *Gallup Gamerco Coal Company.*

1949
Otto FeIlin, Mine Superintendent
R. W. Denard, General Manager

1951
Operations ceased on June 1, 1951, but the company had control over the properties acquired in 1946 until 1976.

TABLE 29, continued

1976
Gallup Gamerco Coal Company was dissolved and *Gamerco Associated Ltd.* was formed. They assumed ownership of the coal properties.

TABLE 30—Production and employment record of the Weaver mine.

Year	Production (tons)	Employment					Days operated
		Miners	Boys	Company men	Top men	Boys	
1900–1901	50,000	125	4		10		150
1901–1902	191,093	150	5		30		262
1902–1903	323,805	190			143		275
1903–1904	376,707	260	10		98	10	300
1904–1905	280,816	265	7		57		195
1905–1906	339,980	208			93		263
1906–1907	344,047	279	7		54	1	273
1907–1908	265,269	272	13		54	4	231
1908–1909	264,948	235	3		60	3	220
1909–1910	272,845	168	2	40	25	5	262
1910–1911	265,307	175	4	45	40	2	289
1911–1912	No record						
1913		127	4	23	13		
1914		127		22	20	3	
1915	No record						
1916		110		23		1	
1917	107,429	77		48	27		205
1918		85		35			296
1919	125,440	87		45	30		292
1920	141,772	87		46	28		301
1921	126,552	117		47	25		134
1922	114,173	91		35	26		222
1923	61,811	68		21	16		145
1924	Mine closed because of fire						

TABLE 31—Fatalities at the Weaver mine.

Name	Date	Cause
Harry Applegarth	March 29, 1901	Dust explosion
Robert Holman	March 29, 1901	Dust explosion
H. Dupree	March 29, 1901	Dust explosion
Tetsugho Tetshai	July 20, 1901	Blast from an adjoining room
Anton Visconti	September 18, 1901	Fall of rock
R. Kihara	February 10, 1902	Fall of rock
Francisco Rosales	September 8, 1902	Fall of rock
George Audler	January 7, 1903	Fall of rock
Charles Karrow	January 26, 1903	Fall of rock
K. Kanda	December 9, 1907	Fall of rock
Albert Tiber	May 11, 1909	Fell under a mine car
Julian Rodriquez	December 22, 1909	Asphyxiated by a mine fire
Porfillio Garcia	December 22, 1909	Asphyxiated by a mine fire
Tony Petrovitch	January 16, 1910	Fall of rock
Gaspar Gronovich	May 19, 1910	Fall of rock
Remen Eskra	February 1, 1911	Fall of rock
Rafael Visic	June 20, 1911	Fall of rock
Bruno Rocco	January 26, 1912	Fall of rock
Anton Mynovich	May 7, 1912	Fall of rock
John Touse	December 30, 1912	Pit cars
Frank Rusic	June 26, 1916	Derailed mine cars
Santa Gransoti	November 2, 1916	Fall of rock
Arthur Faddio	June 29, 1917	Shot
Eugenio Sartor	April 16, 1918	Fall of rock
Joe Micholetti	September 10, 1920	Fall of rock
Pete Benderach	February 11, 1923	Locomotive

Peacock No. 1 and No. 2 mines

Gibson Coal Company, 1950-1959
4,700 ft NL, 2,100 ft EL, sec. 34, T16N, R18W (GE-50, Fig. 33)

The Peacock No. 1 mine was opened by the Gibson Coal Company in 1950 to mine coal left near the surface after the Weaver mine operation. The State Mine Inspector's report for 1952 states that Bill Fry, General Manager, and Ben Thomas, General Superintendent, were the owners. Eight men were employed that year. This underground mine was operated until 1957 when it caught fire and, therefore, was sealed. The Peacock No. 2 mine, a strip mine, was then opened, and six to 12 men were employed.

Another small strip mine, the Peacock No. 3 mine, was opened in 1957 by Saulter and Brano Coal Company. This company was formed by C. E. Saulter, lessee, and the Gibson Coal Company was the lessor. The operation of Saulter-Brano was brief because by 1958 Gibson Coal Company was operating both the No. 2 and the No. 3 mines with John B. Williams as General Manager. The No. 3 mine was closed in 1958, and the No. 2 was closed in 1959. Two strip pits were found at the above location in 1979, during field work for the Abandoned Mine Lands study. The two trenches were about 150-200 ft long and met at the nose of a hill. These two pits could have been the No. 2 and No. 3 mines. One of the trenches exposed an opening, which could have been the Peacock No. 1 mine. One trench bears S70°E and the entry bears about S82°E.

It is interesting to note why these mines and mines in other fields were given the name Peacock. Some coals have a film deposited along minute fractures in the coal. When they are exposed to the light, iridescent color similar to the colors in the tail feathers of peacocks is observed; hence, it was called peacock coal or peacock mine.

Gallup-Gibson mines+

Gallup Coal Company, 1881?-1892?
Crescent Coal Company, 1892?-1900
American Fuel Company, 1900-1904
250 ft SL, 600 ft WL, sec. 34, T16N, R18W
(GE-53, 54, 55, 56, 57, 58, and 61, Fig. 33)

In *History of New Mexico* (1907, p. 980) the following account is given of the beginning of the Gallup mine.

> The news of the success of these two men [Patten and Dye] spread, and soon after Patten began his operations [1881] the firm of Pegram & McMillen began operations on a tract of land which they secured from the government. Mr. Pegram subsequently retired from the firm, which then became McMillen, Kennedy & Weaver. It was these gentlemen who organized the Gallup Coal Company. The product of this mine also was purchased by the railroad company.

The company store, established by the Gallup Coal Company, was the first general merchandise store in Gallup.

The Gallup mine was one of the best of the early mines in the Gallup field. In 1885 it produced 52,269 tons of coal (Mineral resources of the United States, calendar year 1885, p. 41). Many of the miners lived in the camp (later town) of Gibson. According to Pearce (1965, p. 63), a post office was established in Gibson in 1890, but certainly the town had grown up with the mine before that time. The miners were prone to live near the mine site because they did not relish a long walk home after a 10- or 12-hour shift, especially during the winter months. Even after the Gallup mine closed, the town of Gibson continued to grow, and it served the Weaver and the Navajo mines during their periods of operation. The post office at Gibson did not close until 1947 (Pearce, 1965, p. 63). The Gallup Coal Company was very important in promoting the organization by independent

FIGURE 38—Powder house at the Gallup–Gibson mines. These well-constructed stone buildings, found near the larger coal mines, have survived. They were used to safely store and dispense explosives as they were needed underground.

mine operators of the Crescent Coal Company, which took over the operations of most of the mines in Gallup on January 16, 1892 (see Table 16).

The first available information from government records concerning the Gallup mine is found in John W. Fleming's Territorial Mine Inspector's annual report of 1894-1895; at that time the Crescent Coal Company employed about 180 men and produced 107,727 tons of coal (Fig. 38). Officials of the company were William Weaver, General Manager; Hugh McGinn, Superintendent; and James McQuade, Pit Boss.

The first mine was opened in the No. 5 or lowest coal bed in the Gibson Coal Member. The bed, which was 6-7 ft thick, was developed along the 3,000-ft main slope. The mine was ventilated with a 20-ft diameter Crawford McCrimmon fan, and water was piped into the mine to provide fire protection and eliminate dust. During fiscal year 1895-1896 there was little change in operation, and the mine was in good condition. In fiscal year 1896-1897 there were no reports from the mine inspector. During fiscal year 1897-1898 a ventilation shaft was sunk 232 ft to connect with the No. 15 left entry. The following year P. 0. O'Neil was made Pit Boss, and the mine had increased production by about 33,000 tons since fiscal year 1894-1895. The railroad, then called the Santa Fe and Pacific, hauled the coal to New Mexico, Arizona, California, Texas, and Mexico.

On April 1, 1900, the ownership of the Crescent Coal Company passed into the hands of the American Fuel Company, which had close ties with the Colorado Fuel and Iron Company of Denver, Colorado. Julian A. Kebler, Alfred C. Cass, and John L. Jerome of Denver were the incorporators. John T. Kebler was named General Manager. The No. 3 bed, with 5 ft of coal, and the No. $3^1/2$ bed, with 5 ft of coal, were mined, with some production coming from the No. 5 bed, which had 6 ft of coal. The mine was operated from a slope that was 4,000 ft long with a double-entry roomand-pillar system. The dip of the beds ranged from 4 to 14°. In 1900 the main slope was brushed and the track relaid, a machine shop was constructed, and 15 four- to six-room homes were built for the miners. The town of Gibson consisted of 100 comfortable homes and a good school (Fig. 39). The company was very conscientious about good schooling and paid a generous part of the costs. The mine name gradually assumed the name of this town.

The Territorial Mine Inspector reported a strike that closed the mine early in 1901 for about 50 days. The company claimed the equivalent of a takeover of the mine. In April of that year the inspector examined a fire that had been caused by spontaneous combustion 10 years before in the No. 4 bed, which had 4 ft of coal, but it was deemed not dangerous to the current workings.

In 1901 Thomas Pattison was the Division Superintendent at Gallup. The main slope reached a depth of 5,000 ft, and it became necessary to install a new hoisting plant, which equaled the capacity of anything in the territory. Two drums, 5 and 8 ft in diameter, and their motors were capable of pulling 35 $1^{1}/2$-ton cars from the face of the 5,000 ft slope, which dipped 22° at the bottom and 5° at the top, at a rate of six trips per hour. The mine cars traveled by gravity from the mouth of the portal to the tipple. The coal-handling facility was equipped with a scale to weigh each car. The most modern screens and dust collectors were installed, as were automatic rail car loaders capable of continuous loading. The tipple, which was 410 ft long, was capable of loading 250 tons per hour. All of this modern equipment hardly had the paint scuffed on the surface before the mine was closed on March 31, 1902, because of overproduction and a poor market. At this time a great deal of cheap oil was being developed in California, which was taking the place of coal.

In November 1901 carbon dioxide was found coming through a brick wall that sealed a fire from the workings in the No. 4 bed, and then on March 10, 1902, fire was discovered in the same bed within the old workings that had been mined some 12 years before. Mr. Weaver asked Jo E. Sheridan, Territorial Mine Inspector, to help confine the fire to those old workings. By April 9 the fire was in the fan shaft; the fan was then moved to the main slope, and the old shaft caved. The fire was reported under control by the end of June 1902.

The mine resumed operations on June 30, 1903, but fire again broke through its barriers, and early in 1904 the mine was closed permanently. By 1905 triple stone barriers were built to protect the remaining coal, and the mine entries were sealed. Most of the four million tons of coal developed in the mine was eventually recovered through the Weaver mine. A record of production and employment and a list of fatalities are shown in Tables 32 and 33.

TABLE 32—Production and employment record of the Gallup–Gibson mines.

Year	Production (tons)	Employment			Days operated
		Miners	Boys	Top men	
1893–1894	107,786	205 employees			
1894–1895	107,727	160		20	
1895–1896	104,310	155	5	45	216
1896–1897	No report				
1897–1898	141,145	240	5	24	235
1898–1899	151,525	250	5	20	
1899–1900	180,000	200	5	20	300
1900–1901	145,000	200		20	250
1901–1902	80,733	100	3	30	203
1902–1903	Closed March 31, 1902; reopened June 30, 1903				
1903–1904	21,417	41		35	86
Ceased operation in the early part of 1904 because of fire					

TABLE 33—Fatalities at the Gallup–Gibson mines. No record could be found of fatalities from 1881–1894.

Name	Date	Cause
James Hennessey	December 24, 1894	Fell in front of a trip
M. Morrillas	March 4, 1896	Run over by mine cars
S. Harper	May 19, 1896	Fall of rock and coal
Franz Dellazer	March 3, 1898	Fall of rock
Franz Cadiz	December 6, 1898	Pit car
John Barrett	September 22, 1899	Fell in front of a trip
John Calcaterra	June 13, 1900	Killed by a blast
Charles Gracey	June 13, 1900	Killed by a blast
Alfred Jones	April 17, 1901	Caught in a belt on a steam engine
Steve Deleanor	November 7, 1903	Killed by flying coal from a blast

FIGURE 39—The last day of school at Gibson, probably in the early 1900's. *Photo from archives of the Gallup Public Library.*

Navajo mine

Date unknown
4,600 ft NL, 200 ft EL, sec. 33, T16N, R18W (CE-59, Fig. 33)

It is not known if this small wagon mine should be named a Navajo mine. Its location is between the Navajo No. 1 workings and the Gallup-Gibson complex, and the records do not indicate who was in charge. The mine was opened on the No. 2 bed of the Gibson Coal Member by an entry bearing N56°E. The dump is small.

Navajo-Navajo No. 1 mine+

American Fuel Company, 1906-1909
Victor American Fuel Company, 1909-1917
Gallup American Coal Company, 1917-1924
4,300 ft NL, 1,100 ft EL, sec. 33, T16N, R18W
(GE-60, 64, 65, and 67, Fig. 33)

Early in the 20th century a new source of coal was needed by the American Fuel Company, a subsidiary of the Colorado Fuel and Iron Company of Denver. The decision was made to begin a mine on the Gibson Formation coal beds west of the Gibson and the Gallup mines, an area that had not been exploited before. In fiscal year 1906-1907 the company opened the Navajo (later Navajo No. 1) mine at the above location. A main slope was driven on the No. 2 coal bed N22°W for 1,235 ft. At that point a fault brought the No. 1 bed into juxtaposition with the slope face, and an adjustment to the slope was required to return to the No. 2 bed. Near this location the bearing was changed to N23°E to put the slope in an area downdip from the lowest workings of the Gallup and Gibson mines. The dip was about 15° to the northwest. The coal in the No. 2 bed was about 4.5 ft thick, and the coal in the No. 3 bed, which was also opened by the main slope, reached a maximum thickness of 6.5 ft. Double entries were driven from the slopes, and off the double entries a room-and-pillar system of mining was developed.

After a year of operation the main slope had reached a depth of 1,856 ft, and the company had spent over $100,000 developing and equipping the mine and surface facilities. A 150 HP furnace boiler for the hoisting engine, a 150 HP boiler at the tipple, one 14 x 18-inch, 150 HP tailrope hoist, and a 20 HP tipple engine were in place. The tipple, a frame structure 250 ft long, was equipped with a Mitchell dump, and the coal was sized by screening over adjustable bars. The railroad was extended to the tipple, and track scales were installed to weigh the coal cars (Fig. 40). Sixteen three-room, 10 four-room, two nine-room, one six-room, and one 12-room houses were built to shelter the employees, along with sheds and various facilities needed for a mine of this size. The coal was sold to the Atchison, Topeka and Santa Fe Railroad and to markets in New Mexico, Arizona, and Texas.

In 1909 the company was reorganized, and the Victor American Fuel Company was formed. In fiscal year 1910-1911 a new mine hoist and 17 three- and four-room houses were added at a cost of $30,000. By 1913 the main slope of the mine reached a depth of 3,300 ft. Between 1913 and 1916 there was a general deterioration of the mine, and the records mention poor air, coal dust, roof falls, and heaving floors. In 1916 the State Mine Inspector noted the worsening conditions in both his annual report and a report to the General Manager. On July 1, 1917, the Victor American Fuel Company sold its mines to the Gallup American Coal Company, and the following day the miners struck at the Navajo, Heaton, and Weaver mines; they remained on strike until October. In spite of the time missed, 146 men worked a total of 209 days during the year, and $17,235 was expended by the new company on a mule barn, a new rock dump, and mine development.

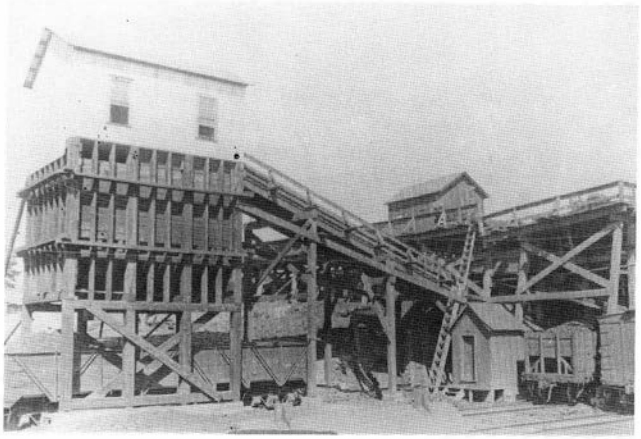


FIGURE 40—Loading bin and tipple at the Navajo mine in 1913. *Photo from archives of the Gallup Public Library.*

Mining difficulties continued to trouble both the Navajo No. 1 mine and the Navajo No. 2 mine, which had been opened nearby in 1914 (see next page). The mines operated separately until their combination in 1921 when the main slope of the No. 1 mine was used as the intake and the air was exhausted out of the No. 2 slope; the change was made because of poor ventilation and caved aircourses. In 1922 the combined mine was connected to the new workings of the Navajo No. 5 mine, resulting in much improved ventilation. By 1923 pillars were being pulled and the coal remaining in the lower workings (the No. 1 slope eventually reached a depth of 5,950 ft) was mined through the No. 5 mine. The No. 1 and No. 2 mines were closed by 1924.

It is estimated that the No. 1 mine produced 1.2 million tons. A small area, probably a pillar or two near the coal crop, was on fire in 1979. Mine officials are listed in Table 29. A record of production and employment is shown in Table 34, and the fatalities are listed in a compilation for all of the Navajo mines (Table 37).

TABLE 34—Production and employment record of the Navajo–Navajo No. 1 mine. *Production and employment figures are from both the Navajo No. 1 and No. 2 mines. The Navajo No. 1 and No. 2 mines were closed in 1923 or early 1924. Some production came from pillars at the bottom of the mines and was drawn through the Navajo No. 5 mine.

		Employment			
Year	Production (tons)	Miners	Company men	Top men	Days operated
1906–1907	Opened				
1907–1908	33,964	56	17	2	166
1908–1909	85,344	110	29	2	216
1909–1910	132,278	85	24	26	275
1910–1911	142,919	100	26	31	290
1911–1912	No record				
1913		136	22	5 boys	
1914		75	12	2	
1915		90	15		
1916		54	16		
1917	86,867	85	40	21	209
1918		71	16		
1919	93,033	60	31	12	293
1920	85,072	53	38	10	303
1921*	127,663	160	110	30	140
1922*	155,572	223	143	42	226
1923*	65,968	53	17	8	188

Unknown mine

500 ft NL, 2,000 ft EL, sec. **4, T15N, R18W** (GE-66, Fig. 33)

An open entry that bears about N45°W was found in the vicinity of the Navajo No. 1 mine. The entry appears to be on the Gibson No. 2 coal bed, and this working may be part of the Navajo No. 1 mine.

Navajo No. 2 mine+

Victor **American Fuel Company, 1914-1917**
Gallup American Coal Company, 1917-1924
4,400 ft NL, 2,600 ft EL, sec. 33, T16N, R18W
(GW-13-15 and GW-63, Fig. 33)

The Navajo No. 2 mine, another of the large coal mines along the Gibson Formation, was begun by the Victor American Fuel Company in 1914. The main slope was about 900 ft southwest of the main slope of the Navajo No. 1 mine. The No. 2 mine was planned so that the loading and other facilities of the No. 1 mine could be used. The slope, bearing N40°W, was driven on the No. 3 bed, the overall dip of which was about 12°. It was declined through intervening rock to the No. 5 bed and eventually reached a depth of about 5,000 ft.

Information concerning mining procedures and production is sketchy. It is noted in the State Mining Inspector's records that in 1916 the air was bad because the manway and aircourse had been plugged by roof falls and heaves. In July 1917 the miners went on strike when the Gallup American Coal Company took over the operation, as did the miners of other company mines in the area (Heaton and Weaver). A lengthy period of time was spent, both during the strike and into the next year, cleaning up the mine and putting it in workable order. Because tonnage records for 1918 are lacking, it is not known if production was resumed that year. The peak recorded production for one year, 80,433 tons, occurred in 1920.

In 1921 the Navajo No. 1 and No. 2 mines were connected to ameliorate ventilation conditions. At the same time the new Navajo No. 5 mine was being developed, as were plans to mine the rest of the coal at the bottom of the No. 1 and No. 2 mines through an entry driven from the No. 5 mine for that purpose. Pillars were being pulled in 1923, and by the end of the year the Navajo No. 1 and No. 2 mines were practically closed.

The Navajo No. 2 mine produced more than 173,000 tons that are accounted for in the records; from 1914 to 1919 only one year's production record is given, and from 1921 to 1924 the figures are combined with those of the Navajo No. 1 mine. It is estimated that the No. 1 mine produced 1.2 million tons and the No. 2 mine produced 700,000 tons.

Company officials are listed in Table 29. A record of production and employment is shown in Table 35, and the fatalities are listed in a compilation for all of the Navajo mines (Table 37).

TABLE 35—Production and employment record of the Navajo No. 2 mine. *Production and employment figures are from both the Navajo No. 1 and No. 2 mines. The mine was practically closed by the end of 1923.

Year	Production (tons)	Employment			Days operated
		Miners	Company men	Top men	
1914		116	20		
1915		100	20		
1916		60	16		
1917	14,565	100	44	40	205
1918		57	68		
1919	78,456	60	35	11	293
1920	80,433	56	34	10	304
1921*	127,663	160	110	30	140
1922*	155,572	223	143	42	226
1923*	65,968	53	17	8	188

Baudino-Navajo No. 3 mine

Baudino Company, 1913-1917
Gallup American Coal Company, 1917-1920
800 ft NL, 2,700 ft EL, sec. 4, T15N, R18W **(GW-3, Fig.** 33)

A small operation, which was eventually added to Gallup American Coal Company's mines, was started by Frank Baudino, Manager of the Baudino Company, in 1913. He drove a double slope to the west with one of the slopes connected to a shallow shaft that served as an aircourse. Sears (1925, p. 32) reported that his workings were 6 ft thick with several partings. The No. 3 bed was also mined but to a lesser extent. A second air shaft to the bottom of the mine was located approximately 1,400 ft from the slope portals. Electric power for the mine was obtained from the Victor American Fuel Company. Mr. Baudino employed from 10 to 12 men, and in 1914, 10,500 tons of coal were mined; in 1915, 2,533 tons; and in 1916, 4,000 tons. From the surface indications it appears that the minable coal was under the high ground between two swales that trend east-west. The coal crops out in the south swale, but the overburden in the north swale is so shallow that the coal would be weathered there.

In 1917 a railroad spur off the Weaver spur was connected to the tipple. Later that year the Baudino mine ceased operations and the Gallup American Coal Company acquired the property, naming it the Navajo No. 3 mine. In 1918 Dan King was Superintendent of the Navajo No. 1, No. 2, and No. 3 mines, but the operations were carried on independently. At that time the inspector stated that the No. 3 mine had about 20 places for miners to work. Mining was being carried on in the No. 2 bed, the roof of which was sandstone and the floor fire clay.

Production is not listed in the State Mining Inspector's records for the individual mines in 1918, but presumably production in 1918 was higher at the Navajo No. 3 mine than it was in 1919, when five miners and three outside men were employed and only 6,431 tons were mined. In April of 1919 the mining operations were suspended until their resumption became economical, which evidently did not occur; the mine closed in 1920. A total production of 30,000 tons is estimated. Figure 41 is a map made in 1923 showing the extent of the underground workings.

Navajo No. 5-Gamerco mine+

Gallup American Coal Company, 1921-1946
Gallup Gamerco Coal Company, 1946-1951
3,000 ft NL, 1,100 ft EL, sec. 32, T16N, R18W (GW-16, Fig. 33)

By about 1920 conditions at the mines owned by the Gallup American Coal Company dictated the need for new coal resources. Both the Weaver and the Heaton mines had a troubling history of fires, and their recoverable reserves were limited. The reserves of the Navajo No. 1 and No. 2 mines were projected to be sufficient for a few years, but the long trams and expensive maintenance of these mines militated against their future. The decision was made to develop the Navajo No. 5 mine, destined to be the largest and the most modern underground coal mine in the Gallup coal field.

Before the development of the mine the coal beds were diamond drilled to determine their thickness and quality.

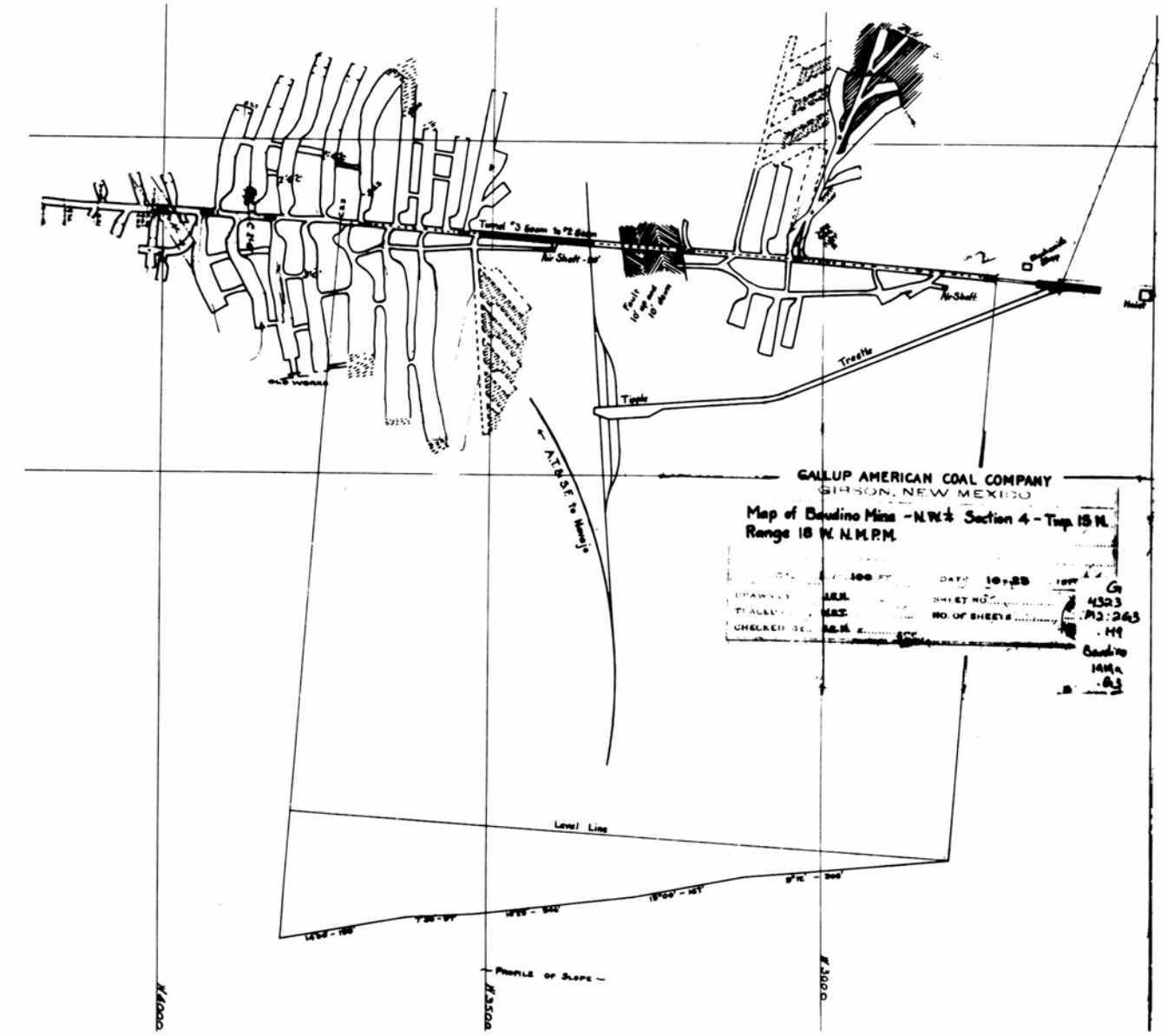


FIGURE 41—Map of the Baudino mine. *Made in 1923 by engineers from Gallup American Coal Company.*

The drilling indicated that about 1,280 acres of coal could be mined from the No. 3 bed and 32,000 acres from the No. 5 bed, which was about 80 ft lower. The No. 3 bed was minable downdip from the Navajo No. 1, the Navajo No. 2, and the Weaver mines. The No. 5 bed covered most of the above area but was the predominant bed to the north, south, and west of the proposed shafts. Both beds were about 5 ft thick.

Plans were formulated to develop the coal beds through two vertical shafts 550 ft apart, concreted from top to bottom with walls 2 ft thick for the first 30 ft and 18 inches thick for the remainder. In 1921 purchase and installation of modern, high-quality equipment began. The locations of the shafts were planned to allow for a railroad grade of less than 2.5%. The west shaft had three compartments. The airway was 9 x 10.5 ft, and the two material and man compartments were each 10.5 ft x 6 ft 3.25 inches. The depth of this shaft was 776.5 ft to the coal, plus 20 ft for a sump. The east shaft, 20 ft 8 inches x 9 ft, also contained three compartments. Two were used to hoist coal by 7-ton overturn self-dump-type skips in balance. The skip guides were 6 ft 6 inches apart. This shaft reached a depth of 781 ft to the coal bed, and a 58-ft sump was sunk to accommodate the underground coal-loading facility (Figs. 42-44).

The hoist facility at the air shaft consisted of a 28 x 56 ft all-metal building housing a 400 HP AC motor, which drove 7-ft double drums wound with 1 3/8-inch cable at a speed of 1,100 ft/min. The main shaft house, a 34 x 68 ft all-metal building, housed hoisting machinery that consisted of a 1,000-1,100 HP DC motor, a 975 KW 580 V DC generator, and a hoist with 7-ft double drums wound with 1 5/8-inch cable that were capable of a speed of 2,200 ft/min. The hoisting cycle was 43 seconds long, which included a loading time of 10 seconds.

The fan house, 34 x 25 ft, housed a reversible fan capable of producing 300,000 cf/min, which could be run either by engine or by electric motor. The main tipple was equipped with shaking screens, a picking table, and conveyors and bins. Under the tipple were five railroad tracks and two sets of railroad scales. Two air compressors were used, one for an airlift water pump and one for general use.

The powerplant was housed in a 100 x 113 ft fire-proof building. The steam plant consisted of four 419 HP Heine boilers that powered one 1,500 KW Allis Chalmers Parson turbine, two 500 KW G. E. Curtiss turbines, and one 500 KW Westinghouse Parson turbine, all 3,600 rpm with 2,200 volts. A 262-ft stack 14.75 ft in diameter exhausted the fumes from the boilers.

FIGURE 42—Surface facilities at Navajo No. 5 mine, October 15, 1922. To the left are the electrical shop, warehouse, and machine shop. To the right are the headframe and hoist house. The town is in the background. *Photo courtesy of John Kleiner; NMBMMR photo #700.*

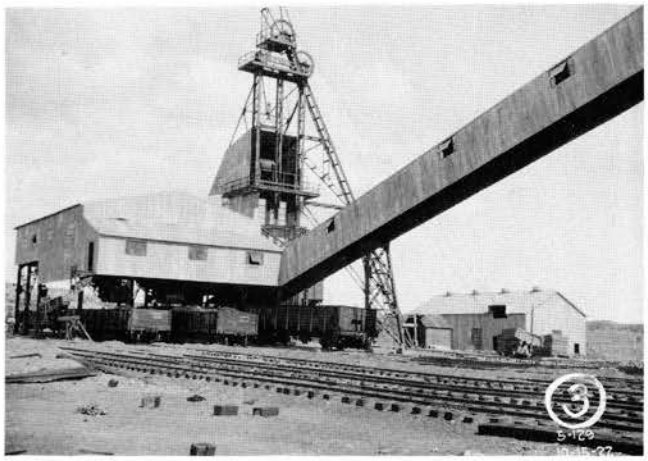


FIGURE 43—Loading tipple at Navajo No. 5 mine, October 15, 1922. *Photo courtesy of John Kleiner; NMBMMR photo #698.*

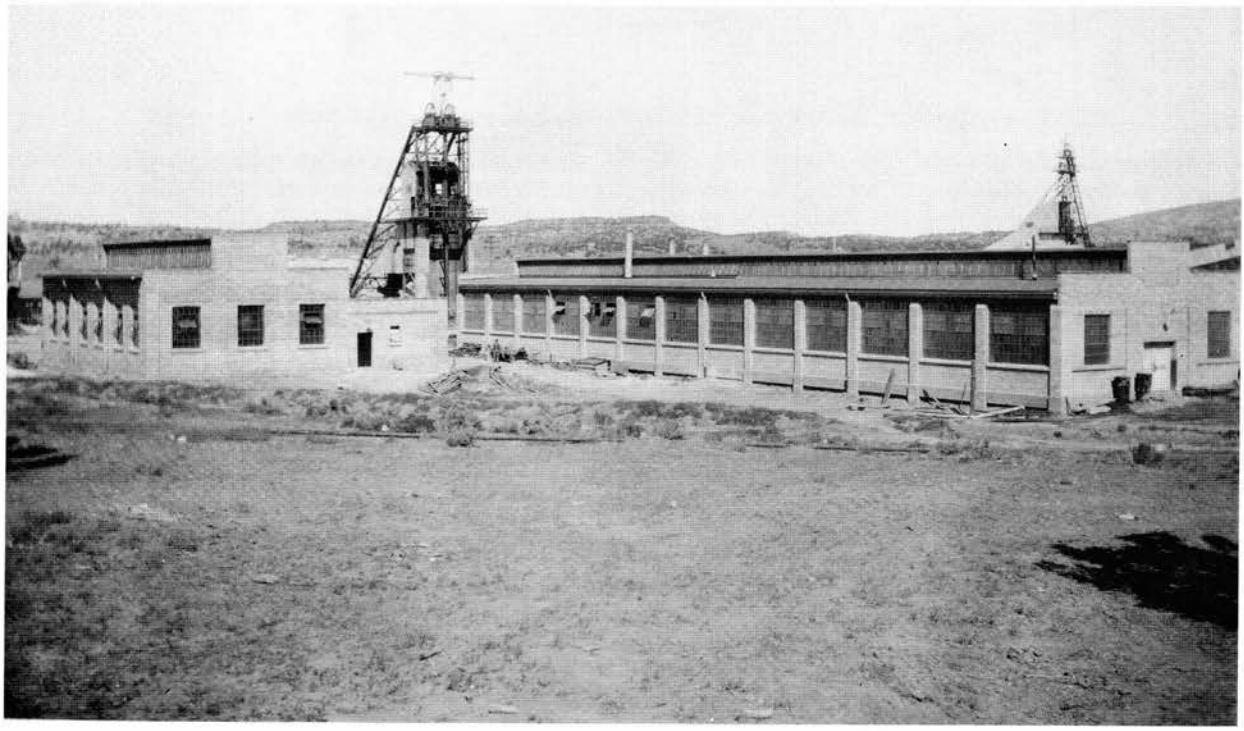


FIGURE 44—Shaft, tipple, and buildings at Navajo No. 5 mine, October 15, 1922. *Photo courtesy of John Kleiner; NMBMMR photo #693.*

FIGURE 45—Underground entry showing the main line timbering in the Navajo No. 5 mine, Gallup, New Mexico. *Photo courtesy of John Kleiner; NMBMMR photo #686.*

The mine was developed off three main parallel entries bearing north—south on 60-ft centers with the aircourse on the west and the empty track on the east. A two-entry roomand-pillar system of mining was developed with 500-600 ft between these entries. The main entries were driven to the farthest boundary, and the coal was then mined toward the shaft. Large 10-ton trolley locomotives were used in the main entries, and smaller 6-ton motors were used in the secondary entries. The coal was dumped into skip pockets by two rotary dumps. Mine water was taken care of by 4-inch 120 gal/min pumps. Figure 45 is a typical view of an entry.

An entry was completed in June 1922 from the new shaft to the Navajo No. 2 mine to improve ventilation in both mines. By the middle of September 1922, the Navajo No. 5 mine was on a limited production schedule. By early 1923 pillar coal was being mined from the bottom of the Navajo No. 1 and No. 2 mines and taken out the No. 5 shaft. By the end of the year those two mines were essentially closed. The No. 5 entries were driven downdip from the Navajo No. 1, the Navajo No. 2, and the Weaver mines to open coal reserves that those mines could not reach. The No. 3 bed was the main producer in this area, but the No. 5 bed was mined wherever it was of economic thickness.

By the end of 1924 the company was producing about 400,000 tons of coal per year. Safety, a primary concern, was engineered and built into all the facilities. The ventilation system was carefully planned to provide the quantities of air needed for the extent of the mine. Rock dusting and coal dust removal to prevent explosions were a must (Fig. 46). By 1925 the open-flame cap light was replaced by the electric cap light, and rock dust barriers were built and electrically fired shots adopted. The transportation system

FIGURE 46—Small rock crushing unit at the Navajo No. 5 mine site, which was used to make rock dust. During the early 1920's the use of rock dust was widely adopted to help suppress coal-dust explosions. Fine limestone or gypsum was plastered on the ribs and floors, and specially constructed rock-dust barriers were filled with dry rock dust and placed overhead throughout the entries of the mine. An explosion would blow the rock dust out of these units, and the dust would confine the explosion to that particular area. This was a labor-intensive three-man rock crushing operation, which was replaced with a more efficient system designed by J. Kleiner that could be run by one man. *Photo by H. B. Nickelson, 1979.*

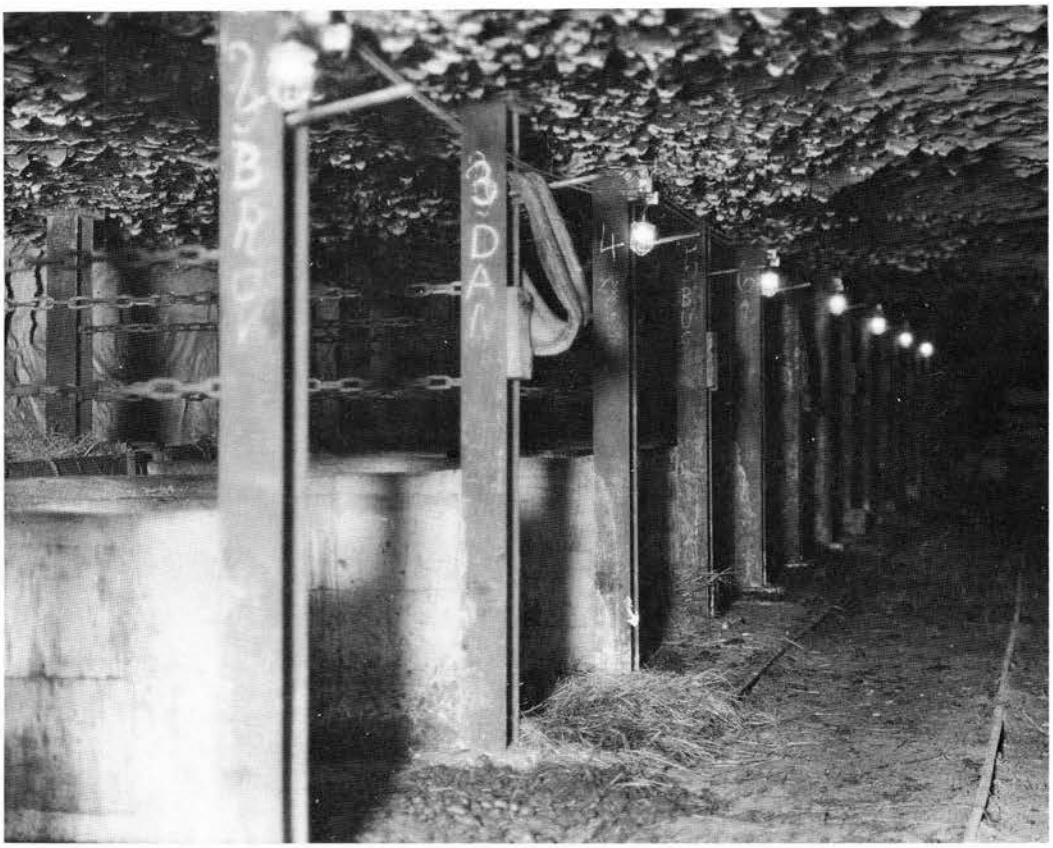


FIGURE 47—Underground mule stalls in the Navajo No. 5 mine, Gallup, New Mexico. Note the mule names—Brown, Dan, Abel, Buck, and Andy—on the stalls. *Photo courtesy of John Kleiner; NMBMMR photo #694.*

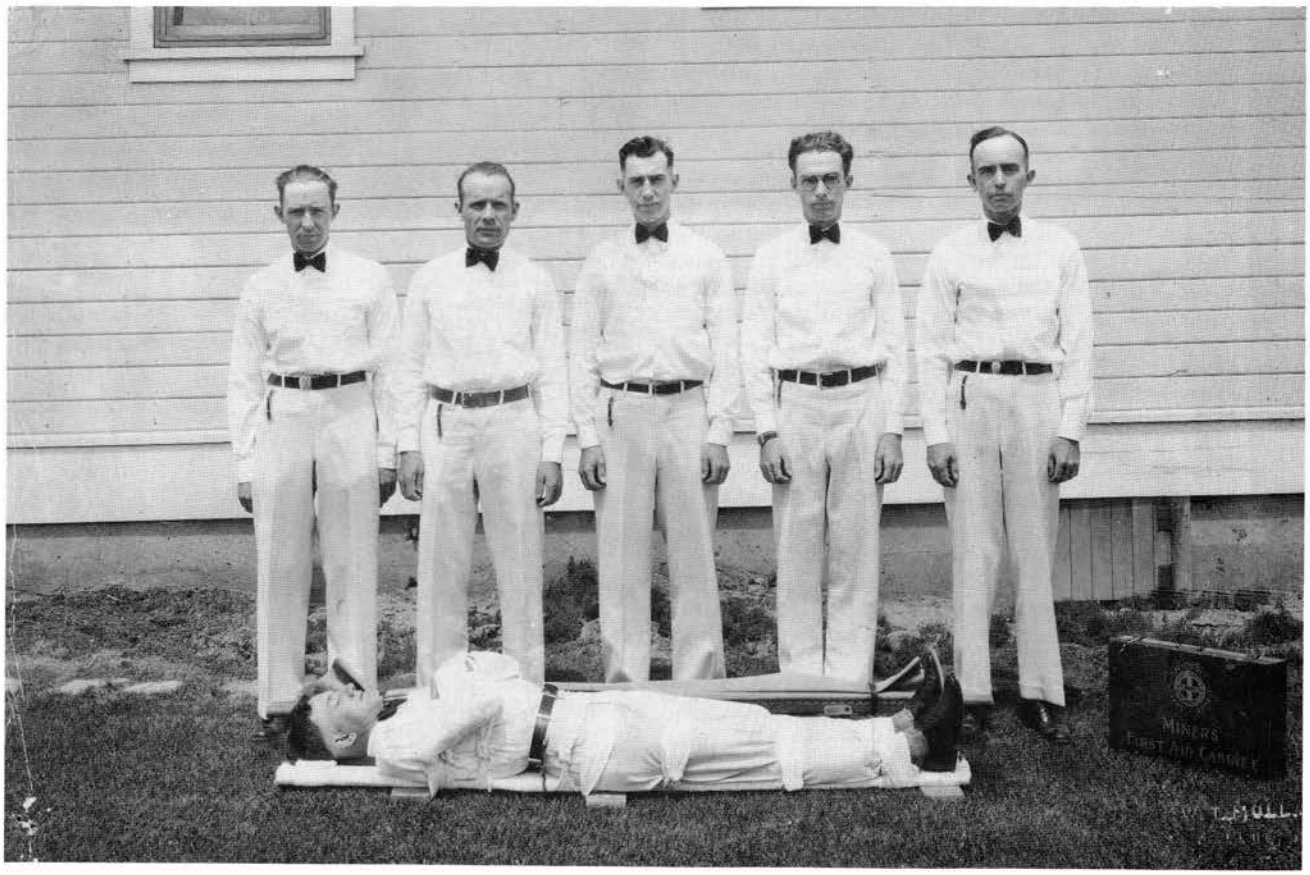


FIGURE 48—First aid team at Navajo No. 5 mine, about 1926. *W. T. Mullarky photo, courtesy of John Kleiner; NMBMMR photo #687.*

FIGURE 49—Navajo No. 5 mine rescue team at their headquarters in about 1926.

FIGURE 50—Trade poster advertising American Block Coal, a product of the Gallup (New Mexico) American Coal Company, about 1930. *NMBMMR collection; donated by Gamerco.*

of the mine was designed to eliminate the use of mules, although an underground barn was provided (Fig. 47).

The company town of Gamerco, which had been founded with the mine, was mostly complete by the end of 1924. All the power needs for Gamerco and the mine were furnished by the modem powerplant, and electric power was also sold. Planned to accommodate 4,000 people, Gamerco, which is still occupied today, was modem in every respect. In 1925 a swimming pool, tennis court, and baseball diamond were added, and a 50-piece band helped to provide enjoyment and good living for the employees. Safety was also enhanced by company-sponsored competition of first aid teams and mine rescue teams (Figs. 48 and 49). These company teams performed the valuable service of protecting and saving the lives of miners. They also competed with other company teams within the camp; the winners then proceeded to competition with other teams in Madrid and Raton, where the meets drew enthusiastic audiences.

After 1925 information concerning the mine, except for employment, production, and fatalities statistics, is almost nonexistent in the annual reports of the State Mine Inspectors. Because of a state law passed in 1933, production records were not reported for any mines after 1933. In 1931 it was noted in the reports that the company purchased 50 potty cans that were placed underground for the miners' convenience. They were seven-gallon galvanized cans with wooden lids, placed in wooden frames. They were cleaned and disinfected every third night. A satisfactory first.

West of Gallup is a huge area with no coal mines to provide a source of cheap domestic fuel. Gallup coal mines eagerly sought this market by providing sized coal for the fuel needs of people from Gallup to the west coast. Advertising was important for each large coal producer. The logo used to promote the sale of domestic coal for the Gallup American Coal Company pictured a group of coal shuttles overflowing with American Block Coal being propelled by running legs with little arms waving coal shovels (Fig. 50).

During the World War II years the mine was a heavy producer, but after the war demand for coal was poor and hard times were felt by the coal industry. In 1946 the Gallup American Coal Company sold its properties, including the producing Navajo No. 5 mine, to the Gallup Gamerco Coal Company. By 1949 the retreating sections on the north side of the mine were closed because of lack of orders. This slow mining was partly responsible for squeezes, and it became necessary to shut down this side of the mine. The south side of the mine continued operation until June 1, 1951, when the company closed the mine.

FIGURE 51—One of the underground hoists used to raise and lower the mine cars along the No. 4 NE slope in the Navajo No. 5–Gamerco mine. The hoist was removed from the mine because it caused a fire that killed seven mules. *Photo by H. B. Nickelson, 1979.*

The Gallup Gamerco Coal Company has maintained an office at the site over the years. The mine shafts are still open, and the head frames are intact. The powerplant, the stack, and the loading facilities remain, but they are in poor condition. The waste dumps, which fired long ago, are now almost gone; their residue has been used for road metal. The remnants now remind many that from 1922 to 1951 the Navajo No. 5 mine was the last great underground coal mine at Gallup. A remnant that was too heavy to move is shown in Figure 51.

Production and employment figures, so far as they are available, are listed in Table 36. The fatalities at this mine are listed in a compilation for all of the Navajo mines (Table 37). A mine map of the Navajo No. 5 mine is shown in Figure 52.

Gallup American Coal Company prospect

SF 077090 **2–22–44** **Lease**
Gallup American Coal Company, Gallup
W½ sec. 32, T16N, R18W **(Fig. 33)**

The Gallup American Coal Company had mined around the above land on three sides and desired to obtain this

TABLE 36—Production and employment record of the Navajo No. 5-Gamerco mine. *In 1933 state law prohibited publication of production records in the State Mine Inspector's annual report.

		Employment			
Year	Production (tons)	Miners	Company men	Top men	Days operated
1921	Shafts were being sunk and entries developed				
1922	Production started in September				
1923	310,657	265	121	32	279
1924	479,413	415	138	35	237
1925	447,879	407	137	37	224
1926	443,937	336	119	32	234
1927	451,591	329	125	32	220
1928	413,818	336	128	32	209
1929		358	133	32	251
1930	423,625	355	146	32	212
1931	318,300	341	117	32	149
1932	268,565	317	90	32	
1933*			402		
1934		282	102	4	
1935		290	114	45	
1936		286	117	117	
1937		401	123	124	
1938		338	157	134	
1939		292	137	125	178
1940		242	95	127	170
1941		280	93	127	237
1942		280	92	127	281
1943		212	98	117	
1944		163	8	139	
1945		75	33	34	
1946	No record				
1947		75	30	23	
1948		85	25	23	
1949		85	25	23	
1950		66	18	20	
1951		57	14	10	
	Mine closed June 1, 1951.				

TABLE 37—Fatalities at the Navajo mines.

Name	Date	Cause	Mine number
Antone Vlohovic	August 14, 1907	Mine car	1
J. B. Herman	February 25, 1908	Fall of rock	1
E. Bulzonic	January 5, 1912	Mine cars	1
Romaldo Gonzales	June 16, 1913	Caught on a cable	1
William Hawkins	March 1, 1914	Fall of rock	1
Nick Mcosak	December 15, 1915	Fall of rock	1
K. Yabuki	February 26, 1916	Fall of rock	2
Marco Kezele	March 16, 1916	Shot	1
Charles Murray	November 21, 1917	Rope broken on a trip	1
Veron Lee	September 29, 1918	Fall of rock	1
George Polich	December 24, 1919	Fall of rock	1
Pox Gonzales	March 3, 1920	Fall of rock	2
Samuel Conceros	March 16, 1920	Fall of coal	2
Paul Ruskin	April 5, 1920	Trip	1
Tom Leck	June 1, 1920	Fall of rock	1
Alfonzo Espinosa	April 13, 1921	Fall of rock	1
John Brown	April 27, 1923	Touched a trolley wire	5
Antonio Perez	June 12, 1924	Pit car	5
W. E. Renfro	March 26, 1925	Premature shot	5
Heradio Raldon	April 2, 1925	Fall of rock	5
Antonio Franco	March 18, 1926	Fall of rock	5
Dan DiSantus	January 20, 1927	Mine car	5
Tairez Moras	May 12, 1927	Fall of rock	5
Alfredo Balderrama	July 27, 1927	Fall of rock	5
Jose Espinosa	August 17, 1927	Fall of rock	5
Lotario Padilla	September 8, 1927	Runaway trip	5
Three fatalities; names not recorded (1928)			5

TABLE 37, continued

Name	Date	Cause	Mine number
Angel Valles	June 18, 1929	Electrocuted	5
Brigido Avalos	September 26, 1929	Fall of rock	5
Primitivo Gomez	January 3, 1930	Fall of rock	5
Florentino Martinez	March 3, 1930	Runaway trip	5
Frank Chefin	May 4, 1932	Runaway mine car	5
Ambrose Chilli	January 6, 1933	Electrocuted	5
Trinidad Lira	January 9, 1934	Mine cars	5
Gust Alexander	October 16, 1934	Mine cars	5
Ben Valenzuela	June 2, 1935	Mine car	5
William Jones	August 8, 1935	Mine car	5
Marko Vickovich	March 25, 1936	Mine car	5
E. P. Holman	July 6, 1936	Fell in front of a trip	5
Sam Norton	January 16, 1937	Fall of rock	5
Charles Littell	November 22, 1939	Killed by the bar while barring down rock	5
Juan Carrillo	July 8, 1940	Asphyxiated	5
John Gonzales	July 8, 1940	Asphyxiated	5
Bonifacio Rodriquez	March 25, 1941	Coal burst, fall of rock	5
John Vivian	April 4, 1942	Runaway motor knocked out timber causing fall of rock	5
John C. Portley	July 24, 1942	Fall of coal	5
Pete Vutich	February 12, 1943	Fall of coal	5
Celso Esparza	August 2, 1944	Fell in front of motor	5
Matt Yovanovich	March 29, 1945	Fall of rock	5

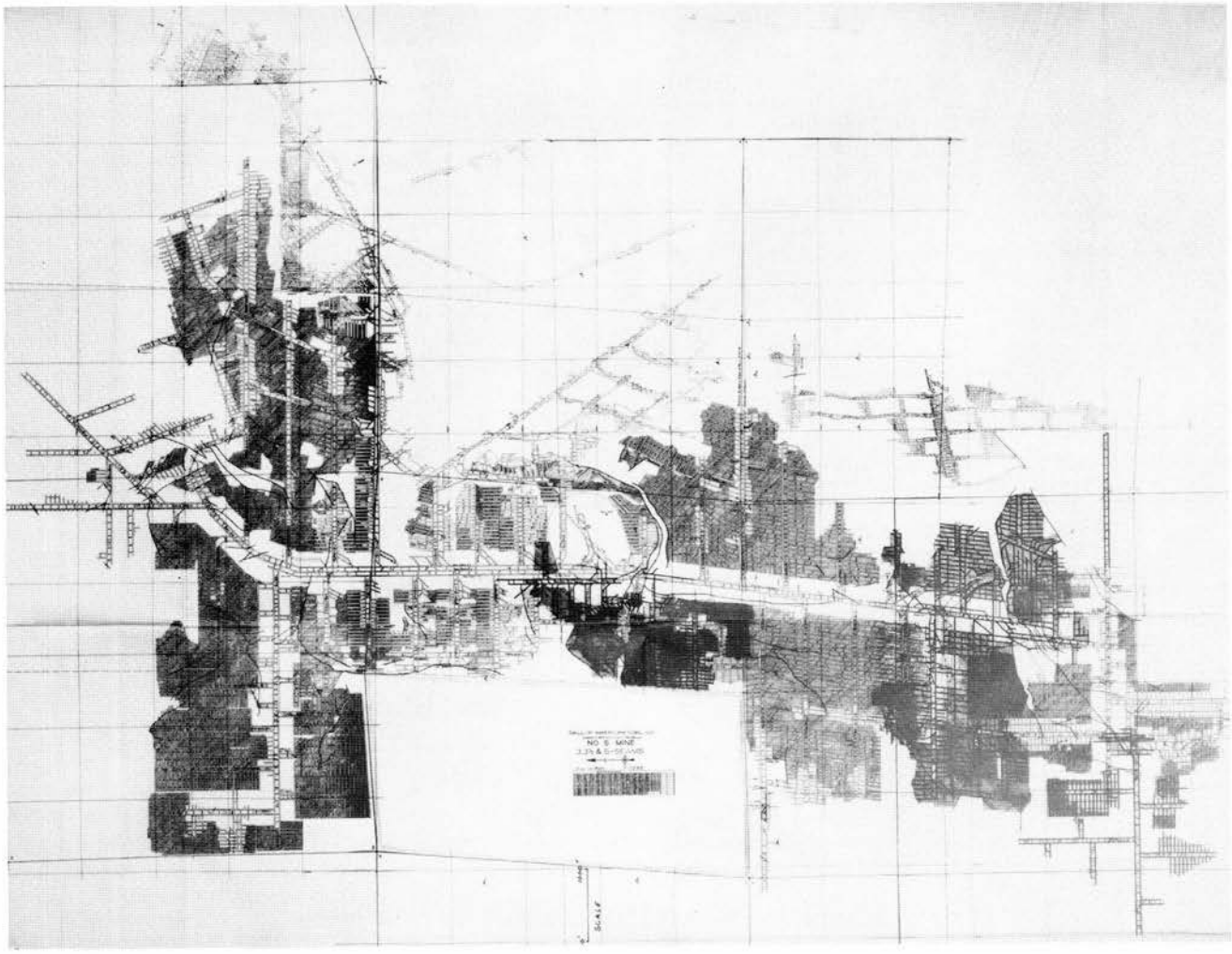


FIGURE 52—Map of the Navajo No. 5–Gamerco mine.

land for the coal reserves and to facilitate access to their coal on adjacent fee land (see Fig. 52). After the company made application for the W^1/2 sec. 32, it was put up for competitive sale on August 24, 1943, and the lease was issued on February 22, 1944.

The company planned to have two entries driven from their existing workings on the No. 5 bed to open the leased land. These entries would start to the west toward the center of the section. The entries were started, but by 1945 the Santa Fe Railroad had cancelled a large portion of its contract with the company to furnish coal to fuel engines because they were rapidly changing to diesel engines. Therefore, the Gallup American Coal Company, which was largely owned by Kennecott Copper Company, sold the mine to the Gallup Gamerco Coal Company, a group of Gallup capitalists. The buyers were interested in the easily accessible coal and the remaining pillars. On February 22, 1947, the Gallup Gamerco Coal Company requested indefinite suspension of operations, and on May 31, 1950, asked to surrender the lease. On June 1, 1951, the mine was closed. The suspension of operations was approved on June 15, 1951, and the lease was cancelled on August 21, 1951.

The Gallup American Coal Company estimated that bed No. 5 on the lease contains 2,818,000 tons of coal, of which 1,972,000 tons could be recovered. There was no production from this prospect.

Caledonia mine

Caledonian Coal Company, 1888-1897
2,400 ft NL, 3,000 ft EL, sec. 4, T15N, R18W (GW-4, Fig. 33)

In 1888, a year when several new mines were opened in the Gallup field, the Caledonian Coal Company was formed and opened three mines: the Thatcher, the Otero, and the Caledonia. Organizers of the company were Alexander Bowie, Mariano S. Otero, Neill B. Field, M. D. Thatcher, John Stewart, and others. Mr. Bowie was one of the most respected coal engineers and operators of coal mines in New Mexico. The part he played in this early-day industry is presented in an interesting paragraph from *History of New Mexico, its resources and people* (1907, pp. 981-982).

> Alexander Bowie, for years superintendent of the Caledonia Coal Company's properties, is recognized as the highest authority on the subject of the coal fields of northwestern New Mexico. His entire life has been devoted to scientific coal mining in Scotland, his native land, and in America. In young manhood he came to the United States and in the coal region of Westmoreland County, Pennsylvania, became superintendent of a large mine. In 1880 he was selected by the Canyon City Coal Company to open the mines near Canyon City, Colorado, for supplying fuel to the Atchison, Topeka & Santa Fe Railway Company. He opened shafts 1 and 2 and the Shaw mine, and performed other expert work there of a similar character. In 1882 he went to Carthage, New Mexico, for the San Pedro Coal and Coke Company, remaining there about a year. From 1882 until 1886 he served as mine expert for the Santa Fe, during which time he made a study of coal mining conditions and prospects in many parts of the Territory. In 1887 he went to Gallup to manage the property of the Bell Company. The year following he organized the Caledonian Company, of which he remained superintendent until its purchase by the American Fuel Company in March, 1906. Mr. Bowie expresses the conviction that the coal field of northern New Mexico is one of the greatest and most important in the world.

John C. Spears, Territorial Mine Inspector in fiscal year 1892-1893, described a carriage invented by Alexander Bowie to facilitate the moving of coal underground. The main slope at the Caledonia mine dipped 18 to 20°, and it was therefore difficult to change direction from the working entries to the main slope. The Bowie carriage consisted of a framework built on two sets of iron wheels that traveled on rails of the main slope. The rear wheels were larger to offset some of the dip. A braking system that gripped the main slope rails and was operated by a trip rider made it possible to stop the carriage at a given location. Six of these carriages made up one trip. At the back of the carriage, rails were anchored to the carriage so that a mine car could be placed on the carriage at right angles to the main slope but in the same direction as the working entries. The working entries were driven exactly opposite on each side of the main slope, and the rails from these opposite entries matched the rails on the carriage. The trip rider could brake the carriage to match the rails, allowing him to push the empty car into one or the other working entry and to push a loaded car onto the carriage from the opposite working entry. Spears believed that these carriages produced a great savings in mining costs and that the mine could not have shown a profit using the ordinary methods of moving the coal from the working levels to the surface.

John W. Fleming, Territorial Mine Inspector, visited the Caledonia mine in fiscal year 1894-1895 and reported that it was operating on a coal bed 5-6 ft thick off a slope 1,800 ft long. This bed, later named the No. 2 bed in the Gibson coal bed sequence, is the youngest bed of economic importance. The mine was ventilated by shaft and furnace. Mr. Fleming reported that the ventilation and the mine condition were good. The mine was connected by a spur 3 mi long to the main rail line, and the coal was sold to the railroad for its use and for markets in California. The mine covered an area 4,000 ft long and 500-1,000 ft wide trending north-south. John Stewart was Superintendent; Alex Bowie was General Manager of the company; and George Evan was Pit Boss at the mine. Sears (1925, p. 49) mentioned that in 1920 the mine was on fire.

Production and employment figures taken from the annual Territorial Mine Inspection reports are listed in Table 38. The property was sold to the American Fuel Company in 1906. During the field work on the Abandoned Mine Lands project in 1979 two shafts about 300 ft apart were found that are believed to be part of the Caledonia mine workings.

TABLE 38—Production and employment record of the Caledonia mine.

Year	Production (tons)	Employment (men)	Days operated
1893–1894	37,152	70	
1894–1895	41,455	75	
1895–1896	41,832	82	225
1896–1897	20,000	43	
1897–1898	No record; the mine was apparently closed.		

Canavan-Bartlett mine

Stephen Canavan, 1904-1909
Victor American Fuel Company, 1909-1914
SE^1/4 sec. 4, NE^1/4 sec. 9, T15N, R18W; 4,500 ft NL, 1,300 ft EL, sec. 4 (GE-42, Fig. 33)

The year 1904 marked the start of the first New Mexico coal mine to be opened by shafts. The operator, Stephen Canavan, sank a 225-ft shaft that year, and by the end of fiscal year 1905-1906 a second shaft and a connecting drift of 1,200 ft were completed. Drifts were developed in the Dilco Formation on the Crown Point coal bed, which is 4.5-

5.5 ft thick and dips westward 6°. The floor was hard shale, and the roof graded from soft, wet fire clay at the first shaft to a good sandstone at the second. Unfortunately the drift caved, and it was necessary to sink a third shaft between the other two for ventilation. Another problem was the fact that the mine was wet and made considerable water. Mr. Canavan spent about $40,000 for equipment and for development work during fiscal year 1905-1906. A development entry driven south was 600 ft long, and the coal was mined off this drift updip. The mine was in good condition, and by early 1907 a railroad spur had been built to the mine site.

In fiscal year 1906-1907 it was discovered that the mine could produce an excellent quality of fire clay, and several thousand tons were shipped to the smelters in Arizona. One year later the Territorial Mine Inspector ordered William McVickers, Mine Superintendent, and the company to comply with the laws and safety regulations or close the mine; the mine was wet, the ventilation and aircourses were in poor shape, and the men were shooting off the solid. Apparently the cost to put the mine in working order was too great, and the mine was sold to the Victor American Fuel Company in fiscal year 1909-1910. The new owners spent about $20,000 fixing up the mine and surface facilities, and within a year the mine was operational again.

By 1913 the main entry was 2,500 ft long. Under the direction of Superintendent John Jennings, a longwall system of mining was experimented with in one area on coal about 3 ft thick. The life of the mine, however, was limited, and by the summer of 1914 the mine was closed because of logistics, ventilation problems, and wet conditions that made mining costs too expensive to continue operation. Figure 53 shows the Canavan-Bartlett mine. A record of production and employment is shown in Table 39.

TABLE 39—Production and employment record of the Canavan–Bartlett mine. *Production was included with that of all mines operated by the Victor–American Fuel Company (see Table 28).

Year	Production (tons)	Employment			Days operated
		Miners	Company men	Top men	
1904–1905	Opened				
1905–1906	7,000	10		4	
1906–1907	7,500	10		3	180
1907–1908	19,600	30		5	275
1908–1909	42,000	50		9	275
1909–1910	49,000	35	10	7	300
1910–1911	30,305	30	10	8	186
1912	No record				
1913*		32	7		
1914*	Mine closed during summer				

Unknown mine

3,000 ft NL, 1,900 ft WL, sec. **9, T15N, R18W (GW-53, Fig. 3)**

Two slopes about 40 ft apart, which bear S80°W and dip 25° provide access to one of the beds of the Gibson Coal Member. These two slopes are probably part of the Gallup-Gibson mines.

Unknown mine

2,100 ft NL, 4,600 ft EL, sec. 16, T15N, R18W (GW-40, Fig. 3)

A mine dump and remnants of a hoist foundation were found at the above location. This shaft is over the old Mutual mine workings, but the small size of the dump seems to indicate that the shaft was too shallow to reach those workings.

Coal Basin mine+

Coal Basin Fuel Company, 1913-1917
Diamond Coal Company, 1917-1929
4,100 ft NL, 2,600 ft EL, sec. 8, T15N, R18W (GW-8, Fig. 15)

The Coal Basin mine (Fig. 54) was opened by two two-compartment shafts about 315 ft deep by the Coal Basin Fuel Company in 1913. R. R. Pollock of Albuquerque was

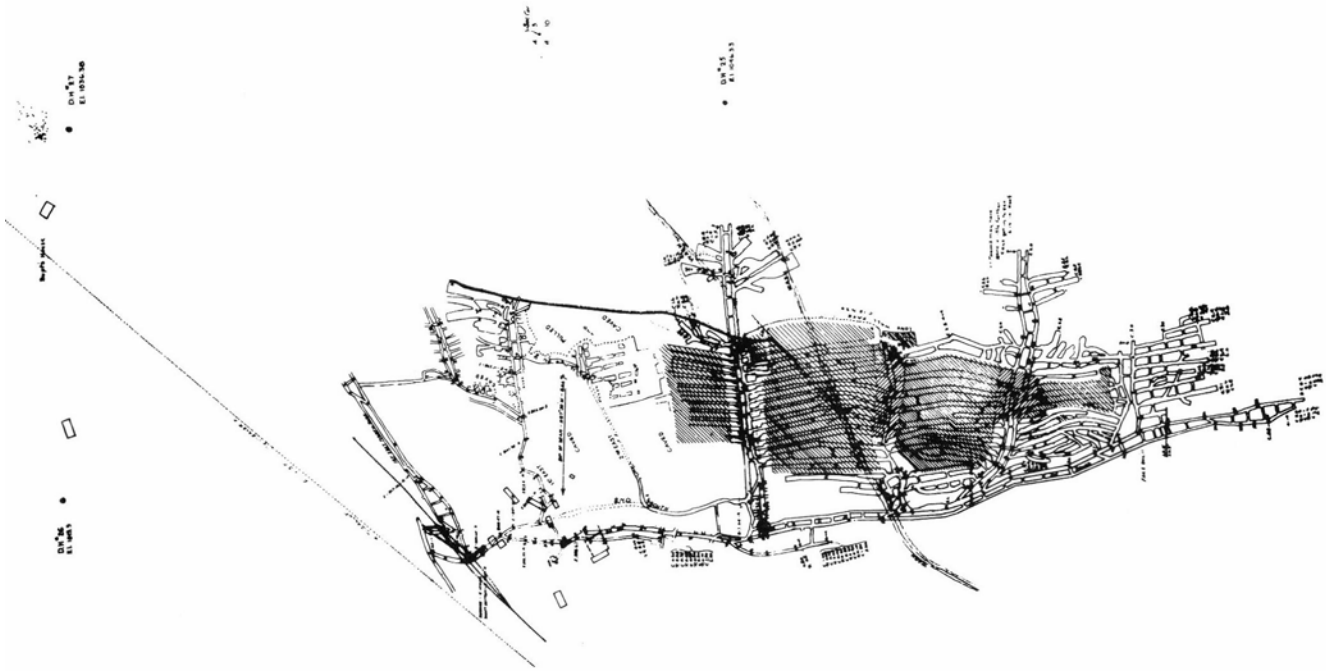


FIGURE 53—Map of the underground workings and surface facilities of the Canavan–Bartlett mine. This map appears to be almost up to date at the time the mine closed in 1914. *Permission to use map granted by the Gamerco Associates, Ltd.*

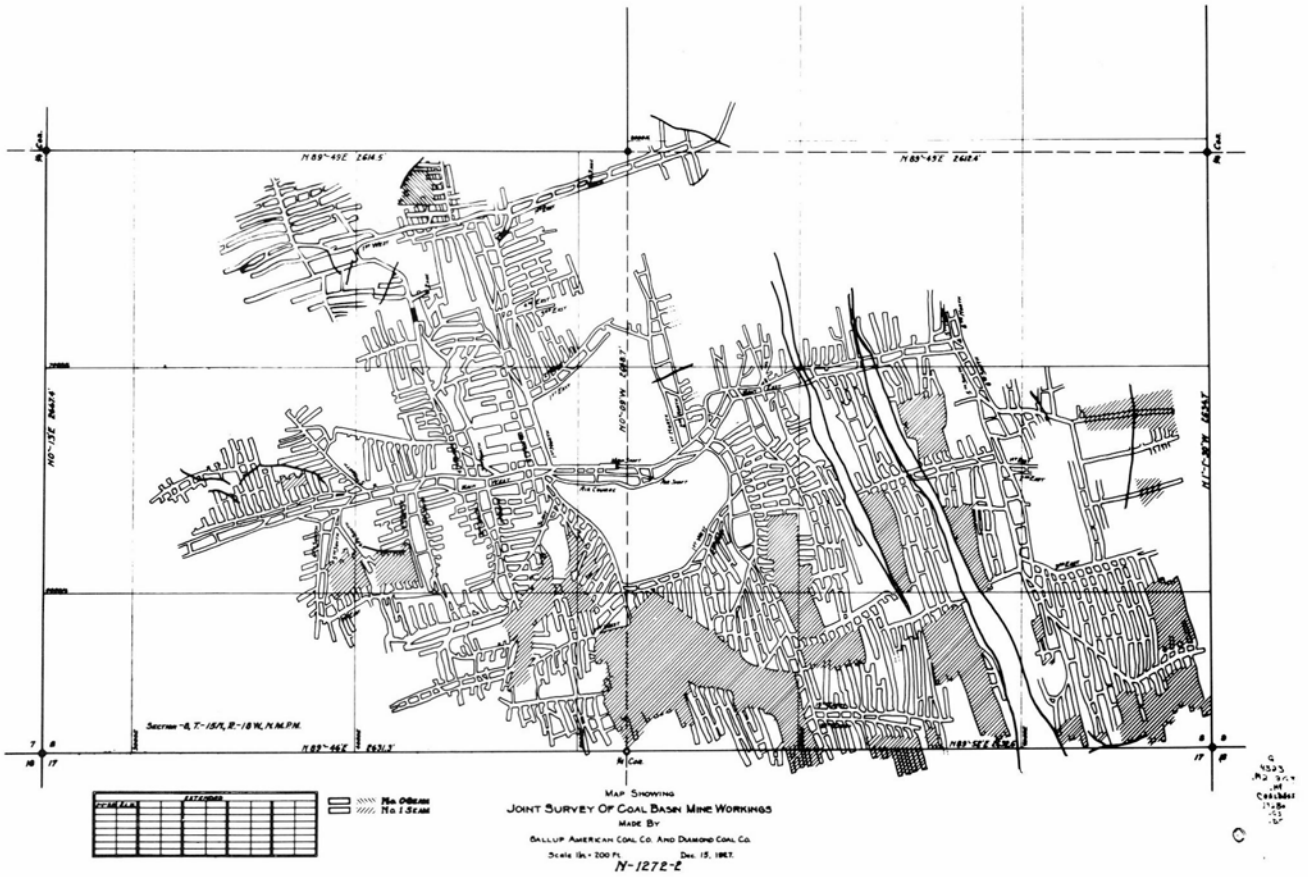


FIGURE 54—Map of the Coal Basin mine workings.

General Manager, and John Beddow of Gallup was Superintendent. Development work off the shafts was carried on during 1914, but after that the mine was virtually closed until 1917. Part of the delay in the work was apparently caused by difficulty in getting the railroad company to build a spur to the mine site.

In 1917 the Coal Basin Fuel Company merged with the Diamond Coal Company, apparently under the same ownership. By the end of that year a great many improvements had been made. The railroad spur was completed to the tipple, and the powerplant, which served not only this mine but also the Diamond mine and the company towns at Coal Basin and Allison, was constructed.

The camp at Coal Basin consisted of one six-room, 30 four-room, and 10 two-room cottages with a water tap in each house. Electricity for the streets and homes was furnished, and a 3-inch water line provided water as well as fire protection. The Diamond Stores Company erected a modern 30 x 70-ft building with a basement to accommodate a merchandise business. A plentiful supply of water was pumped by an airlift from a well 1,515 ft deep. Good schools and community halls for the camp were provided by 1919, and in December of that year a 14% raise was given to the miners and other employees.

Mining practices and equipment were very good, and the literature mentions no water problems. The mine was furnished with compressed air, the tipple and screening plant were modern, and the ventilation fans were driven electrically. Two Sullivan Ironclad mining machines equipped with 6-ft cutter bars were part of the up-to-date underground equipment.

The mine workings, which records indicate covered the S1/2 of sec. 8, were on the Gibson coal beds. In 1920 a new slope was driven in order to mine a lower bed, reportedly the Aztec or No. 2 bed, which ranged from 2.5 to 4.5 ft thick. In 1922 much of the south and west workings was closed because a heavy squeeze had developed, but several years of good production ensued. The mine was closed on May 31, 1929, probably a victim of the depression. Production in the records from 1919 to 1929 was 537,000 tons, and another 100,000 tons can be assumed for the years where no records are available. A mine map of the underground workings, made in December 1927, is shown in Figure 54.

A list of mine officials included the following: 1917, Peter Westwater, General Superintendent; 1918, H. B. Hanger, Albuquerque, General Manager; 1921, John McKinley, General Superintendent; 1923, Robert Wyper, General Superintendent. Field work in 1979 for the Abandoned Mine Lands project revealed that the last distinguishing landmark of the Coal Basin mine, its well-built powerplant, was being torn down for its bricks. Records of fatalities, production, and employment are shown in Tables 40 and 41.

TABLE 40—Fatalities at the Coal Basin mine.

Name	Date	Cause
George Ballestra	February 20, 1914	Fell down the shaft
Jaquin Rodriquiz	November 13, 1924	Fall of rock
John J. Madas	April 1, 1925	Caught in the crusher at the tipple

TABLE 41—Production and employment record of the Coal Basin mine.

Year	Production (tons)	Employment			Days operated
		Miners	Company men	Day men	
1913	Opened				
1914	1,000				
1915–1916	Closed				
1917	22,000	30	10	40	250
1918	60,000	34	7		285
1919	83,856	58	30	28	288
1920	73,246	70	34	36	292
1921	57,278	87	27	34	176
1922	34,716	56	19	31	261
1923	49,033	79	19	35	232
1924	46,420	75	18	35	221
1925	40,867				203
1926	77,232	70	23	26	289
1927	32,464	34	15	19	240
1928	29,701	42	11	14	278
1929	12,134	25	5	7	153
Mine closed May 31, 1929					

Mulholland-Casna and Diamond-Allison mines+

Gus Mulholland, 1893-1899
Andrew Casna, 1900-1902
F. J. Allison and W. A. Patching, 1907-1910
Diamond Coal Company, 1910-1939
Mulholland-Casna-5,200 ft NL, 3,300 ft EL, sec. 18, T15N, R18W (GW-45, Fig. 15)
Diamond-Allison-4,400 ft NL, 3,000 ft EL, sec. 18, T15N, R18W (GW-46, Fig. 15)

John C. Spears, first Territorial Mine Inspector, reported that Gus Mulholland opened a mine in the spring of 1893 at the first location given above. He sank a shaft and drove a short entry on 5-6 ft of coal. He then closed the mine, but with the intention of reopening it on an extensive scale.

According to Mr. Fleming, the next Territorial Mine Inspector, the mine was reopened, and the slope was extended to 300 ft in 1895. The workings were on a 5-ft bed of coal; the roof was a fine-grained sandstone. Mulholland hired eight to 12 miners and two to four top men, who produced about 650 tons per month. The mine was ventilated by the slope and through a shaft. A whim was used to hoist the coal, which was sold to the Atlantic Pacific Railroad. The mine closed in 1899.

The first record of Andrew Casna's ownership was about 1900. Apparently, he operated the mine until about 1902 when he was killed, presumably by Indians. His widow fled to Germany and allowed the coal claim to lapse. F. J. Allison and W. A. Patching filed a coal claim on the land and began operations in May of 1907. The name of the mine remained Casna.

When Mr. Mulholland ceased operation there were two slopes. One slope, the aircourse, connected with an air shaft. Apparently Mr. Casna used the slopes and air shaft but added an additional air shaft. When the Messrs. Patching and Allison obtained the mine, the slope was 1,200 ft long, and the two air shafts were in use. By 1909 the slope was 1,700 ft long. They operated the mine until 1910 when it was sold to the Diamond Coal Company.

The General Manager of the Diamond Coal Company, which was owned by a group of Arizona and New Mexico residents, was R. E. Pollock of Albuquerque, and the Mine Superintendent was John James of Gallup. After the Diamond Coal Company obtained the mine, considerable work was done on mine development and the construction of surface facilities and dwellings. By this time a railroad spur had been built to the mine site. About 1911 the company started a new slope and sank a 65-ft shaft near the second location given above. A deep well was drilled for fresh water, and a schoolhouse and more tenant houses were added.

In 1915 a manway was driven down to the coal bed as a travelway for mules and men. That year six mining machines were in use. Other improvements, both outside and underground, were made in 1917. Electricity was provided by a company powerplant at the Coal Basin mine. Allison, a good company town, existed complete with bathhouses and community halls. Peter Westwater was made Mine Superintendent in 1915, and H. G. Hanger of Albuquerque was made General Manager in 1918. John McKinley was General Superintendent from 1921 to 1923, and then Robert Wyper held that position until the mine closed.

In 1920 a new slope was driven in order to mine the lower bed. Fire was found in the mine in 1922, but good firewalls were built and the fire was controlled. On March 31, 1926, the tipple and shaft were destroyed by fire. A new slope and tramway were built to replace the shaft, and a new tipple was also constructed. Later the same year, fire broke out at the bottom of the mine from behind the seals, but it was controlled. A new opening was reported in 1928, and in 1932 a main entry was driven with single-entry roomand-pillar system of mining.

In May 1937 the fire broke out again. The fire area was sealed, and by August the fire was out. The mine was apparently closed in late 1939 or early 1940. Production from the mines, reported for the years up to 1933 and estimated for the period from 1933 to 1939, totals about three million tons.

During field work for the Abandoned Mine Lands project in 1979 a small ventilation and manway shaft that was sealed and some sealed slopes were found. Quite a bit of leveling had been done by the surface owner, who had construction shops and equipment storage in the old mine yard. Some of the old slopes and openings had been filled. Records of fatalities, production, and employment at the mines are shown in Tables 42 and 43.

TABLE 42—Fatalities at the Mulholland–Casna and Diamond–Allison mine.

Name	Date	Cause
S. Galbadon	April 19, 1913	Fall of rock
Joe Ceretto	June 11, 1914	Fall of rock
Tony Otto	October 5, 1917	Fell down hoisting shaft
Kaminski Wactaw	February 17, 1918	Fall of rock
Don Whittman	September 27, 1918	Fall of rock
Charles Data	July 26, 1921	Fall of rock
Ignacio Enriquez	April 29, 1922	Killed by shaft cage when he crossed the shaft
P. J. Davis	November 22, 1922	Caught between cage and shaft wall while being hoisted from mine
Vincenti Savedra	October 14, 1930	Killed by pit car
Tom Grenko and Andrea Munoz	October 19, 1931	Killed by a runaway slope trip that became uncoupled
S. Mattingo	July 28, 1932	Electrocuted
Hipolito Lopez	March 14, 1937	Killed by a trip of empty cars
William McKinley	April 9, 1937	Entangled in belt machinery in pump house on surface

TABLE 43—Production and employment record of the Mulholland–Casna and Diamond–Allison mine. *In 1933 state law prohibited publication of production records in the State Mine Inspector's annual report; **estimated.

Year	Production (tons)	Employment			Days operated
		Miners	Company men	Top men	
1894–1899	3,100**	8–12		2–4	
1900–1902	600	2–4		1	
1907	400	2		1	60
1907–1908	2,200	6		1	182
1908–1909	2,000	3		2	180
1909–1910	Did not operate—development work				
1910–1911	35,092	35	14	14	162
1911–1913	157,737	168			
1914	177,341	15	150		
1915	221,928	155	33		
1916	230,991	163	65	39	294
1917	207,600	150	52	32	310
1918	240,000	173	65	57	285
1919	141,958	98	50	33	280
1920	124,529	105	52	38	287
1921	88,105	106	45	41	172
1922	91,958	78	32	30	265
1923	113,302	99	37	38	225
1924	112,202	102	34	35	219
1925	99,736				205
1926	37,933	40	18		243
1927	76,518	74	24	24	253
1928	91,830	94	27	28	229
1929	110,181	100	30	33	242
1930	117,905	129	33	30	204
1931	95,151	156	31	30	172
1932	85,987	134	32	30	170
1933*		143 employees			
1934		105	25	24	
1935		80	21	22	
1936		49	14	15	
1937		54	12	16	
1938	No record				
1939		10	1	2	155
	Mine closed in 1939 or early 1940				

W. A. Clark mine+

W. A. Clark, 1896(?)-1907
American Fuel Company, 1907-1908
1,400 ft NL, 1,600 ft EL, sec. 14, T15N, R19W (GW-20, Fig. 56)

Senator W. A. Clark of Montana opened the mine that bears his name to supply fuel to the Arizona copper mines that he owned or controlled. An important figure in the mining industry of the late 19th century, the Senator also held a major interest in the copper mines at Butte, Montana.

W. L. Bretherton was Agent and General Manager of the mine, which was probably begun in 1896. Holdings in the mine property eventually totaled 1,200 acres (Fig. 55). The workings, 4 mi west of Gallup, were in the Clark coal bed in the Gibson Coal Member of the Mesaverde Formation. In this area five coal beds are present, the Clark being the third below the youngest, or top, bed. The coal varied in thickness from 4.5-8.5 ft, with partings occurring in some areas; the dip ranged from flat to 4.5°N70°E. Lenses from the other beds were mined also. The floor was fire clay, and this material was mined and used in the copper smelters.

By fiscal year 1898-1899 the main entry was 1,500 ft deep, and that year 90 employees produced almost 50,000 tons of coal. The mine was in good condition and free of gas and water. It was equipped with the best machinery available at that time, including the following: two 100 HP boilers, one 150 HP engine, one 25 HP engine, two 250 V electric generators, one electric pump and one steam pump to furnish water for the village of Clarkville, two electric cutting machines, one Link Belt rib shearing machine, one Morgan Gardiner electric drill to drill holes for shooting the coal, one pit dumper, and shaking screens with four sizes. In 1899 Clarkville had 50 adobe dwellings, a large powerhouse, a two-story store, a large reading room, and a schoolhouse that accommodated 40 pupils.

FIGURE 55—Several remaining buildings mark the location of the village of Clarkville, a modern village for its time, which was built by W. A. Clark to house 100 to 200 miners and their families. Clark, who was from Montana, was highly respected in that state; a bronze bas-relief statue of Clark was erected in the rotunda of the capitol at Helena. *Photo by H. B. Nickelson, 1979.*

By fiscal year 1899-1900 the main slope was driven another 1,500 ft, and a new ventilation shaft large enough to provide 100,000 cfm to the mine workings was sunk. Almost 240 workers were employed, and production was over 90,000 tons. That year the mine also produced 6,250 tons of fire clay of excellent quality, which was shipped to Jerome, Arizona, for furnace linings.

On January 1, 1901, the miners were organized into the American Mine Workers Union. On May 13 they struck because a member was fired for incompetency, but by May 20 the mine was operating again with nonunion men, and it gradually returned to a nonunion status. Only a small loss of tonnage was incurred by the strike, and production for fiscal year 1900-1901 totaled 155,000 tons.

The records show that the following year (1901-1902) operations were handled by the Clark Coal Company, offices located at 59 Wall Street, New York, New York. The mine was ventilated with a Capell fan exhausting through a shaft located near the center of the workings, and seven coal cutters powered by electricity were in operation. The mine was very dry, with a resultant coal dust problem. Steps were taken to clean up and wet down the working areas, but the company wells could not supply sufficient water to suppress the hazard. A loss of 17,500 tons from the previous year was sustained because oil had taken 25% of the coal sales from the area where the coal was marketed.

In January of 1903 Territorial Mine Inspector Jo E. Sheridan found indications of fire in the gob between the second and third west entries, and he informed Mine Foreman William McVickers of the conditions. Less than 2 months later the inspector was notified by telegram that the mine was on fire, and his aid was requested, but another 2 months passed before combined efforts brought the fire under control.

On one of his visits to the Clark mine the Territorial Mine Inspector found John Aimo, 10 years old, loading coal with his father. Mr. Aimo claimed that the boy would not attend school and was better off digging coal. The inspector did not agree, and the boy was ordered from the mine. Strangely,

if John had been two years older he could have continued mining; in 1904 28 boys were employed at the mine. During that year production remained high under the direction of John Beddrow, Mine Foreman. The mine was in good condition except that it remained very dry and dusty. The miners had orders not to shoot off the solid; the penalty for noncompliance was discharge from employment.

In 1906 the fire problem, which had been under control since mid-1903, surfaced again, and it was necessary to close the Brown entry, which had served as a second entry. That function was then taken over by the air shaft. By May of 1907 there were three fires in the mine and carbon dioxide was escaping through the firewalls into the mine workings, but the walls were repaired and operations continued.

On May 1, 1907, the property was sold to the American Fuel Company. Work continued at a normal pace for several months, but then it was decided that it would be more economical for the company to concentrate production and to lower expenses by maintaining and managing as few mines as possible. On February 18, 1908, operations at the W. A. Clark mine were suspended. The equipment was moved to the company's other mines, and the Weaver and

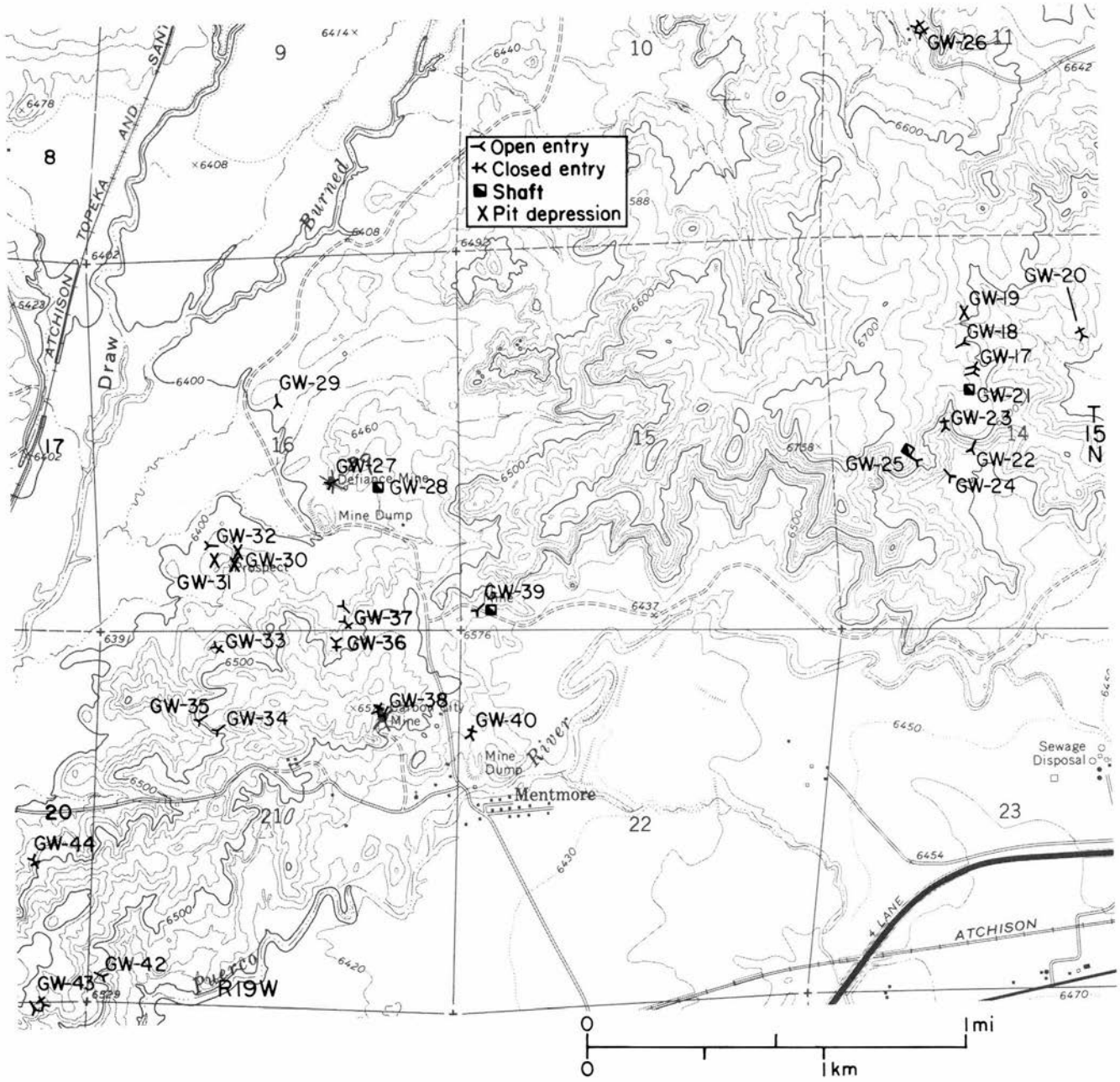


FIGURE 56—Mines in the Clarkville and Mentmore areas on the Gallup West 7½-min quadrangle.

GW–17, 21—Unknown mines
GW–18—Unknown mine
GW–19—Carbon Coal Company test pit
GW–20—W. A. Clark mine
GW–22—Unknown mine
GW–23, 24, 25—Enterprise mine
GW–26—Peacock No. 4–Thomas mine
GW–27, 28, 29—Defiance–Morris–Defiance No. 1–Mentmore mine
GW–30, 31—Pass strip mine
GW–32—Unknown mine
GW–33—Unknown prospect
GW–34, 35—Unknown mine
GW–36—Defiance No. 3 mine
GW–37—Defiance No. 2 mine
GW–38—Defiance No. 6 mine
GW–39—Marquez mine
GW–40—Dilco mine
GW–42—Richards mine
GW–43—Myers–Mycos Brothers mine
GW–44—Smith mine

the Heaton mines produced enough coal to supply the demand. Jack Hamilton was Mine Foreman when the mine ceased operations. A total production of 1,030,883 tons is listed for the Clark mine. Production and employment figures and a list of mine fatalities are shown in Tables 44 and 45.

TABLE 44—Production and employment record of the W. A. Clark mine.

		Employment					
		Underground		Surface			
Year	Production (tons)	Miners	Boys	Top men	Boys	Total employees	Days operated
1895–1896							
1896–1897							
1897–1898	3,500					80	
1898–1899	46,986	60		30		90	270
1899–1900	90,050	190	10	35	3	238	290
1900–1901	155,000	200	4	50		254	300
1901–1902	137,500	113	12	25	2	152	286
1902–1903	109,000	100	3	36	2	141	261
1903–1904	132,000	98	12	38	12	160	287.5
1904–1905	125,160	128	12	39	16	195	254
1905–1906	105,000	99	3	30	5	137	301
1906–1907	81,922	96	6	30	12	146	249
1907–1908	44,765	102		32	1	135	159
Total	1,030,883						
	Mine closed February 18, 1908						

TABLE 45—Fatalities at the W. A. Clark mine.

Name	Date	Cause
Michael Rosqualona	November 29, 1899	Fall of rock
Antonacio Lopez	December 23, 1899	Fall of coal
John Tieman	July 9, 1901	Fall of rock
Frank Prevedal	March 24, 1902	Fall of rock
J. L. McBroom	April 16, 1904	Fall of rock
R. A. Bell	February 15, 1908	Boiler explosion

Unknown mine

3,000 ft NL, 3,300 ft EL, sec. 14, T15N, R19W (GW-22, Fig. 56)

This single opening bears about N20°E. The opening was driven on one of the Gibson coal beds.

Unknown mine

1,900 ft NL, 3,100 ft EL, sec. 14, T15N, R19W (GW-17, Fig. 56)

The mine was opened by a main entry that bears about S67°W, a second entry about 40 ft to the south, and a ventilation shaft about 300 ft to the southwest (GW-21, Fig. 56). A small strip mine trending east-west was opened about 50 ft to the north of the main entry. It is believed that this small truck mine operated sometime after the Clark mine was closed.

Peacock No. 4-Thomas mine

Gibson Coal Company, 1958-1959
Clarksville Coal Company, 1959-1964
2,600 ft NL, 3,800 ft EL, sec. 11, T15N, R19W (GW-26, Fig. 56)

The Peacock No. 4 mine was opened in 1958 as a small truck mine, reportedly in sec. 11. The Gibson Coal Company, with John B. Williams as Manager, was the first operator. In 1959 Clarksville Coal Company became the operator, with Ben Thomas as Foreman and Mr. Williams continuing as Manager. The mine came to be known also as the Thomas mine.

The mine was developed on the top bed of the Gibson Coal Member on 4 ft 10 inches of coal that had a sandstone roof. It was opened by two entries about 50 ft apart and a shaft that was covered by a fan house equipped with an old fan. The entries, which bear about N60°E, were reportedly about 800 ft long.

Mr. Thomas took advantage of a narrow steep-walled arroyo located within about 150 ft of the main entry. He sloped the bank for truck access and built the mine track over the arroyo to dump the coal directly into the truck. The lack of mine waste suggests that it was disposed of by dumping into the arroyo.

The number of employees ranged from 14 men in 1959 to four or five men in later years. The records of the mine end in 1964. Although no information concerning possible earlier work has been found in the literature, the mine may have been opened in the late 1930's because cars of that vintage were found around the mine site.

Enterprise mine

Enterprise Coal Company, 1914-1920
3,100 ft NL, 4,000 ft EL, sec. 14, T15N, R19W
(GW-23, 24, and 25, Fig. 56)

The Enterprise Coal Company mine was opened by James and Hutchinson Brown in 1914 after the Enterprise-Brown and McVickers mine (GE-9, Fig. 3) in sec. 10, T15N, R18W, was forced to close in 1913 because black damp from the Black Diamond mine had invaded the workings.

The old Enterprise bed, part of the Gibson Coal Member, was the first bed opened in the new Enterprise mine. The bed was 2.5 ft thick, but the sandstone roof and floor were found so close together in many places that the operation became unprofitable (Sears, 1925, pp. 33, 49). Before the mine was abandoned, the entry, which dipped about 4% and was driven northwesterly, reached a depth of 800 ft.

Subsequently another bed about 100 ft higher in elevation was opened on 3 ft 10 inches of coal. This seam, known as the Enterprise coal bed, averaged approximately 3 ft in thickness in the mine but thinned to 1.5 ft to the northwest. The new opening was located almost directly above the mine on the old Enterprise bed. Both mines operated only during the winter months.

In late 1917 or early 1918 G. A. Kaseman of Albuquerque purchased the mine. Although this operation was quite small, Mr. Kaseman's role in the coal-mining industry of the state was extensive. Previously, he had been an important figure in coal mining in the Madrid field, and subsequent to his work at the Enterprise mine he was owner-operator of the much larger Defiance-Morris-Defiance No. 1-Mentmore mine (see following chapters). He also managed the Kistler-Black Rose mine in the La Ventana field. It seems, therefore, not amiss to digress for a few biographical notes.

According to information given in *The history of New Mexico, family and personal history* (1961, pp. 200-201), George Ambrose Kaseman, a native of Shamokin, Pennsylvania, was born July 5, 1868. He attended Bucknell University and completed a formal course at a business college. Ill health compelled him to move to New Mexico in 1887. A short time afterwards he attempted to further his studies at Leland Stanford University, where he was assigned a room with future president Herbert Hoover, but his health again became a factor, and he returned to New Mexico. He held various positions until 1900, when his record of business achievement on his own, in El Paso and Albuquerque, began. In 1906 he became owner and operator of the Albu-

querque and Cerrillos Coal Company, which operated both anthracite and bituminous coal mines at Madrid, New Mexico. He also became owner of the Defiance Coal Company at Gallup and President of Hahn Coal Company, Aztec Fuel Company, and Security Warehouse Improvement Company. In addition, he had extensive lumber and oil interests. In later years his major business interest was the Albuquerque National Bank, which he founded in 1924. He was a member of and held offices in many state and national organizations, and also served as State Senator in New Mexico. He excelled as a progressive organizer and businessman. His untimely death was caused by a premature explosion of nitroglycerine near Hobbs on June 23, 1938.

Under the direction of Mr. Kaseman as General Manager and Hutchinson Brown as Mine Superintendent, approximately $10,000 was spent at the Enterprise mine. The development of the Enterprise coal bed was undertaken, and the mine was put into production. A tramway about 1 mi long was built to a new railroad siding equipped with a two-track tipple. New equipment was purchased, and a boarding house, three dwellings, a bath house, and other buildings were constructed to provide accommodations for a permanent camp. Production reached 13,000 tons in 1919, but in 1920 the mine was closed and abandoned.

Production under the Brown brothers amounted to 9,600 tons for 3 years, and production under Mr. Kaseman was about 24,000 tons for 2 years. It is estimated that the mine produced a total of 38,000 tons. Ten men were employed during the winter months under the Brown management, and about 18 men were employed during the last two years before abandonment. There are two prospect entries, one at the head of the gulch and one across the gulch to the north, that were probably dug by the company. The Enterprise coal beds, which were thin and limited to small areas, were attractive but hardly commercial.

Defiance-Morris-Defiance No. 1-Mentmore mine

Defiance Coal Company, 1912-1952
3,200 ft NL, 1,800 ft EL, sec. 16, T15N, R19W
(GW-27, 28, and 29, Fig. 56)

The history of the Defiance mine spans a period of 40 years, but the mine got off to a slow start. In 1912 development was begun by the Defiance Coal Company on the upper coal bed, referred to as the Defiance or the Dilco No. 1 bed, in the Dilco Coal Member. By November the company had driven a slope downdip bearing about N60° to 65°E to a depth of 500 ft, but work was stopped at that time because of litigation concerning title to the lands. Mining did not resume until 1917. Under the direction of L. E. Morris, Superintendent, 15 men were employed that year, and almost 9,000 tons of coal were produced. A hoist and boiler were installed, and the slope was extended to 700 ft with 1,200 ft of entries driven to accommodate a double-entry room-and-pillar system of mining. The coal was hauled about 0.5 mi to the Direct Line Coal Company's tipple and bins that connected with the railroad, and it was then marketed in Albuquerque and El Paso. The mine, which was called the Defiance mine, was kept in excellent condition.

In 1919 G. A. Kaseman of Albuquerque became owner and General Manager of the company, and John Jones was named Mine Superintendent. The company name was retained, but the mine name was changed to Morris. In 1920 George Miksch was made Superintendent. During that year three gasoline locomotives and three coal cutters were purchased, and a rail line was built to haul the coal to the Direct Line Coal Company docks, then known as the Jones property. The village of Mentmore housed most of the miners, although some miners' cottages, which were found in ruins in 1979, were at the mine site.

By 1921 five more Sullivan mining machines had been purchased, and all the coal mined was cut with machines. An 18-ton Porter steam locomotive replaced the gas engines used to haul the coal from the mine to the loading dock. Three Vulcan hoists, two water pumps, three transformers, two railroad bridges, 50 new mine cars, and some new buildings were added to the mine and plant facilities at a cost of $50,700. An additional $25,000 was spent for buildings and equipment the following year, and for the first time yearly production totaled more than 100,000 tons.

The slope had reached a depth of 2,400 ft by 1924. The coal bed dipped about 6% and varied in thickness from 3 to 7 ft, averaging about 5 ft. The main slope pillars were 100 ft wide, the main entry pillars were 75 ft wide, and the cross entry pillars were 50 ft wide. The rooms were 23 ft wide and 300 ft long on 50-ft centers. Production, which continued to average more than 100,000 tons for several years, was sold to an expanded market in New Mexico, Arizona, and California.

In 1926 management changed the name of the mine to Mentmore; many people also called it the Defiance No. 1 mine. In 1927 the main slope reached a length of 5,000 ft, and for several years the number of employees averaged about 150. The management team of Mr. Kaseman, Owner and General Manager, and Mr. Miksch, General Superintendent, remained in charge of the mine until 1938. In that year Mr. Kaseman was killed near Hobbs, New Mexico, by a premature explosion of nitroglycerine. The nitro was to have been used in fracturing an oil well. In that year H. A. Manda was made General Superintendent, and in 1941 G. H. Larson of Albuquerque became General Manager. The mine at that time covered most of the NE1/4 sec. 16, most of the N1/2 sec. 15, and most of the SE1/4 sec. 10.

The main slope eventually reached a length of 7,500 ft. The coal bed was still 5 ft 2 inches at the end of the slope but thinned to about 2.5 ft along the northern edge of the workings. In the last few years of operation the number of employees slowly decreased, but even in the final months 50 men were working.

The mine was closed in April 1952. Contributing factors were probably a depressed market and the removal of most of the reserves. Production listed in the records amounts to 1.23 million tons, and it is estimated conservatively that about 2.3 million tons were mined over the 35 years of continuous operation. Production and employment figures and a list of mine fatalities are shown in Tables 46 and 47.

Defiance No. 2, No. 3, No. 6-Ramirez mines

Defiance Coal Company, unknown date-1948
Carbon City Coal Company, 1948-1961
Defiance No. 2-5,000 ft NL, 1,600 ft EL, sec. 16, T15N, R19W (GW-37, Fig. 56)
Defiance No. 3-300 ft NL, 1,700 ft EL, sec. 21, T15N, R19W (GW-36, Fig. 56)
Defiance No. 6-1,200 ft NL, 1,100 ft EL, sec. 21, T15N, R19W (GW-38, Fig. 56)

South of the Defiance No. 1 coal mine the Defiance Coal Company opened three entries on the Dilco No. 1 (Defiance) coal bed; each entry was called a mine in the literature. There were about 40 acres of coal in a peninsula of coal extending southwesterly across the SE1/4 and NE1/4 of secs. 16 and 21, respectively. The date of this work is not known.

The Defiance No. 2 mine was opened by two entries, the aircourse bearing about S40°E and the main entry bearing about S10°E. A tram line was built from it to the main tipple of the Defiance No. 1 mine. The No. 3 mine was opened

by an entry bearing about N64°E and ventilated through a shaft; this entry was connected with the No. 2 mine entries. The No. 6 mine was evidently opened for an aircourse along the south outcrop and was later developed by the Ramirez brothers. These three small operations were essentially one mine. The coal dips gently to the northeast, and the bed was about 5 ft thick. Production was probably combined with that of the Defiance No. 1 mine (Table 46).

In 1948 the Carbon City Coal Company was in charge of the mine. The company owners, Dogaberto and Jesus Ramirez, operated through the No. 6 mine openings, where a tipple and bins were constructed. The mine was then known as the Ramirez mine. The No. 2 and No. 3 openings were used for ventilation and possible for limited production. There was a tipple and bin at the No. 3 site in 1979. A small strip mine was also developed just off the No. 3 entry. The Ramirez brothers employed from three to eight men from 1948 until 1961, the year the mine was closed. Reportedly the Defiance Coal Company did not remove any pillars, and quite possibly the Ramirez brothers obtained most of their coal from these pillars. It is not known if they mined any of the lower Dilco coal beds. Production from these mines is not known.

TABLE 46—Production and employment record of the Defiance–Morris–Defiance No. 1–Mentmore mine. *In 1933 state law prohibited publication of production records in the State Mine Inspector's annual report.

Year	Production (tons)	Employment			Days operated
		Underground	Outside Men	Outside Boys	
1912	Opened				
1913–1916	Closed because of litigation				
1917	8,928	13	2		252
1918	10,112	8			
1919	4,638	10	2		
1920	64,070	91	10		281
1921	69,033	83	23		110
1922	109,229	70	30		220
1923	113,462	104	32		
1924	100,066	110	30		165
1925	95,877				152
1926	104,730	102	35		167
1927	113,255	107	30		190
1928	106,346	110	36		155
1929	117,762	120	33	1	189
1930	97,974	100	40	4	143
1931	68,100	90	41	2	91
1932	63,298	82	32		114
1933*		104 total employees			
1934		74	27		
1935		82	27	2	
1936		101	33	2	
1937		122	40	1	
1938		115	35	1	
1939		95	28		141
1940		80	28		115
1941		82	30		145
1942		92	38		251
1943		101	40		
1944		90	41		
1945		57	27		
1946	No report				
1947		36	15		
1948		47	18		
1949		44	16		
1950		36	13		
1951		39	12		
1952		39	10		
	Closed April 1952				

TABLE 47—Fatalities at the Defiance–Morris–Defiance No. 1–Mentmore mine.

Name	Date	Cause
Joe Brachetti	June 1, 1921	Fall of rock
Benjamin Alaron	May 19, 1922	Fall of rock
Mariano Zatto	August 11, 1924	Runaway trip
Tony Anaya	February 12, 1926	Electrocuted
Joe Ben	February 3, 1927	Fall of rock
Jose B. Ranggel	October 26, 1927	Fall of rock
Carpio Revera	September 26, 1929	Fall of rock
Mike Blazovich	June 4, 1930	Fall of rock
John McNeeley	July 28, 1930	Mine car
Tony Dalla	September 14, 1931	Pot
Salvador Esquibel	February 15, 1937	Trip
John Machimara	May 16, 1938	Fall of rock
Pilar Rodriquez	January 5, 1943	Fall of rock
Frank Garcia	April 2, 1943	Fall of rock
Joe Bennett	August 4, 1944	Fall of rock
Steve Radosevich	August 4, 1944	Fall of rock

Direct Line-Jones-Dilco mine+

Direct Line Coal Company, 1915-1919
Mentmore Coal Company, 1919-1921
1,600 ft NL, 5,000 ft EL, sec. 22, T15N, R19W (GW-40, Fig. 56)

In 1915 the Direct Line Coal Company began its mine with a slope on the Dilco No. 1 coal bed. The following year the company built a 4,000-ft railroad spur to the mine and constructed a new tipple with shaker screens. A new hoist and pit cars were added; a new mine slope, apparently to the Dilco No. 2 bed, was started; and a water well was drilled. The mines were ventilated through air shafts. In 1917, under the direction of A. A. Jones, President and General Manager, and R. A. Jones, General Superintendent, extensive mine development was carried out, and another tipple and houses for employees were built at a cost of $25,166. The mine was then known as the Jones mine.

The west side of the mine was worked by the longwall method and cut by machine, and on the east side of the mine the coal was mined with picks by a room-and-pillar method. The No. 2 Dilco bed was worked by the longwall method.

In 1918 the Direct Line Coal Company was in the hands of receiver Gregory Page of Gallup. Robert Wyper was made Superintendent. In 1919 the company was purchased by the Mentmore Coal Company, which operated a mine on adjoining property. The mine name was then changed to the Dilco mine. John James was made Superintendent, and then in 1920 Robert Wyper again held that position.

In the Dilco mine three beds of coal were worked, and the No. 1 slope, which had reached a depth of 1,500 ft, was extended 547 ft in 1919. The Dilco No. 1 coal bed is reported by Sears (1925) to range in thickness from 2 ft 6 inches in the northwest part of the mine to 4 ft. The thickness of the Dilco No. 2 bed varies from 3 ft 6 inches to 4 ft 7 inches,

TABLE 48—Production and employment record of the Direct Line–Jones–Dilco mine.

Year	Production (tons)	Employment			Days operated
		Miners	Day men	Top men	
1915	2,800		9 employees		
1916	No record	17	2		288
1917	49,700	50	12	20	288
1918	30,896	22	12	14	292
1919	33,377	30	7	11	320
1920	20,142	14	5	21	296
1921	5,000	Mine closed February 1, 1921			

thinning to the northwest. The Dilco No. 3 bed, which was apparently also mined, averages less than 4 ft in thickness. In 1920 the No. 3 slope of the Dilco mine was extended into the Dilco No. 4 bed, which measured 4 ft in thickness, and a small amount of coal was reportedly mined (Sears, 1925, pp. 29-30).

The Mentmore Coal Company operated the mine until February 1, 1921, when the mine was closed. Total production was more than 140,000 tons. Production and employment figures are shown in Table 48. One fatality was reported on January 15, 1917: K. Higuchi was killed by a fall of rock.

New-J. and P.-Marquez (Marquis) mine

New Coal Mine Company, 1951-1952
M. B. M. and 0. Coal Company, 1958-1967
5,000 ft NL, 5,000 ft EL, sec. 15, T15N, R19W (GW-39, Fig. 56)

In 1951 the New mine was begun to develop the Dilco No. 1 or Mentmore coal bed, which consisted of 4 ft 1 inch of clean coal. The coal bed was opened by a slope, bearing about N45°E, and the mine was ventilated through a shaft about 150 ft east of the slope. Figure 57 shows the fan and fan house that cover the shaft. The mine had an excellent sandstone roof and was almost dry, but it was reported in 1960 that the roof had changed at the face.

The mine was opened by the New Coal Mine Company with Albert Grijalva as General Manager and Leonardo Padillo as General Superintendent. In 1952 it was closed temporarily. The owners then were Jerry Marquez, who was in charge, Albert Grijalva, and Bartolo Borbon. In 1958 the mine was reopened by the M. B. M. and 0. Coal Company with Jerry Marquez, Partner, in charge. In 1963 the M. B. M. and 0. Coal Company ceased its operation, and the mine name was changed to the J. and P. mine. Locally it is known as the Marquez or Marquis mine. The mine operation ended in 1967. No production figures are available. During the life of the mine the number of employees ranged from two to eight.

Unknown prospect

300 ft NL, 3,500 ft EL, sec. 21, T15N, R19W (GW-33, Fig. 56)

This old single entry, which bears S65°E, was used to prospect for one of the Dilco coal beds.

Unknown mine

1,400 ft NL, 3,500 ft EL, sec. 21, T15N, R19W
(GW-34 and 35, Fig. 56)

This mine was opened on one of the Dilco coal beds by two entries. The southernmost entry, which bears N54°E, has been disturbed by a bulldozer trench. The other entry, driven on the same bearing, is located about 300 ft to the southeast.

Unknown mine

4,000 ft NL, 3,500 ft EL, sec. 16, T15N, R19W (GW-32, Fig. 56)

This mine was opened by two slopes on one of the Dilco coal beds. One of the slopes bears S73°E. The other is obscured by bulldozing from the Pass strip mine operation of 1947-1948. In 1979 an old coal chute was in existence at the end of the waste dump.

FIGURE 57—A view of the Marquez mine showing the fan house in the left foreground; the fan sits over a vertical shaft. The tipple and loading bin are in the center background. The incline is just beyond the truck. The waste was dumped under the tipple. *Photo by H. B. Nickelson, 1979.*

Pass strip mine

George Pass, 1947-1948
4,100 ft NL, 3,300 ft EL, sec. 16, T15N, R19W
(GW-30 and 31, Fig. 56)

The Pass strip mine, which was operated by George Pass of Mentmore, was opened in 1947 and closed in 1948. There are two trenches; one is about 100 ft wide and 140 ft long and bears N10°W; and the other is a short single or double cut bearing S20°E. The mine is on one of the Dilco coal beds.

McDermott et al. prospect

SF 077168 **4-10-44** **Permit**
James T. McDermott, Gallup
W. A. Hamilton, Sr., Gallup
Albert Lebeck, Gallup
Sec. 6, S^{1}/2 sec. 8, T15N, R19W

The prospect land is approximately 1 mi north of Mentmore. A 10-ft drift near the southeast corner of sec. 6 was driven on a coal bed that had the following cross section:

Roof	Shale
Carbonaceous shale	6"
Coal	3'9"
Floor	Shale

The bed dipped 5° northeast. There was no production, and the permit expired on April 10, 1946.

Mentmore (Carbon No. 1) mine

Carbon Coal Company, 1976-?
Secs. 3, 10 through 16, and 21, T15N, R19W, and sec. 33, T16N, R19W

During the early and mid-1970's Kenneth Robert Scholz and J. Michael Miller of Albuquerque began securing options and coal leases in the Gallup area and coal prospecting permits on the Zuni Reservation. Considerable exploratory drilling was done, and a review of maps, records, and literature concerning previous mines on their lands was undertaken. By 1976 an area on the sections above had been leased, and it was found to have sufficient coal reserves to justify an open-pit mine. The Carbon Coal Company was formed to open and operate the Mentmore mine.

The Carbon Coal Company is a partnership composed of two partners: H. B. Joint Venture (1976; 80% ownership), Denver, Colorado; and Property Holding Company-New Mexico (20% ownership), Albuquerque, New Mexico. H. B. Joint Venture is a general partnership composed of these partners: Hamilton Brothers Oil Company, Hamilton Brothers Corporation, and Hamilton Brothers Exploration Company, all of Denver. Property Holding Company-New Mexico is a limited partnership with two individuals as general partners: Kenneth Robert Scholz and J. Michael Miller of Albuquerque.

The lessors of the above lands are Gamerco Associates, Ltd., Allen Rollie, William W. Head, Jr., Atkinson Pension Trust, L. E. Wilson, and Larry and Shirley Wilson, all of Gallup, and Santa Fe Pacific Railroad and Atkinson Revocable Trust, both of Albuquerque. The New Mexico Surface Mining Commission issued Carbon Coal Company a permit to mine coal at the Mentmore mine on July 23, 1976.

The mining plan is a conventional truck-shovel operation. It utilizes 85-ton off-highway end-dump trucks, 10 Cy electric mining shovels, 15 Cy rubber-tired front-end loaders, crawler dozers with rippers, and truck-mounted rotary drills. Topsoil is removed by a self-loading scraper and stockpiled for future replacement on recontoured areas. Overburden is removed by drilling, blasting, and loading into off-highway trucks that place some of the overburden in storage areas; the greater portion is spread on the mined-out areas. The coal is ripped by bulldozers, loaded by rubber-tired end loaders, and hauled to the coal processing facility. The coal processing plant is in the southwest corner of sec. 3. The coal processing and loading facilities were constructed between September 1977 and April 1979, and the expanded office and warehouse were completed in February 1981. The complex covers about 98 acres. The coal handling and processing facilities consist essentially of a coal crusher, raw coal pile, preparation plant, clean coal stockpile, and load-out facilities. The process water pond uses Gallup sewage water for the coal washing facility. A 2.1-mi railroad spur was built from the main line of the Santa Fe Railroad. The coal is loaded on railroad cars and shipped to the Apache generating station operated by Arizona Electric Power Cooperative near Benson, Arizona.

Mining at the Mentmore was completed in secs. 3 and 33. Subsequent mining was slated to progress to the southeast into secs. 10-15 and then into secs. 16 and 21. Anticipated production was 1,500,000 tons of coal per year with 14,400,000 yd^3 of overburden moved per year.

The company produced the following tonnages:

1978	40,000
1979	628,250
1980	973,980
1981	Not available
1982	1,164,879
1983	21,125
1984	674,341

The Mentmore mine, however, was placed on inactive status in December 1984, and production operations were moved to a new site, named Carbon No. 2 (see p. 29), 2 mi south of Gallup (Anderson and Reddy, 1986). Production at the Mentmore and Carbon No. 2 mines was stopped in mid 1986, and all employees were laid off except for a "skeleton" crew.

Smith mine

D. M. Smith, 1886-?
3,300 ft NL, 900 ft EL, sec. 20, T15N, R19W (GW-44, Fig. 56)

In 1886 D. M. Smith, a trader, was the first to mine coal from the Gallup Sandstone Member, and he shipped a few carloads that year (Sears, 1925, p. 25). The mine was opened by an entry bearing S30°E, and a second entry may have existed about 50 ft to the west.

Mr. Smith opened the lower bed that was 4 ft thick and has a strike of N30°E and a dip of 4°. Shaler (1907, p. 415) described a section of the coal-bearing bed as follows:

Sandstone, massive	70'
Shale, carbonaceous	10'
Coal	2'9"
Shale, carbonaceous	12'
Coal	4'
Shale, carbonaceous	1'

Richards mine+

Richards Coal Company, 1918-1928
4,900 ft NL, 4,900 ft EL, sec. 21, T15N, R19W (GW-42, Fig. 56)

In 1918 Harry Richards and C. N. Colton of Gallup opened the Richards mine at the above location. The mine operated under the Richards Coal Company, and Mr. Richards was Mine Manager. By 1919 an 800-ft entry was driven on 2.5 ft of coal in the Myers or Richards coal bed in the upper (nonmarine) part of the Gallup Sandstone. The mine, which was ventilated through an air shaft, had an interbedded sandstone-shale roof that was unstable and had to be timbered. This was one of the few mines, if not the only one, to produce coal from the Gallup Sandstone.

A railroad spur was built to the mine site, and a small mine camp was built at the mine to house the miners. By 1926 the main slope reached a length of 2,000 ft. The records show that the mine had three openings, although only one, bearing N65°W, was found during the field work for the Abandoned Mine Lands project in 1979. Total production was more than 100,000 tons. Production and employment figures and a list of fatalities are shown in Tables 49 and 50.

TABLE 49—Production and employment record of the Richards mine.

Year	Production (tons)	Employment			Days operated
		Miners	Day men	Top men	
1919	4,000	10	2	2	
1920	7,905	12	16	3	251
1921	10,700	20	3	3	152
1922	12,830	20	3	3	
1923	19,000	35	6	5	170
1924	21,400	42	6	5	133
1925	15,870				
1926	7,000	22	3	1	90
1927	4,000	12	1	1	150
1928	Mine closed				

TABLE 50—Fatalities at the Richards mine.

Name	Date	Cause
E. Tabo	June 24, 1920	Fall of rock
Hugh Bolton	June 30, 1921	Fall of rock
Crisensis Lopez	May 26, 1923	Fall of rock
Joe Ingram	June 18, 1925	Suffocated in a 30-ft air shaft he contracted to drive

Myers—Mycos Brothers mine

1916-?
200 ft NL, 600 ft EL, sec. 29, T15N, R19W (GW-43, Fig. 56)

According to the State Mine Inspector the Mycos brothers were operating a small wagon mine at the above location

in 1916. The mine was opened by two drifts on 3 ft of coal, and a chute and tipple were built. The drifts, about 200 ft apart, were on the upper bed of coal in the Gallup Sandstone Member of the Mesaverde Formation. Sears (1925, p. 25) called this mine the Myers, and stated that there were two beds of coal 2.5-3 ft thick separated by a few feet of shale at this location; the lower bed was impure or dirty. Production, which was small (775 tons in 1916), was confined to domestic use. No other mention of the mine was found in the literature.

Government-Agency mines and Fort Defiance-Window Rock mines'

Navajo Agency, 1894-1950
Navajo Tribe, 1950-1965
Government-Agency mines—SE1/4 sec. 5, T16N, R2OW Fort Defiance-Window Rock mines—sec. 20, T17N, R2OW, projected survey or 13,500 ft north of south reservation boundary at 38.5 mi post

The Navajo Agency's coal mines were developed to provide fuel to heat the agency's schools and administration buildings and to power small generating plants. These mines were developed on coal beds that existed as close to these facilities as possible because the roads and methods of transporting the coal were poor. Usually a miner contracted to provide a year's supply of coal to the facilities; consequently an entry was driven on a coal bed to good coal, rooms were turned off immediately, and all the readily available coal was mined to fill that yearly contract. Some mines lasted only two seasons before caving with this type of mining, and at times the facilities were without coal.

There were several of these small mines, called either government or agency mines. About 1906 Shaler (1907, p. 417) visited an agency mine situated 7 mi southeast of Fort Defiance, Arizona. He stated that the mine had been providing about 600 tons of coal annually for the last 10 or 12 years to supply coal for the Navajo Agency and school at Fort Defiance. The strata had a low easterly dip, and the bed was 5-6 ft thick with a sandstone roof and shale floor. This mine is believed to have been in the SE1/4 of sec. 5, T16N, R2OW because there are numerous dumps and caved entries in this area. The Santa Fe Railroad has long owned the land and coal, now leased to Pittsburg and Midway Coal Company, which has strip mined the area.

During fiscal year 1906-1907 the Territorial Mine Inspector visited the mine, which was managed by H. H. Harrison, Superintendent of the Navajo Indian Agency. An entry 540 ft long existed, but the mine was in bad condition with little or no ventilation. The inspector ordered the mine closed until the ventilation was restored and the workings properly supported. A new mine was planned close by, but it was not started until fiscal year 1910-1911, at which time Peter Paquette was Superintendent. There is a gap in the records, but **apparently operations at this mine** continued until 1917. That year the mine was found to be in bad condition by the State Mine Inspector, and it was ordered closed until it passed state and federal regulations.

Production from the early Agency mine was estimated by Shaler (1907) at 600 tons annually for the years 18941906. Estimates by Territorial Mining Inspectors for the years 1906-1910, when records ceased temporarily, were from 450 to 800 tons annually. Usually from three to six employees worked about 2 months of the year.

In 1918 the first of several mines that shared the same name, Fort Defiance mine, was opened under the direction of Mr. Paquette. Its location was near the present-day Fort Defiance (Window Rock) mine, in sec. 20, T17N, R2OW, projected land survey. A slope and an aircourse were driven, and the mine was ventilated by a furnace. At a depth of 200 ft the coal was still weathered. A practical miner was in charge of three miners and six top men, usually Navajo Indians, who produced about 2,000 tons annually. By 1921 there were complaints of bad mining practices and unsafe conditions, but the mining operations were continued until the summer of 1927, when the workings caved. It was then necessary to open a mine immediately to supply the coal needs for 1927-1928. The new mine was developed from a slope that had been started, but not continued, in 1925. Unfortunately the mine was poorly planned, and the rooms were driven too wide. In April of 1928 when J. J. Bourquin, USGS Deputy Mining Supervisor, made an inspection trip, he reported that the mine was unsafe and would be too expensive to rehabilitate the workings again. The bed also contained partings that produced high-ash coal.

In 1928, as a result of this inspection, the USGS Mining Supervisor, Mineral Leasing Division, was requested by the Office of Indian Affairs to assist in developing mines on the reservations to provide for the fuel needs. The records in the Mining Supervisor's office of these mines began at that time.

A cross section of the coal bed in the mine of 1928 is given below:

Shale and coal mixed	2' to 3'
Dirty coal	0' 4"
Bone	0' 4"
Coal	1' 7"
Rock	1' 5"
Coal	3' 0"
Shale	Floor

This mine was opened by a slope driven S28°E. The bed dipped 9°SW and had a strike S60°E. The requirements of coal for Fort Defiance were 4,500 tons per year, and the contract price paid for the coal in 1927-1928 was $1.23 per ton for + 1 inch. The Indian Service furnished all the mine material and the animals for hauling the coal to the surface. The contract rate for hauling the coal 7 mi was $3.20 per ton.

Two areas were known that would provide a new mine site, one adjacent to the existing mine and the other adjacent to an old mine in the area of the present Window Rock mine. The latter was chosen although it was 3 mi farther from Fort Defiance.

The old mine at the location of the present Window Rock mine had a bed of clean hard coal about 4.5 ft thick with a good sandstone roof. The strike of the bed was N65°E, and the bed dipped 5°SE. The tipple site was advantageous.

In 1928 the Mining Supervisor recommended to the Navajo Agency that a well-developed mine be started that would produce coal for many years. Contrary to his recommendation another mine of small potential was begun about 200 ft east of the mine opened before 1927. Again the coal needs for the coming season were the prime consideration.

Engineers over the years have mapped the mine workings at the Fort Defiance-Window Rock mine, which encompasses several openings (Fig. 58). The No. 1 portal, the first portal on the west side of the map, was opened a number of years before 1928 when Mr. Bourquin first entered and examined this working. B. W. Dyer, District Mining Supervisor, and C. L. Duer mapped the accessible workings in October 1928. The No. 1 mine was worked before 1928, and the No. 2 mine, which is approximately 200 ft to the northeast, was opened during the summer of 1928. An analysis of a 4.5 ft coal sample taken by Mr. Dyer showed the following:

Moisture	12.8%
Volatile matter	35.7%
Fixed carbon	46.7%
Ash	4.8%
Sulphur	0.6%
BTU	11,630

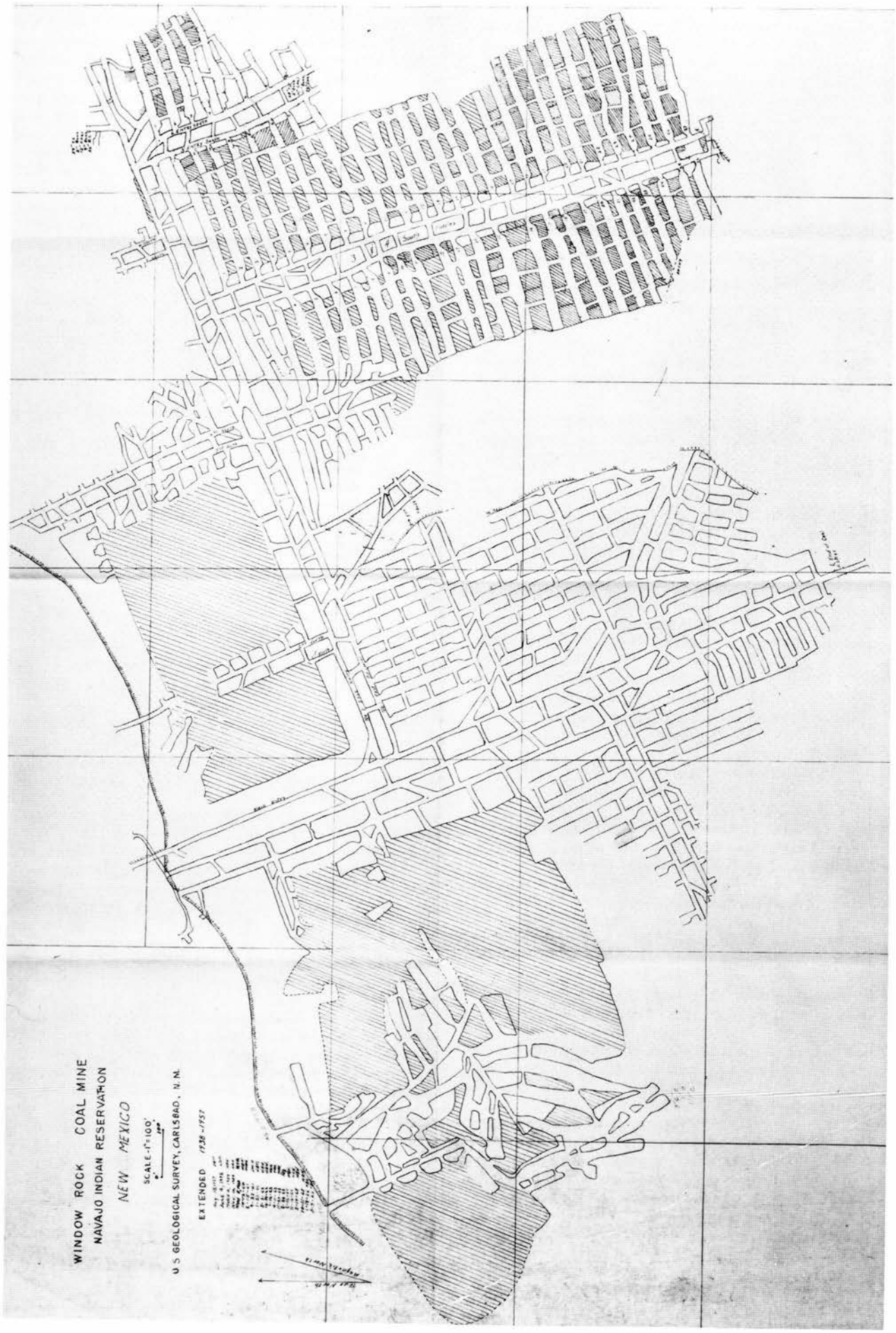


FIGURE 58—Map of the Window Rock mine.

By October 1928 the mine was in poor condition and apparently by spring the contract miner had gone broke. By October 1929, under the direction of Mr. Hunter, Superintendent of the Agency, and Sam Strong, Mine Foreman, the mine was put in working order and was capable of producing 20-30 tons of coal per day. By 1930 a new mine had to be developed again because the No. 2 mine had barely enough coal to provide the agency's fuel for the coming winter. The coal bed to the east was prospected with good results during June and July 1930.

The No. 3 mine, which was started about 700 ft east of the No. 2 mine, operated under the direction of Sam Strong, Mine Foreman, and proceeded so well that by 1935 the mine's capacity exceeded the agency's yearly need of 10,000 tons. The No. 3 mine was operated in a workmanlike manner, and improvements were systematically undertaken for the mine, the surface facilities, and the miners' living conditions. Production amounted to 11,479 tons in 1936, with overall mining costs of $2.11 per ton, of which $1.61 per ton was attributed to the underground labor costs. Part of the improvements proposed were a rock tunnel and a new tipple from this tunnel, which were completed in October 1937. The rock tunnel eliminated steep 8° grades in the two original entries to the west of the No. 3 mine. This rock tunnel is faintly marked "Main Entry" on Figure 58. The new storage bin and tipple eliminated the steep road to the old bins. By 1938 the mine had been confined to the cross-hatched area west of the three entries (Fig. 58).

In 1938 the Fort Defiance mine name was changed to the Window Rock mine. It furnished coal for the powerhouse at Window Rock, the school at Fort Defiance, and 16 or more other schools within a 65-mi radius. The mine foreman was Dave Bryant, who kept the mine in excellent condition. The Window Rock mine was the largest on the Navajo Indian Reservation; it employed 36 men. Its considerable tonnage was sold in three sizes: lump, fine, and very fine slack. The coal bed averaged 6 ft of coal with about 1-2 ft of partings.

By 1942 the main three-entry system to the south had been extended to the surface, and one was used for ventilation. Most of the production was from an area east of the main-entry system and north of the first east-entry system. By 1949 the block of coal in the southeast part of the mine was being developed, and the production came from this area until the mine was closed.

The pillars in the area of the mine off the No. 3 main-entry system were never removed because in this area several coal beds were developed and mined. The roof in these workings was 20-25 ft high, and all the entries and rooms were narrow because timber could not be set. Pillar removal in areas crosshatched on the map (Fig. 58) was made easy because cover over the coal bed was less than 100 ft.

Dan King, Supervisor of Coal Mines on the Navajo Reservation, retired after many years of service with the Navajo Indian Agency. He was replaced in early 1950 by Dewey Weddington, Acting Supervisor of Mines on Indian Lands. At about that time the Navajo Service, Navajo Tribe, began operating the mine and continued for some years. John G. Davidson became Mine Superintendent in April 1955, and he held this position until he retired in January 1963. Production in the late 1950's was from the coal bed off the No. 3 and No. 4 south entries. The bed was 12 ft thick, and the top 8.5 ft were mined.

William Bia replaced Mr. Davidson as Superintendent and was replaced within a few months by Tsosie Blackgoat, who operated the mine until the summer of 1965. At that time the Navajo Tribe stated that they could buy coal cheaper from the Sundance mine, east of Gallup. Mr. Blackgoat was allowed to work the mine on his own under a tribal agreement, but his work was sporadic, and soon he was financially unable to continue. The mine began to deteriorate, and operations ceased by the spring of 1966.

During 1964-1965 the mine was declared a Civil Defense shelter, and food and water were stored in it for emergency disaster use. The mine undoubtedly could be so used again if areas in the main entries were cleaned up and rehabilitated.

In 1962 the Pittsburg and Midway Coal Mining Company obtained from the Navajo Tribe a lease, 14-20-0603-8669, covering the strippable area of coal on the reservation. The Window Rock mine area was excluded from this lease.

Total production from the mine is not given in the files. It is known that in the late 1920's the needs of Fort Defiance were approximately 4,500 tons per year; in the 1930's the mine capacity was more than twice that amount; and in fiscal year 1958 12,219 tons were sold.

Joe Plunker was killed in 1936 by a fall of rock in a mine near Fort Defiance. As a result of this fatality the State Mine Inspector wrote the State Attorney General to ask if he had jurisdiction and could apply the state mining laws to government mines on the Indian reservations. The answer was that he had no jurisdiction.

St. Michaels—Brothers mine

St. Michaels Mission, Arizona, 1904—? 1,700 NL, 3,500 ft EL, sec. 5, T16N, R2OW

The St. Michaels Mission, located a few miles south of Window Rock, Arizona, opened a coal mine in 1904 to provide fuel for their school and mission complex. At that time Friar Anselm Weber was in charge of the Mission. The mine was on lands owned by the Santa Fe Railroad; the railroad company had given permission for St. Michaels to mine and use the coal without cost.

Shaler (1907, pp. 416-417) reported that the bed was 53 inches thick with a good sandstone roof and bony coal floor. The Territorial Mine Inspector's first report of the mine, in fiscal year 1906-1907, stated that a white miner and two Navajo miners produced 150 tons per year for the complex, and the coal was hauled by wagon to the Mission. The last record available for the mine, which was also called the Brothers mine at times, is from 1911, but it is believed that the mine operated for a number of years after that year.

Sisters mine

Operator and dates unknown
SW¼ sec. 13, T16N, R21W

The Sisters mine, which was probably in the SWI/4 of sec. 13, was opened to provide fuel for a nunnery near Window Rock, Arizona. Mining was on a lower coal bed in the Gibson Coal Member, on Santa Fe Railroad land. The coal was mined from one entry, and the handling facilities were well made. A stone house for powder or tool storage constructed there was a classic example of Navajo stone masonry. The mine was closed after natural gas was obtainable in the Window Rock area. Pittsburg and Midway Coal Company has strip mined the site.

Ganado Mission mine

SF 076841 **8-5-42** Coal license
Ganado Mission, Ganado, Arizona SW¼4NE¼4, NW¼4SE1/4 sec. 14, T16N, R21W

In 1901 the Ganado Mission was established at Ganado, Arizona, for the benefit of the Navajo Indians. The Mission,

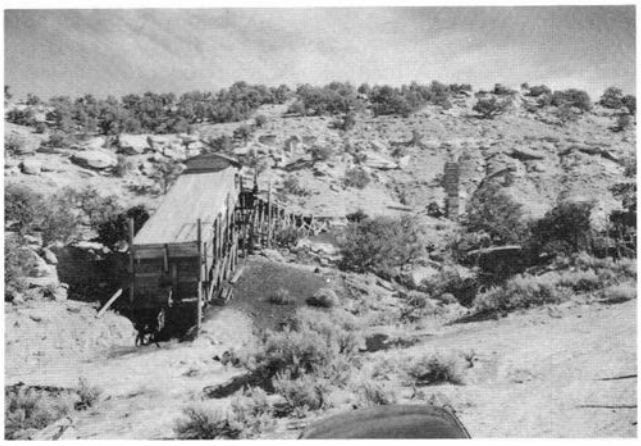


FIGURE 59—Roofed tipple and chimney used to aid ventilation at the Ganado Mission mine. *Photo by R. H. Allport, October 4, 1944.*

which is still very active, is owned and operated by the Board of National Missions, Presbyterian Church, U.S.A. The Mission was composed of Sage Memorial Hospital and School of Nursing, Religious Education, High School, Cornfields Community Center, Tselani Health Center, and Field Health Service. It operated a powerplant, farm and dairy, commissary and food service, coal mine, fire department, laundry, and refrigeration plant. The motto of the Mission was "The desert place shall be made fruitful and the waste places turned into gardens."

In the early part of the century a coal mine on Santa Fe Railroad land probably in SE1/4 sec. 13 was opened to supply the needs of the Mission. In the early 1940's this mine was worked out, and another mine was needed to heat the plant facilities at Ganado; the Mission therefore applied for a coal license on the federal section that adjoins the Santa Fe Railroad land. A coal license gives organizations such as the Ganado Mission the right to mine coal without cost for their use, but it was subject to federal coal regulations. The license had to be renewed every 2 years.

The mine was opened soon after the license was issued in 1942, and production of about 2,500 tons per year was expected. A tipple was built to handle the coal (Fig. 59). The mine workings began on the NW1/4SE1/4 and were developed in the SW1/4NE1/4 sec. 14. The coal bed was opened by two entries driven on a course N60°E. The bed dipped 4° to the northeast. A coal section measured in the newly opened entries was as follows:

Roof	Sandstone
Coal and bone	1 ft
Coal	5 ft
Floor	Shale

The mine was managed by an experienced miner, and the laborers were Navajos. Operations continued until November 25, 1957, when the fuel was changed to natural gas.

The Ganado Mission mine map (Fig. 60) shows the extent of the workings. The mine area was included with Pittsburg and Midway coal leases, which have now been strip mined. The mine produced 61,889 tons of coal for the Mission.

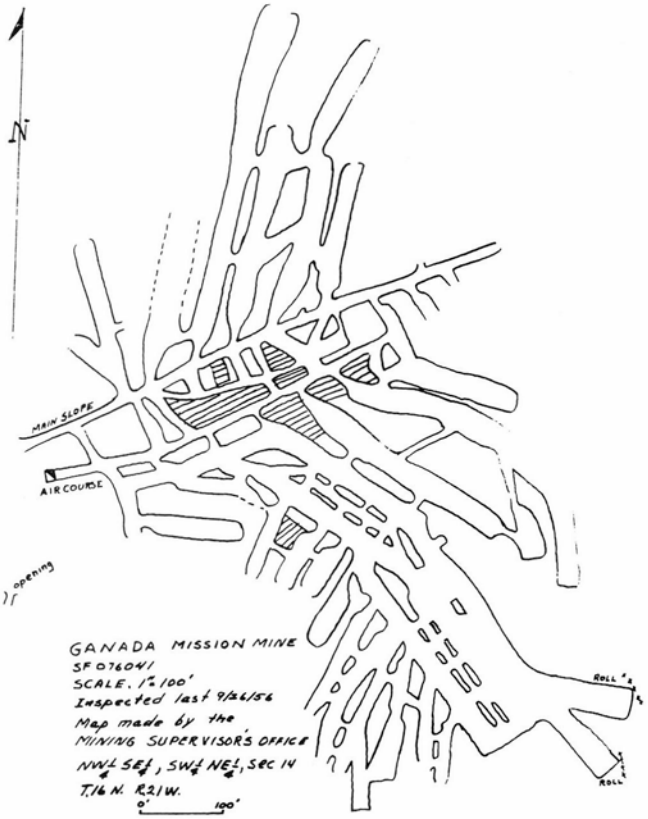


FIGURE 60—Map of the Ganado Mission mine on federal lands. *Made by engineers from the Mining Supervisor's office.*

McKinley mine+

NM 057348, NM 057349,
NM 0554844, NM 065466 1958- Federal leases
Fee lands from Santa Fe Pacific Railroad Company, 1958-
Navajo Tribal Coal Lease 14-20-06-3-8669, 1961-
Spencer Chemical Company
Pittsburg and Midway Coal Company
Gulf Oil Corporation, Kansas City, Missouri
Lands in Tps. 16 and 17 N, Rgs. 19, 20, and 21 W

The McKinley mine is located approximately 25 mi northwest of Gallup and 3 mi east of Window Rock, Arizona. It covers lands under leases held by Gulf Oil Corporation and operated by Pittsburg and Midway Coal Company, a subsidiary of Gulf Oil. The leases are as follows: U.S. public lands, 8,156 acres, even sections; Santa Fe Pacific Railroad Company, 7,613 acres, odd sections; and Navajo Reservation lands, 11,157 acres.

The Pittsburg and Midway Coal Company, originally owned wholly by Spencer Chemical Company, obtained leases from the Santa Fe Pacific Railroad Company on the odd-numbered sections and applied for federal coal prospecting permits on the even-numbered sections on lands in T16N, R2OW; T17N, R2OW; and T16N, R21W in 1958 and 1959 (Fig. 61). The federal permits were assigned to Spencer Chemical Company, the exploration company for P & M, in October 1960.

A brief history of the company follows (McKinney, pers. comm. 1979).

> The Pittsburg and Midway Coal Mining Company was established in 1885. The Company takes its name from the town of Pittsburg, located in Southeastern Kansas, and the village of Midway, a watering place used by the cavalry in pre-Civil War days between Fort Scott and Baxter Springs, Kansas. The Company's first operation was started in the same vicinity. Strip and underground mining continued in Kansas and was extended into the adjoining states of Oklahoma, Missouri, and Arkansas. New mining methods and larger more efficient equipment were utilized as they were developed to increase production and improve quality of the product. The Company has been a pioneer in the use of new mining equipment and in the development of new and more efficient methods for producing better coal.
>
> In 1941, in addition to increased production of coal to meet war requirements, The Pittsburg and Midway Coal Mining Company organized the Military Chem-

ical Works, Inc., a wholly-owned subsidiary, charged by the War Department, with the responsibility of designing, constructing and operating a large chemical plant near Pittsburg, Kansas to produce anhydrous ammonia, nitric acid, and ammonium nitrate. The plant later became the nucleus of the Spencer Chemical Company. In 1964, The Pittsburg and Midway Coal Mining Company became a wholly-owned subsidiary of the Gulf Oil Corporation.

Growth and expansion of the Company continued as the demand for coal grew. Currently, Pittsburg and Midway is operating eight (8) mines in four (4) states. Four (4) mines consisting of the Colonial Mine, Paradise Mine, Drake IV and Pleasant Hill Mines are located in Western Kentucky. The other operations include the Empire Mine and Midway Mine in Missouri, The Edna Mine in Colorado, and the McKinley Mine in New Mexico.

Coal is one of the important basic natural resources and the production, distribution, and utilization of coal as a source of energy influences directly and indirectly almost every phase of community, state and national well-being. Large reserves, easily accessible transportation, services, and uniquely flexible facilities for the production of coal to meet current and long term requirements of electric utilities and in-

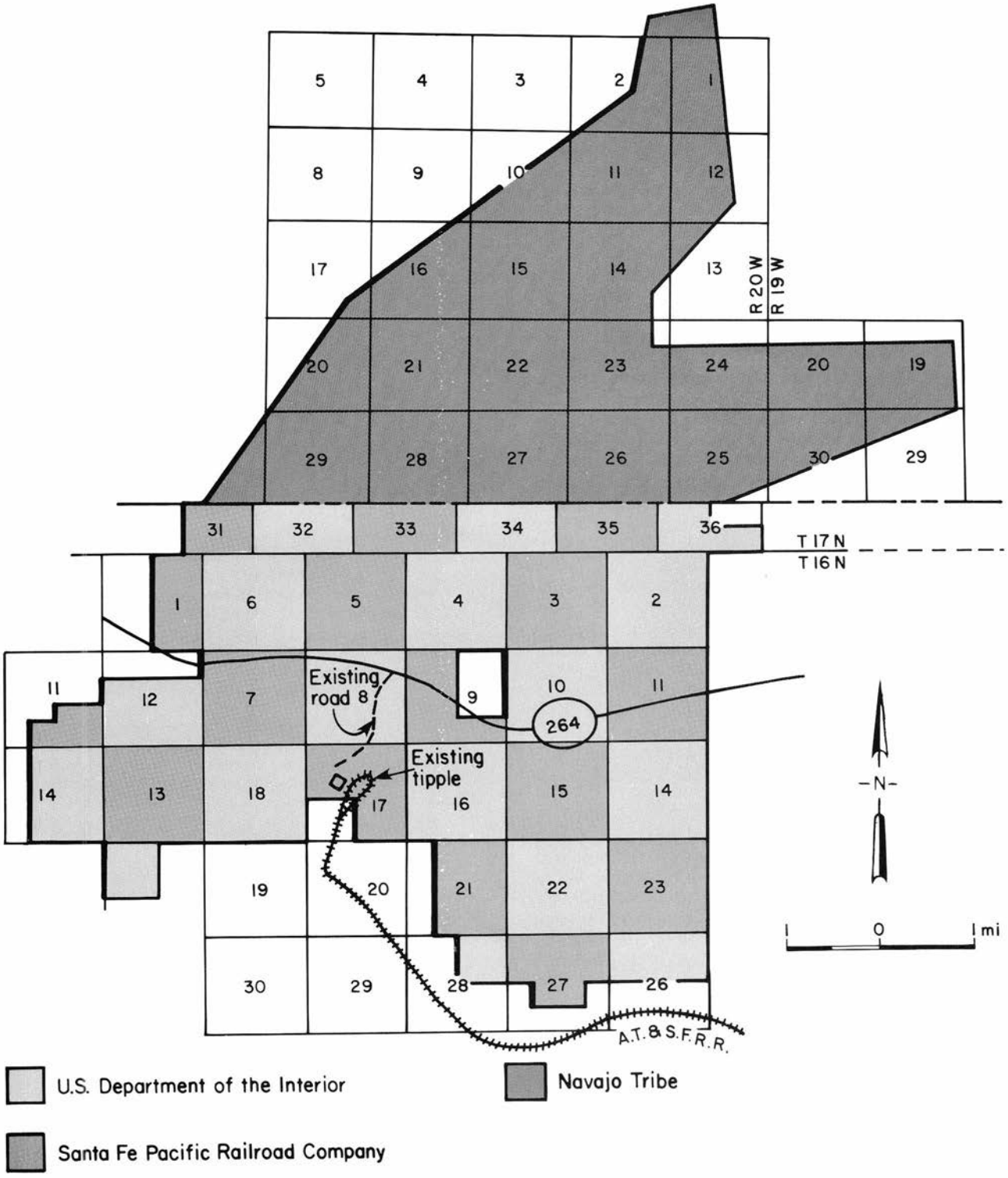


FIGURE 61—Coal ownership in the vicinity of McKinley mine, about 1961.

> dustrial plants make it possible for Pittsburg and Midway to help meet the demand for increased energy and by so doing make a significant contribution to the local and national economy.
>
> The McKinley Mine, located 25 miles northwest of Gallup, was opened in 1962 and was the first coal property developed to penetrate the utility market of the far southwest. Coal is produced for utility and industrial markets with the largest consumer being Arizona Public Service's Cholla Power Plant at Joseph City, Arizona. The mine will produce approximately five million tons of coal per year by 1980. It will provide employment for approximately 350 people. In addition, it makes a further substantial contribution to the economy by generating income for the railroad and many other businesses, who furnish services, equipment, and supplies to the mine.

Exploration drilling by mobile drill rigs began in May of 1959. These rigs were capable of drilling wet or dry, and the log of the hole was either cored or obtained by logging the cuttings blown from the bottom of the hole. Sufficient coal reserves were found on the lands to interest power companies, especially Arizona Public Service Company, in constructing a powerplant. The demand for electric power in areas served by that company was at a point of exceeding its powerplant capacities. A search began for sufficient water to cool a plant, and company engineers found sufficient ground water in the vicinity of Joseph City, Arizona, about 100 mi from the coal field. A sales contract was negotiated with Pittsburg and Midway Coal Company, and construction began on the 115 MW Cholla plant about 2 mi east of Joseph City. Arizona Public Service Company's great need for power before the construction and operation of the Four Corners powerplant at Fruitland was fulfilled by putting this plant on line. The Santa Fe Railroad obtained a right-of-way and began building a spur line from the main line at a point about 1 mi east of Defiance to a loading dock site. The loading dock and the coal-handling facilities were being constructed off the coal beds near the center of sec. 17, T16N, R2OW.

On November 9, 1961, the Advisory Committee of the Navajo Tribal Council passed a resolution giving Spencer Chemical Company a 2-yr drilling permit with an option to lease lands containing 150 million tons of coal. The permit became effective May 25, 1962, for 49,920 acres. By March 1, 1964, 64,154 ft of drilling were completed. Lease negotiations resulted in the issuance of a lease effective September 18, 1964, for 11,157 acres to Pittsburg and Midway Coal Company. The public land leases were assigned from Spencer Chemical Company to Gulf Oil Corporation on October 1, 1964. The Navajo lease apparently was not assigned to Gulf Oil Corporation. The reserves found on all lands are estimated at 150 million tons.

The initial stripping began in July 1961 on sec. 13, T16N, R21W, with a Manitowoc 4500 dragline with a 120-ft boom and a 6-yard bucket plus two Caterpillar D9 bulldozers. When P & M's 90-yard shovel was put to work at the No. 19 mine in Kansas, it released a 33-yard 950—B shovel for service at McKinley mine. In 1937 this shovel was the largest in the world. P & M trucked all but a few components of the 950—B shovel 800 mi to the mine site, thus eliminating the necessity of building 2.5 mi of road and powerline, which saved both money and time. The 950—B shovel could dig to a depth of 75 ft. The uncovered coal was ripped with a D9 bulldozer and loaded in trucks by a 6-yard 71—B shovel working in combination with a Michigan 125A front-end loader. The truck fleet consisted of five 30-ton Euclid 70 FDTs and two 25-ton Euclid 43 FDTs, which hauled 3,150 tons per day. The overburden was drilled by a Robbins RR-10 vertical rotary machine, which drilled 9-inch holes on a 24 x 27 ft pattern (Coal Age, 1966a, p. 97).

Most or all of this equipment had been used previously in other company mines. This old equipment was used until about 1974 or 1975 when new equipment was built for the increased expansion. During the latter years prayers, frustration, and a lot of careful know-how kept this equipment operating to produce the 300,000-400,000 tons of coal needed to supply coal for the Cholla powerplant and private sales.

The raw coal-handling facilities were designed by McNally—Pittsburg and Pittsburg and Midway Coal Company. The plant was essentially a coal crushing and loading facility, but special features were built for a one-man operation. A unique structure was designed to eliminate dust collection within the building, and placing the haul ropes between the rails eliminated track-side sheaves and added to safety. The 2,000-ft haul system was designed to handle 24 90-ton railcars. The plant was designed to crush, sample, weigh, and load 1,000 tons of coal per hour (Coal Age, 1966b, p. 121). This crushing and loading facility is still in use today for loading custom sales.

By 1972, under the terms of the Navajo Indian lease, mining had to be started on the reservation land, and after this date production from the fee and federal lands was small and sporadic.

By 1974 Arizona Public Service Company needed to build additional generating plants to supply its projected power needs in southern Arizona. Enlargement of the Cholla plant at Joseph City was contemplated, but an additional supply of water had to be found and developed. The original plant water came from an aquifer in the vicinity of the plant. Exploration showed that this source could be enlarged to supply water to two 250 MW generating plants that would use 3 million tons of coal per year. Commitments for coal from the lumber industry, mining companies, and others that found coal cheaper than natural gas or oil for fuel made up an additional million tons of production per year. P & M began planning a mine and facilities to eventually handle 5 million tons of production per year (Wilson, 1977, p. 253).

Site preparation began in 1974, and the new facilities were completed in mid-1976. John C. Wilson (1977, pp. 253-254) described the McKinley mine facilities as follows:

> The plant site consists of coal storage piles, hoppers, a crushing plant and a loading chute, which occupies approximately 30 acres. Adjacent to this facility are the service facilities, which consist of a machine shop, personnel office, test laboratory, parking yard and other service buildings and areas. These facilities occupy an additional area of approximately 25 acres. Both areas required leveling and drainage culverts.
>
> Over 5,000 cubic yards of concrete were used in the construction of the preparation plant. The upper half consists of a hopper, reciprocating feeder, primary crusher, secondary crusher, vibrating screens, sample systems, and traveling stacker. The coal is stockpiled at a rate of 2,000 tons per hour and sized at 3 x O. After being stacked along the 700-foot-long stockpile, the coal is selectively fed through the 26 reclaim hoppers onto a belt running to the train load-out station. Unit trains of various sizes are flood loaded at the rate of 3,000 tons per hour.
>
> The railroad spur extension of 8.2 miles was constructed from the existing terminal in sec. 17, T. 16 N., R. 20 W. It crosses sections 17, 8, 5, 6, 1 and 31 and enters the Navajo Reservation. The first 6.4 miles were constructed by the Santa Fe and Pacific Railroad Company. This terminal is 0.65 miles north of the reservation line. The 1.8 miles from this point to the plant site was constructed by P & M and was maintained by Santa Fe. The maximum grades are 0.6 percent ascending and 2.0 percent descending for the loaded trains. Cuts as much as 50 feet deep, fills up to 40 feet high, and several trestles across the larger gulleys were constructed to maintain these grades. The disturbed land ranges from 50 to 150 feet wide along the route.

An erection site for the dragline was cleared adjacent to the railroad in sec. 5, T. 16 N., R. 20 W., and most of the new equipment and construction material came to this site by railroad. Thus, Santa Fe has other business over this spur line than hauling coal. The spur will probably never be abandoned and could be extended to the Fort Defiance–Sawmill area for the Navajo lumber and other industry developing in this area.

The company's description of their equipment follows:

STRIPPING EQUIPMENT

Four Bucyrus Erie 1370–W draglines 55 cubic yards

Working Weight:	7,000,000 lbs.
Heights:	Taller than a 20-story building, 200 feet from ground to point sheave at top of boom
Boom:	320 feet long
Maximum Dumping Height:	160 feet
Effective Spoil Radius:	235 feet—outreaches one and one-half football fields.
Power:	Provides 6,000 horsepower under normal operating conditions and 12,000 horsepower under peak loads. All four draglines will use power equivalent to that used by a community of 50,000 people.
Tub Diameter:	58 feet
Approximate Digging-Cycle Time:	60 seconds
Normal Walking Speed:	One 8½ ft step every 45 seconds or 0.13 MPH
Bucket:	Capacity of 55 cubic yards or approximately 82 tons
Operating Crew:	One operator, one oiler, and one groundman
Erection Information:	Construction time—10–12 months; peak number of men employed—70.

DRILLING EQUIPMENT

Seven vertical overburden drills:
- 3 RR15 Joy
- 1 B E 60R
- 1 Ingersoll Rand T-5
- 1 Chicago pneumatic drill
- 1 Gardner Denver

COAL DRILLING EQUIPMENT

3 Twin Mast Schroeder coal drills
4 10 ton I & M bulk Anfo blast hole loading trucks
1¾ ton coal shooter's truck

LOADING EQUIPMENT

Three rubber tired front-end loaders, 20 cubic yards
Two O & K RH75 hydraulic shovel loaders, 16 cubic yards and 13 cubic yards
Two Marion 151 M's diesel electric shovel loaders, 11 cubic yards

HAULAGE UNITS

Five—100 ton unit rig-end dump trucks
Ten—120 ton Wabco-end dump trucks

Once the coal has been loaded into the cars, P&M has not felt that the job of mining is completed. Since 1964, P&M has voluntarily graded all spoil banks.

At the present time, the relative merits of removing, preserving, and replacing topsoil, versus other methods of spoil bank preparation, is not known. Research concerning feasible methods of revegetating areas affected by mining has been carried on at the McKinley Mine by the United States Department of Agriculture Forest Service, the McKinley Soil and Water Conservation District, and the Company.

RECLAMATION EQUIPMENT

- 5—D9 dozers (Cat)
- 9—HD 31 dozers (Fiat-Allis)
- 4—HD 41 dozers (Fiat-Allis)
- 1—D 10 dozer (Cat)
- 1—380 rubber tired dozer (Michigan)
- 5—10,000 gallon water trucks
- 6—637 scrapers
- 1—641 scraper
- 2—16G motor graders
- 1—14 motor grader

Topsoil is distributed on all final graded slopes before seeding. This is to insure that the seeds and transplants have a favorable medium to establish themselves in.

Native grasses have been both broadcast and drill seeded with the drilling approach being the more favorable. Test areas have been set aside to determine the merits of various seeding programs. Crested Wheatgrass, Siberian Wheatgrass, Western Wheatgrass, Fourwing Saltbrush, Blue Grama, and others are being tested. Mulching and fertilizing programs are also in progress. It is our commitment the end result will be rangeland that is at least as productive as the land prior to mining.

John C. Wilson's (1977, p. 255) description of the geology of the mine area follows:

> C. E. Dobbin, U. S. Geological Survey, mapped the area in 1932 and described the coal and the rocks deposited during Late Cretaceous time in about five townships south of the Navajo Reservation and east of the Arizona state line; the work is unpublished. To describe some of the general geology in the area, the writer has used Dobbin's information.
>
> Rocks exposed in the vicinity, in ascending order, are the Dakota Sandstone, the Mancos Shale, the Gallup Sandstone, the Crevasse Canyon Formation and the Menefee Formation. These formations comprise the limb of the Defiance monocline that extends northeast, just west of the leased area (O'Sullivan and Beaumont, 1957). The Gallup Sandstone, forming the base of the Mesaverde Group, is about 240 feet thick in this area. The Crevasse Canyon Formation is composed of the Dilco Coal, Bartlett Barren and Gibson Coal members. The Dilco Coal Member is about 300 feet thick, crops out in T. 15 N., R. 20 W., and lies beneath the coal beds in the leased area. The Bartlett Barren Member, about 375 feet thick, has sandstone beds at the base and top with some scattered thin beds of coal. The Gibson Coal Member and the Cleary Coal Member of the Menefee Formation (undivided) is about 150 feet thick; this contains the coal beds presently being mined. The Menefee Formation above the Cleary Member is over 250 feet thick and was named the Allison Barren Member by Dobbin. The Allison Member designation has been discontinued. Dobbin does not mention the Cleary Coal Member.
>
> The regional dip of the beds is south to southeast, generally less than two degrees. Local dips may exceed two degrees and the direction will vary with local minor structure.
>
> Faults, having displacements of less than 100 feet, occur along the Tse Bonita Wash and the unnamed wash east of and parallel with Coal Mine Wash. It is

suspected that Coal Mine Wash is coincident with a fault. All these faults trend northeast and apparently dip steeply. The upthrown fault blocks are to the southeast, essentially the same direction as the dip. The coal beds are brought to the surface several times by the faults; thus a greater area of coal is exposed for strip mining. A complementary system of faults of small displacement has been observed during mining. These faults trend northwest and appear to dip steeply.

The company named the coal beds by colors: the lowest bed was called the "green"; then "brown," "blue," "fuchsia," "yellow," and "orange" at the top. The "red" bed was later added; it is a lower split-off of the "blue" bed. A brief description of each bed follows.

The "green" bed of coal is the lowest economic coal bed in the Gibson Coal Member. It occurs under most of the leased area, but it is thickest along the outcrop on the western edge of the Navajo leased area. The bed reaches thicknesses of 12 feet in this area. Thus, considerable reserves are available for strip mining. The old Window Rock coal mine produced coal from this bed. The bed thins to the east and south to a marginal minable thickness.

The "brown" bed of coal is about 20 inches thick in the northern portion of the Navajo lease and about 30 inches thick in the federal leases at the south end of the area. This bed can only be mined with the "green" bed, because it rarely exceeds 3 feet in thickness. One such location is in sections 1 and 2 and in the northern portion of sections 11 and 12, T. 17 N., R. 20 W., at the northern end of the Navajo lease.

The "blue" bed of coal is less than 5 feet thick in the northern portion of the Navajo lease, and usually can only be mined with the "green" bed, or the "fuchsia" bed, to provide a minable stripping ratio. This bed thickens to over 9 feet in sections 27, 28 and 29, and is a minable bed of coal in sections 5, 6, 7 and 8, T. 16 N., R. 20 W. Generally, in sections 2, 3, 4, 9, and 10, and extending north into the reservation, the "blue" bed is very poor. The bed thickens to about 5 feet in sections 15, 16, 21 and 22 and reaches 9 feet thick in sec. 14, T. 16 N., R. 20 W. This bed has provided the coal for most of the past production. It lies 40 to 60 feet above the "green" bed.

The "fuchsia" bed of coal is about 40 feet above the "blue" bed; it is one of the most important beds of coal in the leased area. In most places it is a zone of several beds, but in some places it forms one thick bed. This bed, or zone, is the most important with regard to coal thickness and occurs over the greatest strippable area. The poorest area is east of the Window Rock coal mine in sections 14, 15, 22, and 23; however, this area is also poor for all of the other beds, because it was probably a high area during the periods of coal deposition.

The "yellow" bed of coal lies 10 to 40 feet above the "fuchsia" bed. It occurs on the Navajo lease in three areas that are thick enough to strip mine. The "yellow" bed in sec. 12 lies about 40 feet above the "fuchsia" bed and is about 4 to 5 feet thick. It thins to less than 2 feet thick at the north line of the section. This bed can generally be mined with the other lower beds, but is too thin to be mined in any quantities by itself.

The "orange" bed of coal is separated from the "yellow" bed by a 15- to 40-foot-thick parting. It occurs in sections 15 and 22 on the Navajo lease. This bed is 7 feet thick at the west edge of the sections, and thins to 4 feet at the east edge of the sections. Owing to the erratic nature of this bed, little production is expected from it.

The quality of the coal will vary from place to place in each bed and somewhat from zone to zone. The company tries to maintain a BTU content of 10,000 to the Cholla plant, but at times the quality drops because of high moisture, parting and weathered coal. The power company buys the coal by its BTU content. The average quality is 9,500 to 10,500 BTU, 10 to 12 percent ash, 13 to 15 percent moisture and 0.5 to 0.7 percent sulphur. The coal does not slack easily; it will fire if not compacted, but not readily.

Since the inception of the McKinley operation, P & M officials have been cognizant of reclamation needs. Reclamation of the spoil piles was not required until about 1972, but the company was aware that the reclaiming of strip lands would become necessary because of public demand. Before the numerous state and federal regulations on reclamation were passed, the company leveled the peaks of the spoil piles and experimented successfully with planting small areas with various plants and shrubs. The federal leases and the Navajo lease were governed by the regulations of 30 CFR, part 211, which were revised in 1973 or 1974.

The state of New Mexico enacted the New Mexico Coal Surface Mining Act in 1972, and under these regulations P & M made application for a permit to mine coal by strip mining. After two hearings the permit was granted on December 17, 1973, and the state of New Mexico became responsible for the enforcement of the terms of the permit. It was determined that the best usage of the land following strip mining was for grazing. The primary commitment of P & M was to reclaim the affected areas so that they produced as much or more usable herbage than was produced before mining; this policy covered all lands under lease. The reclamation of the land now is essentially under the jurisdiction of the Office of Surface Mining; the change in enforcement occurred in 1977 when the Office of Surface Mining was created by the federal government. The rainfall in this area is 15-20 inches per year, which provides sufficient moisture for the revegetation of disturbed land without undue problems. The lands reclaimed now show the bureaucratic touch of careful grading of the spoil piles, row planting of foreign plants, and a strange setting now exists within an almost worthless area of sagebrush and juniper trees.

John H. Plumb, Vice President of the McKinley mine, began operations in February 1962 with 36 employees. Oscar Baize was Superintendent and Frank Barrett was Mine Foreman. In 1963 54 men were employed, and from 1965 to 1974 from 32 to 35 men were employed. Production and employment figures during the expansion period follow.

	Production	Employment
1974	500,000	45
1975	500,000	96
1976	800,000	71
1977	1,400,000	89
1978	2,900,000	241
1979	3,400,000	326
1980	4,570,000	351
1981	4,940,000	352
1982	5,250,000	362
1983	5,000,000	393
1984	5,100,000	435
1985	5,000,000	481
1986	4,800,000	473

In 1967 Alva Smith was made Mine Superintendent. He relinquished that position in 1968 to Harry White; John Schmidt was General Superintendent in Kansas City. R. R. Pertile was made General Manager in Kansas City in 1969. In 1970 the main offices for the operation of P & M western properties were moved to Denver with Charles Spielman as Western Division Manager. C. E. McKinney was made Mine Superintendent that year. In 1972 A. L. Smith was made Western Division Manager of the Albuquerque office. John H. Schmidt was Central & Western Division Manager in Pittsburg, Kansas, in 1975. In 1976 John C. Williams was Western Division Manager in Albuquerque. C. R. Rice was made Western Division Manager in 1978 in Denver.

This is the only coal mine in the state where a pick-up load or a million tons of coal can be bought. The company

employs a large percentage of Navajo Indians. Glen Ray Wright, Pit Foreman, was killed in 1974 by a fall from the pit wall while trying to free an electric cable. The McKinley mine is expected to continue operation for the next 20 to 25 years.

Weber prospect

SF 053287 **10–28–27** **Permit**
W. L. Weber, Rexburg, Idaho
Secs. 2, 6, T15N, R19W; secs. 28, 32, 34, T16N, R19W

The permittee drilled three diamond drills holes on permit land. Drill hole No. 1, located 840 ft east of the NW corner of sec. 2, cut into a coal bed from 159 ft to 166 ft 5 inches that had 5 ft 8 inches of coal and three partings of bony coal totaling 1 ft 9 inches. No commercial thickness of coal was found in the other two holes.

In this case file was a blueprint showing graphic sections of the described logs and also of three other logs, with a plan map showing their locations in sec. 11, T15N, R19W. The graphic logs are shown below. Approximate locations of the three graphic logs not on the permit land in sec. 11 were scaled from the map and are as follows:

DH 14	2,105 ft NL and 442 ft EL	6′ 4″ coal	235′
DH 15	812 ft NL and 2,448 ft EL	5′ 11″ coal	158′
DH 16	975 ft NL and 860 ft WL	5′ 9″ coal	115′

The permit was relinquished on March 9, 1929, without any more work being done. Sullivan Machinery Company drilled the three diamond drill holes on the Weber prospect. Albert Oleson was Drill Foreman. The three logs follow:

Drill Hole No. 1

The hole was located 840 ft E of NW corner sec. 2, T15N, R19W on February 11, 1928. The elevation at the top of the hole was 6,451 ft.

0′–42′	Alluvium sand and clay
42′–56′	Sandstone, thin beds of shale
56′–154′	Shale, some sandstone, 7″ coal at 67′ 5″ and 6″ coal at 120′
154′–159′	Sandstone
159′–160′ 6″	Coal 1′ 6″
160′ 6″–160′ 8″	Bony coal 0′ 2″
160′ 8″–163′ 7″	Coal 2′ 11″
163′ 7″–164′ 2″	Bony coal 0′ 7″
164′ 2″–165′ 5″	Coal 1′ 3″
165′ 5″–166′ 5″	Bony coal 1′ 0″
166′ 5″–175′	Shale
175′–176′	Coal 1′ 0″
176′–177′	Shale
177′–178′ 6″	Bony coal 1′ 6″
178′ 6″–199′ 6″	Shale
199′ 6″–215′	Sandstone
215′–217′	Shale
217′–226′ 6″	Sandstone
226′ 6″–255′ 6″	Shale, 2 thin seams of bony coal
255′ 6″–256′ 6″	Coal 1′ 0″
256′ 6″–258′	Shale
258′–274′	Sandstone
274′–283′	Shale
283′–294′	Sandstone
294′–296′ 6″	Coal 2′ 6″
296′ 6″–327′ 6″	Shale, 6″ coal at 314′ (total depth)

Drill Hole No. 2

The hole was located 1,860 ft E of WL, 1,148 ft N of SL sec. 34, T16N, R19W on February 21, 1928. The elevation at the top of the hole was 6,474 ft.

0′–15′	Alluvium
15′–27′	Sandstone
27′–30′	Shale
30′–43′	Sandstone
43′–49′	Shale
49′–92′	Sandstone
92′–95′ 3″	Shale
95′ 3″–101′ 6″	Sandstone
101′ 6″–107′ 6″	Shale, 6″ coal at 102′ and 106′
107′ 6″–108′ 6″	Coal 1′ 0″
108′ 6″–124′ 4″	Shale
124′ 4″–125′ 10″	Coal 1′ 6″
125′ 10″–128′ 6″	Shale
128′ 6″–130′ 0″	Coal 1′ 6″
130′–133′	Shale
133′–135′	Coal 2′ 0″
135′–141′ 6″	Shale
141′ 6″–143′	Coal 1′ 6″
143′–144′	Bony coal
144′–153′	Shale
153′–166′ 6″	Sandstone, some shale
166′ 6″–167′	Coal 0′ 6″
167′–169′	Shale
169′–170′	Bony coal
170′–173′ 4″	Dirty coal
173′ 4″–179′ 4″	Sandy shale
179′ 4″–180′	Coal 8″
180′–184′ 6″	Sandy shale
184′ 6″–185′ 6″	Coal 1′
185′ 6″–197′	Sandstone and shale
197′–207′	Sandstone
207′–212′	Sandstone, 2 thin seams of coal
212′–216′ 9″	Shale
216′ 9″–219′ 9″	Bony coal
219′ 9″–223′	Shale
223′–224′ 6″	Coal 1′ 6″
224′ 6″–232′	Shale
232′–242′ 10″	Sandstone (total depth)

Drill Hole No. 3

The hole was located 1,254 ft from WL and 1,006 ft from SL sec. 32, T16N, R19W on March 2, 1928. The elevation at the top of the hole was 6,487 ft.

0′–18′	Alluvium
18′–30′	Sandstone
30′–60′	Shale
60′–89′	Sandstone
89′–113′	Shale, 1′ coal at 96′
113′–161′	Sandstone
161′–201′	Shale
201′–219′	Sandstone
219′–249′	Shale
249′–260′	Sandstone
260′–262′	Coal 2′ 0″
262′–269′	Bony coal and shale
269′–281′ 11″	Shale
281′ 11″–283′ 4″	Coal 1′ 5″
283′ 4″–283′ 9″	Bony coal
283′ 9″–288′	Shale
288′–289′	Bony coal
289′–314′	Shale, some sandstone (total depth)

Chaco Canyon coal field

Robin C. Lease (Shomaker et al., 1971, p. 52) described the Chaco Canyon coal field this way:

> The Chaco Canyon upper Menefee area is a northwestward-trending area of Menefee Formation outcrop in the southern San Juan Basin. . . . It is bounded on the southeast by R. 8 W. and on the northwest by the Navajo Indian Reservation boundary (T22, 23N, R14W). In terms of coal beds there are two areas of interest: the South Chaco Canyon National Monument subarea and the La Vida Mission subarea.

Coal in these areas was probably used by the Indians before the advent of white men. There are only two mines mentioned in the literature, the Blake mine in sec. 13, T22N, R13W in the La Vida Mission area, and the Pueblo Bonita mine in sec. 14, T2ON, R11W. Both mines were small and furnished coal for the local trading posts and for domestic fuel. Robin Lease calculated that there were 1-1.9 million tons of strippable coal in the La Vida Mission area (Shomaker et al., 1971, p. 56). The area covered by the Chaco Canyon coal field is shown in Figure 1.

Blake mine

Sec. 13, T22N, R13W

The only information found concerning the Blake mine includes a cross section of the coal bed and an analysis. The cross section shown below was taken from Bauer and Reeside (1921, p. 188).

Sandstone	
Coal	1′ 7″
Shale	1′ 1″
Coal	1′ 5″
Sandstone	

The analysis quoted from Bauer and Reeside (1921, p. 183) is as follows:

Moisture	19.0%
Volatile matter	32.4%
Fixed carbon	43.2%
Ash	5.4%
Sulphur	0.92%
Calories	5,665
BTU	10,190

There are several abandoned mines along the north rim of Tsaya Canyon in section 13, one of which was the Blake mine.

Pueblo Bonita mine

The Wetherills, 1905–?
Sec. 14, T20N, R11W

The Pueblo Bonita mine, located in the south wall of Chaco Canyon, was opened on a bed of good subbituminous coal, which occurs below the upper sandstone of the Mesaverde Formation. The mine was opened by the Wetherills in 1905 by a 30-ft drift to the rise of the coal bed, and the coal was used at the Putnam post office (1901–1911) and an Indian trading post (Shaler, 1907, p. 405).

A cross section at the mine, measured by Shaler (1907, p. 405), follows:

Sandstone, upper	
Coal, bony	1′ 6″
Coal	3′ 8″
Coal, bony and sandstone, variable	4″
Coal	2′ 4″

In 1921 Bauer and Reeside (1921, p. 188) visited the mine and cut a cross section as follows:

Bone	2″	
Coal	2′ 8″	sampled
Bone	6″	
Coal	1′ 7″	sampled
Carbonaceous shale	2′ 6″	
Coal, impure	2′ 4″	

Analysis of a sample taken by Bauer and Reeside (1921, p. 199) 1 mi west of the store, in sec. 14, T21N, R11W, follows:

Moisture	14.4%
Volatile matter	34.8%
Fixed carbon	43.3%
Ash	7.5%
Sulphur	1.54%
Calories	5,680
BTU	10,220

The duration of the mine and the extent of its production are unknown.

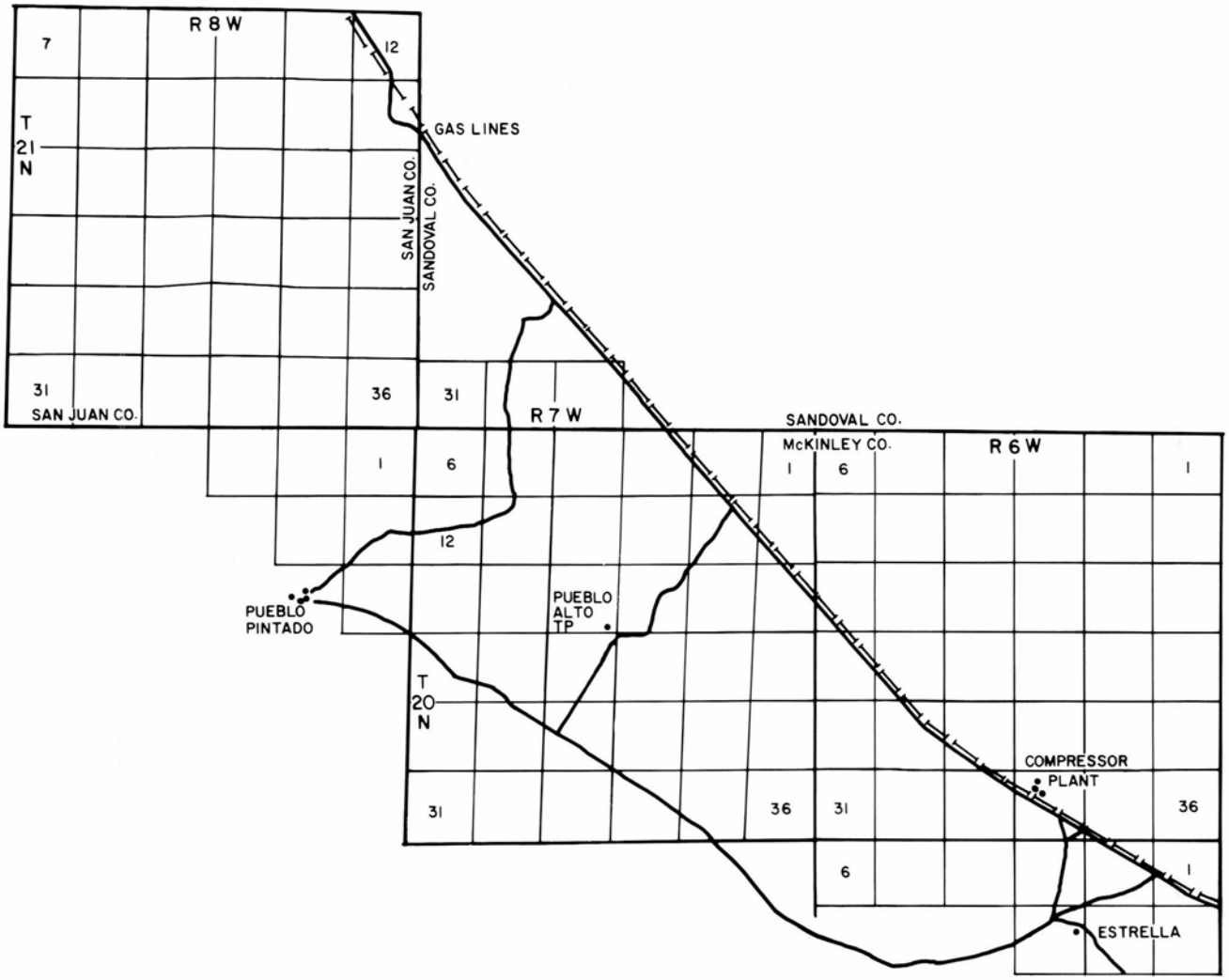
Star Lake coal field

The Star Lake coal field is a continuation of the Bisti coal field eastward (see Fig. 1) and covers an area occupied by the Fruitland Formation from the eastern edge of R9W and extending eastward into R1W; minable coal ends, however, near the west edge of R4W. Figures 62 and 63 were made to show the area and aid the reader in following the land descriptions given in this section.

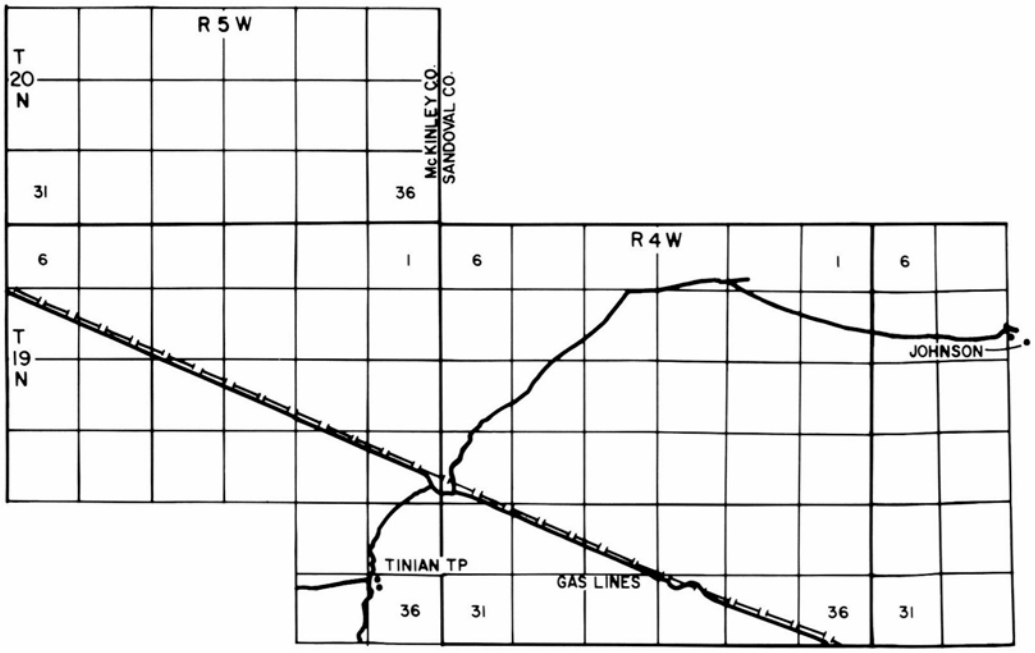
The first mining was by the Navajo Indians for their winter fuel. One known pit is in the center of sec. 9, T19N, R5W, and there is evidence of underground workings in NW1/4NW1/4 sec. 7 of the same township and in the vicinity of the Star Lake Trading Post. The first consideration of the field as a possible source of a large coal reserve occurred in 1962 when Edward Beaumont, Consulting Geologist, examined the field for the Public Service Company of New Mexico. The remoteness of the area, the lack of water, and the low grade of the coal discouraged further interest at that time.

In June 1966 Paul F. Faust, a promoter from Denver, filed prospecting permit applications over a large area in Rgs. 7W and 8W. Some of these permits were issued to him, but no work was done, and they expired by law in 2 years. In September 1966 United Electric Coal Companies (United Electric) submitted prospecting permit applications for a large area across Rgs. 3W, 4W, 5W, and 6W. The lands not in conflict with previously filed permits were approved except those lands across R6W, which were determined to be subject to competitive lease. The permits issued to United Electric were all drilled, and the only coal of interest was found on Permit NM 585 across three sections in R5W. A preference right lease application was filed, but the lease issuance is still pending. Freeman United Coal Company now holds the lease application and has plans for an operation to be known as the Salazar project. The other permits were cancelled, but the drilling results are presented for their informational value in the chapter on the Salazar project.

A competitive lease sale was held in Santa Fe on May 16,



FIGURES 62 and 63—Plan maps of the Star Lake coal field showing the area of federal coal prospecting permits and leases. The maps were copied from Bureau of Land Management quadrangle maps. Each square = 1 mi.



1967, for all of the strippable coal on federal lands across R6W. C. B. Branan, Jr., and his partner Warren Shear bid $1.11 per acre and received a lease for the lands. No other bids were offered. The lease changed hands several times, and as of 1977 it was controlled by Chaco Energy Company, who still holds the lease. The company obtained additional adjacent lands, which included options to Santa Fe Railroad lands, preference right leases held by Thermal Energy Company, and state leases. Chaco Energy has obtained a mining permit from the state and has submitted mining plans to the government for the development of this block of land, to be known as the Star Lake project.

In 1968 Leland A. Hodges obtained prospecting permits on land in R8W, which was drilled. Good minable beds were discovered. The permits were assigned to Thermal Energy Company, and applications for preference right leases were submitted. Thermal Energy gave Chaco Energy an option, later dropped, and the Alamito Coal Company now holds the option, along with adjacent Santa Fe Railroad lands. Planned development of this block of coal land is known as the Gallo Wash project.

Development of the area has been held up because the Star Lake Railroad Company, a subsidiary of Santa Fe Railroad, has been unable to obtain a right-of-way across land belonging to individual Navajo Indians; negotiations continue. The railroad company not only has plans to haul Chaco Energy and other companies' coal from the Star Lake field, but it also plans to accommodate the Hospah project and to extend the line westward for mines in the Bisti field as they come on stream. I believe that plans for a railroad across the southern edge of the Fruitland Formation will not be carried out until the government issues the pending preference right leases. If reliable companies are given clear title to the coal reserves they will be able to generate and justify the large capital expenditures for development of the area.

The Star Lake coal needs to be cleaned before shipment. The water necessary for the operation of cleaning plants is available from the Westwater Formation, as demonstrated by a water well drilled by Chaco Energy near the Star Lake Trading Post. The Westwater Formation underlies the coal fields along the southern edge of the Fruitland Formation, and this huge aquifer could be drilled for water suitable for dust suppressant and plant uses. It may not be fit in all areas for human use or for irrigation to promote plant growth on the reclaimed spoil piles. The Westwater Formation wells will exceed 3,000 ft in depth, but they have artesian possibilities.

All of the Star Lake field has been drilled on 160 acres and much of it on 40-acre centers. The large reserves of stripping coal determined by this exploration will support two large strip mine operations and possibly one smaller one.

Gallo Wash project

NM 8128 **7-1-69** **Permit**
NM 8130 **7-1-69** **Permit**
Leland A. Hodges, Trustee, Houston, Texas (?)
Thermal Energy Company, Dallas, Texas
Thermal Energy Company-Peabody Coal Company, St. Louis, Missouri
NM 8128
SE1/4SE1/4 sec. 8; S1/2 sec. 9; S1/2 sec. 10; sec. 15; E1/2 sec. 17; W1/2 sec. 22; SW1/4 sec. 25; SW1/4NE1/4, W1/2, SE1/4 sec. 26; sec. 27; lots 1-8, NE1/4, N1/2SE1/4 sec. 34; sec. 35; T21N, R8W, 4,498.56 acres NM 8130
Sec. 6; NE1/4 sec. 7; SW1/4 sec. 8; T2ON, R7W, 973.22 acres
Sec. 1; lots 1, 2, 3, 4, S1/2NE1/4, SE1/4NW1/4 sec. 2; lots 1, 2, sec. 3; NE1/4 *sec.* 12, T2ON, R8W, 2,133.42 acres

NM 11670 **9-1-70** Permit
Sharon Allen La Rue, Dallas, Texas
E. B. La Rue, Jr., Dallas, Texas
Thermal Energy Company, Dallas, Texas
Lots 3, 4, E1/2SW1/4 sec. 7; W1/2 sec. 17; sec. 18, T21N, R8W, 1,118.55 acres

The lands are about 2.5 mi north of Pueblo Pintado. Paul F. Faust acquired permits for practically all of the subject lands on July 1, 1966, and 50% of the permits were assigned to Atlantic Richfield Company on November 1, 1967, and 50% to C. B. Branon, Jr., on January 1, 1968. These permits expired on June 30, 1968, for lack of any exploration that would justify an extension.

On October 21, 1968, Leland A. Hodges, Trustee, made application for NM 8128 and NM 8130 permits, which were issued on July 1, 1969; a limited number of holes were drilled. The results of this drilling showed that several beds of commercial coal exist on the land. Mr. Hodges relinquished a small part of the original permit NM 8130 land on June 24, 1970.

E. B. La Rue, Jr., became interested in the land, and, effective April 1, 1971, Mr. Hodges assigned the permits to Thermal Energy Company, in which Mr. La Rue held one-third interest. During the same month Peabody Coal Company acquired an undivided 50% interest in the Hodges permits. On April 13, 1970, Sharon Allen La Rue filed for a permit; she was issued permit NM 11670 on September 1, 1970.

Peabody Coal Company began a drilling program to determine the thickness of the coal beds, to locate their outcrops, to correlate the beds, and to determine strippable reserves and the quality of the beds. The drilling was done in a random pattern. At the same time Peabody drilled on lands under permit NM 11670. It was found that coal beds under the Hodges permits were commercial deposits that could be strip mined. The coal bed under NM 11670 lands is of commercial thickness, but it is difficult to open because the coal crops out off the permit area and a producing oil field covers much of the land. Peabody Coal Company did not obtain an interest in this permit.

Thermal Energy Company made application for preference right leases on NM 8128 and NM 8130; the application was received by the BLM on January 26, 1972. The company also applied for a preference right lease on NM 11670 on March 20, 1972.

The Gallo Wash project is currently under option to Chaco Energy Company. That company has presented its plans for the area to the Environmental Impact Statement team, which is preparing a statement regarding coal that covers a large area of federal lands in the northwest part of the state. The preference right leases are still held by Thermal Energy-Peabody Coal Company and have not been transferred to Chaco Energy.

Salazar project

NM 585 **10-1-67** **Permit**
United Electric Coal Companies, Chicago, Illinois
Freeman United Coal Mining Company, Mt. Vernon, Illinois S1/2 sec. 3; sec. 4; S1/2 *sec.* 5; lots 6, 7, E1/2SW1/4, SE1/4 sec. 6; lots 1, 2, E1/2NW1/4, NE1/4 sec. 7; N1/2 sec. 8; N1/2, SW1/4, **E1/2SE1/4, SW1/4SE1/4 sec. 9, T19N, R5W, 2,811.17** acres

The permit area is 3 mi east of the Star Lake Compressor Plant and extends 3 mi from there to the east. Probably the earliest use of the coal in this area was from small pits mined by Indians in sec. 9 and sec. 7, T19N, R5W. From 1926 through 1933 several permits were issued in the township, mostly on the land now covered by United Electric Coal Companies permits, but no or very little work was ever done on those old permits.

Edward C. Beaumont, Consulting Geologist, examined the outcrops in the area in 1960 for the Public Service Company of New Mexico. He reported the coal to be of poor quality; thus, the company did not show further interest in the property. Paul F. Faust filed an application on June 1, 1966, for lands in T19N, R6W; the application was rejected because the area was classified as known coal lands. He also filed for lands in sec. 7, T19N, R5W, but later withdrew that application.

On September 22, 1966, United Electric Coal Companies filed for permits NM 584 and NM 585 in this general area. NM 585 was approved by the USGS on August 3, 1967, and the permit was issued October 1, 1967. H. B. Nickelson, Mining Engineer, spent several weeks in the area mapping the outcrops in T19N, Rgs. 5 and 6W, before the permit was recommended.

The company drilled 37 test holes totaling 4,130 ft in the early part of 1968. The results of the drilling showed that part of the land was barren of coal, and therefore the original 4,897.48 acres in the permit were reduced to 2,811.17 acres on September 12, 1968. The lands described in the heading were retained. The thickness and extent of the coal beds were determined, which gave a picture of the coal geology in the immediate area. More detail could have been obtained regarding the quality of the coal by additional core drilling; this will have to be done to determine the feasibility of the deposit for development. Problems in regard to Indian surface rights will be forthcoming, but undoubtedly they can be resolved. The company made an application for a preference right lease on September 20, 1971.

United Electric Coal Companies was a part of the Division of Materials Service Corporation; the latter merged with Freeman United Coal Mining Company and informed the BLM of this merger on August 23, 1977. United Electric Coal Companies is therefore now absorbed into the Freeman United Coal Mining Company.

Freeman United Coal Mining Company applied to the BLM for an exploration license, a method of exploration allowed under recently enacted regulations. The company was granted a license (NM 29970) on October 26, 1977, and began exploration soon after. The program consisted of drilling the permit on about 40-acre centers. Roland C. Townsend, Consulting Geologist from Green Valley, Arizona, was in charge of the drilling and evaluation. The information in regard to coal thickness and quality is proprietary information. The environmental information was submitted to the Bureau of Land Management's Environmental Impact Statement (EIS) team, which wrote an EIS for the Bisti-Star Lake area and other parts of the northwest section of the state. The EIS was completed in late 1981 or 1982.

The preference right lease has not been issued, and issuance at an early date appears to be unlikely.

Star Lake project

NM 2457 **9-1-67** **Lease**
C. B. Branon, Jr., Oklahoma City, Oklahoma, and Warren Shear, Duncan, Oklahoma
Seneca Oil Company, Oklahoma City, Oklahoma
E. B. La Rue, Jr., Dallas, Texas
Thermal Energy Company, Dallas, Texas
Peabody Coal Company, St. Louis, Missouri
Chaco Energy Company, Albuquerque
Lots 1, 2, 3, and 4, S^1/2NE^1/4, E^1/2SE^1/4 sec. 4; lots 1 and 2, sec. 5; N^1/2 sec. 10; T19N, R6W; S^1/2 sec. 17; lots 3 and 4, E^1/2SW^1/4, SE^1/4 sec. 18; S^1/2 sec. 26; S1/2 sec. **27; lots 3 and 4, N^1/2, N^1/2SE^1/4 sec. 34; and all of secs. 19, 20, 21, 28, 30, and 35, T2ON, R6W, 6,336.12 acres**

M15597 and M15596 **State leases**
Thercol Energy Company, Dallas, Texas
Sec. 2, T19N, R6W
Railroad fee lands
Cherokee and Pittsburg Coal and Mining Company, Albuquerque
Secs. 29, 32, 33, and 36, SW^1/4 sec 34; T2ON, R6W; secs. 1, 3, 11, and 12, T19N, R6W; secs, 13, 14, 15, 23, 24, and 25, T2ON, R7W
NM 8715 **1-1-70** **Permit**
1-21-72 **Preference right lease application**
E. B. La Rue, Jr., and Sharon Allen La Rue, Dallas, Texas
Thermal Energy Company, Dallas, Texas
S^1/2 sec. 3; N^1/2 sec. 5; secs. 10 and 11, T2ON, R7W, 1,921 acres

Interest in the coal potential of the Star Lake area was shown in 1962 by the Public Service Company of New Mexico. At that time Edward C. Beaumont, Consulting Geologist, was evaluating lands for large reserves of coal, but the distance from the proposed powerplants and the problem of availability of water discouraged the company from obtaining the lands.

On June 1, 1966, Paul F. Faust of Denver, Colorado, filed coal prospecting permit applications for lands in the area, and at about the same time the United Electric Coal Companies also applied for permits on parts of the lands. The engineers in the Mining Supervisor's office examined the lands and found a bed of coal cropping out across the southern edge of the lands. One especially interesting coal outcrop was in the bottom of the Chaco Wash, where a 10-12-ft bed of coal was exposed for about 0.5 mi. The existence and workability of the coal were confirmed. The prospecting permit applications were then rejected, and the lands were recommended for competitive lease.

The lands were advertised to be sold by competitive bid, and the resultant sale was held at Santa Fe on May 16, 1967. C. B. Branon, Jr., and his partner, Warren Shear, bid $1.11 per acre. No other bids were offered. The effective date of lease NM 2457 to the partners was September 1, 1967.

Mr. Branon and Mr. Shear had bought the lands for speculation, and within a year, on June 1, 1968, the BLM approved an assignment of the lease from them to the Seneca Oil Company. Mr. Branon and Mr. Shear received a cash settlement and an overriding royalty in the agreement.

The Seneca Oil Company did not work on the lease itself, but entered into an agreement to sell to E. B. La Rue, Jr., after testing of the lands. One hole was to be drilled on each section to determine the coal thickness because the sale price was to be based on estimated reserves plus an override royalty. Mr. La Rue needed a mining and exploration company to evaluate the land, and an agreement was started with the Peabody Coal Company, which began a drilling program in January 1972 to drill the holes required by Seneca. The drilling results were favorable, which fulfilled the commitment, and the lease was then assigned to Mr. La Rue on April 1, 1974.

Effective on December 1, 1974, Mr. La Rue assigned the lease to the Thermal Energy Company, a joint venture then composed of Murcol, Inc., a Nevada corporation; Spenco, Inc., a Nevada corporation; Planet Oil and Mineral Corporation, a Delaware corporation; Dalco Oil Company, a Texas corporation; and E. B. La Rue, Jr., and his wife Sharon Allen La Rue of Dallas, Texas. (Dalco Oil Company and Planet Oil and Mineral Corporation have since merged to form the Sabine Corporation, recognized by the BLM on October 21, 1977.) In the same BLM decision, effective December 1, 1974, Thermal Energy Company assigned 51% interest in the lease to Peabody Coal Company, which became the operating company. This lease (NM 2457) was assigned to Chaco Energy in February 1977 and is still held by that company.

Peabody Coal Company began a drilling program to determine reserves, correlate the coal beds, and do basic en-

gineering work toward developing a strip mine on this lease and on the state leases in sec. 2. This basic engineering reportedly required 369 drill holes, approximately one hole for every 40 acres and additional holes for the outcrop determination.

Other lands in the planned Star Lake project include those described under Cherokee and Pittsburg Coal and Mining Company (see chapter heading for this section). The lands were held by the Santa Fe Pacific Railroad, a Cherokee and Pittsburg affiliate. Cherokee and Pittsburg drilled 222 holes from 1972 to 1974 to determine the extent of the coal resources on these lands.

In late 1975 the Salt River Power Company approached Peabody Coal Company, Thermal Energy Company, and Cherokee and Pittsburg Coal and Mining Company to buy coal for the Coronado plant near St. Johns, Arizona. The plans advanced to a point where an Environmental Impact Statement (EIS) was started for the proposed coal mine and railroad, but the proposition and this part of the Coronado EIS were dropped, reportedly because the price asked by Cherokee and Pittsburg was too high.

The status of other lands that could become a part of the large Star Lake project was in limbo as of 1979. On May 26, 1969, E. B. La Rue, Jr., and Sharon Allen La Rue filed a prospecting permit application; they received permit NM 8715 dated January 1, 1970. By June 1970, Mr. La Rue had drilled 10 holes. On March 18, 1971, an option agreement was signed between Thermal Energy Company and Peabody Coal Company and acknowledged by the BLM on April 7, 1971. The permit was assigned to Thermal Energy Company on June 9, 1971. The permit, originally valid until January 1, 1972, was extended for an additional 2 years. Before the expiration of the permit Peabody Coal Company drilled an additional 16 holes on secs. 10 and 11, and one bed of coal was found that is commercial.

On January 21, 1972, Thermal Energy Company made application for a preference right lease on this land. The lease has not been issued. In 1977 the Solicitor, Division of Energy and Resources, cancelled both the permit and the right for lease. The permittee appealed the case, and eventually they obtained preference right lease application NM 8715, but this pending lease is now held by Chaco Energy.

Early in 1976 Texas Utilities Service, Inc., approached Thercol Energy Company (the new name for Thermal Energy Company and Peabody Coal Company) and Cherokee and Pittsburg Coal and Mining Company, a subsidiary of Santa Fe Industries, Inc., to obtain their lands. They wanted to develop coal mines to provide coal to upgrade the lignite mined in Texas and phase out natural gas, which is used to power their electric generators. By late 1976 Texas Utilities Service, Inc., had formed Chaco Energy Company to handle this large development.

Chaco Energy Company check-drilled their optioned lands and submitted mining plans and data for the required Star Lake-Bisti EIS to the BLM. The Santa Fe Railroad planned to build a railroad from their main line near Prewitt to the Star Lake area to transport the coal to Texas. The lease at this time has not been assigned to Chaco Energy Company pending the final analysis of the EIS for the Star Lake-Bisti area and the EIS for the proposed railroad. The first draft of the latter EIS was released during July 1978.

Chaco Energy Company planned to produce 2 million tons of coal by 1980, 3.2 million tons each year for 1981 and 1982, 5.1 million tons in 1983, 6 million tons each year for 1984-1986, and eventually 8 million tons per year. The coal reserves are present in the Star Lake project area. These plans have not materialized because of continuing problems with building a railroad in the area.

The Star Lake project involves two thick beds of coal in the Fruitland Formation that extend from the east township line in R6W west to the west line of secs. 10 and 15 in township T2ON, R7W. The lands are now optioned or controlled by Chaco Energy Company and can be strip mined along an outcrop 9-10 mi long and north from the outcrops for approximately 1.5 mi. The eastern edge of this unit is a property boundary, but the western edge is a depositional boundary. The coal is typical Fruitland coal that will require cleaning if it is transported from the site.

State section 32, leased to Cherokee and Pittsburg and optioned to Chaco Energy Company, will probably provide ground for the plant site. One water well was drilled on this section through the Westwater Canyon Member of the Morrison Formation. Artesian water of poor quality from this well can provide cleaning plant water and water for dust abatement but probably cannot be used for irrigation of the reclaimed land. Considerable strippable coal may have to be left in the ground along the 36,000 ft of right-of-way that belongs to the Southern Union Gas Company gas pipe lines and the oil line owned by the Texas-New Mexico Pipeline Company. There is also a gas compressor plant in sec. 34. If the lines are not moved, the coal north of these lines may also have to be left. The lines could be moved, but the expense would be great.

The Star Lake and Gallo Wash projects have not been consummated because a railroad line to transport the coal from the field to the Atchison, Topeka and Santa Fe Railroad main line near Prewitt could not obtain the right-of-way and the necessary environmental and political sanctions. I believe that there was also the question that there were not enough coal reserves across the southern Fruitland outcrop that were actually owned or leased by companies to justify the economics of a railroad into the area. A large portion of the coal reserve is held by the federal government, and until preference right leases are issued to applicants this coal reserve is not collateral to raise money to develop the area. Coal is only a black rock in the ground until it can be exploited. Texas Utilities Service, Inc., could have blended their Texas lignite with the coal of the Star Lake coal field to increase the BTU value of the lignite they now use to fuel their powerplants in east Texas. The blended fuel would also have a lower sulphur content, a step toward controlling acid rain.

Thermal Energy Company prospect (Star Lake field)

NM 8717 **3-1-70** **Permit**
E. B. La Rue, Jr., Dallas, Texas
Sharon Allen La Rue, Dallas, Texas
Thermal Energy Company, Dallas, Texas
Peabody Coal Company, St. Louis, Missouri

Some of the lands on permit NM 8717 were formerly held by United Electric Coal Companies under permits NM 583 and NM 585. That company drilled 37 holes on NM 585 in the early part of 1968 and relinquished all of NM 583 and part of the lands in NM 585 in September of 1968. E. B. La Rue, Jr., included part of these lands under this permit. Exploratory drilling by the United Electric Coal Companies determined the workability of the coal deposit in this township. As a result of this drilling the SE1/4 of sec. 33, the S½ and S1/2NE1/4 of sec. 34, and the Nib of sec. 38, T2ON, R5W, were classified as known coal lands.

Mr. La Rue filed for an amended permit after his original permit was denied because the lands he filed for were not contiguous. The following lands were requested in the amended permit:

Secs. 1, 10, 11, 12; W½NE¼, NW¼, NW¼SE¼, N½SW¼ sec. 14; NE¼, N½NW¼, NE¼SE¼ sec. 15, T19N, R5W; S½NE¼, NW¼, S½ sec. 25; E½SE¼, SW¼SE¼ sec. 26; NE¼, E½NW¼, SW¼NW¼, S½ sec. 35, T2ON, R5W, 4,445.44 acres

The permit for these lands, NM 8717, was issued March 1, 1970. On January 22, 1970, Mr. La Rue requested the withdrawal of the following lands, which was granted:

W'/2, SE1/4, S1/2NE1/4 sec. 25; 0/2SE^1/4, SW^1/4SE^1/4 sec. 26, T2ON, R5W, 680 acres, leaving 4,165.44 acres

During April and May 1970, nine holes were drilled on the lands. On February 17, 1971, Mr. La Rue relinquished all but the following land, for which a preference right lease had been requested:

NE1/4, E1/2NW1/4, SW1/4NW1/4, S1/2 sec. 35, T2ON, R5W, leaving 600 acres

An option agreement, dated March 18, 1971, between Thermal Energy Company and Peabody Coal Company as a joint venture was acknowledged by the BLM. In March and April 1971, Peabody Coal Company drilled six additional holes on sec. 35, and on July 1, 1971, the La Rues assigned the permit to Thermal Energy Company. A preference right lease application from that company was received by the BLM on January 26, 1972.

The exploration drilling on the permit land and on state sec. 36 determined that there was sufficient reserve for a small strip mine unit. Chaco Energy Company had plans to mine this coal with their Star Lake project. The coal would have to be trucked about 7 mi to their proposed cleaning plant and railhead to be located on sec. 32, T19N, R6W.

Chaco Energy Company had an option to acquire the lands under this preference right lease application. The assignment was not made, and Peabody/Thermal still holds NM 8717.

United Electric Coal Companies Star Lake-Johnson Trading Post project

United Electric Coal Companies, Chicago, Illinois

NM 583 7-1-67 Permit
Parts of secs. 7, 18, 20, 21, and all of sec. 17, T19N, R4W; parts of secs. 13 and 14 and all of secs. 11 and 12, T19N, R5W, 4,076 acres

NM 584 2-1-67 Permit
Parts of secs. 7, 18, 19, 29, and 30 and all of secs. 8, 17, and 20, T19N, R3W, 3,431 acres

NM 587 7-1-67 Permit
Parts of secs. 10, 11, 12, 13, 14, 16, 22, 25, and 26 and all of secs. 9, 15, 23, and 24, T19N, R4W, 5,120 acres

The United Electric Coal Companies applied for prospecting permits on land along the Fruitland Formation from Ranges 3W-5W, T19N. Another permit, NM 585, was also obtained, the lands of which are not described here because after prospecting the company discovered a commercial quantity of coal and applied for a preference right lease. The lease, which is still pending, is now held by Freeman United Coal Company; because the lease is pending the drilling results on NM 585 are considered proprietary information.

The United Electric Coal Companies did not consider the 10-ft bed of coal, which was discovered on the N'/2 sec. 9 and the NW^1/4 sec. 10 and projected into the S1/2 sec. 4, T19N, R4W, to have sufficient reserve to be of interest to them, and the permits expired by law. It is estimated from the drilling that 10 million tons of strippable coal exist on the above lands.

The drill logs of 12 holes follow. Many of these holes have no coal intercept, but I consider negative information as valuable as data from holes drilled that intercept coal beds. This drilling information also shows that the Fruitland coal beds are poor or nonexistent east of sec. 9, T19N, R4W.

Hole 15
Location: NW corner sec. 11, T19N, R5W

0'-13'	Shale
13'-35'	Sandstone
35'–38'	Brown and carbonaceous shale
38'–44.7'	Gray shale
44.7'–45.6'	Coal 0.9'
45.6'–48'	Brown shale
48'–60'	Sandstone, T.D.

Hole 31C
Location: 1,150 ft SL, 2,200 ft WL, sec. 11, T19N, R5W, on top of Little Blue Mesa

0'–6'	Sand
6'–28'	Sandstone
28'–28.6'	Soft coal 0.6'
28.6'–31.5'	Shale
31.5'–32.3'	Soft coal 0.8'
32.3'–33.7'	Coal 1.4'
33.7'–35'	Carbonaceous shale
35'–37'	Brown shale
37'–63.5'	Brown and gray sandstone
63.5'–71'	Carbonaceous to brown shale
71'–71.5'	Coal 0.5'
71.5'–76'	Brown to gray shale
76'–100'	Gray sandstone, T.D.

Hole 35
Location: N^1/$_4$ corner sec. 11, T19N, R5W

0'–52'	Brown and gray shale
52'–59'	Sandstone
59'–61'	Brown shale
61'–80'	Brown and gray sandstone
80'–83'	Gray shale
83'–94.5'	Sandstone
94.5'–96.6'	Poor sandy coal 2.1'
96.6'–105'	Carbonaceous shale to gray shale
105'–160'	Gray sandstone, T.D.

Hole 35
Location: N^1/$_4$ corner sec. 7, T19N, R3W

0'–40'	Sand lost the hole—middle of the wash

Hole 14
Location: on the road 1,150 ft NL, 100 ft WL, sec. 8, T19N, R3W

0'–21'	Sand
21'–61.8'	Sandy shale to 1' brown shale
61.8'–62.5'	Coal 0.7'
62.5'–64.3'	Shale
64.3'–67.8'	Coal 3.5'
67.8'–69'	Shale and dull coal 1.2'
69'–175'	Gray sandstone, T.D.

Hole 33–1
Location: on the road 2,200 ft SL, 2,100 ft WL, sec. 8, T19N, R3W

0'–3'	Shale
3'–5.3'	Coal 2.3'
5.3'–5.5'	Sandstone
5.5'–6.5'	Coal 1.0'
6.5'–9.0'	Shale
9.0'–20'	Sandstone, T.D.

Hole 33 cored
Location: 2,100 ft WL, 2,650 ft SL, sec. 8, T19N, R3W

0'–9'	Sand
9'–35.7'	Shale
35.7'–36.8'	Coal 1.1'
36.8'–40'	Shale
40'–40.6'	Coal 0.6'
40.6'–40.8'	Sandstone
40.8'–43.7'	Coal 2.9'
43.7'–43.9'	Sandstone
43.9'–44.7'	Coal 0.8'
44.7'–60'	Sandstone, T.D.

Coal sampled for analysis	40'–44.7'
Moisture	9.44%
Ash	30.49%
Volatile	27.40%
Fixed carbon	32.67%
Sulphur	0.57%
BTU	8,161

Hole 45
Location: on the road 1,300 ft EL, 100 ft NL, sec. 8, T19N, R3W

0′–15′	Alluvium
15′–42′	Shale
42′–63′	Sandstone
63′–73′	Shale
73′–97′	Sandstone
97′–107.5′	Brown to gray to brown shale
107.5′–108′	Coal 0.5′
108′–108.5′	Sandstone
108.5′–112.7′	Coal 4.2′
112.7′–113′	Sandstone
113′–113.6′	Coal 0.6′
113.6′–200′	Gray sandstone, T.D.

Hole 43
Location: 1,700 ft EL, 2,640 ft SL, sec. 18, T19N, R3W

0′–3′	Sand
3′–13′	Shale
13′–125′	Sandstone
125′–128′	Brown shale
128′–153′	Gray sandstone, T.D.

Hole 15
Location: NW corner sec. 30, T19N, R3W

0′–47′	Sand
47′–62.2′	Sandy shale
62.2′–135′	Sandstone
135′–140′	Gray shale
140′–170′	Gray sandstone
170′–200′	Sandy shale, T.D.

Hole 42B
Location: 600 ft EL, 1,200 ft SL, sec. 7, T19N, R4W

0′–16′	Sand
16′–25′	Sandstone
25′–37.8′	Shale
37.8′–44.3′	Coal 6.5′
44.3′–44.8′	Dull coal 0.5′
44.8′–47.5′	Shale
47.5′–50′	Coal 2.5′
50′–86′	Sandstone
86′–100′	Sandy shale, T.D.

Hole 12C
Location: on the road 1,900 ft SL, 100 ft WL, sec. 9, T19N, R4W

0′–3′	Sand
3′–8′	Sandy shale
8′–21′	Sandstone
21′–26′	Sandy shale
26′–85′	Sandstone
85′–95′	Gray shale
95′–100′	Sandstone, T.D.

Hole 15
Location: NW corner sec. 9, T19N, R4W

0′–10′	Sandy shale
10′–64′	Sandstone
64′–73′	Shale
73′–87′	Sandstone
87′–95.2′	Shale
95.2′–98.6′	Coal 3.4′
98.6′–99′	Sandstone
99′–105.2′	Coal 6.2′
105.2′–120′	Sandstone, T.D.

Hole 33C
Location: 2,050 ft NL, 2,500 ft EL, sec. 9, T19N, R4W

0′–7′	Sand
7′–11.5′	Sandstone
11.5′–12′	Coal 0.5′
12′–20′	Brown shale
20′–100′	Sandstone, T.D.

Drilled just south of the coal outcrop.

Hole 35
Location: 100 ft S of the N1/4 corner sec. 9, T19N, R4W

0′–6′	Sand
6′–20′	Shale
20′–33′	Sandstone
33′–48′	Carbonaceous shale
48′–65.3′	Gray and brown shale
65.3′–66.4′	Coal 1.1′
66.4′–66.9′	Carbonaceous shale
66.9′–69.4′	Coal 2.5′
69.4′–69.6′	Sandstone
69.6′–72.5′	Coal 2.9′
72.5′–72.7′	Sandstone
72.7′–76.6′	Coal 3.9′
76.6′–78.6′	Shale
78.6′–79′	Coal 0.4′
79′–120′	Gray sandstone, T.D.

Cored sample for analysis 11.3 ft from 65.3 ft.

Moisture	11.5%
Ash	19.86%
Volatile	36.57%
Fixed carbon	32.07%
Sulphur	0.67%
BTU	9,473

Hole 15
Location: NW corner sec. 10, T19N, R4W

0′–13′	Sand
13′–25′	Shale
25′–26.5′	Shaly coal 1.5′
26.5′–27.4′	Shale
27.4′–28.0′	Coal 0.6′
28.0′–28.4′	Shale
28.4′–30.4′	Coal 2.0′
30.4′–30.6′	Sandstone
30.6′–32.4′	Coal 1.8′
32.4′–57.7′	Sandstone
57.7′–58.8′	Coal 1.1′
58.8′–100′	Sandstone, T.D.

Hole 35
Location: N1/4 corner sec. 10, T19N, R4W

0′–4′	Sandy shale
4′–28′	Sandstone
28′–34.5′	Shale
34.5′–35.3′	Poor coal, soft 0.8′
35.3′–37.2′	Coal 1.9′
37.2′–80′	Brown to carbonaceous to gray sandstone, T.D.

Hole 53
Location: E1/4 corner, sec. 10, T19N, R4W

0′–100′	Sandstone, T.D.

Hole 51
Location: SW corner of sec. 12, T19N, R4W

0′–8′	Sand
8′–9′	Brown shale
9′–11.5′	Shale coal 2.5′
11.5′–20′	Sandstone, T.D.

Hole 51C
Location: 400 ft N of SW corner sec. 12, T19N, R4W

0′–20′	Sand
20′–26′	Sandstone
26′–29.5′	Brown shale
29.5′–30′	Soft coal 0.5′
30′–30.8′	Shaly coal 0.8′
30.8′–32.2′	Coal 1.4′
32.2′–32.4′	Sandstone
32.4′–34.8′	Coal 2.4′
34.8′–60′	Brown to gray sandstone, T.D.

Hole 53
Location: E1/4 corner sec. 11, T19N, R4W

0′–8′	Sand
8′–28′	Sandstone
28′–29.5′	Brown shale
29.5′–30.6′	Coal 1.1′
30.6′–30.8′	Shale
30.8′–32′	Coal 1.2′
32′–80′	Sandstone, T.D.

Hole 33
Location: center sec. 12, T19N, R4W

0′–22′	Sandstone
22′–26′	Brown shale
26′–28′	Sandstone
28′–30.8′	Brown shale
30.8′–32.8′	Coal 2.0′
32.8′–33′	Shale
33′–34.2′	Coal 1.2′
34.2′–34.7′	Shaly coal 0.5′
34.7′–36′	Shale
36′–62.8′	Sandstone
62.8′–63.8′	Shale
63.8′–64.2′	Coal 0.4′
64.2′–67′	Shale
67′–100′	Sandstone, T.D.

Hole 53
Location: E1/4 corner sec. 12, T19N, R4W

0′–36.4′	Sandstone
36.4′–37.5′	Soft poor coal 1.1′
37.5′–60′	Sandstone, T.D.

Hole 12C
Location: 1,800 ft SL, 100 ft WL, sec. 15, T19N, R4W

0′–12′	Sandy clay
12′–105′	Sandstone
105′–111′	Shale
111′–160′	Sandstone, T.D.

Hole 41C
Location: 1,100 ft EL, 500 ft SL, sec. 17, T19N, R4W

0′–17′	Sandstone
17′–19′	Shale
19′–80′	Sandstone
80′–85′	Shale
85′–130′	Sandstone, T.D.

La Rue projects (Star Lake field)

E. B. La Rue, Jr., and his wife, Sharon Allen La Rue, major stockholders of the Thermal Energy Company of Dallas, Texas, made coal permit applications for large acreages of land on the southeastern edge of the coal-bearing Fruitland Formation early in 1969. Each permit they held on land in the Star Lake field is described below.

NM 8718 3-1-70 Permit
Sharon Allen La Rue and E. B. La Rue, Jr., Dallas, Texas
Parts of secs. 6, 7, 9, 16, 18, 20, and 21 and all of sec. 17, T19N, R4W; parts of secs. 13 and 14, T19N, R5W, 4,000.5 acres

The original application was for 5,000.5 acres, but, before issuance of the permit, lands were rejected in secs. 6, 7, 8, and 9, T19N, R4W because they were known to contain valuable deposits of coal and were subject to the leasing provision of the Coal Leasing Act.

On April 9, 1970, two holes were drilled under the direction of William R. Spear, Geologist. The results of this drilling follow:

Hole 19–4–6B
Location: 1,900 ft NL, 900 ft WL, sec. 6, T19N, R4W

0′–20′	Alluvium
20′–25′	Shale
25′–31′	Sandstone
31′–32′	Shale
32′–163′	Pictured Cliffs Sandstone, T.D.

Hole 19–4–7B
Location: 350 ft NL, 1,750 ft WL, sec. 7, T19N, R4W

0′–45′	Sand
45′–49′	Shale
49′–51′	Coal 2′, soft and weathered
51′–63′	Siltstone
63′–163′	Pictured Cliffs Sandstone, T.D.

The permit was terminated because of nonpayment of rent on April 1, 1971.

NM 9769 4–1–70 Permit
E. B. La Rue, Jr., and Sharon Allen La Rue, Dallas, Texas
Thermal Energy Company, Dallas, Texas
Lots 3 and 4, E1/2SW1/4 sec. 31, T20N, R5W, 162.03 acres

There was no exploration drilling done on the land. The permit expired by law although the permittees applied for a 2-year extension of the permit.

NM 9770 3–1–70 Permit
E. B. La Rue, Jr., and Sharon Allen La Rue, Dallas, Texas
Parts of secs. 7, 8, 16, 17, and 18, T19N, R5W, 1,046 acres

The exploration consisted of one drill hole, with the following results:

Hole 19–5–7D
Location: 1,500 ft SL, 1,100 ft EL, sec. 7, T19N, R5W
The hole was drilled April 14, 1970.

0′–18′	Alluvium
18′–44′	Sandstone with two thin shale beds
44′–73′	Pictured Cliffs Sandstone
73′–81′	Shale
81′–85′	Sandstone
85′–163′	Shale
163′–183′	Sandstone, T.D.

The permit expired on April 1, 1971, because of nonpayment of rent.

NM 9772 3–1–70 Permit
E. B. La Rue, Jr., and Sharon Allen La Rue, Dallas, Texas
Parts of secs. 2, 3, 12, 14, 22, and 23 and all of secs. 10, 11, and 15, T19N, R4W, 3,520 acres

There were two holes drilled on the permit. The permit was terminated because of nonpayment of rent on April 1, 1971.

Hole 19–4–11B
Location: 2,100 ft WL, 500 ft NL, sec. 11, T19N, R4W
The hole was drilled on April 10, 1970.

0′–26′	Alluvium
26′–46′	Sandstone
46′–47.5′	Coal 1.5′
47.5′–53′	Sandstone
53′–57′	Shale
57′–156′	Sandstone, T.D.

Hole 19–4–10D
Location: 1,200 ft EL, 800 ft SL, sec. 10, T19N, R4W
The hole was drilled on April 10, 1970.

0′–17′	Alluvium
17′–26′	Sandstone
26′–31′	Siltstone
31′–88′	Sandstone
88′–90′	Shale
90′–129′	Sandstone
129′–165′	Shale, T.D.

NM 9774 3–1–70 Permit
E. B. La Rue, Jr., and Sharon Allen La Rue, Dallas, Texas
Parts of secs. 3 and 4 and all of secs. 5 and 6, T19N, R3W, 2,243.67 acres

One hole was drilled on the permit. The permit was terminated on April 1, 1971, because of nonpayment of rent.

Hole 19–3–6D
Location: 1,300 ft SL, 1,600 ft EL, sec. 6, T19N, R3W

0′–32′	Alluvium
32′–50′	Sandstone
50′–53.5′	Coal 3.5′, 6″ of carbonaceous shale at 51′
53.5′–163′	Sandstone
163′–174′	Shale
174′–183′	Sandstone, numerous thin shale partings, T.D.

Bisti coal field

The Bisti coal field occupies an area from the eastern Navajo Reservation boundary near Bisti eastward along the Fruitland Formation to the eastern line of T21N, R9W, a distance exceeding 30 mi. Underlying this area, specifically under townships in Ranges 10 and 11W, is some of the best stripping coal in the Fruitland Formation (see Fig. 1). The coal beds in R9W are poor or nonexistent, and this area of no economic coal forms a natural separation between the Bisti field and the Star Lake field to the east. Figures 64 and 65 were made to show the area and aid the reader in following the land descriptions given in this section.

The first coal was probably mined by the Navajo Indians off the exposed outcrops. One such digging is about 1 mi southwest of Bisti. The Public Service Company of New Mexico (PNM) was the first to be interested in acquiring large acreages of coal land. On July 1, 1961, the Public Service Coal Company, a wholly owned subsidiary of the Public Service Company of New Mexico, was issued federal leases for 10,630 acres by competitive bid. The lands covered the coal outcrops across T23N, R13W. Soon after the leases were issued 32 holes were drilled to evaluate the coal potential, and 5,174 acres were relinquished.

Activity then remained dormant until February 1967 when Hugh J. Mitchell of Farmington was issued a prospecting permit (NM 10931) for secs. 29, 30, and 31, T23N, R11W. He drilled on the lands and acquired a lease in January 1970.

In October and November 1967 Messrs. Badgett, Stegelman, and Anderson filed for prospecting permits for about 10,000 acres each, all that the federal regulations would allow then. The permits covered acreages in townships along the Fruitland Formation including lands on R1OW through R12W. On September 3, 1970, 51% of the permits were assigned to Ark Land Company and, as required by the terms of the prospecting permits, one hole was drilled on each 160 acres. Applications for preference right leases were made in May 1972, and although economic bodies of coal were found by the drilling program, the Department of the Interior has not issued leases on the lands to the company.

On January 1, 1969, Marvin Weaster was issued four prospecting permits for lands in Tps. 22 and 23N, Rgs. 10 and 11W. These lands were drilled. The permits were reassigned several times and were eventually obtained by Eastern Associated Properties Corporation and Fannin Square Corporation, which also acquired the Hugh Mitchell lease. The company applied for preference right leases on the lands, but none have been issued.

H. N. Cunningham of Houston, Texas, also acquired two prospecting permits, one in January 1970 and the other in January 1971. The required drilling was done, and preference right leases were applied for; they have not been issued.

E. B. La Rue, Jr., and Sharon Allen La Rue were issued prospecting permits in 1970 for T21N, R8W and T23N, R13W. After a drilling program, a preference right lease (which has not been granted) was applied for on a small acreage in T21N, R8W; the balance of the land did not warrant further study.

The Public Service Coal Company leases in T23N, R13W and all of the Eastern Associated Properties lands have been drilled on at least 40-acre centers. The Ark Land holdings have been drilled on 160-acre spacings.

PNM had plans to build a mine-mouth powerplant facility near their leases by 1984, but present plans for the plant, to be known as New Mexico Generating Station, are for the first of four 500-megawatt units to be in operation by 1990 with the last unit to be on line by 1996. Shortage of electric power in the state and adjoining areas is not imminent, and it is believed that the plans for this plant have been put aside.

Sunbelt Mining Company, Inc., a subsidiary of PNM, began a small strip mine in 1980 on a state lease in the N1/2 of sec. 16, T23N, R13W. It was still active in 1986, and the coal was being trucked to the San Juan Generating Station.

In 1979 the Bureau of Land Management identified three areas south of Farmington as Wilderness Study Areas (WSAs). One of these, the Bisti WSA, overlapped a large portion of Western Coal Company's (now known as Sunbelt Mining) Bisti Project lease. The designation of a wilderness study area terminated any further exploration activity on Sunbelt's lease in this area. In 1984, 4 years after the WSA went into effect, Sunbelt and the BLM reached an agreement to exchange the lease area covered by the Bisti WSA for leaseholdings to the east, near Sunbelt's De-Na-Zin mine. The new lease will be in effect until 1994, replacing a lease that would have expired in 1991. The company will get an estimated 29 million tons of coal instead of 26.1 million tons of coal in the former lease (Nauman, 1984).

Western Coal Company's Bisti project

Public Service Coal Company, Albuquerque
Western Coal Company, Albuquerque

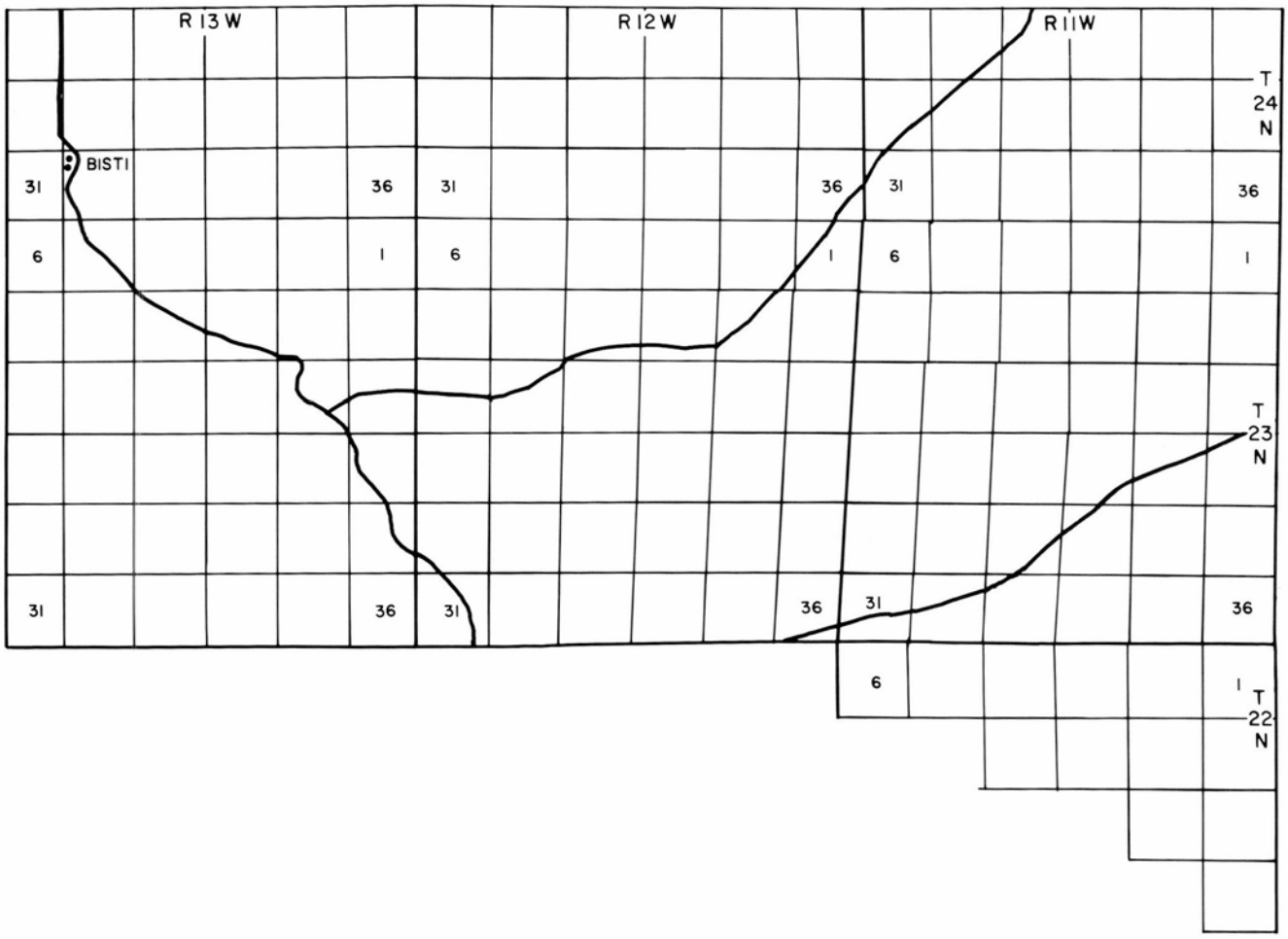
NM 0186612 7-1-61 Lease
S1/2NW1/4, W1/2SW1/4 sec. 5; lot 1, E1/2NW1/4, NE1/4, SE1/4SE1/4 sec. 6; lots 4, 5, 6, 7, NE1/4, N1/2SE1/4 sec. 7; lots 1, 2, 3, 4, NW1/4SW1/4, W1/2NW1/4, NE1/4SW1/4, N1/2SE1/4 sec. 8; lots 1, 2, 3, 4, N1/2S1/2, NW1/4NW1/4 sec. 17; and lots 5, 6, E1/2NW1/4, N1/2NE1/4, SW1/4NE1/4 sec. 18, T23N, R13W.
Lots 2, 3, 4, SE1/4NW1/4, E1/2SW1/4, SW1/4NE1/4, SE1/4 sec. 31, T24N, R13W, 2,188.62 acres

NM 0186613 7-1-61 Lease
W1/2, N1/2NE1/4 sec. 4; NE1/4, N1/2NW1/4, E1/2SE1/4 sec. 5; NE1/4NE1/4 sec. 8, T23N, R13W
S1/2 sec. 33; SW'/4 sec. 34, T24N, R13W, 1,240 acres

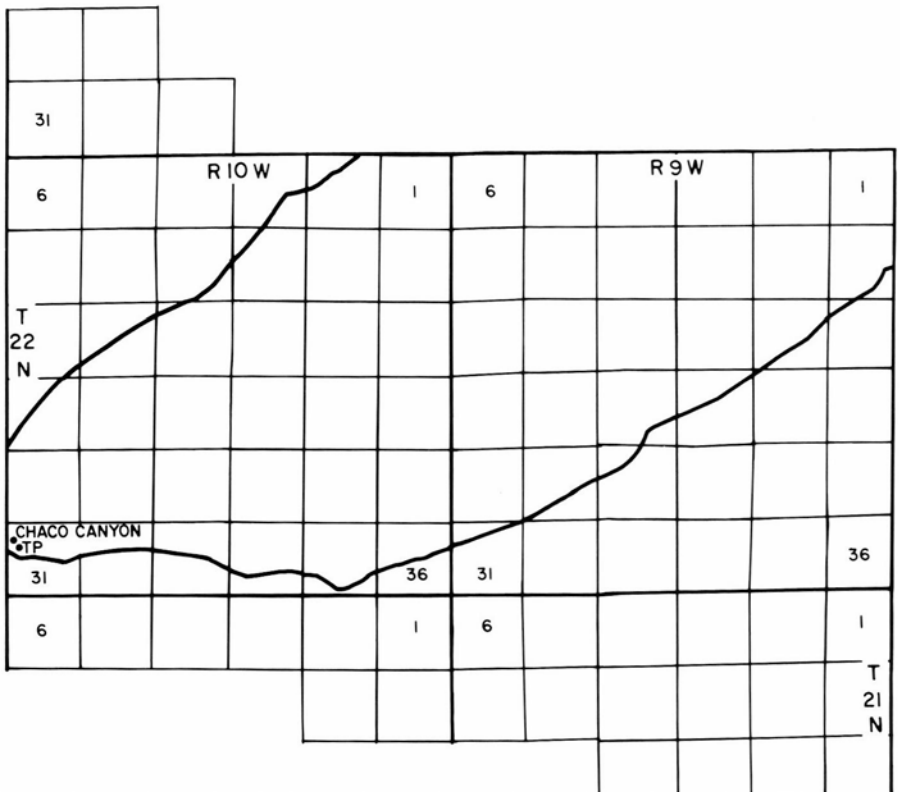
NM 0186615 7-1-61 Lease
SW1/4NE1/4, NE1/4SW1/4, NW1/4SE1/4, S1/2S1/2 sec. 1; lots 1, 2, 3, 4, S1/2N1/2, N1/2S1/2 sec. 10; lots 1, 2, 3, 4, NE1/4NW1/4, S1/2NW1/4, NE1/4, N1/2S1/2 sec. 11; sec. 12, T23N, R13W, 2,027.16 acres The Bisti project also includes some state land leases.

The Public Service Company of New Mexico (PNM) filed for permits on all the federal lands along the Fruitland Formation in Tps. 23 and 24N, R13W, in the vicinity of Bisti, San Juan County, on September 20, 1960. A report from the Mining Supervisor recommended that the lands be offered for competitive bid because they were known to contain valuable deposits of coal. A public hearing was conducted on January 24, 1961, in Santa Fe to hear any objections for the sale of the lands because the holdings of the company exceeded the 10,240 acres allowed by statute at that time. Malcom Heffelman, Vice President of PNM, presented the power needs of the company and its long-range projections. No objections were raised, and the lands were then offered for competitive sale by sealed and oral bids. The sale was held June 28, 1961, in Santa Fe. Public Service Coal Company, a wholly owned subsidiary of PNM, obtained the leases for the minimum bid of $1.00 per acre; no other bids were offered. The leases were issued effective July 1, 1961.

Soon after the leases were issued Edward C. Beaumont, Consulting Geologist, drilled 32 holes across the townships to determine roughly the amount of coal on the leases and to determine the number of beds of coal and their locations in the stratigraphic section. From this information the company made application to relinquish 5,174 acres from the original leases, and this request was approved on November 13, 1962.



FIGURES 64 and 65—Plan maps of the Bisti coal field showing the area of federal coal prospecting permits and leases. The maps were copied from Bureau of Land Management quadrangle maps. Each square = 1 mi.



Some of the area lies within the Bisti badlands, and numerous meetings with environmental groups have been held since 1972 to withdraw certain areas in order to preserve the badlands formations and the exposed fossils.

A black-top road to Crownpoint was planned to be built diagonally across the coal field in 1975, but, because its location would be strip mined, plans were changed to locate the road just west of the east Navajo Reservation boundary line.

Public Service Coal Company changed its name to Western Coal Company, and they began a development drilling program during the summer of 1977. David Krebs, Company Mining Engineer, was in charge of the program. Thelease area was drilled on 40-acre spacings to determine the quality and quantity of the coal and to obtain environmental information about the coal deposits. This information was submitted in 1977 to the Environmental Impact Statement (EIS) team of the BLM, which wrote the Star Lake-Bisti regional EIS for this area.

In 1980 the Western Coal Company Bisti leases were reassigned to Paragon Resources, Inc. (a subsidiary of PNM) and to Valencia Energy Company (a subsidiary of Tucson Electric Power Company). In the mid 1980's Western Coal became Sunbelt Mining (also a subsidiary of PNM).

PNM plans to construct a large mine-mouth generating plant near the east end of the leased area. The plant will be known as New Mexico Generating Station. Current plans call for having the first of four 500-megawatt units in commercial operation by 1990, with the fourth unit coming on line by 1996; however, as of 1986, no action had been taken toward construction of the plant.

Kin-Ark Corporation project

NM 11916 12-1-70 Permit
Hoover Wright, Santa Fe
Kin-Ark Corporation, Tulsa, Oklahoma
Secs. 25, 26, 27, 35 and E1/2 sec. 28, T24N, R13W, 2,880 acres

The permit land begins 2 mi east of Bisti and extends 3 mi to the east, occupying a considerable area in the Bisti badlands. Hoover Wright made application for a prospecting permit on June 1, 1970, and it was issued to him effective December 1, 1970. He did no work on the permit but assigned it to the Kin-Ark Corporation of Tulsa, Oklahoma, effective February 1, 1973.

The corporation hired Henry F. Pohlmann, a consulting geologist in Farmington, to drill four holes on the land, which was accomplished during the winter of 1972-1973. As a result of the findings from the drilling, the corporation filed an application for a preference right lease before the permit expiration date, November 30, 1973, but the lease has not been issued. Data for the area EIS were filed with the BLM at the request of that agency.

De-Na-Zin mine

Sunbelt Mining Company, Inc., 1980-
? N1/2 sec. 16, T23N, R13W

In March 1979 Sunbelt Mining Company, Inc., acquired by assignment from Eastern Associated Properties Corporation a coal lease on state land in the N1/2 of sec. 16, T23N, R13W. In December 1980 surface coal mining operations were commenced. The mine, which is called the De-NaZin, has a capacity of 250,000 tons per year. The coal mined is the basal Fruitland seam in this area and a second seam about 40 ft above the first; both seams are about 5 ft thick. The coal, which is mined by the dozer/scraper method, is trucked to the San Juan Generating Station. It was still operating as of 1986. A production summary from 1980-84 follows.

1980	13,177 tons
1981	211,145 tons
1982	229,585 tons
1983	19,165 tons
1984	9,697 tons

Ark Land Company projects I and II

Roger Badgett, Madisonville, Kentucky
Arthur Stegelman, Madisonville, Kentucky
Robert Anderson, Madisonville, Kentucky
Ark Land Company, St. Louis, Missouri

The Ark Land Company, begun by some of the original management people of Peabody Coal Company, is the operator of a large strip mine in Wyoming. The company currently holds permits on the lands herein discussed as projects I and II, and has made applications for preference right leases for both blocks of land. The blocks are separated by a township, coal rights to which are controlled by Eastern Associated Properties, Inc.

The permits were obtained by Roger Badgett, Arthur Stegelman, and Robert Anderson, coal mine operators in Kentucky, who became interested in developing or promoting western federal coal lands that were open to prospecting permit.

Project I land lies within T23N, R12W, and is about 3 mi north of Tsya, a Navajo Indian village and school. Western Coal Company holds leases in the next township to the west. Land descriptions of the permits follow.

NM 3752 6-1-68 Permit
Roger Badgett
Lot 5, W1/2SW1/4 sec. 17; secs. 18 and 19; lots 4, 5, 6, and 9 through 16, sec. 20; lots 1, 2, 3, and 6 through 16, sec. 21; and secs. 22 and 23, T23N, R12W, 3,759.81 acres

NM 3753 6-1-68 Permit
Roger Badgett
E1/2 sec. 9, secs. 10, 13, 14, and 15, T23N, R12W, 2,950.78 acres

NM 3754 6-1-68 Permit
Arthur Stegelman
NW1/4, N1/2SW1/4, NW1/4SE1/4 sec. 26; secs. 27, 28, 29, and 30, NE1/4NW1/4, W1/2W1/2 sec. 33; SE1/4SE1/4 sec. 35, T23N, R12W, 3,075.32 acres

Mr. Badgett and Mr. Stegelman filed for coal prospecting permits NM 3751, NM 3752, NM 3753, NM 3754, and NM 3755 with the BLM in October and November of 1967. H. B. Nickelson, Mining Engineer, examined the areas of the applications on December 10-13, 1967, and February 6-14 and 21-23, 1968. As a result of these examinations it was determined that coal beds existed and were workable on lands in two areas. These two areas were classified as known coal lands and subject to the leasing provisions of the Coal Leasing Act; permits were issued June 1, 1968, on the balance of the lands.

Project II land extends east-west across two townships, T22N, R10 and 11W, several miles north of Chaco Canyon National Monument.

NM 3755 6-1-68 Permit
Arthur Stegelman
SW1/4 sec. 4; lots 8 through 23, sec. 6; sec. 8; N1/2, SE1/4 sec. 10; sec. 12, T22N, R11W, 2,587.70 acres

NM 3918 6-1-68 Permit
Robert Anderson
Secs. 17, 18, 19, 22, 23, 24, and 25, T22N, R1OW, 4,476.66 acres

NM 3919 6-1-68 Permit
Robert Anderson
Secs. 5, 6, 7, 8, 9, 14, and 15, T22N, R1OW, 4,478.24 acres

NM 8745 1-1-70 Permit
Robert Anderson
SE1/4NW1/4 sec. 20; N1/2,, SE1/4 sec. 21, T22N, R1OW, 520 acres

Mr. Anderson and Mr. Stegelman filed for permits NM 3755, NM 3918, and NM 3919 in November 1967; permits were issued effective June 1, 1968. Mr. Anderson made application for the land under NM 8745 on January 20, 1969, and that permit was issued January 1, 1970.

The permittees, under the supervision of Mr. Stegelman, drilled about 35 holes throughout their permit lands including both Project I and Project II land during the latter part of 1968. The information obtained from the drilling consisted of the driller's logs and some analyses of coal that had been separated from the drill cuttings by floating the coal in CCl_2, carbon tetrachloride. The results of the drilling showed that coal beds of commercial quantities amenable to strip-mining operations exist on the permittees' lands.

On September 3, 1970, the permittees assigned NM 3752, NM 3753, NM 3754, NM 3755, NM 3918, and NM 3919 to Ark Land Company. The permittees retained a 49% interest, and the assignments became effective December 1, 1970. The same arrangement was made for NM 8745 on March 11, 1971; the assignment became effective September 1, 1971. All permits were extended for an additional 2-year period.

Additional drilling was required under the terms of the permits and also was needed to evaluate the coal under the lands. Under the direction of Henry F. Pohlmann, a Farmington consultant, a program was started late in 1971 to drill approximately one hole per 160 acres. The drillers made a log of the formation, and a logging company ran an electric log consisting of a resistivity log, a spontaneous potential log, and a natural gamma log to obtain coal bed locations and thicknesses. Few core samples or analyses were taken; consequently, the quality of the beds remained to be determined, although sufficient samples had been taken to determine that the coal is typical of that found along the southern Fruitland Formation coal beds. Certainly the coal is suitable for fuel to drive electric generators and produce synthetic gas.

Applications for preference right leases were made by Ark Land Company to the BLM on May 9, 1972. (Permit NM 3751 had been allowed to expire because the lands were south of the Fruitland Formation.)

No land-disturbing actions are being or can be undertaken until the leases are issued. In 1975 Ark Land Company conducted preliminary studies of soils, vegetation, and archaeology. During the fall of 1976 intensive studies were devoted to soils, forage, wildlife, and archaeology. Archaeological clearance will be done in areas that will be disturbed, such as production areas, proposed roads, and plant sites, in 5-year periods.

In 1976 the Environmental Impact Statement (EIS) team requested information concerning future plans of all coal permit and lease holders within their area covering the federal lands in the northwest part of the state. Ark Land Company submitted two plans outlining Project I and Project II as separate mining units. The company first planned additional drilling on 40-acre centers to determine the minable outcrops. The drilling required about 6 months to complete both projects.

A preparation plant, including a cleaning plant, was planned for Project I in sec. 28, T23N, R12W, a section in permit NM 3754, and a similar plant for Project II for the SE1/4 sec. 19, T22N, R1OW, on permit NM 3918. The surface for each is public resource land. Each plant was to be a center for the haulage roads, the proposed railroad, the necessary water facilities, and the facility buildings. Project I was to have begun mine development first after the leases were issued and the mining plans approved; Project II, 3 years later. Anticipated dates were Project I, 1980; Project II, 1983. These dates were not met, and no development has occurred.

The Public Service Company of New Mexico planned to construct a large power-generating station within 2-3 mi of the permit lands of Project I. Coal sales to the power company were to be a possibility. To facilitate its mining in Project I and to enable it to recover coal that is now unstrippable, Ark Land Company needs to acquire state sec. 16, T23N, R12W. Thermal Energy holds state lease M 16523 on this section.

The coal beds underlying the Project II area can be developed into the most economical strip mine along the Fruitland Formation. The mining in Project II will not be involved with large areas that require multiple-bed mining; the quality there is better and the beds are thicker. Operations pend approval of mining plans, the area EIS, and leases, none of which has been approved.

Eastern Associated Properties Corporation and Fannin Square Corporation Bisti project

NM 10931 2-1-67 Permit 1-1-70 Lease
Hugh J. Mitchell, Farmington
Robert S. Cutherell, Houston, Texas
Eastern Associated Properties Corporation, Pittsburgh, Pennsylvania, and Fannin Square Corporation, Houston, Texas
Secs. 29, 30, and 31, T23N, R11W, 1,190.2 acres

NM 3834 6-1-68 Permit
Secs. 19 through 26, T24N, R12W, 4,804.22 acres

NM 3835 6-1-68 Permit
Secs. 1, 3, 4, 11, 12, and 24 and SE^1/4 sec. 2; lots 5 through 12, inclusive, sec. 5, T23N, R12W, 4,499.84 acres

NM 3836 6-1-68 Permit
Sec. 15 and secs. 17 through 23, T23N, R11W, 5,110.20 acres

NM 3837 6-1-68 Permit
Secs. 24 through 28 and secs. 33 through 35, T23N, R11W, 5,120 acres

NM 3838 6-1-68 Permit
Secs. 27 through 29 and secs. 31 through 35, T24N, R12W, 5,120 acres

NM 6801 1-1-69 Permit
Secs. 19 through 24, T24N, R13W, 4,394.28 acres

NM 6802 1-1-69 Permit
Lots 8 through 15, sec. 6, T23N, R12W, 339.98 acres

NM 6803 1-1-69 Permit
Secs. 10 through 14, T23N, R11W; secs. 18, 19, 30, and 31, T23N, **R1OW, 5,120.94 acres**

NM 6804 1-1-69 Permit
Secs. 3 and 4 and W^1/2 sec. 10, T22N, R1OW, 1,601.56 acres

NM 7235 1-1-69 Permit
NE^1/4 sec. 25, T23N, R12W, 160 acres
Marvin E. Weaster, Houston, Texas
R. S. Cutherell, Houston, Texas
Eastern Associated Properties Corporation and Fannin Square Corporation

The Eastern Associated Properties Corporation acquired 10 prospecting permits and one lease across two townships of land from Bisti Trading Post east. All of the lands are underlain by coal beds, but much of the coal is too deep to strip mine except for an area a few miles east and west of the land first acquired.

Hugh Mitchell, an oil consultant from Farmington, made application for two prospecting permits and was granted NM 425 and NM 606. He drilled a number of holes on the lands and determined the existence of a commercial quantity of coal. Application was made for preference right lease on December 28, 1968, and Mr. Mitchell requested that the lease be assigned to Robert S. Cutherell, who in turn assigned the lease to the Bisti Coal Field Joint Venture No. 2. The assignments were approved on May 20, 1970. The BLM dropped the permit numbers and issued the lease under NM 10931.

Marvin E. Weaster began a drilling program on his extensive prospecting permits in August 1969, under the direction of H. F. Pohlmann. Mr. Pohlmann drilled the area

on the corners of each 160-acre legal subdivision except for a limited number of deep holes that were spaced about one hole per section. In 1971, he returned and cored a number of holes and added others to determine the quality and quantity of the coal and to correlate the coal beds over the permit lands. Mr. Pohlmann did a very good job of drilling over the entire area, and the information on the drilling logs and electric logs provides a good overall picture of the coal found.

Marvin Weaster assigned all his prospecting permits to Robert S. Cutherell, nominee under the Bisti Coal Field Venture No. 1, effective August 1, 1970, and all the permits were extended for an additional 2 years.

Effective May 1, 1972, the BLM approved the assignment of all the permits and the lease to Eastern Associated Properties Corporation and Fannin Square Corporation. Beds containing coal in commercial quantity were discovered on all the permit lands, and applications were submitted for a preference right lease before the expiration of the prospecting permits.

The Eastern Associated Properties Corporation and the BLM, under a Cooperative Research Contract of the Department of the Interior, undertook to drill the coal on lease NM 10931 on about 40-acre centers. The drilling was done under the supervision of Paul Weir Company, Inc., during March and April of 1975. The BLM did not share in the costs, and the drilling results concerning thicknesses and reserves are considered proprietary information except for the environmental information, which is used to aid in writing the Environmental Impact Statement (EIS).

On March 29, 1976, the Eastern Associated Properties Corporation made application for a drilling program on their permit lands containing strippable coal to the BLM under a Cooperative Research Contract. The agreement for the drilling of 84 holes approximately on the corners of each 40-acre subdivision was signed on February 6, 1976, by the BLM state director. The Paul Weir Company, Inc., undertook the drilling in May 1976. The information obtained was submitted to the EIS team, which prepared a statement for coal development in the northwest portion of the state. This drilling also provided the development drilling to undertake a large strip-mine operation.

The preference right leases have not been issued, and the climate in the Department of Interior for early issuance does not appear favorable.

La Rue projects (Bisti field)

E. B. La Rue, Jr., and his wife, Sharon Allen La Rue, major stockholders of the Thermal Energy Company of Dallas, Texas, made coal permit applications for large acreages of land on the southern edge of the coal-bearing Fruitland Formation early in 1969. Each of their applications or permits on land in the Bisti field is described below.

NM 8713 1-10-69 Permit application
E. B. La Rue Jr., Dallas, Texas
Parts of secs. 6 and 7, T23N, R13W and the NW¼NW¼ sec. 32, T24N, R13W

The lands in secs. 6 and 7 were adjacent to a coal lease held by the Public Service Company of New Mexico. Small areas containing coal near the outcrop extended from the lease land onto the land of this permit application; this coal should logically be mined by the company. The application for a permit to prospect was rejected because the coal was known to exist on the lands.

NM 8859 1-1-70 Permit
E. B. La Rue, Jr., and Sharon Allen La Rue, Dallas, Texas
Parts of secs. 19, 20, 21, 28, and 29 and all of secs. 26, 27, and 35, T22N. R9W. 3.800.23 acres

No drilling was conducted on the permit. Depth to coal in this area is more than 200 ft, and the permittees were interested only in strippable coal. The permit was terminated because of nonpayment of rent on April 1, 1971.

NM 8874 1–1–70 Permit
E. B. La Rue, Jr., and Sharon Allen La Rue, Dallas, Texas
Thermal Energy Company, Dallas, Texas
Parts of secs. 10, 22, and 26 and all of secs. 14 and 23, T21N, R8W, 1,920 acres

On April 2, 1970, one drill hole was drilled on this permit land. The results follow:

Hole 21–8–22D
Location: 600 ft SL, 1,800 ft EL, sec. 22, T21N, R8W

0′–20′	Alluvium
20′–32′	Shale
32′–42′	Sandstone
42′–45′	Shale
45′–66′	Sandstone
66′–142′	Shale
142′–155′	Sandstone, total depth

The hole was not drilled deep enough to intersect the coal beds. The permit expired by law on December 31, 1973.

NM 8876 1–1–70 Permit
E. B. La Rue, Jr., and Sharon Allen La Rue, Dallas, Texas
Parts of secs. 13, 14, 21, 22, 23, 29, and 35 and all of secs. 24, 25, 26, 27, and 28, T23N, R13W, 4,320 acres

Two drill holes were drilled on the permit land. The results follow:

Hole 23–13–27B
Location: 1,000 ft WL, 900 ft NL, sec. 27, T23N, R13W
The hole was drilled on March 30, 1970.

0′–15′	Alluvium
15′–34′	Clay and shale
34′–44′	Sandstone
44′–49′	Shale
49′–50.75′	Coal 1.7′
50.75′–55′	Shale
55′–56.5′	Coal 1.5′
56.5′–65′	Shale
65′–66′	Coal 1.0′
66′–73′	Shale
73′–95′	Sandstone, total depth

Hole 23–13–26D
Location: 1,700 ft EL, 1,700 ft SL, sec. 26, T23N, R13W

0′–10′	Alluvium
10′–21′	Shale
21′–24′	Sandstone
24′–33′	Shale
33′–44′	Sandstone
44′–47′	Shale
47′–50′	Coal 3′
50′–83′	Pictured Cliffs Sandstone
83′–92′	Shale
92′–103′	Sandstone, total depth

The permit was terminated because of nonpayment of rent on January 29, 1971.

NM 9502 1–1–70 Permit
Sharon Allen La Rue and E. B. La Rue, Jr., Dallas, Texas
Thermal Energy Company, Dallas, Texas
Sec. 14 and E½SE¼ sec. 24, T22N, R11W, 720 acres

Two holes were drilled on sec. 14, but both were collared in the Pictured Cliffs Sandstone. The results follow:

Hole 22–11–14D
Location: 1,500 ft SL, 1,400 ft EL, sec. 14, T22N, R11W
The hole was drilled on April 1, 1970.

0′–8′	Alluvium
8′–9′	Coal, weathered
9′–10′	Clay
10′–83′	Pictured Cliffs Sandstone, total depth

Hole 22-11-14C
Location: 1,600 ft SL, 1,700 ft WL, sec. 14, T22N, R11W
The hole was drilled on April 1, 1970.
0'-11' Alluvium
11'-60' Pictured Cliffs Sandstone, total depth
The permit expired by law on December 31, 1973.

H. N. Cunningham permits

NM 8592 1-1-70 Permit
H. N. Cunningham, Houston, Texas
NE1/4 secs. 10 and 11; SW¼ secs. 12 and 13, T22N, R1OW

Three holes were drilled on the land during August 1970 under the direction of Henry Pohlmann, Consulting Geologist. The permit was extended until January 1, 1974, and Mr. Cunningham made an application during this time for a preference right lease. The logs of drill holes on pending lease applications and active leases are considered proprietary information.

NM 12324 1-1-71 Permit
H. N. Cunningham, Houston, Texas
Lots 3 and 4, E1/2, E1/2SW1/4 sec. **18, T22N, R9W, 480.87** acres

Mr. Cunningham drilled one test hole on the property on December 20, 1972. The permit was extended through December 31, 1974, and Mr. Cunningham made application for a preference right lease. The drill log is considered proprietary information.

Apparently these two permits have been relinquished.

Thermal Energy Company prospect (a; Bisti field)

NM 8129 7-1-69 Permit
Leland A. Hodges, Trustee, Houston, Texas (?)
E. B. La Rue, Jr., Dallas, Texas
Thermal Energy Company, Dallas, Texas

The lands cover the southwest corner of T22N, R9W. Leland A. Hodges, Trustee, applied for a prospecting permit on October 21, 1968, and the permit was issued July 1, 1969, for the following lands:

> **Lots 3, 4, E½SW¼, SE¼ sec. 19; W½SW¼, SE¼SW¼ sec. 28; S½, NW¼, W½NE¼ sec. 29; and secs. 3034, T22N, R9W; sec. 26; N1/2NE¼ sec. 35, T22N, R1OW, 4,920.48 acres**

On January 9, 1970, Mr. Hodges designated E. B. La Rue, Jr., Dallas, Texas, as operator. Mr. La Rue submitted plans of exploration in January 1970, and following their approval drilled 25 holes on the land during February and March 1970. As a result of this drilling Mr. Hodges relinquished part of the lands with an effective date of June 24, 1970. The following lands remained and were requested for preference right lease:

> **Lot 4, SE1/4SW¼ sec. 19; W½NE1/4, NW1/4 sec. 29; sec. 30; SI/2NE1/4, E1/2SW1/4, SE1/4 sec. 33; SI/2NW¼, SW1/4 sec. 34, T22N, R9W, 1,520.36** acres

One drill hole was required on each 160 acres of the permit, and several holes were needed to qualify the lands for a preference right lease; thus, seven additional drill holes were drilled on the lands during late January 1972. A total of 32 holes was drilled on the original 4,920.48 acres. None of the drill holes were cored, and no information was obtained concerning the quality of the coal. The drilling was adequate to give a reasonable interpretation of the coal deposit on the permit lands.

Effective April 1, 1971, the permit was assigned to Thermal Energy Company. The permit was later extended to July 1, 1973. This land did not enter into the Thermal Energy Company-Peabody Coal Company agreement, and it is believed that Chaco Energy Company has not optioned this permit land.

The drilling across the Fruitland Formation under this permit showed that the environment for coal deposition was poor; although some coal was found, the beds were thin, of limited extent, and dirty. The area that was retained in the permit does contain a limited amount of coal that logically should be mined with Ark Land Project No. 2, which adjoins this land to the west. No lease has been granted as of 1986.

Thermal Energy Company prospect (b; Bisti field)

NM 9764 1-1-70 Permit
Sharon Allen La Rue, Dallas, Texas
E. B. La Rue, Jr., Dallas, Texas
Thermal Energy Company, Dallas, Texas
SW1/4SW¼, E½SW¼ sec. 21; N1/2NW1/4, NW¼NE¼ sec. 28, T22N, R1OW, 240 acres

The permit land is about 3 mi north of Chaco Canyon National Monument. The first interest in the coal potential of the land was shown by Robert Anderson, Jr., from Madisonville, Kentucky, who filed for a prospecting permit on adjacent land on January 20, 1966. E. B. La Rue, Jr., filed for scattered parcels of lands along the Fruitland Formation outcrop on January 10, 1969, but the application was rejected because the lands applied for were not contiguous. Sharon Allen La Rue refiled on May 26, 1969. Part of the lands were rejected because they were in a previously filed application, and a permit was approved for the rest on January 1, 1970. On December 16, 1969, a decision by the BLM recognized and acknowledged that E. B. La Rue, Jr., and Sharon Allen La Rue, his wife, each own an undivided 50% interest in all of their coal prospecting applications and permits outstanding on federal land in New Mexico.

A BLM decision dated April 7, 1971, acknowledged an option agreement dated March 18, 1971, between Thermal Energy Company and Peabody Coal Company, as a joint venture. On May 21, 1971, three test holes were drilled on the permit by Peabody Coal Company; the lower bed of coal, which cropped out along the southern edge of the permit, was found to be of commercial thickness.

On July 1, 1971, E. B. La Rue, Jr., and Sharon Allen La Rue assigned the permit to Thermal Energy Company, Dallas, Texas; the BLM decision for assignment was dated June 9, 1971. Thermal Energy Company made application for a preference right lease on the lands on January 21, 1972. In the latter half of 1977 the Solicitor of the Department of the Interior cancelled the permit. Thermal Energy Company appealed the decision. The results of the appeal are not known, but, in 1980 when the San Juan Regional Coal Environmental Impact Statement was being developed, NM 8715, which had been cancelled in the same 1977 decision, was considered an active preference right lease application; the same may be true of NM 9764.

Thermal Energy Company holds a state lease on sec. 16, which with this permit area does form a contiguous block of land that would support a small strip-mine operation. If the proposed Santa Fe Railroad is built, this small mine could possibly operate because the railroad would be within 1 mi of the permit area.

Chacra Mesa coal field

The Chacra Mesa coal field is delineated by William R. Speer to include the coal deposits of the Allison Member of the Menefee Formation and those of the overlying Cliff House Sandstone (Shomaker et al., 1971, p. 56; see Fig. 1). This field includes 12 townships, namely T17N in Rgs. 4, 5, 6, and 7W; T18N in Rgs. 3, 4, 5, 6, 7, and 8W; and T19N in Rgs. 7 and 8W.

The first mining was some shallow workings opened by Indians principally around settlements in the Torrejon and Medio Arroyo drainage region. In 1933 Rudolf Tachias opened a small mine under a federal prospecting permit in the NW1/4 sec. 34, T17N, R4W, but the operation ceased in 1936. In 1939 Jose de los Angeles Padilla and Elizardo Maestas obtained a coal prospecting permit in the NE1/4 of the same section, but Mr. Padilla was killed in Utah and the mine ceased operation in May 1945 (see Padilla-Maestas prospect). Individual prospecting permits were issued to M. S. McDonald in 1928 and to Victor S. Montoya in 1922 just off the field boundaries of the Chacra Mesa and La Ventana fields in the general area of the SW corner of T19N, R2W, but both failed even though the coal was of minable thickness.

In 1978 and 1979 D. E. Tabet and S. J. Frost, then geologists for the New Mexico Bureau of Mines and Mineral Resources, mapped the geology and coal outcrops over six townships in the east part of the Chacra Mesa field and published Geologic Map 49, *Coal geology of Torreon Wash area, southeast San Juan Basin, New Mexico* (Tabet and Frost, 1979). Study of these maps indicates that two beds of coal occur about 20 ft apart over large areas. If strip mining were used, an individual bed of coal 3 ft thick or two beds of coal at close intervals totaling 4 ft in thickness would be considered minable. If one assumed a stripping ratio of 16 ft of overburden to 1 ft of coal, the minable area would be about one section of land composed of 12 areas, and five million tons of coal might be produced from an average of 4 ft of coal. This is a rough but reasonable estimate of the minable reserves. It is possible that most of the above areas could also be mined by underground methods, which should give about the same recoverable reserve because, although twice the area might be minable, the average recovery in underground mining is 50%. The prospect for exploitation of this area in the foreseeable future is poor because the area is a considerable distance from a railroad or market, the coal beds are lenticular, and the minable reserves are small.

McDonald prospect

SF 056025 **2-7-28** **Permit**
M. S. McDonald, Algodones
Secs. 25, 26, 35, and 36, T19N, R3W

The permit lands are located 7 mi directly west of La Ventana (15 mi via road). Cuthbert C. Mather, Associate Mining Engineer, visited the property on September 2, 1930. He found a prospect opening about 100 ft long driven on a course N35°W in a bed of coal 5.5 ft thick. The bed dipped 3% N35°W. The permittee reported that the bed averaged about 4 ft thick. Mr. Mather could not determine the location of the prospect opening, but he believed it to be on the SE1/4SE1/4 sec. 36. Mr. McDonald reported the sale of 8 tons of coal from his prospect.

Montoya et al. prospect

SF 046374 6-12-22 Prospecting permit
Victor S. Montoya et al., Albuquerque
W1/2 secs. 5, 6, and 7, T18N, R2W

Existing records concerning this prospect are extremely brief. According to information given in them, the applicants dug four small prospect pits in sec. 7. In addition, one short entry 30 ft long was driven on a coal bed reported to be 4 ft thick. John S. Crane of Albuquerque was the secretary for the applicants. Neither he nor any of the permittees reported any tonnage of coal sold. The permit expired by law after 2 years.

Padilla-Maestas prospect

SF 075409 **10-3-39** Permit
Jose de los **Angeles Padilla, Regina**
Elizardo Maestas, Cerrillos
NE1/4, W1/2 sec. 34, T17N, R4W
1,900 ft NL, 1,300 ft EL

The applicants requested a permit for the same land on which Rudolfo Tachias had opened a small mine under permit SF 065988. Government engineers visited the property on November 24, 1944, and they believed that the permittees reopened the same mine; 190 tons of coal were produced. Figure 66 shows the coal chute built to facilitate coal handling.

Mr. Padilla was killed in an explosion in Utah on May 9, 1945. A lease application was pending at the time, and the permittees owed the government $13.50 royalty. Collection of the royalty from the individual surety delayed the cancellation of the permit until October 7, 1958.

In the late 1970's geologists for the New Mexico Bureau of Mines and Mineral Resources mapped the coal geology of the Torreon Wash area and located two mines in sec. 34 (Tabet and Frost, 1979). Comparison of the topography on the 71/2-min quadrangle sheet with the Padilla-Maestas prospect places this prospect at the location given above.

Tachias prospect

SF 065988 **1–30–33** **Permit**
Rudolfo Tachias, Cabezon
N1/2, SW1/4 sec. 34, T17N, R4W
2,000 ft NL, 3,900 ft EL

The permit lands are 10 mi west of Cabezon. Mr. Tachias, who owned the surface rights, opened a wagon mine in

FIGURE 66—Coal chute at the Padilla–Maestas prospect. *Photo by R. H. Allport, October 24, 1944.*

the NW corner of sec. 34. One entry was driven about S35°E for a distance of 175 ft, and an aircourse was driven 35 ft west of the main entry for a distance of 100 ft (Fig. 67). A slant 90 ft inby the main portal connected the two entries. The coal bed was flat. A cross section taken by F. W. Calhoun, Associate Mining Engineer, on August 13, 1935, at the face of the main entry showed the following:

Carbonaceous shale	Roof
Coal	25 1/2"
Bony	
Shale	18"
Bony	2"
Coal	18"
Shale	Floor

He also took a measurement of the coal bed 100 ft away at the face of the aircourse, and it showed the following:

Coal	24"
Bony	1"
Shale	20 1/2"
Coal	22"

Continuation of the operation seemed doubtful because the roof was difficult to support, the coal was dirty, and the access to the mine was poor. Mr. Tachias died on March 10, 1935, and his widow desired to have the permit assigned to her or to one of their sons, but the permit was cancelled on July 16, 1936. The records show that 92 tons of coal were sold or used.

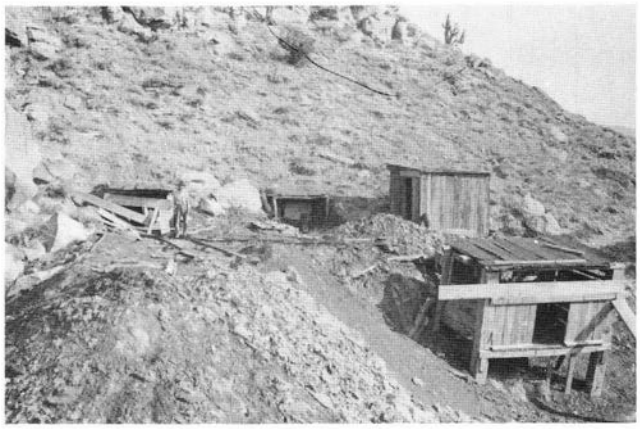


FIGURE 67—The portals and surface facilities at the Tachias prospect. *Photo by F. W. Calhoun, August 13, 1935.*

In the late 1970's, New Mexico Bureau of Mines and Mineral Resources geologists, mapped the coal geology of the Torreon Wash area and located two mines in sec. 34 (Tabet and Frost, 1979). Comparison of the topography on the 7 1/2-min quadrangle sheet with the Tachias prospect photo (Fig. 67) places this prospect at the location given in the heading to the left.

Navajo coal field

The Navajo coal field is defined as the area underlain by the Fruitland Formation within the Navajo Indian Reservation. The area extends from the San Juan River on the north to Hunters Wash and Coal Creek on the south and is bounded on the west by the outcrop of the Pictured Cliffs Sandstone and on the east by the eastern boundary of the reservation (Fig. 1).

The first miners were probably Navajo Indians who opened small pits on the outcrops for their winter fuel. The largest of these pits was located near Bisti and Burnham. Small Indian underground mines about 2 mi south of Fruitland were developed along the outcrop at the break between the San Juan Valley floor and higher lands to the south. Ben Begay and David Cly operated these mines sporadically from 1933 to about 1960.

In 1953 Utah Construction and Mining Company (Utah) obtained a prospecting permit from the Navajo Tribe covering the northern 25 mi of the Navajo field. Drilling showed a large reserve of strippable coal, and by 1957 a mining lease on 24,320 acres (Fig. 68) was granted to Utah by the Navajo Tribe; the lease was later enlarged to 31,000 acres. In 1958 the state of New Mexico granted Utah a permit to use water from the San Juan River. With water and fuel Utah was able to interest Arizona Public Service Company (APS) to sign a sales agreement under which Utah would furnish coal and water for a term of 35 years with a 15-year additional option. By 1963 APS had constructed the Four Corners Powerplant with three units capable of delivering 575,000 kilowatts to their customers in southern Arizona. In 1966 a second fuel agreement was signed with Utah to deliver fuel for units 4 and 5. These units of 755,000 kilowatts each were owned by a group of six utilities, both public and private, which served the Southwest. The No. 5 unit was on stream by 1970, and Utah was in full production by late that year.

With one-third of their 1.1 billion tons of strippable coal thus committed, Utah announced plans in 1973 for developing the other two-thirds of their reserve to supply a coal gasification plant to be constructed near the south part of their lease. Engineering studies, the Environmental Impact Statement (EIS), and meetings with the public, the Navajo Tribe, and government agencies continued until 1978. Reluctance of the Navajo Tribe to give their approval and the escalating costs of the construction stopped the project. The gasification facility was to have been operated by WESCO, a joint venture of Pacific Coal Gasification Company of Los Angeles and Transwestern Coal Gasification Company of Houston. A plant of four 250 mcfd units using the Lurgi process patented in West Germany had been planned.

Since 1970, when the last unit of the powerplant complex went on stream, Utah has been mining 7 million tons of coal per year (they mined more than 8 million tons in 1983). For a few years they had the distinction of having the largest coal mine in the United States. They have pioneered the use of some strip-mining equipment, and they have been successful in reclaiming the spoil piles in an area where the average rainfall is 7 inches per year. Navajo Indians trained by Utah now compose 82% of the Navajo mine work force.

In the late 1950's El Paso Natural Gas Company (El Paso) began planning the use of coal gasification to augment their depleting sources of gas. On March 18, 1959, the company negotiated with the Navajo Tribe a 1-year prospecting permit covering 85,760 acres from the south edge of Utah's lease to about 2 mi south of Hunters Wash, then east to the reservation boundary. Drilling began immediately on a grid of 1,000-ft squares. On August 25, 1960, a lease was applied for to embrace 20,300 acres. On January 25, 1963, a lease and option were signed for 22,642 acres (Fig. 68) "for a period of 10 years and so long thereafter as production in paying quantities would continue." A pilot plant and other stipulations were required; these are discussed in more detail in the next chapter. El Paso could not meet the requirements of the lease by the time of expiration, and cancellation became inevitable.

In November 1965 a new lease agreement was proposed

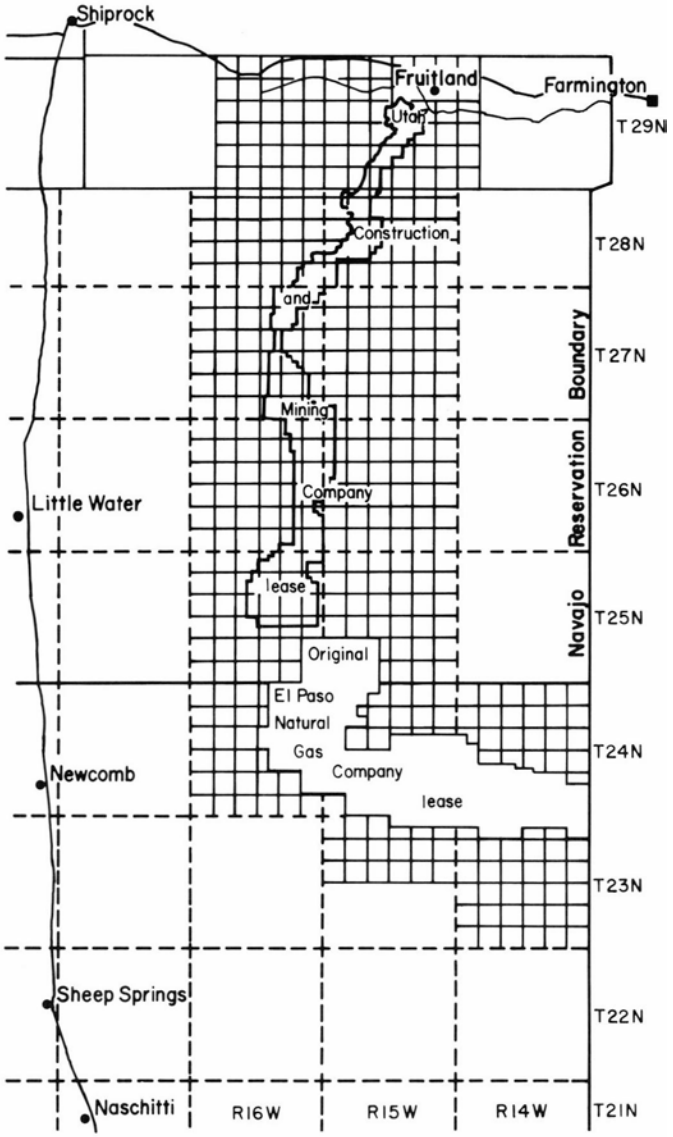


FIGURE 68—The Navajo coal field with the original Utah Construction and Mining Company lease of 24,320 acres and the original El Paso Natural Gas Company lease and option totaling 22,642 acres. *The map was made about 1963 by Utah Construction and Mining Co.*

with El Paso and Consolidation Coal Company (Consol), which had expertise in coal gasification. All negotiations failed, and the lease and option were cancelled. Counter offers were presented, but they also were turned down by the tribe. The lease and option were then put up for competitive bid, and the sale was to be held on May 21, 1968. No bids were received because the royalty rate and other stipulations were too high. A second sale was offered on October 8, 1968, at which both El Paso and Consol bid on and received a lease for 10 years. Consol began a reevaluation of the coal reserves and redrilled the locations of old holes. When the information was put in a computer, the results showed about 0.7 billion tons of strippable coal. El Paso began plans for a gasification plant of four units, each 250 mcfd, using the Lurgi process. The gas produced was to be added to El Paso's pipeline, which passes through the lease land. Federal Power Commission approval was granted in 1973. The EIS was approved in early 1977, and a mining permit from the state was granted in December 1977, but approval by the Navajo Tribe was not given. Again, the lease was about to expire. To save the investment of the companies, the lease was renegotiated in August 1976 for a substantial bonus, a percentage royalty, and other stipulations. To comply with the terms of the new lease, a token mine was developed in 1978, which continues to operate on a limited basis (Burnham mine). This property has become the most drilled-out computerized block of coal reserves in the world.

The Navajo field contains 1.8 billion tons of low-grade strippable coal averaging about 8,500 BTU, 22-27% ash, and 0.6-0.7% sulphur. The coal can be used to generate electric power, or it can be converted to gas or oil. The future of this great field will be destined by the policies of the Navajo Tribe and the building of a railroad to transport the coal or other products from the area.

El Paso—Consol Burnham projects

El Paso Natural Gas Company
Contract no. NOO-C-14-20-2190, permit and lease, 1959-1966
El Paso-Consolidation Coal Company
Contract no. 14-20-0603 7344, mining lease
Contract no. 14-20-0603 7345, option-mining lease, 1968-

In the late 1950's El Paso Natural Gas Company, El Paso, Texas, began formalizing plans to supplement their natural gas needs in the 1960's with gas made from coal. A large reserve of strippable coal near their major pipelines to the west coast was needed, and such a deposit was believed to exist along the southwestern outcrop of the Fruitland Formation just south of Utah Construction and Mining Company's Navajo lease. The Navajo Tribe, desirous of furthering development of the coal potential on the reservation, was receptive to negotiations, and a prospecting permit was granted to El Paso on March 18, 1959, for 85,760 acres for a term of 18 months. The lands were on all or parts of T23N, R14W; T24N, Rgs. 14, 15, and 16W; and T25N, Rgs. 15 and 16W (land grid projected).

Under the direction of H. D. Levine of El Paso, Rare Metals Corporation, a wholly owned subsidiary of El Paso, began a drilling program on April 23, 1959, to determine the amount and characteristics of the coal under the permit lands. A land grid of 1,000-ft squares was surveyed, and plug-bit drill holes were drilled at each corner of the grid, except that at each 4,000-ft corner a hole was cored through the coal beds. The cored holes were offset 2,000 ft on each grid line to give a cored hole every 2,300 ft. Samples every 5 ft from plug-bit holes were piled in sequence along the ground, and El Paso engineers logged the intervals from these piles and logged and sampled the cored holes. The project ended January 29, 1960. All the drilling results and core analyses were submitted to the U.S. Geological Survey. H. B. Nickelson, Mining Engineer, drew cross sections along every 1,000-ft east-west line, correlating the coal beds and calculating the coal reserve, the percentages of ash and sulphur, and the BTUs for each bed of coal under each section of land. The coal reserves were calculated to a depth of 120 ft of overburden, and the results of the drilling delineated about 500,000,000 tons of strippable coal.

El Paso requested approval from the Navajo Tribe for a lease to allow mining of 134,000,000 tons of coal, the tonnage that the company deemed necessary to support their investment in building a gasification plant. The lease was planned to include 20,300 acres. After some years of negotiations a lease was issued and approved on January 16, 1963, retroactively effective September 17, 1960. The requested tonnage was approved, but the extent of the land was reduced to 8,762 acres. The royalty agreed upon was 150 per ton and a percentage of the by-products from the gasification plant. The term of the lease was "for 10 years and so long thereafter as the products from the lease would be produced in paying quantities."

An option agreement for the balance of the coal found under the permit was approved on January 25, 1963, for 13,880 acres (Fig. 68). The option was granted for a period of 3 years, and before its expiration the company had to prove a need for the coal, submit a plan for development, and negotiate a royalty before the Navajo Tribe would consider extending the option lease. The original lease required El Paso to begin construction of a pilot gasification plant and to furnish a plan of production by 1963. This stipulation could not be met; a request for an amendment was proposed to extend the date for construction of the pilot plant to September 17, 1966, and to extend the date for the plan of development to September 1968; the amendment was approved.

During this period El Paso entered into agreements with Consolidation Coal Company (Consol) of Pittsburgh, Pennsylvania, for aid in this project. Consol had done experimental work with gasification, and their expertise and backing were needed. With the deadline date for the pilot plant construction approaching, a meeting was held on November 16, 1965, for discussion of a new lease to include both El Paso and Consol. Present at the meeting were members of the Navajo Tribe and representatives from El Paso, Consol, the Bureau of Indian Affairs (BIA), and the U.S. Geological Survey. The companies desired fuel not only for gasification but also for the generation of electricity on and off the reservation. The Chairman of the Navajo Tribe suggested that negotiations be undertaken to try to arrive at a new lease that would be satisfactory to both the tribe and the two companies. On December 1, 1965, El Paso and Consol presented a proposal for a lease to the tribe. Their requests included granting additional lands away from the coal for a coal cleaning plant and approval of an option whereby the coal could be used not only for gasification but also for electric powerplants either on or off the reservation. The negotiations for the new lease failed.

In 1966 the interest in acquiring coal properties reached the proportions of a coal rush, and the royalty rates were in a how-much-will-the-traffic-bear state. C. V. Collins, Tribal Mining Engineer, had left that office by early 1966, and Henry F. Pohlmann, Oil and Gas Supervisor for the Navajo Tribe, was made head of the combined offices. He strongly recommended that the coal lands be put up for competitive bid and that the El Paso leases be the first offered when they expired. On November 5, 1966, El Paso and Consol submitted another proposal for a lease. It was turned down by the tribe, and both leases were cancelled effective December 8, 1966.

A lease sale was recommended for May 21, 1968, at the office of the Area Director of the BIA, Window Rock, Arizona. The logs from El Paso's original drilling were given to the San Juan Reproduction Company in Farmington, and for $390 anyone could purchase a complete set to evaluate the coal reserves. Stipulations for the sale follow: length of lease-10 years; area-40,287 acres; rental—$1.25/acre, not credited to royalties; royalties-25¢/ton on the reservation, 35¢/ton off the reservation; minimum bonus in lieu of production royalties—$2.00/acre on the 6th year, $3.00 on the 7th, and $5.00 on the 8th, 9th, and 10th years; and restoration of surface. Available for use were 27,500 acre ft of water of the Navajo Tribe's allocation from the San Juan River, approved by the U.S. Bureau of Reclamation; approval of any further allocation would rest with Congress. The sale was held, and no bids were offered.

A second sale was held on October 8, 1968. One bid from El Paso and Consol was received for the following: bonus: $6.25/acre; rental: $1.25/acre, not credited to royalties; royalties: 20¢/ton on the reservation, 25¢/ton off the reservation, and a minimum royalty in lieu of production schedule to begin on the 6th year. The bid was practically the same as the one that the two companies had offered on November 5, 1966. The bid was accepted, and the BIA approved the lease on December 2, 1968.

On December 31, 1969, an agreement was reached between Consol and El Paso calling for Consol to be operator of any coal mines constructed on the lease premises. In June of 1972, Consol extended to El Paso an option to purchase Consol's 50% interest in the lease, and in that month El Paso became the operator of the lease. The sale, however, was never approved by the tribe.

In October of 1972, El Paso filed with the Federal Power Commission (FPC) a request for approval of the Burnham Gasification Project. The FPC had not rendered a final decision by March of 1975, and El Paso asked for a deferral of decision until new cost figures could be obtained for the gasification plant and the coal supply contract.

Early in 1974, because of delays in FPC approval, delays in tribal approval of the sale of Consol's interest in the reserve, lack of a water contract, and other factors, it became clear that the coal gasification complex and the coal mine would be delayed beyond December 1978, the date to start production under the existing lease. El Paso then asked Consol to join with it in obtaining a customer in order that a mine might be opened to fulfill the production requirement.

Negotiations were begun with the Salt River Project for a contract to supply coal to the proposed Coronado Station at St. Johns, Arizona. The negotiations proceeded through August 1974, at which time Salt River wanted certain waivers from the tribe and the Secretary of the Interior that would assure the validity of the lease. By March of 1975 the waivers had not been received, and Salt River operators felt that they could not be obtained on a timely schedule. At that time Salt River operators signed a letter of intent to purchase coal from a group consisting of Peabody Coal Company, Santa Fe Industries, and Thermal Energy, Inc., holders of a large block of coal in the Star Lake area, but negotiations failed. The Coronado Station power complex has been built, and most of the coal for it is being purchased from Kaiser Steel Corporation's York Canyon strip mine and from Pittsburg & Midway's McKinley mine north of Gallup.

In March 1975 El Paso notified Consol that they had decided not to exercise their option to purchase Consol's 50% interest. Extensive negotiations that El Paso and Consol conducted with the Navajo Tribe in the attempt to obtain the waivers and to have certain ambiguities in the lease corrected resulted in a restructured lease proposal scheduled for review by the Navajo Tribal Council in November 1975. At that time a request was sent to the Department of the Interior for a supplement to the existing draft Environmental Impact Statement (EIS) to reflect certain changes. The companies agreed to pursue coal sales for industrial purposes in addition to continuing plans for the gasification complex, and it was desired that the EIS be strengthened in the area of coal mined for industrial and thermal electric purposes; the primary emphasis of the draft EIS had been the coal gasification complex. Also requested was that the final EIS identify Consol as operator of the coal mines on the leased premises and that the provisions of the new lease of Consol, El Paso, and the Navajo Tribe be made part of the final EIS The requested lease amendment was approved on August 26, 1976.

Figure 69 is a map of the Burnham area. This map, made about 1979, is interesting because it shows the locations of proposed railroads that have not been built yet. Figure 70 shows the location of the Burnham mine and the El Paso and Consol leases.

In December of 1977 the New Mexico Surface Mining Commission granted a permit to El Paso and Consol to strip mine coal. In 1979 the Con Paso mine was started, and it produced 39,652 tons in 1980. The coal was opened by scrapers and dozers. It is hauled by truck to a railroad or

to the customer's place of operation. This is a token mine, and until a railroad can be built to the area it will remain such. Consol is still negotiating with the Navajo Tribe for the right to construct a rail line from the Pittsburg & Midway Coal Company spur line across the reservation to the vicinity of Burnham. A list of production figures follows from 1980 (the year production started) to 1984 (the last year for which figures are available to date).

1980	39,652 tons
1981	48,000 tons
1982	50,358 tons
1983	363,338 tons
1984	31,221 tons

Navajo mine*

NOO—C-14-20-0603-2505 1-25-54 Permit
10-30-57 Lease
Utah Construction and Mining Company, San Francisco, California, 1954-1971
Utah International, Inc., San Francisco, California, 1971—
31,000 + acres described by metes and bounds in Tps. 25, 26, 27, 28, and 29N, Rgs. 15 and 16W, Navajo Reservation

In the early 1950's, Utah Construction and Mining Company (Utah), a San Francisco-based firm known primarily for its heavy construction, mining, and land-development activities, began a search for large reserves of strippable

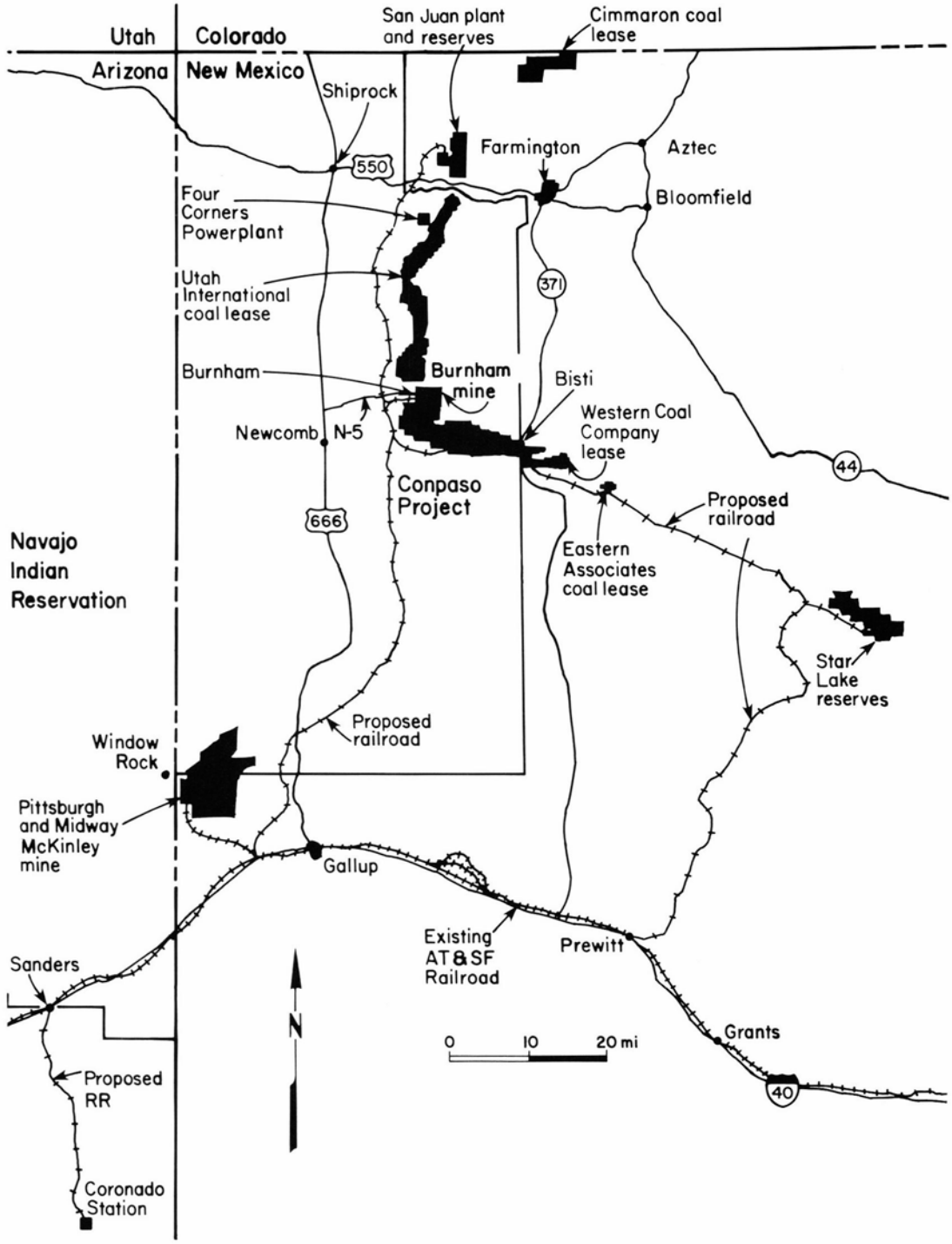


FIGURE 69—Coal leases in northwestern New Mexico (from Consol, 1980).

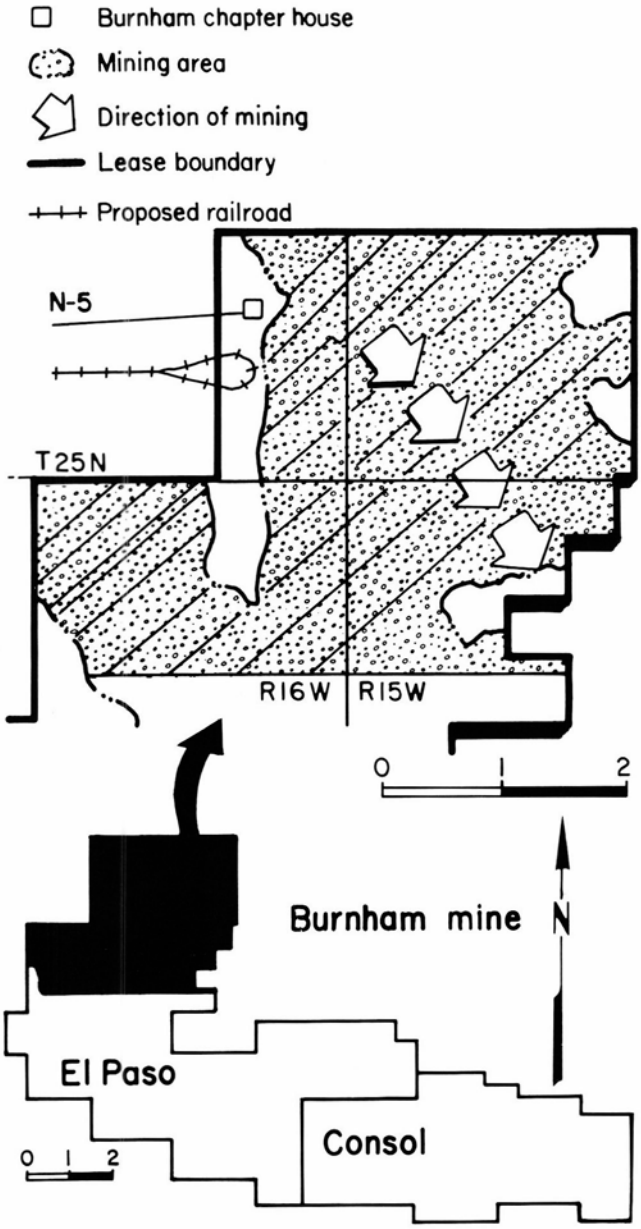


FIGURE 70—Map showing the Burnham mine and the El Paso and Consol leases (from Consol, 1980).

steam coal in the western United States. The western edge of the San Juan Basin in the Fruitland Formation was believed to contain such reserves suitable to fuel large thermal electric powerplants. Utah approached the Navajo Tribe in 1953 for a permit to drill for coal along the outcrop of the Fruitland Formation within the general area described above. The Navajo Tribe, interested in developing its natural resources and in providing employment for its people, was receptive. The Advisory Committee of the Navajo Tribe approved Resolution A.C.J.-56A-53 on July 28, 1953, allowing Utah to explore for coal and kindred products within the boundaries of districts 12 and 13 and more particularly within Tps. 27, 28, and 29N, Rgs. 15 and 16W (projected survey). Subsequently, a permit for exploration was signed on October 30, 1957, by Sam Ahkeah, Chairman of the Navajo Tribal Council, and Allan G. Harper, Area Director of the Bureau of Indian Affairs (BIA). The term of the permit was for 6 months with the right to request two additional 6-month periods. The permit also allowed the company an option to acquire a lease with the approval of the Navajo Tribe and the Secretary of the Interior.

Utah began drilling early in 1954. By late that year it was evident that the coal beds extended north of the permit lands in district 13; a request for additional lands covering the underlying coal beds outside the original permit area was granted on November 23, 1954, by tribal and BIA officials.

Drilling and evaluation of the lands continued, and by September 1956 Utah was in a position to make application for a lease. This was presented to the Navajo Tribe and the Department of the Interior, and meetings were arranged for negotiations. Because the proposed lease area was also potentially valuable for oil and gas, it was necessary to formulate rules for the area concerning oil and gas drilling, crossing with pipelines, and issuing oil and gas leases. The area of the lease had to have the approval of the Secretary of the Interior because it exceeded the 2,500 acres allowed under BIA regulations; therefore, the acreage was held to a minimum and some coal lands along the outcrop on the west side of the lease were unknowingly excluded. The lands on the Navajo Reservation are unsurveyed; however, the lease was eventually well marked and described by a metes and bounds survey.

The terms of the lease, options for additional lands, and many other factors that enter into a lease of this magnitude were discussed. Agreement was reached on most of the issues during a meeting on November 8, 1956. By July 26, 1957, a lease of 24,320 acres was agreed upon (Fig. 68), and on October 30, 1957, it was signed by the Department of the Interior.

Hugh Evans, who had been in charge of the exploration and land surveying before the lease was signed, then began a close-spaced drilling program at the north end of the lease to evaluate the coal beds and to outline a plan of mining. The early drilling indicated sufficient coal reserves to fuel a mine—mouth powerplant complex, but another resource, water, had to be obtained first. In 1955 Utah requested from the state of New Mexico a permit for a yearly allotment of water from the San Juan River. The permit was issued for 31,000 acre feet in 1958 after Utah was granted the coal lease.

Utah was ready to find a customer for its coal in a market that was on the verge of unfolding. The southwest electric utility companies, particulary in Arizona and southern California, had foreseen the impending shortage of natural gas, and because favorable hydroelectric sites had been taken or spoken for, they found the answer to their power needs in the coal discoveries at Fruitland and Gallup. Without delay Arizona Public Service Company (APS) negotiated with the Navajo Tribe for a plant site near the north end of Utah's lease. Utah began discussions for a sales contract with APS, and agreement was reached on August 18, 1960. Utah agreed to deliver an energy equivalent to 1.5 million tons of coal annually for 35 years, with an option to extend the term for an additional 15 years and to provide additional fuel as the generating capacity increased.

On April 1, 1961, Utah obtained from the Navajo Tribe a lease for a plant site conveniently located to the APS powerplant site. The area was enlarged on August 26, 1966, to accommodate anticipated expansion. In March 1961 APS broke ground for the first two 175,000 KW powerplants. Ebasco Services, Inc., was the prime contractor for the Four Corners Powerplant (Figs. 71, 72). As the first two units were completed and crews became available, construction was started on the foundations of a third. The first two units began generating power in May 1963, and the third went on stream during the summer of 1964 (Fig. 73). The third unit brought the generating capability to 575,000 KW; 2.5 million tons of coal per year were required to fuel the complex. The cost of the three units was stated to be $120,000,000 (Kaanta and Cory, 1963, p. 18). The major portion of the electricity developed was to be transmitted

about 300 mi over twin 345 KV lines to Phoenix, Arizona, and the Albuquerque area was to receive the rest over a new transmission line. Mine–mouth powerplants became a reality at this time because of the new technology in transmitting electricity long distances through lines capable of carrying high voltages. Supervising the operation of the Four Corners Powerplant was Hugh W. Cocklin, who had held a similar position with APS at the Saguaro plant north of Tucson. The entire plant was operated and maintained by a staff of 40 men.

In order to supply the power needs created by the demand in the Phoenix area, APS constructed the Cholla Powerplant at Joseph City, Arizona, as a stopgap measure pending operation of the Four Corners Powerplant. The Cholla Powerplant went into service in mid 1962; its coal was furnished by Pittsburg and Midway Coal Mining Company from their mine northwest of Gallup. Even with this 115 MW plant, the Four Corners Powerplant and the mine facilities were urgently needed to meet the constantly escalating power needs. In order to have coal available in January 1963 it was necessary to assemble machines, build haul roads, provide water, and construct a preparation plant for a mine that would produce 2.5 million (and later 8 million) tons of coal per year.

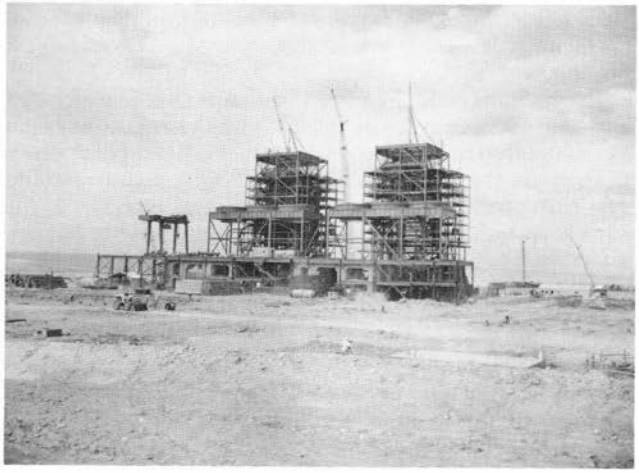


FIGURE 71—View to the north of Arizona Public Service Company plants Nos. 1 and 2 under early construction at the Four Corners powerplant site. *Photo by H. B. Nickelson, April or May 1961.*

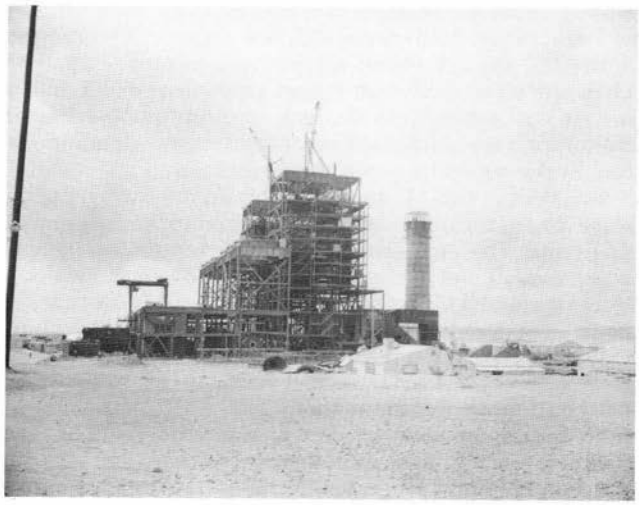


FIGURE 72—View to the west of Arizona Public Service Company plants Nos. 1 and 2 under construction. *Photo by H. B. Nickelson, April or May 1961.*

The first priority was to rebuild the primitive dirt roads from the railroad siding at Prewitt north to the construction sites, a distance of more than 100 mi, to allow shipment of the heavy pieces to build the powerplant, the dragline, and other machines. Some of the semi rigs were so heavily loaded that they required power units to both push and pull them across this country. Loads that were under the state load limits were hauled over the oiled highways.

Near the plant sites an earth dam was built across a natural low-drainage area to create a 1,200-acre artificial lake, which would reach a depth of 100 ft. The water allotted by the state was to be pumped through a pipeline from the San Juan River, 3 mi to the north, and was to be used for cooling and condensing steam from the powerplant and for dust abatement on the haul roads and at the coal plant. In addition, Morgan Lake (named after a former Navajo Tribal Chairman) was planned as a recreational area under tribal jurisdiction.

The logical method of mining this coal deposit was strip mining. In this procedure, a 100-ft-wide strip of shale and sandstone (overburden) is removed over the coal bed along the outcrop. The coal is mined, and the process is repeated, the overburden being put in the area previously occupied by the coal bed. These strips are repeated until the overburden is not economical to remove, or when the overburden reaches a point beyond the capability of the stripping machine. The overburden is drilled and blasted before it is removed. Two machines are used to remove the overburden in large strip-mine operations. One is a large shovel that is placed in the pit and digs the overburden off the coal bed; the other is a dragline that sits on the bank or high wall and scoops up the overburden down to the coal bed. A simple sketch shows this operation (Fig. 74). The overburden in surface mines in the western United States, which consists of relatively soft shales and sandstones, practically dictates the use of draglines.

The stripping tool Utah bought—a Marion 7900—at that time the largest in the world, was capable of moving 12 million yd^3 per year. The 7900 was not operational by the time the powerplant needed coal, and a machine was needed to open the first pit. Utah had just closed the Ozark Philpott mine in Arkansas, and a Marion Model 5323 23-yd stripping shovel was at that property. This shovel was dismantled, shipped to the construction site, and reassembled in time to begin opening the first pit (Fig. 75). The Marion 7900

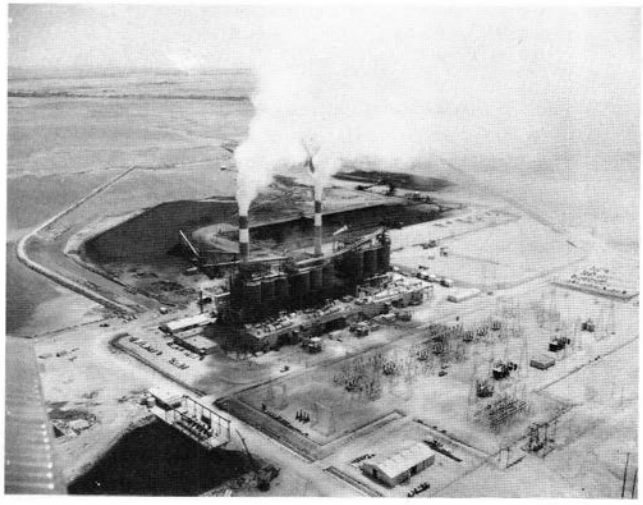


FIGURE 73—Arizona Public Service Company Four Corners Powerplant units 1, 2, and 3 in operation; photo taken looking northeast. The black areas near the plant are coal stockpiles. A corner of Lake Morgan is visible in the upper left-hand corner. *Photo by Utah Construction and Mining Company, late 1964.*

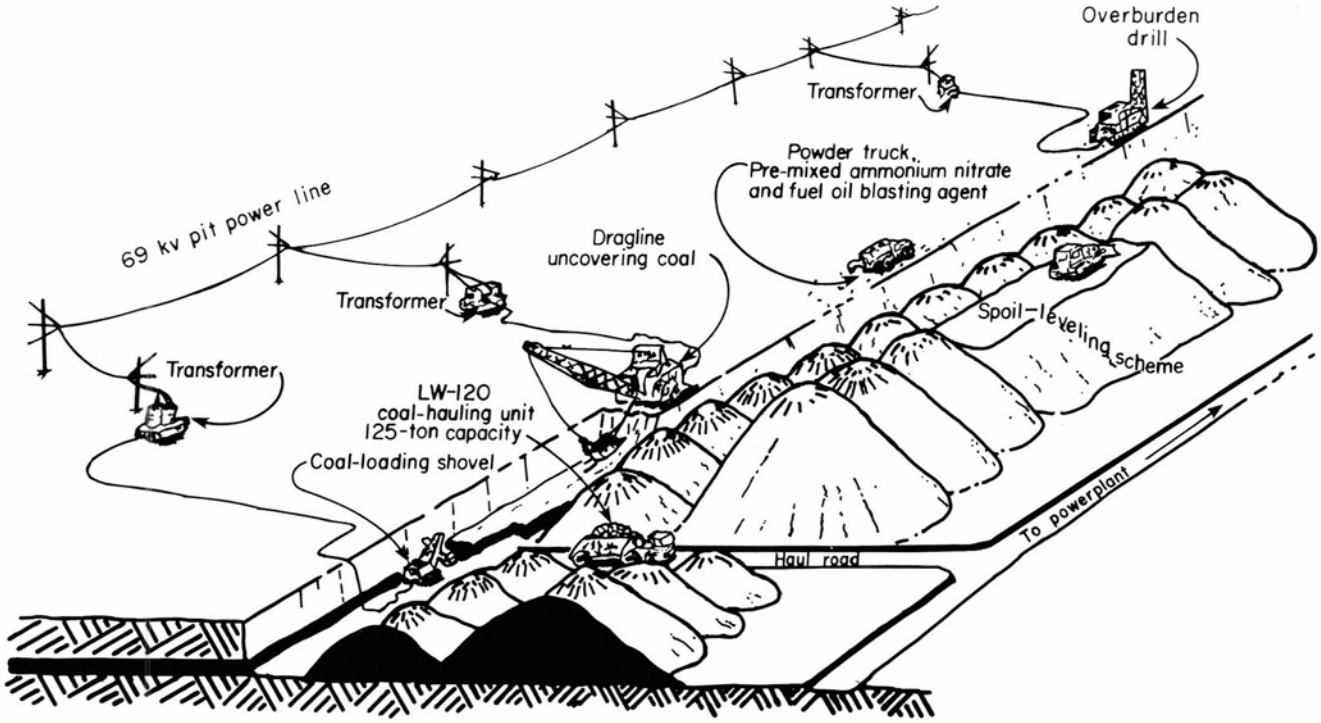


FIGURE 74—Sketch of a typical strip mine operation at the Navajo mine. The coal was formed during Late Cretaceous time (95 Ma) and is found in the Fruitland Formation. *Sketch by Utah Construction and Mining Company.*

FIGURE 75—The Marion model 5323 shovel being reassembled at Utah's Navajo mine assembly yard. This shovel, carrying a 22-yd^3 dipper, was moved from the company's worked-out Ozark Philpott operation in Arkansas. It was used to start the first box cut in the Dodge pit while the Marion 7900 dragline was being constructed, and then it aided the dragline in the early stripping operations. Later it was used to load coal from the pits, but it was not too successful because of its awkward size. It was eventually retired and sold. *Photo by H. B. Nickelson, summer 1961.*

FIGURE 76—Construction of the tub or base that supports the tremendous weight of the 7900 Marion dragline; photo taken at Utah's assembly park at the Navajo mine. *Photo by H. B. Nickelson, spring 1961.*

dragline weighed 3.9 million pounds and had a 250-ft boom that was capable of handling a 40 to 45 yd^3 bucket (Figs. 76-79).

In the early days of Utah's operation, a Bucyrus-Erie 60—R drilled 12.5-inch holes on 33-ft centers for blasting the overburden (Fig. 80). The holes were loaded with "Geneva prills" and detonated with a stick of 75% dynamite. The coal bed was drilled and blasted before it was loaded by two Marion 151M shovels with 11 yd^3 buckets into 10 converted DW-20 Caterpillar 50-ton bottom-dump trucks capable of hauling about 1,000 tons each per shift. From the mine the trucks unloaded on a grizzly over a 400-ton hopper from which the coal went to the primary and secondary crushers for reduction to minus ^{3}/4 inch. After crushing, the coal was delivered to a stacker that blended the coal in piles; it was then recovered from the piles by a reclaimer and delivered over a sampler and scales to APS (Figs. 81 and 82).

The operation of the powerplant units has depended upon fuel rigorously tailored to requirements for BTU, ash, and other components. During the early years of the mine when the pits were near the outcrops, samples were taken at about 100-ft intervals to meet these strict standards. After analysis of these samples, the production foreman could select the amount and type of coal needed from each pit

FIGURE 77—Forty to forty-five-yd³ dragline bucket for Utah's 7900 Marion dragline, which was under construction at the time. Earl Gordon, U.S. Geological Survey, stood beside the bucket to give some idea of its size. *Photo by H. B. Nickelson, spring 1961.*

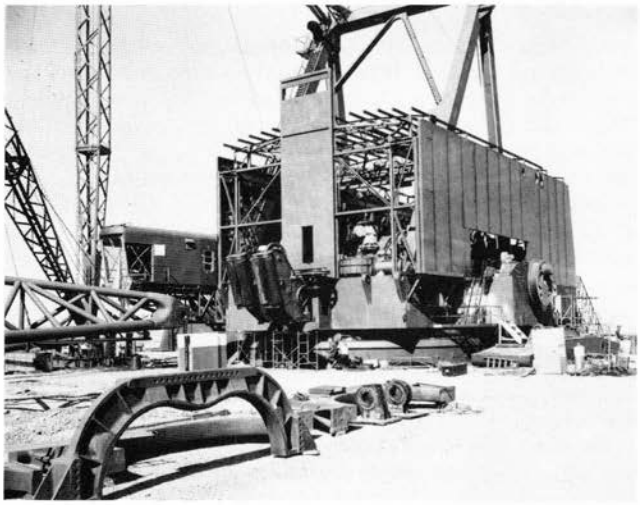


FIGURE 78—The 7900 Marion dragline partially assembled. *Photo by Utah Construction and Mining Company, late 1961 or early 1962.*

for the desired fuel, and the various grade coals were blended by the stacker in a long 30,000-ton pile. The bucket-type reclaimer mixed the layers to the desired quality before burning. Sampling in the pits was discontinued later because this expensive control was found to be unnecessary; the coal-processing plant is so highly efficient that over a period of a year the plant can deliver fuel that varies within only a few BTUs of the amount agreed upon.

The lease with the Navajo Tribe stipulated that Navajo Indians be employed to fill all positions for which they were qualified. From the inception of the operation Navajos were trained by Utah for the various tasks, and within a few years they composed 60% of the labor force. At the present time 75-85% of the employees are Navajo, many of whom occupy supervisory positions. In 1963, 90 people were em

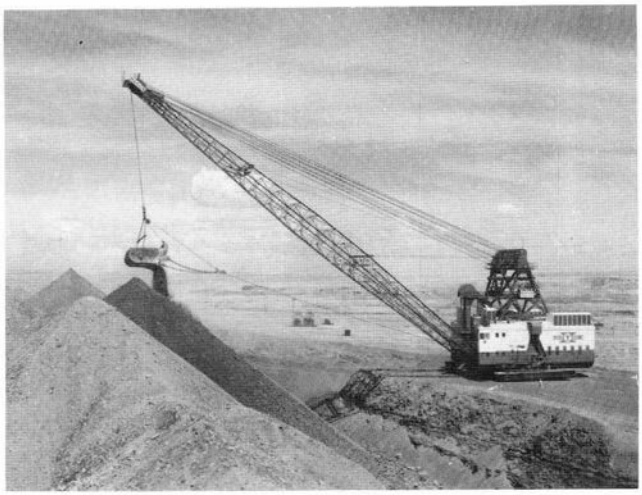


FIGURE 79—View to the north–northeast of Utah's Marion 7900 dragline in operation. Some of its specifications are as follows: 250-ft boom; 40–45-yd³ bucket; working weight—3.9 million lbs; swing speed—1.65 rpm; walking speed—800 ft per hr; spoil radius—215–238 ft depending on boom angle; production per yr—12 million yds³. *Photo by Utah Construction and Mining Company, about 1964.*

ployed by Utah. They were under the supervision of A. F. Geiger, Manager; James H. Olsen, Superintendent; Timothy Winterer, Engineer; William Driscoll, Engineer; Ray Bashioum, Master Mechanic; James Mainard, Chief Chemist; and E. J. Robinson, Office Manager.

The Four Corners Powerplant and the Navajo mine were dedicated on June 21, 1963 (Fig. 83). Paul J. Fannin, Governor of Arizona; Raymond Nakai, Chairman of the Navajo Tribal Council; Walter T. Lucking, President of Arizona Public Service Company; and E. W. Littlefield, Chairman of Utah Construction and Mining Company, gave short speeches regarding the benefits of the mine and power-plants for the people of New Mexico and Arizona. Flag-raising ceremonies were held, and tours of the plant were conducted; later, cocktails and dinner were served at the Elks Club in Farmington.

As the development of the property progressed, problems that had not been foreseen at the time of the original lease agreement arose. The coal lease area is situated on part of the large San Juan gas and oil field, and soon after production began a gas line that would cross the lease land was proposed. Amendment No. 1 in Utah's lease was agreed upon between the concerned parties, and it settled regulations concerning the drilling of oil and gas wells and the location of a corridor for oil and gas lines and transmission lines. Another problem developed when the drilling program established that minable coal existed outside the lease lines. Amendment No. 2 added 549.09 acres of land with an estimated 7 or 8 million tons of crop coal (6,000 BTU) to the north end of the lease. The lower BTU coal near the outcrop was blended in Utah's coal-processing plant with the higher-grade coal from the pits to meet the APS requirement.

Even with Arizona Public Service Company's two new powerplants, the Cholla at Joseph City, Arizona, and the Four Corners at Fruitland, New Mexico, it was apparent that the demand for power in the Southwest would exceed the capacity of all sources by the early 1970's. Expansion of the Four Corners Powerplant was inevitable; Utah's coal was available for about $3.00 per ton, and their water rights were more than adequate to double or triple current capacity. To meet anticipated mine expansion Utah aggressively pursued the programs of development drilling on the lease, experimenting with prototype commercial earth-moving equipment. The Navajo mine was a proving ground

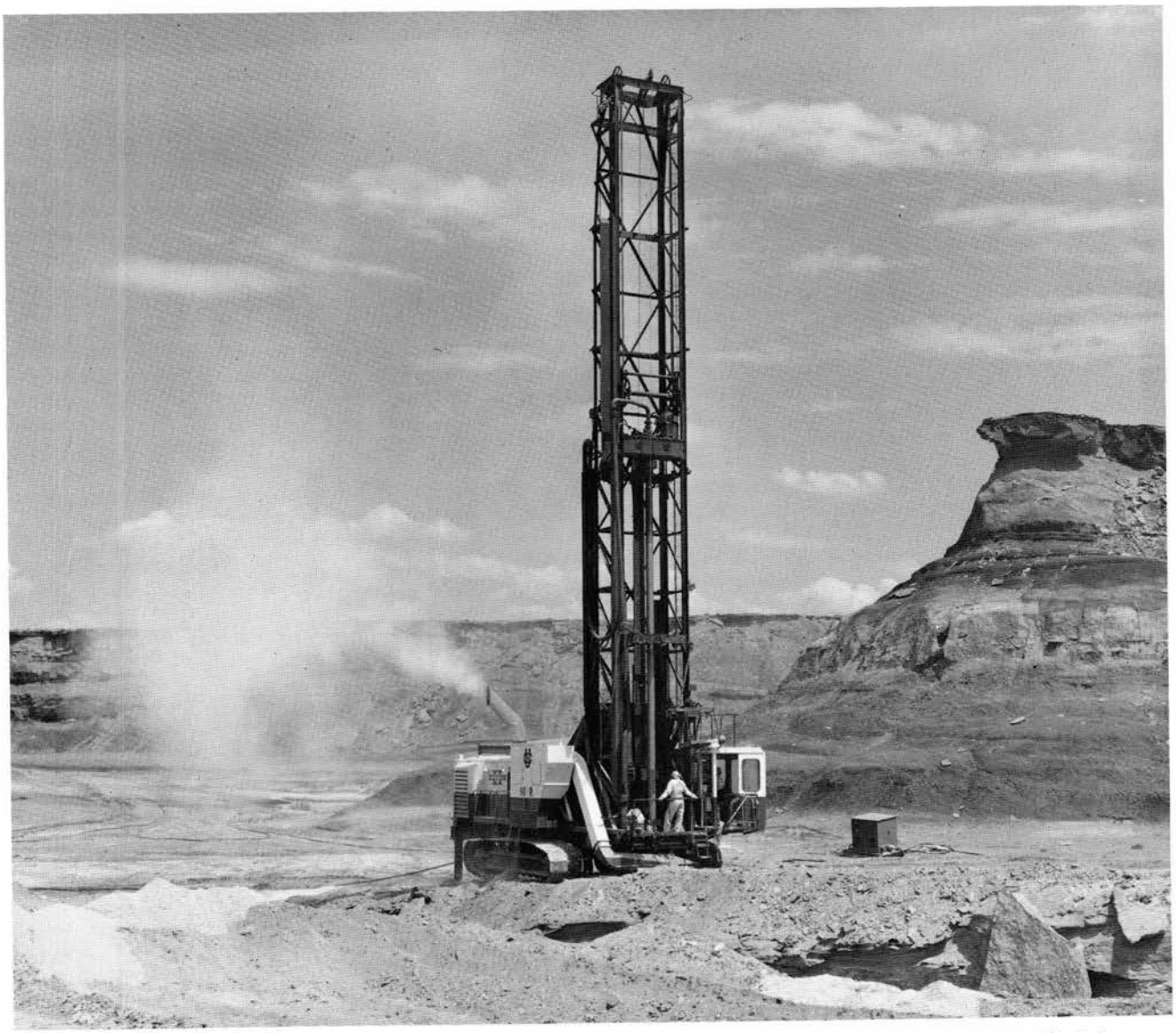


FIGURE 80—60–R drill used at the Navajo mine to drill spaced holes in the overburden on an area the width of the pit. The holes were then charged with a mixture of ammonium nitrate and fuel, primed, and blasted to loosen the overburden enough so that it could be removed and still support the dragline during the removal process. *Photo by Utah Construction and Mining Company, July 1963.*

FIGURE 81—Stacker spreading crushed coal in blending piles at the Navajo mine. This machine is capable of stacking 30,000 tons of coal on each side. *Photo by Utah Construction and Mining Company, about 1965.*

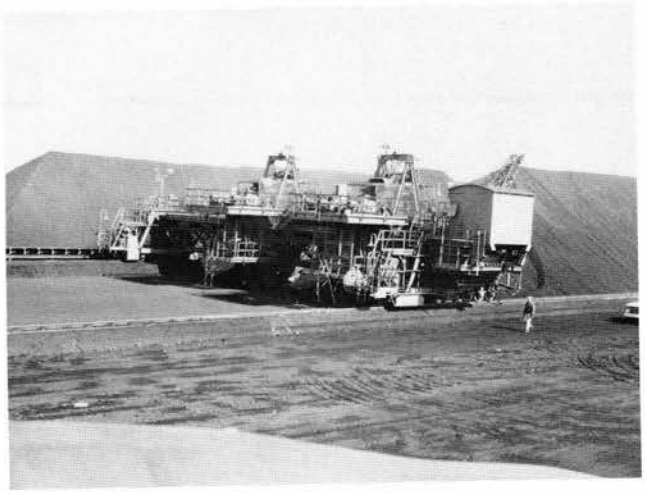


FIGURE 82—Bucket-type reclaiming unit at the Navajo mine. This machine finished blending the coal and conveyed it by belt to scales and a sampler. The delivery point was Arizona Public Service Company. *Photo by Utah Construction and Mining Company, about 1965.*

for many types of coal hauling and loading machines. Some were developed by Utah in their machine and repair shops, but many were developed by other companies and by the U.S. Bureau of Mines. Utah experimented with coal-drilling equipment, borehole drills, and mobile anfo-oil blasting-agent equipment. Much of this equipment survived the field testing and is being used today (Fig. 84).

Development drilling over the years since Utah began exploration work indicates that a coal reserve of 1.1 billion tons of strippable coal exists on the original lease area. The coal beds in the southern part of the lease were formed in a depositional basin where eight economical beds originated. The multiple beds were deposited in a lenticular manner similar to shingles on a roof. The lenticular deposition of the coal beds was such that only four minable beds exist in any one given area. Approximately 7-8 mi south of the north end of the lease the depositional environment changes, and the marine Pictured Cliffs Sandstone underlying the coal-bearing Fruitland Formation rises abruptly to lie within a few feet of the uppermost coal bed, which Utah calls the No. 8, at the northern end of the basin mentioned above. This bed of coal soon thins and then disappears to the south, but to the north it becomes the main productive bed. It extends northward beyond the lease across New Mexico into Colorado, where it is known as the Carbona bed.

Utah began to extend their pits south in 1973 to reach the multiple beds. Before then all of the production came from the No. 8 bed. During these years APS desired a fuel containing 8,900-9,000 BTU, which Utah obtained by blending lower-grade coal near the outcrop with the higher-grade unoxidized coal from deeper pits. The No. 8 bed, which extends across 7 mi of the northern part of the lease, varies between 11 and 14 ft thick and contains between 9,000 and 9,200 BTU. Overall the coal contains about 12% moisture, 21% ash, and 0.6-0.7% sulphur. The grade of the coal decreases and the ash content increases going south. At the north end of the property a thin bed of dirty coal approximately 2-3 ft thick and 40-50 ft above the No. 8 bed is spoiled.

The drilling done until 1965 along the coal crops at the western boundary on the southern half of the lease showed coal beds extending beyond the lease line in a number of separate areas. In order to facilitate mining and utilize the resource, Utah negotiated with the Navajo Tribe and obtained 6,547.12 acres under Amendment No. 3, approved September 29, 1965. This addition increased the size of the lease to the current 31,000 acres.

In 1965 a group of six power companies collectively known as WEST (Western Energy Supply and Transmission) began negotiations to build units 4 and 5, each rated at 755,000 KW, which would bring the Four Corners Powerplant to 2,085,000 KW. Four additional 345 KV lines and one 500 KV line were needed to transport power to the WEST markets, some as far as Los Angeles, 700 mi away. WEST associates' ownership and output interests follow:

FIGURE 83—Mine Dedication Day at the Navajo mine, June 21, 1963. From left to right are the following officials: C. V. Collins, Navajo Tribal Mining Engineer; E. W. Littlefield, Chairman, Utah Construction and Mining Company; A. M. Wilson, President, Utah Construction and Mining Company; Raymond Nakai, Chairman, Navajo Tribal Council; A. F. Geiger, Navajo Mine Manager; E. C. DeMoss, Mining Manager, Utah Construction and Mining Company; Alan King, Personnel Manager, Navajo mine; J. H. Olsen, General Superintendent, Navajo mine. The Marion 7900 dragline is in the background. *Photo by Utah Construction and Mining Company.*

FIGURE 84—Shovel with 11-yd³ dipper loading coal into 300-ton-capacity truck–train with 635 HP tractor and 3-tandium trailer units. A 325 HP dolly is mounted on the middle trailer for power boost. This huge prototype coal-hauling equipment proved to be unsatisfactory. *Photo by Utah Construction and Mining Company, 1965 or 1966.*

Southern California Edison Company	48%
Arizona Public Service Company	15%
Public Service Company of New Mexico	13%
Salt River Project	10%
Tucson Gas and Electric Company	7%
El Paso Gas and Electric Company	7%

Construction began in July 1966, and a fuel agreement with Utah to supply 6-8 million tons of coal per year to the Four Corners complex was also approved that year. By February 1967 the steel structure of the new unit was underway. The coal was hauled only at night to relieve the traffic problems created by the large amount of material being hauled to the construction sites. Construction began in October 1967 on the first of two new 50-yd draglines to uncover the coal. By early 1969 the new 50-yd 285-ft boom Bucyrus-Erie dragline, which was capable of moving 14 million yards of overburden per year, was in operation. The Marion 7920 with a 300-ft boom and a 50-yd bucket with the same overburden capabilities was still under construction, but it was in operation by early 1970. Unit No. 4 was put on stream in 1969, and Unit 5 by early 1970; by late 1970 the mine was operating at near capacity. It had become the largest coal mine in the United States and held that distinction for a number of years.

Utah experimented with several types of coal haulers but settled on the 120-ton bottom-dump Le Tourneau—Westinghouse with a 75A or B series tractor (Fig. 85). Eventually about 11 of these units were obtained; nine units operated in 1970. Another stacker and a reclaimer were assembled on a new storage site to handle the anticipated production of 7-8 million tons per year.

The problems of ash disposal and land reclamation had arisen even before the plant expansion. In 1966 APS and Utah had begun discussions concerning the possibility that Utah could haul the ash and dispose of it in the V's between the spoil pile rows and/or in the bottom of the worked-out pits. It was proposed that the ash disposed of in the V's be covered with at least 3 ft of spoil bulldozed from the top of each pile. With this method the spoil piles would also be leveled; outside pressure was being put on the company to level and reclaim the mined land. An agreement concerning a plan for ash disposal and land leveling and a commitment for the reclamation of the land was signed with the Secretary of the Interior in 1969 or 1970. Before this there had been no government regulations or requirements in the lease concerning land reclamation. The plan to dispose of the ash in the V's, however, proved impractical because the space between the V's was too limited and mixing during

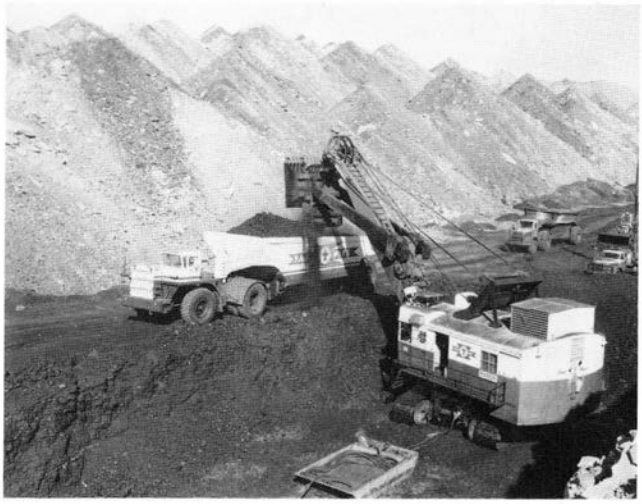


FIGURE 85—The Marion 151M shovel loading coal next to the highwall. The 120-ton, bottom-dump truck is sitting on unloaded coal next to the spoil pile. The coal bed is about 12 ft thick. *Photo by Utah Construction and Mining Company, about 1965.*

the covering process still left ash on the surface. Ash is a relatively harmless material with a composition approaching that of glass, but its presence, as described below, is a problem.

When the new units were put in operation and coal use more than tripled, the still unsolved problem of ash disposal became even greater. To produce steam to turn the turbines, powdered coal is blown into the top of a large combustion chamber or boiler where the coal bums as it descends in the chamber. The portion of the coal that is noncombustible (ash) either is blown from the chamber as fly ash (75%) or falls to the bottom as bottom ash (25%). The fly ash was entrapped in electric precipitators or in bag houses, but considerable ash escaped through the stacks into the atmosphere. It was very noticeable and presented a dust problem in the area. The bottom ash and that caught in the precipitators or bag house were mixed with water, flushed through a pipe, and impounded behind a dam in the Chaco Valley a mile or so away. The possibility that this ash could be carried into the San Juan River presented another problem. Public pressure was brought to bear on the powerplant for effective ash control. In 1971 Arizona Public Service Company closed the No. 3 unit and installed a scrubber in the circuit. With its use, the hot gases and fly ash were passed through a moist atmosphere, and practically all of the fly ash and gases soluble in water were contained and controlled. After unit 3 was reopened, units 1 and 2 were closed for the same equipment installation. While this construction was underway, the No. 3 unit caught fire and was practically destroyed. Production at the mine was curtailed to 3 days per week until the first units were put back on stream.

With the entire complex once again fully operational, the ash from the first three units was flushed with water through a pipeline to settling ponds; several 80-ton end-dump trucks purchased for this purpose were used to haul the ash from the other two units to the worked-out strip pits for disposal. This system is currently in use; Utah disposes of the ash under a contract with APS.

The ash disposal problems that Utah inherited were minor compared to the problems they had with reclamation of the land. It became Utah's goal to return the land to use in a condition as good as or better than it had been before mining. Because Utah had a long history of earth moving experience, the actual leveling was only a matter of scheduling men and equipment to the task of transforming the land so that farm equipment could be used safely to cultivate and seed. The challenge was to accomplish revegetation on this barren land where the average rainfall is about 7 inches per year and in many years, considerably less.

Obviously the land to be reclaimed should be made suitable for grazing. Many questions arose: what kind of vegetation would grow? would vegetation grow on the spoil piles? what kinds of fertilizer and stabilizing agents would do best? should topsoil be used? should irrigation be used? Scientific testing and work were necessary, and it seemed just that the groups pressuring for reclamation (Navajo Indians, state agencies, federal agencies) assume part of the tremendous expense and work of this undertaking. The first of these to help was the Soils Division of the Bureau of Indian Affairs (BIA). In 1969, with their cooperation, Utah established the initial vegetation test plots. In 1972 a soil survey over the regraded spoils was conducted in cooperation with the BIA. Plots were selected to assess the comparative values of various mulches and soil amendments, to test the efficacy of irrigation, and to compare the growth potentials of numerous plant species. Four plots were chosen for their different slope exposures and soil types to evaluate the growth of various plant species.

During the summer of 1973 Utah contracted with a team of range scientists and terrestrial ecologists from Westinghouse Environmental Systems Department for a complete evaluation of the program. The study was repeated in 1974. Conclusions were as follow: 2 years are not enough time for vegetation to stabilize itself; native species show better growth than introduced species; and supplemental irrigation and soil amendments enable regraded spoils to produce growth comparable to that from natural terrain.

The U.S. Forest Service, Rocky Mountain Forest and Range Experimental Station, conducted research on the revegetation of spoil overburden and reached the same general conclusions. Utah adhered to the concept of saving and reapplying topsoil, but one preliminary finding was that plant survival was better on overburden than on topsoil. However, the topsoil was still saved, as required by government regulation. Another study indicated that placement of overburden will not cause significant trace-element effects. From research, it appears also that micro-organisms, which are at a low level in newly turned overburden, will increase to the population needed for plant growth after irrigation.

In 1974 two 20-acre plots were established to evaluate drip and sprinkler irrigation. Drip irrigation proved unfeasible because a great deal of manpower was required to maintain the system and the heavy mineral content of the water caused the system to plug up. The following revegetation program was adopted in 1975 (Balzer et al., 1975, p. 27):

Plant species

Four-wing saltbush	Winterfat
Indian ricegrass	Nuttal's saltbush
Alkali sacaton	Shadscale

Amendments

Straw or native hay mulch — Hydromulch
Gypsum
Bottom ash as mulch
Fertilizers

Irrigation

Pre-irrigation period—moisture build-up
Germination period—frequent applications
Establishment period—infrequent applications

It was found that about 0.8 acre ft of water applied by sprinkler is sufficient for the pre-irrigation phase and as much as 0.4 acre ft is needed for the germination and establishment period if the annual rainfall is scant. The 16-inch diameter main pipeline and the pumping system are reported to have cost $2,000,000.

By early 1973 the state of New Mexico enacted a strip mine law that required a permit for mining and forced the reclamation of all spoil piles and disturbed areas created by strip mining. On April 11 and 12, 1973, a public hearing was held for Utah to present their plan of reclamation and mining. A permit to mine was granted by the state on July 24, 1974.

In early 1977 President Carter signed the Federal Strip Mine Act and created the Office of Surface Mining (OSM). The state relinquished its inspection and enforcement powers, but still required a permit to strip mine coal. A great deal of controversy existed between the strip mine operators and the OSM with their very burdensome and restrictive act and regulations. In 1978 the Department of the Interior (OSM, USGS), the Navajo Tribe, and the state of New Mexico all had a say in how to grow the grass on the reclaimed area. The results of Utah's reclamation program exceeded original expectations, and the grazing potential of the land exceeds that before mining. The cost to Utah in 1978 was about $6,000 per acre. Credit can be given to the devoted and capable people that Utah obtained to reclaim the land to this degree: J. Leroy Balzer, Director of Environmental Quality; and David B. Crouch, Robert W. Poyser, and Wayne E. Sowards, Environmental Engineers.

Early in 1973 Utah extended their pits south into the multiple beds to open greater coal reserves and to keep a lower stripping ratio. The mine then boasted three draglines: the original Marion 7900, 250-ft boom, 40-yd bucket; the Bucyrus-Erie 1350B, 285 ft boom, 45-yd bucket; and the Marion 7920, 300-ft boom, 50-yd bucket. Two Fiat—Allis HD-41's with a 7 by 20 ft full V blade were selected to level the spoil piles for reclamation. By 1978 these two engines leveled all the spoil areas, which previously had been untouched.

All the coal beds that crop out on the west side of the lease strike approximately north and south and dip 3% to the east. In 1978 in the multiple bed area three beds of coal were being mined. The No. 8 bed, nearest the surface, is about 15 ft thick; the No. 7 bed, 11 ft below the No. 8, is 2-4 ft thick; and the No. 6 bed, separated by a 30-ft bed of shale from the No. 7, is 6-8 ft thick. In order to mine these beds in sequence and keep from delaying the operation of the draglines, a great deal of planning is necessary, an interesting problem in logistics. Another problem with logitics is created when the strip pits exceed a distance of 7 mi from the plant because rail haulage becomes cheaper than truck haulage. A rail line was proposed that would extend south from the plant just off the west boundary of the lease. The line was started in 1973, but the construction was delayed for a time until an environmental impact study was approved and the right-of-way was granted by the Navajo Tribe. Two trains are operated; while one is loading, the other is traveling and unloading. The coal is stockpiled and loaded into the rail cars with a 23-yd end loader, a mobile and versatile piece of equipment that replaced the electric coal-loading shovels in the pits.

Further changes in operation were necessitated for additional curbs on air pollution. In August 1975 a public hearing was conducted concerning a draft Environmental Impact Statement (EIS) dealing with a proposed modification of the air pollution equipment on all units of the Four Corners Powerplant to bring the plant into compliance with state and federal air standards. Several proposals were involved. Units 1, 2, and 3 would have scrubbers modified to meet the standards, while units 4 and 5 would have scrubber-absorber systems installed. A limestone quarry and kiln would be opened 130 mi northwest of the plant to supply the scrubbers with lime. In addition, the powerplant would modify solid waste and water disposal systems to minimize environmental damage. After approval of these plans was obtained, the remodeling of the powerplant took place in 1976. Temporary closing of the units was required for the work, and there had to be a corresponding reduction in Utah's coal production.

In the same draft EIS was a 1970 request by Utah for an amendment to their lease that would allow mining of an additional 3,225 acres containing approximately 48 million tons of coal. The request was held in abeyance by the Navajo Tribe, and it is not known if the amendment was granted.

The fuel need for the life of the Four Corners Powerplant was about one-third of Utah's 1.1-billion-ton reserve, and the company was interested in mining the uncommitted coal. It was known that this type of coal could be converted to natural gas and usable by-products by the Lurgi process, which was developed and used in West Germany. Several natural gas companies became interested in producing gas from coal because their reserves were not sufficient to continue supplying their customers on the west coast indefinitely. Utah's coal was attractive because Transwestern's gas pipeline to California and Washington passed within 50 mi.

On February 6, 1973, Utah announced its receipt of a contract to furnish coal and water for a coal gasification plant to be constructed by WESCO about 25 mi south of the Navajo mine plant. The WESCO plant was to be owned and operated jointly by Pacific Coast Gasification Company of Los Angeles, California, and Transwestern Coal Gasification Company of Houston, Texas, subsidiaries, respectively, of Pacific Light Corporation and Texas Eastern Transmission Corporation. Utah was to supply 9.6 million tons of coal per year. Four gasification units of 250 mcfd each using the Lurgi method were to be built eventually, with completion by 1976 planned for the first unit. Approvals from the Federal Power Commission, other federal agencies, state agencies, and the Navajo Tribe were needed. The Environmental Impact Statement was written by the Bureau of Reclamation in Salt Lake City, and mining plans were written by Utah for the approval of the above-mentioned groups. By late 1977 WESCO was unable to secure all of these approvals, and the cost of the plants had risen to a point beyond the financial capabilities of the company. The project was dropped. WESCO had spent millions of dollars developing the gasification plans and pursuing the frustrating process of attempting to obtain approvals. Utah's neighbor, El Paso Natural Gas, also submitted plans for a similar gasification plant to be constructed on the Navajo Reservation just off El Paso's coal lease; this project also failed.

A list of production figures at the Navajo mine is shown below, and a list of fatalities is shown in Table 51.

1%9	3,337,419	1978	6,100,000
1970	6,020,950	1979	5,203,000
1971	6,652,049	1980	7,733,000
1972	6,898,262	1981	6,845,000
1973	7,389,321	1982	7,144,802
1974	6,955,000	1983	8,958,056
1975	6,073,000	1984	8,403,000
1976	7,010,000	1985	6,978,000
1977	7,420,066	1986	6,841,000

TABLE 51—Fatalities at the Navajo mine.

Name	Date	Cause
Woody Diswood, Sr.	January 24, 1965	Overturned end loader
Johnny Bowman	August 1, 1972	Haulage accident
Robert E. Burns	September 1972	Haulage accident
Daniel E. Kelly	April 13, 1973	Haulage accident
George Thomas Dan	October 18, 1973	Hoisting accident
Wilbert Werito	October 18, 1973	Hoisting accident

Ben Begay mine

Permit no. 19 4-26-51 Navajo coal permit
Ben Begay, address unknown 10 acres of sec. 16, T29N, R15W

The mine was about 2 mi southwest of Fruitland on the south side of the San Juan River. It was reportedly opened in 1933 by Navajo Indians; its location was given in the records as 300 ft south of the old government mine shaft on sec. 16. The coal in the area is in the lower 11-ft bed in the Fruitland Formation.

Navajo coal permit no. 19 for 10 acres of sec. 16, exact location unknown, was issued to Ben Begay on April 26, 1951. He mined from a single entry, approximately 250 ft long, which gave access to the coal; rooms were driven off this entry. He conducted his small operation only during the fall and winter months for sale in the local domestic market. It is not known exactly how long Ben Begay operated the mine, but in 1955 Bekis Begay was working it. At a later date the mine became part of the Utah International, Inc., Navajo lease, and has been dug up by Utah's strip mining operations. There are no records of tonnage produced in this mine.

David Cly prospect

Permit no. 20 5-17-51 Navajo coal permit
David Cly, Fruitland
1.5 mi west of Fruitland Irrigation Project Headquarters

The mine was opened with one entry on a lower bed of coal in the Fruitland Formation; the coal bed was about 11 ft thick and contained three partings about 3 inches thick. Mr. Cly operated the mine to provide the local Navajos with winter fuel. The mine has been destroyed by the open pit operation at the Navajo mine.

Barker Creek coal field

The Barker Creek coal field includes all of the Menefee Formation between the south township line of T31N and the Colorado-New Mexico boundary (see Fig. 1). It essentially covers T31N and T32N, Rgs. 14, 15, and 16W. The Barker Creek field was mapped in detail by Hayes and Zapp (1955). They reported that "The Menefee Formation of the Mesaverde Group contains coal in two stratigraphic zones, one comprised of the upper 250 feet and the other of the lower 100 feet." There are only two mines known in the Barker Creek field, the Hepler mine, opened in 1882 and operated until 1890, and three prospects driven by C. W. Fisherdick in the summer of 1905 for the Arizona and Colorado Railroad (Shaler, 1907, pp. 393-394).

It is believed that the Barker Creek field was never developed because of its remoteness from areas of habitation. The coal beds are thin, but a few mines could have been developed underground. The quality of the coal far exceeds that of the Fruitland coal.

Fisherdick prospects

C. W. Fisherdick, **1905**
SE1/4 sec. 6; SW1/4 sec. 5, T31N, R13W

M. K. Shaler located the Fisherdick prospects in sections 5 and 6, T31N, R13W. After a visit to the area and study of the La Plata 7 1/2 min quadrangle, I believe that he was near the SW1/4 sec. 5 and the SE'/4 sec. 6. The text of the Shaler report (1907, pp. 393-394) follows.

> Short prospect entries were driven on each of the three upper Mesaverde coal beds that outcrop in Barker Arroyo, in secs. 5 and 6, T. 31 N., R. 13 W., in the summer of 1905, under the direction of C. W. Fisherdick of La Plata for the Arizona and Colorado Railroad. The upper coal varies greatly in the six prospect entries driven on it. The extremes are shown in the subjoined sections, measured in prospects about 1 mile apart on the middle and south branches of the arroyo, respectively. The strata dip at an angle of 15° to 20° S. 70° E.
>
> Sections of upper bed in Fisherdick prospect, Barker Arroyo
>
> Location No. 35

	Ft.	In.
Sandstone roof		
Shale		2
Coal	3	8
Sandstone floor		
	3	10

Location No. 36

	Ft.	In.
Sandy shale roof		
Coal		8
Shale		1 1/4
Coal	4	2
Shale floor		
	4	11 1/4

Hepler mine

1882-1890
NW corner, sec. **18, T31N, R13W**

The Hepler mine is located at the northwest corner of sec. 18, T31N, R13W, on the La Plata 7 1/2-min quadrangle. M. K. Shaler (1907, p. 394) gave the following account of the mine.

> The middle one of the three Mesaverde beds is separated from the upper by 85 feet of sandstone and shale. It was mined from 1882 to 1890 in the middle branch of Barker Arroyo (No. 37), and supplied coal for the neighborhood. This mine, known as the Hepler, was abandoned because a fault was encountered in the workings and a bony coal parting 6 inches thick had gradually come in near the middle of the bed. The coal is hard and apparently of good quality, and at the breast of the 100-foot entry still remains hard and unweathered. The bed dips at an angle of 16° S. 70° E., and presents the following section in an open prospect in the north branch of Barker Arroyo:
>
> Section of middle Mesaverde coal bed in north branch of Barker Arroyo, at location No. 38.

	Ft.	In.
Shale, sandy		
Coal	1	8 1/2
Coal, bony and shale		11
Coal	3	4
Brown carbonaceous shale		
	5	11 1/2

Hogback coal field

The Hogback coal field is a north- to northeast-trending area of Menefee Formation and Cliff House Sandstone that extends from the south edge of T26N to the north edge of T3ON (see Fig. 1). The field gets its name from the prominent topographic feature formed by the Hogback monocline. The resistant Cliff House Sandstone forms the east-dipping Hogback ridge, and the coal-bearing Menefee Formation lies under the ridge to the west.

South of the San Juan River the Navajo Indians opened several shallow mines to furnish their winter fuel. North of the river extensive mining has taken place.

According to reports of the Territorial Mine Inspector, the Hogback field was first opened by W. T. Shelton, Superintendent of the Shiprock Indian Agency, in fiscal year 1907-1908. Previously the agency had mined Dakota coal along the San Juan River for its use, but that coal would hardly burn and a new source was needed. The San Juan mine (which is also identified by several other names; see San Juan mine chapter) was opened on a steep-dipping 6-ft bed of coal about 8 mi from Shiprock on the Hogback monocline. The land where it is located was originally public land, but in 1936, by an act of Congress, a 1-mi strip along the east boundary of the reservation was given to the Navajo Tribe to provide domestic fuel for the Navajo people in the area. Navajo coal miners then opened numerous small mines along the outcrop, and in the early 1950's the Navajo Tribe, in order to maintain some control over these miners, issued them coal permits. The last of the Hogback mines ceased operation in 1976. The extent of these mines was limited by steep dips and by water encountered at shallow depths.

In the Hogback field there was one public land lease, SF 077115, in the NW1/4 sec. 22, T3ON, R16W. It was issued to Leo Warren in July 1944, and it was cancelled in 1985. The mine on this lease is known as the Hogback No. 13 mine. The Indians have depleted the reserves on their lands in this field, but some coal reserves lie downdip and to the north of the Hogback No. 13 mine, which could be strip mined. The coal of the Hogback field had a low ash content and a high BTU content, which probably made it the best domestic fuel in New Mexico.

Hogback Indian mines

The Hogback coal mines were developed along a clean 6-ft bed of coal on the steeply dipping limb of the Hogback monocline about 8 mi east of Shiprock. The first mine was developed in about 1936 to provide coal for the Shiprock Agency's facilities at Shiprock. The coal bed at that time was just outside the Navajo Reservation boundary, and in order for the Navajo Tribe and Agency to acquire title to the coal land the boundary of the reservation was extended to include this land.

The reserves of this bed of coal were limited from the outcrop downdip to water level. This narrow ribbon of minable coal varied in width from 80 ft at the southernmost mine to 350 ft at the northernmost mine. Mines were not developed along the complete outcrop because some areas were burned, and the burn probably extended to the water level. The dip of the coal bed varied from 24° at the south end to 6° at the northernmost mine. The coal was hard and bright and had low ash content. It was excellent domestic fuel and was in great demand in the immediate area and in southern Colorado.

Mine Nos. 4-12A were at one time or another connected by their respective rooms, and several of these mines used the mine on either side for ventilation and escapeways. The mine operators left 12 to 18 inches of coal in the roof to support the thin-bedded, badly fractured shale immediately above the coal. Surface facilities such as hoist, tipple, and storage bins ranged from very crude to reasonably well constructed. Blasting was done during early-day mining with black powder, but a change was made to permissible explosives after continued insistence by the mine inspectors.

During the early-day mining the Navajo Indian miners constructed stone hogans, many of which are still standing today. The later miners of the 1950's drove from their homes along the San Juan Valley to the mines; however, some cheap frame houses near the mines were homes for a few of the miners.

The individual mines, which follow, are described from the south to the northeast. Production from the individual mines is not known.

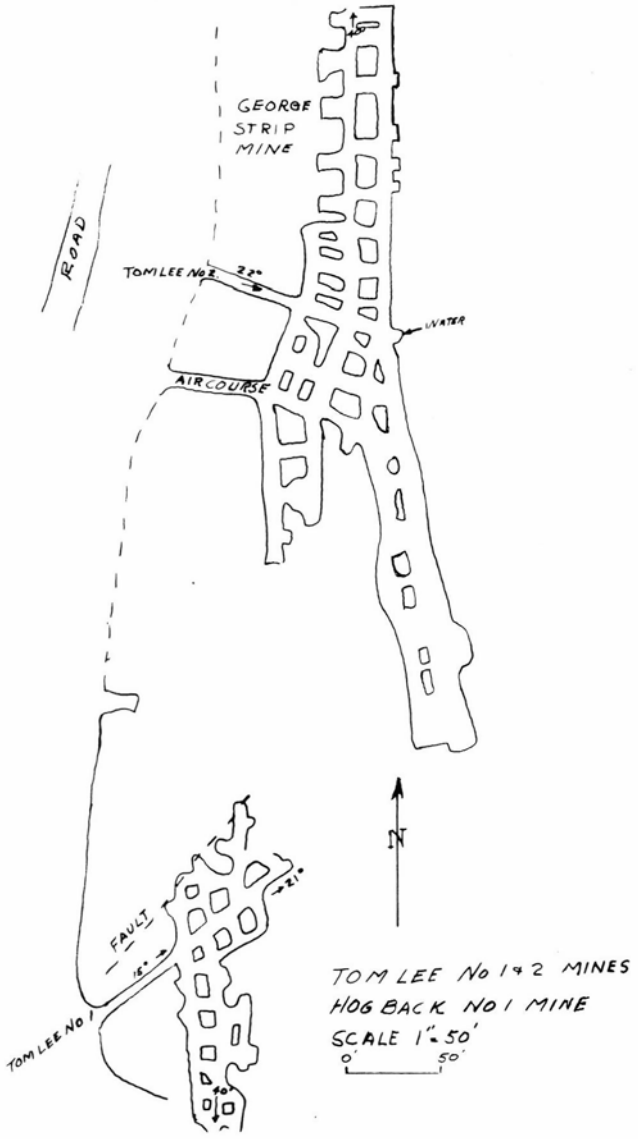


FIGURE 86—Map of the underground workings of the Tom Lee No. 1 and No. 2 mines.

Tom Lee No. 1 mine

Mine No. 1 was opened originally by Tom Lee in the early 1940's. A single slope was driven 130 ft. The rooms that were driven north hit a fault at about 40 ft; the rooms driven south were extended 140 ft from the slope. The coal bed dipped 21° easterly. Figure 86 shows the extent of the underground workings.

Hogback No. 1—Tom Lee No. 2—Clifford George mine

In 1967 Clifford George reopened the slopes labeled Tom Lee No. 2 mine (Fig. 86) and applied for a coal permit from the Navajo Tribe. Permit no. 48 was granted to him on December 6, 1967.

Mr. George operated this mine, also known as the Hogback No. 1, until November 20, 1970, when A. C. Husted, under the Federal Coal Mine Health and Safety Act of 1969, cited him for a number of violations and ordered the mine closed until the violations were rectified. Mr. George generally worked alone and could not afford to obtain within 30 days an electric cap light, a self-rescuer, an automatic brake on the mine car, a formal roof-control plan, a telephone, and a main ventilating fan, so the mine was closed.

Mr. George, who reportedly could not speak English, took his problem to the Navajo Tribe in Window Rock. During the next several months the tribe purchased some safety equipment for him and several of the violations were abated, but the mine remained closed.

On March 31, 1971, the U.S. Bureau of Mines (USBM) assessed Mr. George $950 for violation of the Mine Safety Code of 1969 and gave him the right of appeal within 15 days. On June 11, 1971, the press ran an article that was carried by many of the country's leading newspapers, with the headline

Being Strangled by Bureaucracy
Miner Runs Afoul of Law

On June 16, 1972, the headline was

Pick, Shovel Coal Miner may get Aid to Open Area

This headline referred to an interview with Copp Collins, Field Representative of the USBM at Albuquerque, who stated, "We're going to try and get the man back in business and also protect his safety."

The following week the USBM inspected the property again, and the headline on June 22, 1972, was

Federal Mine Authorities Retain Stiff Line on Navajo Diggings

Mr. George, who was 65 years old, decided to try to open a strip mine, which would not require the expense of the required safety equipment. On June 27, 1972, the headline was

Old Miner may get Bulldozer

Ruben Rodriquez, president of the Rodriquez Land Development, Inc., of Albuquerque, had offered Mr. George a bulldozer. Contractors in the local area also volunteered the use of equipment and personnel. The result was a big hole dug to the coal bed just north of the main slope of the No. 2 Tom Lee mine.

On September 7, 1972, a hearing was held in Farmington. Hearing Examiner Dent 0. Dalby found Mr. George guilty of several of the safety violations, fined him $10 for each conviction, and then suspended the fines. The outcome was that Mr. George was not fined, he had a new strip mine, and he was honored, along with people and firms who had assisted him in launching his new operation, at a dinner hosted by USBM inspectors on September 20, 1972, in Farmington.

A further outcome was that there were no real winners in this episode. The USBM did not help its image with the public; the Navajo Tribe, under Perry Hurlbut, Navajo Tribal Mineral Supervisor, spent considerable time and money helping Mr. George with his problem; and Mr. George had a no-good strip mine with some rusty coal exposed and a dangerous highwall on a bed of coal dipping 22°. The mine ceased operation in late 1976.

Charlie Begay prospect

Navajo coal permit no. 45 was issued to Charlie Begay on November 20, 1964. He opened a single slope dipping 26° on the Hogback coal bed and drove it on the bed about 70 ft until ground water was encountered. The slope was approximately 2,550 ft south of the Tom Marshall mine. Two short rooms were driven off the bottom of the slope. By 1967 the mine was abandoned because Mr. Begay did not have enough salable coal between the water and the outcrop.

Hogback No. 2-Tom Marshall mine

The Hogback No. 2 mine was probably started by Lee John, who obtained Navajo coal permit no. 17 on March 1, 1951, but by March 3, 1954, according to a USBM safety inspection report, Tom Marshall was mining the coal. In June 1968 he began a new entry on a slant toward the south section of the mine, but it is doubtful that the mine was operated during the winter of 1968 because the coal had been practically mined out. The mine workings of the Marshall and Benally mines are shown in Figure 87.

Hogback No. 15-Begay-Benally mine

A Navajo coal permit was issued to Julius Begay in 1951. By March 26, 1953, when R. S. Fulton, Mining Engineer, and K. N. Garard, Navajo Tribal Mining Engineer, made an inspection, the main entry had been driven 375 ft down the 22° dipping coal bed. Entries had been turned both right and left off this slope, and rooms had been driven off these entries up the dip of the coal bed. An aircourse had been holed to the surface.

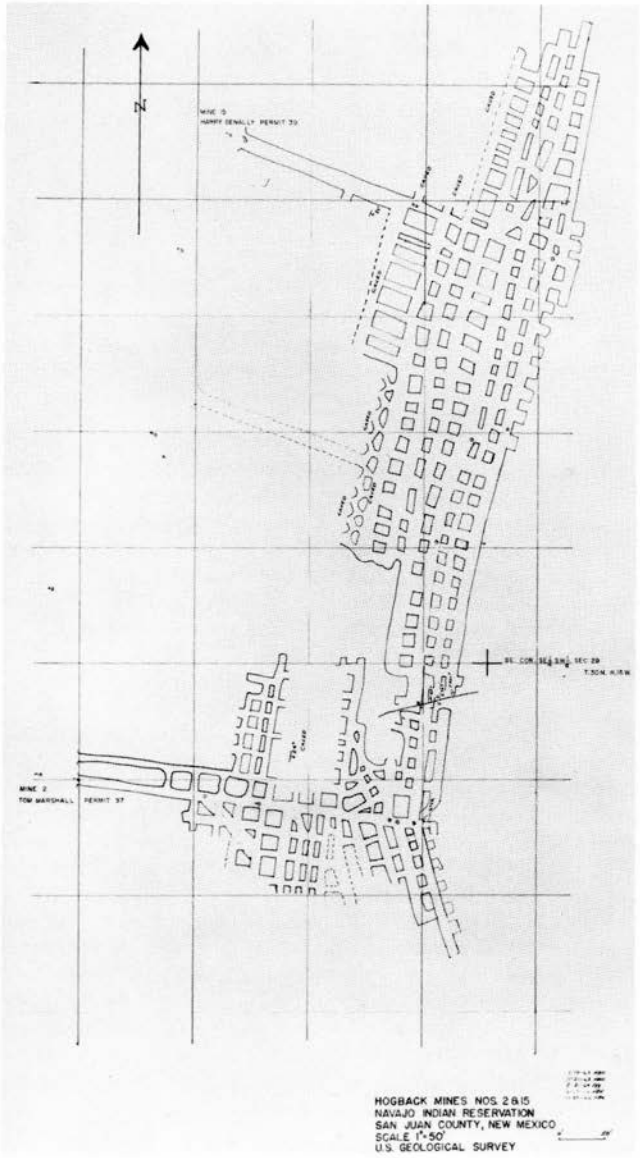


FIGURE 87—Map of the Marshall and Benally mines.

By 1954 Mr. Begay had relinquished operations to Harry Benally, who continued working the mine until early 1967 (Fig. 87). The coal was mined from the water level updip to rusty coal and south into Tom Marshall's mine. Burned coal was encountered to the north. Mr. Benally last operated this property under Navajo coal permit no. 39 issued January 28, 1960.

Hogback mines No. 3 and No. 4

Hogback mine No. 3 was the southernmost mine along a group of closely spaced interconnected mines designated as mines 3 through 12 (Fig. 88). The interval between mine No. 15 and mine No. 3 had been prospected, but the coal bed along the 6,000-ft distance was badly burned, in some areas to the water level.

No records are available to determine when and by whom mine No. 3 was opened, but the coal that was available was probably mined through the No. 4 mine. Records dated in 1951 show that mine No. 4 was operated by H. B. Lewis, who was issued Navajo permit no. 3 in 1951. A safety inspection report dated February 14, 1951, by M. L. Williams,

FIGURE 88—South view of the tipples from the Hogback mines Nos. 3–8 near the northern end of the Hogback mine area. *Photo by R. H. Allport, October 1, 1943.*

USBM, states that five mines were interconnected, which suggests that the mines had been worked extensively before 1951. Mr. Lewis worked the No. 4 mine until 1955 when he turned it over to James Atcitty, who apparently operated the mine during the winter of 1955-1956. The records show that Mr. Lewis was again the operator in late 1956; from 1956 to 1960 there were no reports from the USBM and the Mining Supervisor's Office. It is not known if the mine was producing during this period, but in 1960 Mr. Lewis' grandson, Stanley Jack, was mining coal from mine No. 4.

In 1960 or 1961 the Navajo Tribe drilled a water well 500 ft south of the No. 4 mine to provide water for stock and to dewater this group of mines. It was found that the water level in the mines could be lowered by continued pumping and there was then a possibility that these mines could be worked below the existing water level. However, neither the Navajo Tribe nor the individual Navajo mine operators would pay the pumping costs.

In early 1962 USBM officials, the Mining Supervisor, and Navajo Tribal officials inspected this group of operating mines and came to an agreement that roof conditions were unsafe. The Navajo Tribe ordered the mines closed in the lower levels where the roof was caving and the floor was buckling; the miners had robbed the pillars to a point where it was inevitable that the roof would fall. These orders were heeded, and the mines were closed.

Hogback mine No. 5

Hogback mine No. 5 was opened before 1951, but no early records are available to help ascertain the exact date. Records in the file show that the Navajo Tribe issued coal permit no. 15 to Joe Betah in March 1951. The mine was in operation during early 1956, but Mr. Betah had ceased work by 1957, and the mine remained idle. The Navajo Tribe issued coal mining permit no. 42 to Mr. Tom Joe on March 7, 1960, but Mr. Joe did not reopen the mine, and he relinquished the permit.

On September 29, 1961, permit no. 44 was issued to Arthur Peshlakai of Shiprock, who had operated Hogback mine No. 11. By October 1961 Mr. Peshlakai was reconditioning the mine for operations in the lower portion. He produced coal during the winter of 1961-1962, but by October 1962 the water table had risen and the lower workings were under water. In addition, a cave in mine No. 6 had also created caving in the lower levels of mine No. 5. Mr. Peshlakai was out of coal except for rusty, poor quality coal near the surface. The mine was closed in 1962.

Hogback mine No. 6 (old) or No. 14

The group of mines from Hogback No. 3 to No. 12 is believed to have been opened at about the same time; No. 6 (old), also called No. 14, was one of this group and is between and connected to mines No. 5 and No. 7. It was first operated by Leroy Pettigrew.

On March 1, 1951, C. J. Goodluck was issued Navajo coal permit no. 9 for the mine. Mr. Goodluck operated only a year, discontinuing work in 1952 because of water in the lower entry.

In an inspection report of October 10, 1959, Charles M. McConnell, Deputy Regional Mining Supervisor, stated that Shorty Duncan was building a chute and anticipated reopening the slopes of mine No. 6 (old). Mr. Duncan's mine No. 6 (new), located between mines No. 11 and No. 12A, had caved to within 125 ft of the surface, and he was looking for a new mine site. On November 11, 1958, the Chairman of the Navajo Tribe approved renewal of permit no. 10 for 6 months to reopen the No. 6 (old) mine. Permit no. 31 was later issued for this mine on January 28, 1960.

Mr. Duncan opened rooms off the bottom of the slope and drove both ways until he intersected the No. 5 and the No. 7 workings. These rooms were driven along the top of the water-table level. At this time the operators were questioning the Navajo Tribe in regard to the boundaries between these mines, and some trespass was evident. It was agreed that the boundary between mines would be a line from a point halfway between the portals and a point halfway between the bottoms of the slopes. This line was marked, if possible, in the mine workings, and the problems were resolved.

By October 1962 the lower levels of the mine had caved, and Mr. Duncan was mining rusty coal from a room 40 ft inby the portal. The mine ceased operation soon afterward because the Tribal Engineer ordered it closed on October 25, 1962, and cancelled the permit.

Hogback mine No. 7

Tom Foster was issued Navajo coal permit no. 4 on March 1, 1951, but mine No. 7 had been operated before the issuance of the formal permit. Inspection by R. S. Fulton, Mining Engineer, and K. N. Garard, Navajo Tribal Mining Engineer, on March 25, 1953, found the mine in poor shape. The pillars had been robbed and timbering neglected until the mine roof was about to cave. Recommendations were made by the Area Director of the Navajo Tribe on April 10, 1953, to close the mine, seal the portals, and cancel the permit. The close notice went unheeded. A USBM inspector's report dated March 2, 1954, notes that three men were then working in the mine. Mr. Foster continued to operate the mine until 1959, when his son Larry took over.

Larry Foster was issued Navajo coal permit no. 33 on January 28, 1960, and he operated the mine until the spring of 1962. By that time the lower workings were flooded and caved. The last production came from rusty coal near the outcrop.

Hogback mine No. 8

There is no record of who operated this mine.

Hogback mine No. 9

The Hogback No. 9 mine was reportedly opened in 1936. On February 21, 1952, Navajo coal permit no. 22 was issued to Mark Dan. According to a safety inspection report of March 1, 1950, Mr. Dan was operating the mine then.

By 1953 the lower portion of the mine was in bad condition because the pillars had been robbed to such an extent

that the roof was without adequate support. Mr. Dan was told by K. N. Garard, Navajo Tribal Mining Engineer, to pull back to about 250 ft inby the portal and begin an orderly removal of the remaining pillars. Coal mine inspectors from the USBM made periodic examinations of the mine until January 1956. It is assumed that the mine closed in the spring of 1956.

Hogback mine No. 10

The Navajo Tribe issued Navajo coal permit no. 14 for this mine to Ben Begay on March 1, 1951. The first record of inspection is in 1953. When R. S. Fulton, Mining Engineer, visited the mine on March 26, 1953, the main slope was approximately 175 ft in length and rooms had been turned to the left and right from it. A connection had been made into old workings, but the workings were caved shut and prevented a circulation of air into the Begay mine. A new entry to provide air and a good coat of rock dust were recommended. In the early 1960's Frank Peshlakai mined some coal between the old workings and the water level. By 1962 he had abandoned the lower levels, and the mine was closed.

San Juan-Shiprock Agency-Government-Hogback No. 11 mine

Shiprock Indian Agency
1907-1923 and 1951-1960
Sec. 21, T3ON, R16W

The San Juan mine, which later acquired the various other names listed above, was begun in fiscal year 1907-1908 to fuel the Shiprock Indian Agency schools. W. T. Shelton, Superintendent of the Agency, opened the mine in about the center of sec. 21 on a 6-ft 3-inch bed of clean coal. A drift driven off the bottom of a slope down the dip of the bed reached 200 ft during the first year, and 350 tons were mined by two men. Mining conditions were not always ideal, and for some time there was no second opening. Usually it was necessary to leave about 18 inches of coal in the roof to support the bad roof above the coal.

Agents E. W. Estep and Mark A. Radcliffe were also associated with the Shiprock Agency mine, and from 1921 to 1923 Navajo William Enoah was in charge of operations. I was unable to find any records for the mine from 1923 until March 1, 1951, when Frank Peshlakai was issued Navajo Tribe coal permit no. 8 for the mine, which by this time was called the Hogback No. 11 mine. The No. 11 mine was connected to Hogback No. 6 mine and to the abandoned Hogback No. 10 mine. Mr. Peshlakai drove a new main slope about 420 ft long through the existing No. 11 mine to provide access to the lower reaches of the mine and to rob what pillars remained. By 1958 the workings off the new main entry had hit water and were stopped. By 1959 the lower working had caved to 150 ft inby the portal because the pillars had been robbed to such an extent that the roof was unsupported. By 1960 mining was being conducted near the outcrop where the coal was badly stained, and late that year the mine caved within 70 ft of the portal. The mine was abandoned in early 1961. No figures of production are available from 1951 to 1961.

The records contain one analysis of a coal sample taken in 1917 by Mr. Bossler, who was associated with Bauer and Reeside (1921, p. 184) and in their work in the area. The analysis showed the following:

Moisture	10.1%
Volatile matter	39.9%
Fixed carbon	45.8%
Ash	4.2%
Sulphur	0.85%
Calories	6,675
BTU	12,010

Official records are cursory and incomplete, and for several years production was estimated by the Territorial Mine Inspector. The number of miners and the amount of production are shown in Table 52 during the early years for which records exist.

TABLE 52—Production and employment record of the San Juan–Shiprock Agency–Government–Hogback No. 11 mine.

Year	Production (tons)	Miners
1907–1908	350	2
1908–1909	500	3
1909–1910	500	3
1910–1911	500	3
1913	500	
1916		3
1918		3
1921	800	5
1923		5

Hogback mine No. 6 (new)

Mine No. 6 (new) is connected to mine No. 11 to the southwest and mine No. 12 to the northeast. Navajo coal permit no. 10 was issued to Shorty Duncan for mine No. 6 (new) on March 1, 1951. The earliest record in the files was by William Roberts, USBM Coal Mine Inspector, in October 1953. The mine undoubtedly had been operated many years before this date because connections had already been made to the No. 11 and the No. 12 mines. Mr. Duncan operated the mine for a few years; a report states that in 1959 he was mining rusty coal near the outcrop. No map was ever made of this mine because the workings had caved and were inaccessible.

Hogback mines No. 12 and No. 12A

A Navajo coal permit was issued to George Simpson on March 1, 1951, for the No. 12 and No. 12A mines. The No. 12A mine was being developed in 1948, but the earliest records in the files consist of a USBM safety inspection report in 1953. The mine was connected to the old mines to the southwest. Mr. Simpson developed the coal to the water level and pulled all the available pillars. During June 1960 the coal chute and tipple burned. They were not rebuilt, and the mine was not reopened so a few pillars near the outcrop were lost. The tipples and storage bins at the Hogback mines Nos. 12 and 12A are shown in Figures 89 and 90.

Hogback No. 13 mine

SF 077115 **7-27-44** **Lease**
Leo Warren, Waterflow
Clayton Davidson, Fruitland
Hollis L. Tate and George R. Simpson, Waterflow
Floyd E. Ingraham, Albuquerque
NW1/4 sec. 22, T3ON, R16W

The Hogback No. 13 mine is the northernmost of the Hogback mines along the monocline about 5 mi east of Shiprock. The land adjoins the Navajo Indian Reservation to the south.

FIGURE 89—A common type of tipple at the Hogback mines; this one was at the Hogback No. 12 mine. *Photo by R. H. Allport, October 6, 1944.*

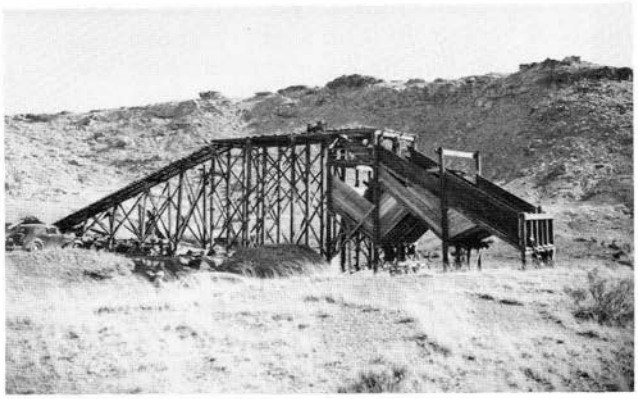


FIGURE 90—The George Simpson No. 12A mine surface facilities. These were the best tipple and bins used at the Hogback mines; this tipple later burned. *Photo by R. H. Allport, October 7, 1949.*

Mr. Warren made application for a prospecting permit for 1,231.83 acres in parts of six sections in T3ON, R16W, on May 21, 1943, but the Mining Supervisor recommended that part of the lands be subject to leasing; he also felt that, because of the scarcity of labor, the opening of additional mines would not be in the public's best interest. The permit was rejected, but the applicant was advised that he could choose to apply for a competitive coal lease. Mr. Warren applied for the NW1/4NW1/4 and the sale was held on May 23, 1944; the applicant as petitioner received the lease with no bonus, and the lease was approved on July 27, 1944.

Mr. Warren opened a portal on the NW1/4NW1/4 sec. 22, and by October 1944 he had a slope driven about 20 ft. At the face the coal measured 6 ft 2 inches; 1 ft 10 inches of coal above a 1/4-inch shale parting was left for roof support. Three coal tipple samples were taken by the USBM in December 1944. The analyses are shown in Table 53.

The first mine opened is in the center of the workings of three mines (Fig.. 91). The coal is the same bed mined by the Navajo Indians south along the Hogback and is excellent domestic coal.

Mr. Warren sold the lease to Clayton Davidson, formerly foreman of the Hogback Indian mines, who began to operate the mine in December 1945. The assignment was approved on September 29, 1947, and the NE1/4NW1/4 sec. 22 was made a part of the lease land. By the time the assignment was approved Mr. Davidson was about out of coal because the portal was only 300 ft from the east line of the lease.

The coal bed maintained a 5-6 ft thickness of clear coal. The bed dipped 8-10° to the southeast, the strike was N40°E.

TABLE 53—Coal tipple samples from the Hogback No. 13 mine taken by the U.S. Bureau of Mines, December 1944. Sample No. 1 was three tons of minus 3/4-inch slack; sample No. 2 consisted of five tons of 3/4-inch to 2-inch coal; and sample No. 3 was 10 tons of plus 2-inch coal.

	Sample No. 1	Sample No. 2	Sample No. 3
Moisture	10.6%	10.8%	11.3%
Volatile matter	38.8%	40.2%	39.3%
Fixed carbon	43.1%	45.2%	46.0%
Ash	7.5%	3.8%	3.4%
Sulphur	0.8%	0.6%	0.7%
BTU	11,470	12,025	12,090
Initial deformation temperature	2,590°F	2,340°F	2,130°F
Softening temperature of the ash	2,650°F	2,480°F	2,290°F
Fluid temperture	2,750°F	2,580°F	2,450°F

By June 1946 a tipple was built with a capacity of 18 tons. The hoist was a 12-inch drum hooked to a Model A Ford engine. The coal sold for $4.50 per ton for lump coal, $2.25 for nut coal, and $1.25 for slack coal. The miners were paid $2.00 per car (1-ton capacity) to mine the coal.

Clayton Davidson continued to develop and mine coal until May 1948, at which time he was hospitalized. According to a letter from his lawyer, G. W. R. Hoy, to Mr. Allport, Thomas Davidson then took over the mine, claiming he had an interest in it. He also took the production records. Royalty and Social Security monies were due, and Clayton Davidson filed suit to regain the mine and the records; either he won the case or an agreement was reached because he was back in production in October 1949. At that time nine miners and three top men were employed, and they produced about 35 tons of coal per day. Clayton Davidson ran a good mine. In March 1951 the following prices were received for coal at the mine:

Lump	2"+	$6.00/ton
Nut	2" x 1 1/2"	$4.00/ton
Stoker	1 1/2" x 1/4"	$3.00/ton
Slack	1 1/2" minus	$1.50/ton

By 1952 most of the mining consisted of extending the main entries southeast and developing rooms off these entries. By 1954 Mr. Davidson developed a new set of entries to begin the No. 2 mine about 600 ft northeast of the old or No. 1 mine (Fig. 91).

In February 1957 Mr. Davidson became ill and left the underground mining in charge of a Navajo Indian whom he had employed for many years, with Mrs. Davidson directing the operation from the surface. The north or No. 2 mine was being worked at that time. On October 4, 1957, Mr. Davidson died after a long illness. He was a good miner and a fine man who was missed by his friends. Leo Warren took over the operation of the mine for Mrs. Davidson and later agreed to take over the property, and the lease was assigned to him on April 21, 1958.

Before Mr. Davidson's illness he had filed to include the SW1/4NW1/4 sec. 22 in the lease, but a survey mistakenly showed no or very little coal was under this land, and that the coal was under the SE1/4NW1/4; the assignment of the lease to Mr. Warren included a modification to add the SE SE1/4^{N}W1/4.

Mr. Warren operated the mine until September 1, 1958, when Alva M. Tate and his partner, Wayne Zufelt, took an assignment of the lease. The assignment was never approved by the BLM because not all the necessary requirements were met. Mr. Tate quit in November 1958, and Mr. Zufelt operated the property that winter, awaiting the lease assignment. By the first of October 1959 George R. Simpson, who operated the No. 12 and 12A Hogback mines just south

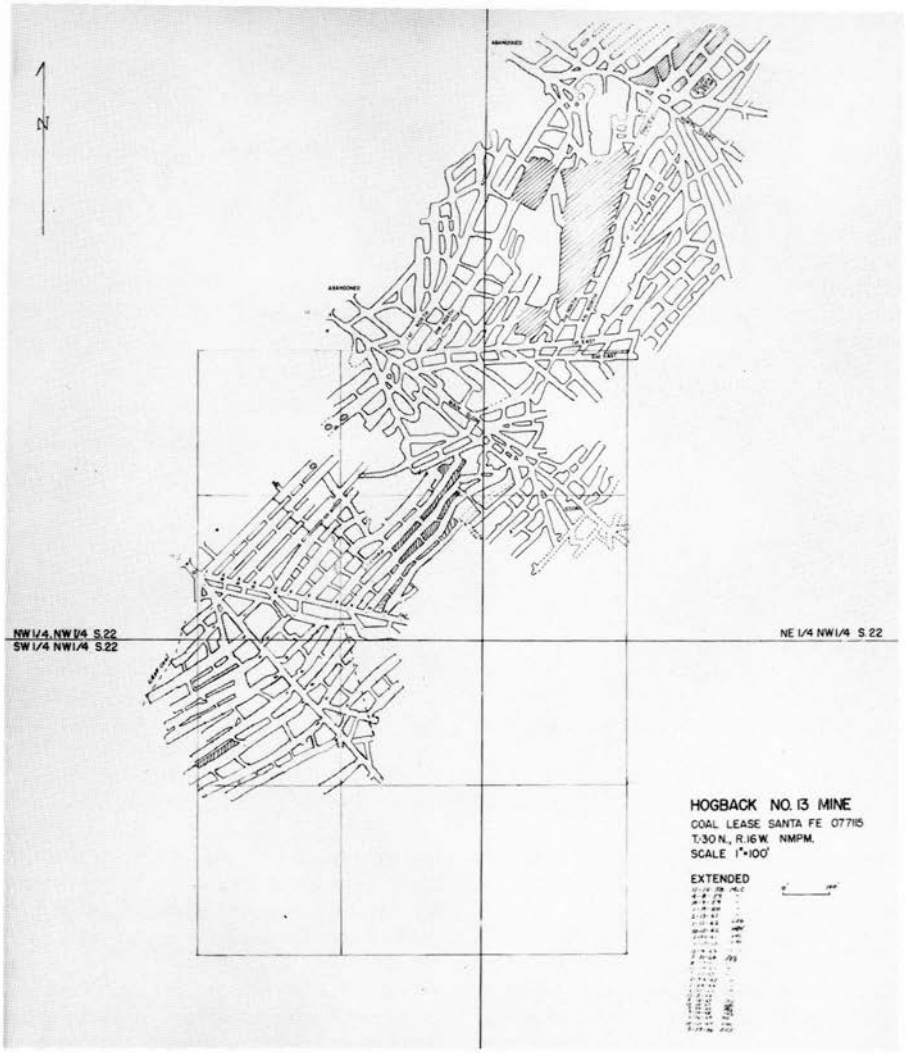


FIGURE 91—Map of the Hogback No. 13 mine.

of this mine, and Hollis L. Tate had worked out an agreement to purchase the mine from Mr Warren, and Mr. Zufelt released the assignment.

The coal bed in the No. 2 mine developed a shale parting 4-6 inches thick near the middle of the bed in the north rooms. This parting was hard to separate from the coal and spoiled the slack coal, which had been accounting for the largest sales. The roof conditions in the rooms off the main entry of the No. 1 mine became impossible to hold, and that area was rendered inaccessible. A new mine was needed as soon as the recoverable pillars were removed from the other mines. A new portal was started at the No. 3 mine site soon after Mr. Tate, who managed the mine, began operations (Fig. 91).

The assignment of the lease to Mr. Tate and Mr. Simpson was approved by the BLM effective April 1, 1960. By January 1960 all the recoverable pillars had been removed in the No. 2 or north mine, and development of the No. 3 mine was well under way. The coal bed was about 6 ft thick, and about 1 ft 4 inches were left to support the roof. A concrete-block fan house was planned, and a tipple and storage bin were constructed with screens for slack and lump coal (Fig. 92). A power unit was installed, and a short-wall cutter was in use to undercut the coal bed. Seven miners, almost all Navajo Indians, were employed.

By 1962 the main entries were crossing into the SW1/4NW1/4 of sec. 22. This was the 40-acre tract that Mr. Davidson had previously requested, at which time he had been told that the coal did not exist on the land; now the tract was needed. The modification to include the $SW^1/4NW^1/4$ was approved January 15, 1965.

Mr. Tate continued to operate the mine without major problems except that the surface water drained into the mine during heavy rainfall; problems of silt and water ac-

FIGURE 92—Tipple and bins at the Hogback No. 13 mine. *Photo by R. H. Allport, June 17, 1946.*

cumulation were therefore created in the lower portions of the mine, and the shale floor softened, which made the timbers give. Miners were hard to employ; most of them would work a few days, then party until their money was gone.

By 1968 Mr. Tate's health was failing; he was unable to go into the mine, and his two sons worked it. In 1970 the mine operated only about 3 months during the first part of the fall. Then a small strip mine was begun because the operators could not comply with the Health and Safety Law of 1969. Joe Tate, one of the sons, hired a dozer and opened a pillar of coal just south of the main entry. About 300 tons of rusty coal were mined.

Hollis Tate died on July 16, 1972. Mrs. Tate reassigned the lease to Leo Warren; approval was issued on January 24, 1973. Mr. Warren wished to sell the property. A Mr. Hunt was interested and dug several holes near the portal and a test pit south of it; discouraged by the results, he did not purchase the property.

The property remained idle, most of the tipple lumber was stolen, and the scale and small buildings were destroyed. In 1975 Floyd E. Ingraham became interested in the property, and on August 1, 1977, the BLM approved a lease assignment to him. Mr. Ingraham had no firm plans for development, and the lease was cancelled in 1985. Production from the Hogback No. 13 mine is estimated to be 70,700 tons.

Fruitland coal field

The Fruitland field covers an area along the Fruitland Formation from the San Juan River north to the Colorado boundary (see Fig. 1). The coal occurs in two beds; the lower is a thick bed that is on or a few feet above the Pictured Cliffs Sandstone, and the upper is a poor, thin, dirty bed near the top of the Fruitland Formation. The Carbonero or lower bed of coal is about 14 ft thick when it crosses the San Juan River. It reaches a thickness of about 30 ft at La Plata and continues at that thickness into Colorado. The BTU value of the coal at the south end of the field is about 9,200, and as it comes in contact with the Hogback monodine the BTU value increases to about 12,000 at the Colorado boundary. The ash content is 17-25%.

In 1895 ranchers in the La Plata area were the first to open the coal beds for their own use and for the sale of a few tons to their neighbors in the small villages and outlying areas. The use of coal saved much hard work because the piñon and juniper forests were quite some distance from the homes along the river valleys. In addition, the trees were small, and coal provided a much better fuel.

In early 1903 there was talk of a railroad being built in the area. The Colorado and Arizona Railroad Company was organized with the aim of building a railroad from Durango, Colorado, to Clifton, Arizona, which would connect in the Lordsburg area with the Southern Pacific Railroad. The officials of Phelps Dodge Mining and Smelting Company, even though negotiating for coal land owned by Charles Eddy at Dawson, were also looking for cheaper coal. With the knowledge of this proposed railroad they began exploration work at La Plata in 1904, but when they found that the Fruitland coal would not coke, the work was stopped. Plans for the railroad also were shelved, but the six to 10 small truck mines continued to operate during the cold months to supply domestic fuel for the people in the area. The Denver Rio Grande Railroad Company built a narrow-gauge railroad to Farmington in 1905 but apparently hauled very little coal from the Farmington area.

Although it was known for many years that a sizable coal potential existed in the Fruitland field, large-scale development was not begun until 1958. Public Service Company of New Mexico (PNM) and William J. Sganzini of Albuquerque made application for coal prospecting permits for 12,800 acres of coal land in T3ON, R15W. The acquisition of coal reserves was necessary so that an electric power facility for anticipated needs in New Mexico could be constructed. As a result of findings from 29 drill holes, two preference right leases were obtained in late 1%1. Western Coal Company began mining in 1973 to provide coal for the mine—mouth San Juan Generating Station.

A plan for liquidation of Western Coal Company was adopted by its owners, PNM and Tucson Electric Power Company, effective December 1, 1980. Effective on the same date, Western subleased its working interest in the coal leases at the San Juan mine to Utah International, Inc. (UII). Simultaneously, Western Coal Company sold certain of its assets including the San Juan Coal Processing Plant to San Juan Coal Company, a subsidiary of Ull. The leases were subleased by UII to San Juan Coal Company.

On July 1, 1963, Peabody Coal Company obtained a competitive lease for 2,044 acres on land between La Plata and the Colorado boundary. The company drilled 30 holes on the leased lands and found 25-30 ft of coal in the Carbonero bed. Peabody Coal Company sold the federal lease to Cimarron Coal Company, which also acquired the adjoining fee lands. The Cimarron Coal Company trenched the outcrops and drilled the holdings. A permit to mine a 480-acre tract of privately owned coal was granted to Cimarron in 1979. The private lease and the mining permit were assigned to Western Coal Company in November 1979. The federal lease was assigned from Cimarron Coal Company to Western Coal Company in January 1981. Western Coal was dissolved in 1981, and this property was acquired by San Juan Coal Company. A permit application was submitted in 1982 for the La Plata mine. In September 1985 La Plata's mine plan was approved by the Office of Surface Mining. A transportation corridor to the San Juan Generating Station was decided upon, and mine operations were begun in 1986. First shipment of coal from the La Plata mine was in August 1986. Production for the La Plata mine was 594,643 tons in 1986.

Smouse mines

Sam Smouse
Mrs. Sam Smouse
Harry Smouse
1926-1954
3,500 ft NL, 4,400 ft EL, sec. 3, T29N, R15W **(W-7, Fig. 93)**

A mining operation was begun in 1926 by Sam Smouse, owner, with W. B. Keener in charge of the work. An entry was opened and rooms were driven off it. This operation continued until 1931, when a new entry nearby was opened. Mrs. Sam Smouse became the mine owner in 1931 and continued operations until 1947, when Harry Smouse became owner. From two to four miners were usually employed. The mine ceased operation about 1954.

The mine dumps, which were close to the main road from

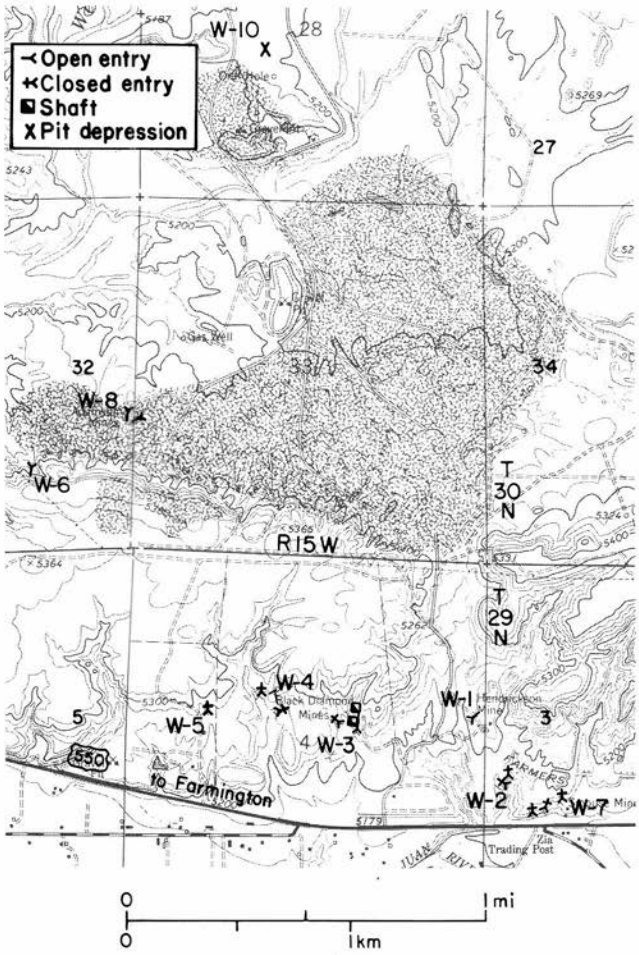


FIGURE 93—A group of mines north of Fruitland on the Waterflow 7½-min quadrangle.

W–1—Stevens (Stephens)–Young—Keener mines
W–2—Young mine
W–3—Kirtland–Hendricksons' mines
W–4—Christensen–Black Diamond No. 1 and No. 2–Rocks of Fire–Tree Doctors mines
W–5—Stalling–Strang–Silva mine
W–6—Hunter test mine
W–7—Smouse mine
W–8—Keener mine
W–10—Marcelius–Caudell mine

Farmington to Shiprock, were on fire for many years. Fortunately, when the new road was put through, the fire and smoke were eliminated because the dumps were used for fill. No record of production is available.

Stevens (Stephens)-Young-Keener mines

Walter Stevens
E. S. Young
W. B. Keener
1898-1923
Mine No. 1-3,100 ft NL, 4,900 ft EL, sec. 3, T29N, R15W (W-2, Fig. 93)
Mine No. 2-2,300 ft NL, 200 ft EL, sec. 4, T29N, R15W (W-1, Fig. 93)
Mine No. 3-3,200 ft NL, 100 ft EL, sec. 32, T3ON, R15W (W-8, Fig. 93)

The Stevens mine No. 1 was opened about 1898 by Walter Stevens, who both owned and operated it. He produced 310 tons of coal during fiscal year 1898-1899 for local use. By 1901 the mine was owned by E. S. Young and operated by Thomas Evans, who developed a main entry 350 ft long and two 150-ft entries off each side of the main entry. Two men produced 1,100 tons that year. By 1904 the mine was owned by Mrs. Abbie S. Young and was still leased by Thomas Evans. The drift on the bed was driven N30°W to a depth of 100 ft in 1906 (Shaler, 1907, p. 398). Only the lower bench was worked. Shaler measured a section at the mine, which follows:

Shale	
Coal	4'
Coal, bony	6"
Coal	5'
Slate, draw	2"
Coal	2'
Slate, draw	2½"
Coal (mined)	5'
Fire clay	

In May 1910 the mine was flooded by an irrigation ditch above the mine. No activities at the mine were reported by the mine inspector from then until 1916. In 1917 W. B. Keener, Lessee, opened mine No. 2. Mr. Keener stayed at the mine and dug coal when orders were received. In 1918 the No. 2 mine was reported to be in bad condition. In 1921 Mr. Keener opened mine No. 3, which was called the Keener mine, and two drifts were driven, but this operation was apparently short-lived. There is also brief mention of a new opening in the vicinity of the No. 1 mine in 1922, but the mines were all closed by 1923.

In 1979 the old workings were found during the Abandoned Mine Lands project. They have slumped over the rooms because the weak, thin shale roof is overlain by terrace gravels. Two entries opened for mine No. 1 and two closely spaced slopes driven at mine No. 2 were also observed at that time.

The USGS Waterflow 7'/2 min quadrangle (Fig. 93) lists mine No. 2 as the Hendrickson mine, which does not conform to the information in the mine inspector's reports. On the same map mine No. 3 is called the Adamson mine, but the mine inspector's report states that Keener opened this mine; perhaps at one time Adamson may have worked it. The mines produced an estimated 20,000 tons. There were no reported fatalities.

Brimhall mine

Clayborne Brimhall, early 1900's
Next to the Stevens mine, sec. 3 or 4, T29N, R15W (Fig. 93)

In his report for fiscal year 1903-1904 the Territorial Mine Inspector reported that Clayborne Brimhall had opened a mine next to the Stevens mine and had driven a single entry to a depth of 100 ft. The following year the inspector reported that the mine had been sold. It is possible that one of the openings described in the Stevens-Young-Keener mine was Mr. Brimhall's prospect.

Kirtland-Hendrickson mines

The Hendrickson family, 1903-1938
2,400 ft NL, 2,000 ft EL, sec. 4, T29N, R15W (W-3, Fig. 93)

In 1903 W. L. Hendrickson opened the Kirtland mine to furnish domestic coal for people in Farmington and in the local area. He opened a drift entry about 300 ft long on the Carbonero bed, which is 16 ft thick in this area. Rooms were driven off this entry. By 1905 this mine was abandoned and a new one was started. There was no reason given in the reports for the closing of this mine, but it may have caught on fire. The miners in this area shot the coal off the rough, forked the coal for the lump, and left the slack in the mines,

and this coal fires very easily. The new entry was driven in a northwest direction. By 1907 it had reached a depth of 100 ft, and by 1910 it was 475 ft long. In fiscal year 19081909 Thomas Evan took over the operation of the mine, and he was in charge until 1913. In 1910 the mine was worked for 300 days, and 2,000 tons of coal were produced.

In 1913 Jess Foutz was in charge of the mine. By 1917 owner Hendrickson was again operating, and in 1918 he put Henry Strasburg in charge. Mr. Strasburg opened a new mine across the ravine from the second mine, which had caught on fire. A single opening was made, and eventually a shaft was driven for an aircourse. In 1919 the ownership was changed, and L. W. Hendrickson became owner and mine superintendent. The name of the mine was changed to the Hendrickson mine in 1923, and L. W. Hendrickson continued in charge until 1929. At that time the mine was leased to Smouse and Company, who apparently operated it until 1933, although information in State Mine Inspector's records is sparse.

In 1933 J. W. Hunt leased the mine from J. W. Hendrickson of Salt Lake City, and operations continued until 1937 when the mine caught on fire and was sealed. The State Mine Inspector reported that two men were employed a year later, but there are no records of operation thereafter. Based on sketchy production reports of the Territorial and State Mine Inspectors it is estimated that the mines produced 25,000 tons. There were no known fatalities.

In 1979 two entries and a shaft, apparently openings of the last two mines operated, were found during the Abandoned Mine Lands project. The mine lands were acquired by Western Coal Company, and they have strip mined the coal that was left.

Christensen-Black Diamond No. 1 and No. 2-Rocks of Fire-Tree Doctors mines

Christensen et al., 1914-1944; 1969-1972
2,200 ft NL, 3,200 ft EL, sec. 4, T29N, R15W (W-4, Fig. 93)

The mine was opened during fiscal year 1914-1915 by a Mr. Christensen. He drove a drift in a 15-ft-thick bed of coal, but only the lower 6 ft were mined. He operated the mine for local domestic needs during late fall and winter months until 1917, and during that time the mine was known as the Christensen mine. In 1917 J. C. McGee became operator and owner, but ownership apparently soon reverted to Mr. Christensen because in 1918 he leased the mine to H. J. Head and M. H. Hunt. They paid him 900 per ton. These leasers operated the mine by a method known as the gouge and abandon system. This method of mining is done by driving an entry and then driving off each side of the entry. When this becomes too dangerous the openings are abandoned. Under the direction of Head and Hunt the mine was known as the Black Diamond.

In 1919 the mine was owned by Mattie Christensen, and Dan Christensen was superintendent. It is believed that the first Mr. Christensen had died. They apparently operated the mine until 1926, when Mattie Danul and George Christensen assumed ownership of the operation. They ran the operation until 1933. Carl McGee then became manager, and Dan Christensen was owner. This ownership lasted until 1939, when W. L. Kennedy became owner.

Kennedy was in charge until 1944, and then there was no record of the mine until 1969, when Hugh Lee and a Mr. Hunt became owners; they worked the property as a strip mine and called it the Rocks of Fire mine. They built a truck tipple and bin near the main highway between Ship-rock and Farmington. In 1970, Hugh Lee was owner and called the strip mine the Diamond No. 2 mine. In 1972 the mine was owned by Mrs. Hugh Lee, who sold it to the Tree Doctors in Kirtland; George T. Briggs was then General Mine Manager.

The top production from the property was 2,500 tons for one year, but for most of the years when operated the mine produced between 600 and 1,200 tons. The main slope was reported to be 900 ft long, and an aircourse had been driven as a second entry.

The mine is now owned by Western Coal Company, and that company has strip mined through the old mine workings.

Stalling-Strang-Silva mine

SF 071448 **1-23-36** **Permit**
6-11-40 **Lease**
Emanuel B. Stalling, Waterflow
E. A. Strang, Quemado
Fred A. Silva, Waterflow
Western Coal Company, Albuquerque
$SW^1/4NW^1/4$, $NW1/4SW^1/4$ sec. 4, T29N, R15W, 80 acres
2,300 ft NL, 4,100 ft EL (W-5, Fig. 93)

The Stalling mine is 4 mi west of Kirtland and about 0.5 mi north of the Farmington-Shiprock highway (US-550). Mr. Stalling began work in April 1936 by starting a single slope through the alluvium to intersect the lower bed of coal in the Fruitland Formation.

By June 22, 1938, it became evident that the slope had been driven about 50 ft below the coal bed, and work was stopped. By October 1939 a new slope was driven at 12° due north, and the thick lower bed in the Fruitland Formation was cut at about 160 ft inby the portal. The slope was extended into the coal bed about 175 ft. A 65-ft single-compartment vertical shaft was driven to provide ventilation. The coal bed was about 18 ft thick, but only the lower 6 ft were mined; these 6 ft contained four partings totaling 6 inches. The main chute was 125 ft long and 6 ft wide and was compartmented for the various coal sizes. It was constructed 1,160 ft from the portal on a downgrade of 1°. An old Nash automobile engine and drum served as a hoist. The permittee's home was about 300 ft northwest of the chute, and an adobe house for the miners was built 330 ft south of the slope.

A preference right lease application was filed on October 3, 1939. The lease was granted for only the $SW^1/4NW^1/4$ sec. 4, because no coal existed on the $NW1/4SW^1/4$ sec. 4; the lease was approved June 11, 1940.

Mr. Stalling moved to Indiana on August 10, 1940, to live at a lower altitude to ease his heart condition, leaving the mine in the charge of his brother, L. L. Stalling. The Bituminous Coal Commission visited the mine on March 4, 1941, and ordered L. L. Stalling to close the screens on the tipple because the price of the nut coal had not been determined by the commission and his competitors had complained because they could not make nut coal. Mr. Stalling then forked the coal in the mine and wasted the slack on the surface. Before this decision he had sold the small amount of slack coal.

A tipple sample taken March 24, 1941, by H. Fowler, U.S. Bureau of Mines, gave the following analysis:

Moisture	10.1%
Volatile matter	39.1%
Fixed carbon	41.7%
Ash	9.1%
Sulphur	0.5%
BTU	11,460
Softening temperature of ash	2,800°F

On May 1, 1941, the mine was sold to E. A. Strang, who operated it only a month before entering into an agreement that allowed Fred Griffitts to work the property. The assignment to Mr. Strang was approved by the Land Office (BLM) on January 5, 1942. Apparently the Navajo Indians

FIGURE 94—Mine tipple and storage bins at the Silva mine. *Photo by R. H. Allport, October 24, 1942.*

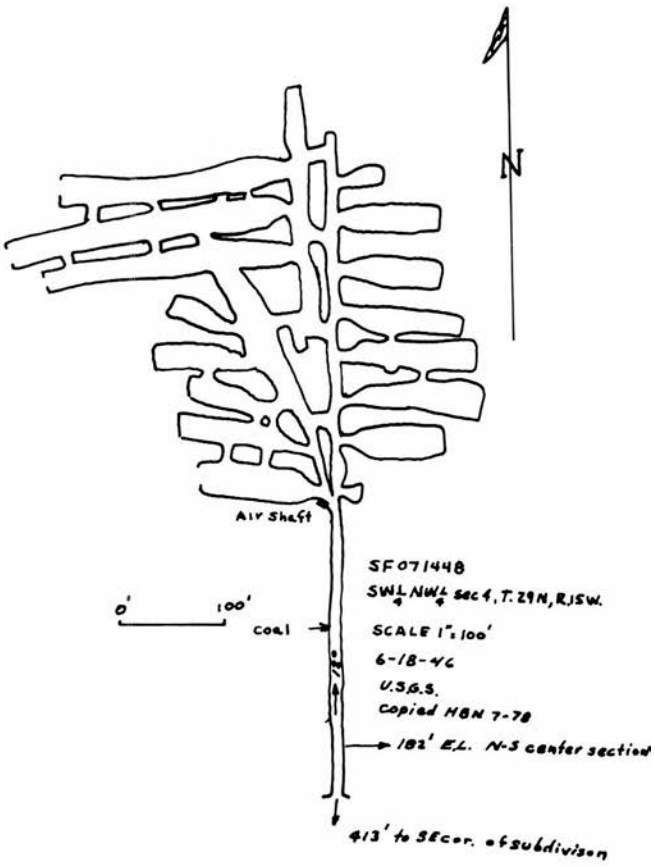


FIGURE 95—Underground map of the Strang mine in 1946.

at the Hogback mines were allowed at this time to sell coal to everybody, which cut Mr. Strang's sales. Figure 94 is a photo of the tipple and bins in 1942.

By October 1942 Mr. Griffitts had quit, and Mr. Strang's son and Mr. Dufurs, Mine Foreman, were operating the mine. Business was slow in February 1943 because of gasoline rationing, but by September many orders had to remain unfilled because no miners could be hired. By November 1944 Mr. Strang's son had left, and Gilbert Silva was hired to operate the mine for the coming season. By November 1946 Fred Silva was in charge of the mine and had agreed to purchase the property for a sum of $4,000. Figure 95 is a map showing the extent of the mine workings in 1946. The lease assignment to him was approved by the Bureau of Land Management on February 27, 1952. Mr. Silva, an efficient operator, kept the mine in good condition. The last production from it was in June of 1948, except for 23 tons that were mined during the last part of 1949. The mine produced 8,245 tons. When the mine operated, four men were usually employed.

Mr. Silva died during 1969, and the lease was assigned to Mrs. Silva. She sold it to the Western Coal Company, and the assignment was approved effective February 1, 1977. This company has strip mined the land.

Blanchard property

Mr. Blanchard, early 1900's
Secs. 28, 32, 33, and 34, T30N, R15W **(Fig. 93)**

According to reports of the Territorial Mine Inspector, a Mr. Blanchard took out claims for the above sections and spent $3,000 in development work in 1906-1907. His prospect was on the upper bed of coal. Some small dumps in section 34 remain to mark his development work.

Bruce mine

R. E. Bruce, 1898-1902
Sec. 27, T31N, R15W

The Bruce mine was first reported in 1898-1899 in the annual report of the Territorial Mine Inspector and according to his reports was still operating in 1902. In autumn of 1906 Shaler (1907, p. 398) measured the 23-ft bed of coal but reported that mining had ceased. R. E. Bruce was the manager and operator of the mine, and he produced a few hundred tons of coal a year for local domestic use.

Marcelius—Caudell mine

SF 048562 **4-30-28** **Lease**
Mr. Marcelius, before 1916
Benjamin Caudell, Farmington
NE1/4SWI/4 sec. 28, T3ON, R15W
2,900 ft NL, 3,300 ft EL **(W-10, Fig. 93)**

The lessee started the Caudell mine in the abandoned workings of the Marcelius mine, which had opened before 1916. There is a record of an analysis taken in the Marcelius by the U.S. Bureau of Mines (USBM) in 1917, but not much else is known about this early-day operation except that it had ceased by 1916 (Bauer and Reeside, 1921, p. 204). C. C. Mather, USGS mining engineer, took a picture of the tipple in October 1929 (Fig. 96). Using the old slope, Mr. Caudell drove workings northwest of the caved mine. The Caudell mine map shows the extent of his work up to February 15, 1936 (Fig. 97). A cross section of the coal bed measured 14.5 ft of coal with 8 inches of refuse in several partings. The coal bed was the lower bed in the Fruitland Formation.

The mine was dependent upon the domestic trade in Farmington and the adjacent areas for a market. The major portion of the coal was produced each year from September through April to supply this trade. The mine operated rather

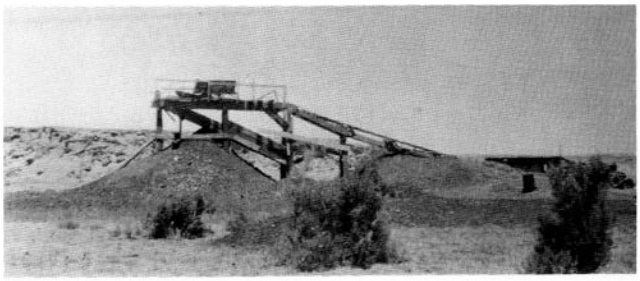


FIGURE 96—The Caudell mine surface facilities. *Photo by C. C. Mather, October 1929.*

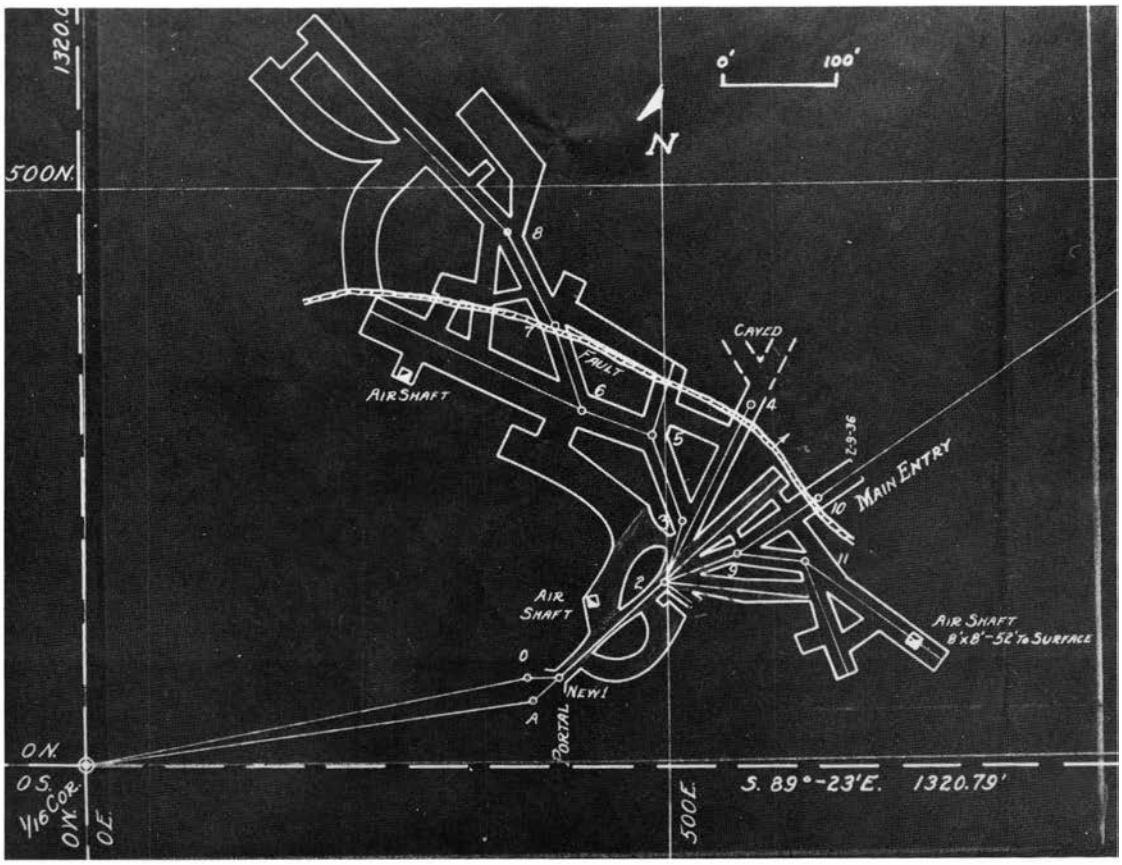
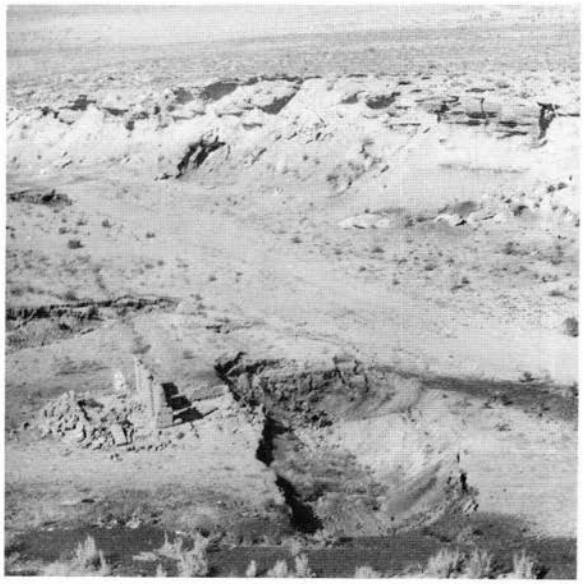


FIGURE 97—Map of the Caudell mine, February 15, 1936. *Drawn by John L. Kleiner.*

smoothly until the latter part of 1935, when Mr. Caudell became ill and passed away. His son operated the mine after the father's illness and death. The timbering and other conditions at the mine became rundown under the management of Caudell's son and a sublessee, Jess Foutz, who operated the mine during the 1936-37 season. Payments of royalty were in arrears. Conditions became worse, and on December 2, 1938, R. D. Reeder, Acting District Mining Supervisor, closed the mine and ordered the portals barricaded. The Caudell mine was not put back in operation; it has now been dug up by Western Coal Company's San Juan strip mine.

On August 17, 1943, the USBM at Denver was notified that the Caudell mine property was on fire. It was believed that the tumbleweeds in the old entry were set on fire or caught fire and the fire spread to the coal bed. Because the Fruitland coal is very susceptible to spontaneous combustion, that also might have caused the fire. The fire was allowed to burn as long as the surface remained stable (Figs. 98a, b); then in September 1951 the USBM hauled in soil, compacted it over the fire, and put the fire out.

The lease, of course, remained inoperative, but it was not formally cancelled until that action was ordered by court decree on June 16, 1945. During the period of the lease the



FIGURES 98a and b—Telephoto pictures of the surface subsidence at the Caudell mine. *Photos by R. H. Allport, September 30, 1943.*

mine produced 10,319 tons of coal. The mine is now under the spoil pile of the San Juan mine operation.

Walker mine

Mr. Walker, early 1900's
2,300 ft NL, 4,700 ft EL, sec. 16, T3ON, R15W

The Waker mine was in operation in 1906, because it is mentioned by Shaler (1907, p. 396). He stated that Mr. Walker had driven an entry 100 ft long on a dip of 5°S65°E on 6 ft 6 inches of coal. Production figures and duration of the mine are unknown. The mine is on state land and is held under lease by Western Coal Company, who have strip mined the area.

William J. Sganzini prospecting permits

William J. Sganzini, Albuquerque

NM 045216 8-20-59 Permit
Parts of secs. 8, 19, 20, and 31 and all of secs. 17 and 30, T3ON, R15W

NM 045217 8-25-59 Permit
Parts of secs. 3, 9, 10, and 11 and all of sec. 4, T3ON, R15W, 2,560 acres

Mr. Sganzini, a businessman in Albuquerque, was a stockholder of the New Mexico Public Service Company. He and a business associate applied for coal prospecting permits that would be assigned to that company if a commercial discovery of coal were made. There was no drilling or prospecting done on NM 045216 lands. Eight drill holes were drilled on lands under NM 045217. NM 045216 was relinquished on September 27, 1960, and part of NM 045217 was included in New Mexico Public Service Company leases. The balance of the land was relinquished.

Public Service Company of New Mexico prospecting permits

Public Service Company of New Mexico, Albuquerque

NM 045196 7-2-58 Permit
Parts of secs. 15, 20, 21, 22, 27, and 28, and all of sec. 29, T3ON, R15W, 2,560 acres

NM 045197 7-2-58 Permit
Part of sec. 3, T29N, R15W; parts of secs. 14, 22, 23, 26, 27, and 34 and all of sec. 35, T3ON, R15W, 2,576.20 acres

NM 074808 12-4-59 Permit
Parts of secs. 3, 9, 10, 11, 14, 15, 21, 22, 27, 28, and 34 and all of sec. 33, T3ON, R15W, 2,548.24 acres

The prospect area is 3 mi north of Fruitland and covers lands on the Fruitland Formation. The company desired to prospect for sufficient coal reserves to construct a power facility for anticipated needs in New Mexico. During December of 1959 eight drill holes were drilled on permit NM 0451%, one hole was drilled on NM 045197, and 20 holes were drilled on NM 074808.

The company filed for preference right leases on July 27, 1961, for two leasing units that became leases NM 045196 and NM 045197; the lands under NM 074808 were combined with the above permits, and that case number was eliminated. A description of the lands that make up these two leases is given under the San Juan mine (see next chapter); the rest of the lands held under the above permits were relinquished.

In about 1976 Western Coal Company, a wholly owned subsidiary of New Mexico Public Service Company and Tucson Gas, made application for a competitive lease on part of the land relinquished contiguous to the San Juan leases to the east. A large underground mine was planned to furnish coal to fire the San Juan Powerplant complex.

During the summer of 1977 the Conservation Branch of the USGS drilled six sections on 40-acre centers east of and adjacent to the Western Coal Company's San Juan mine leases to determine the royalty rate and the bonus should the company want the lands. San Juan Coal Company (formerly Western Coal Company) obtained cheaper strippable coal reserves in the La Plata area and interest in the deep coal ceased. Because of present coal regulations and competitive leasing regulations, the BLM has not put these lands up for bid, but San Juan Coal Company has obtained strippable coal reserves in the La Plata area.

San Juan mine

NM 045196, NM 045197, and NM 045217
New Mexico Public Service Company-Western Coal Company, 1961-1980
Utah International, Inc., 1980-
Secs. 2-4, 9, 10, 15, 16, 21, 22, 27, 28, 32-34, and 36, T3ON, R16W; secs. 4 and 5, T29N, R15W

The San Juan mine is located on coal leases that are about 2 mi north of Fruitland and occupy an area that extends for 2 mi in an east-west direction and 6 mi in a north-south direction. The land was originally taken up under six prospecting permits held by New Mexico Public Service Company, William J. Sganzini, and a Mr. Savage. The leases were issued to New Mexico Public Service Coal Company, which later became Western Coal Company. They were both wholly owned subsidiaries of New Mexico Public Service Company. Large acreages of the permit lands were not included in preference right lease requests, but the lands applied for were granted under leases NM 045196, NM 045197, and NM 045217, which were issued in November and December of 1961.

Prospecting began during the latter part of 1959 under the direction of Edward C. Beaumont. The thickness and extent of the coal was determined by drilling, and the results confirmed the belief of New Mexico Public Service Company that a strip mine could be opened. The company was not prepared to do the mining itself, so reputable coal mining companies were approached to look at the property. Pittsburg and Midway Coal Mining Company and Peabody Coal Mining Company both drilled on the land to confirm Mr. Beaumont's drilling results, and they also drilled a few other holes for their own evaluation.

From 1961 until the latter months of 1969 the property remained dormant except that some coal samples were taken for boiler tests to aid in the design of the electric generating plants, and some basic engineering was conducted. The leases were all assigned to Western Coal Company. Plans were being approved by late 1969 to build the generating plants, and a close-spaced mine-development drilling program was begun that extended into early 1970 under the supervision of Mr. Beaumont. The information obtained was presented to coal mining companies, and bids were requested. Utah International, Inc., which was operating the Navajo mine across the San Juan River on the same bed of coal, was chosen to mine the coal under a mining agreement dated June 1, 1972.

The first unit of the powerplant and its coal-handling facilities was in the process of construction in early 1971. An application was made to the Secretary of Interior for 20,200 acre ft of water annually from the San Juan River to cool the turbine steam and to promote plant growth on the reclaimed spoil. After acquisition of the water, a pumping plant was constructed on the San Juan River south of the lease, together with a dam to form a backwater for the plant

and to serve as an underwater bridge. This bridge would accommodate the heavy loads of equipment that had to be trucked across the country from Prewitt because there was no railroad to the area.

The first coal was produced on March 7, 1973, to supply the fuel for the first unit of the mine-mouth powerplant. The mine was started on the outcrop near the south end of the leases. The first coal was uncovered by bulldozers and rippers; then a 10 yd^3 Cy dragline was added to remove overburden. The coal uncovered averaged about 16 ft thick. The coal quality was uniform throughout, averaging 9,400 BTU/lb, 20% ash, and 0.80% sulphur.

A public hearing was held on May 9 and 10, 1973, in Farmington to satisfy the requirements of the New Mexico Coal Surface Mining Commission for a permit to open a strip mine.

The final Environmental Impact Statement (EIS) for the San Juan Generating Station and coal mine and transmission lines, prepared by the Bureau of Reclamation, was approved in March 1973. Another EIS, covering the expansion of the powerplant, was approved in August of 1976. Construction on the second unit was almost completed in late 1976, and a Page 54-yd dragline was put in operation in January 1977 to uncover sufficient coal to feed this second unit. A third unit was started in 1977, and production was expected to rise to about four million tons per year. In July 1977 an explosion almost completely destroyed the boiler unit of the No. 2 unit after it had operated for only a few months. After the explosion the mine was supplying only the No. 1 unit, but in anticipation of the completion of the No. 3 unit and the repair of the No. 2 unit, mining continued at almost full capacity and the coal was stockpiled. The No. 2 unit was put back on the line in July 1978.

In about 1975 Western Coal Company began acquiring adjoining lands between their leases and US-550 for additional reserves. These small tracts of land included the old Stevens, Smouse, Silva, and other mines along the highway.

Under a revised mining agreement, which became effective December 1, 1977, Utah International, Inc. (Utah) began contract mining for Western with responsibility for all phases of strip mining except topsoil removal and placement, reclamation, and crushing.

A 62 Cy dragline was completed and put into service in January 1979. However, due to major repairs on the No. 1 dragline, full utilization of the two large draglines was not realized until mid 1979. To meet production requirements, two 45-R surface drills were utilized in preparing the overburden for dragline stripping. The overburden was normally blasted using a mixture of ammonium nitrate and diesel oil. Wet conditions were frequently encountered, however, and it was then necessary to use packaged explosives to fragment the overburden effectively. The coal in place was hard and had to be blasted before mining. Front-end loaders with rubber tires and an electric shovel loaded the coal into a fleet of eight bottom-dump 120-ton trucks that transported the coal to the preparation plant. After being crushed, weighed, and sampled, the coal was distributed to a stockpile for powerplant use or to a field stockpile. Under terms of the contract with Western Coal Company, Utah was responsible for disposal of the ash generated by the powerplant. A fleet of three end-dump trucks was used to collect the ash and to deposit it in mined-out areas.

Between 1977 and 1980, four million tons of coal were stockpiled to supplement production from a proposed underground mining operation, but because other lands underlain with strippable coal were obtained the underground operation did not take place. The four million tons, known as the CSE stockpiles, were sold to a group of investors.

Between 1977 and 1980, Utah had responsibility for production and mine engineering only. Western Coal Company retained a staff to manage overall mine environmental quality, general engineering review, all crushing and delivery operations, and the interface between the mine and powerplant.

In 1980 Public Service Company of New Mexico (PNM) decided it would be advantageous to sell all of its assets in the San Juan mine to Utah. The 1980 renegotiation retained the spirit of the 1977 contract agreement and simply expanded the concepts to account for Utah's greater responsibilities and investment. In addition to the purchase of the San Juan mine assets, Utah secured subleases on the Fruitland leases and the La Plata coal property (20 mi northeast of the San Juan mine). Utah also assumed all of the state, federal, and private royalty obligations associated with these leases.

The San Juan Generating Station, on which construction began in 1969, currently comprises three units of 350 megawatts (MW), 360 MW, and 534 MW, respectively. These units are jointly owned by Tucson Electric Power and PNM. A fourth unit of 534 MW was completed in 1982. It is 92% owned by PNM and 8% by the city of Farmington. With the completion of the fourth unit, this plant will supply 80% of New Mexico's power needs.

Growth of the San Juan mine has been orderly and progressive. Production has expanded from 350,000 tons mined in 1973 to 4,000,000 tons in 1979. Production figures from 1980 to 1986 follow.

1980	4,200,000
1981	4,119,000
1982	4,906,034
1983	4,975,770
1984	5,151,579
1985	5,110,790
1986	5,215,966

The San Juan mine employed 272 people in 1986.

Public Service Coal Company's Ute Mountain project

Ute Mountain Ute Indians 2-11-70 **Drilling permit**
Public Service Coal Company, Albuquerque
Secs. 25, 26, 34, and 35 and W1/2 sec. 36, T31N, R15W

Public Service Coal Company, a wholly owned subsidiary of New Mexico Public Service Company, received a permit from the Ute Mountain Ute Indians to drill a number of core holes on their reservation to determine quantity, quality, and geology of the coal beds that extend to the north of the New Mexico Public Service Company's public land leases. Thirteen holes were drilled on reservation lands. The evaluation of this drilling is described by Shomaker and Holt (1973).

The permit, which was granted for only 6 months, did not allow the company any option for a lease. The drilling indicated that 10-14 million tons of coal could be strip mined from the land. The dip of the coal beds and the large number of shale partings are disadvantages that may make the lands difficult to lease.

Enterprise-Jones-Neff mine

Jones brothers
A. J. Neff
1903-1930
4,300 ft NL, 2,000 ft EL, sec. 21, T32N, R13W **(LP-10, Fig. 99)**

The Enterprise mine, owned and operated by George W. Jones of Pendleton, was first reported in 1903. A slope 250 ft long and a second opening by inclined shaft were opened in that year. The mine is on the lower coal bed, locally called the Carbonero bed. At this location the bed is about 30 ft

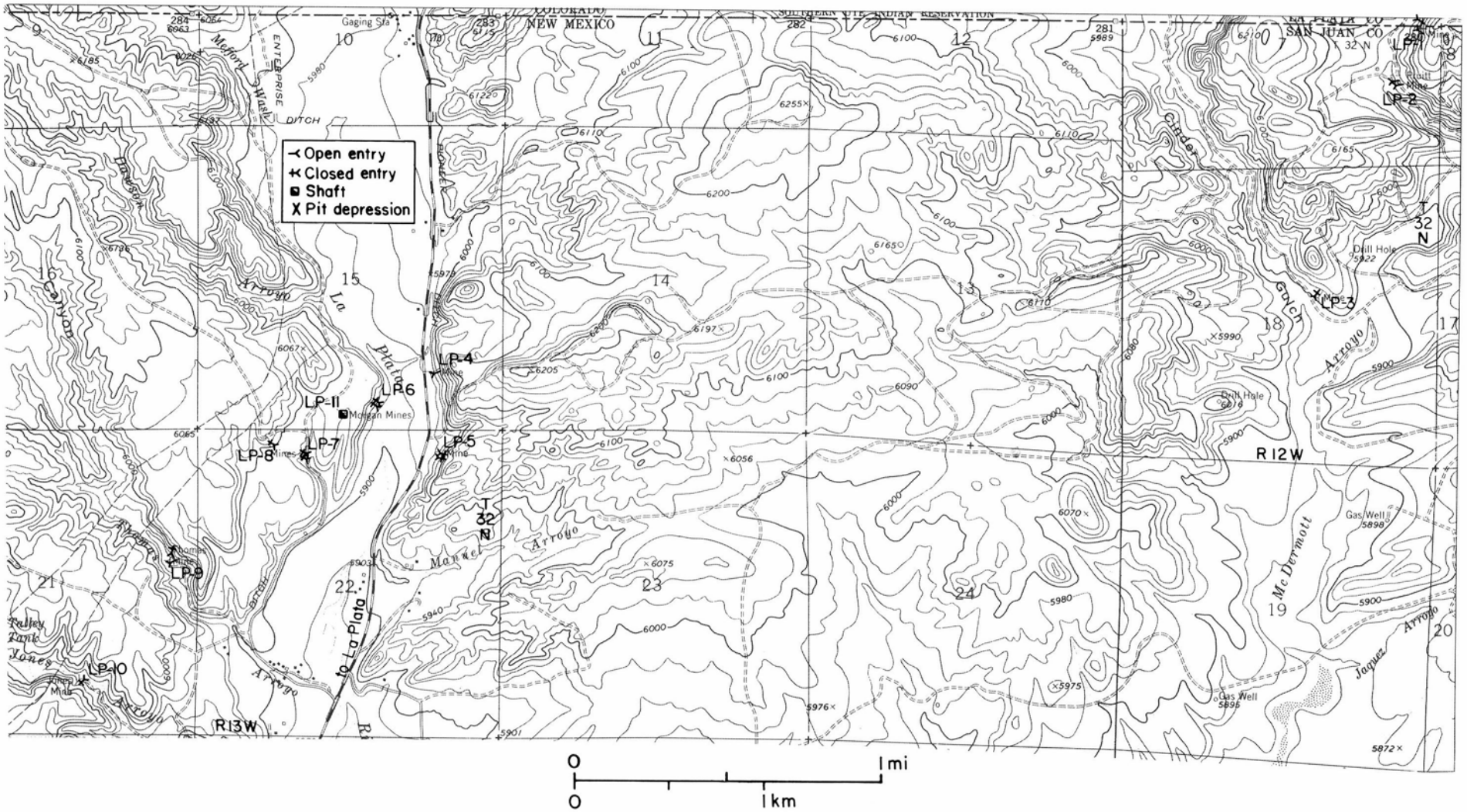


FIGURE 99—The coal mines in the La Plata area on the La Plata 7½-min quadrangle.

LP–1—Pruitt mine
LP–2—Kempton mine
LP–3—Unknown mine
LP–4—Phelps Dodge prospect
LP–5—O'Brien–La Plata mine
LP–6—Firebaugh–Greer–Morgan and Thomas mine
LP–7—Thomas mine
LP–8—Thomas mine
LP–9—Thomas mine
LP–10—Enterprise–Jones–Neff mine
LP–11—Morgan mine

FIGURE 100—Bulldozing done in about 1979 at the Enterprise–Jones–Neff mine, which exposed the 30-ft bed of coal amidst the old mine openings (view is S15°E). The loose coal on the exposed outcrop provides an ideal condition for spontaneous combustion in the spoil pile; a crop fire could be created that would be difficult or impossible to extinguish. *Photo by H. B. Nickelson, 1979.*

thick and dips about 29° to the southeast. In fiscal year 19041905 a second incline was started, and 4 years later the main slope reached a depth of 300 ft. Water was then encountered, which apparently came up in the slope and created some problems in the lower portion of the mine. The mine operated about 60 days per year, producing about 600 tons of coal that was sold in the local area.

In 1913 Mr. Jones leased the mine to John T. Schaaf who operated the mine for 3 years. George Jones died in 1916 and the estate, handled by Administrator George F. Bruington of Aztec, leased the mine to Frank Parson, but there is no record of operation by Mr. Parson. At about that time, because of the poor condition of the mine, the State Mine Inspector ordered it to be timbered or closed. In 1917 Mr. Schaaf resumed operation of the mine, which was then owned by the Jones brothers. Evidently the timbering was not done, and the mine was closed in 1917 by the State Mine Inspector. It did not operate until 1918 when A. J. Neff obtained ownership; he leased the mine to C. 0. Walker. The last record from the inspector's annual reports was in 1930. Mr. Neff still owned the mine then, and N. H. Knight was operating it on a royalty basis.

The land is under the control of Black Diamond Coal Company at this time. Recent bulldozing (Fig. 100) by that company is very evident.

Thomas mines

W. H. Thomas
A. C. Thomas
1895-1932
Original mine-500 ft NL, 3,400 ft EL, sec. 22, T32N, R13W **(LP-7, Fig. 99)**
A. C. Thomas-200 ft NL, 4,000 ft EL, sec. 22, T32N, R13W **(LP-8, Fig. 99)**
W. H. Thomas-2,200 ft NL, 500 ft EL, sec. 21, T32N, R13W **(LP-9, Fig. 99)**

W. H. Thomas and A. C. Thomas, members of a ranching family west of Pendleton, were involved with one or more coal mines from the late 1890's until the 1930's. According to the records, W. H. was more actively interested in these operations than A. C., but the latter did open one of the three mines. The production was small, and the coal was used for domestic fuel in the local area; the mines were worked only from September into April to supply local demand. Wood is not a practical fuel in this area because the trees are small and at considerable distances from the habitations.

The first of the Thomas mines was opened in 1895 by W. H. Thomas (Shaler, 1907, p. 396). He drove an entry 275 ft in length along the strike of the Carbonero bed that dips 20°S53°E at this location. He mined 4 ft 10 inches of coal, 6 inches of fire clay, and 4 ft 6 inches of coal above a sandstone floor from a bed of coal about 30 ft in thickness.

During the later years the coal bed was mined at great height, and timber was seldom used. The main entry reached a depth of 350 ft, and the mine operated for many years with only one entry. This mine was closed in 1916, and two new mines were developed that year. A. C. Thomas opened a mine in sec. 22, about 600 ft west of the original mine. The A. C. Thomas mine was leased in 1918 by two practical miners, who did a good job of mining. The following year, when G. C. Dawson was operating the mine, development work to open new working places was neglected, and the mining area was opened too wide. The mine caved about 1919. A slump, which still exists on the surface, indicates the width of the room. The third mine, begun by W. H. Thomas in about 1916, had a longer life. From two entries in sec. 21 this mine continued until about 1932.

During most of the years W. H. Thomas had charge of the mines, but at various times they were leased to several individuals, among them B. F. Steel, 1908; G. C. Dawson, 1919; Durango, Colorado, capitalists, 1921; and a Mr. Rasmusson, in the 1930's. Usually from two to five people were employed for about 125 days per year, and they produced between 400 and 700 tons of coal per year for local domestic needs.

Firebaugh—Greer—Morgan and Thomas mine

SF 055565 **7-31-28** **Lease**
Firebaugh mine, about 1900, Mr. Firebaugh
Greer mine, 1905, Mr. Greer
George C. Morgan, La Plata
William H. Thomas, La Plata
SW¼SE¼, SE¼SW¼ sec. **15, T32N, R13W, 80 acres**
4,800 ft NL, 2,200 ft EL **(LP-6, Fig. 99)**

Shaler (1906, pp. 395, 396) refers to a Greer mine that was on the west side of the La Plata River right across from the O'Brien mine. That description undoubtedly is also the location of the earlier Firebaugh mine, which, according to USGS lease files, operated about 1900. The main entry at the Firebaugh was 175 ft in length driven N45°W; a second entry had been driven to the left 230 ft, and several rooms were also driven off these entries. There was 28 ft of coal in the bed. Shaler (1906, p. 396) stated that, "At the Greer mine a heading was driven for about 350 feet with the rise of the coal, and rooms were worked out from cross entries driven for 200 feet on either side of the main entry." This roughly corresponds to the description given above. The report also states that Phelps-Dodge Mining and Smelting Company took over these mines (the Greer and the O'Brien) and closed them in 1905. The Greer mine was a few miles north of the village of La Plata on the La Plata River. The coal bed, which was in the lower portion of the Fruitland Formation, was approximately 27 ft thick and dipped 12°S30°E.

On January 25, 1928, a coal lease on these lands was acquired by competitive bid. An application had been filed by Monroe Fields, but the lease was granted to William H. Thomas and George C. Morgan, partners, who offered a bonus bid of $275. Mr. Morgan claimed to have worked at the Firebaugh 30 years previously.

In 1928 J. J. Bourquin, District Mining Supervisor, was able to open the caved portal, and he explored the old mine. He found the main entry to be 175 ft long, driven on a course N45°W, with numerous workings driven off the right side of this entry. At a point in the main entry 90 ft inby the portal, a working had been driven to the left a distance of 75 ft S75°W, thence 81 ft due west, and thence 75 ft S75°W. The main entry and this left entry crossed the pitch of the coal bed, and Mr. Bourquin was able to measure the thickness of the coal bed except for coal that was burned at the portal. The bed was 27 ft 3 inches consisting of 25 ft 6 inches of coal and nine shale partings, 1 ft 9 inches thick. These old workings were standing the same as they had been left some 30 years before.

Mr. Morgan and Mr. Thomas cleaned up the Firebaugh entry and drove a second entry to the surface. A 50-ft pillar was left southeast of the main Firebaugh entry. They began mining coal by driving short rooms off the old workings, but it was an unplanned system that opened too much area unsupported by pillars.

Mr. Bourquin inspected the property on April 27, 1935, and found conditions at the mine in shambles. Soon after the lease was issued a bitter quarrel had developed between the partners. As a result the mine became two mines: Mr. Thomas used the old Firebaugh portal, and Mr. Morgan used the entry that the partners had driven for ventilation (Fig. 101). Mr. Morgan brought civil action against Mr. Thomas in local court in regard to the lease. He lost his case and then appealed to the district court; the result of this action was not stated in the files. Mr. Bourquin's mine map (Fig. 102) shows the Thomas and Morgan portals. Mr. Morgan sublet a portion of the mine to Irvin A. Smith during

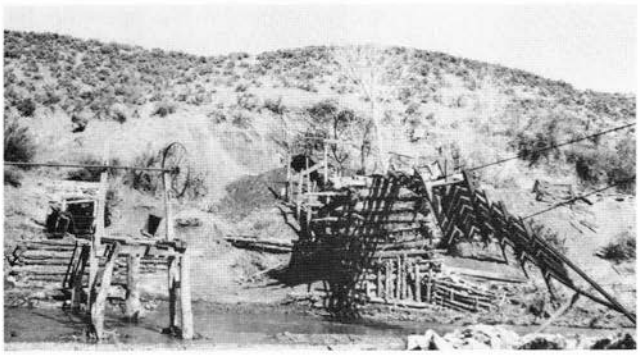


FIGURE 101—The portals of the Morgan and Thomas mine, with the La Plata River in the foreground. Morgan's opening is on the left; Thomas' is to the right. The hay rake wheel was used with a chain fastened to the axle to aid in dumping a carload of rock. *Photo by J. J. Bourquin, April 27, 1935.*

FIGURE 103—The portals of the Morgan and Thomas mine. *Photo by R. D. Reeder, April 28, 1939.*

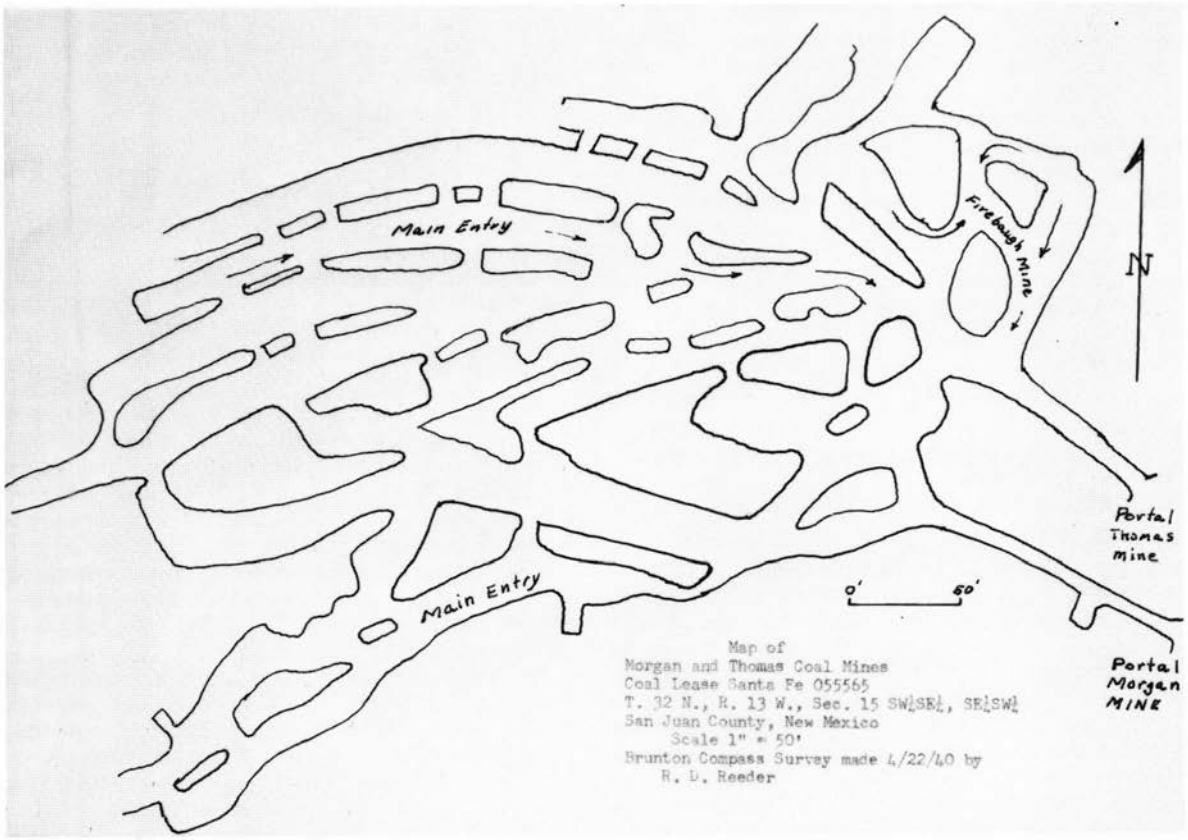


FIGURE 102—Map of the Morgan and Thomas mine.

the fall of 1934. Mr. Smith mined his room 33 ft wide and left a 5-ft pillar between it and a 22-ft-wide room. No timber was used because he mined the coal to a height of 10-25 ft. The coal was forked in the mine, and hundreds of tons of slack were gobbed in the mine. Mr. Thomas used 36-inch gauge track for his side of the mine, and Mr. Morgan used 30-inch gauge track for his mine. Both used black powder because it was cheaper, but an explosion could have been created with all the coal dust and slack in the mine. Records of coal sales were practically nonexistent, and the partners were in arrears in payment of rent and royalties.

At times Mr. Thomas and his family lived in a tent on the river, and his children slept in the mine. Their living quarters varied according to what they could find. Mr. Morgan was an old bachelor who lived among ranchers.

By 1938, each partner had built a trestle across the La Plata River to serve his customers. The Thomas trestle was a conglomeration of poles and planks fashioned to support the rails and a mine car of coal (Fig. 103). The partners had both retained a series of sublessees who mined coal on their respective sides of the mine. Scales had been placed in each entry, and a better record was kept of the coal sales.

By the middle of 1941, Mr. Morgan was living in Colorado and drawing an old-age pension. Mr. Thomas and his son were operating the Thomas mine. The son, however, was drafted during the summer of 1943; Mr. Thomas mined what he could, but he was elderly and could not work hard, and he was unable to hire miners because of the war.

By 1946, Mr. Morgan had died. Mr. Thomas had the rail and equipment removed, and for practical purposes the mine was abandoned. The lease was cancelled on July 25, 1949. Records of production show that 7,521 tons of coal were sold.

Morgan mine

George Morgan, 1898-1905
5,000 ft NL, 2,800 ft EL, sec. 15, T32N, R13W (LP-11, Fig. 99)

The Morgan mine, which was first mentioned in the Territorial Mine Inspector's report for 1898-1899, was operated by George Morgan. This mine was apparently opened by a short shaft on the upper coal bed, which according to Shaler (1907, p. 396) was called the Peacock bed. The coal was 3 ft 10 inches thick. The output listed for the above year was 250 tons, which was used for local trade, and although the mine was worked intermittently until 1905 no further production figures are available. A sealed shaft at the above location was found during 1979 field work for the Abandoned Mine Lands project.

O'Brien-La Plata mine

Thomas O'Brien
Phelps Dodge Mining and Smelting Company
1904-1905
400 ft NL, 1,100 ft EL, sec. 22, T32N, R13W (LP-5, Fig. 99)

In the early 1900's Phelps Dodge Mining and Smelting Company was interested in obtaining coal lands in New Mexico to fuel its copper smelters and mines in Arizona. Interest in the Colorado and Arizona Railroad, which would connect with the Arizona smelters and mines, was at its peak. In 1904, cognizant of the thick coal bed in the vicinity of La Plata, the officials sent Thomas O'Brien of Dawson to open up the coal bed and determine if it was suitable for their needs. Mr. O'Brien hired 20 men for 150 days and had two slopes driven 300 ft and 800 ft at a dip of 10° at the above location. He found gas and water in the deeper slope and also established that the coal was not suitable for coking. Production from the development work, all of which was stockpiled, was about 2,500 tons. In 1905 the company acquired the Dawson mines from Charles Eddy. Interest in the La Plata mines ceased, and they were closed.

The old literature places the O'Brien mine in the $SE^{1}/4SE1/4$ of sec. 15, but during field work in 1979 for the Abandoned Mine Lands project two old openings bearing easterly were found at the above location in sec. 22, and it is believed that these are the openings of the O'Brien mine. There is a single slope driven westerly 1,400 ft north of the O'Brien mine that may have been associated with Phelps Dodge exploration (see next chapter).

Phelps Dodge prospect

Phelps Dodge Mining and Smelting Company, 1904(?)
4,300 ft NL, 1,200 ft EL, sec. **15, T32N, R3W (LP-4, Fig. 99)**

It is believed that this single opening was mined by Phelps Dodge Mining and Smelting Company. The operators became interested in this thick bed of coal when there was talk about a railroad that would connect the Farmington area with the Santa Fe Railroad. However, the railroad failed to become a reality. Shaler (1907, p. 396) reported that Phelps Dodge acquired the Greer and the O'Brien mines that were in the immediate vicinity. The three mines ceased operations in about 1904 or 1905. In 1979 the opening at the above location was found during the Abandoned Mine Lands project. The drift was driven about N70°E.

Unknown mine

2,200 ft NL, 2,100 ft EL, sec. 18, T32N, R12W (LP-3, Fig. 99)

It is not known who opened this mine or when the operation took place. The location of the mine is shown on the La Plata 71/2-min topographic map. In 1932 the annual State Mining Inspector's report mentioned a wagon mine opened by Irwin Brown in the La Plata area, which could be this mine. In 1979 an old portal was found at the above location during the Abandoned Mine Lands project. Recent bulldozing along the coal bed has almost destroyed the old mine site.

Pruitt-Kempton mines

SF 056261 **7-18-29** Lease
Mr. Pruitt, early 1900's
100 ft N, Colorado state line, 400 ft EL,
sec. 7, **T32N, R12W** (LP-1, Fig. 99)
Lucian 0. Kempton and William E. Nietzel, Aztec Lots 1 and 2, sec. 7, T32N, R12W, 88.3 acres,
1,000 ft NL, 800 ft EL (LP-2, Fig. 99)

The Pruitt mine is mentioned by Shaler (1906, p. 395) as "An opening in the Pruitt pasture, known as the Pruitt Mine, is located about 25 feet north of the State Line in sec. 23, T. 32 N., R. 12 W. This mine is a chamber 25 feet wide, 100 feet long, and high enough for wagons to enter and load direct from the working face. The bed is 36 feet thick, but only 10 feet is mined." Information concerning the Pruitt mine does not appear again in the literature until after a period of almost 30 years when the mine became part of an operation by L. 0. Kempton.

On August 9, 1927, Lucian 0. Kempton and William E. Neitzel made application for a prospecting permit for land on the Colorado-New Mexico boundary 5-6 mi east of La Plata. An application for a lease was submitted by them on March 17, 1928, and before September of that year they completed several hundred feet of workings. The permit was never issued, but the land was put up for competitive sale on March 5, 1929, and the applicants were awarded

the lease as petitioners on July 18, 1929; no bonus was paid.

The mine is in the lower bed of coal in the Fruitland Formation. The bed was 25-30 ft thick in this particular area but contained numerous rock and carbonaceous shale partings; it dipped 6-8° southeast. By 1929 a chute, equipped with a bar screen with 1-inch spacings, and a tipple had been constructed at the mine. About 7 ft of the bed were mined, and the coal was sold to ranchers in the vicinity and to customers in Aztec and in the Durango, Colorado, area.

Mr. Neitzel assigned his interest in the lease to Mr. Kempton effective February 27, 1931, and the latter continued to operate the mine until the spring of 1933. At that time he abandoned the mine because a fault cut the coal bed off going north, and he could not find the bed in the underground workings north of the fault. In addition, down the dip to the southeast water was encountered that could not be pumped with the equipment on hand (Fig. 104).

Mr. Kempton then cleaned up the old Pruitt mine and built about 250 ft of outside track to accommodate the construction of a tipple, which was equipped with a 1-inch bar screen. The lower 7-8 ft of the 25-30 ft coal bed were mined (Fig. 105). The miners received $1.25 for screened lump coal, which sold for $2.50 at the mine; the slack was difficult to sell. The mine produced some water, which was pumped by a deep well pump. A horse was used to pull the cars from the mine. During most of the life of the mine Mr. Kempton was in charge of operations, but in early 1939 Charles Hadden and two assistants entered into an operating agreement with him, under which Mr. Kempton paid them $1.25 per ton for all coal sold.

Mr. Kempton asked for suspension of operations in January 1941, and the mine did not produce again until the third quarter of 1943, at which time 83 tons were sold. There was no more production after 1944. The workings of the Pruitt mine and the Kempton mine were compiled on the Kempton mine map (Fig. 104).

On April 13, 1948, Mr. Kempton requested that the lease be relinquished, but the portals and the air shafts had not been sealed so relinquishment was delayed. Cy Wade, one of Mr. Kempton's employees, decided to reopen the mine, and assignment proceedings were started; however, he failed to supply the information required, and the assignment was denied. The necessary abandonment work was completed, and the lease was cancelled on October 24, 1950. Production under the lease was 11,327 tons, of which approximately 4,304 tons came from the Kempton mine.

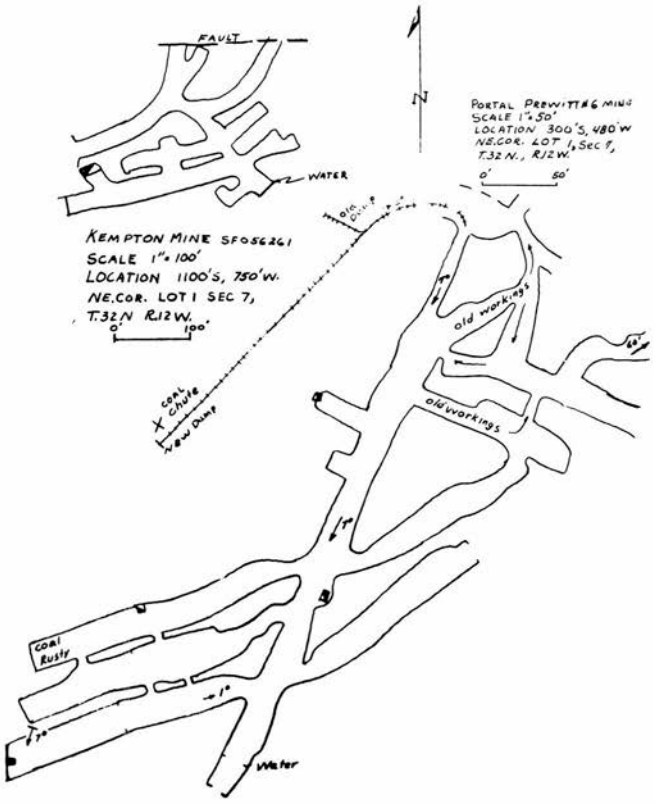


FIGURE 104—Map of Kempton and Prewitt mines. The Kempton mine map was sketched from a line survey on a map made by J. W. Macfarlane, Civil Engineer, on June 10, 1935. The locations of the portals of each mine were scaled from this map. The Prewitt mine map was traced from a map made by R. D. Reeder, last addition 1944. *Map information compiled by H. B. Nickelson, April 1978.*

New Mexico mine

Bauer and Reeside (1921) furnished a small amount of information about the New Mexico mine, but study of the literature has failed to reveal any further data. They located the mine about 1,000 ft north of the $S^1/4$ corner of sec. 7, T32N, R12W. A coal section of the bed, containing 24 ft of coal and 1 ft 9 inches of partings, is shown in Bauer and Reeside (1921, plate XXVI). An analysis of a sample, apparently cut across the bed, which was made by Max A. Pishel in 1913 follows (Bauer and Reeside, 1921, p. 184):

Moisture	6.6%
Volatile matter	35.4%
Fixed carbon	44.9%
Ash	13.1%
Sulphur	0.66%
Calories	6,380
BTU	11,490

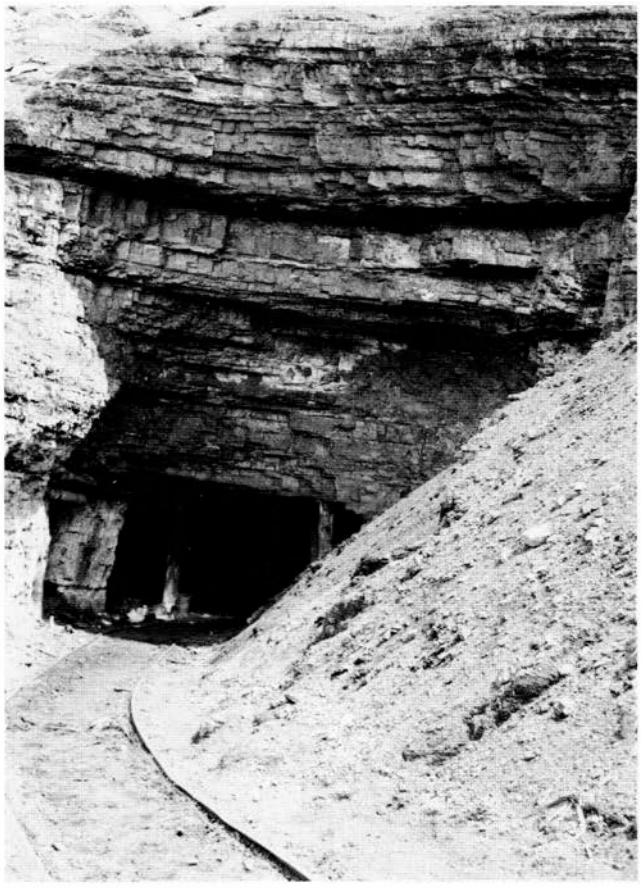


FIGURE 105—The main portal of the Prewitt No. 6 mine. The stratum exposed above the portal is the coal bed. *Photo by J. J. Bourquin, April 24, 1935.*

According to Bauer and Reeside's location of the mine on the outcrop it would be in the NE1/4NE1/4 sec. 18, T32N, R12W on the La Plata 7 1/2 min quadrangle (Fig. 99).

Peabody Coal Company's La Plata project

NM 0315559 7-1-63 Lease
Sentry Royalty Company, St. Louis, Missouri
Peabody Coal Company, St. Louis, Missouri
Lots 1, 2, 3, SE¼SW¼ *sec. 7;* **lots 5, 6, 7, 8,** *sec. 8;* **lots 3, 4, 5,** *sec. 17;* **lots 1, 3, NE¼SW¼, N½SE¼, SE¼NE¼** *sec. 18,* **T32N, R12W; lots 3 through 12, S½NW¼** *sec. 13;* **SE¼NE¼,** *S½ sec. 14;* **S½SW¼, SE1/4** *sec. 15; E1/2NE1/4 sec. 22; N½N½, SW1/4NW¼ sec. 23,* **T32N, R13W, 2,044.15 acres**

(Sections in italic type are part of the La Plata mine.)

This project is in the vicinity of and extends east of La Plata on federal land underlain with coal beds in the Fruitland Formation. Sentry Royalty Company, a wholly owned subsidiary of Peabody Coal Company, made application on February 12, 1962, for coal permits on federal lands from the east line of the Ute Mountain Ute Indian Reservation in New Mexico to the Colorado line. The lands are described by Hayes and Zapp (1955).

The Mining Supervisor recommended that the area be put up for competitive bid in two units; Unit No. 1 would be an area in the vicinity of the La Plata River and east to the Colorado line, and Unit No. 2 would include the area from the La Plata River southwest along the limb of the monocline to the Indian reservation boundary. The sale was held in Santa Fe on May 22, 1963, and Sentry Royalty Company offered $1.00 per acre for Unit No. 1 by oral bid. There were no bids for Unit No. 2. The lease for Unit No. 1 was issued effective July 1, 1963. This land was a part of a mining unit that extended into the Ute Reservation in Colorado that Peabody Coal Company already had leased. Part of the land had been mined previously in underground operations (see chapters on Kempton-Prewitt mine, SF 056261, and Morgan-Thomas mine, SF 055565).

Peabody Coal Company began a drilling program on the land during 1963 and drilled about 30 holes across the lease area. Results showed a 25-30 ft bed of coal dipping 5-8° southerly. The outcrop was severely burned over large areas; deep box cuts will be required to open the bed by strip mining. Sentry Royalty Company, which handles the exploration phase of the lands, assigned the lease after the exploration to Peabody Coal Company, the developer and mine operator. Peabody Coal Company sold the federal lease to Cimarron Coal Company, which also acquired adjoining fee lands. Cimarron Coal Company drilled on the property in early 1979. In June 1979, Western Coal Company acquired these lands and applied for a state permit to mine. The permit was granted, and Western Coal Company began plans for the La Plata mine. In 1982 the lands and the permit were transferred to San Juan Coal Company, a subsidiary of Utah International. Production started in late 1986. The anticipated annual production is 1.5 million tons. One major bed exceeds 30 ft in thickness, and the beds dip 29 to 32° southerly. The average quality of the coal is 9,500 BTU/ lb with a sulphur content of 0.9% and ash content of 22%. The coal is trucked to the San Juan Generating Station. The La Plata mine will provide fuel for the anticipated life of this plant.

Monero coal field

Very little information was found in early literature concerning the existence of coal in the Monero coal field. Lee and Knowlton (1917) published a chronological bibliography (with abstracts) of writings concerning geology and paleontology in Colorado and New Mexico. In one of the abstracts, J. J. Stevenson (1881, p. 145) mentioned that J. S. Newberry regarded the coal beds near Chama and farther to the north and west as younger than the Galisteo coal beds. Research by E. D. Cope in the Chama area is also mentioned by Stevenson. Precise locations were not given, and these areas may have been in the Monero coal field or in the neighboring Tierra Amarilla coal field.

In 1881, when the Denver Rio Grande and Western Railroad was built across the Monero coal field (see Fig. 1), the development of the coal beds for engine fuel began. Two villages or coal camps (Fig. 106), first Amargo and later Monero, were established. Amargo, the ruins of which can hardly be found, had a post office from 1881 to 1894. The settlement probably began as a railroad camp and then served as a coal camp. Monero, about 3 mi southeast of Amargo, was started in 1884 by a group of Italian coal miners who optimistically gave their town the name of the Italian word for money. Amargo began to decline because the operating coal mines came to centered around Monero; the latter village survived until 1963.

Very little information has been found in the literature concerning the mines from 1881 to 1893, but the early Rio Arriba County production statistics, which are available, are included in Table 2. John C. Spears, Territorial Mine Inspector in 1892-1893, visited the area in July 1893. He reported that two mines, the Monero and the San Luis, were operating at Monero and that two small mines near Amargo were being worked to provide winter coal for the local people. The first record of the mine was found in the first formal Territorial Mine Inspection report, which was for fiscal year 1893-1894. Three mines operated during that period: the Monero produced 18,720 tons, the Ray 3,350 tons, and the Simers 723 tons. Except for a small amount used for domestic purposes, the coal was sold to the Denver Rio Grande and Western Railroad. The Monero and Ray mines were owned by the Monero Coal and Coke Company (owner-operator Pascal Craig), and the Simers mine was owned by M. F. Simers. In 1895 the Ray mine holed through to the Monero mine and became part of it. There was little change in operation of this mine until its ownership changed hands in fiscal year 1897-1898. At that time it became the property of the Rio Arriba Coal Company, of which E. A. Fiske was President and J. H. Crist was Manager. This company also purchased the A. H. Willis and M. F. Simers mines, and its holdings were then called the Monero No. 1, No. 2, and No. 3 mines. The Monero No. 3 mine, formerly the Simers mine, closed in 1898.

From 1899 through 1907 was a good period because 35,000-51,000 tons of coal were produced per year from the Monero field. The major portion of this production came from the Monero No. 1 and No. 2 mines; the balance came from the adjoining Kutz mine located 0.25 mi east. In 1908 production from the field was less than half that of the previous year. A recession was blamed, but, in addition, the Monero mines had run out of developed reserves, and, the operators were retreating from the lower workings. In 1911 the outside facilities at the Monero No. 1 mine were destroyed by

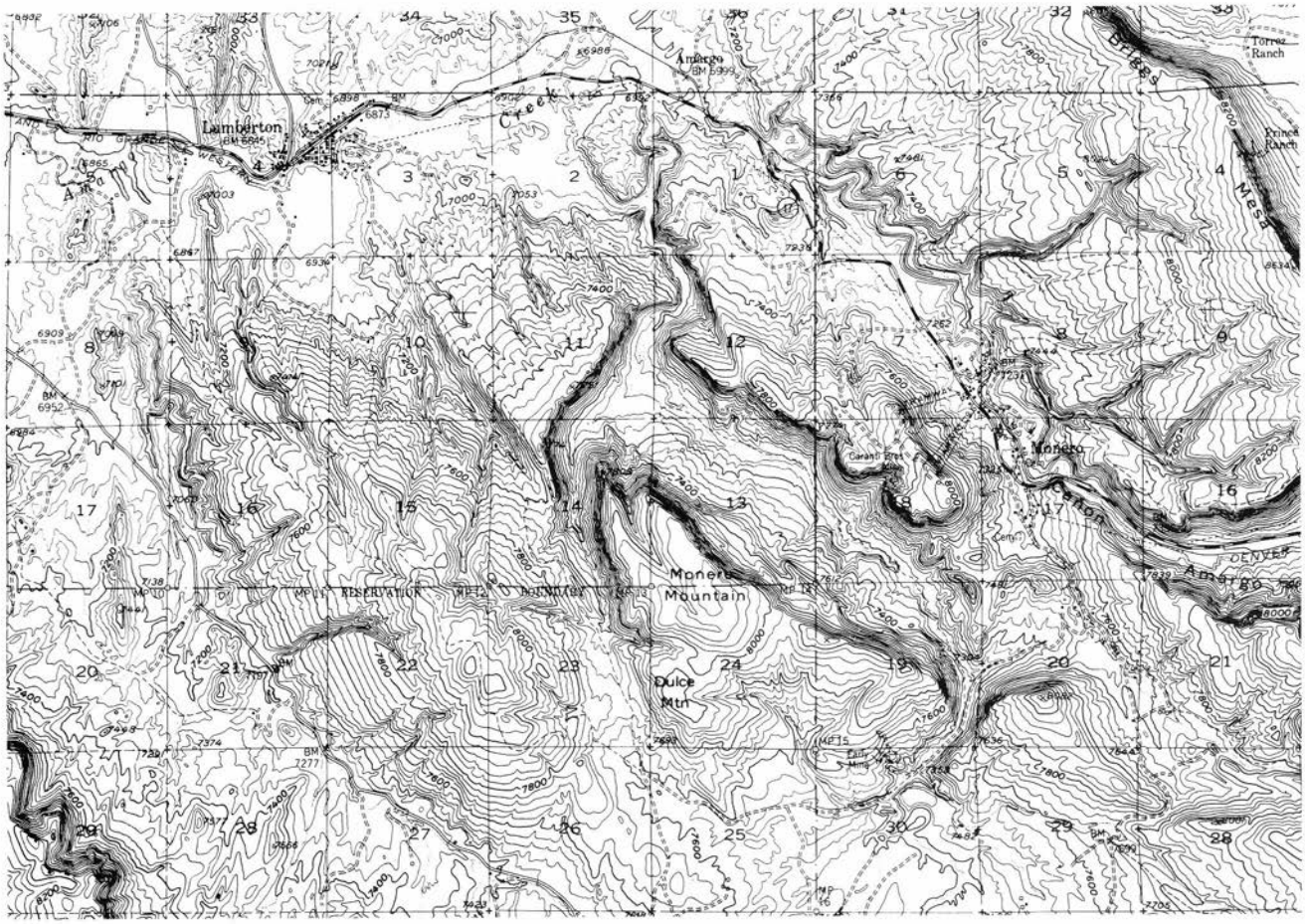


FIGURE 106—Map of Monero, Amargo, and Lumberton area, Lumberton quadrangle. See Figs. 107, 118, 128, and 131 for locations of mines.

fire, and the mine was never operated again. Hard times continued for the area until 1922, when production from the Monero field again exceeded 16,000 tons (see Table 2, Rio Arriba County).

During the Abandoned Mine Lands project in 1979 evidence of many old, unknown mines was found. It is, of course, impossible to furnish information other than the locations, but mention should be made here of the small early-day mines for which some written history exists. The Angel mine, owned by the San Luis Coal Company, operated briefly about 1890 and then was closed. The same property was mined by A. Luchetti from 1909 to 1911. From 1895 to 1897 Fred Sterling operated a small mine 3 mi east of Monero.

In 1899 G. W. Kutz, a businessman and rancher from Lumberton, opened a mine adjoining the Monero mine on the east. During his ownership, until about 1912 or 1913, many problems were encountered: gas in the mine, lack of second openings, a strike, and a gas explosion on July 24, 1902. In fiscal year 1905-1906 Mr. Kutz leased the mine to W. C. Ferguson of Denver, who operated it until 1910. A. Luchetti obtained the property in 1912 or 1913, made fairly large expenditures, and developed the reserves. He organized the Peacock Coal Company in 1920, and it continued under his guidance until February 22, 1925, when he was killed by a fall of rock. Levi Martinez was then made General Manager, and he continued the operation of the mine until the end of 1930 when the mine closed.

Another mine begun in 1899 was the McBroom brothers' mine. The McBroom mine, about 0.5 mi southeast of Monero, was the first of five or six mines to open along a southeast-trending gulch. The McBroom brothers operated the mine until 1901 or 1902 when it was purchased by the Rio Arriba Coal Company, with J. H. Crist as General Manager. Mr. Crist operated the mine until fiscal year 19031904 when Felix Gandella leased it, continuing the operation until the fall of 1910, when the mine was closed.

No further interest was shown in this area until 1921, when John Caranta was issued a federal lease on lands in sections 17 and 20, T31N, R1E. A second lease was issued to him in 1923, and he mined the leases until January 8, 1924, when they were assigned to the Western Fuel Company of Hesperus, Colorado. Arthur Ayres of Durango, Colorado, and William I. Gifford of Hesperus were the new lessees of the mine, which they called the Monero. Andrew Erler became Superintendent of the Monero mine in December 1925, and he continued in charge until 1929. Mr. Erler had applied for and obtained a prospecting permit on land adjoining the company leases in 1927, and when the mine became inoperable he drove a new entry through the company leases into his permit, which later became a lease. The Erlers operated this mine until March 31, 1940.

The Burns and Biggs Lumber Company began a mine in 1906 near the SE corner of sec. 8, T31N, R1W, about 1 mi southwest of Lumberton, to supply fuel for the Denver Southwestern Railroad, which transported its lumber from the sawmills of El Vado to Lumberton. James McBroom was the first General Manager, a position later held by Barne Caranta. The mine continued to provide fuel for the railroad until late 1911 when it ceased operations.

The Monero Coal Company opened the Laing mine on a bed of coal 1.25 mi northwest of Monero. The mine operated for about 2 years between 1906 and 1908.

In 1924 a coal prospecting permit was issued to Daniel

G. Kutz for land 0.75 mi south of Lumberton. Mr. Kutz opened an old mine entry that had been operated by James Corrigan in 1898 and 1899. As that mine became depleted of reserves, an adjoining one was opened and then another, until by 1937 four entries had been driven along the outcrop. In 1937 Frank J. Blunt, who was associated with the Navajo Mercantile Company, opened the Garcia mine through Kutz's No. 4 entry. Mr. Kutz assigned his interest in the lease to W. C. Ferguson in 1939. Mr. Ferguson and Mr. Blunt then worked the property successfully, contracting the mining to Arthur and Isadore Erler for $1.85 per ton delivered into railroad cars. The mine continued operation until 1942; most of the production was sold to the Denver Rio Grande and Western Railroad.

In 1921 a federal lease for land 1 mi southwest of Lumberton was issued to Daniel G. Kutz and Ernest G. Miller, a civil engineer from Santa Fe. In 1922 Mr. Kutz assigned his share of the lease to Mr. Miller, who employed managers to take charge of the mine. The operation was plagued with problems and in 1928 was on the verge of bankruptcy; Mr Kutz and W. C. Ferguson of Denver obtained the lease then. They furnished capital to reopen the mine, and through Mr. Ferguson's connections a market with the Denver Rio Grande and Western Railroad was obtained. On March 29, 1930, Mr. Ferguson formed the Navajo Mercantile Company, and Mr. Kutz assigned his share of the lease to that company, which operated the mine until 1936. By then mining had become unprofitable because the bed had thinned to 30 inches and faults had been encountered.

Barne Caranta was mining coal from deeded land in the SW1/4SW1/4 sec. 8, T31N, R1E and desired a small block of coal on federal land in the SE1/4SW1/4. A lease was issued in 1927. Information given by the State Mine Inspector menitons that a Mr. Dicks was associated with Mr. Caranta, but after the mining began on the lease land the name Dicks was no longer mentioned in the records. Mr. Caranta mined all the coal in the small block, and the lease was cancelled in 1938.

Nick Bellino opened a mine before 1927 on the SE1/4SE1/4 sec. 8, T31N, R1W, about 2 mi south of Lumberton, but he soon sold the land to Emmett Wirt, who for many years was the Postmaster and County Commissioner in Dulce. A title search proved that the land was not Bellino's but instead belonged to the New Mexico Lumber Company. That company gave Mr. Wirt a quitclaim deed to the mine land, and he then leased it to Edward F. Peisker for a royalty of 300 per ton sold. By 1932 Mr. Peisker was mining in the NE1/4NE1/4 sec. 17, T31N, R1W, on land held by the government. In 1935 the General Land Office ordered a survey and after its completion charged Mr. Peisker with innocent trespass. The problem was cleared up, and in 1936 he received a lease to the land. All the coal mined was sold to the Jicarilla Indian Agency at Dulce. The mine eventually extended to sec. 16, which was acquired by federal lease in 1940. In the same year legal problems with the estate after Mr. Wirt's death forced the cancellation of the federal leases, and the mine was closed in 1942.

In 1939 Andrew Erler and sons, who were operating mines held under federal lease in the NE1/4 sec. 20, T31N, R1E, needed new reserves. Inez Erler, who was married to Arthur, one of Andrew's sons, made application for federal lands in sections 19 and 30, T31N, R1E. After the prospecting permits were issued the Erlers began six prospect openings on the two beds. A preference right lease was requested, but because of poor advice, government haggling, and incorrect land descriptions, the lease was not issued until 1947. The mines developed at a rapid rate and furnished the Erlers' contract needs. Operations were continued until 1961, when Mr. Erler's health became poor, and the equipment and lease were sold to Christobal and Jose Carrillo. The Carrillos operated the mine until 1965, when Christobal was injured by a fall of rock. The lease was relinquished that year.

The Caranta family, who operated coal mines in the Monero area for about 25 years, had depleted their mines of profitable reserves and needed a new area to develop a supply of coal. They prospected and applied for coal prospecting permits on land along the high bluff to the south of Monero. The Monero coal beds had been faulted to the top of this bluff from the valley floor at Monero. The permits were granted in 1940, and after prospecting showed two minable beds of coal a lease was issued in 1942. During the life of the Caranta mines eight entries were developed, and to transport the coal off the top of the mountain three aerial trams were built to bins on the valley floor. The mines furnished much of the coal for the Denver Rio Grande and Western Railroad.

By 1960 two of the Caranta brothers had died, Barne in 1950 and Joseph in 1960, leaving John Caranta and the widows to operate the property. They wanted to sell, and in September 1961 the property was purchased by the McElroy brothers of Los Lunas. Financial problems, partly caused by the closing of the railroad, troubled the business, and by October of 1963 the property reverted to the Carantas. The lease was then assigned to Stanley Idzior, a miner who had worked for the McElroy brothers. He operated the mine until December 1966 when the tipples and loading facilities at the portals were destroyed by fire. The U.S. Bureau of Mines was hasty in issuing a close order, and, although the fire was put out in 2 days, the order was not rescinded for a month. Mr. Idzior produced a small tonnage until the Mine Safety Laws of 1970 put him out of business; in 1971 he closed the last mine to operate at Monero.

During the early 1940's Juan A. Tafoya of Lumberton opened the Amargo Knot mine about 0.5 mi south of Amargo in sec. 1, T31N, R1W, to provide fuel to the Jicarilla Indian Agency at Dulce. In 1945 he applied for a federal prospecting permit on 40 acres adjacent to the mine. Because of misinformation by his competitors, the permit was withheld until an examination by the government showed that the coal was needed in the area, and after due time a lease was issued in 1947. Mr. Tafoya operated the mine until 1959 and then leased the property for a couple of years. Total production was small. The mine was closed in 1962.

About 1977 a drilling program was undertaken on land north of the site of Amargo, but nothing has developed to date from this exploration. A few people now live in and around Monero, but unless one is familiar with the town of Amargo even its location is difficult to find. Figure 107 shows the location of the mine openings in the vicinity of Monero.

Kutz—Luchetti—Peacock mine'

G. W. Kutz, 1899-1910 A.
Luchetti, 1912(?)-1920
Peacock Coal Company, 1920-1930
500 ft NL, 4,600 ft EL, sec. 17, T31N, R1E **(L-38, Fig. 107)**

A new mine was opened in 1899 about 0.25 mi southeast of the Monero Post Office by G. W. Kutz, a businessman and rancher from Lumberton. By July of 1900 the slope had reached a depth of 400 ft on the lower bed, which dipped 11° westerly, and during the first year of working 4,000 tons were mined. The coal was sold at that time to the Denver Rio Grande and Western Railroad Company. Later, additional markets were found in Santa Fe, adjacent towns, and the San Luis Valley in Colorado. In early 1900 a ventilation shaft was sunk. Because the operation was near abandoned workings of the Monero No. 1 mine, John W. Fleming, Territorial Mine Inspector, ordered that a drill hole be kept 10 ft ahead of the working to protect the miners from possible water and methane.

By fiscal year 1901-1902 the lower bed of coal was opened; both beds were about 4 ft thick, with sandstone roofs. A 30 HP steam engine hoist was put in use to haul the coal from the mine to the tipple. Gas was found on the lower slope, and a pipe was inserted in the ground so the gas could be fired. Other problems presented themselves. During a miners' strike from May 1 to June 9, 1902, the pumps were shut down, and the mine flooded. Timbering and ventilation were poor, and a second opening for egress was needed. Jo E. Sheridan, Territorial Mine Inspector, issued a warning about gas and ordered that a fire boss be employed and safety lamps used.

During the following fiscal year (1902-1903) the problems were compounded. Operations were suspended for 3 weeks in July and August 1902 because of a gas explosion on July 24 that burned three men badly and injured two more slightly. On January 27, 1903, an injunction was obtained by Mr. Sheridan forbidding mine operation until a second opening was made. The opening was completed on March 11, 1903, and Mr. Kutz was assessed and paid $111.60 for the costs of the suit. On June 10 of that year the miners struck for a wage increase of 5¢ per ton for mining the coal. Probably as a result of this strike (which was settled some time after the end of the fiscal year) the practice of issuing the miners a coal ticket every day was started. The tickets could be used to obtain goods at the G. W. Kutz and Company Store,

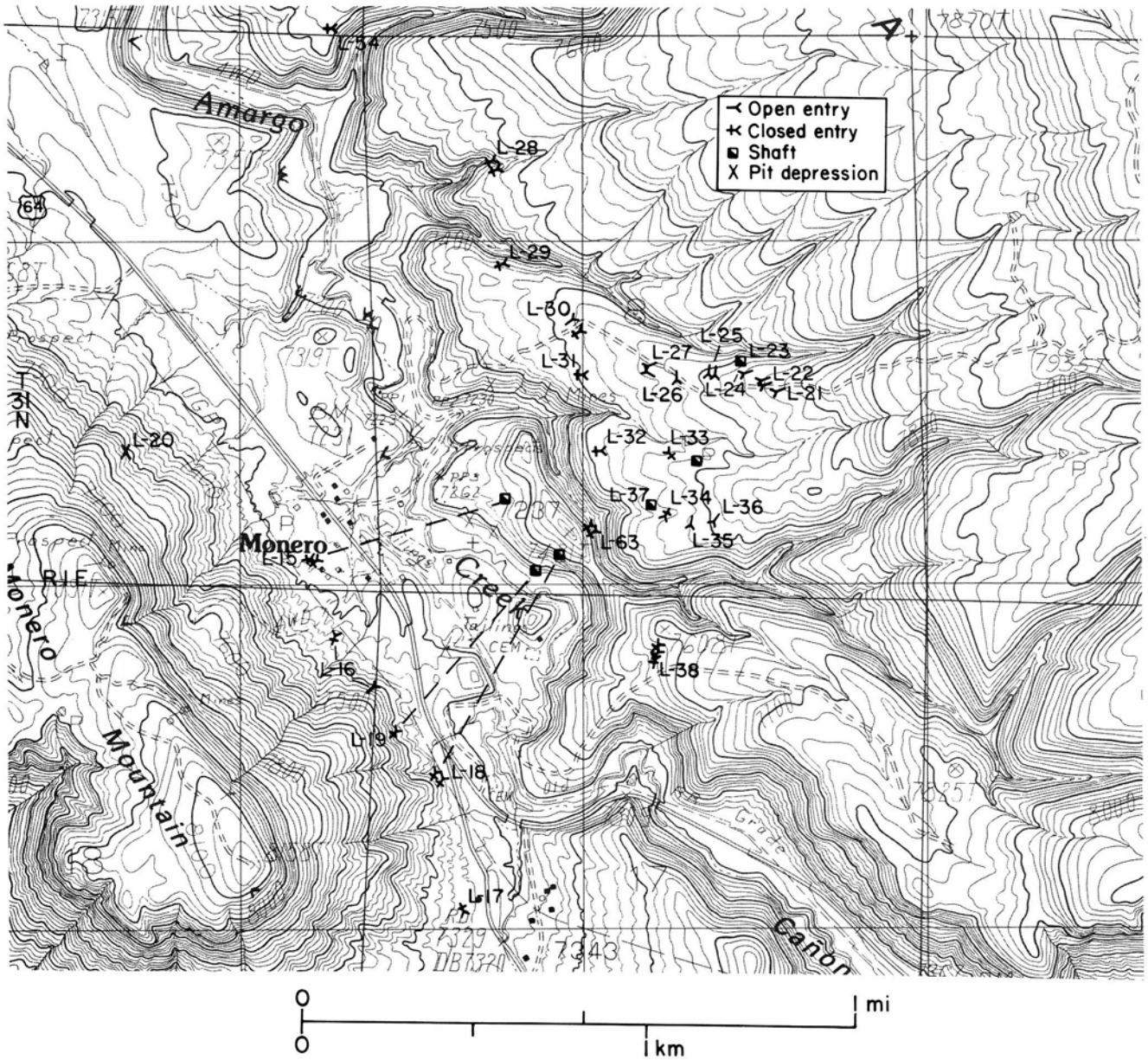


FIGURE 107—Mines in the Monero area on the Lumberton 7½-min quadrangle (enlarged).

L–15—Caranta No. 5 mine
L–16—Caranta No. 2 and No. 3 mines aircourse
L–17—Caranta prospect
L–18—Caranta No. 1 and No. 4 mines
L–19—Caranta No. 2 and No. 3 mines
L–20—Walker–Caranta mine
L–21—Unknown mine
L–22—Unknown mine
L–23—Unknown mine
L–24—Unknown mine
L–25—Unknown mine
L–26—Unknown mine
L–27—Unknown mine
L–28—Unknown mine
L–29—Unknown mine
L–30—Ray mine(?)
L–31—Unknown mine
L–32—Angel mine
L–33—Tomacino–Davito mine(?)
L–34—Unknown mine
L–35—Unknown mine
L–36—Barne Caranta mine
L–37—Unknown shaft
L–38—Kutz–Luchetti–Peacock mine
L–54—Laing mine(?)
L–63—Monero mine

FIGURE 108—View looking northwest of the old tipple, dump, and boiler at the Luchetti mine. The refuse pile at the Monero mine is at the right in the distance. *Photo by H. B. Nickelson, 1979.*

FIGURE 109—The remains of the old steam boilers used to provide electric power for the mine pump, hoist, and other electric power needs at the Luchetti mine. *Photo by H. B. Nickelson, 1979.*

or they could be redeemed for cash on the 1st and 16th of each month, a system favorable to the employees. During 1903-1904 the mine was kept in good condition, and the No. 2 slope driven on the upper bed was made usable.

In 1904-1905 Albert Sanstrom was Superintendent in charge of the mine. Operations were confined to the No. 2 slope, which had but one opening; however, plans were made to connect both beds. In 1905-1906 W. C. Ferguson of Denver, who invested in and operated various mines, leased the property from Mr. Kutz and employed James Rodenbaugh as Pit Boss. Mining continued from the upper level until fiscal year 1909-1910, when pillars were pulled.

The mine remained idle until 1912 or 1913, when it was obtained by A. Luchetti. Initially the operation consisted only of pulling more pillars, but gradually improvements were instituted. A new entry a few feet to the south of the original Kutz mine entries was started to open the upper bed of coal. A new tipple (Fig. 108) and new boilers were in use, and by 1915 an expenditure of $4,000 had been made. The program of improvements continued, and in 1918 funds spent on dwellings consisted of $3,000 and those spent on mine materiel, including a small powerplant (Fig. 109) and an electric cutter, totaled $5,000. In that year the inspector commented that some problems with the local miners had developed because they would fire shots during the day, say that the mine was smoky, and then go home. It was ordered that all shots be fired at quitting time and that only enough powder to blast holes drilled in one shift be issued at a time.

In 1920 Mr. Luchetti organized the Peacock Coal Company, with himself as General Manager. Production, which was averaging about 10,000 tons per year for railroad fuel, continued without untoward incidents until 1922. In that year a heavy squeeze developed along 200 ft of the slope; cribs were placed, and the movement was stopped. The slope was 2,000 ft long, sloping 7° to the southwest.

On July 6, 1922, the mine inspector received a letter from Joe Davito, one of the operators of the Tomacino-Davito mine located across the canyon, stating that the furnace at the Luchetti operation had "burned out" and bad air conditions existed. The inspector found that the furnace stack had burned during a noon hour, and one of the employees reported to him that an explosion had occurred in the mine. It was felt by the inspector that Mr. Davito probably knew more about the fire than he had written in the letter. As soon as material was obtained and assembled the stack was rebuilt.

On February 22, 1925, Mr. Luchetti was killed in the mine by a fall of rock, and Levi Martinez was then made General Manager of the mine. Operations continued at a gradually slower pace until the end of 1930, after which no records exist. Known production at the Kutz-Luchetti-Peacock mine totals 222,637 tons. A record of production and employment, so far as available, and a list of mine fatalities are shown in Tables 54 and 55.

TABLE 54—Production and employment record of the Kutz–Luchetti–Peacock mine.

Year	Production (tons)	Employment		Days operated
		Miners	Top men	
1899–1900	4,000	12	5	300
1900–1901	15,000	10	2	310
1901–1902	15,000	10	3	235
1902–1903	9,600	15	3	
1903–1904	12,000	13	3	210
1904–1905	5,523	15	3	181
1905–1906	15,000	20	3	240
1906–1907	8,583	20	3	
1907–1908	3,680	15		90
1908–1909	2,300	8		
1909–1910	4,750	10	3	
1910–1911	Did not operate			
1911–1912	No record			
1913		13		
1914	9,000	15		300
1915	7,207	12	1	
1916	3,960	12	1	
1917	5,000	15	2	240
1918	15,000	15	2	240
1919	8,727	3	2	225
1920	9,892	8	2	300
1921	11,044	21	3	255
1922	12,600	25	2	273
1923	14,985	23	3	255
1924	15,000	23	3	240
1925				
1926	12,000	9	3	
1927–1929	Operating, no report			
1930	2,786	4 employees		
1931	No record, probably ceased operation			

TABLE 55—Fatalities at the Kutz–Luchetti–Peacock mine.

Name	Date	Cause
Ricardo Gurule	May 24, 1924	Unknown
A. Luchetti	February 22, 1925	Fall of rock

Monero mine+

Monero Coal and Coke Company, 1880's-1897
Rio Arriba Coal Company, 1897-1911
400 ft SL, 100 ft WL, sec. 8, T31N, R1E (L-63, Fig. 107)

The village of Monero was established by Italians in 1884, and the Monero mine was opened at some time between that year and 1893, the date of the first available record of the mine. It is believed that it was one of the first mines opened to provide fuel for the Denver Rio Grande and Western Railroad, which was built in 1881. In 1893 the main entry of the Monero mine was 1,200 ft long. The minable reserves were confined to an area between the outcrop along the south side of Amargo Creek and the Monero fault, which formed the scarp to the southwest. The original mine portals are not evident at the present time, but a large pile of refuse marks the mine site (Fig. 110).

Before 1892 coal mines were not inspected, and the safety, ventilation, and general working conditions of the mines were dependent upon mine superintendents. In 1893 the Monero mine needed improvement, and according to Territorial Mine Inspector John W. Fleming, Superintendent Pascal Craig was slow to follow his orders. During the following year $6,000 was spent to better operations, and by January 1896, when William Ray was Superintendent, the machinery and the mine were in good condition.

During 1897 the Rio Arriba Coal Company acquired the Monero mine, the A. H. Willis mine, and the F. M. Simers mine. E. A. Fishe was President of the company, and J. H. Crist was General Manager. The company immediately spent $4,000 for improvements. Mr. Crist hired 32 miners and 13 day men, and he increased production to 22,500 tons in 313 working days. These efforts were directed toward the Monero and Simers mines because the A. H. Willis mine was closed within a year or two. The Monero No. 1 mine and Monero No. 2 mine were the same mine; entry L-63 (Fig. 107) was used for this mine.

There were two coal beds in the Monero mine area. About 40 ft apart, each bed was 3-4 ft thick, dipped 7° westerly, and contained high-volatile bituminous coal, B or C rank, which reportedly would coke. It is believed that the Monero No. 1 mine was opened on the upper bed and the Monero No. 2 mine on the lower bed. In 1901 the mines were connected, after which the No. 2 mine was used for an aircourse. Some methane was found, especially in the fault zones. The No. 1 slope eventually reached a depth of 1,700 ft, and the No. 2 reached 600 ft. Ventilation was by shaft and furnace during early-day mining, but later natural ventilation was used, which created numerous discussions between management and the federal mine inspector. At one time there was a two-inch pipe bleeding off methane from a fissure at the bottom of the slope, and the gas was burned to keep it from entering the mine workings.

Monero coal was sought by the Denver Rio Grande and Western Railroad and by fuel users along its route because it was excellent for domestic and steam use, and from 1898 until 1907 the demand exceeded the supply. It was difficult to obtain and keep sufficient miners because of the isolation of the area.

During May of 1902 there was a sympathy strike, which lasted 30 days, because the miners at Durango, Colorado, had struck for more pay. The desired increase was not received, but all the miners went back to work. Another short strike was called the following year.

FIGURE 110—The old Monero mine site showing the screening or refuse dump, the old Caranta store and Post Office, and the railroad loading dock. The structure over the top of the spoils pile was the base of the aerial tram and storage bin built by the Carantas for their mines at the top of the ridge. *Photo by H. B. Nickelson, 1979.*

The miners were Italian, German, and other Europeans; Spanish-Americans were employed on the outside. The mine continued to operate at a steady pace until fiscal year 1907-1908, a year of recession. The lumber industry was curtailed, and the loss of freight limited the number of trains and put people out of work, which in turn affected coal production. The Monero operation was suspended on January 1, 1908, and one month later the pumps were pulled.

The following year the Monero mine was worked again to a small extent in conjunction with the McBroom mine, and seven men produced 2,588 tons. In fiscal year 19091910 leasers took over the operation and mined only on an order-to-order basis; the production was not recorded. At some time during fiscal year 1910-1911 fire destroyed the facilities and equipment, and the Monero operations ceased permanently. A record of production and employment and a list of fatalities are shown in Tables 56 and 57.

TABLE 56—Production and employment record of the Monero mines; *production was combined with that of the McBroom mine.

Year	Production (tons)	Employment			Days operated
		Miners	Boys	Top men	
1893–1894	18,720	25 men employed			
1894–1895	15,000	10		5	
1895–1896	1,000	6		3	150
1896–1897	18,000	23 men employed			
1897–1898	22,500	32		13	313
1898–1899	30,000	24		8	295
1899–1900	39,000	36	6	15	275
1900–1901	35,400	40	3	8	285
1901–1902	30,600	22	3	7	278
1902–1903	25,000	25	3	7	295
1903–1904	26,000	25	1	7	274
1904–1905	31,000	30		5	275
1905–1906	26,000	20	1	4	275
1906–1907	26,000	22	1	3	276
1907–1908	11,000	34	1	6	140
1908–1909*	2,588	5		2	120
1909–1910	Not recorded				
1910–1911	2,000	4		1	150

TABLE 57—Fatalities at the Monero mines.

Name	Date	Cause
Edward Norton	September 24, 1901	Mine car
Louis Fantaconi	March 28, 1904	Misfired shot
Ramon Montoya	April 14, 1906	Eye splice broke lowering a trip

Barne Caranta mine

SF 053246 7-15-27-1938 Lease
Barre Caranta, Monero
SE1/4SW1/4 sec. 8, T31N, R1E
500 ft SL, 1,200 ft WL (L-36, Fig. 107)

Barne Caranta applied for the above land as a competitive lease. It was put up for sale, and after he paid a $125 bonus, the government issued the lease on July 15, 1927. Mr. Caranta was already mining on deeded land adjoining his newly acquired lease land, and he wanted to extend these workings into the lease land to recover about 4.5 acres of minable coal.

Access to this coal was by an entry system from the old mine on deeded land. The distance was considerable, and the time required for each car of coal to be hauled by a burro was too long; thus, a need for new openings was created. Two openings, a haulage entry and an air shaft, were then holed just off the lease land (Fig. 111). The upper bed of the coal formation at Monero was the bed mined. It was 3 to 3 ft 8 inches thick, clean, high-quality coal, with a good sandstone roof and a fireclay floor.

As the mine was developed to the northeast, a fault was encountered that dropped the coal northeast of the fault. The coal bed dipped about 8°S80°W. Three faults were encountered before the eventual abandonment of the mine. The last fault required a rock slope to intersect the down faulted block. The mine is about 0.5 mi east of the major Monero fault, and the above faults are related to and roughly parallel to that fault. The northwest-trending Monero fault has a ± 200-ft displacement with the upthrown block to the southwest.

Mr. Caranta was continually reminded to submit records of production, and it was a problem for him and the government to separate the tonnage mined on fee lands from that mined on the leased land. The mine was abandoned with all of the minable coal removed, and the opening was sealed on April 9, 1938. The production was 17,899 tons. Some coal was sold to the railroad or shipped on the railroad for sale to customers in Antonito, Colorado, and Chama, Espanola, and Santa Fe, New Mexico.

Tomacino—Davito mine

John Tomacino and Joe Davito, 1922
4,200 ft NL, 4,500 ft EL, sec. 8, T31N, R1E (L-33?, Fig. 107)

In the State Mine Inspector's annual report for 1922 it is stated that John Tomacino and Joe Davito obtained a lease on 40 acres in the SW1/4 of sec. 8. They opened their mine with an entry bearing S60°E and an air shaft; a furnace was used for ventilation. According to the report 10 men were employed, who produced 6,280 tons of coal in 150 days of that year. The coal was hauled by wagon and loaded into railroad cars at the Monero Station. Apparently the mine closed in 1922 because no later records were found.

Simers mine

F. M. Simers, before 1893-1897
Rio Arriba Coal Company, 1897-1898
Located at Monero

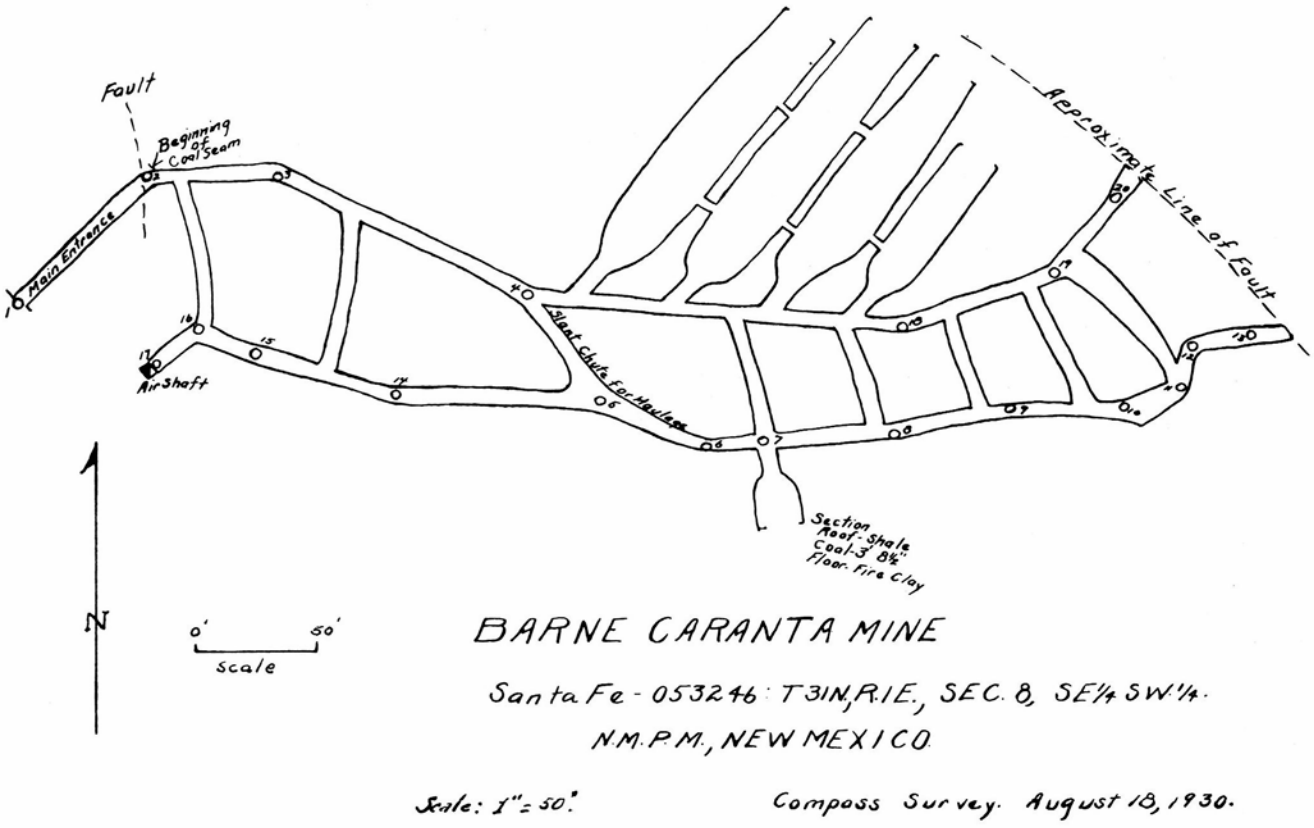


FIGURE 111—Barne Caranta No. 1 mine map, showing the workings of the mine up to August 1930. *Made from a compass survey by government engineers.*

The Simers mine may have been one of the early mines begun to provide coal for the Denver Rio Grande and Western Railroad after its construction through this area in 1881. At some time before 1893 F. M. Simers opened his mine to explore a 3-ft-4-inch bed of coal. A slope 350 ft long was driven to provide access to underground workings. Three miners and two top men produced 723 tons of coal in fiscal year 1893-1894, 852 tons in 1894-1895, and 2,620 tons in 1895-1896.

In 1897 the Rio Arriba Coal Company purchased the Simers mine and renamed it the Monero No. 3 mine. Production from it was combined briefly with that of the other two Monero mines, but because there is no mention of the No. 3 mine after fiscal year 1897-1898, it was presumably closed during those years. I believe that the Simers mine was in the area of L-21—L-27 on Figure 107.

Angel mine

San Luis Coal Company,
1890 A. Luchetti, 1909-1911
4,000 ft NL, 200 ft WL, sec. 8, T31N, R1E (L-32, Fig. 107)

The Angel mine was operated briefly about 1890 by the San Luis Coal Company and was then abandoned until 1909, when A. Luchetti negotiated a lease with the company on a royalty basis. The mine was opened by "a drift driven 300 ft to the raise at an angle of r" (Territorial Mine Inspector's report, 1909-1910). The coal bed, which was the upper bed of the Amargo coal sequence, was 3 ft thick.

A short tram and a tipple were constructed by Mr. Luchetti so that the coal could be loaded into a rail car; the remains were still in existence in 1979. Mr. Luchetti mined when he had orders, and during 1909-1910 13 miners, 2 company men, and 5 outside men made up the crew during one busy period. The miners were paid $1.00 per ton to mine the coal, which was sold for $1.50 per ton at the mine. That year the mine was operated 120 days and produced 3,600 tons of coal. During 1910-1911 Mr. Luchetti operated 150 days with 6 men and produced 1,000 tons. There are no further records of the Angel mine.

San Luis mine

1891-1893
Near the Denver Rio Grande and Western Railroad station at Monero

In 1893 John C. Spears, Territorial Mine Inspector, visited this small mine, which was located near the railroad station on the opposite side of the railroad tracks from the Monero mine. The coal bed, which was 2 ft 8 inches thick, was of good quality. The entry was driven 500 ft from the surface; the roof was a good sandstone. T. C. Jones was Superintendent, and five men were employed. The locations of the Angel mine and this mine, which were described by Spears, appear to be the same. The Angel mine was originally opened by the San Luis Coal Company in about 1890, and, according to Spears, this mine was opened in 1891.

Ray mine

Monero Coal and Coke Company, ?-1896
2,900 ft NL, 100 ft EL, sec. 7, T31N, R1E (L-30?, Fig. 107)

The Territorial Mine Inspector's report for fiscal year 1894-1895 mentions the Ray mine and locates it 1 mi north of Monero. The mine was owned and operated by the Monero Coal and Coke Company. In that year, three miners and two top men, under the direction of David Ray, Superintendent, produced 3,500 tons of coal from a slope 300 ft long bearing S45°W. The workings were developed along a 3-ft bed of coal. Ventilation through the workings was aided by a furnace. The coal was sold to the Denver Rio Grande and Western Railroad. The inspection report for the following fiscal year states that the Ray mine was closed and then merged into the Monero mine.

During the Abandoned Mine Lands field work in 1979 a mine site was visited at the location given above. It is assumed that the site represents the Ray mine because this is the only mine in the vicinity that could have been driven into the Monero mine.

Unknown mine

2,200 ft NL, 800 ft EL, sec. 7, T31N, R1E (L-29, Fig. 107)

This is one of the small mines or prospects along the west side of Amargo Creek below Monero. The mine site is marked by two entries about 70 ft apart bearing S44°W.

Unknown mine

1,400 ft NL, 800 ft EL, sec. 7, T31N, R1E (L-28, Fig. 107)

This mine, on the west side of Amargo Creek, was opened by two entries bearing S66°W.

Unknown mine

3,400 ft NL, 0 ft WL, sec. 7, T31N, R1E (L-31, Fig. 107)

This mine is on the west side of Amargo Creek; the entry of which is now within a few feet of the creek. The coal bed is well exposed in the creek. The entry bears N86°W, and a small, narrow dump marks the location.

Laing mine

Monero Coal Company, 1906-1908
100 ft NL, 2,300 ft EL, sec. 7, T31N, R1E (L-54?, Fig. 107)

The Monero Coal Company, with W. C. Ferguson as General Manager, opened the Laing mine on the lower bed of the Monero coal beds. A drift was driven along the strike of the bed for 250 ft. The coal was a good bituminous coking coal mined from a bed with a sandstone roof and the following measurements were made:

Coal	1 1/2"
Sandstone	
Coal	15"
Shale	11"
Coal	14"

Burros were used to haul the coal to the surface. The Denver Rio Grande and Western Railroad Company built a short rail spur from the main track to the mine, and most of the coal was sold in the San Luis Valley, Colorado, and in Santa Fe. The mine was closed on December 9, 1908, after producing only 5,674 tons.

Walker—Caranta mine

M. **C. Walker, 1917**
Barne Caranta, 1918-1919
4,000 ft NL, 4,200 ft EL, sec. 7, T31N, R1E (L-20, Fig. 107)

M. C. Walker opened this mine during the summer of 1917. During 1918 the mine was operated by Barne Caranta,

and two men mined the coal and hauled a railroad car of coal per week by wagon to the railroad. The mine was closed about 1919 because the property was in litigation. The workings are on the road to the Caranta mines on the top of the mesa.

Caranta mines*

SF 076008 11-26-40 Permit 1-21-42 Lease
John Caranta, Monero
Joseph Caranta, Monero
Barne Caranta, Monero
McElroy brothers, Los Lunas
Stanley Idzior, Monero
Lot 4, SE¼SE¼, NW¼SE¼ sec. 7; lot 1, NE¼NW1/4, NW1/4N¤1/4, S¼NE¼ sec. 18, T13N, R1E, 324.47 acres
Mines No. 1 and No. 4-1,700 ft NL, 1,300 ft EL, sec. 18 (L-18, Fig. 107)
Mines No. 2 and No. 3-1,300 ft NL, 1,700 ft EL, sec. 18 (L-16 and 19, Fig. 107)
Mine No. 5-300 ft SL, 2,400 ft EL, sec. 7 (L-15, Fig. 107)

The Caranta mines are located near the top of the high bluff immediately south of Monero. The Caranta brothers were sons of Barne Caranta, who operated coal mines on federal and fee lands in the Monero district for many years. Work began immediately after the permit was issued because the Caranta brothers needed a new source of coal to continue furnishing engine fuel to the Denver Rio Grande and Western Railroad; the other mines they were operating were mined out or prohibitively expensive to operate.

R. D. Reeder, Acting District Mining Supervisor, visited the property on May 14, 1941, by which time a slope had been started 670 ft south and 132 ft east of the northwest corner of the SE1/4NE1/4 of sec. 18. These workings became known as the Caranta No. 1 mine. Two beds of coal, to be referred to as the upper bed and the lower bed, were minable on the Caranta lands. The interval between them is about 40 ft. Mr. Reeder believed that the slope was being driven on the upper bed, but as the coal beds were developed and the fault system became known, it was found that the slope was on the lower bed. On the day of his visit the main portal had been driven 420 ft on a course of S62°W on a downdip of 4°, and the aircourse to the south was approximately the same length. Two entries were turned off the main slope, one to the right and the other to the left, and rooms were started off these entries. The coal bed exposed varied from 2 ft 8 inches to 3 ft 5 inches of clean coal. Burros were used to haul the coal to the main slope, where the cars were hoisted to the surface.

The mine portal was about 900 ft above the valley floor, and in order to transport the coal from the mine to a bin accessible to trucks an aerial tramway (jig back type) about 3,000 ft long was constructed. Two bottom-dump buckets, capacity 1,400 lbs, moved on special wheels over two 1-inch stationary cables; these buckets were attached to a ³/8-inch cable that moved them between the loading dock and the storage bin. The coal was not screened because it was sold to the railroad mine run for $2.35. The cost of opening the mine, exclusive of supervisory salaries, was reported to be $7,060. Application for a preference right lease was made soon after the No. 1 mine was opened, and the lease was issued on January 21, 1942.

On March 31, 1942, at about 3:00 p.m. Pablo Valdez, age 62, married, and the father of three grown children, was killed by a fall of rock (pot) from the roof. Mr. Valdez had worked for the Carantas for 18 years. He was the first fatality in the Caranta mines, which operated in the Monero district for 25 years.

By late October 1943 the Caranta No. 1 mine had been worked out and abandoned, and development work had been started on the No. 2, No. 3, and No. 4 mines. The No. 2 mine was opened on the upper bed, and the No. 3 mine was opened below the No. 2 on the lower bed of coal. The No. 4 mine was opened above the No. 1 mine on the upper bed of coal. The Mining Supervisor's staff surveyed the land and compiled a map that showed the mine workings, the coal outcrops, and the faults (Fig. 112).

The coal bed was measured 475 ft inby the No. 2 main slope as follows:

Top	Sandstone
Coal	10"
Sandstone	4"
Coal	3' 8"
Bottom	Sandstone

The bed dipped 3°S17°E. The coal mined from the No. 2 mine was originally transported by chute to the No. 3 mine bin, and the coal from these two mines was then shipped by an aerial tramway to the No. 1 mine bin. This bin was connected by aerial tramway to a storage bin on the valley floor (Fig. 113) where the coal was stored until sold. The coal in the No. 3 mine was 3.5 ft thick with a sandstone roof and floor.

The coal bed of the No. 4 mine, approximately 500 ft inby the portal of the main entry, was measured as follows:

Top	Sandy shale
Coal	11"
Shaly clay	4"
Coal	3' 6"

The No. 2 and No. 3 mines were closed in early 1944 for construction of a new aerial tramway system to improve coal handling. New bins at both mines were built to accommodate the loading of coal in aerial tramway buckets (Fig. 113), and an 80-ton bin (Fig. 114) was built on the valley floor to handle the coal at the unloading end. During this construction, which was completed by June 10, 1946, the No. 4 mine supplied the coal needs. A new road was graded to the top of the mountain, but it was impassable during the winter; consequently, all the mine timber had to be obtained during good weather and stockpiled at the mine portals.

On December 23, 1948, John Caranta filed an assignment of his portion of the lease to his brothers Joseph and Barne, Jr., and the action was approved January 4, 1952. On February 14, 1950, Barne Caranta, Jr., died, and his interest in the mine went to his wife and five children.

From June 1946 to the middle of 1951 all production came from the No. 2 and No. 4 mines. By mid 1951 the No. 4 mine was about depleted and the No. 2 mine could not supply the coal needs, so by August 1951 development had begun on the No. 5 mine. A new Joy cutting machine equipped with a 5.5-ft bar was purchased and electric cable was installed in the No. 2 mine because Rural Electrification Association power was to be available by September 1.

By early 1953 the pillars had been mined from the No. 4 mine, and the No. 2 and No. 5 mines were in production. The coal from the No. 5 mine was transported by aerial tramway to a small bin accessible to the main road (Fig. 115).

During May 1955 the entries that paralleled the northwest-trending fault in the No. 2 mine were advanced through the northeast-trending fault and intersected a bed of coal on the north side of that fault. The bed seemed to have the characteristics of the lower bed, and additional development proved that this was the case. In an unusual occurrence, the fault had brought the lower bed to a position that almost exactly matched that of the upper bed. Considerable mining was done on this new block of coal beyond the fault, but the distance of hoisting rendered the operation marginal, and some coal was left.

On January 8, 1958, Mr. and Mrs. Joseph Caranta and Mrs. Marcella Caranta, widow of Barne Caranta, Jr., organized Caranta Brothers, Inc., and requested that the lease

be assigned to this corporation. The action was approved on September 22, 1958.

Mining continued from the No. 2, No. 3, and No. 5 mines from early 1956 until October 1960. On October 21, 1960, Joseph Caranta died of a heart attack. The operation of the mine was thus left to his widow and, again, to John Caranta, who was interested less in mining than in raising cattle. The Carantas also operated the post office and a small store.

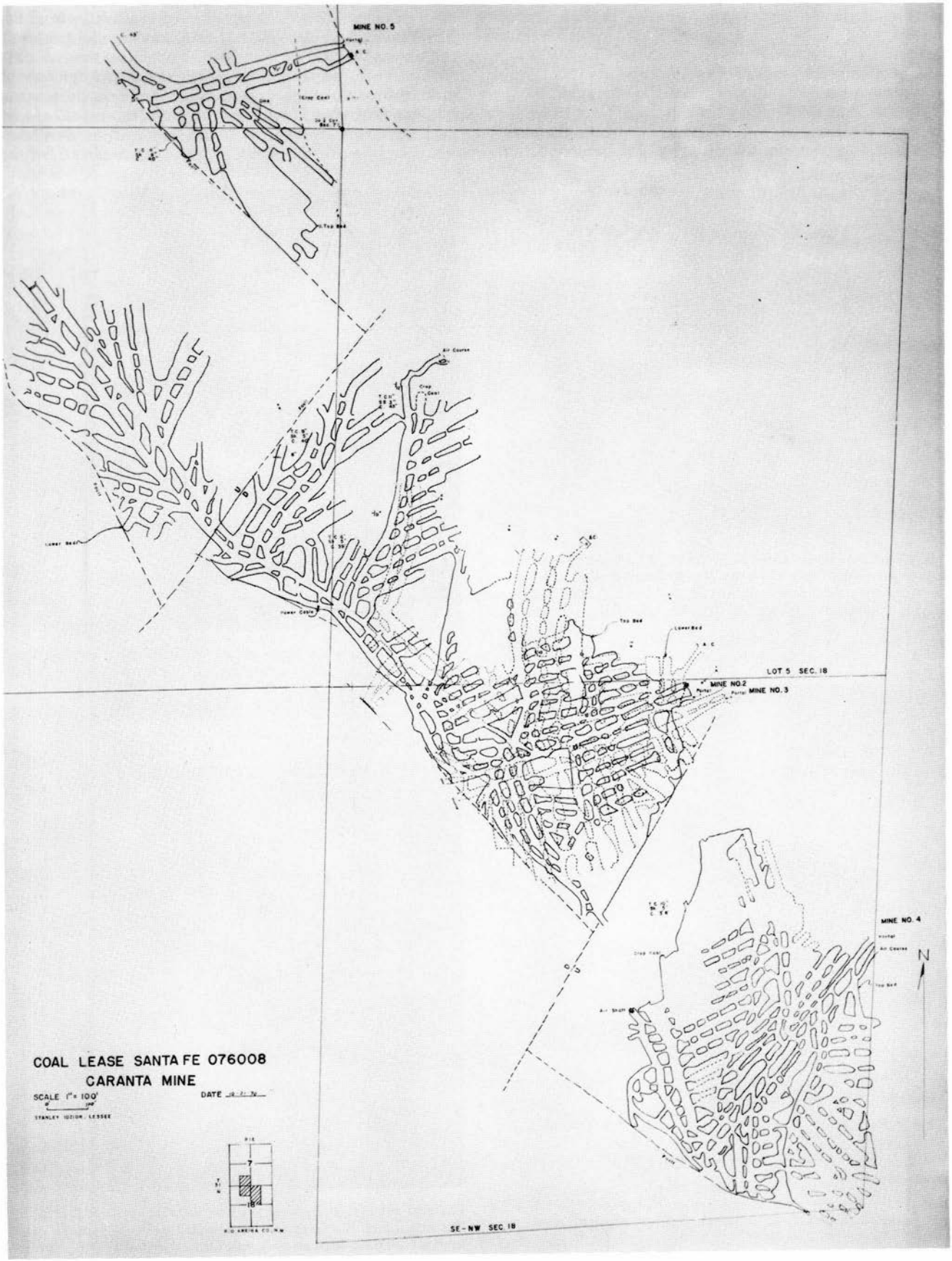


FIGURE 112—Map of the Caranta mines. *Compiled by the Mining Supervisor's staff.*

In January 1961 the No. 3 and No. 5 mines were producing only a small amount of coal, and Mrs. Caranta was trying to sell the property.

On September 18, 1961, the property was assigned to the McElroy brothers (Perry, Clyde, Jerry, and Johnny, who were construction contractors from Los Lunas). The McElroys, with the help of Art Erler, Foreman, assumed the operations of the No. 3 and No. 5 mines. The No. 2 mine was reopened in September of 1962 and the No. 5 mine was closed; the No. 3 mine continued production.

By July 1963 the McElroy brothers could not make their contract payments to Mrs. Caranta, who gave them a 30-day notice to abandon the property. On October 3, 1963, the lease was reassigned to Caranta Brothers, Inc., and was then assigned to Stanley Idzior, a miner who had worked for the McElroy brothers.

By December 1963 Mr. Idzior was operating the No. 3 mine with seven miners. A shaker was used to load the coal from the rooms. Mr. Idzior continued to produce from the No. 3 mine until December 3, 1966, when a fire destroyed the tipples at the No. 2 and No. 3 mines and the loading facility for the aerial tramway. The coal on the outcrops of both the upper and lower beds caught on fire at the portals, and the danger was imminent that both fires would spread into the mine workings. Mr. Idzior informed the New Mexico State Mine Inspector on Saturday, December 3, of the

FIGURE 113—The Caranta No. 1 and No. 4 mines surface facilities, which were constructed in 1943. The coal from the No. 2 mine was dumped over a tipple into the chute to the No. 3 mine bin where it was combined with the No. 3 mine coal. The coal was then transported from this bin by a 2,900-ft-long aerial tramway to a larger bin (Fig. 114) on the valley floor. *Photo by R. H. Allport, 1945.*

FIGURE 114—This partly constructed storage bin on the valley floor was for the coal mined from the Caranta No. 2 and No. 3 mines. The bucket and cable to the right of the bin are part of the tramway for the storage bin for the No. 1 and No. 4 mines. *Photo by R. H. Allport, winter 1943–44.*

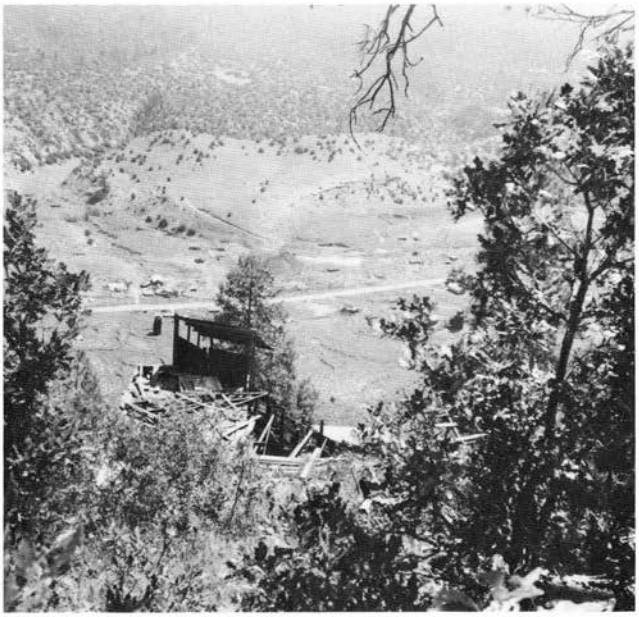


FIGURE 115—The old tipple, chute, and bin at the Caranta No. 5 mine. This bin was the loading dock for the aerial tramway, which was unloaded in a bin at the bottom of the hill. The latter bin is visible to the left of the left edge of the shed. *Photo by H. B. Nickelson, 1979.*

FIGURE 116–Ventilation chimney at the Caranta No. 4 mine. In this method of mine ventilation a fire built at the base of the chimney created heat that rose and pulled the air in the mine out through the chimney. *Photo by H. B. Nickelson, 1979.*

mine fire, and on Monday, December 5, Inspector Angelo Pais was at the property. On December 5 the Mining Supervisor, U.S. Geological Survey (USGS), and the U.S. Bureau of Mines (USBM) were informed about the fire.

Howard B. Nickelson, Mining Engineer, USGS, and A. C. Husted, Coal Mine Inspector, USBM, examined the fire the following day, Tuesday, December 6. They believed that the fire in the lower-level crop could be controlled by shoveling the fire from the crop and cooling the coal with snow or water, but they believed that a dozer would be needed to subdue the fire in the upper level outcrop, which was burning for a distance of 75 ft. A no-work order was posted at the scale house by Mr. Husted on Wednesday, December 7.

Monday (December 5) eight inches of snow had fallen, and Tuesday a rain began which fortunately continued until Thursday morning. On Wednesday Mr. Nickelson contacted John Caranta, Bondsman, who agreed to hire a man to help Mr. Idzior, and work was begun on the lower-level fire. By Thursday morning a frost had frozen the road enough so that Mr. Idzior was able to get water to the fire. He, the hired man, Mr. Pais, and Mr. Nickelson worked all day and were able to put the fire out from all the burning areas on the lower bed. On Friday inspection at the upper level showed that the heavy rains had caused the banks above the coal to cave over the outcrop, putting out most of the fire, and a dozer was not needed. The few hot spots left were dug out, and water was poured on the hot areas to cool them sufficiently so they would not reignite. The fire was completely out by Friday evening. Hard work and a lucky break from the weather had probably averted a serious underground fire.

The mine could not be reopened until January 5, 1967, at which time the Director of the USBM rescinded the no-work order. Because the tipples, which had also served to anchor the loading facility for the aerial tram had burned, Mr. Idzior constructed a ramp from the upper-level mine portal so that the coal could be dumped directly into a truck and hauled off the hill to serve his customers.

He continued this small operation alone, working part time at other mining jobs. Mrs. Caranta had given him relief on their agreement after the fire, and he was able to continue producing a small amount of coal until 1970, when the new mine safety laws were put into effect. Mr. Idzior received seven orders of withdrawal and nine notices of violation between September 29, 1970, and February 27, 1971. He was not financially able to comply with the new requirements to continue production and requested the relinquishment of the lease in January 1971. At that time he was in poor health and was unable to seal the portals. John Caranta had a small bulldozer, and he abandoned the property satisfactorily the following year. The lease was cancelled effective January 22, 1973.

FIGURE 117—View looking north from the Caranta No. 4 mine chute. The chute connected to the No. 1 mine bin where the coal was transported by aerial tramway to the smaller of the two bins on the valley floor. *Photo by H. B. Nickelson, 1979.*

TABLE 58—Employment record of the Caranta mines. (In 1933 state law prohibited publication of production records in the State Mine Inspector's annual report.)

Year	Miners	Company men	Top men	Operator(s)
1940	8	2	1	Barne Caranta
1941	17	2	3	
1942	8	3	3 +1 boy	
1943	11	2	2	Annie Caranta and sons
1944	7	7	3	
1945	7	7	3	
1946				
1947	7	1	2	
1948	8	2	2	
1949	7	9	2	
1950	8	10	2	
1951	8	2	2	
1952	9	2	1	
1953	9	2	1	
1954	6	1	1	
1955	9	1	1	
1956	8	1	1	
1957	8	1	3	
1958	8	2	1	Caranta brothers
1959	5	1	2	
1960	4	1	2	
1961	7		2	
1962	4	1	2	McElroy brothers
1963	4		3	Stanley Idzior
1964–1970		1–3 men		

Under permit and lease SF 076008 the Caranta brothers produced 185,238 tons of coal, the McElroy brothers 7,940 tons, and Mr. Idzior 4,401 tons. An employment record of the Caranta mines is shown in Table 58.

Photos taken during the Abandoned Mine Lands project in 1979 show a chimney of a type that was commonly used to aid mine ventilation (Fig. 116) and a view looking from the Caranta No. 4 mine into the Amargo Valley and the village of Monero (Fig. 117).

Caranta prospect

SF 077725 6-29-45 **Permit**
Joseph Caranta, Monero
Barne Caranta, Jr., Monero
Lots 2, 3, and 4, SE^1/4SW^1/4, NW^1/4NE^1/4 sec. 7 and lot 1, NE^1/4NW^1/4 sec. 18, T31N, R1E; N1/2SE^1/4, NE^1/4SW^1/4, E1/2NW1/4 sec. 12, T31N, R1W, 483 acres
3,000 ft NL, 1,100 ft EL, sec. 18 **(L-17, Fig. 107)**

The permit area was previously included in permit SF 076008 (see previous chapter). Part of the lands of SF 076008 became a preference right lease that the Carantas were actively mining; the lands not in the lease were reapplied for and became permit SF 077725.

Although there was faulting between the permit land and the adjacent lease lands, the same coal beds existed on both. The Caranta brothers began two openings on lot 4 of sec.

7. The first opening was driven on a course S23°W, and the second opening, approximately 400 ft south, was driven on a course S52°W on the same bed of coal. The first opening, driven on a weathered bed of coal 3 ft 6 inches thick, was advanced 80 ft and then abandoned because the coal bed had an unfavorable dip. The second entry was driven 60 ft on a bed of coal 3 ft 9 inches thick. The coal was soft in both prospect drifts but probably would have improved with an additional 50 or 100 ft of entry. A third entry, located near the west edge of the SE1/4SW1/4 sec. 7, was driven on a course S72°E for 185 ft. A measured section of coal of good quality was taken at 140 ft by R. S. Fulton, Mining Engineer. The coal section follows:

Top coal	4" to 6"
Rock	4"
Coal	42"

The roof was shale, and the floor was clay.

A chute was under construction, and a considerable amount of road was built. The coal chute was never completed and the coal stockpile was never utilized. The permittees allowed the permit to expire at the end of its 2-year period. There was no reported production.

Rainbow-Erler mines

SF 075338 2-18-39 Permit 1-20-47 Lease
Inez E. Erler, Monero
Christobal and Jose P. Carrillo, Monero
S1/2SE1/4 sec. 19; NE1/4, NW1/4 sec. 30, T31N, R1E, 400.44 acres
First mine-1,400 ft NL, 4,500 ft EL, sec. 30 (L-45, Fig. 118)
Mines No. 1 and No. 2-800 ft NL, 3,200 ft EL, sec. 30 (L-43, Fig. 118)
Mine No. 3-450 ft NL, 3,200 ft EL, sec. 30 (L-42, Fig. 118)
Mine No. 4-100 ft NL, 3,000 ft EL, sec. 30 (L-48, Fig. 118)

In 1939 Andrew Erler and sons, who were operating the mines under leases SF 054780 and SF 041699-046752, needed additional reserves of coal to continue furnishing fuel for the Denver Rio Grande and Western Railroad. The Erler mine (lease SF 054780) was becoming expensive to operate because the workings at that time were below the level of

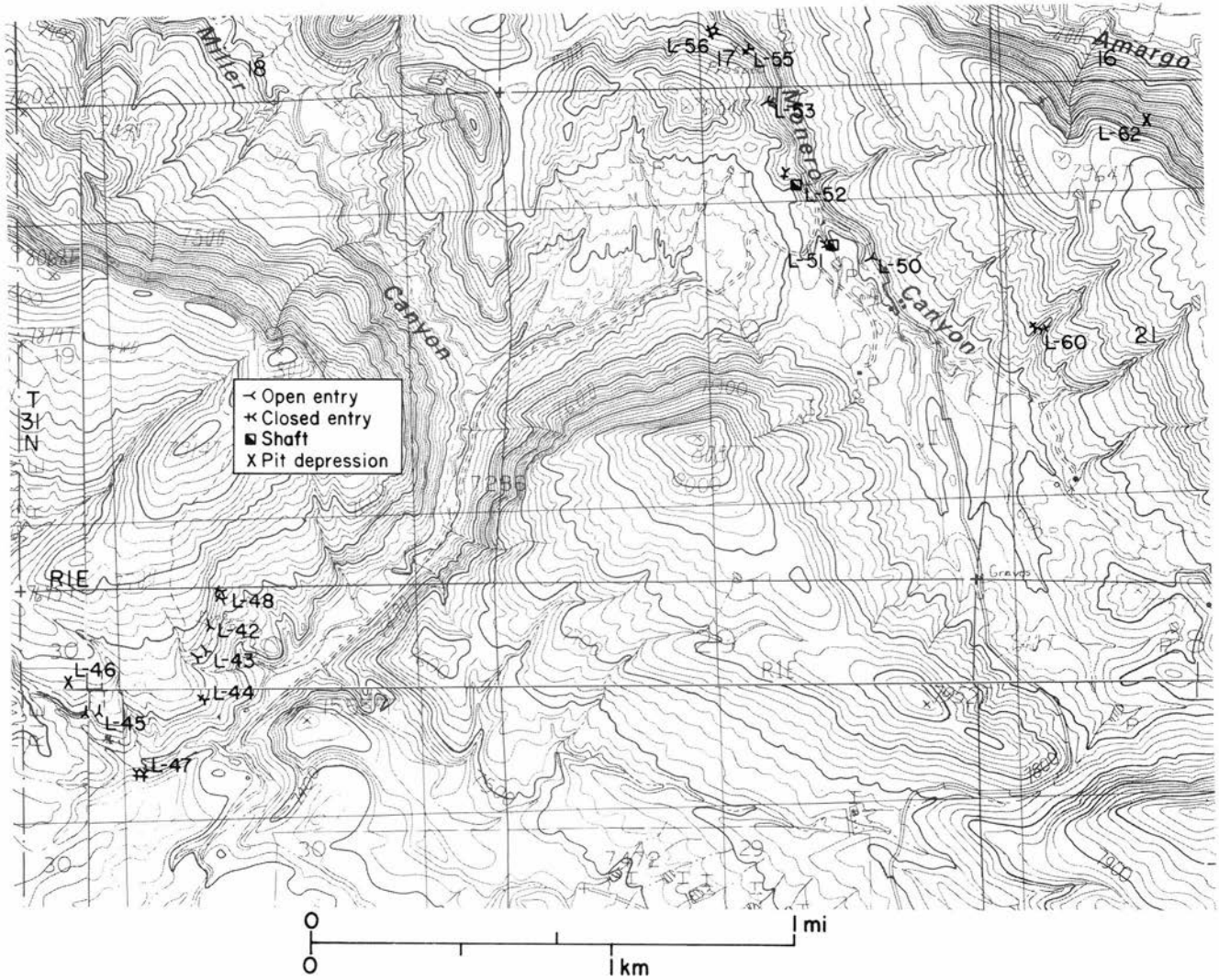


FIGURE 118—Mines in the area south and east of Monero on the Lumberton 7½-min quadrangle (enlarged).

L–42—Rainbow–Erler mine No. 3
L–43—Rainbow–Erler mines No. 1 and No. 2
L–44—Rainbow–Erler mines prospect entry
L–45—Rainbow–Erler first mine
L–46—Rainbow–Erler mines prospect entry
L–47—Unknown mine
L–48—Rainbow–Erler mine No. 4
L–50—Last mine worked by Mr. Erler, Monero–Erler mines
L–51—Air shaft and entry, Monero–Erler mines
L–52—Monero–Erler mines
L–53—Caranta opening, Monero–Erler mines
L–55, 56—McBroom–Crist mine
L–61—Unknown mine
L–62—Caranta Brothers prospect(?)

the stream that flowed near the portal of the mine, and pumping costs were excessive. Because Mr. Erler and his sons were already involved with coal leases, they thought the officials might hestitate to grant them additional lands; Mrs. Inez E. Erler, wife of Arthur Erler, therefore applied for the land. The permit was issued to her on February 18, 1939.

By August 1939 six prospect openings had been driven. Four of the entries were on an upper bed of coal and two were on a lower bed of coal. The first two entries, about 30 ft apart on the upper bed, were approximately 1,400 ft southwest of the other two entries on the upper bed. The coal cross sections in the first two entries on the upper bed were as follows:

No. 1 entry	
Shale	Roof
Bone and coal	7½″
Shale	3″
Coal	3′ 10″
Shale	Floor
No. 2 entry	
Shale	Roof
Coal	3′ 8½″
Shale	Floor

The coal cross sections in entries 5 and 6 on the upper bed were as follows:

No. 5 entry	
Shale	Roof
Coal	7″
Shale	3″
Coal	4′ 3″
Shale	Floor
No. 6 entry	
Shale	Roof
Coal	7″
Shale	3″
Coal	4′ 0″
Shale	Floor

Analysis by the USBM of a 2-ton tipple sample of +5-inch coal from the upper bed showed the following:

Moisture	2.8%
Volatile matter	34.0%
Fixed carbon	52.6%
Ash	10.6%
Sulphur	4.4%
BTU	12,960

The coal thickness in the lower bed was 2 ft 6 inches. The coal bed dipped 2-4°S80°E. Arthur Erler developed the mine from the No. 1 and No. 2 entries and proved that the coal bed was amenable to mining.

On December 20, 1939, Mrs. Erler applied to the U.S. Land Office for a preference right lease for the lands. On April 20, 1940, Kenneth A. Heron, an engineer from Chama, surveyed the portals of the mine and tied them to the land grid; it was then found that the portals were off the permit land. Mr. Reeder, Acting District Mining Engineer, advised Mrs. Erler to modify her application to include all of the NW1/4 sec. 30 because the site of the portal was on the SW1/4NW1/4, and the working faces off this portal had been extended into the NW1/4NW1/4. The modification was approved on June 24, 1941.

By late 1940 this mine was furnishing practically all the coal for the Erlers' contract needs, and, consequently, development of the mine proceeded at a fairly rapid rate. The coal thickness averaged about 3 ft. The miners were paid 654 for loading a 2,300-lb car, and the day laborers were paid $3.50 per day. About 13 men were employed. Mr. Erler received $2.35 per ton mine run, and Mr. Ferguson retained 354 per ton for selling the coal. The coal was trucked 3.5 mi on a graded road that was impassable during wet weather. The mine was ventilated mostly by natural means, aided by a 20-ft stack placed over the portal of the aircourse (Fig. 119).

On July 8, 1940, a decision was handed down from the Commissioner of the General Land Office in Washington that Mrs. Erler's application of December 20, 1939, for a preference right lease had been denied because a 40-acre subdivision was considered sufficient to supply all the coal needs described in her application. She was allowed 30 days to respond and to supply a survey map of the workings and their location on the land. The survey sent showed that her workings were off the permit lands, and on August 6, 1940, she submitted a formal withdrawal of the lease application and requested that her permit be modified to include the NW1/4 of sec 30. On June 24, 1941, her permit was modified as requested and was extended to February 18, 1943.

On September 5, 1941, she filed another application for a preference right lease; she was allowed 30 days from June 30, 1942, to respond and pay the amount due as of December 31, 1941—$3,851.40. In her response she requested that she pay only 104 per ton from the date of her first request for lease, December 20, 1939. This request was denied, but a decision was given that when the said lease was issued she would be allowed the 104 royalty rate for coal produced after September 5, 1941.

Mrs. Erler was ill advised. She should have requested that the NW1/4 section, the new land that she wanted, be put up for competitive lease sale because the coal was known to exist and was present in commercial quantities. The application for a preference right lease for the permit land that she already held would then have proceeded on its normal course. Instead, by requesting the addition of new land to that already under permit, she inadvertently caused lengthy delays in the necessary decisions.

On November 17, 1942, the Land Office demanded one-half the money owed and payments of $100 per month until the amount was paid. The Land Office accepted $1,500 and the monthly payment. Mrs. Erler made the $1,500 payment and eight $100 payments, but royalties from coal mined continued to build until, by January 15, 1944, she owed $2,506.49. The money was demanded, and Mrs. Erler was informed that if it were not received the alternative would be to deny the lease and bring suit against her and the bondsmen. She could not obtain the $3,000 bond that was required, and the Land Office rejected the lease application

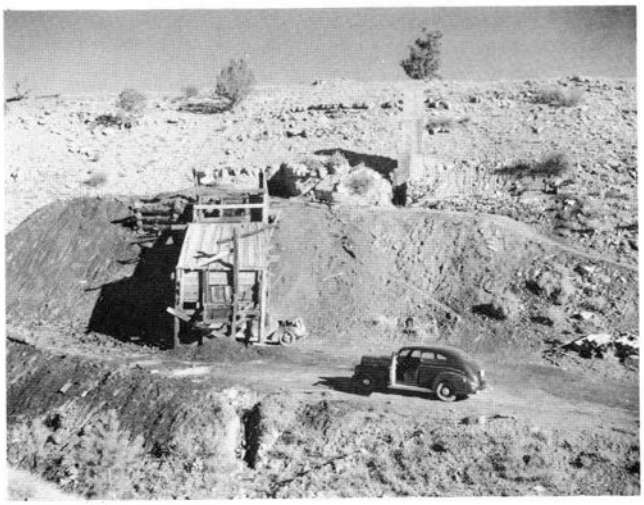


FIGURE 119—The portal and chute of the original Erler (Rainbow) mine. The chimney to aid ventilation is directly under the tree on the horizon. The black car in the foreground was the government car used by Mr. Allport. *Photo by R. H. Allport, September 27, 1943.*

as of December 5, 1944. On June 18, 1945, she petitioned for reinstatement of her application and submitted an acceptable corporate surety bond and rent for the first 'year.

On December 23, 1946, Fred W. Johnson, Director of the Bureau of Land Management (BLM), wrote a letter to the Secretary of the Interior in regard to the issuance of a coal lease to Mrs. Erler. An accounting of all the tonnage mined in violation of various regulations amounted to 29,044 tons, for which more than $32,000 could be charged for intentional trespass. If the preference right lease were issued,

FIGURE 120—Map of the Rainbow mines showing the extent of the mine workings.

the government would owe Mrs. Erler $208.56 plus the $80.25 rents she had just paid. Under the regulations on royalty existing at the time of this mine, the royalty rate was 25¢ under a permit and 10¢ under a lease, retroactive to the date of the lease application. But throughout all the delays when no decision was given to Mrs. Erler, the government continued to charge her the higher royalty. Other considerations were brought out. If the land were put up for competitive bid, probably no one would bid except perhaps the Erlers, at a token bonus. If other people were interested, they would have to pay the bonus plus the cost of the Erlers' improvements. If the mine were closed, the underground would soon deteriorate and the coal reserves left would be lost; that loss might be blamed on the BLM. The decision was made finally to issue the lease. It appears that the BLM did not approve of lady coal miners between 1939 and 1946. Lease SF 075338 was issued on January 20, 1947, and the government allowed Mrs. Erler credit for her overpayments.

The Rainbow mines map (Fig. 120) shows how the mines were developed and the extent of all mine workings. The first mine, opened when the prospecting permit was issued, is shown at the bottom of the map, and all the coal mined until 1944 came from there. In 1944 the second mine, shown as No. 1 on the mine map, was opened. This mine was connected to the original workings. There was no production from the Rainbow mine from December 15, 1944, until some time in July 1945 because of rejection of the lease application. By 1946 the No. 1 mine had practically ceased operations; by August 1948 production was from the entry marked No. 2 on the map (Fig. 120) and the No. 3 entry had just been opened. The average coal section in the No. 2 mine (Fig. 121) was 4-6 inches of top coal, 2-4 inches of rock, and 46 inches of coal. By April 1950 the No. 3 workings had been connected with the first No. 2 mine rooms driven north, and a new tipple had been constructed at the No. 3 portal (Figs. 122, 123). Both mines were contributing to the production. Thirteen men were employed at this time, and they produced about 35 tons per day with the aid of a Sullivan 11670 coal cutter (Fig. 124).

By January 1951 the Rural Electrification Administration had completed a three-phase powerline to the mine site, and power was available that summer. By August 1951 all work had ceased in the No. 2 mine, and all production was from the No. 3 mine. By August 1954 the No. 4 opening had been started and connected to the first rooms driven

FIGURE 121—Tipple, long chute, and storage bin at the portal of the Rainbow No. 2 mine. *Photo by R. H. Allport, June 13, 1946.*

FIGURE 122—Construction at the portal of the Rainbow No. 3 mine. The hoist is under the crude shed. *Photo by R. S. Fulton, August 9, 1949.*

FIGURE 123—Chute, tipple, and storage bin under construction at the Rainbow No. 3 mine. *Photo by R. S. Fulton, August 9, 1949.*

FIGURE 124—A Sullivan 11670 coal cutter. When the Rainbow–Erler No. 3 mine was abandoned, the cutter, which is on a timber truck, was removed from the underground workings and parked on the tipple. *Photo by H. B. Nickelson, 1979.*

northeast on the No. 3 entry; this new working was used for an aircourse. By May 1955 entries and rooms were being opened off the No. 4 entry. Mules were used to haul the coal from the working places to the parting, where the cars were lowered to the No. 3 portal by an electric-operated hoist.

By 1961 production from the No. 4 mine was less than 100 tons per month, and Mr. Erler planned to sell the mine and the equipment to two brothers, Christobal and Jose Carrillo. Mr. Erler's health was failing, and he was unable to do the hard work required to operate the mine. The application for the assignment was made to the BLM on July 15, 1961, and it was approved March 26, 1962. The Carrillo brothers began operations when Mrs. Erler assigned the lease to them. In 1962 and 1963 less coal was bought by the railroad because of the discontinuation of passenger service, but more was sold as domestic coal in the adjoining areas of New Mexico and Colorado. The mine continued operations under the direction of the Carrillo brothers until May 4, 1965, when Christobal Carrillo was incapacitated by a broken ankle caused by a fall of rock. The lessees asked that the lease be relinquished as of August 26, 1965, and the action was approved on June 20, 1966.

A small coal reserve on the west side of the mine was left because the long haul to the portal was too time-consuming and expensive. Earl Gordon, Engineering Technician, reported that the coal in the west end of the No. 4 mine was rusty because it was near the outcrop. The bed apparently continued north under the east end of Monero Mountain. The Rainbow mine produced 144,281 tons of coal.

Unknown mine

2,100 ft NL, 4,200 ft EL, sec. **30, T31N, R1E** **(L-47,** Fig. 118)

This mine is south across the draw from the first Rainbow—Erler mine, which it appears to antedate. It was opened with a double-entry system, and both entries bear S13°E.

McBroom-Crist mine

McBroom brothers, 1899-1902
Rio Arriba Coal Company, 1902-1910
4,700 ft NL, 2,800 ft EL, sec. 17, T31N, R1E
(L-55 and 56, Fig. 118)

The McBroom mine was begun in September 1899 by the McBroom brothers, who were both owners and operators. James W. McBroom was General Manager. The mine was opened with a single entry 200 ft long on a bed of coal 3 ft 8 inches thick. The bed dipped 8° and had a strong sandstone roof. Most of the coal produced was sold at Creede, Colorado, with some sales in New Mexico. In 1901 or 1902 the Rio Arriba Coal Company bought the property from the McBrooms, and J. H. Crist became General Manager. The slope had reached a depth of 400 ft, and production was increased from 1,200 tons to 5,000 tons. Mules were used to move the coal underground. The mine needed better timbering, and the ventilation was weak because of the

TABLE 59—Production and employment record of the McBroom mine.

Year	Production (tons)	Employment		Days operated
		Miners	Top men	
1899–1900	1,706	3	1	250
1900–1901	1,200	3	1	150
1901–1902	5,000	4	2	180
1902–1903	4,500	6	2	250
1903–1904	4,000	7	2	260
1904–1905	6,000	6	2	265
1905–1906	5,000	7	2	275
1906–1907	3,240	9	2	216
1907–1908	2,000	4		140
1908–1909	Operated on an order-to-order basis			
1909–1910	Operated, no production recorded			
1910–1911	Ceased operations			

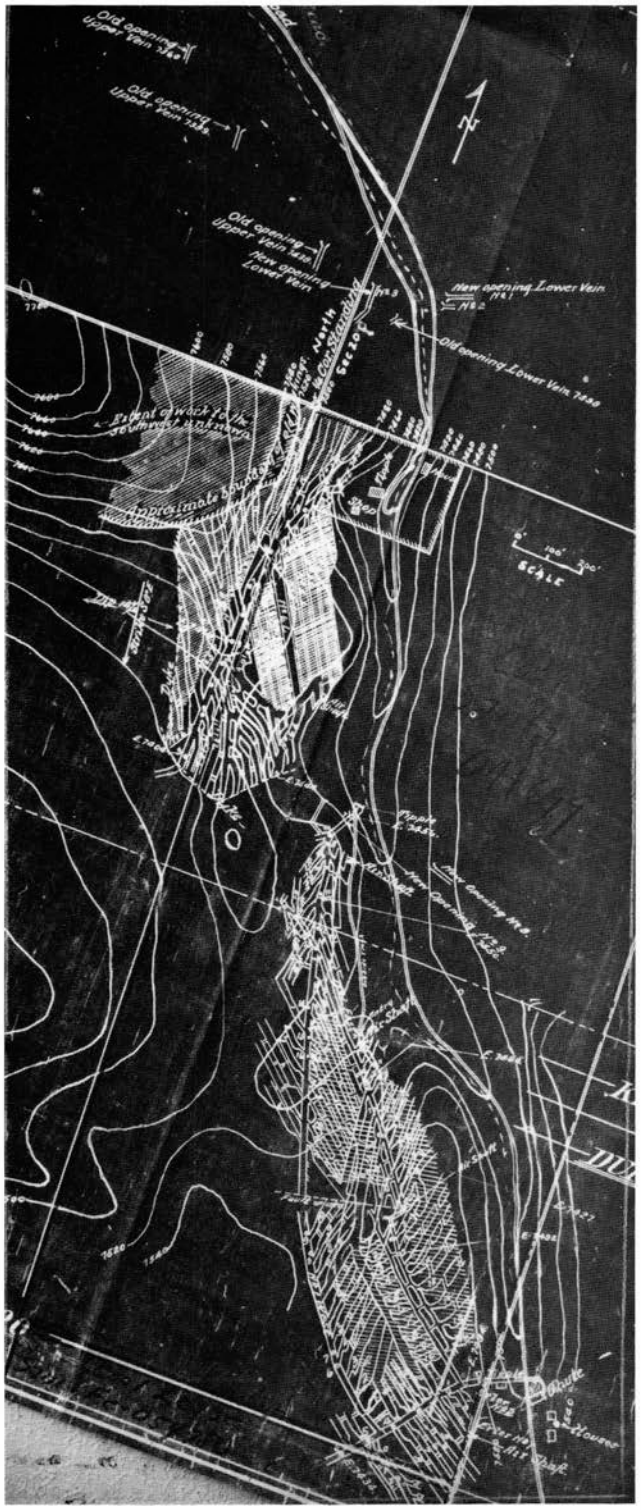


FIGURE 125—Map of the McBroom mine, T31N, R1E, Rio Arriba County, New Mexico. Last extension was added November 7, 1935, by A. L. Kroeger, Engineer. Legend: / / / / area worked out; ═══ lease boundaries; **E,** underground elevation. *Mapped by Kroeger and Ritter, Civil Engineers, Durango, Colorado.*

lack of a second opening; the problem of bad air persisted intermittently.

In fiscal year 1903-1904 Felix Gandella leased the mine, and the following year contractors worked on a per-ton-delivered basis to the Monero Station. Schrader reported that the slope was 1,600 ft long in 1905, and he cut a sample across 33.5 inches of coal (Schrader, 1906, p. 248). The coal was sold to the Denver Rio Grande and Western Railroad, the New Mexico Lumber Company, and the Bums and Briggs Lumber Company. Production began to decline in 19061907 and continued to worsen until fiscal year 1909-1910, when the mine was operated on an order-to-order basis. It was closed in the fall of 1910.

Interest in the area developed again in 1921 when leases were obtained by John Caranta and later by Andrew Erler, who opened mines along the outcrop to the southeast. These workings holed into the McBroom mine. A map (Fig. 125) shows that the McBroom mine had three openings on the upper bed, two on the southwest side of the gulch, and two on the other side on the lower bed. This mine was also referred to as the Crist mine. A record of production and employment is shown in Table 59.

Monero-Erler mines

SF 041699 **5-31-21** **Lease**
John Caranta, Monero
S1/2SE1/4, SW1/4SE1/4, S1/2SE1/4, SE1/4SW1/4, SE1/4SW1/4 sec. 17; SW1/4SE1/4, SE1/4SW1/4 sec. 20, T31S, R1E, 360 acres
200 ft SL, 2,400 ft EL **(L-53, Fig. 118)**

SF 042140 **12-5-23 Lease by competitive bid**
John Caranta, Monero
SW1/4SE1/4, SE1/4SW1/4 sec. 20, T31S, R1E, 80 acres
1,000 ft SL, 2,100 ft EL **(L-52, Fig. 118)**

SF 054780 **6-9-72** **Permit**
7-2-30 **Lease**
Andres Erler, Monero
SW1/4SE1/4 sec. 20, T31S, R1E
1,900 ft SL, 1,200 ft EL **(L-50, 51, Fig. 118)**

Early in 1920 and 1921 the demand for coal to supply the Denver Rio Grande and Western Railroad created a need to prospect and mine coal in the Monero area. John Caranta was issued a lease in 1921 on land in this area. He began prospecting for coal by driving an entry due south from a point several hundred feet south of the N1/4 corner of sec. 20 (L-53, Fig. 118) on what was known in the area as "the upper bed of coal" (Fig. 125). The development thus begun by Mr. Caranta eventually burgeoned to coal leases that produced for about 20 years.

In early 1923 Amedeo Luchetti made application for a competitive lease on the SW1/4NE1/4, SE1/4NW1/4 sec. 20, T31N, R1E; this land adjoined Mr. Caranta's lease. On July 10, 1923, the sale was held, and Mr. Caranta was the highest qualified bidder. The new lease, SF 042140, was then combined with his older lease, SF 041699, and the operations of Mr. Caranta's mine continued apace. From the time of his first operations in 1921 until early 1924, production on what came to be known as the Monero mine was 26,360 tons.

A letter from Mr. Caranta on January 9, 1924, informed the Mining Supervisor at Denver that he had intersected old workings while driving a room west off the main entry just west of the N1/4 corner, sec. 20 (Fig. 125).

On January 8, 1924, Mr. Caranta assigned his leases to Arthur Ayres of Durango, Colorado, and William I. Gifford of Hesperus, Colorado, who operated the Western Fuel Company of Hesperus, Colorado. The reputed price for the leases was $10,000. The assignment was approved by the government on March 6, 1924.

It might be noted here that the government engineers were not concerned solely with coal and the royalties accruing therefrom. During an inspection trip to Monero, C. L. Duer, District Mining Supervisor, learned that the mining camp of Monero was without school facilities. On March 31, 1924, Mr. Duer wrote Mr. Gifford calling this fact to his attention and informing him that about 100 children of school age lived within the Monero district. He asked Mr. Gifford to initiate and boost the establishment of school facilities. Mr. Duer also wrote to the Superintendent of Schools in Rio Arriba County concerning this matter. A letter was later received by Mr. Duer from the Superintendent's clerk stating that two teachers had been hired. Unfortunately, both resigned, one because of illness and the other because he lost his boarding place and could not find living quarters. The government files do not state if the children of Monero ever got an education.

In regard to the mined-out area that Mr. Caranta had discovered while driving rooms to the west, it was found that J. H. Crist, an attorney living in Santa Fe, had operated a mine on the SE1/4SW1/4 sec. 17 and had trespassed to the NE1/4NW1/4 sec. 20. A letter dated April 4, 1924, from the General Land Office to Mr. Duer, tells the story of this old mine developed at the turn of the century. It is quoted as follows:

> I have your letter of April 1, 1924, making reference to an alleged coal trespass committed years ago on SE1/4SW1/4, sec. 17, T. 31 N., R. 1 E., N.M.P.M., by one J. **H.** Crist, the coal so mined having been taken through an opening in the NW1/4NE1/4 of sec. 20, same township and range.
>
> In reply I have to advise you that under date of August 21, 1917, report was made by a mineral examiner of this office relative to coal trespass committed by the Arriba Coal Company, a New Mexico Corporation, during the years 1904, 1905, and 1906, on the NE1/4NW1/4 of said Sec. 20, the amount of coal taken being 4,060.987 tons from said tract of public land. The coal was sold at $1.65 per ton, the principal purchaser being the Denver and Rio Grande R. R. Co.
>
> . . . Under date of Oct. 12, 1917, the Acting Assistant Commissioner of the General Land Office directed that the case be closed because it was believed that the Government could not establish the amount of the coal taken in trespass.

A map of the mine by the mineral examiner was enclosed with the letter but is not in the files now.

As a result of the above trespass and the fault or "dyke" found to the west and south of the original mine, the Monero mine was almost depleted of commercial coal, according to a company report of March 20, 1925. In this report the operators describe doing exploration work resulting in the expenditure of $2,500. Nine prospect tunnels were driven to find the outcrop of the beds, but in only one, No. 9 (L-52, Fig. 118), was a minable bed found (Fig. 125). The next mine was developed from this working.

The fault on the west side of the mine, called the Monero fault, was mapped by the U.S. Geological Survey (USGS). It was determined that the fault trended northwest-southeast through sec. 20 and was upthrown 200 ft, and no coal existed south of the fault in sec. 20. The remaining coal on the lease was therefore confined to a narrow block between the outcrop and the Monero fault.

Andrew Erler became Superintendent of the Monero mine for the Western Fuel Company in December 1925, replacing William N. Bay. Under his direction the mine was developed from the No. 9 entry by entries driven southeast until an east-trending fault was intersected that displaced the coal bed up about 15 ft. This fault created a number of mining problems, which were eventually overcome.

Faults and coal mined in trespass were not the only problems that the operators had to contend with, for on July 25, 1927, the following threat to the Mine Superintendent, Mr. Erler, was received in the mail:

> Srs:—You are here-by notified that emidetly after this you should do away with the managers of the Western Fuel Co. here in Monero, N.M. sons and all If you dont remove them pretty soon you will received grait damages in your property. It is why you are first notefied. This men are not wanted here in Monero, you are first notefied because after notice you dont have to goudge. You must not think that this notice is a blofe. There are 600 men that dont want this germans in this place.
>
> Signe by the black hand. [sic]

The postal authorities were notified, but apparently writing this note was the only action ever taken by this person.

An inspection report dated October 1, 1929, by C. C. Mather stated that the Monero No. 9 mine had been closed since March because of adverse mining conditions, mainly water, and the lack of orders. During the intervening time Mr. Erler had been developing an entry system from the Western Fuel Company's lease into his (Mr. Erler's) prospecting permit SF 054780, which later became a lease. He then developed the Erler No. 2 mine on both leases. The Erler No. 1 mine (L-50, Fig. 118) was an entry used for the aircourse (Fig. 126). The Monero No. 9 mine never produced again, but it was used as an escapeway and for ventilation. The Erler No. 2 mine (L-51, Fig. 118) continued producing small amounts of coal for many years. Mr. Andrew Erler passed away in late 1938, and his son Arthur operated the mine until it closed on March 31, 1940.

The Erlers paid the Western Fuel Company 30¢ per ton for the coal that was mined from their lease. Contributing factors to the closure were the low prices paid for coal and the costs of pumping excessive water, hoisting the coal, tramming by burro, and hauling to Monero.

The coal bed was 4-4.5 ft thick with 2-4-inch partings within about 1 ft from the top of the bed. The immediate roof above the coal was a shale to soapstone bed about 14 inches thick that was either supported or taken down during mining. Above the shale was a good sandstone. The bed dipped to the southwest between 6 and 12°. The only analysis in the records shows that the coal was of good quality. This analysis of a sample taken 800 ft from the portal of the Monero mine at the face of the main entry, from 3 ft 3 inches of the lower portion of the bed, on August 20, 1923, was as follows:

Moisture	3.6%
Volatile matter	36.9%
Fixed carbon	49.0%
Ash	10.5%
Sulphur	2.9%
BTU	12,590

The coal was drilled, blasted off the rough, and loaded by hand. During the life of the mine the miners received about 65¢ per ton in the car. The drivers, top men, and laborers made about $4.00 per day.

The major portion of the coal was sold to the railroad for fuel, and the company received $2.75 per ton in the car. The railroad company never built a spur to the tipple so

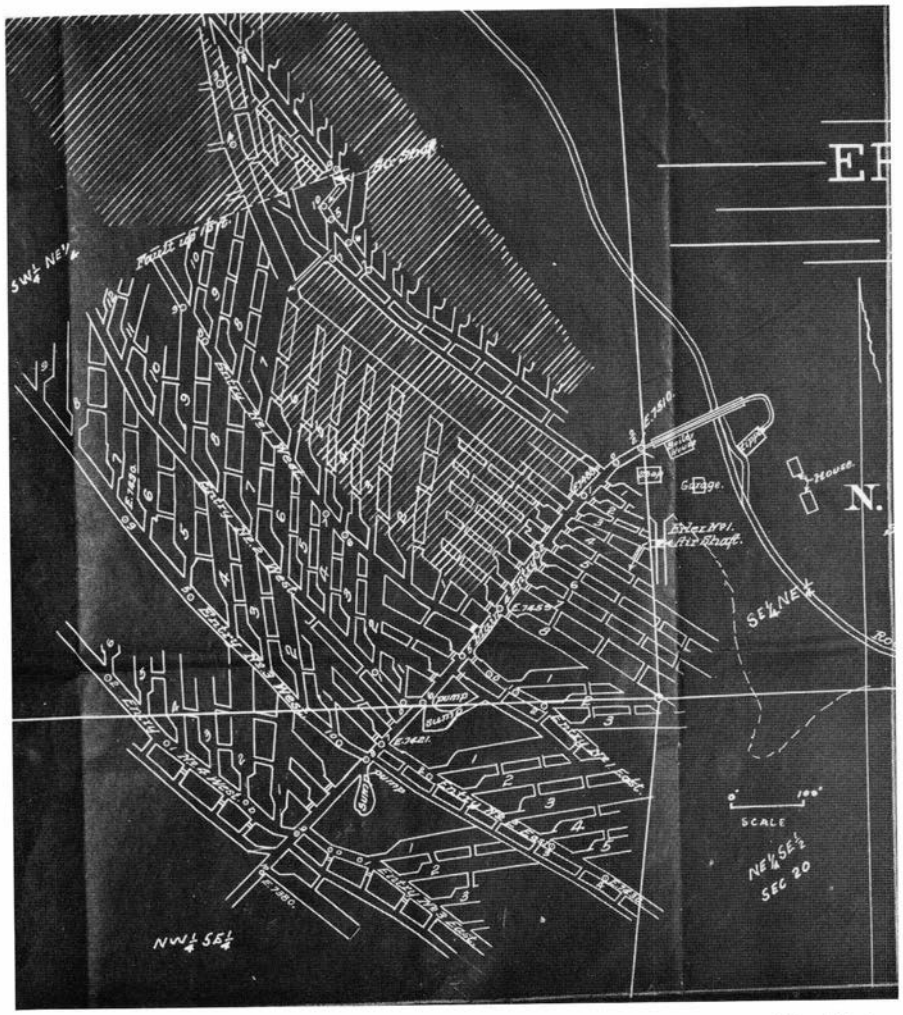


FIGURE 126—Map of the Erler coal mine, sec. 20, T31N, R1E, Rio Arriba County, New Mexico. Legend: / / / / pillars drawn; **E,** spud elevation. *Mapped by A. L. Kroeger, April 19, 1939.*

the coal was hauled by team and wagon to Monero. The company paid the haulers 65¢ per ton for a distance of 1.25-1.75 mi.

The records show that no fatalities or serious injuries were reported for the 20-year life of the mine. The mine was nongassy and damp to wet. The production from the leases and the dates of the last production are shown in the records as follows:

SF 041699-046752	91,742 tons	6-30-40
SF 054780	50,391 tons	7-2-40
Total	142,133 tons	

Peacock Coal Company prospect

SF 056332 **2-16-29** **Lease**
Peacock Coal Company, Monero
NW1/4NE1/4, NE1/4NW1/4 sec. 17, T31S, R1E **(Fig.** 118)

The Peacock Coal Company made application for a lease on the above land, and the sale was held on December 26, 1928, in Santa Fe. No bonus bids were offered, and the lease was granted to the Peacock Coal Company as the petitioner.

The lease land is about 0.25 mi east of the town of Monero. Levi Martinez, the General Manager of the company, also operated a coal mine on fee lands at Monero. That mine had nearly depleted its reserve, and it was hoped that sufficient coal would be found on this lease to replace the mine at Monero.

During the prospect work two beds of coal were discovered on the land approximately 40 ft apart. Four development entries were driven into the side of a steep hill (Fig. 127). The map shows the extent of the work done on the lease and the thickness of the coal beds. The location of the workings was not tied to any known section marker, but Mr. Bourquin thought they were in the southwest corner of the NW1/4NE1/4 and very close to the south line of the lease.

There was no production from the property. On March 2, 1937, the Attorney General notified the General Land Office that a compromise had been agreed upon, which required the bonding company to pay $200 for indebtedness to the government and required the lease lands to be relinquished. A. Luchetti, President of the Peacock Coal Company, relinquished the lease, and the case was closed.

Caranta Brothers prospect

SF 076364 **10-24-41** **Permit**
Joseph Caranta, Monero
Barne Caranta, Jr., Monero
Parts of secs. 17, 20, and 21, T31S, RIE, 640 acres
(L-62?, Fig. 118)

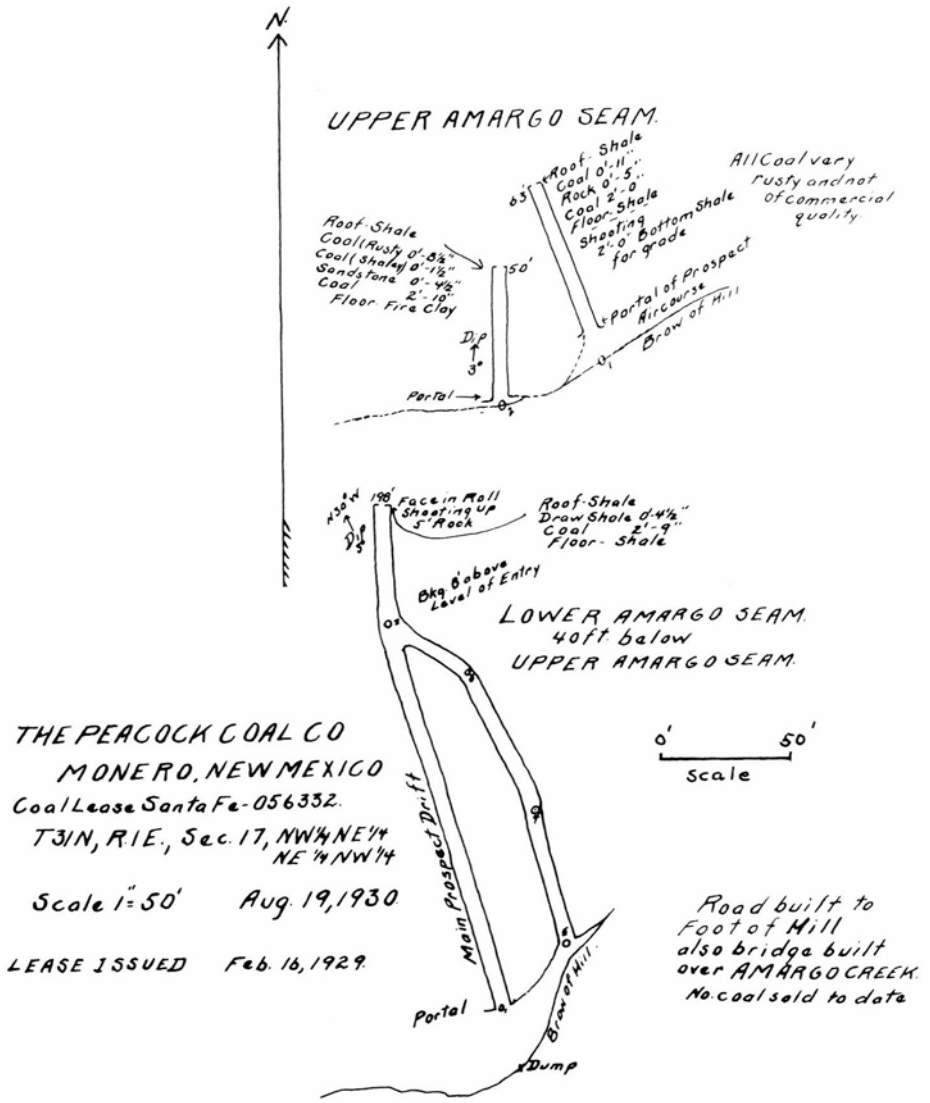


FIGURE 127—Map of the Peacock Coal Company prospect. *Made by J. J. Bourquin with Brunton compass and tape, August 19, 1930.*

The Caranta brothers had been operators in coal mines for some time before the issuance of this permit. Because their previous mines had been worked out or because costs of mining were too high, they needed to find a new mine in order to continue operations. They began prospecting on this permit by opening a portal near the center of the NE1/4NW1/4 of sec. 21. A slope 454 ft long was driven in a southeast direction. The slope followed a bed of coal that was 3 ft 10 inches thick at the portal but thinned to 22 inches at the face. The coal mined, estimated to be 100 tons, was stored on the ground because there was no means of transporting it off the mountain to the valley below. There was no additional work done on the permit because labor was so difficult to obtain during the World War II years. The permit expired by law after 2 years.

Sterling mine

Fred Sterling, 1895-1897
2 mi southeast of Monero **(Fig. 106)**

In his 1895-1896 report John W. Fleming, Territorial Mine Inspector, gives limited information concerning the Sterling mine. A drift 200 ft long was driven along a bed of coal 3.5 ft thick, and during that year three miners produced 750 tons of coal, which was sold to the Denver Rio Grande and Western Railroad Company. According to sketchy records, the mine closed by 1897.

Unknown mine

2,700 ft NL, 4,700 ft EL, sec. 21, T31N, R1E **(L-61, Fig. 118)**

No record of this mine has been found in the literature. During the Abandoned Mine Lands study in 1979, mine dumps were observed on an aerial photo, and the site was visited. Two drifts were found. One was driven N45°W, and the other, driven across a draw, bears N55°E. The dumps are small. This could be the Sterling mine because it is about 2 mi southeast of Monero.

Some information concerning this mine was obtained from Dan Torres, a local resident. Earlier in 1979 he had met a man who was looking for a family grave. The man said that a woman, who Mr. Torres presumed was the man's mother, was buried near one of the old cabins and that his family had opened the mine. Mr. Torres stated that he thought the man's name was Cadwell.

Isadore Erler prospect

SF 072804 **1-18-37** **Permit**
Isadore Erler, Monero
N1/2SW1/4 sec. 28, T31S, R1E **(Fig. 118)**

Mr. Erler opened three short prospect drifts off the permit land, which is 3 mi southeast of Monero. On June 24, 1938, R. D. Reeder, Deputy Mining Supervisor, measured the coal at the face of the No. 1 drift. The opening there, which was near the north boundary of the permit, had been driven S17°E for a distance of 46 ft. The face was on permit land. The coal bed at the face was 2 ft 2 inches thick with a shale roof and floor; the bed dipped 22°S80°W. Prospect openings Nos. 2 and 3 were in the alluvium. The permittee did no more prospecting, and the permit expired by law after 2 years.

Sczerbiak prospect

SF 053312 **11-7-27** **Permit**
Wasyl Sczerbiak, Lumberton
Sec. 6, T31N, R1E

Mr. Sczerbiak's permit was located about 4 mi east of Lumberton on the north slope of Monero Canyon, about 1,800 ft from the Denver Rio Grande and Western Railroad. The permittee opened two short prospect slopes on the N1/2NW1/4 sec. 6. One slope, which was 25 ft long on the upper bed of coal, showed 18 inches of coal, and the other slope, which was 20 ft long on a lower bed of coal, showed 23 inches of coal. The coal was too thin to develop, and the permit expired with no production.

Martinez prospect

SF 054881 **5-16-27** **Permit**
Levi Martinez, Monero
Parts of secs. 6 and 7, T31N, R1E; parts of secs. 1 and 12, T31N, R1W, 760 acres

The permit lands are 2 mi west of Monero. Mr. Martinez opened a number of short entries because he was looking for a commercial bed of coal. C. L. Duer, District Mining Supervisor, described this work in his visit to the Monero area on November 14,1927. Near the NE corner of NW1/4SW1/4 sec. 7 a shaft 45 ft deep was sunk. No commercial coal was found. However, 2 ft 8 inches of coal was found at the face of a 24-ft slope driven in a southwesterly direction. The location of this slope was near the east line SE1/4SW1/4 sec. 6 and approximately 200 ft north of the south line. Approximately 600 ft northwesterly of this prospect 2 ft of coal was discovered in two short entries about 50 ft apart.

Mr. Martinez filed an application with the General Land Office for a lease, but because it was determined that coal had not been found in commercial quantity, the General Land Office closed the case on April 29, 1930.

Castelone prospect

SF 052199 **10-14-25** **Prospecting permit**
Samuel Castelone, **Lumberton**
SW1/4SW1/4 sec. 12, T31N, R1W

C. L. Duer, District Mining Supervisor, reported that the prospecting work done on this permit consisted of an entry 85 ft long driven on a course of S20°W, located 1,100 ft north and 300 ft east from the W1/4 corner of sec. 12. The coal at the face of the entry was 4 ft thick, but it was soft, badly stained, and of poor quality.

The Castelone family moved from the area in early 1926, and the permit was abandoned. The permittee filed a relinquishment with the Santa Fe Land Office on January 19, 1926.

It is assumed that Mr. Duer's location or entry bearing is in error because in 1979 the field workers for the Abandoned Mine Lands survey could find no evidence of the opening he described.

Unknown mine

1,600 ft SL, 3,200 ft EL, sec. 1, T31S,R1W **(L-14, Fig. 128)**

This small prospect is marked by a single entry driven at the edge of a hill south of NM-17. There is coal on the dump.

Tafoya prospect

SF 075024 **May 1938** **Permit application**
Juan A. Tafoya, Lumberton
SW1/4NW1/4 sec. **1, T31N, R1W** **(Fig. 118)**

Before obtaining a prospecting permit Mr. Tafoya opened six short drifts to obtain information on the thickness of a

coal bed or beds on the subject land. The cross sections below were measured by R. D. Reeder, Deputy Mining Supervisor, on October 17, 1938. General locations for the entries were furnished by Mr. Reeder; he stated that two prospect drifts were driven in a southwest direction in the north half of the SW1/4NW1/4 sec. 1, on the hillside southwest of the railroad track, and four drifts were driven on the hillside along the western border of the subdivision. The measurements follow:

Drift No. 1		**Drift No. 4**	
Roof	Shale	Roof	Sandstone
Sandstone	11″	Coal	1′ 0″
Rusty coal	1′ 11″	Sandstone and shale	7′ 2″
Floor	Shale	Coal	1′ 3″
Drift No. 2		Floor	Shale
Roof	Sandstone	**Drift No. 5**	
Coal	1′ 3″	Roof	Sandstone
Floor	Shale	Coal	1′ 0″
Drift No. 3		Floor	Shale
Roof	Shale	**Drift No. 6**	
Coal	3″	Roof	Sandstone
Shale	1′ 3″	Coal	1′ 7″
Coal	1′ 3″	Shale	9½″
Floor	Shale	Coal	9″
		Floor	Shale

On August 20, 1938, Mr. Tafoya wrote to Mr. Reeder that he would have to suspend all action on the permit application, and the application was then rejected.

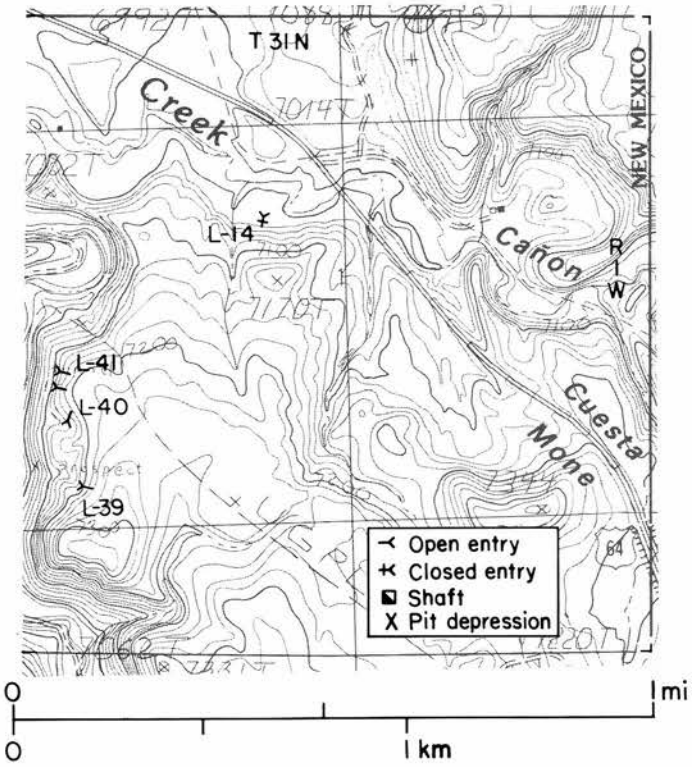


FIGURE 128—Mines in the Amargo area on the Lumberton 7½-min quadrangle (enlarged).

L–14—Unknown mine
L–39—Amargo Knot No. 2 mine
L–40—Amargo Knot No. 1 aircourse
L–41—Amargo Knot No. 1 mine

Amargo Knot No. 1 and No. 2 mines

SF 077749 **10-1-47** **Lease**
Juan A. Tafoya, Lumberton
SW1/4SW1/4 sec. 1, T31N, R1W **(L-39, 40, and 41, Fig. 128)**

The Amargo Knot No. 1 mine (L-41, Fig. 128), 3 mi east of Lumberton, was operated in the 1940's for the Amargo Knot Coal Company by Juan A. Tafoya. He was the owner of fee title to 160 acres of land, the SW1/4NEI/4, SEI/4NW1/4, and N1/2SW1/4 sec. 1, T31N, R1W. He supplied the Jicarilla Indian Agency at Dulce with the coal that he mined from this land. In need of additional coal to fill his contract with that agency, he applied on January 30, 1945, for a prospecting permit on the SW1/4SW1/4 sec. 1, T31N, R1W, adjacent to the workings of his mine.

After a long wait with no response, Mr. Tafoya sent a letter in February of 1946 to the Commissioner of the General Land Office inquiring why the permit had not been issued. He discovered that there were several reasons. The Caranta brothers of Monero had filed a protest against the granting of the permit because sufficient coal mines already existed in the locality to supply the needs of the community. R. H. Allport, District Mining Supervisor, also believed that no new coal source supply was needed in the area. And, in addition, the Caranta brothers stated that coal had already been mined from the government acreage that Mr. Tafoya was applying for.

On June 9, 1946, Mr. Allport examined the mine on fee land and found conditions as Mr. Tafoya had stated. The coal was needed, and there had been no trespass. At the time of Mr. Allport's examination, the two main entries of the mine, on the NW1/4SW1/4 of sec. 1, had been driven about 250 ft in an easterly direction and an entry had been driven south for 700 ft where an aircourse 280 ft long, driven west, holed to the surface. The aircourse was almost on the line separating the fee and government lands. A coal measurement near the face of the south entry showed 4 ft 4 inches of clean coal with sandstone for the floor and roof. The coal mined was lowered to the valley floor by aerial tram (Fig. 129).

FIGURE 129—The bin at the base of the aerial tram of the Amargo Knot No. 1 mine on fee land. The building on the side of the hill is the loading dock at the head of the tram. *Photo by R. H. Allport, June 8, 1946.*

The decision of the government was to recommend that the federal land be subject to leasing. The protest was dismissed because the granting of a lease to Mr. Tafoya would not result in another coal source supply for the area, as had been alleged, because the operating mine on fee land was almost depleted. After due process the lease was granted to Mr. Tafoya, effective October 10, 1947, and development of the Amargo Knot No. 2 mine (L-39, Fig. 128) was begun.

By October 1948, a new entry had been opened, and a new chute and 150-ton hopper, which contained four bins for the three screen-size coal products and the mine-run coal had been constructed. The coal bed in the new workings averaged 4 ft of clean coal.

By January 1951 the Rural Electrification Administration had completed a three-phase 220-volt line to the mine. Five miners and two drivers produced about 25 tons per day during the coal season.

In October 1952 Mr. Tafoya had a new survey made. According to the survey, the old line between Mr. Tafoya's fee land and this lease was 220 ft too far north, and Mr. Tafoya had paid royalty to the government for his own coal. Walter G. Turley, a licensed engineer from Santa Fe who had discovered the error while conducting a survey for another party, was retained by Mr. Tafoya. Linguistics as well as a faulty survey complicated the problem because Mr. Tafoya spoke little English and the engineers in the Mining Supervisor's office spoke less Spanish. Fortunately, communication was established, the Mining Supervisor agreed with Mr. Turley, and Mr. Tafoya was reimbursed for his overpayment.

The mine portal was tied into the new survey by Mr. Turley. The Brunton and tape survey by the engineers in the Supervisor's office shows the extent of the mine workings (Fig. 130). The major portion of the coal mined was used by the Indian School at Dulce on the Jicarilla Indian Reservation.

The mine ceased operations in March 1959, and then was reopened in August 1960 when Joe Salazar began operating it. His work continued until March 1961. The mine was closed then until September 1961, after which Randy Marez mined a few tons each month until January or February 1962. By early 1962 the coal reserves in the mine were essentially depleted, and Mr. Tafoya requested that the lease be relinquished as of May 4, 1962. It was cancelled June 18, 1962.

Under the lease, 15,643 tons of coal were produced, and the reports show that an additional 10,007 tons were mined from the land that was involved with the new survey. There is no record in the government files showing how much additional coal was produced on the adjacent fee land.

Cornell prospect

SF 054010 **10-9-26-10-9-28** **Permit**
H. M. Cornell, Dulce
SE¼NE¼ sec. 17, T31N, R1W
1,300 ft NL, 400 ft EL, sec. 17 **(L-3a, Fig. 131)**

The permit land is located about 2.5 mi southwest of Lumberton. Edward Peisker, an associate of Mr. Cornell, started the prospecting by facing up an outcrop in the bank of an arroyo near the center of the NE¼4NE¼ sec. 17. The bed had a sandstone roof, and the following measurements were made.

Coal	2' 6"
Rock and bone	8"
Coal	4"
Shale	Floor

Mr. Peisker drove a prospect entry along the bed for 47 ft on a course of S10°W and found that the coal had pinched down to 8 inches at the face. It is believed that the coal bed was cut off by the fault on the west side of the Belino-Peisker mine map (Fig. 134). The small north-trending arroyo shown on the quadrangle map (Fig. 131) marks this fault. No more work was done on the permit land, and no coal was sold. The permit was assigned to Charles E. Pound on May 27, 1929, but he did no work, and the permit expired by law. During the Abandoned Mine Lands study in 1979 the old workings were found in the arroyo.

Unknown mine

1,600 ft NL, 300 ft EL, sec. 17, T31N, R1W **(L-3, Fig. 131)**

During the Abandoned Mine Lands survey in 1979 an old sealed entry was found at the above location, which is on federal land. The entry, which bears N65°E, is covered with vegetation. There is no dump near it; probably the miners dumped the waste in the arroyo. The site is near the Cornell prospect, and a coal outcrop is exposed in the arroyo 75 ft away.

Bellino prospect

SF 047363 **3-31-24-12-8-25** **Prospecting permit**
Frank Bellino, Lumberton
W½E½ sec. 17, T31N, R1W
500 ft NL, 600 ft EL **(L-4, Fig. 131)**

The Bellino prospect is about 3 mi southwest of Lumberton. In beginning exploration work, Mr. Bellino drove an entry for a distance of 165 ft on a bed of coal approximately 2 ft thick. Several rooms were driven; these were connected to a second entry, as shown on a map made by C. L. Duer, District Mining Supervisor (Fig. 132). Mr. Duer reported a 2-ft bed of coal overlying the bed explored by the main entry, but 5 ft of shale separated these two beds. A back entry was driven on the upper bed.

The property was well operated, and a good chute was constructed. The beds proved too thin to be mined economically, however, and Mr. Bellino asked that the permit be relinquished as of December 8, 1925. It was estimated that 260 tons were produced from the prospect.

After the prospecting permit was relinquished, the equipment, including the chute and cars, was moved to a prospect on fee land in the SW¼SE¼ sec. 8, a short distance from the opening on the permit land. At the new location Mr. Bellino's brother Louis opened an entry S8°W along a lower bed of coal 34-38 inches thick. There is a 45-ft stratigraphic interval between the two beds. The government had no jurisdiction over fee lands; consequently, there is no further information on this prospect in government files.

During the Abandoned Mine Lands study in 1979 the field examiners could find no opening on the W½E½ of sec. 17. A portal was observed at the location given above, and it is believed that this was the opening for the Bellino prospect. The blank space on the west side of the Bellino mine map (Fig. 134) probably represents the extent of the underground workings of this prospect. If this is true, the mine was developed off the land for which the prospecting permit was issued.

Belino-Peisker mine

SF 071493 **7-1-36** **Lease**
Nick Belino, 1925?
Edward F. Peisker, Lumberton, 1927-1942 NE¼4NE¼
sec. 17, NW¼4NW¼ sec. 16, T31N, R1W
400 ft SL, 300 ft EL, sec. 8 **(L-5, Fig. 131)**

The Belino mine was opened by Nick Belino before 1927 on the SE1/4SE1/4 of sec. 8, which was fee or patented land.

Mr. Belino sold the land to Emmett Wirt, but a title search showed that the land belonged to the New Mexico Lumber Company. The company gave a quitclaim deed for the land to Mr. Wirt on April 19, 1927. Mr. Wirt was Postmaster at Dulce for many years and also a County Commissioner. He then leased the land to Edward F. Peisker, who negotiated a contract to furnish coal to the Jicarilla Indian Agency. Mr. Peisker paid Mr. Wirt 30¢ per ton on coal sold from the lease.

The mine was developed through two openings (Fig. 133) on the patented land, but by July 1, 1932, the mine was in the NE^1/4NE^1/4 of sec. 17, where the coal was owned by the government (Figs. 131, 134). Mining continued until September 19, 1935, when the General Land Office ordered a

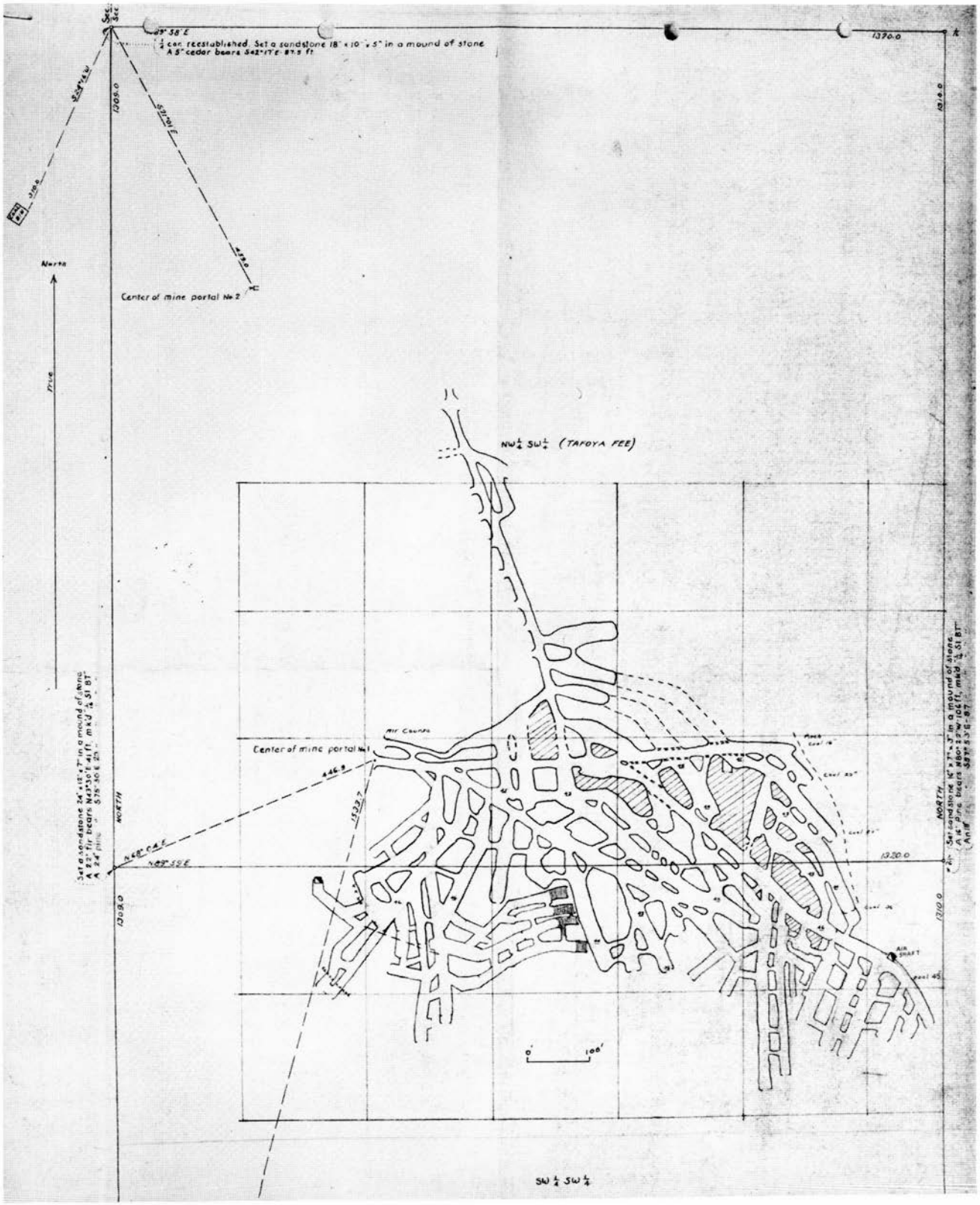


FIGURE 130—Map of the Amargo Knot No. 2 mine based on Walter G. Turley's survey of October 17, 1953, with additions made by engineers from the Mining Supervisor's office.

survey of the mine to determine the amount of coal mined in trespass. The Special Agent, Mr. Berry, determined that Mr. Peisker had mined 10,000 tons in trespass, and 1,500 tons of this amount were slack. The records of the Jicarilla Indian Agency showed purchase of 7,555 tons during this period, and Mr. Peisker was charged for 7,500 tons at 25¢ per ton royalty.

Mr. Peisker made application for a lease on the NE^{1}/4NE1/4 of sec. 17 on October 7, 1935, and the government issued him a lease on July 1, 1936.

The coal bed was the same bed as that mined in the upper mine workings of the Miller mine (SF 040606). The bed was 2.5-3 ft thick and generally had a 3-6-inch parting near the middle of the coal bed; it dipped from 13° to 7° westerly. The roof was a good sandstone with a thin shale bed between the sandstone and the coal. The shale could not be supported and had to be removed. The coal was transported from the mine by a "very small burro." The floors were brushed about 14 inches below the coal bed to provide access. E. S. Latton, Mr. Peisker's son-in-law, was Mine Foreman.

In 1937 the State Inspector of Mines ordered Mr. Peisker to drive an opening east across the NW1/4NW^{1}/4 of sec. 16 to hole the surface for ventilation. The lessee complied with the order and completed the entry, which is labeled Air Course on Figure 134. A search of the coal ownership was then made, and it was determined that this coal belonged to the government instead of the state of New Mexico. Mr. Peisker was advised to file application with the General Land Office to include this land under lease SF 071493. The government modified the lease to include the addition of the NW1/4NW1/4 of sec. 16 on March 19, 1940. The coal was

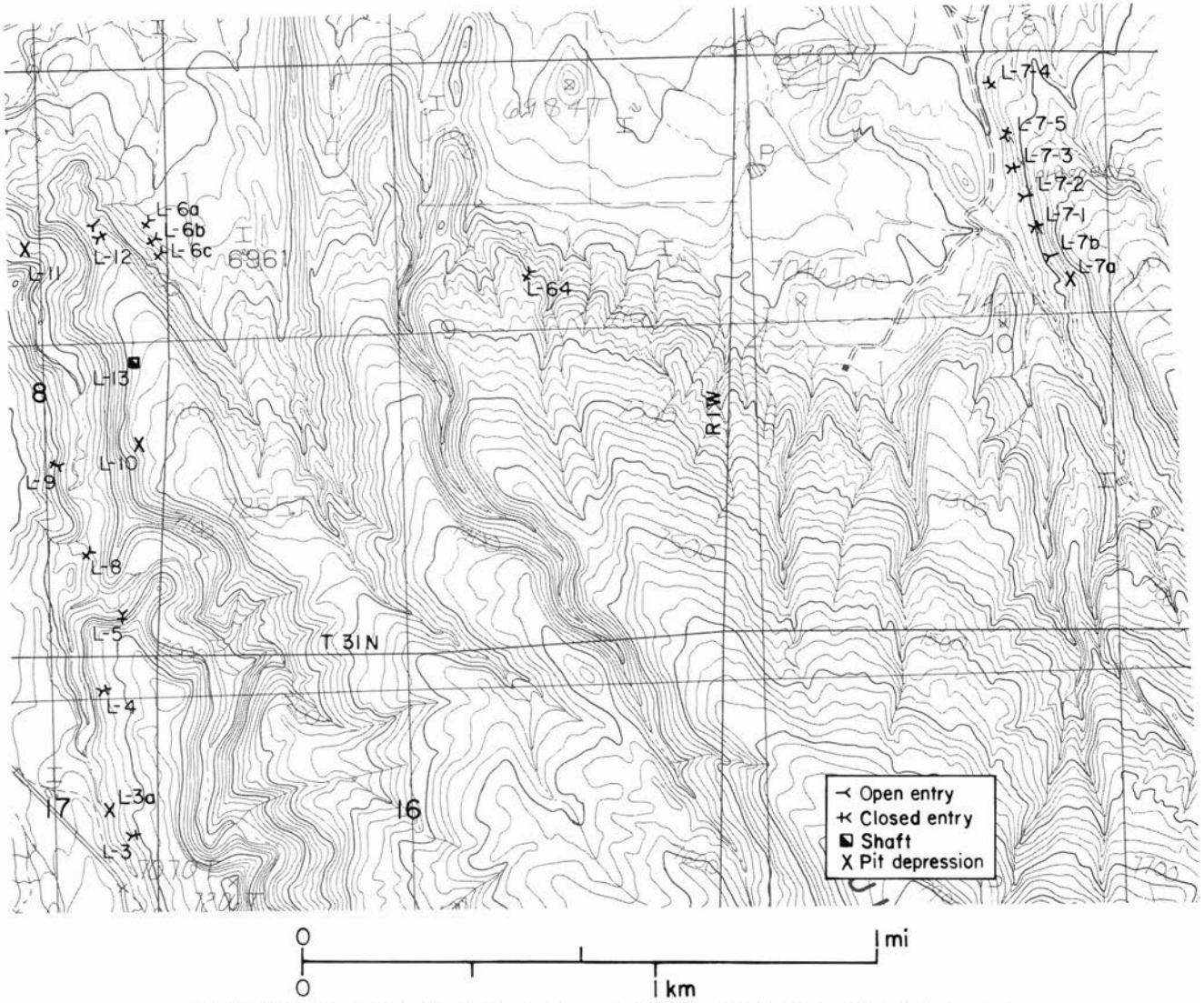


FIGURE 131—Mines in the Lumberton area on the Lumberton 7½-min quadrangle (enlarged).

L–3—Unknown mine
L–3a—Cornell prospect
L–4—Bellino prospect
L–5—Belino–Peisker mine
L–6a—Main entry lower bed of Miller–Kutz mine
L–6b, 6c—Main entries upper bed of Miller–Kutz mine
L–7a, 7b—Early-day openings, by James Corrigan or others, Lumberton–Kutz–Garcia mines
L–7–1—Old entry, possibly the original James Carrigan mine first working, reopened by Kutz, Lumberton–Kutz–Garcia mines
L–7–2—Kutz No. 2 mine entry
L–7–3—Kutz No. 3 mine entry
L–7–4—Kutz No. 4 mine entry
L–7–5—Garcia mine entry
L–8—Burns and Biggs Lumber Company mine
L–9—Peisker prospect
L–10—Aircourse on lower bed of Miller–Kutz mine
L–11—Unknown prospect on Miller Creek
L–12—One of main entries on the upper bed of Miller–Kutz mine
L–13—Air shaft on upper bed of Miller–Kutz mine
L–64—Lobato prospect

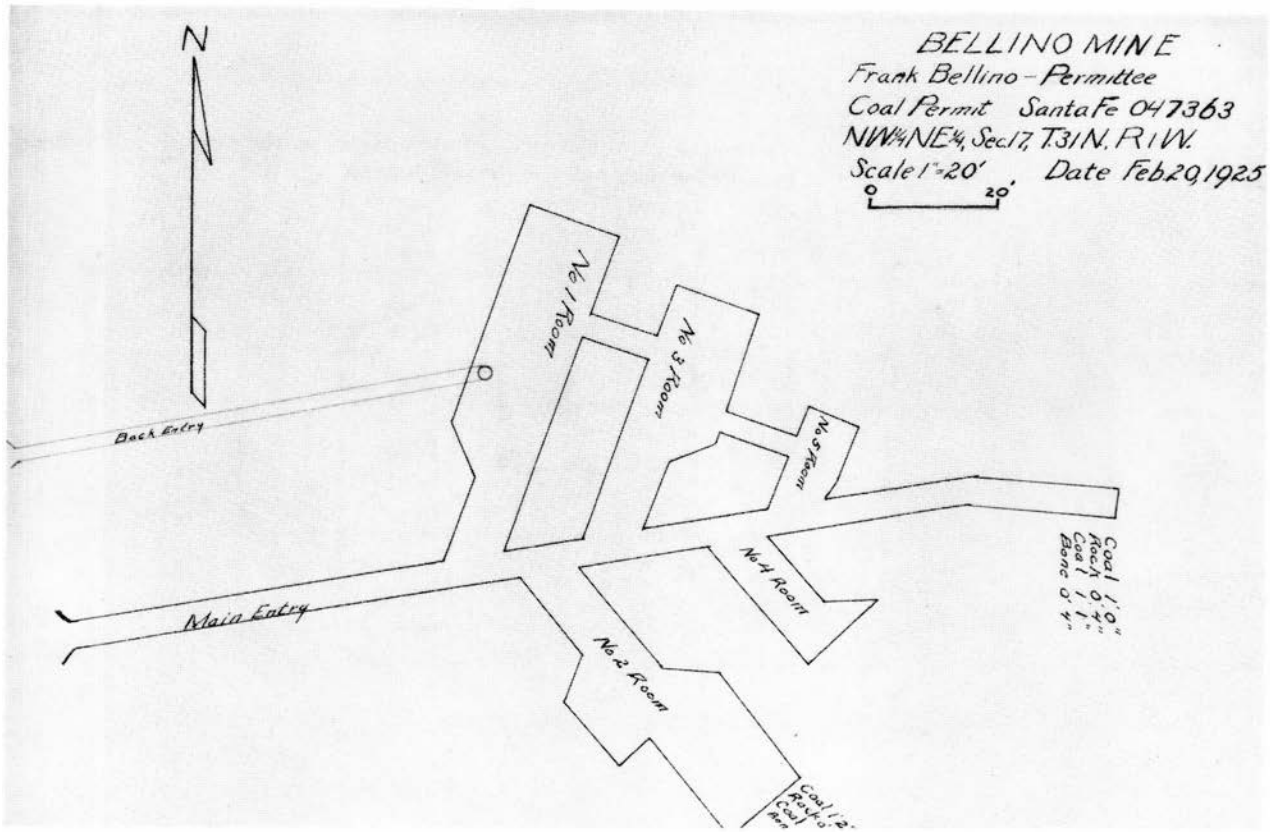


FIGURE 132—Map of the Bellino prospect. *Made by C. L. Duer.*

then developed and mined from that section until January 1, 1942, when the mine was closed and properly abandoned.

Mr. Wirt, who allowed Mr. Peisker to mine the coal on the patented land for 30¢ per ton, died during 1940. The agreement had been an oral one, and the administrator of Mr. Wirt's estate tried to collect the 30¢ per ton on all coal mined on federal land that passed through the portal of the patented land. Mr. Peisker divested himself of his coal holdings by relinquishing this lease and dropping permit SF 075423, which he held on other land, to avoid becoming involved in legal proceedings. Stokers were installed in the Dulce powerplant in 1939, and Mr. Peisker was able to dispose of the slack piled at the loading chute during the life of the mine.

The request for relinquishment of the lease was filed on April 23, 1942, and the government approved the relinquishment on February 10, 1947. Before the lease date 7,500 tons of coal were produced, and 14,008 tons were produced during the life of the lease. It is estimated that 10,920 tons were produced from the fee lands. The total production of the mine was approximately 32,428 tons. From four to 10 men were employed by Mr. Peisker about 140 or 150 days per year.

Burns and Biggs Lumber Company mine

Burns and Biggs Lumber Company, 1906-1911
4,300 ft NL, 800 ft EL, sec. 8, T31N, R1W (L-8, Fig. 131)

The Burns and Biggs Lumber Company began a mine in 1906 to supply fuel for the railroad that transported its lumber. The Denver Southwestern Railroad, 38 mi long, was laid from El Vado, where the Burns and Biggs sawmills were located, to the Denver Rio Grande and Western Railroad at Lumberton. James McBroom, General Manager of the mine, had a contract with the lumber company to provide it with coal at a price of $1.90 per ton. The mine was in a clean bed of coking coal 32 inches thick that dipped 6°SW. Development was from a slope with single-entry, room-and-pillar system of mining, and ventilation was aided by a furnace. A horse whim hoisted the coal from the mine.

In 1909 Barne Caranta was made General Manager with a similar contract to provide coal to the lumber company. The Territorial Mine Inspector reported that the mine made a small amount of gas and water that year, and the slope was 600 ft long. The mine continued to provide fuel for the

FIGURE 133—The surface facilities of the Belino–Peisker mine, showing the large pile of slack coal stored beyond the storage bin and cables that anchored the chute and bin to the hillside. *Photo by J. J. Bourquin, September 2, 1937.*

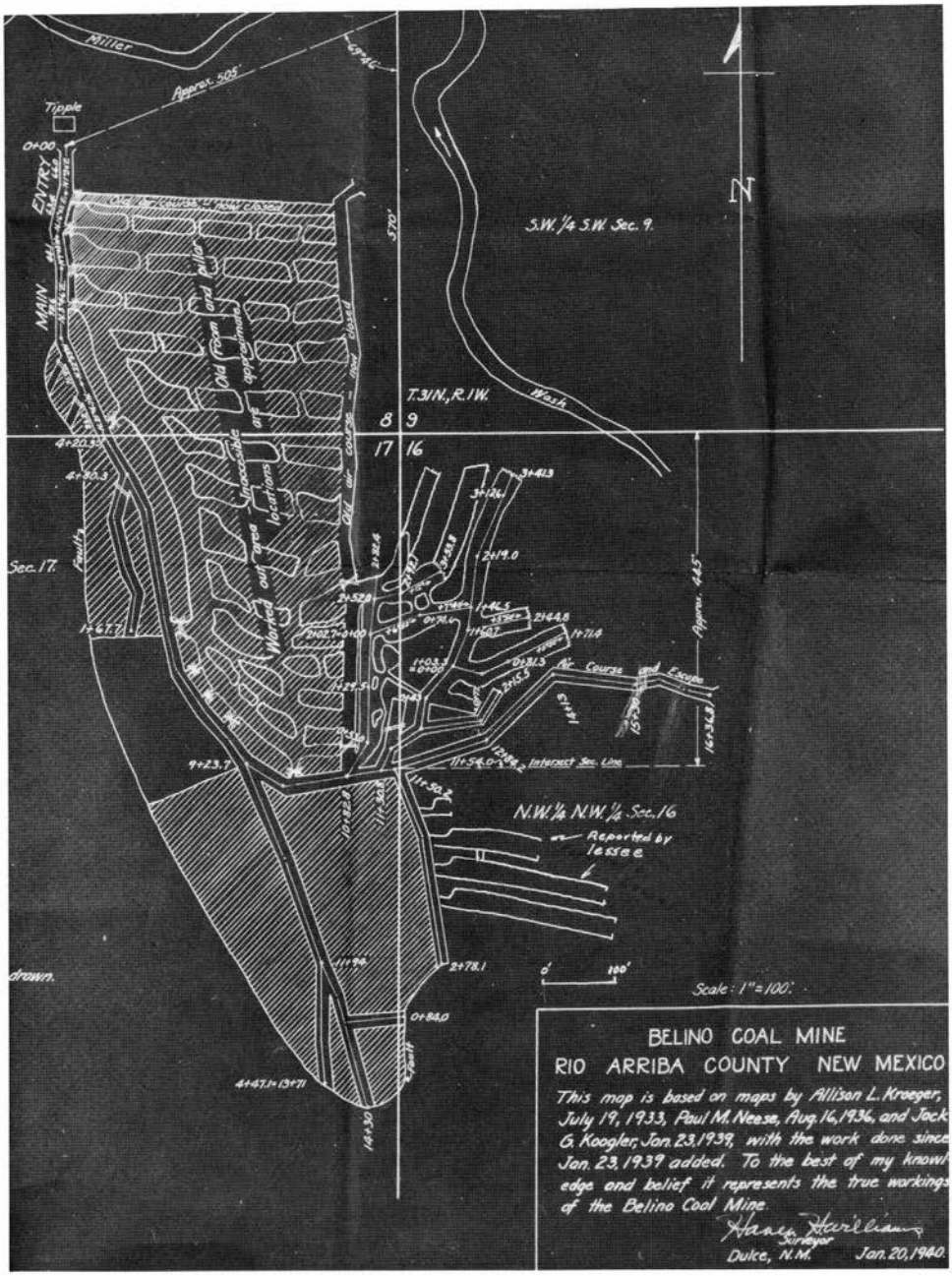


FIGURE 134—Map of the Belino–Peisker mine.

railroad until late 1911 when it ceased operations. A record of production and employment is shown in Table 60.

Peisker prospect

SF 075423 **6-12-39** **Permit**
SF 076695 **6-30-42** **Lease**
Edward F. Peisker, Lumberton
Lugarda Peisker, Lumberton
N1/2SE1/4 sec. 8, T31N, R1W **(L-9, Fig. 131)**
3,600 ft NL, 900 ft EL

The prospecting permit land is about 1.5 mi southwest of Lumberton. The permittee, Edward F. Peisker, had operated the Belino mine (SF 071493), which was essentially depleted, and new coal reserves were needed to supply his commitment for coal to the Jicarilla Indian Agency at Dulce. Mr. Peisker's land was part of former lease SF 040606 or the Miller mine. The Miller workings, on the lower bed, extended into the NE1/4SE1/4 sec. 8, on the east side of Miller Creek. In those workings an aircourse had been holed to the surface near the E1/4 corner (L-13, Fig. 131).

Mr. Peisker's work was confined to the upper bed on the west side of Miller Creek; he began the development work with a slope on a course N70°W on the upper bed of coal

TABLE 60—Production and employment record of the Burns and Biggs Lumber Company mine.

Year	Production (mines)	Employment		Days operated
		Miners	Top men	
1906–1907	3,240	9	2	216
1907–1908	3,342	10	2	182
1908–1909	4,127	7	2	
1909–1910	5,500	7	2	240
1910–1911	5,500	7	2	240
1911–1912	Ceased operation in late 1911			

that consisted of 1 ft 6 inches of coal, 3 inches of sandstone, and 2 ft 3 inches of coal. The roof and floor were shale, and the bed dipped 5°N67°W. The portal was near the north boundary of the NE1/4SE1/4. According to a report by R. H. Reeder, in January 1942 the slope inclined -4° and was 203 ft long, the aircourse was 51 ft long, and two rooms to the right and three rooms to the left had been driven 51 ft and 69 ft, respectively.

On November 12, 1941, Mr. Peisker filed a relinquishment of the permit, and his wife, Mrs. Lugarda Peisker, filed an application for a lease on the same land a few days later. This was done because Mr. Peisker was involved in a legal problem with Emmett Wirt's heirs, who wanted to collect a fee for all government coal hauled through the Wirts' land in the Belino mine. Mr. Peisker's lawyer advised him to relinquish this permit to keep from losing it in case the Wirt heirs won the suit. The approval of the relinquishment was formalized on January 7, 1941, and Mrs. Peisker was awarded the lease at a sale held on May 25, 1942 (Fig. 135).

Mr. Peisker could not hire miners because of the war, and he and his wife moved to Henderson, Nevada, where they were employed for defense work. They had trouble complying with the procedures necessary for formal relinquishment of the lease, and the rents and minimum production costs were considerable before the lease was cancelled on June 11, 1951 (BLM decision dated April 2, 1953). Under the permit 385 tons of coal were produced.

Miller-Kutz mine

SF 040606 **9-20-21-9-15-36** Lease
Ernest G. Miller, Daniel G. Kutz, Navajo Mercantile Company, **Lumberton**
Parts of secs. 8 and 9, T31N, R1W
From 1,600 ft NL to 3,500 ft NL, 100 EL to 600 ft EL, sec. 8
(L-6a-c, 10, 12, and 13, Fig. 131)

The Miller mine was developed, haltingly, on lands covered by lease SF 040606, which was issued to Mr. Miller and Mr. Kutz. Mr. Miller, a civil and irrigation engineer, was president of the Amargo Trading Company, which later opened the Lumberton Coal Company in Santa Fe. The Lumberton Coal Company motto was "From Our Mine to Your Bin." As things turned out, this was an optimistic logo, and not a great deal of coal made that progression.

Fairly soon after the lease was issued (September 26, 1922), Mr. Kutz assigned his interest to Mr. Miller. The latter did not spend much time at the mine, and as a consequence it developed operational and financial problems. In the files are many verbose letters from Mr. Miller to the Mining Supervisor's office explaining these problems. One of the economic difficulties was that the coal slacked easily because the cleats in the bed were close together; thus, the coal had to be sold as steam coal, rather than as domestic coal, which would have brought a higher price.

By 1925 Mr. Miller was in trouble with the government in regard to delinquent royalty payments. At that time Edward Peisker was in charge of operating the mine and was apparently not paying Mr. Miller, who, in turn, was not paying the government. Mr. Peisker had entered into an agreement to operate the mine and pay Mr. Miller 40¢ per ton, but could not fulfill this agreement, and he declared bankruptcy late in 1925. The operation of the mine then reverted to Mr. Miller. Figure 136 is a photo of the Miller mine and camp at about this time.

The business itself seemed headed for bankruptcy. The U.S. Geological Survey considered cancellation of the lease and collection from the bondsmen. The decision was made, however, not to cancel the lease because the government would have had problems collecting the back royalties; in addition, it was felt that the mine would prove relatively successful under good management.

In early 1926 Mr. Miller hired Luther Maynard as Manager to operate the mine under the Cerro Verde Coal Trust. However, conditions were not ameliorated; a letter dated April 26, 1926, from Deputy Sheriff Alfredo Benavidez of Rio Arriba County, to the Mining Supervisor's office stated that he had to impose his official authority to keep the peace because the company was paying the miners and others with ". . . vaugus checks, some of them have been refused by the banks some of them have been predated without the knowledge of the person to whom the check is issued . . . [sic]." Other letters, from unpaid employees, are in the files, with, of course, valid complaints. That was the end of Mr. Maynard, and on May 10, 1926, Mr. Miller wrote to the District Mining Supervisor as follows: "I will on the 15th pay all wages and indebtedness against the mine. . . . You will get no more complaints from Lumberton as I don't intend to hire any more Mexican miners or coal haulers." Rightly or not, he felt that his financial difficulties were due in part to the inefficiency of Mexican miners.

On about July 1, 1926, George W. Prichard, Lawyer, and John Vaughn, Miner, by agreement with Mr. Miller, took charge of operating the property, and they agreed to pay $100 per month back royalty to the government. But Mr. Prichard and Mr. Vaughn were also unable to clear the indebtedness, although they did pay the back royalty at the

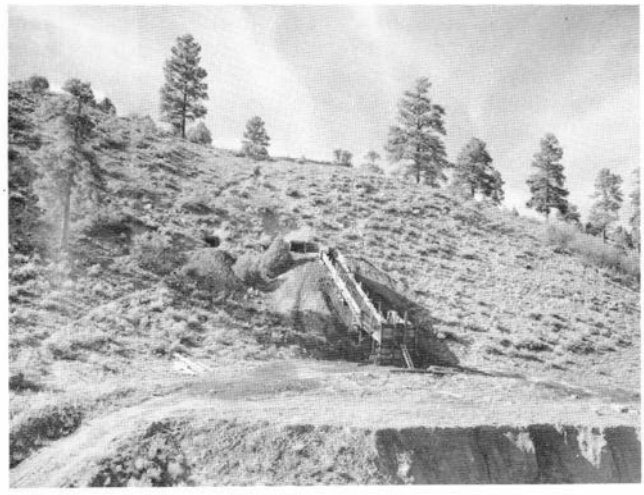


FIGURE 135—Chute and portals of the Peisker prospect when Mrs. Lugarda Peisker owned the lease. *Photo by R. H. Allport, September 26, 1943.*

FIGURE 136—The early-day miners' cabins at the Miller mine about 1925. The portal and tipple are on the hillside. *Photo by engineers from the U.S. Geological Survey.*

agreed rate for several months. Because they could not foresee a profitable future, they would have nothing more to do with the property after May 16, 1927.

While the mine was idle, the property and mine cabins were vandalized, and much of the equipment was removed. Some of this equipment (windows, doors, etc.) was taken, according to Mr. Miller, by one of the Kutz sons for "safekeeping." Once again the lease, with most of its indebtedness, was completely back in Mr. Miller's hands.

Still, in spite of all these vicissitudes, the property had potential, and several parties were interested in it. Daniel Kutz, one of the original lessees, a rancher in the Lumberton area who was a practical coal-mining man, contracted to take over the property and relieve Mr. Miller of the indebtedness. The assignment formalizing this agreement was approved November 7, 1928, and the arrangement was readily sanctioned by the government. An associate of Mr. Kutz, W. C. Ferguson of Denver, agreed to furnish the capital to reopen the mine and to market the coal; he had connections with the Denver Rio Grande and Western Railroad, where the operators hoped to be able to sell the coal. The government agreed that Mr. Kutz would be allowed to pay the back royalties within 2 or 3 years, and he began reopening the mine and repairing the facilities (Fig. 137).

Mr. Ferguson formed the Navajo Mercantile Company, and Mr. Kutz assigned the lease to that company effective March 29, 1930. The company also made application to include in the lease the SW1/4 of sec. 9; confirmation of this inclusion was received on August 26, 1930. Mr. Frank Blunt was named General Superintendent of the mine, and the Miller mine became a revitalized property.

Two blueprints of the mine, which were photographed and reduced in size, show the extent of the underground workings. Figure 138 shows the extent of the work on the upper bed until 1931, about the time Mr. Kutz acquired the property. Figure 139 shows the extent of workings on a lower level, which was mined by the Navajo Mercantile Company up to November 6, 1935. Figure 139 probably represents the eventual extent of the workings because the last coal was mined by the removal of pillars.

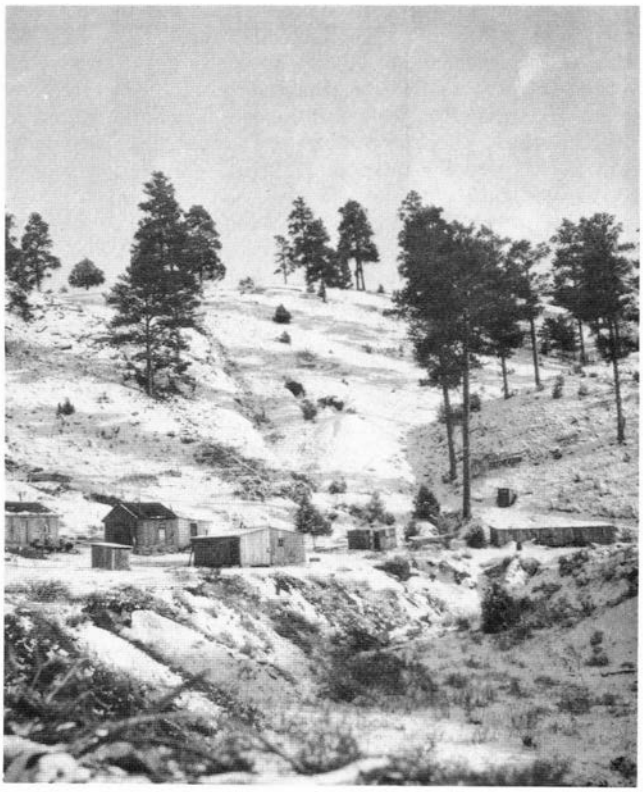


FIGURE 137–The miners' cabins and a small prospect hole halfway up the hill at the Miller mine in about December 1928. The new cabins were built by Mr. Kutz. *Photo by engineers from the U.S. Geological Survey.*

There were two beds of coal. The upper bed was mined until February 1931; then the lower bed, about 40 ft lower in elevation, was developed. The strike of the beds was in the direction of the rooms, and the dip was northwesterly approximately outby the main entry. Unfortunately, the upper bed contained one to two partings that varied throughout the mined area. Mr. Miller began the mine with 70 inches of coal with two partings 4 and 14 inches thick, respectively. Other coal sections of the upper bed showed 3 ft 10 inches of coal with a 4-inch parting, but overall the coal averaged 4-4.5 ft thick. The lower bed maintained a thickness of 2 ft 2 inches of clean coal, but during the later life of the mine the coal thinned in places to about 14 inches. Small faults and rolls plagued the miners with problems throughout the mine area. The coal reserves were limited to the area under a hill formed between a small valley and Miller Creek. The coal beds cropped out along the sides of this hill.

No analyses were found in the records for the lower bed. Two analyses taken from coal from the upper bed are as follows:

	70 tons mine run coal	Face sample, **3 ft 10 inches of coal; 3-inch shale parting**
Moisture	1.7%	2.8%
Volatile	38.2%	36.8%
Fixed carbon	46.9%	50.2%
Ash	14.9%	10.4%
Sulphur		0.9%
BTU	12,410	12,600

The Navajo Mercantile Company sold almost their entire production to the Denver Rio Grande and Western Railroad for steam coal. The railroad company had a spur at the mine tipple and paid $2.25 per ton delivered in the car. Mr. Blunt contracted with the mine company to mine the coal and put it in the car for $1.35 per ton. He hired 17 miners, two drivers underground, a tipple man, and a car loader on the surface. Mr. Miller et al. sold the coal at prices ranging from $2.00 for slack to $3.25 for lump coal at the mine. No fatalities or serious accidents were reported during the life of the mine. The mine was nongassy.

The records show that the mine produced 15,906 tons under the management of Mr. Miller and 91,384 tons under the management of the Navajo Mercantile Company, a total of 107,290 tons.

The Navajo Mercantile Company operated the mine from 1931 until 1936, but then respectfully asked that the lease be cancelled as of September 15, 1936, because the coal had decreased in thickness to 30 inches and had become crushed and broken by faults.

J. J. Bourquin, District Mining Supervisor, stated in his last inspection report of September 8, 1937, "Coal produced in the Miller mine was used primarily as railroad fuel by the D. and R. G. W. Railroad and the demand for this coal was so great that efforts were made to recover every ton of commercial coal available through the mine workings before the mine was abandoned; these efforts were remarkably successful."

Lobato prospect

SF 048099 **11-22-24** **Permit**
SF 054759 **5-16-27** **Permit**
Francisco Lobato, Lumberton
SW1/4NE1/4, SE1/4NW1/4, NE1/4SW1/4, NW1/4SE1/4 sec. 9, T31N, R1W
1,900 ft NL, 1,700 ft EL **(L-64, Fig. 131)**

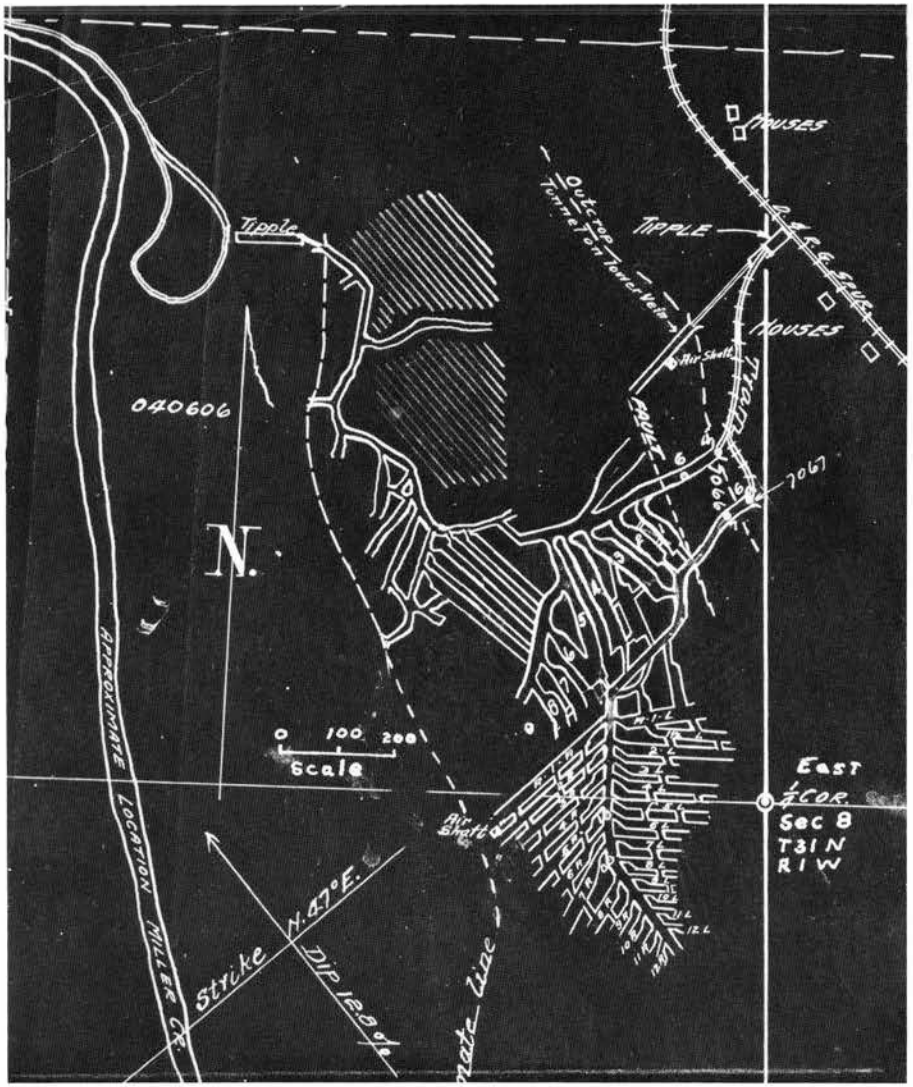


FIGURE 138—Map of the upper bed of the Miller mine, Rio Arriba County, dated February 9, 1931. *Made by Allison L. Kroeger.*

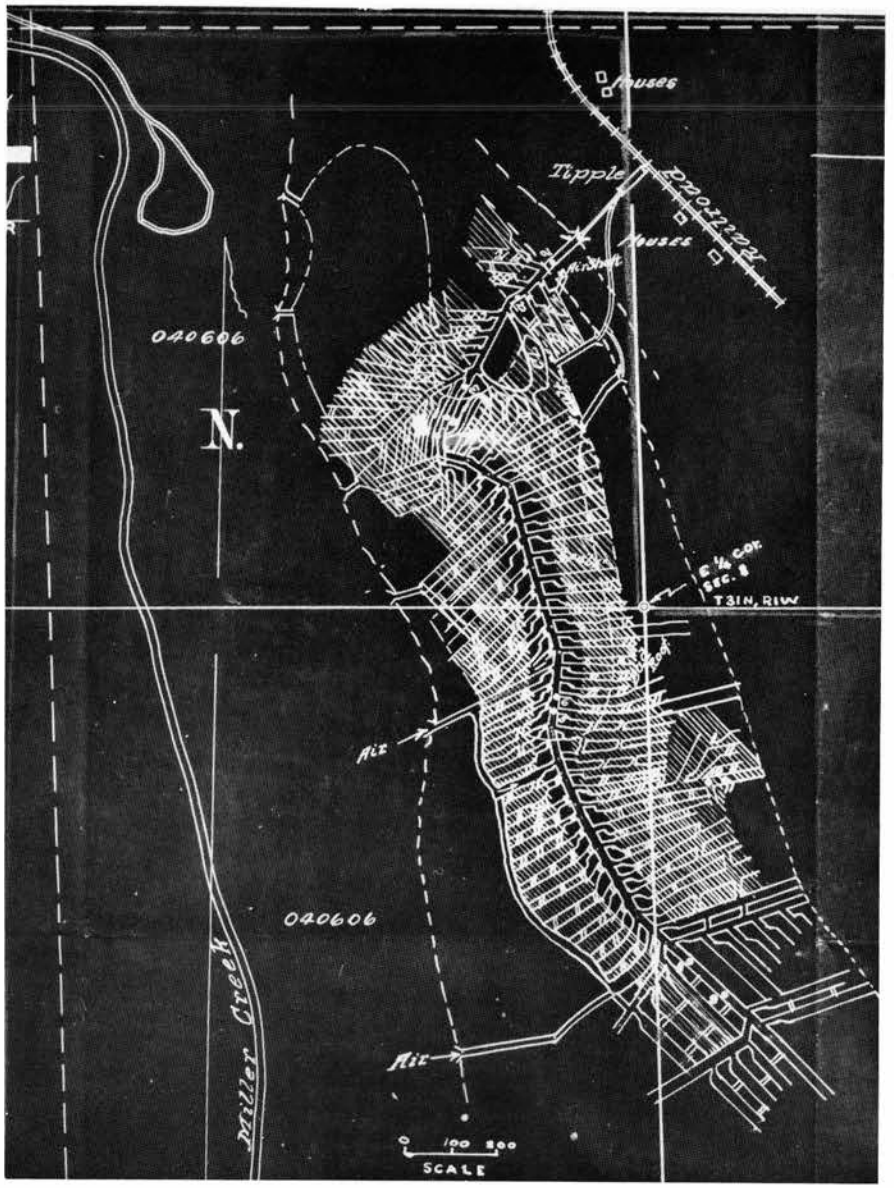


FIGURE 139—Map of the lower bed of the Miller mine, Rio Arriba County, dated November 6, 1935. *Made by Allison L. Kroeger.*

The permit land is 0.75 mi south of Lumberton. Mr. Lobato began an entry approximately 400 ft west and 600 ft south of the NE corner, SW1/4NE1/4 sec. 9. By August 1925 the entry had been driven on a course S30°E for 65 ft on a bed of coal that measured 1 ft 3 inches coal, 4 inches sandstone, and 1 ft 3 inches coal. The roof was sandstone, and the floor was shale. The coal bed dipped 9°N60°E.

Permit SF 048099 expired on November 22, 1926, and the permittee reapplied for another permit and was granted SF 054759 on May 16, 1927. By October 1928 the main slope had been advanced 140 ft from the portal. An entry located 100 ft inby the portal was turned southwest at a right angle to the main entry, and this entry or room connected to a rock tunnel driven from the surface. Mr. Lobato constructed a wagon road 0.75 mi long, built a bridge across an arroyo, built a bin and chute (Fig. 140), and constructed a blacksmith shop. The mine was equipped with steel rail and steel car.

However, the coal bed was too thin and weathered to be commercial, and Mr. Lobato did not apply for a lease or another permit. C. L. Duer, District Mining Supervisor, stated that the overburden over the coal at the face of the main entry was 70-80 ft and would not increase materially. Thus, it was unlikely that additional development would result in unweathered coal of better quality. The permittee reported 136 tons of coal sold.

Lumberton—Kutz—Garcia mines

James Corrigan, 1898-1899
1,300 ft NL, 2,600 ft EL, sec. 10, T31N, R1W

SF 047362	**3-31-24**	**Permit**
SF 053627	**10-9-26**	**Permit**
	4-1-30	**Lease**

Daniel G. Kutz, Lumberton
W. C. Ferguson, Denver, Colorado
SE1/4 sec. 3, NE'/4 sec. 10, T31N, R1W, 320 acres
300 ft NL to 2,100 ft NL, 2,000 ft EL to 3,100 ft EL, sec. 10
(L-7, Fig. 131)

SF 072176	**3-15-37**	**Permit**

Frank J. Blunt, Lumberton
W. C. Ferguson, Denver, Colorado
NE1/4NW1/4 sec. 10, T31N, R1W

The Lumberton mine, which was owned and operated by James Corrigan, was started in July of 1898. The drift reached a depth of 250 ft on a 2-ft 8-inch coal bed, and production of about 10 tons per day was hauled to Lumberton by wagon and sold locally and to the Biggs Lumber Company. In the Territorial Mine Inspector's report of December 12, 1899, it is stated that the mine had ceased operations.

FIGURE 140—Lobato prospect; part of the chute is covered with sheet metal to keep the coal dry. *Photo by C. L. Duer, September 1928.*

C. L. Duer, District Mining Supervisor, inquired into the history of this old mine. He reported that the mining was done in trespass and that two of the trespassers got into a fight; one was killed and the other was sentenced to life imprisonment. It is possible that the tragedy interrupted the finalizing of Mr. Corrigan's coal claim.

Some years later Daniel G. Kutz became interested in the property when he was informed by pioneer residents that when the early work stopped the coal in the face of one of the workings was 3 ft thick. He obtained a prospecting permit on March 31, 1924. When he began his operation, three caved entries existed, all located in the NW1/4NE1/4 sec. 10. In July 1898 the Territorial Mine Inspector had reported a single entry; the other two openings were driven at a later unknown date.

Mr. Kutz began to reopen an old entry to the reported bed. The entry, located near the north line of the SW1/4NE1/4 sec. 10, extended in an almost east—west direction. The entry was cleaned out and retimbered for 300 ft and driven an additional 86 ft. The coal was 38 inches thick near the entry, 14 inches thick at the face of the old work, and 8 inches thick at the face of the new work. Mr. Kutz then stopped this work and mined a few tons of coal from the old entry pillar stumps near the portal. Because there were a number of mines or openings developed during the life of the area, they will be numbered here according to their time of development. The above workings are labeled mine No. 1.

An economic operation did not exist in mine No. 1, so Mr. Kutz did considerable prospecting to find a suitable location to start a new portal. He chose a spot, shown on Figure 141 as portal #2, and began an entry due east for a distance of 100 ft, where some of the old workings mentioned above were encountered. The entry was turned due northeast to go around these workings. At the time Mr. Duer inspected the mine the NE entry had been driven 50 ft. The coal dipped approximately 12° to the north. A section of the coal bed at the NE entry face is as follows:

Shale	Roof
Coal	1' 6"
Sandstone	
Coal	8"
Rock and bone	20"
Coal	32"
Shale	Floor

At the time of this inspection, Mr. Kutz had constructed two chutes 84 ft and 70 ft long, respectively (Fig. 142). He had also started an entry from the surface that intersected burned coal, but that entry had been discontinued. The No. 2 mine was being developed, and some coal was being mined from rooms. A fault was intersected about 325 ft inby the portal of the No. 2 mine. The fault dropped the coal about 6 ft, but the entry was brushed and the workings advanced.

The permit expired on March 31, 1926, and Mr. Kutz applied for another prospecting permit, which was granted on October 9, 1926. In early 1927 the No. 3 opening was started to provide ventilation for the No. 2 mine and to furnish an entry to mine the coal to the north (Fig. 143). A coal section taken 145 ft inby the portal showed a shale roof, 3 ft 10 inches of clean coal, and a shale floor. The dip of the coal bed had flattened to 6°N35°W.

The main entry east of the fault in the No. 2 mine was advanced in the hope of finding coal to prolong the life of the mine, but the parting in the bed thickened and the coal thinned, so extending the mine to the east was unfeasible. The coal bed in the rooms as they advanced also showed the parting to be more than 2 ft thick with 3 ft 8 inches-4 ft of coal. One of these rooms and the entry hit the old workings mined in the early 1900's. Because the old workings were encountered several times, one can assume that

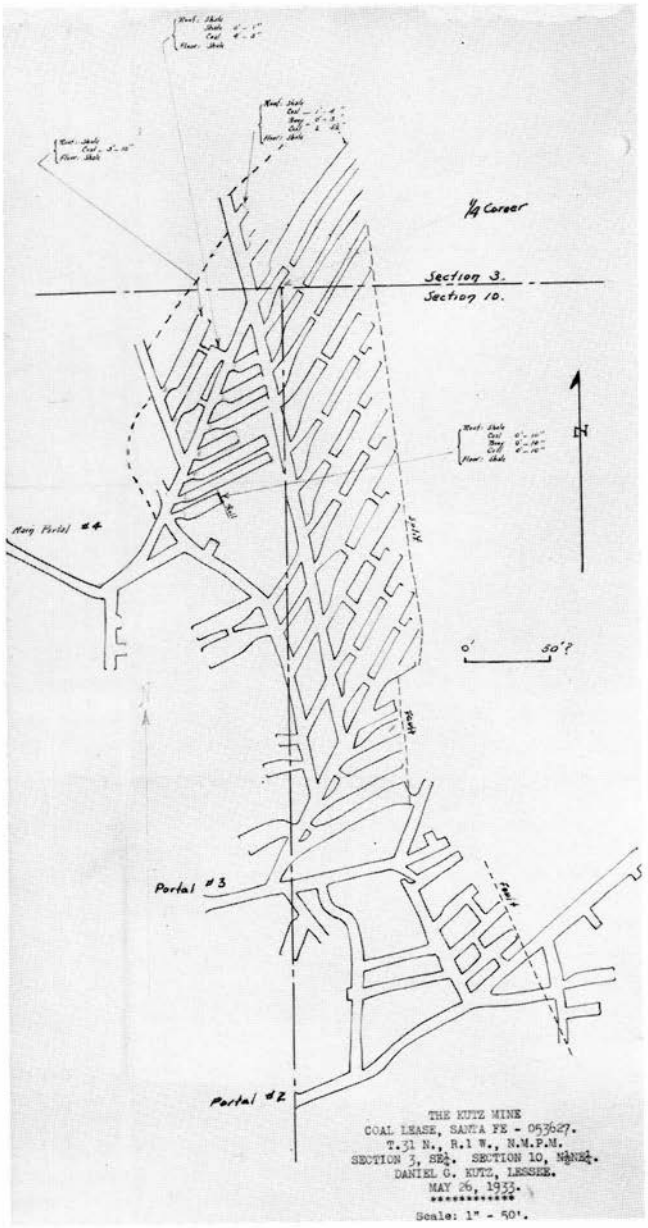


FIGURE 141—Map of the Kutz mine. *Brunton tape survey by government engineers.*

FIGURE 142—One of the surface facilities at the Kutz mine. This photo might have been taken at the No. 2 mine. Note the two chutes, one above the road and one below. *Photo taken about 1928.*

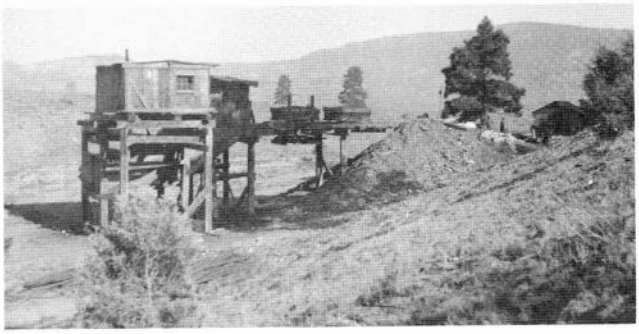


FIGURE 143—One of the portals and the surface facilities at the Kutz mine. This small tipple, hoist house, and bin might have been used during the early development of the No. 2 mine. *Photo taken about 1928.*

this mine had considerable production. An attempt was made to use the old mine as an aircourse for the No. 2 mine, but it was caved and proved unsatisfactory.

The No. 3 main entry was driven to provide access to coal to the north, and a room-and-pillar system was then developed to recover this block of coal. A shorter haulage-way was needed, so the No. 4 entry was driven for that purpose and to develop the extension of the coal bed to the north. The entry was driven down on approximately a 3° slope, and it was a hard pull for a mule to bring a car of coal from the mine to the tipple (Fig. 144). A hoist was considered, but a bad turn inby the portal proved unfavorable for a hoisting operation.

Mr. Kutz applied for a preference right lease, and it was issued by the government on April 1, 1930. The market for coal during 1931 and 1932 was poor; during the summer months the mine was closed, and consequently water accumulated in the lower reaches. During the working days some water was hauled out of the mine by tank car to keep the workings accessible.

The reserves of the mine were limited. The coal crop trended north—south on the west side of the block, and on the east side of the block the parting increased to a width that made mining costs excessively high. Faults encountered to the west also hampered the operation because the coal dropped down about 6 ft and considerable brushing was required to maintain the haulage system on grade. The trend of the increased parting was north—south (Fig. 141). Considerable water was encountered in the workings at the north end of the mine.

By 1935 most of the coal within the area of development had been mined. The No. 2 mine was abandoned by 1930, and the coal was being transported through the No. 3 entry. By 1935 the workings were off the No. 4 entry, and from 1935 to 1937 production was sporadic. Mr. Kutz was in the process of trying to sell the property.

Analyses of samples taken by C. L. Duer showed the following:

	Sample 1	Sample 2	Sample 3
Coal thickness		2' 5"	3' 7/2"
Moisture	3.0%		
Volatile matter	39.0%	40.3%	44.7%
Fixed carbon	48.3%	49.7%	55.3%
Ash	9.7%	10.0%	
Sulphur	3.5%	3.6%	4.0%
BTU	12,930	13,340	14,810

On March 15, 1937, Frank J. Blunt was issued prospecting permit SF 072176 on the NE1/4NW1/4 sec. 10, T31N, R1W. Portal No. 3, portal No. 4, and some mining off portal No. 4 were on this land. Mr. Blunt owned the surface of this land and wanted to develop the coal in the SE1/4SW1/4 sec. 3, which was owned by the Navajo Mercantile Company. This mine was eventually known as the Garcia coal mine.

Mr. Kutz assigned his interest in lease SF 053627 to W. C. Ferguson of Denver, Colorado, on March 28, 1939.

FIGURE 144—The tipple at the No. 3 portal of the Kutz mine. *Photo by J. J. Bourquin, May 26, 1933.*

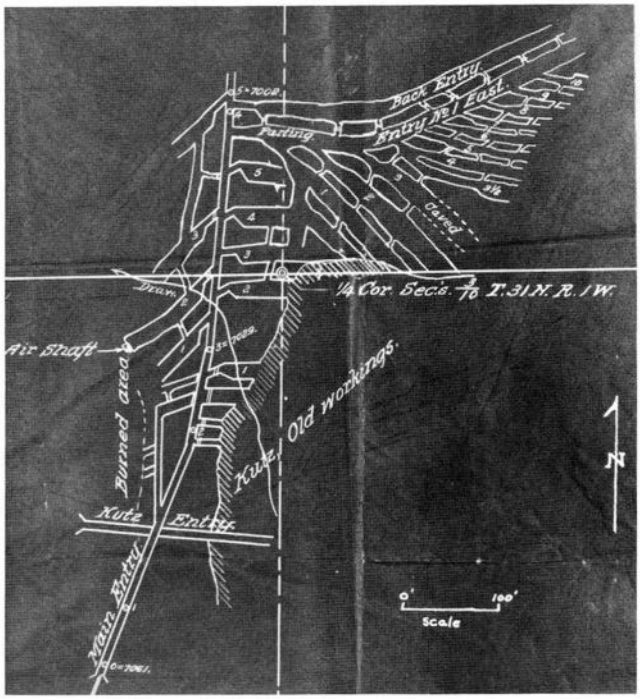


FIGURE 145—Map of the Garcia mine, Rio Arriba County. *Made by A. L. Kroeger, September 7, 1941.*

Mr. Ferguson was involved in mining in several western states and had acquired the Miller property a few miles from this lease from Mr. Kutz (see Miller—Kutz mine chapter).

Mr. Blunt began work soon after his permit was issued. He started a portal about 240 ft south of Kutz's No. 4 portal and drove northerly across the Kutz No. 4 entry. The Garcia entry sloped 10° to the north along the bed of the coal and skirted the west edge of the Kutz workings (Fig. 145). Mr. Blunt contracted the mining of the coal to Arthur and Isadore Erler, who received $1.85 per ton to deliver the coal into railroad cars.

The mine continued to develop through the permit lands into the fee lands held by the Navajo Mercantile Company, and by March 1939 W. C. Ferguson had acquired the Kutz lease, and the Garcia mine was extended northeast into the SF 053627 lease land (Fig. 145). There was a working agreement between Mr. Blunt and Mr. Ferguson, and they developed and mined the Garcia mine for its best interest. In 1940 there were 11 men working in and about the mine. The miners were making 65¢ per ton, and the day's pay men were paid $2.25 to $2.50 per day. Coal sold for $2.35 for railroad fuel, delivered. Top lump coal sold for $3.50 per ton at the mine. The coal in the bed was about 4 ft thick, and at this time was mined by pick. There was electric power in the mine to operate the pump.

Mr. Blunt made application for a preference right lease involving the land under permit SF 072176, and it was awarded to him on February 28, 1940. On March 27, 1940, Mr. Blunt filed an assignment of his interest to W. C. Ferguson, and then both parties agreed not to sign the lease, and the assignment was dropped by them. The General Land Office set the lease aside and rejected the assignment. Mr. Ferguson and Mr. Blunt would then have had no access through the Garcia portal after the expiration of the permit on March 15, 1941. Consequently, on September 6, 1940, Mr. Ferguson requested the reinstatement of lease application SF 072176 and the approval of the assignment; he also asked that his lease SF 053627 be modified to relinquish the $NW^{1}/4NE^{1}/4$ of sec. 10 and to include the permit land $NE1/4N^{W}1/4$ sec. 10. This arrangement was approved on January 15, 1941.

The mine continued to operate until April 1942. At that time Mr. Ferguson stated on his second quarterly report that there was no production and the mine would be closed indefinitely because of his inability to secure miners. Poor royalty records and the fact that production came from three land ownerships created problems with the government and the lessee, but after much letter writing the problems were solved.

The Kutz mine map (Fig. 141) is not entirely correct, but it will adequately locate the land mined if used in conjunction with the Garcia mine map (Fig. 145). The Kutz map was a Brunton tape survey made by government engineers, and the location of the mine was not tied to a known corner of the land grid because the corners either did not exist or were not known in the vicinity of the mines. There is also a question about the scale of the map because on the map the scale is supposed to be 50 ft =1 inch, but it fits sketches in the files that are on a scale of 100 ft =1 inch.

The Garcia mine map (Fig. 145) is apparently tied into the land grid system, and it does seem to locate the underground workings correctly to the date of the map. Neither map is up to date, and there are more underground workings than are shown. Doubtless the pillars were pulled and all the commercial coal mined.

The lease was relinquished on December 16, 1943, and the government approved the relinquishment on December 19, 1947. Production from lease SF 053627 was 42,343 tons. Production from permit SF 072176 was 1,509 tons. Production on fee lands through March 1941 was 2,105 tons. The major portion of the total production was sold to the Denver Rio Grande and Western Railroad. Part of the production was shipped to small towns along its track for domestic use.

Kern mine

SF 076644 **5-13-42** **Permit**
4-30-51 **Lease**

Lloyd H. Kern, Albuquerque
James L. Simmons, Regina
$NW1/4NE^{1}/4$, $NE1/4N^{W}1/4$ sec. 21, T25N,
800 ft NL, 2,200 ft EL

The Kern mine is 1.5 mi east and 1 mi north of Llaves on National Forest lands. In May 1942 Mr. Kern started to drive an entry alongside an old prospect drift that was 70 ft long. He proceeded to develop the prospect, and he made an

application for a preference right lease on May 10, 1944. An unfavorable report by R. H. Allport, District Mining Supervisor, on May 23, 1944, resulted in rejection of the lease on May 7, 1945. The surface facilities constructed at the mine are shown in Figures 146 and 147.

Mr. Kern appealed to the Secretary of the Interior and stated that he would compile the production records and make the necessary payment and that he believed the work accomplished justified the issuance of the lease. He also thought it very unfair that an unfavorable report had been made because the temporary road was in such bad shape that Mr. Allport had gotten the government car stuck and stated that under these conditions the local area could hardly be supplied with coal. Mr. Kern also said that a new road was planned if the lease was assured. The government representatives relented. By 1948 the delinquent accounts were collected, the rent was paid, and the lease was issued on April 30, 1951.

Mr. Kern's mine contained a bed of clean coal 5 ft thick. The bed dipped about 25-30° to the northwest. Analysis of the coal by the University of New Mexico in August 1950 showed the following:

Moisture	8.92%
Ash	4.37%
Volatile matter	41.55%
Fixed carbon	45.16%
Sulphur	0.61%
BTU	12,450

Mr. Kern continued to operate the mine to supply the local coal needs until December 2, 1956, when he sold the mine and equipment to James L. Simmons; the BLM approved the assignment January 29, 1958.

Mr. Simmons added a short-wall cutter that was powered by a Diesel generating unit, and he improved the mine. He continued to operate until early 1957, after which no production was reported until the fourth quarter of 1959. On January 15, 1960, the miner who operated the mine died in bed of a heart attack. Mr. Simmons was unable to reopen the mine because he could not find another miner. The extent of the workings under both Mr. Kern and Mr. Simmons is shown on the mine map (Fig. 148). Production of the mine is estimated to have been 2,500 tons.

FIGURE 147—The main portal of the Kern mine. *Photo by R. H. Allport, June 14, 1946.*

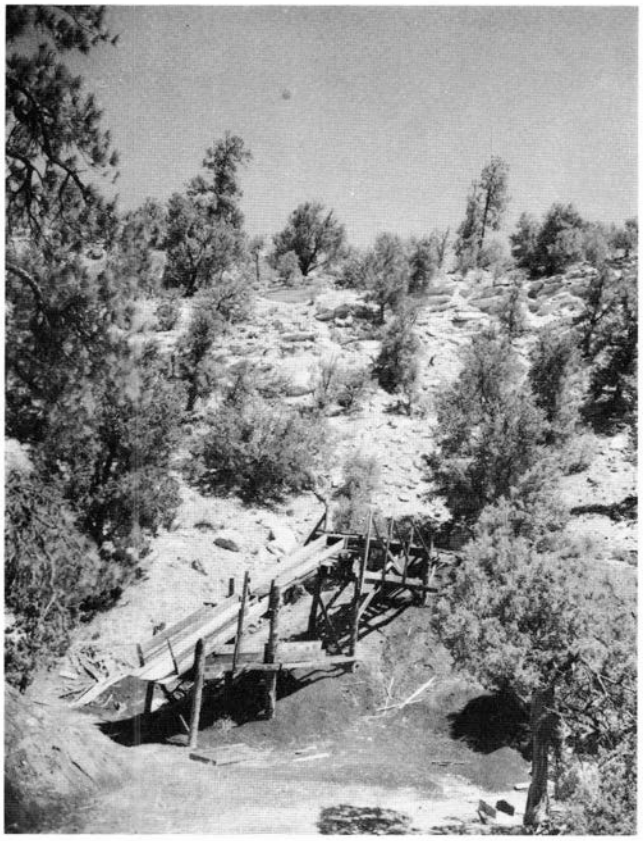


FIGURE 146—The crude tipple and chute at the Kern mine. *Photo by R. H. Allport, June 14, 1946.*

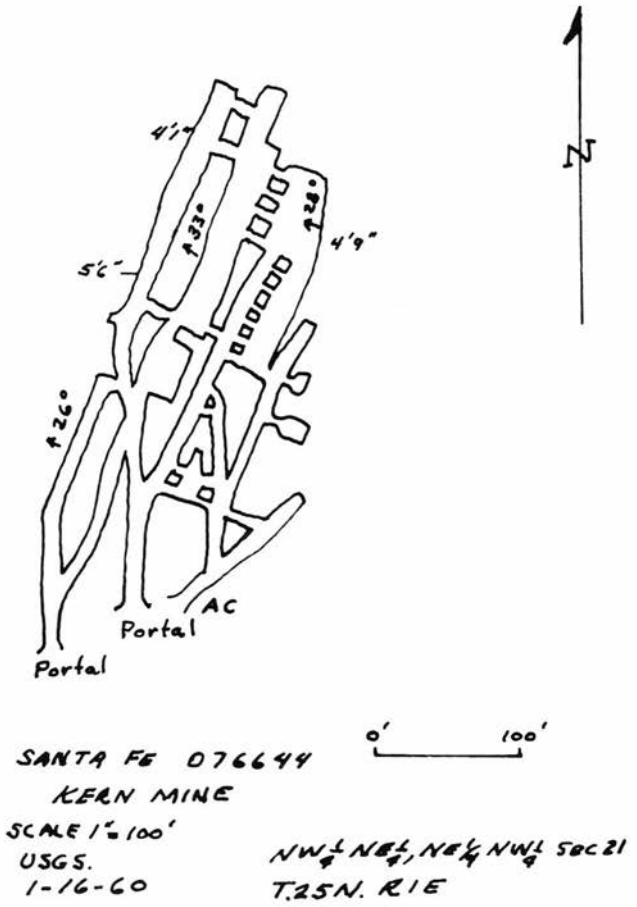


FIGURE 148—Map of the Kern mine.

Tierra Amarilla coal field

The history of coal mining in the Tierra Amarilla coal field was not well known and is not discussed in early literature. Few in number and small, the coal mines provided fuel only for domestic consumption in the local area. The extent and the geology of the coal field were not studied until the 1964-1967 field work of Edwin R. Landis and Carle H. Dane of the U.S. Geological Survey (Landis and Dane, 1969). Two coal beds of importance were found, both were thin and lenticular. The thicker bed was reported to be 4 ft thick at one location. An analysis of the coal shows it to contain 10,100 BTU, 7-10% ash, and 1% sulphur. This small coal field is on the east side of the San Juan Basin (Fig. 1).

The State Mine Inspector's annual report first mentions the Dandee mine in 1945. Landis and Dane (1969) reported that four coal mines were found during their investigation. Three—the Dandee, the White, and an unknown mine—are described herein; the field examiners for the Abandoned Mine Lands study in 1979 could not locate the other, and no information on it exists in the literature. It is believed that coal was probably mined sporadically from small mines before 1945 to provide fuel for local use.

The potential of this coal field for development of a mine of even 20,000-50,000 tons per year is poor, but there is no reason why a mine to provide fuel for local needs could not be opened with a limited amount of exploration. One possible site would be in the locality of the radio and microwave relay station 3 mi south of Tierra Amarilla, just off NM-84. There is a possibility that some small areas could be strip mined, but any operation undertaken at the present time would probably be uneconomical because of the many restrictions and high taxes imposed now.

Dandee mine

Mr. Herron, 1944-1949 Rafael Flores, 1949-1955 6 mi NL, 300 ft WL, Cebolla 15 min quadrangle on the Tierra Amarilla grant

According to information from the State Mine Inspector, a Mr. Herron began a mine in 1944 on land on the Tierra Amarilla grant. Two entries about 500 ft apart extended 600 ft along the bed. The entries bear N85°E and N40°E, respectively. The bed had 2 ft of coal on the bottom, 1 ft parting, and 1 ft of coal below a good sandstone roof. From two to four miners were employed, and the coal was sold locally.

In 1949 Rafael Torres, who had been the operator for Mr. Herron, took over the mine. He also opened a new mine across the gulch and about 200 yards from the first. Two entries, driven about 100 ft apart, bear S56°E. The mine ceased operation in 1955 because the workings had reached the limit of natural ventilation and there was a shortage of help (Landis and Dane, 1969, p. 13).

The U.S. Bureau of Mines sampled an 8-ton and a 2-ton lot on November 30, 1944. The analyses follow.

8 tons plus 1-inch lump, as received

Moisture	17.9%
Volatile matter	33.1%
Fixed carbon	41.3%
Ash	7.7%
Sulphur	1.0%
BTU	10,110

2 tons minus 1-inch slack, as received

Moisture	19.5%
Volatile matter	32.1%
Fixed carbon	39.1%
Ash	9.3%
Sulphur	1.1%
BTU	9,640

There is no record of production.

Unknown mine

6.3 mi NL, 3 mi EL, Tierra Amarilla 15 min quadrangle on the Tierra Amarilla grant

This small mine is located near the top of the high bluff 3 mi south of Tierra Amarilla and just east of NM-84. The lower of two beds of coal, which measures 4 ft 1 inch thick (Landis and Dane, 1969, fig. 3), was opened by a single entry bearing N56°E. The coal was trammed or hoisted around the very edge of a 100-ft cliff to a flat area where it was screened and loaded into a truck or wagon. The upper bed of coal crops out on the top of the bluff.

White mine

Guy White, 1935
7.7 mi NL, 2.33 mi EL, Tierra Amarilla 15-min quadrangle on the Tierra Amarilla grant

According to sketchy records, Guy White was operating a coal mine on the Tierra Amarilla grant in 1935. It is believed that the location given above is for the White mine. It was opened on the lower and upper coal beds in the Menefee Formation, near the top of the ridge east of NM-84, 4 mi south of Tierra Amarilla. Two entries were developed on the lower bed about 30 ft apart bearing N45°E. The coal was dumped into a chute or bin. The upper coal bed was also developed by two entries about 30 ft apart, and the coal from it was trammed down an incline to a bin at the bottom of the hill. The coal was screened, and the minus material is still in piles at the foot of the hill. This property was larger than a prospect and undoubtedly supplied domestic coal locally for several years.

A cross section of the coal beds at the mine showed 7 inches of dirty coal, 1 ft 2 inches of coal, 1 ft of shale, and 11 inches of coal in the upper bed and 2 ft 7 inches of coal in the lower bed (Landis and Dane, 1969, figs. 2 and 3).

La Ventana coal field

Shomaker et al. (1971, p. 94) located the La Ventana coal field in the following way:

> The La Ventana Field is defined to include the coal-bearing rocks of the Upper Cretaceous Mesaverde Group in the southeast corner of the San Juan Basin, from the west line of R. 2 W. northeastward to the vicinity of Cuba. . . .

The first coal mines in the La Ventana field, the Senorita the San Pablo, and the San Miguel, were developed from 1884 to 1900 to provide fuel for several metal mines and smelters located along the mineral belt adjacent to the Nacimiento fault southeast of Cuba. The Señorito and the San Pablo mines were along the steep-dipping beds just west of the Nacimiento fault in secs. 11 and 23, T2ON, R1W. The San Miguel mine was in sec. 33 of the same township. When the metal mines and smelters closed, the coal mines also closed. Figure 1 will aid the reader in locating this field in relation to the other coal fields in the San Juan Basin.

With coal no longer needed for the hard-rock operations, interest in it did not revive until construction of a rail line from Bernalillo to Cuba was planned. Boatright (1966, p. 11) reported the following:

> On August 16,1920 the Santa Fe Northwestern Railroad Company was organized to construct a line from Bernalillo, New Mexico to La Ventana, New Mexico, a distance of 55 miles. The road was built to Porter, New Mexico only, a distance of 41 miles. Later the White Pine Lumber Company constructed a line from Porter to Deer Creek, 6 miles, and leased it to the Santa Fe Northwestern Railroad.
>
> On August 11, 1923 the Santa Fe Northern Railroad was organized and was to build a line from San Ysidro, New Mexico, where it was to connect with the Santa Fe Northwestern, to Cuba, New Mexico, a distance of 44 miles. This line was only built to a point two miles north of Tilden, New Mexico *[writer's note: Tilden was a depot and townsite 3 mi north of La Ventana]*, a distance of 33 miles. This company finally went into bankruptcy and was sold under court order on September 5, 1928. On December 19, 1928 the Santa Fe, San Juan and Northern Railroad Company was organized to take over the Santa Fe Northern, and was to complete the line to Cuba.
>
> The Santa Fe Northwestern operated at a loss over the years and on February 8, 1933 applied to the Reconstruction Finance Corporation for a loan of $228,824 to rehabilitate the line. On April 4, 1933 the Santa Fe, San Juan and Northern also applied to the R. F. C. for a loan of $50,000. Both of these loans were denied. The Santa Fe, San Juan and Northern was abandoned and dismantled in the late 1930's, and the Santa Fe Northwestern was torn up in 1941.

In 1922 and 1923, when the future of the railroads appeared propitious, a group of 11 people became interested in the La Ventana area and made application with the General Land Office for individual coal prospecting permits over a large area. F. S. Donnell of Albuquerque was in charge of finding coal on the permit lands for the applicants. As a result of his efforts, the San Juan Coal and Coke Company mine was developed. The Wilkins mine, the Sandoval mine, the Anderson—Sackett mine, the Kistler mine, the White Ash mine, and several other mines or prospects were also developed.

The fortunes of these mines were, of course, intertwined with those of the railroad, and for a time satisfactory progress was made. A spur line was constructed to the San Juan mine and was extended to the Anderson mine by early 1931. Another spur was built to the White Ash mine, and a few cars of coal were shipped by rail from the Sandoval mine. Practically all of the mines were closed by May of 1931 because the railroad had ceased serving them. Washouts hampered the operation of the railroad, and capital for it was almost nonexistent. After the railroad failed, the mining of coal was limited to needs of the local area. The last of the small operations closed in 1969.

In 1964, Consolidation Coal Company made application for coal prospecting permits on lands about 9 mi south of Cuba. By 1967 leases had been obtained for a block of land containing one bed of coal that reached a maximum thickness of 16 ft, which could be developed by underground methods. Economics and the lack of rail transportation hindered development. In 1976 Consolidation Coal Company sold the leases to Ideal Basic Industries, Inc., and that company planned to open a mine to furnish coal to its Tijeras Canyon cement plant. The mine plans were in the process of being approved in June 1980, but the mine has not been developed yet.

Señorito mine

Operator and date **unknown**
2,900 ft NL, 3,900 **ft EL, sec. 11, T2ON, R1W**

The Señorito is an old mine that was opened for fuel by the operator of a metal mine and smelter located nearby. The coal bed is about vertical in this area because of the influence of the Nacimiento fault. Therefore, the workings were probably begun by a slope driven down the bed because that was one way to attain depth and a minable reserve over the opening. The coal bed appears to be at least 6 ft thick.

Señorito was a small village established first as a trading point and then in 1893 as a mining camp. A post office operated there from 1901 to 1924 (Pearce, 1975, p. 153).

San Pablo mine

Operator and date unknown
3,400 ft NL, 3,400 ft EL, sec. 23, T2ON, R1W

The San Pablo is an old mine that was begun to supply fuel to local metal mines, probably during the 1880's-1890's. The mine was opened with a slope down the strike of a bed of coal 7.5 ft thick that bears S30°W and dips 75° to the west.

W. R. Reid prospect

SF 052926 **4-23-27** **Lease**
W. R. Reid, Albuquerque
Sec. 32 and W1/2NW1/4 sec. 34, **T2ON, R1W**

W. R. Reid of Albuquerque was issued a lease on April 23, 1927, on the above land. He did no work, and the lease was cancelled in 1932.

San Miguel-Padilla mine

Mr. Pope, 1917
SF 077779 **5-1-49** **Lease**
Florentino Padilla, Cuba
$SW^1/4NE^1/4$ sec. 33, T2ON, R1W, 1,800 ft **NL,**
1,600 ft EL **(SP-1, Fig. 149)**

The mine is 7 mi south of Cuba just west of the old highway from Albuquerque to Cuba (NM-44). It was orig-

inally opened by a Mr. Pope who supplied coal to a smelter then in operation on the NE1/4NW1/4 sec. 3, T19W, R1W. The smelter was later dismantled and the coal mine closed.

C. C. Mather, Associate Mining Engineer, made a sketch of the mine, which showed an entry about 240 ft long, driven N45°W. A working 120 ft inby the portal was driven 190 ft N70°W. The coal bed was shown to be 8 ft 6 inches thick with the upper 2 ft 6 inches streaked with resin and of poor quality.

On March 14, 1945, Florentino Padilla of Cuba made application for a coal prospecting permit on the W1/2SE1/4 sec. 28 and W1/NE1/4 sec. 33, T2ON, R1W. The prospecting permit was rejected because the land was known to contain workable coal. Mr. Padilla then made a lease application for the permit area, but later amended his request to include only the SW1/4NE1/4 sec. 33. The sale, which had been advertised for the larger acreage, then had to be cancelled, reapproved, and readvertised. On January 11, 1949, the sale was held, and Mr. Padilla obtained the lease for the minimum bonus of $1.00 per acre. The lease was issued on May 1, 1949.

The lessee immediately began to open a portal and drive an entry about 50 ft east of the old San Miguel opening, which he planned to use for an aircourse (Fig. 150). By early fall he had driven the main entry 65 ft on a course of S45°W, begun construction of a tipple and chute, and built 1/8 mi of access road. The coal bed consisted of a sandstone roof, about 2.5 ft of top coal, which was left in the roof, and 8 ft 4 inches of coal that was being mined. The coal bed dipped 8°SW.

By 1950 Mr. Padilla had cleaned out the portal of the San Miguel mine and connected it to the old shaft so it could be used as an aircourse. At this time six miners and a top man were at the mine, and they produced about 25 tons per day in season. By 1952 seven rooms had been driven due south off the main entry, the pillars had been pulled between rooms 3 and 4 and 4 and 5, and the roof had caved to the surface (Fig. 151).

On June 3, 1952, Mr. Padilla noticed smoke coming from the mine. The New Mexico State Mine Inspectors and the U.S. Bureau of Mines (USBM) were notified. They proceeded to use rescue equipment to determine the location of the fire and found that it was burning within the cave between rooms 3 and 4 (Fig. 150). The room had caved to the surface, allowing water to mix with the 2.5 ft of top coal left in the roof, and spontaneous combustion had created the fire. The mine portals were sealed on June 6, and the mine was closed.

Angelo Pais, Deputy State Inspector of Mines, and Carl Hallet of the USBM were the officials in charge of controlling the fire. Several recommendations were made to prevent fires in the La Ventana coal beds: that the pillars be kept of sufficient size to support the overlying beds during first mining; that the mine be well ventilated in compliance with state regulations; that open workings be inspected every three days; and that stopping built of fireproof material and fire doors at the portals be required.

At this juncture Mr. Padilla did not have a mine. It was evident that a new mine had to be opened, and by 1953 two slopes were started about 175 ft northwest of his first mine portal. The new mine was developed and worked without problems for a number of years. The old mine was reentered during early 1958, and it was found that the fire was out and that the mine could be entered and worked again; the state's permission to do so was granted on October 30, 1958. The old workings were in excellent shape. By early 1962 a large portion of the production was coming from robbing the pillars. The state had recommended that pillars not be pulled, but orders were never issued to cease removal. A new tipple was constructed at the portal of the San Miguel entry, and an undercutter was introduced into use. Most of the previous mining had been powered by a diesel engine-generator, which had required a lot of attention. On October 24, 1962, a new rectifier was delivered, and the power for its use came from the Rural Electrification Association line.

The coal from Mr. Padilla's mine was sold to local people

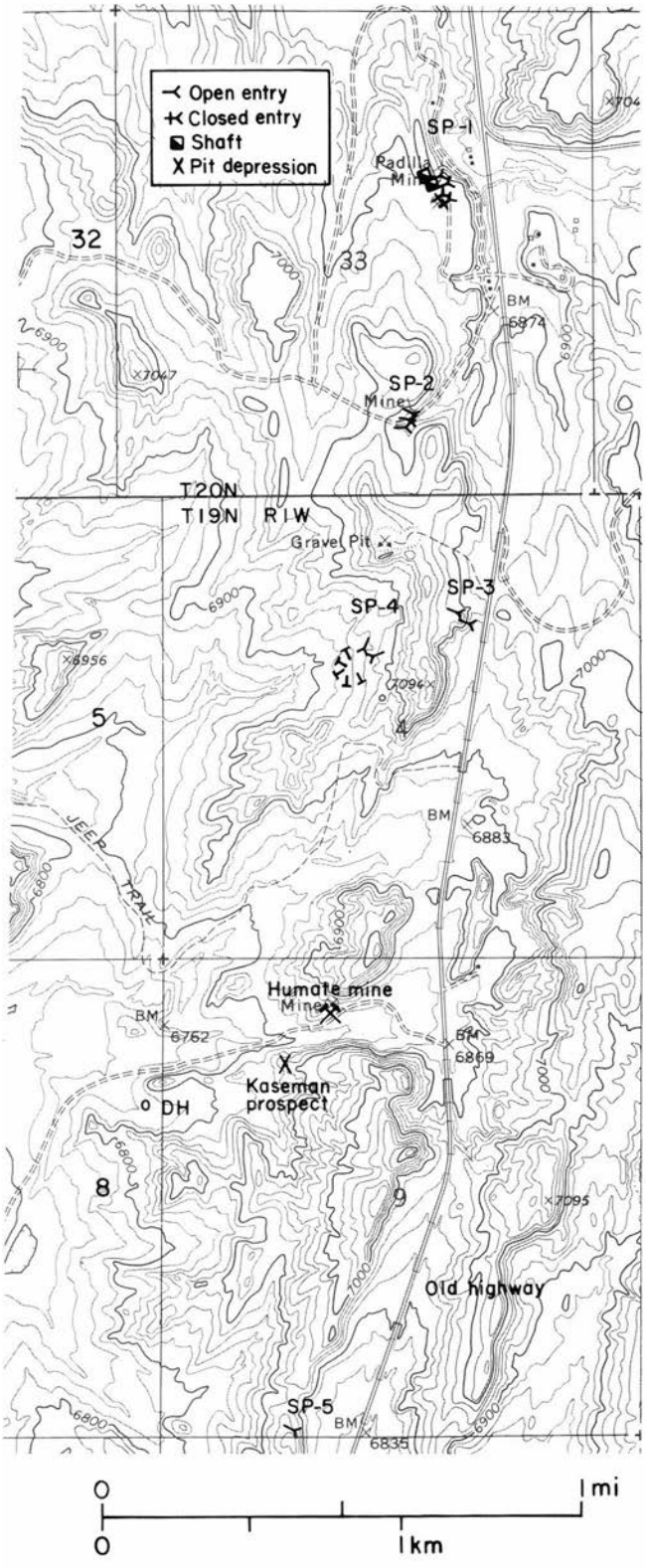


FIGURE 149—A few mines on the San Pablo 7½-min quadrangle.

SP–1—San Miguel–Padilla mine
SP–2—Sunny Slope mine
SP–3, 4—Kistler–Black Rose mine
SP–5—Easley prospect

for domestic use, and, because this trade stopped during the spring and summer months, the mine was not operated during the summer. By 1964, Mr. Padilla was developing rooms to the south off the old No. 1 Padilla main entry, and this area provided the coal until the mine was closed in April 1968 by the State Mine Inspector. The aircourse had caved shut, and roof conditions were deplorable. At that time Mr. Padilla decided that he could not provide the funds necessary to meet the state requirements for mine improvement. Therefore, he closed the San Miguel—Padilla mine and reopened the Sunny Slope mine, SF 075321, for a short time; he ceased all operations in the winter of 1969. The San Miguel—Padilla mine produced approximately 38,250 tons.

The lease is still in effect. Mr. Padilla has had several offers for the mine, but none have been approved.

FIGURE 150—Portal to the first mine of the San Miguel–Padilla mine, which was developed in 1949. *Photo by R. S. Fulton, August 12, 1949.*

Sunny Slope mine+

SF 075321 12-12-39 Lease
Alex **H.** McCrary and Fred S. Pearson, Albuquerque
Florentino Padilla, Cuba
W1/2SE1/4, SE1/4SW1/4 sec. 33, T2ON, R1W
4,400 ft NL, 2,000 ft EL (SP-2, Fig. 149)

The Sunny Slope mine is 7 mi south of Cuba, about 1,000 ft west of the old Albuquerque—Cuba highway (NM-44). Mr. McCrary and Mr. Pearson made an application in the General Land Office at Santa Fe for a prospecting permit on the SW1/4NE1/4 and W1/2SE1/4 sec. 33 on August 22, 1938. While waiting for the permit to be issued and under false information given them by an individual in the Land Office that they could begin prospecting, they drove a slope on the coal bed and exposed a bed 8.5 ft thick. While R. D. Reeder, Deputy Mining Supervisor, was inspecting other mines in the area, he looked at this land and found the applicants' slope, which had been driven in innocent trespass. The land had been included under lease SF 052740 previously issued to R. A. Kistler.

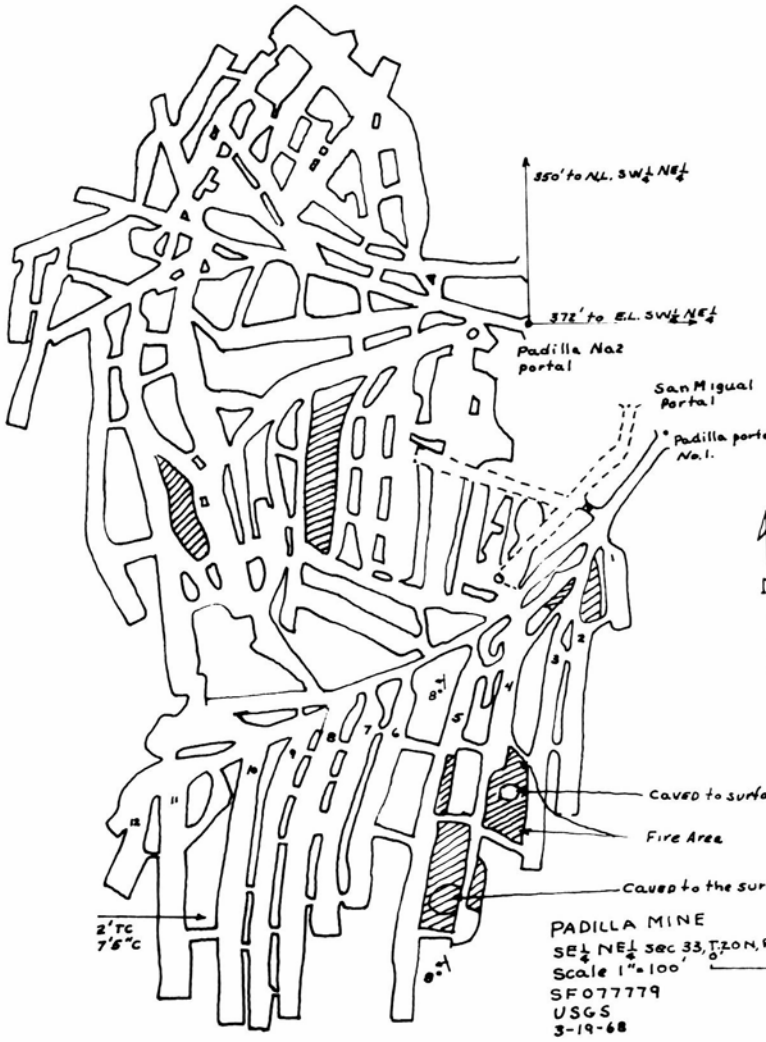


FIGURE 151—Padilla mine map, March 19, 1968.

Mr. Reeder had to recommend that the lands were leasable, and the permit was rejected. The applicants then applied for a lease on the same lands. The sale was held on July 25, 1939, and the applicants were awarded the lease, effective December 12, 1939, with no bonus offered. They were fortunate that no one else had bid because they would have had to overbid or lose all that they had already invested. A new tipple (Fig. 152) was part of their investment.

Mr. McCrary was a certified mine foreman and had operated the Hayes mine in sec. 10, T19N, R1W. He and his two sons were mining and building the surface facilities; Mr. Pearson had only a financial interest in the operation. By October 1938 the slope had been extended 80 ft from the portal on a course of N65°W on a dip of 12°, and by the time the lease was issued the mine was in good shape and fairly well developed.

By 1940, Mr. McCrary was working as a carpenter in Albuquerque and had hired Dan Kutz of Lumberton to manage the mine. Joe Yardis, who was certified as a mine foreman, and four miners were employed at the mine. Mr. Kutz left the mine by 1942, and Mr. Yardis was made foreman.

On September 11, 1941, the lease was modified to exclude the SW1/4NE1/4 and add instead the SE1/4SE1/4. A survey by the Cadastral Engineers of the Public Survey Office showed that the portal of the mine was in the SE1/4SE1/4 and the workings extended through this parcel into the SW1/4SE1/4. Later Mr. Reeder ran a Brunton survey and found the portal to be in the SW1/4SE1/4. Mr. Pearson assigned his interest in the lease to Mr. McCrary, and the changes in the land description were reflected in the new lease, which was issued in March of 1942.

Analyses of three coal tipple samples in 1942 showed the following:

	3/8" x 1"	1" x 2 1/2"	+ 2 1/2"
Moisture	16.6%	17.7%	18.3%
Volatile matter	33.9%	34.2%	33.9%
Fixed carbon	42.0%	42.5%	43.2%
Ash	7.5%	5.6%	4.6%
Sulphur	1.9%	1.4%	1.3%
BTU	10,200	10,340	10,390
Softening temperature of the ash	2,230° F	2,290° F	2,300° F

The coal bed remained about 8.5 ft thick with about 1-2 ft of bony and dirty coal at the top of the bed.

Mr. McCrary planned to operate the mine (Fig. 153) during the winter of 1942-1943, with his son trucking the coal to Albuquerque, but by December the mine had closed because his miners had been drafted into the Army. R. H. Allport, District Mining Supervisor, visited the property on August 28, 1943, and found the mine boarded up. By October 1944 the mine had been reopened, however, under an agreement with Western Coal Company of Albuquerque. A new and bigger tipple was being constructed, and an advance of several hundred feet had been made in the rooms.

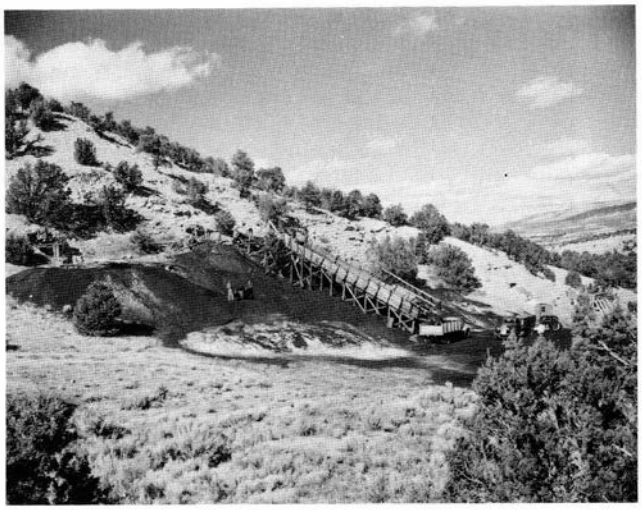


FIGURE 153—Mine portal and facilities at the Sunny Slope mine during the time that Mr. McCrary operated the mine. *Photo by R. H. Allport, October 30, 1942.*

By July 1945 the Western Coal Company had dropped their option to operate and purchase the mine, and Juan Lobato was operating the mine under a similar agreement. In July 1945 the tipple constructed by Western Coal Company (Fig. 154) burned down, after catching on fire from a burning slack pile stored too close to the structure. The fire also charred the first two sets of timber in the mine. Mr. Lobato rebuilt the tipple (Fig. 155). From April 1946 through 1947 a very small amount of production was reported. From 1949 to 1955 only 100 tons of coal were reported sold, but in February 1954 an agreement was made with Mr. Cardenas to operate with an option to purchase the mine. During 1952 and 1953 a new opening was started (Fig. 156).

Mr. Cardenas soon lost interest in the mine, and by October 1, 1955, Mr. McCrary had an approved assignment of the lease to Florentino Padilla of Cuba. Mr. Padilla mined a small amount of coal in 1956, but then closed the mine until the summer of 1968. At that time his mine on another

FIGURE 152—Tipple and chute at the Sunny Slope mine, which were built before the issuance of the lease. *Photo by R. D. Reeder, December 13, 1938.*

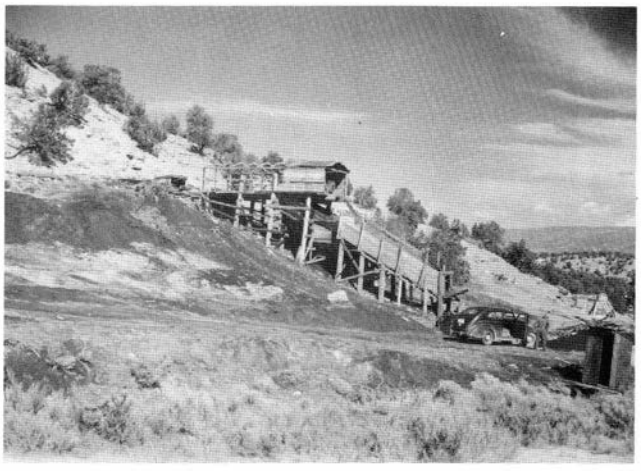


FIGURE 154—Tipple and chute constructed by Western Coal Company at the new portal of the Sunny Slope mine. *Photo by R. H. Allport, October 22, 1944.*

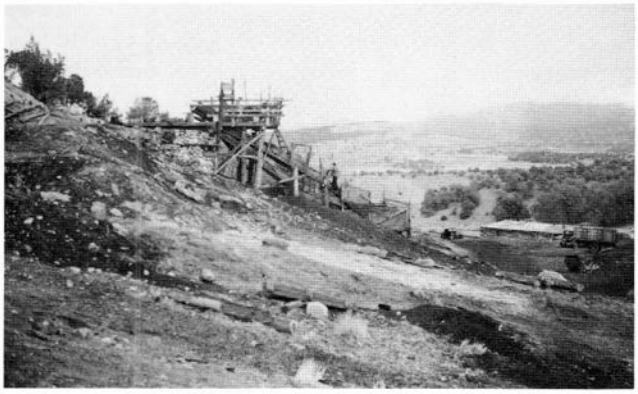


FIGURE 155—Mr. Lobato rebuilding the tipple of the Sunny Slope mine in November 1946, after the Western Coal Company tipple had been destroyed by fire. *Photo by R. H. Allport, November 5, 1946.*

lease, SF 077779, needed expensive work done on the aircourse, so he reopened the Sunny Slope mine. It then operated until the spring of 1969, and a small amount of coal was removed during the winter of 1969. Operations ceased at that time, and the mine has not been opened since. Mr. Padilla requested relinquishment of the lease in December 1970, but later withdrew the request and tried to sell the property. The lease was cancelled in 1979.

Production from the Sunny Slope mine to date is estimated to be 12,000 tons. Jacobo Garcia was killed by a fall of rock on October 31, 1947.

Kistler—Black Rose mine

SF 052740 **10-21-25** **Permit**
3-20-30 **Lease**

J. M. McDonald, Mountainair
R. A. Kistler, Albuquerque
Hugh F. Munn, Albuquerque
Nick Luciani, Albuquerque
Sec. 4, E1/2 sec. 5, T19N, R1W; E1/2 sec. **32, T2ON, R1W, 1,245.11 acres**
1,200 ft NL, 2,000 ft EL, sec. 4 **(SP-3 and 4, Fig. 149)**

Under the direction of G. A. Kaseman of Albuquerque a prospect was developed for J. M. McDonald on the NW1/4NE1/4 sec. 4, between La Ventana and Cuba. C. C. Mather, Assistant Mining Engineer, reported that by June 20, 1926, a slope 170 ft long had been driven on a bed of coal 9 ft thick, which dipped 12°.

The permit was assigned to R. A. Kistler on July 22, 1926. Mr. Kistler was a businessman in Albuquerque who was associated with the Kistler, Collister and Company Dry Goods Store at 301 W. Central Avenue. G. A. Kaseman, President of the Albuquerque National Trust and Saving Bank, managed the mine for Mr. Kistler (see pp. 76-77).

After the permit was assigned to Mr. Kistler, the work of developing the prospect ceased pending the extension of the Santa Fe Northern Railroad beyond Tilden to the mine site. This extension was never made, however, and the railway company, after being in the hands of a receiver, ceased operations in 1931. The depressed coal market also delayed opening the property for production.

Mr. Kistler applied for a preference right lease, and the government approved the lease on March 20, 1930. Development work began on November 28, 1935, under the direction of John James, a mining engineer. Two openings that were started in the alluvium and driven east intersected the coal bed at approximately 115 ft. The No. 1 portal was located 325 ft north and 115 ft west of the center of sec. 4 at an elevation of 7,045 ft, and the No. 2 portal was 600 ft

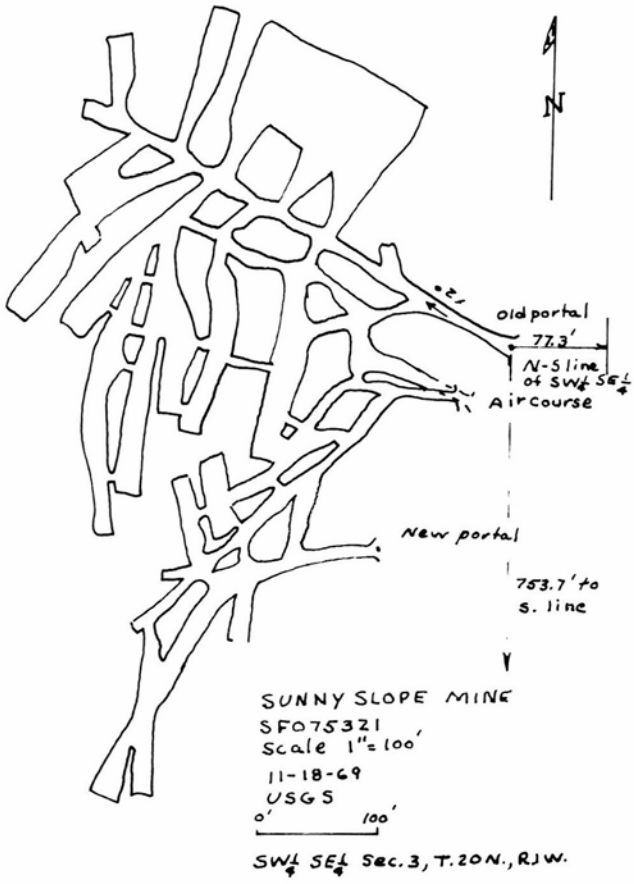


FIGURE 156—Map of the Sunny Slope mine.

north and 300 ft west of the center of sec. 4 at an elevation of 7,015 ft. The No. 2 entry was driven 130 ft before unburned coal was intersected. The coal bed was 9.5 ft thick, contained clean coal, and dipped 12°N62°W.

During 1936 R. A. Kistler committed suicide, probably because of his ill health and the fact that his wife was in a sanitarium. The Albuquerque National Trust and Saving Bank was executor of the Kistler estate, and E. C. Iden was attorney for the estate. Mr. Kaseman and associates worked out an agreement with the executor of the estate to acquire the lease and operate the mine.

The mine continued to be developed underground, and tipples were built (Fig. 157). The mine produced a good lump coal initially, but the coal soon slacked. This charac-

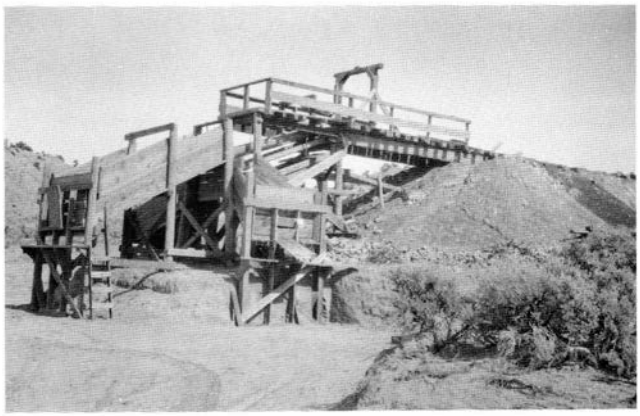


FIGURE 157—Tipple, chute, and bins at the Kistler–Black Rose mine, which were constructed off the main portal by John James. *Photo by F. W. Calhoun, October 18, 1936.*

teristic lowered its value as domestic coal and caused an understandable reluctance on the part of the operators to expend additional money for development of the mine.

It might be noted here that the case file of the Kistler—Black Rose mine contained information on the Albuquerque coal market. It is included here for general interest.

G. A. Kaseman, who was also a jobber for domestic and steam coals in Albuquerque, was requested by R. D. Reeder, Deputy Mining Supervisor, to give his estimate of the coal consumed in that city during 1936. Mr. Kaseman estimated that the following tonnages (for domestic use) were within 5%:

From Gallup via rail	6,172 tons
From Colorado, Raton, Carthage, and other miscellaneous places, via rail	1,317 tons
From Cerrillos	16,513 tons
From Gallup, Hagan, and La Ventana via truck	6,000 tons
Anthracite via rail from Cerrillos	7,756 tons
Amount of coal used at railway shops in Albuquerque for power not known, but coal was acquired from Cerrillos	unknown
Total	37,758 tons

On June 24, 1938, Mr. Kaseman was killed in the Monument oil field by a premature explosion of nitroglycerine. The lease was then assigned to Hugh F. Munn of Albuquerque on October 14, 1938, but no mining was done during his tenure of the lease. Mr. James was still in charge of the mine for the lessee.

The mining and development work ceased in June 1938. During that month 15 tons of coal were stolen from the mine cars, which had been parked in the mine. By late 1942 the rails had been removed from the mine and the tipple had been partially removed in preparation for closure. Early in 1943 a Mr. Munn inquired about the procedure required to seal the mine before relinquishing the lease.

On February 22, 1944, the lease, for 1,085.11 acres, was assigned to Nick Luciani. He named the mine Black Rose. Mr. Luciani reopened the old J. M. McDonald working, which had been dug before 1931, constructed a small tipple, and was producing some clean-up coal by the early part of 1946. By late 1946 a new tipple was being constructed (Fig. 158), two rock entries were being opened near the main portal, which had been driven by Mr. James, and a small chain shortwall machine (cutter) had been purchased. The plans were to install a generator to provide power to the undercutter. By the middle of 1949, however, the underground work had been discontinued, and all of the production was coming from an open pit (Fig. 159). The coal was loaded in pit cars and taken through the mine to the tipple. Approximately 40 tons per day were mined from the pit.

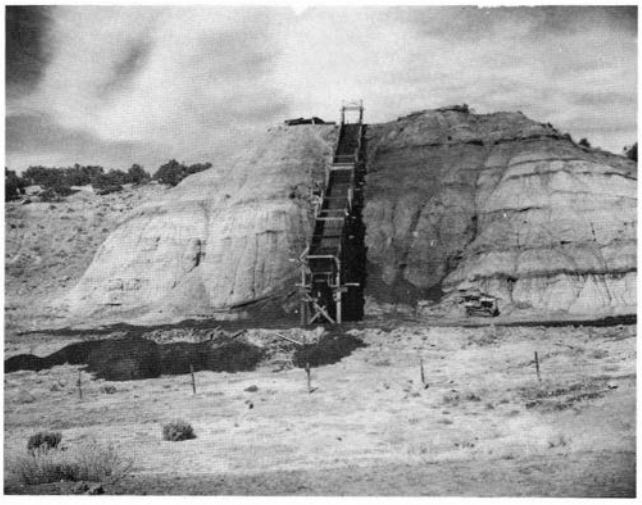


FIGURE 158—Chute and storage bin at the Kistler–Black Rose mine, which were constructed by Nick Luciani. *Photo by R. S. Fulton, April 17, 1948; taken from the old main highway to Cuba (NM–44).*

FIGURE 159—The abandoned strip pit mined by Nick Luciani at the Kistler–Black Rose mine. *Photo by R. S. Fulton, July 29, 1953.*

By the fall of 1950, work in the pit had been discontinued, and Mr. Luciani was again mining coal from the underground workings; his son Attelio was in charge of operating the property. Four employees were producing about 15 tons per day.

On January 27, 1953, Robert Fulton, Mining Engineer, examined the property and found that all the equipment and fixtures had been removed and sold to satisfy a mortgage held by an Albuquerque bank.

As of March 20, 1953, Mr. Luciani owed the government $13,355. He was very lax about keeping production records. The government engineers were unable to see his records because he would give the excuse that the records were in the hands of his lawyer. The engineers then usually had to measure the mine and calculate the production from the amount removed from the mine. The minimum production requirement was far too much for Mr. Luciani to mine each year, but he would not reduce his acreage or apply for relief. The mine was small, but the lease contained 1,085 acres. The rent was a dollar per acre, which exceeded the royalty on the production. Rent was credited to the royalty on the coal produced.

The Bureau of Land Management (BLM) demanded payment of the indebtedness. Mr. Luciani appealed because royalty was charged against slack coal that had burned, but his appeal was rejected. The bonding company submitted the full amount of the bond for his indebtedness. The lease was forfeited by decree of the United States District Court for the District of New Mexico, entered December 30, 1955. It was determined that Mr. Luciani had no assets. The mine produced 19,733 tons of coal under lease SF 052740.

Black Rose—Garcia mine

NM 023823 1-1-58 Lease
John A. Garcia, Albuquerque
Andrew D. Kelley, Sr., Albuquerque
SW1/4NE1/4, NW1/4SE1/4, NE1/4SW1/4, SE1/4NW1/4 sec. 4, T19N, R1W (Fig. 149)

On March 2, 1956, Mr. John A. Garcia filed for a lease on lands previously covered by lease SF 052740, the Kistler—Black Rose mine, which had been most recently operated

by Nick Luciani. The competitive lease sale was held on July 5, 1957, at Santa Fe, and the successful bidders, at $1.00 per acre, were Andrew D. Kelley, Sr., and John A. Garcia. The lease was issued on January 1, 1958, to Mr. Kelley; Mr. Garcia had withdrawn as a party of the lease effective October 31, 1957 because he took the New Mexico State Mine Inspector's job. No work was done on the property, and the lease was relinquished as of April 25, 1966; the relinquishment was approved on June 8, 1966.

Black Rose-Elena mine

NM 0732 **2-1-67** **Lease**
Elena Mining Corporation, Santa Fe
SW1/4NE1/4, SE1/4NW1/4, NE1/4SW1/4, NW1/4SE1/4 sec.4, T19N, R1W **(Fig. 149)**

The lease is on land between La Ventana and Cuba where the Kistler-Black Rose mine was opened originally under lease SF 052740. That lease was cancelled by court action on December 30, 1955, and lease NM 023823 was later obtained for the above-listed land by Andrew D. Kelley, Sr., and John A. Garcia. The latter lease was cancelled on April 25, 1966.

On October 10, 1966, the Elena Mining Corporation filed an application for the land and was awarded a lease by sealed competitive bid for $1.25 per acre on December 22, 1966; there were no other bids. The lease was issued effective February 1, 1967. The Elena Mining Corporation wanted the coal for fuel for an anticipated copper mine and leaching development in the immediate vicinity. Production of approximately four to 10 tons of coal per day was anticipated, and it was scheduled to begin by the summer of 1967. **D.** M. Linney was vice president of the corporation and managed its operations. The Harms Engineering Company was hired to develop the copper claims, the leaching plant, and the coal mine.

By May of 1967 some road work had been done, and 52 tons of coal had been mined from the strip pit on the coal lease. However, by September of 1967 all operations had ceased, and the Elena Mining Corporation had left the area. It was reported that the corporation had been put in the hands of a receiver and that its assets had been taken over by Vance M. Thompson, President. In March 1969 Mr. Thompson was killed in an automobile accident. Because the coal lease had never been assigned to him, there was a question about responsibility for the rent, and considerable correspondence was involved in an attempt to collect the rent on the lease each year. Garth Black eventually gained administrative control of the unassigned lease. On January 31, 1978, the Bureau of Land Management approved Mr. Black's assignment of the lease to Lee Western, Inc. Lee Western, Inc., then assigned the lease to Mrs. J. L. Roller, who assigned it to the Ametex Corporation, which now holds lease NM 0732. Recorded production of coal under lease NM 0732 totals 52 tons.

Kaseman prospect

SF 048403 **3-11-25** Prospecting permit
Marguerite B. Kaseman, Albuquerque
Parts of secs. 5, 6, 8, 9, 17, and 20, T19N, R1W, 2,388 acres

The work undertaken by Mrs. Kaseman under her permit consisted of one entry 43 ft long and one churn drill hole. She also contracted with W. B. Emery and Leo Horton, Geologists, and C. B. Corey, Mining Engineer, for a geologic evaluation and recommendations; their reports were not very favorable.

The entry was driven along a 3-ft 9-inch bed of coal located near the SW corner of the NE1/4NW1/4 sec. 9. The churn drill hole, located approximately 1,600 ft from the north line and 200 ft from the east line of sec. 8, T19N, R1W, intersected 7 ft 3 inches of coal with a 2-inch shale parting at 140 ft. The coal bed contained water of poor quality, which raised in the hole to 108 ft. The detailed log of this drill hole, which was completed August 21, 1926, is shown below.

0'-51'	Shale
51'-63'	Sandstone
63'-96'	Shale (96 ft of casing in the well)
96'-140'	Sandstone
140'-147'	Coal (7' 3" coal, 2" shale, water)
147'-159'	Shale, thin coal seams
159'-172'	Sandstone
172'-177'	Shale
177'-182'	Sandstone
182'-194'	Shale
194'-200'	Sandstone

Before the expiration of prospecting permit SF 048403, Mrs. Kaseman applied for a preference right lease for the entire permit lands. The application was denied, but she was informed that she could reapply and obtain a preference right lease on only the NE1/4 sec. 8 and NW1/4 sec. 9, or she could substitute a new application for a prospecting permit on the entire area. An appeal from Mrs. Kaseman concerning these terms was rejected by the Assistant Secretary of the Interior, and no further action was taken by Mrs. Kaseman.

Easley prospect

SF 057842 **2-28-29** **Permit**
M. B. Easley, Albuquerque
Sec. 8 and parts of secs. 5, 6, 9, 17, 20, T19N, R1W, 2,348 acres
2,500 ft NL, 4,700 ft EL, sec. 20 **(LV-3, Fig. 160)**
5,100 ft NL, 3,800 ft EL, sec. 9 **(SP-5, Fig. 149)**

The permit lands were 3 mi north of La Ventana. According to an inspection report on October 21, 1931, by C. C. Mather, Associate Mining Engineer, Mr. Easley drove a prospect drift at location LV-3 (Fig. 160) for a distance of 120 ft in ashes on a bed of coal 4 ft thick. A small shaft was sunk in this drift, and a second bed of coal 4 ft 2 inches thick was found unburned. It was about 5 ft between the beds.

Another opening (SP-5, Fig. 149) was driven 275 ft as a slope along a bed of coal that measured 8 ft thick and dipped 15° to the north. No coal was sold because the location was rather inaccessible.

Mr. Easley reported that four churn drill holes were drilled during April, May, and June of 1930. He gave the following information obtained by the exploration drilling: Hole No. 1 was drilled to locate a fault. It was drilled near the outcrop, and 4 ft of coal were cut at 15 ft, and a lower bed of 4 ft was intersected at 24 ft. The coal was crop coal. The location of the hole was 1,220 ft S18° 40 ft E from the NW corner of sec. 20. Total depth of drilling was 50 ft.

Hole No. 2 was drilled 1,080 ft S20° 30 ft E of the NW corner of sec. 20. Two beds of coal were cut, the first 5 ft thick at 74 ft and the second 4 ft thick at 83 ft. The hole bottomed at 100 ft.

Hole No. 3 was drilled 70 ft S54°E of the W1/4 corner of sec. 16. One coal bed 6 ft thick was cut at 94 ft. Total depth of drilling was 120 ft.

Hole No. 4 was located 193 ft N49°W from the SE corner of sec. 8. The test encountered poor ground conditions and had to be cased but cut only one 2-ft bed of coal at 196 ft. The hole bottomed at 340 ft.

The permit expired by law on February 28, 1933. There was no production from the prospect.

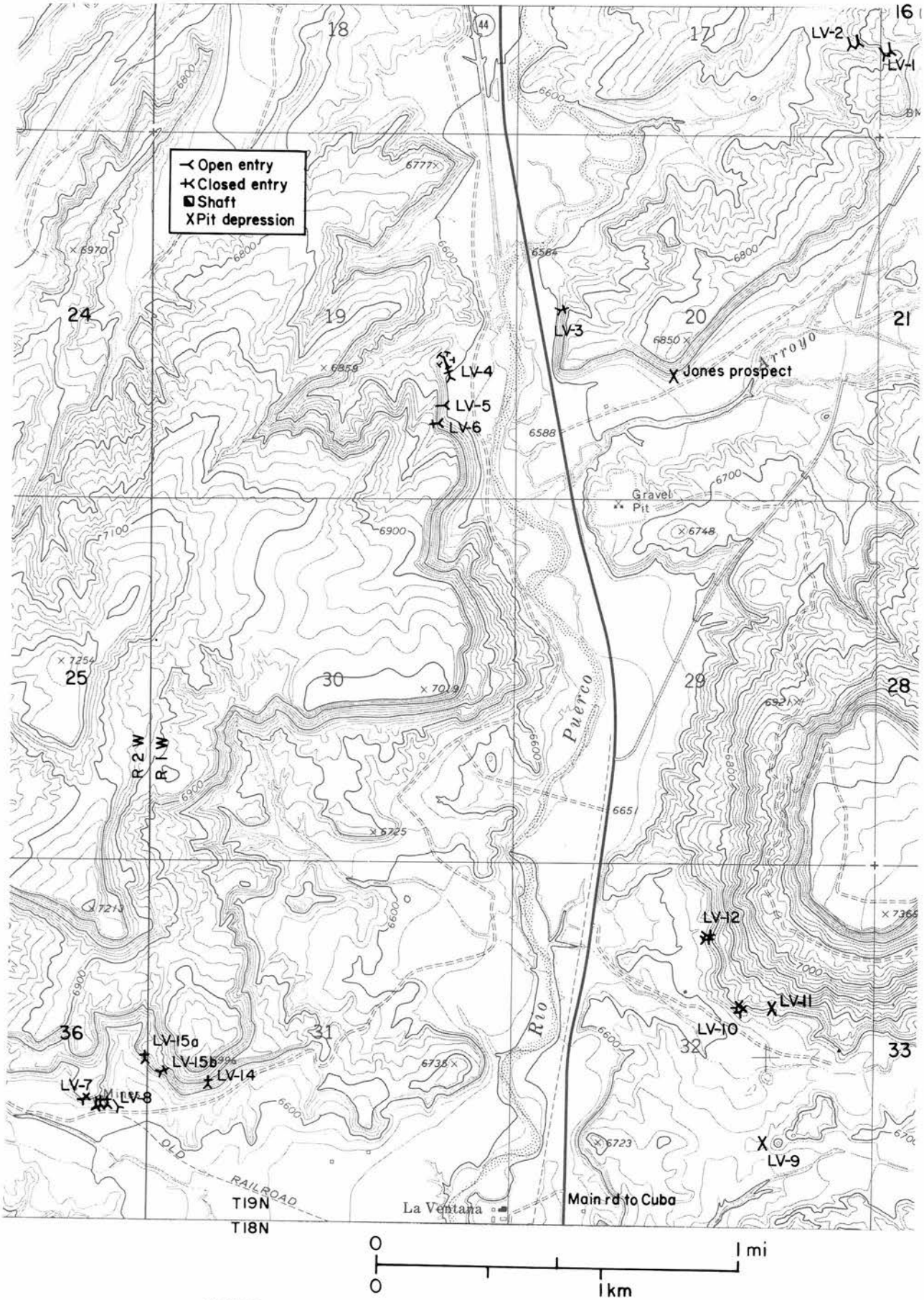


FIGURE 160—Some of the mines on the La Ventana 7½-min quadrangle.

LV–1—McDonald and Hayes mines
LV–2—Weil prospect
LV–3—Easley prospect
LV–4—Sandoval–Weil mine and Carlisle mine
LV–5—Sandoval Coal Company prospect
LV–6—Sandoval Coal Company prospect
LV–7—Peacock No. 1 mine
LV–8—Peacock No. 2 mine
LV–9—Humate mine
LV–10—White Ash mine
LV–11—White Ash prospect
LV–12—Sanders–Yardas mine
LV–13—Jones prospect
LV–14—San Juan mine
LV–15a—Peacock No. 4 mine
LV–15b—Peacock No. 3 mine

Carlisle prospect

SF 066628 **6-20-33** **Permit**
Montie Carlisle
W1/2 sec. 20, T19N, R1W, 320 acres **(Fig. 160)**

The permit land is about 2.5 mi north of La Ventana, within 20 ft of the highway to Cuba. Mr. Carlisle dug a trench about 5 x 25 ft, 10 ft deep, and about 50 ft north of it a slope was driven north for 158 ft on a 50% grade. The prospects were located near the SE corner of the SW1/4NW1/4 of sec. 20. The Carlisle mine, SF 065023, was on adjoining sec. 19. The coal bed on the permit land was reported to be 2 ft thick, but not of commercial quality because it was too soft; no coal was sold. The permit expired on June 20, 1937. There was no record of proper abandonment.

McDonald and Hayes mines

SF 075322 **5-2-39** **Permit**
J. M. McDonald, Albuquerque
E1/2 **sec. 17, T19N, R1W**
4,100 ft SL, 5,100 ft EL, sec. 16 **(LV-1, Fig. 160)**

The permit area is 3 mi northeast of La Ventana. The E1/2 of sec. 17 has been covered by five previous coal permits, but the only permittee who did any work was Sidney M. Weil (SF 042718 issued February 21, 1924; LV-2, Fig. 160). His work did not prove the existence of an economic coal bed.

Mr. McDonald opened a slope in the SW1/4SW1/4 of sec. 16 immediately west of the abandoned Hayes mine on state land. The location of the portal and the extent of the mines are shown on Figures 161 and 162. At the time of Mr. McDonald's operation, George Gardenas was in charge; he was paid $1.50 per ton for each ton sold.

R. D. Reeder, Acting District Mining Supervisor, measured a coal section at the face of the slope at 117 ft inby the portal as follows:

Shale	Roof
Coal	3' 2 1/2"
Bone	1/2"
Coal	2' 7 1/2"
Shale	Floor

An analysis taken of + 1-inch lump coal from the tipple on May 7, 1941 by H. Fowler of the U.S. Bureau of Mines showed the following:

FIGURE 161—The McDonald and Hayes mine portals and surface facilities. The Hayes mine portal is on the left. *Photo by R. H. Allport, October 28, 1942.*

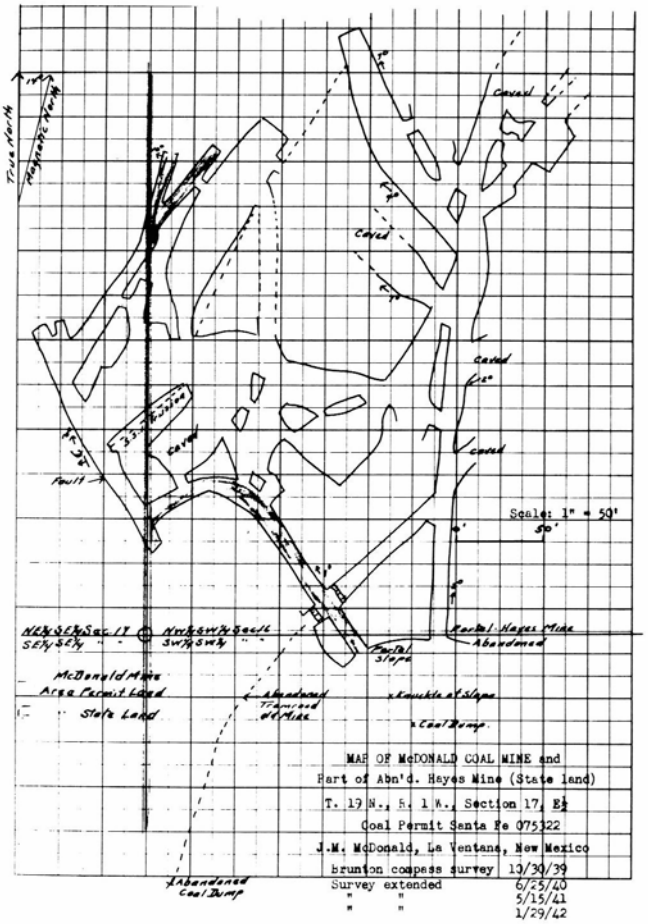


FIGURE 162—Map of the McDonald mine and part of the abandoned Hayes mine. *Made by engineers of the Mining Supervisor's office.*

Moisture	19.2%
Volatile matter	33.3%
Fixed carbon	42.8%
Ash	4.7%
Sulphur	0.6%
BTU	10,270
Softening temperature of the ash	2,470° F

Because of the difficulty of obtaining miners during WWII Mr. McDonald did not apply for a lease or a new permit. The original permit produced 442 tons of coal, but there are no records of any production from the Hayes mine on state land.

Jones prospect

SF 074624 10-14-37 **Permit**
Paul L. Jones, Albuquerque
W1/2 sec. 20, T19N, R1W
3,500 ft NL, 3,000 ft EL **(LV-13, Fig. 160)**

Mr. Jones started a prospect slope on the south side of a hill east of the Rio Puerco and 100 ft north of the Arroyo Pinos, on the NE1/4SW1/4 sec. 20. The 21-ft entry was driven N10°W on a coal bed dipping 12° northerly. R. D. Reeder, Deputy Mining Supervisor, measured the coal section at the face of the prospect slope on November 15, 1937, as follows:

Shale	Roof
Coal	6 1/2'
Soft shale coal	2"
Coal	8"

Sandy shale	10"
Coal	2' 10"
Shale	Floor

No more work was done on the property, and there was no production.

Ideal Basic Industries, Inc. (La Ventana project)

NM 0510466 **5-1-64** **Permit**
7-1-67 **Lease**
W1/2E1/2, W1/2 sec. 28; lots 1, 2, 6, 7, 8, 9, 10, E1/2E1/2, SW1/4NE1/4, SW1/4SE1/4 sec. 29; lots 3, 4, 7, 9, 10, SE1/4NW1/4, NE1/4SW1/4, NE1/4NW1/4 sec. 30; lots 1, 2, 3, S1/2NE1/4, SE1/4 sec. 31; N1/2, N1/2SW1/4, SW1/4SW1/4 **sec. 32, T2ON, R1W, 1,998.14 acres**

NM 0510467 **5-1-64** **Permit**
7-1-67 **Lease**
Lots 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, W1/2 sec. 18, T19N, R1W Lots 1, 2, 3, 4, 5, 6, 7, SW1/4NE1/4, S1/2NW1/4, SW1/4, W1/2SE1/4 **sec. 1; lots 1, 2, 3, 4, W1/2E1/2, W1/2 sec. 12; lots 1, 2, 3, 4, W1/2E1/2, W1/2 sec. 13, T19N, R2W, 2,432.94 acres**

NM 0510468 **5-1-64** **Permit**
7-1-67 **Lease**
Lots 1, 2, 3, 4, S1/2N1/2, S1/2 sec. 6; lots 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, E1/2NE1/4, NE1/4NW1/4, W1/2W1/2, SE1/4SW1/4 sec. 7; W1/2NW1/4, SE1/4NW1/4, SE1/4 sec. 8, T19N, R1W
Lots 1, 2, 5, 6, sec. 30; lots 4, 5, 6, 7, SE1/4NW1/4, E1/2SW1/4 sec. 31, T2ON, R1W; sec. 25, T2ON, R2W, 2,505.47 acres

NM 0555316 **1-1-65** **Permit**
2-1-69 **Lease**
SW1/4 sec. 8, T19N, R1W, 160 acres

NM 0555317 **12-1-64** **Lease**
Lots 3 and 4, SW1/4NW1/4, NW1/4SW1/4, S1/2SW1/4 **sec. 4; sec. 5; NE1/4, NE1/4NW1/4 sec. 8; W1/2 sec. 9; lots 1, 2, 3, 4, E1/2W1/2, W1/2SW1/4 sec. 17, T19N, R1W**
SE1/4SW1/4, SE1/4 **sec. 32; W1/2 sec. 33, T2ON, R1W, 2,206.04 acres Consolidation Coal Company, Pittsburgh, Pennsylvania**
Ideal Basic Industries, Inc., Denver, Colorado

The Ideal Basic Industries, Inc., coal leases cover contiguous lands beginning 5 mi south of Cuba. Consolidation Coal Company made application for coal prospecting permits on the lands in January 1964, and permits NM 0510466, 0510467, and 0510468 were issued effective May 1, 1964. The lands under permit NM 0555317 adjoined active leases SF 077779, SF 075321, and NM 732 and were known to contain valuable deposits of coal. Miles A. Williams, who was associated with Consolidation Coal Company, filed a coal lease application on June 3, 1964. The sale was held on October 8, 1964, and Consolidation Coal Company bid $2.05 per acre by sealed bid, the only bid offered; lease NM 0555317 was issued to the company on December 1, 1964. On October 8, 1964, the company filed an application for a prospecting permit for additional lands; coal permit NM 0555316 was issued effective January 1, 1965.

By early 1965 exploration consisted of 10 drill holes on the permits and four drill holes on the lease. No other work was done on the permit lands. Application for preference right leases was made on March 21, 1967, and leases NM 0510466, NM 0510467, and NM 0510468 were granted effective July 1, 1967. The lease for NM 0555316 was granted effective February 1, 1969.

Consolidation Coal Company discovered one bed of coal suitable for underground mining. The bed dips from 4 to 16° and reaches a maximum thickness of 16 ft. Some coal may be strip mined, but the steep dips along the outcrop restrict the strippable area. The company did not do any additional work on the land because a sales contract was not found that justified a mine in this area without a railroad.

In 1976 Ideal Basic Industries, Inc., was faced with the phaseout of natural gas in their cement plants throughout the country, and they became interested in this property to provide coal for fuel at their Tijeras Canyon cement plant and, if economical, to fuel their other industries. A tentative agreement was reached between the companies, and Ideal Basic Industries, Inc., confirmed the results of Consolidation Coal Company's exploration and began a close-space drilling program in 1977 for development planning. The coal bed was found to fulfill the needs of the company, and the leases were assigned to Ideal Basic Industries, Inc., effective November 1, 1977. Additional drilling was done in July 1978 to gain further information, but no development has taken place.

Wilkins Coal Company prospect

SF 048269 **3-11-25** Prospecting permit
5-5-28 Lease
Edson W. Wilkins, Douglas, Arizona
Wilkins Coal Company, La Ventana
Secs. 27 and 34 and parts of secs. 26 and 35, T19N, R1W, 1,880 acres
3,800 ft NL, on the WL, sec. 26

The building of the Santa Fe Northwestern Railroad into the La Ventana area created an interest in the coal potential in the field that brought in speculative money for its development. Edson W. Wilkins of Douglas, Arizona, was one of the interested people. He made application for a prospecting permit for land about 3 mi east of La Ventana and was granted the right to prospect for coal on March 11, 1925.

Soon after the prospecting permit was issued the Tiger #1 slope on the coal bed was started on the Wilkins No. 1 mine (Fig. 163). By June 21, 1926, C. C. Mather, Assistant Mining Engineer, reported that the slope was driven 75 ft in a bearing S65°W, and a second slope, Tiger #2, was down 125 ft on a bearing S45°W, located about 200 ft to the east. The Tiger slopes were later called the Wilkins slopes.

A cross section of the coal in the Tiger #2 face, taken on June 21, 1926, was as follows:

Shale	Roof
Coal	0' 2 1/2"
Shale	0' 1"
Coal	0' 2'/2"
"Mother coal"	0' 2 1/2"
Coal	3' 7"
Shale	Floor

A cross section of the coal in the Tiger #1 face taken on June 21, 1926, showed the following:

Shale	Roof
Coal	0' 2"

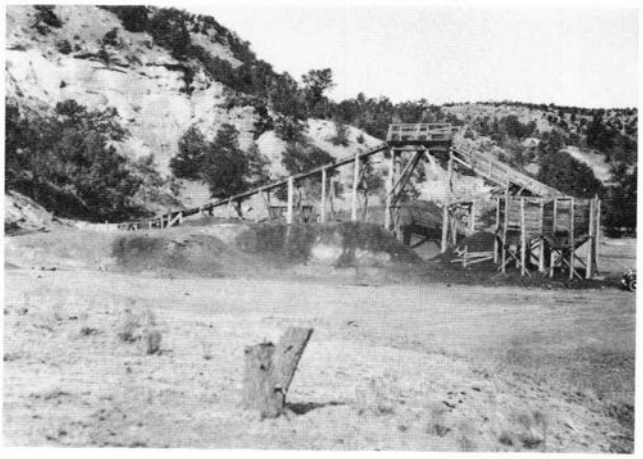


FIGURE 163—Tipple, chute, and bin of the Wilkins Coal Company No. 1 mine. *Photo by J. J. Bourquin, May 1929.*

Shale	0' 1"
Coal	0' 3"
"Mother coal"	0' 2½"
Coal	3' 8½"
Shale	Bottom

A sample taken by C. C. Mather 175 ft inby the portal of Tiger #1, November 11, 1928, showed the following when analyzed:

Moisture	18.2%
Volatile matter	34.4%
Fixed carbon	40.8%
Ash	6.6%
Sulphur	0.9%
BTU	10,280

According to Mr. Mather the bed of coal could not be traced into two known coal beds in the La Ventana field. The coal bed dipped approximately 6½°, S45°W. The shale roof proved to be very heavy and required a great deal of timber in the entries.

Eventually the Tiger #2 slope and a parallel aircourse were driven 550 ft down the dip of the bed, and a cross entry 100 ft long was turned to the left at the bottom of the slope. The entries produced a small amount of water.

On November 1, 1926, Mr. Wilkins made application for a preference right lease, which was granted on May 5, 1928. On May 21, 1927, Mr. Wilkins assigned his rights to the lease application to the Wilkins Coal Company, of which he was president. The assignment was approved by the government on November 4, 1927. A list of the stockholders in the company shows that 81 people, most of whom were from the Douglas, Arizona, area, had invested their money in the venture.

Operations on a second prospect, known as the Wilkins No. 2 mine, were begun with a new opening, about 300400 ft northwest of the No. 1 mine. By January 2, 1929, the face was at 175 ft from the portal. The coal bed, 4 ft thick, dipped S75°W, and at the opening the dip was 18°, but it gradually flattened to 4° at the face. By May 1929 both mines were flooded and all operations ceased. The mine problems could have been solved, but a more serious problem arose. By mid 1929 the Santa Fe Northwestern Railroad was in the hands of a receiver, and failure was imminent. The lack of transportation forced the coal prospectors and miners to close their properties.

Money was owed to the government in the form of royalty and rents, but it could not be collected because the individual bondsmen were unable to pay because of the depression conditions. The lease was cancelled by court decree on May 14, 1933. The prospect produced 551 tons of coal, the bulk of which was sold to the railroad.

White Ash and Sanders—Yardas mines*

SF 059731 **7-1-30** **Lease**
White Ash Coal Mining Company, La Ventana
S½ sec. 28; NE¼ sec. 32; N½, **N1/2S½ sec. 33, T19N, R1W**
2,100 ft NL, 2,000 ft EL, sec. 32 **(LV-10 and 11, Fig. 160)**
1,100 ft NL, 2,500 ft EL, sec. 32 **(LV-12, Fig. 160)**

The lease land is 0.75 mi northeast of La Ventana. Mr. Robert Wetherill applied for a prospecting permit for the E½ of sec. 32 before May 1929, and the Santa Fe Land Office assigned to him permit application SF 057485. The plans were for Mr. Wetherill's associate, W. F. Nance, formerly Superintendent of both the Wilkins Coal Company and the San Juan Coal and Coke Company, to prospect and develop the land when permit SF 057485 was issued.

On April 26, 1929, J. J. Bourquin, Acting District Mining Supervisor, visited the land under application and found a prospect opening situated on the NE¼SE¼ sec. 32, which had been driven about 60 ft (Fig. 164). The opening exposed a coal bed with the following cross section:

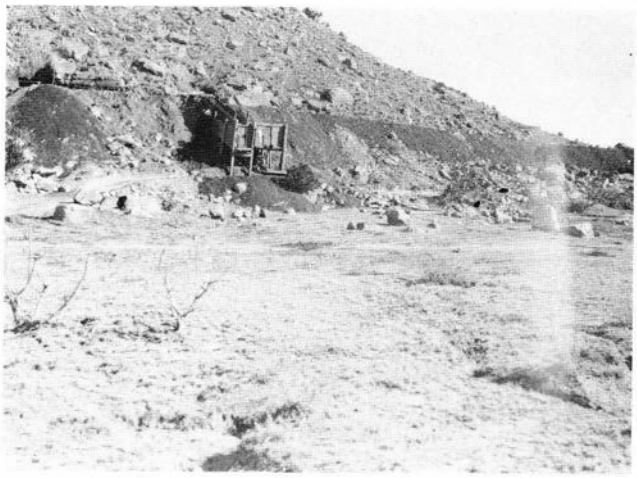


FIGURE 164—White Ash mine; photo was taken soon after Mr. Wetherill had made application for a lease. *Photo by J. J. Bourquin, April 1929.*

Shale	Roof
Rock	1' 8" taken down
Coal	3" black, shiny, and fairly hard
Rock	1"
Coal	3' 6"
Shale	Floor

In Mr. Bourquin's opinion the land was favorably located with respect to the railroad, and development could be made at reasonable expense. His report, therefore, indicated that the land should be classified for leasing, and it was suggested to the applicants that they request a lease on the lands they desired. The lease application was made, and the application for the prospecting permit was rejected. The sale of the land for coal lease SF 059731 was set for April 15, 1930, and the White Ash Coal Company offered a bonus of $10 per acre. Because no other bids were received, the lease was granted on July 1, 1930. The President of the White Ash Coal Company was David J. Peter, Jr., and W. J. Nance was Secretary—Treasurer.

A considerable amount of development work was done on the land before issuance of the lease. Two entries were driven on 50-ft centers 400 ft on a course N45°E. According to a report in December 1929 by C. C. Mather, Associate Mining Engineer, the railroad spur from the Santa Fe, San Juan and Northern Railroad was 75% complete, and a tipple equipped with bar screens was started. A good mine development plan was proposed that would provide production of 150 tons daily; the coal was to be sold to the railroad.

A coal section taken by Mr. Mather across the bed at the face of the main entry was as follows:

Sandstone	Roof
Block shale	1' 6" (brushed)
Coal	3' 4"
Hard shale	Floor

By September 1930 a triple-entry system was developed to a depth of 650 ft from the portals, and room entries were turned off the main entries (Fig. 165). A furnace was used to aid the natural ventilation, which was not adequate. The coal was transported by cars hauled by mule within the mine. A 4.5-ton Plymouth gasoline-driven motor was used from a point about 400 ft inby the portal to the tipple, and use of this motor was of some concern to the government engineers. Mr. Mather took several air samples, but the analysis by the U.S. Bureau of Mines (USBM) failed to include carbon monoxide; therefore, it was not known how much the mine air was contaminated. A generating plant

supplied light to 500 ft of the main entry, to the Superintendent's cabin, and to the tipple area. Three railroad loading tracks were under the tipple (Fig. 166), and three cabins and a stable were constructed (Fig. 167). Superintendent W. F. Nance reported that the investment to September 1930 was $40,000.

The coal bed at the face of the main entry at 650 ft was as follows:

Sandstone	Roof
Coal	1' 10"
Sandstone	1/2"
Coal	2' 9"
Shale	Floor

The coal bed dipped to the northeast approximately 7% at the outcrop but flattened to 3% at the face of the main entry. The mine was dry except for a slight seep at the face of the main entry.

By late October 1931 the mine was closed because the railroad had been put into the hands of the receiver, and its operation had ceased. The mine did not operate for several months, and the caving in of most of the workings made it practically inaccessible. The roof rock air-slaked, and even though it was timbered, the roof caved. No work was done during 1932, but Mr. Nance cleaned up the caved material and began a small operation in January of 1933. Mr. Mather reported in April 1933 that two men were mining in one room on the east side of the mine, but this was short-lived because no production was reported until September when production was reported from a new mine.

The General Land Office, in a letter dated January 17, 1935, suspended the operations of the company for 5 years, retroactive to July 1932; thus, the company was relieved of paying rent or meeting a minimum production.

A new mine or wagon mine, as it was called, was begun during the spring of 1933 and was producing steadily after September 1933. It was operated by J. W. Sanders, a black American, and Joe Yardas, an Austrian, under a sublease agreement with the White Ash Coal Company. This mine was later known as the Sanders—Yardas mine (Fig. 168). The location of the mine and its underground development are shown on Figure 165.

The bottom bench of coal, which averaged about 31 inches, was the only coal that had commercial value. The top coal, which varied from 12 inches of good coal in the southeast to 9 inches and 16 inches of bony and mixed coal on the north, was not saved. Lump coal was sold for $3.00 per ton, and the screened slack and the pea coal were sold for $1.00 per ton at the mine. The coal was screened through a 1 1/2-inch hole screen and stored in a two-ton storage bin. The slack was hand screened. Eight men were employed at the Sanders—Yardas mine during the winter months.

J. J. Bourquin learned during an inspection trip that a miner of Italian descent, Sisto Solo, age 55, was injured on November 13, 1936, and died in a hospital in Albuquerque on November 26. Warren C. Bracewell, State Inspector of Mines, reported that Mr. Solo had his place well supported,

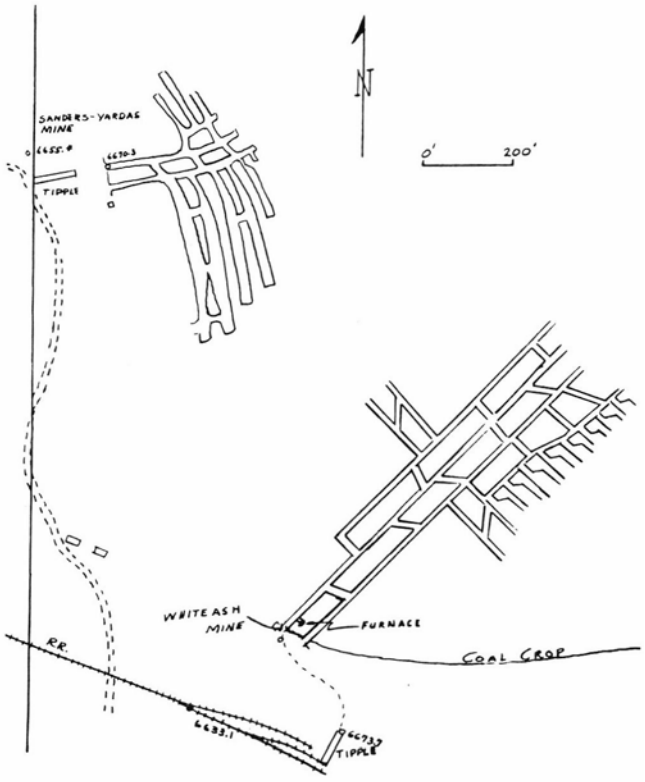


FIGURE 165—Map of the White Ash and Sanders–Yardas mines; White Ash Coal Company SF 059731, N1/4, sec. 32, T19N, R1W. The locations of the mines were taken from a map made by James Yates and A. E. Lawton in October 1935. The White Ash mine map was copied from a map made by W. F. Nance, Mine Manager, January 31, 1931. The Sanders–Yardas mine map was copied from a map made by J. J. Bourquin, February 25, 1937. *Compiled by H. B. Nickelson, April 1978.*

FIGURE 166—White Ash mine railroad loading facilities and the portal. *Photo by C. C. Mather, September 8, 1930.*

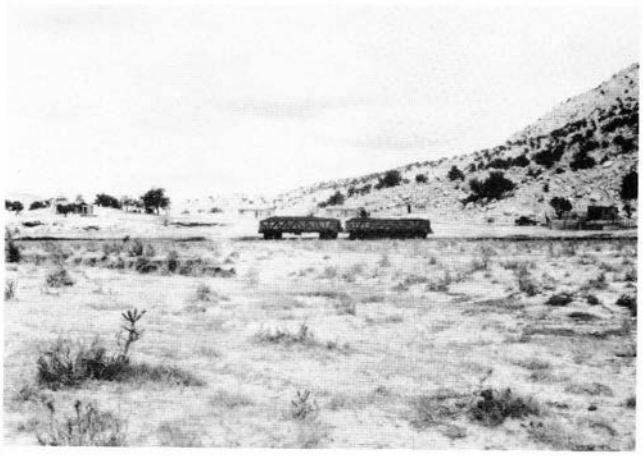


FIGURE 167—The White Ash mine camp facilities. *Photo by C. C. Mather, September 8, 1930.*

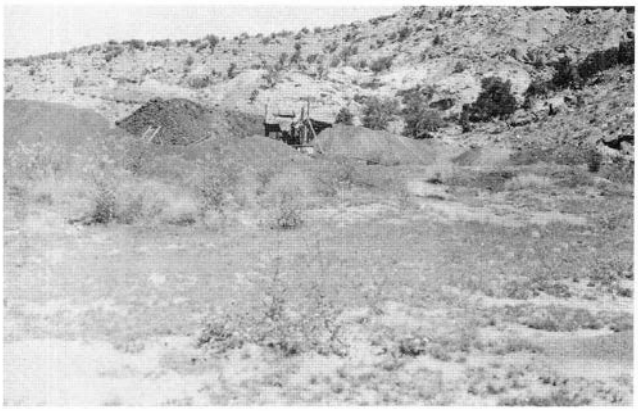


FIGURE 168—Sanders–Yardas mine portal. *Photo by C. C. Mather, August 8, 1935.*

but a pot fell out between the props and struck him, with fatal results.

The mine continued to operate under the direction of Sanders and Yardas until April 1937 when Steve Paklar took over the operation. He paid Mr. Peter of the White Ash Coal Mining Company 30¢ per ton, and Mr. Peter paid the federal royalty. According to a report on June 17, 1938, by R. D. Reeder, Deputy Mining Supervisor, Mr. Paklar ceased operations after about one year.

Charles B. Barker, Attorney, Santa Fe, filed for relinquishment of the lease on June 27, 1938, with the General Land Office in Santa Fe. On March 10, 1939, the company filed a withdrawal of the relinquishment and requested a modification of the lease to include only the S1/2NE1/4, NW1/4NE1/4 sec. 32. It was then recommended by the government that a minimum production of 5,000 tons per year be set and suspension of operations be granted to July 1, 1940; however, again on September 23, 1939, the President of the White Ash Coal Company requested a relinquishment of the lease, and the lease cancellation was approved on July 29, 1940. The White Ash mine produced 10,178 tons, and the Sanders-Yardas mine produced 5,958 tons.

Jagels prospect

SF 048654 **1-7-26** **Prospecting permit**
Philip Jagels, Bernalillo
Part of sec. 33, T19N, R1W, and parts of secs. 1, 2, 3, 4, 5, 6, 7, 18, and 19, T18N, R1W, 2,534 acres

Mr. Philip Jagels, a New Mexico Senator, made an application for and acquired a prospecting permit on a large area of land in the La Ventana field. Much of the permit was on land barren of coal. J. J. Bourquin, Acting District Supervisor, and C. C. Mather, Associate Mining Engineer, reported that the prospecting work consisted of one drift located in the SW1/4SE1/4 sec. 33, T19N, R1W. The drift, which was about 30 ft long, was driven on a course N20°E on a bed of coal 3 ft 10 inches thick. The coal at the face of the drift was oxidized.

A cross section across the coal at the face showed the following:

Sandstone	Roof
Coal	0' 3"
Rock	0' 1"
Coal	3' 6"
Sandy shale	Floor

The permit was cancelled as of September 20, 1929.

Sandoval Coal Company-Weil prospect

SF 052502 **9-20-25** **Prospecting permit**
3-5-29 **Lease**
Sandoval Coal Company, Albuquerque Rio Puerco Coal Company, Albuquerque
Sec. 19, T19N, R1W and sec. 24, T19N, R2W, 1,280 acres
3,500 ft NL, 900 ft EL, sec. 19 **(LV-4, Fig.** 160)

The Santa Fe Northwestern Railroad, which was being constructed in the early 1920's from Bernalillo to La Ventana, created a flurry of applications for coal prospecting permits in the La Ventana area. The Sandoval Coal Company was organized by a group of individuals, which included Sidney M. Well of Albuquerque. The company applied for the subject coal prospecting permit; it was issued on September 20, 1925. Under Mr. Weil's direction, work began soon after issuance of the permit, and within 2 years exploration included three prospect drifts (LV-2, 5, and 6, Fig. 160) and four prospect drill holes on the E1/2 sec. 19.

The prospect drifts were on a bed of coal 5-6 ft thick, which was of poor quality. A short distance from the outcrop a large fault was intersected, and those drifts were abandoned. Eventually five other exploratory drifts were driven, mostly in ash and oxidized coal on the outcrop. A map made in 1930 (Fig. 169) shows the locations of the drill holes, the underground workings, and other features. The drill holes all intersected 5-6 ft of coal, which gave the company sufficient evidence to warrant underground development.

An 8.5 x 16 ft three-compartment shaft, located 2,075 ft north and 1,125 ft west of the SE corner of sec. 19, was sunk 63 ft to the bottom of the coal bed. A slope 360 ft long, driven on a course N10°W, was sunk to the coal and connected to the shaft (Fig. 170). These workings were known as the Weil slope and shaft (LV-4, Fig. 160). The slope was located 1,750 ft north and 1,050 ft west of the SE corner of sec. 19. The coal bed, which dipped 6° to the north, was cut in both the slope and the shaft; the coal bed, which was of poor quality, was 5-5.5 ft thick. The condition of the coal might have been due to a fault that was cut 330 ft inby the portal of the slope.

The company made application for a preference right lease, which was granted on March 5, 1929. By December 23, 1929, prospects for production seemed fair, and a spur to the mine was being laid. Two months later, however, the organizational status had changed, and the property was in financial trouble. The Sandoval Coal Company, with essentially the same people, had been changed to the Rio Puerco Coal Company. No personnel in either company are listed in files except for Mr. Weil, last reported as living in New York.

This was probably the smallest of many mining operations with which Mr. Weil was associated in New Mexico. According to biographical information on him (Coan, 1925, pp. 130-131) Weil was an important figure in industrial development in the state. Sidney M. Weil was born at Keokuk, Iowa, on October 3, 1881. Upon graduation from the North Division High School in Chicago, he received a scholarship to the University of Chicago. About that time his father suffered business reverses, and Sidney went to work. He became a reporter for the City Press Association and later, in Milwaukee, he was a feature writer on the *Milwaukee Sentinel*. Subsequently, while in the advertising business he studied the hydro-metallurgy of copper, and in order to further a career in mining he came to New Mexico in 1916. The copper deposits in Sandoval County were his particular interest, and he developed properties at Senorito and later acquired the San Miguel mine in this county. He then became instrumental in bringing in much capital from the East for railroad development, again especially in Sandoval County. Mr. Weil opened several coal mines in the La Ventana field. Among other interests of this very enter-

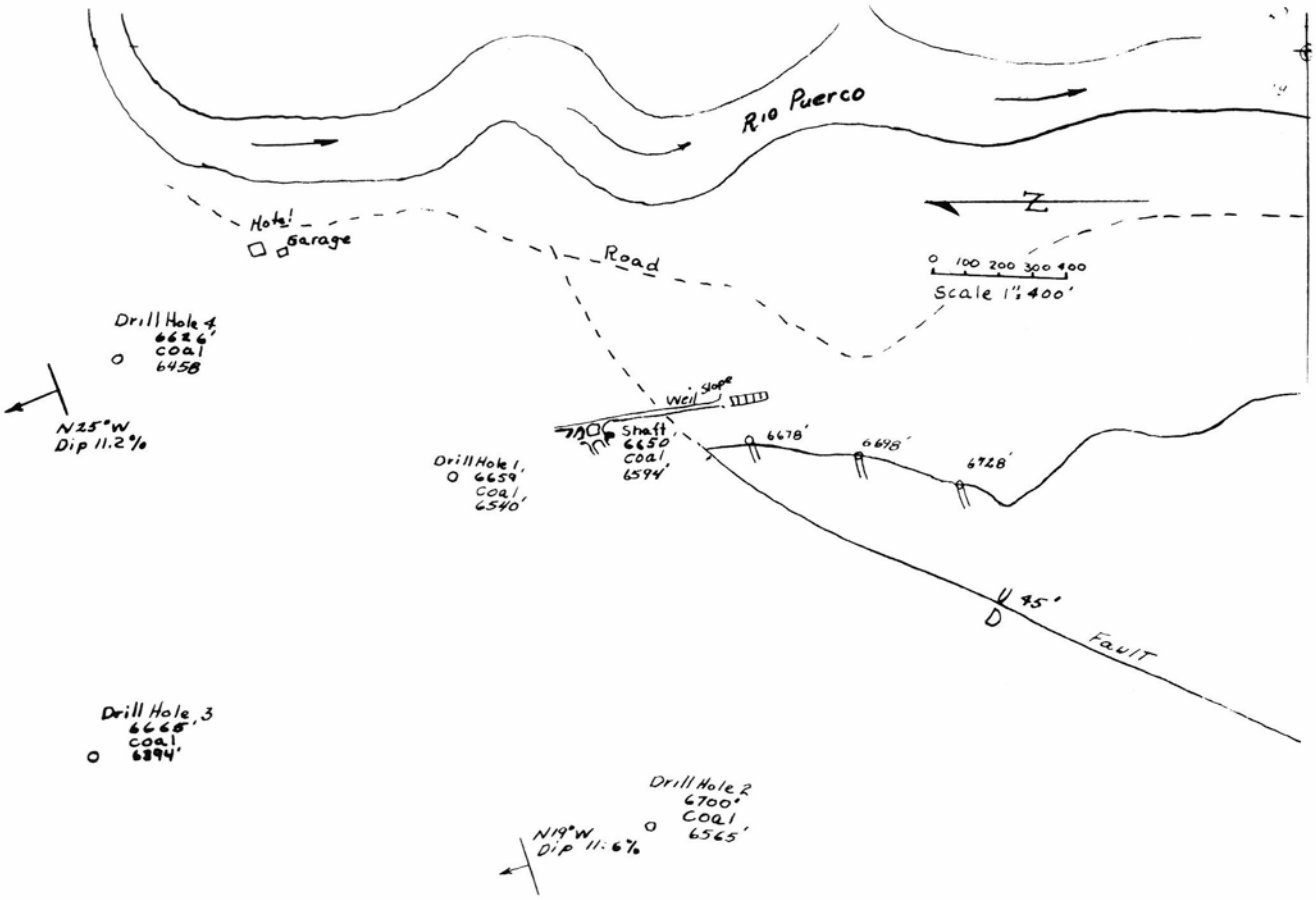


FIGURE 169—Mine workings and locations of drill holes at the Sandoval Coal Company prospect. The map was traced from an old print made by James Yates in May 1930; it shows part of sec. 19, T19N, R1W (see Fig. 171).

FIGURE 170—Simple tipple and chute constructed to handle coal from the development workings of the Weil slope at the Sandoval Coal Company mine. *Photo by J. J. Bourquin, April 26, 1929.*

prising man were the following: research work in connection with the growing of sugar beets, work to finance development of iron and its reduction by blast furnaces, assistance to secure financing for timber and coal operations in Sandoval County, publication of an Albuquerque newspaper, authorship of a book, and innumerable civic and charitable activities. Mr. Weil was a partner in the firm of Weil and Hunter of New York City (investment bankers), President of the Cuba Extension Railway, Vice President of the Santa Fe and Northwestern Railway, Vice President of the San Miguel Copper Company, and President of the Pioneer Construction Company of Albuquerque (Coan, 1925, v. 2, pp. 129-132).

After completion of the spur to the Sandoval mine, it was unofficially reported that 13 railroad cars of coal, approximately 650 tons total, were loaded from the mine during the time it was in operation. Because records of the railroad company were destroyed in a fire in August 1931 these figures cannot be confirmed.

No other production was ever reported, and operations were totally suspended in February 1930. A considerable amount of money had been expended in mining operations, and the company was broke and had no assets. The government had failed to obtain a bond because the company was allowed 1 year from the date of the lease to post bond. On April 4, 1932, the Secretary of the Interior declared the debt uncollectable and cancelled the lease.

Drill logs on the Sandoval Coal Company prospect and the dates they were drilled follow. See Figure 169 for locations of the drill holes.

Drill Hole No. 1, 3-2-27

0'-19'	Alluvium
19'-118 1/2'	Sandstone
A small amount of water at 89'	
118 1/2'-124 1/2'	Coal 6', black, soft
124 1/2'-125 1/2'	Shale
Hole was 6" in diameter	

Drill Hole No. 2, 3-9-27

0'-12'	Alluvium
12'-82'	Shale
82'-134 1/2'	Sandstone
A small amount of water at 122'	
134'/2'-140'	Coal 5 1/2', black, soft
140'440 3/4'	Shale

Drill Hole No. 3, 3-21-27

0'-31'	Alluvium
31'-48'	Sandstone
48'-190'	Shale
190'-271'	Sandstone
271'-277'	Coal 6', black, soft
277'-278'	Shale

Water at 50', 95', 170', about 1 gal per hour
Considerable water at 190'

Drill Hole No. 4, 3-28-27

0'-39'	Alluvium
39'-53'	Loose sand-water
53'-67'	Sand silt, had to case at 67'
67'-103'	Shale
103'-168'	Sandstone
168'-179'	Coal 11', black, soft
179'-180'	Shale

Carlisle mine

SF 065023 12-14-31 Permit
Montie S. Carlisle, San Ysidro—Albuquerque
Sec. 19, T19N, R1W; sec. 24, T19N, R2W, 1,219.9 acres
3,500 ft NL, 900 ft EL, sec. 19 (LV-4, Fig. 160)

The permit land is 2.5 mi north of La Ventana; this permit covers part of the lands held under coal lease SF 052502, cancelled on October 14, 1931, which was held by the Sandoval Coal Company and operated by Sidney Weil. The mine went broke because the market that was to be developed by the Santa Fe, San Juan and Northern Railroad failed to become a reality when the railroad went into receivership and ceased operation about 1931. This mine was opened by the Sandoval Coal Company and had several other names, among them the Sandoval Tilden mine and the Weil mine.

Mr. Carlisle reopened the slope that had been driven by Mr. Weil. The slope, which was driven through the alluvium, intersected an east-trending fault that displaced the coal bed down approximately 50 ft to the north. The slope was driven N10°W and dipped 11.5%. Two entries had been started toward the west, and several rooms had been driven from them before the mine was abandoned.

Mr. Carlisle cleaned up the old workings and continued to develop the mine in a westerly direction. Coal was being produced by 1933; it was trucked to Albuquerque where Mr. Carlisle had opened a coal yard to facilitate the sale of his production. A 75 HP steam boiler to power the 50 HP steam hoist and a steam pump were installed at the mine, but the State Mine Inspector would not allow the steam pump. The reason for his decision was not given; perhaps he felt that the steam would soften the shale roof and create a roof problem.

The coal bed averaged about 5 ft 3 inches in thickness, with minor or no partings. The roof was a strong sandstone that required a minimum of support. The only mine map available was a map made by James Yates in 1933 of the Sandoval mine (Fig. 171).

Trouble between Mr. Carlisle and the Mining Supervisor began with the first production of coal and lasted until the last ton was mined. Records were presumably kept, but they were never available when it came time to account for production, and the accounts at the coal yard did not check with the meager records at the mine. Long reports were written to account for the production, and when Mr. Carlisle could not justify his figures, more correspondence ensued.

The permit expired on December 14, 1935, and Mr. Carlisle made application for a new permit. Before it could be issued, however, the production and royalty had to be de-

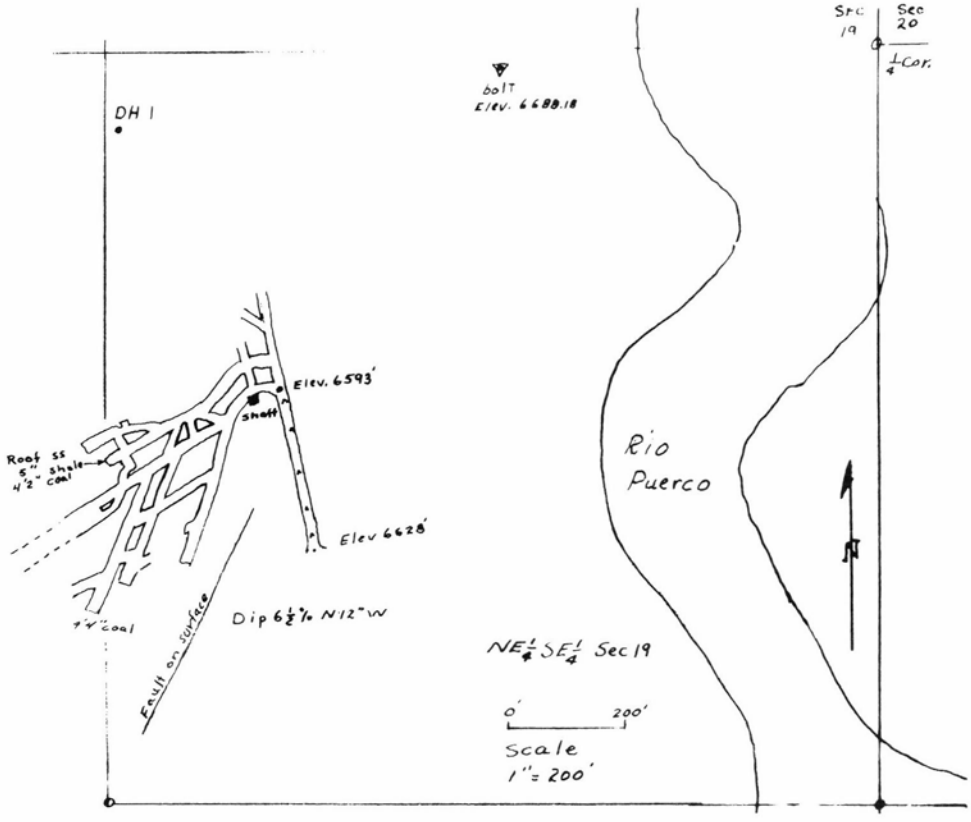


FIGURE 171—Map of Carlisle mine. The map was traced from a map made by James Yates in July 1933. The mine working by Mr. Carlisle was added in pencil to the original (see Fig. 169). *Made by engineers from the Mining Supervisor's office.*

termined, and updated maps of the mine had to be submitted; these requirements were not met. Witnesses stated that coal was mined in the spring of 1936, but no production reports were submitted.

Attempts were made, without success, to get Mr. Carlisle to fill the air shaft and abandon the mine properly. An inspection report by R. H. Allport on November 10, 1942, stated that the incline presented no problem but the air shaft had only a loose plank covering the hole and should be filled.

The Department of Justice finally accepted a compromise: payment of $75 from an individual surety and $150 from Mr. Carlisle. The case was closed on January 19, 1943. According to the Mining Supervisor's calculations production amounted to 6,754 tons; under the compromise the lessee claimed production of 3,792 tons.

Sturgis prospect

SF 044208 date unknown Permit
Loyd Sturgis, home unknown
Extent of permit lands unknown

After being issued a coal prospecting permit Loyd Sturgis drove two drifts about 75 ft apart on the SW1/4NW1/4 sec. 31, T19N, R1W. One drift was approximately 140 ft long and the other was 75 ft long. A section of the coal bed was described as follows:

Sandstone	Roof
Coal	3' 8"
Parting	2"
Coal	2' 6"

No coal was sold.

San Juan mine

SF 042373 3-6-23 Permit 11-6-26 Lease
SF 048326 1-10-25 Permit 3-6-28 Lease
Edgar L. Mitchell, Albuquerque
Richard Hanna, Albuquerque
San Juan Coal and Coke Company, Santa Fe
All of secs. 29 and 30 and part of sec. 31, T19N, R1W; sec. 25 and part of sec. 26, T19N, R2W, 2,529 acres
3,300 ft NL, 4,400 ft EL, sec. 31 (LV-14, Fig. 16)

In 1922 and 1923 11 people became interested in the La Ventana area for its coal potential and made application with the General Land Office for individual coal prospecting permits over a large area. The Santa Fe Northwestern Railroad was to be built from Bernalillo to Cuba and would provide transportation to outside markets such as Albuquerque and Santa Fe. F. S. Donnell of Albuquerque was in charge of finding coal on the permits for the applicants. One of the successful finds was on permit SF 042373, which was issued to E. L. Mitchell on March 6, 1923.

Mr. Donnell opened a drift on the NW1/4 sec. 29, T19N, R1W on two beds of coal: one was 1 ft 1 inch thick and the other was 2 ft thick, separated by 2 ft of shale. This drift was abandoned before November 19, 1923, the date of the inspection report of Cuthbert C. Mather, Assistant Mining Engineer.

By December 1924 the Santa Fe Northwestern Railroad had a lumber railroad in operation from Bernalillo to San Ysidro, and the grade was practically completed to La Ventana. With the imminence of transportation, the future for coal exploration looked good.

C. C. Mather reported in his field inspection on December 4, 1924, that two openings on the Mitchell prospect had been driven in the SW1/4NW1/4 sec. 31, T19N, R1W as follows.

Sandstone	Roof
Coal	3' 8"
Bone	2"
Coal	2' 8"
Shale	Floor

One drift was about 75 ft long and the other was about 140 ft long; the openings were about 75 ft apart. A minable bed of coal was found. Work on the permit had practically ceased at the time of inspection because the railroad was unfinished. Mr. Mitchell applied for a preference right lease on the permit lands, and it was approved and assigned to the San Juan Coal and Coke Company on November 6, 1926.

Richard Hanna, a judge in Albuquerque, made application for a prospecting permit on the NW1/2SE1/4 sec. 31; permit SF 048326 was issued to him on January 10, 1925. The San Juan Coal and Coke Company began development work on a coal outcrop on that land, under the supervision of John Cleary. The development work became the entries and part of the San Juan mine (Fig. 172). Mr. Hanna then applied for a preference right lease, which was granted on March 6, 1928. The lease was assigned to the San Juan Coal and Coke Company and made a part of lease SF 042373.

By the middle of 1929 the Santa Fe, San Juan and Northern Railroad was at the San Juan mine. The underground workings of the mine were fairly well developed, a well-constructed tipple to load both railroad cars and wheeled vehicles was in operation, and in general it was a modern facility capable of producing 5,000 tons or more per month (Fig. 173). As many as 35 men were employed during the fall and winter months, but, of course, during the summer months production was on a smaller scale. The mine was nongassy, but faults and rolls were encountered in the underground workings. The coal had to be hoisted up a 3° slope. The coal bed, which dipped 3° to the northwest, averaged 6-6.5 ft in thickness and was good quality domestic fuel. The mining plan, however, was not good and government engineers advised the company manager that a better mining plan should be laid out. An analysis from the face of No. 3 room sampled by C. C. Mather on November 19, 1928, showed the following:

Moisture	15.8%
Volatile matter	34.5%
Fixed carbon	43.8%
Ash	5.9%
Sulphur	0.6%
BTU	10,900

By April 1931 both the coal company and the railroad were in financial troubles. Washouts on the railroad connecting with the mine and the resultant lack of outlets and reduced coal sales were responsible for the eventual closing of the mine. Production during the winter of 1932 was only 362 tons. According to a letter to J. J. Bourquin from E. W. Fiske, Secretary of the company, the San Juan Coal and Coke Company was in the hands of a voluntary receiver by September 1931. Relief of minimum production was approved on January 29, 1932. By December 1933 the company owed $10,472.16 to the government for royalties and rents. F. W. Calhoun, Associate Mining Engineer, recommended on September 9, 1935, that the portals of the mine be closed, but he could find no one in the organization that was willing or had money to do so.

On January 15, 1937, residents of La Ventana and miners going to and from the Cardenas mine noticed smoke emitting from the air shaft and the main portal of the San Juan mine. Two days later, Joseph Yardas, Miner, and Alcario Cardenas, Coal Mine Operator, investigated the mine and found an active fire in the first left entry, about 35 ft inby the main slope and approximately 435 ft inby the portal of the mine.

A comedy of errors began. Isaias Sanches reported the fire to the U.S. Land Office at Santa Fe on January 18, 1937.

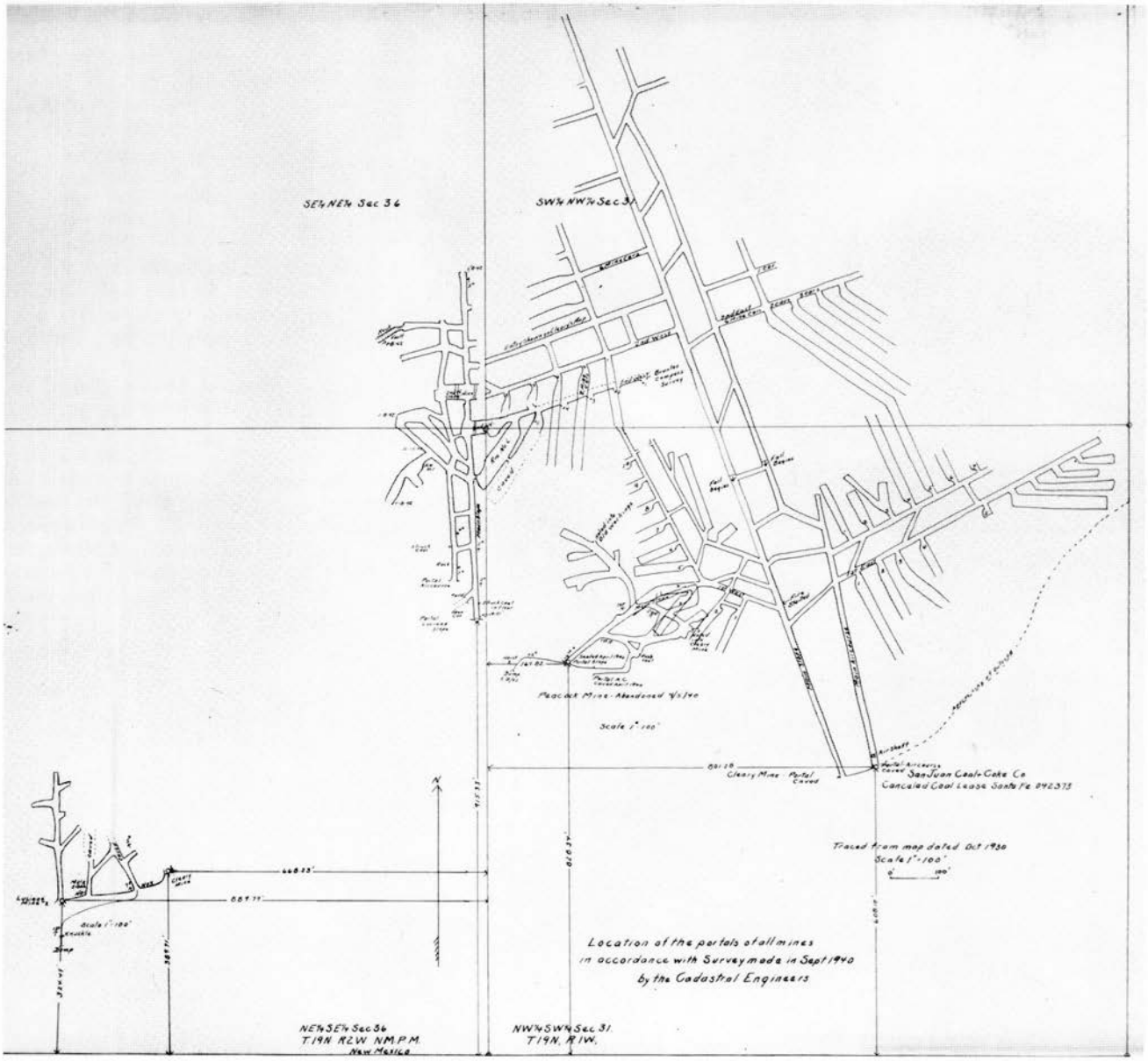


FIGURE 172—Map of the locations and workings of the San Juan mine and the Peacock mines. The Peacock No. 1 mine is shown in the lower left-hand corner of the map.

The fire was also reported that month to the Soil Conservation Service and to the Chief Coal Mine Inspector of New Mexico in Albuquerque, but J. J. Bourquin, District Mining Supervisor, who could have begun work immediately toward sealing the opening, was not aware of the fire until February 3. He examined the fire on February 7 and found that it had traveled from the origin (435 ft inby the portal) to the portal and was burning the crop coal and adjoining tipple. The Soil Conservation Service Camp No. 7 personnel tore up the track and part of the tipple so the complete structure would not burn, and they attempted to partially seal the aircourse by covering the stack with boards and closing the air door in the aircourse (Fig. 174). These efforts were rather puny because the air door and the brattice around the door were old and leaked a considerable amount of air (Fig. 175); the fire continued to spread within the mine (see Fig. 172). A photo taken on February 10, 1937 shows the tipple, bins, and stranded railroad equipment (Fig. 176).

The responsibility of putting out the fire rested with the lessee, but the San Juan Coal and Coke Company was in the hands of a receiver, Charles B. Barker, an attorney in Santa Fe. Mr. Barker put J. G. Cleary of Jemez Springs in charge of putting out the fire, but Mr. Cleary could not be found. The United States Fidelity and Guaranty Company, the surety company, would have allowed money to aid in controlling the fire, but it was discovered that the outstand-

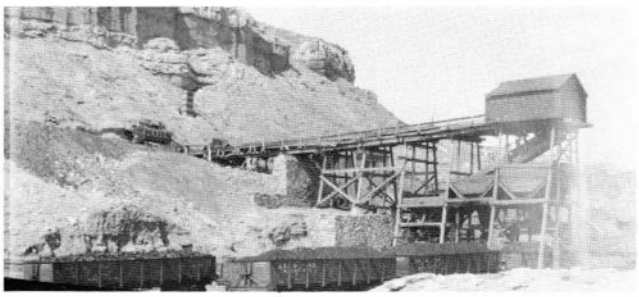


FIGURE 173—Tipple and loading dock of the San Juan mine, taken about 1930. Note the loaded Atchison, Topeka and Santa Fe Railroad coal cars.

ing charges against the coal company already amounted to $17,472.16; the bond amount was $5,000.

Use of Civilian Conservation Corps personnel to provide the labor to fight the fire was considered, but Chief State Coal Mine Inspector Warren Bracewell believed the work to be done was far too hazardous for the young men. The problem of controlling the fire became entirely the respon

FIGURE 174—Superintendent Evan Carron and laborers from the Soil Conservation Camp No. 7 sealing the air shaft in order to control the fire at the San Juan mine. *Photo by J. J. Bourquin, February 9, 1937.*

FIGURE 175—Smoke cloud over the main portal of the San Juan mine during efforts to control the fire. *Photo by J. J. Bourquin, February 10, 1937.*

sibility of Mr. Bourquin. He hired local miners and laborers to blast the main portal down and seal the opening. By the evening of February 12 the job of sealing the opening was completed at an out-of-pocket cost of $37.65.

Mr. Bourquin suggested arson as a possible cause of the fire; his report of February 18, 1837, is quoted as follows:

> Hence the origin of the fire in the mine is a mystery but it is suspected that it may have been of incendiary origin. It is believed that somebody may have been stealing rails from the mine and that the mine may have been fired as a means to conceal the theft.

If the fire had been reported to Mr. Bourquin on the day of its discovery, it quite possibly could have been confined to the area of origin. But because it spread over a large portion of the main entry area, its future story had just begun.

R. D. Reeder, Deputy Mining Supervisor, visited the property on October 13, 1937, to check the fire seals and found J. G. Cleary, former general manager of the lessee company, engaged in opening the fire seal in the main aircourse. It is believed that Mr. Cleary wanted to recover the rails and cars that were sealed in the mine. Mr. Reeder ordered the work to cease. At this time Mr. Cleary applied to Warren Bracewell, Chief State Inspector of Mines, for authorization to reopen the San Juan mine, but he was informed that because Mr. Bourquin had sealed the portals only the Department of Interior could authorize reopening of the mine.

An inspection by R. D. Reeder on November 16, 1937, found that Mr. Cleary was again attempting to reopen the main aircourse; again he was ordered not to open any of the fire seals. Reeder then wired the U.S. Attorney, Mr. Espanola, at Santa Fe to serve an injunction to stop all work on the lease. The U.S. Attorney could not do so because of insufficient evidence, but he requested an investigation by W. H. Burnett, who was in charge of investigations for the Department of the Interior in Albuquerque. The U.S. Attorney also stated that he would attempt to seek authorization to bring suit for cancellation of the lease and collection of rents and royalties.

After investigation by Mr. Burnett, a bill of complaint was filed on December 27, 1937, which asked for cancellation of the lease and judgment against the San Juan Coal and Coke Company in the sum of $20,972.16, with interest. Judgment was also asked for $5,000 against the United States Fidelity and Guaranty Company, surety under the lease bond. Suit was recommended by the Department of Interior on March 23, 1938, for long-standing noncompliance of the lease terms.

Mr. Cleary submitted a compromise to the U.S. Attorney

FIGURE 176—The tipple and loading dock at the San Juan mine. Note the stranded engine and tender, which probably belonged to Santa Fe Northwestern Railroad. A cloudburst had washed out several trestles, and they were never repaired. *Photo by J. J. Bourquin, February 10, 1937.*

asking that the San Juan lease SF 042373 be assigned to him and reduced to 320 acres. He stated that he would pay $5,000 over a period of 4 years, and he requested that the royalties and rents that had accrued be waived. The Department of the Interior objected to this compromise because there were no regulations permitting such a waiver.

The hearing was held on October 21, 1938, in Albuquerque. Mr. Reeder, who had not been informed of the hearing date, learned about it while he was in the field. He then went to the U.S. Attorney, Mr. Espanola, and explained that the fire in the mine was not under control and that if Mr. Cleary opened the seals to recover mine cars and rails, as he claimed he wished to do, the fire would again become active. The U.S. Attorney agreed with Mr. Reeder and asked that he explain the conditions to District Judge Neblitt.

The judge ruled that the mine should not be reopened without the consent of the Secretary of the Interior and that if such consent were given in order for equipment to be recovered, Mr. Cleary would have to pay all expenses involved in reopening and resealing the mine. He also ruled that if the mine was reopened, the lease could not be cancelled until the mine had been resealed. The Secretary refused permission to break the fire seals; thus, the lease was, in effect, cancelled on October 25, 1938.

The Under Secretary of the Interior recommended an appeal to seek a ruling in regard to ownership and disposal of equipment. Mr. Cleary claimed ownership of equipment, but the Under Secretary maintained that the government had a claim on it because of money owed under lease terms. The appeal procedures were denied. Before this court action, the San Juan Coal and Coke Company receiver, Charles B. Barker, sold the real property to J. G. Cleary; thus, the lessee assets had no value. On December 28, 1938, the $5,000 bond was collected from the surety company, but no other debts were paid to the government.

With the end of San Juan Coal and Coke Company participation on this property and the cancellation of lease SF 042373, the lands reverted to the Bureau of Land Manage

FIGURE 177—The tipple and loading dock of the San Juan mine. *Photo taken on October 28, 1942.*

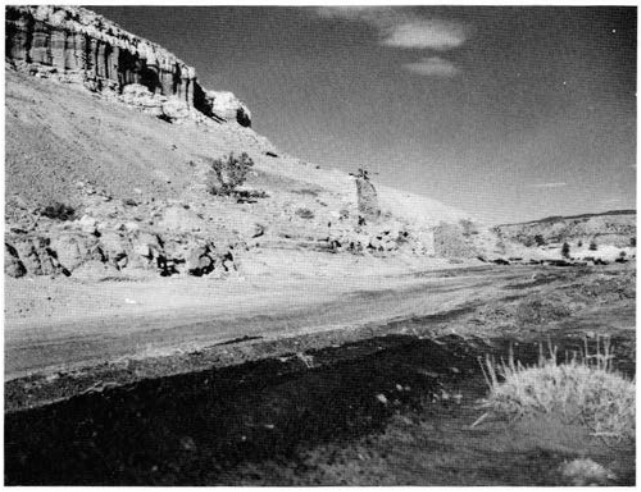


FIGURE 178—The foundation of the tipple at the San Juan mine and the terrace formed by the USBM to control the mine fire. *Photo taken in February 1951.*

ment, and the property was again subject to lease. The mine was still on fire in 1939, but the seals were tight and the fire was quite dormant. Figure 177 shows how the surface facilities appeared in 1942.

Nick Luciani acquired a state lease in 1938 for the SE1/4 of sec. 36, T19N, R2W, which is contiguous to the SW1/4 of sec. 31, T19N, R1W, the location of the San Juan Coal and Coke Company mine. Mr. Luciani and his sons organized the Peacock Coal Company. He also made an application (SF 075671) for the NW1/4SW1/4 sec. 31, T19N, R1W, the same land that the San Juan mine was on (Fig. 172). The Peacock Nos. 1, 2, and 4 mines on the state lease and later the Peacock No. 3 mine on federal lands were developed. These four mines will be described in the next chapter. The Peacock mines No. 3 and No. 4 holed into the old San Juan mine, and again the fire was reactivated, causing problems until 1951, at which time the U.S. Bureau of Mines (USBM) had completed a project of fire control (Fig. 178). The San Juan mine produced 57,332 tons of coal as of November 6, 1937.

On February 11, 1946, E. W. Fiske, former secretary of the San Juan Coal and Coke Company, made an application for a lease over lands occupied by the old San Juan mine. The outcome will be described in the chapter entitled Fiske application.

Peacock mines

M 1450 and M 1742 **circa 1937** State lease
Nick Luciani and sons, La Ventana
N1/2N1/2 lot 3, SE1/4NE1/4 sec. 36, T19N, R2W, 48 acres **Peacock No. 1 mine-3,500 ft NL, 900 ft EL, sec. 36, T19N, R2W (LV-7, Fig. 160)**
Peacock No. 2 mine-3,700 ft NL, 650 ft EL, sec. 36, T19N, R2W (LV-8, Fig. 160)
Peacock No. 3 mine-3,100 ft NL, 5,100 ft EL, sec. 31, T19N, R1W (LV-15b, Fig. 160)
Peacock No. 4 mine-3,000 ft NL, on the EL, sec. 36, T19N, R2W (LV-15a, Fig. 160)

In 1936 Nick Luciani began a mine on state of New Mexico land on lot 3, sec. 36, T19N, R2W. This mine is shown in the lower left corner of Figure 172. The description of the Luciani or Peacock mines plays an important role with the history of the San Juan mine. A limited amount of information, which is presented here, regarding the history of the Peacock mines on state land was found in the govern-

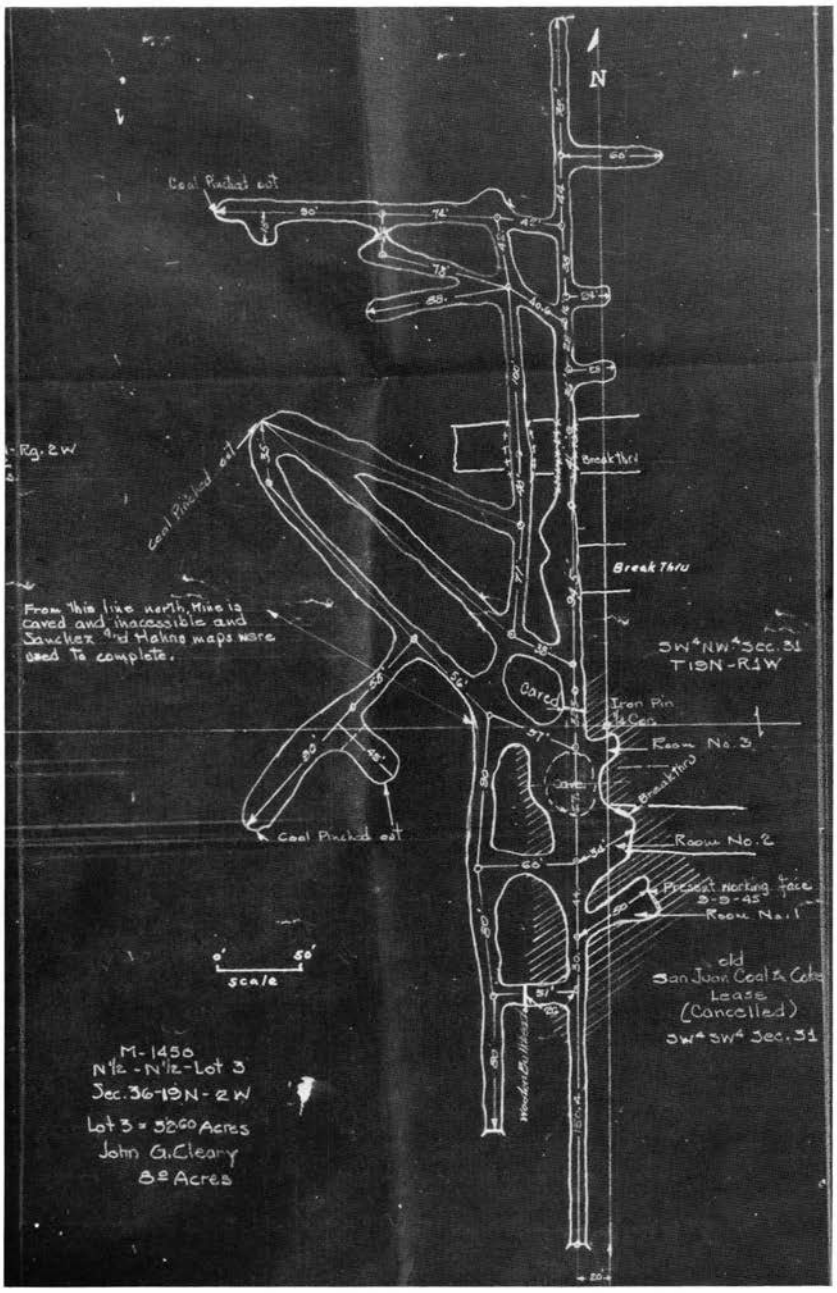


FIGURE 179—Map of Nick Luciani's Peacock No. 4 mine.

ment lease files of the San Juan Coal and Coke Company mine.

The Luciani No. 1 and 1A mine was started during 1936 before Mr. Luciani obtained a lease from the state, but he was very careful to file for a lease and to pay the royalties in person, for which he obtained receipts. Having accepted royalties, the state had no alternative but to issue a lease, although it was known that Mr. Luciani was intentionally in trespass. Mr. Cleary of the San Juan Coal and Coke Company protested the trespass.

The No. 1 mine was soon stopped, and the No. 2 mine was begun in 1939 with a two-entry system; it holed into the No. 1 mine. The coal in the No. 1 and the No. 2 mines was of poor quality and contained too many rolls and partings to be economical. Mr. Luciani then began mine No. 3 on federal land on November 11, 1939. This operation, which was also in trespass, resulted in the unintentional reactivation of the fire in the San Juan mine; therefore, mine No. 3 had to be closed. The operation of Luciani mine No. 3 is described under case SF 075671 (see next chapter).

Mr. Luciani was unable to obtain a lease for the No. 3 mine on the NW1/4S^{W}1/4 sec. 31, which was on federal land, and he was ordered on April 2, 1940, to seal the portals and thus the breakthroughs that had been made into the San Juan mine. He then began the No. 4 mine by an entry started a few feet west of the line between secs. 31 and 36 on leased state land. Within a few months rooms were started to the east into federal lands in sec. 31, and eventually four of these workings holed into the old San Juan mine. The extent of these workings is shown in Figure 172.

In 1940, after mine No. 3 and mine No. 4 had been closed, Mr. Luciani returned to mine No. 1 and mine No. 2 and gouged some coal off the ribs and opened several rooms. The mines were small, and the area mined was only about 200 x 250 ft. The production of coal from mines No. 1 and No. 2 can be estimated at 4,000 tons.

On October 14,1940, R. D. Reeder, Acting District Mining Engineer, accompanied by Steven Polk, Miner, entered the San Juan mine through the Luciani No. 4 mine; they were able to get to the main slope through the No. 2 west entry.

In his inspection report, Reeder stated that they found the main slope and the aircourse caved, and they also found that the coal at the portal of the San Juan mine aircourse, a source of the past fires, was burning furiously. The fire had again been reactivated by Mr. Luciani's mining into the old rooms of the San Juan mine. The aircourse at the San Juan mine and the openings created by Mr. Luciani were then closed in an attempt to subdue the fire.

On April 4, 1941, R. D. Reeder reported that Mr. Luciani had spent considerable time and money trying to find the extension of the coal bed beyond a north-trending fault discovered in the west rooms and west entry of the No. 4 mine; he was not successful. The life of the mine had become limited to the block of coal between the property line on the west and the fault on the east. What Mr. Reeder determined to be a fault is shown on Figure 179 and is labeled "Coal Pinched out."

During the active life of the No. 4 mine, the coal taken from it was trammed to the No. 3 mine, where a coal-handling facility had been constructed during the operations of that mine. Because the application for a lease on the No. 3 mine land was rejected, concern about this procedure was expressed by the government engineers.

An inspection of the area by R. H. Allport, District Mining Supervisor, showed that Mr. Luciani had pulled the recoverable pillars and abandoned the No. 4 mine by April 4, 1946. The fire was still burning actively along the coal outcrop at the old San Juan mine aircourse portal because the stoppings placed in the No. 4 mine leaked air. Mr. Allport also stated that J. G. Cleary had obtained a state lease on the $N^1/2N^1/2$ lot 3, sec. 36, and was driving an opening toward the old San Juan mine for Mr. Fiske. The latter, former Secretary of the San Juan Coal and Coke Company, had made application for a government lease on land formerly held by the San Juan mine (see Fiske application chapter), and the land applied for was adjacent to Mr. Cleary's state lease.

Production from the Luciani No. 4 mine was approximately 7,700 tons of coal. The Luciani family and Mr. Reeder are shown in Figure 180.

FIGURE 180—The Nick Luciani family and R. D. Reeder. (From the left are: Mrs. Nick Luciani, Nick Luciani, their daughter, their son-in-law, and R. D. Reeder.) *The photo was taken about 1941.*

Luciani Peacock No. 3 mine

SF 075671 **10-11-39** **Application for lease**
Nick Luciani, La Ventana
$SW^1/4NW^1/4$ sec. 31, T19N, R1W
3,100 ft NL, 5,100 ft EL **(LV-15b, Fig. 160)**

On November 11, 1939, Nick Luciani and his sons, who had organized the Peacock Coal Company, began the Luciani No. 3 mine approximately 600 ft west of the main portal of the San Juan mine (Fig. 172). At the same time Mr. Luciani applied for a lease on the land. Apparently there was no objection to this application from the government, and it probably would have been granted; however, before the issuance of a lease the Luciani operations had holed into the old San Juan mine in four places and had reactivated the old mine fire there. The openings were then closed by Mr. Luciani, but the stoppings were of poor construction and leaked air.

R. D. Reeder, Acting District Mining Supervisor, and Warren Bracewall, State Coal Mine Inspector, were extremely concerned about control of the fire and the safety of the miners. Paul F. Cutter, Special Agent of the Division of Investigations, Department of the Interior, was ordered to investigate the trespass of the Luciani No. 3 mine. As a result of this investigation the application for a coal lease was rejected.

Mr. Luciani appealed the rejection and also offered a mining plan to enter the No. 3 mine from his No. 4 mine (LV 15a, Fig. 160) on state land to mine the coal, which he believed existed between the No. 2 west entry and the main entry of the San Juan mine. Again his plan was rejected because the government engineers believed the coal in that area had already been mined. This decision, which might have been unfair to Mr. Luciani, was made on the basis of the San Juan mine map (Fig. 172); that map was incomplete and quite possibly inaccurate. One cannot fault Mr. Luciani for wishing to continue operations; the coal bed was ideal to mine, with 6 ft of clean, dry coal and a good roof. In addition, Mr. Cleary, Mr. Fiske, and others had invested approximately $120,000 in the San Juan mine. Part of this investment was in the rails, cars, and other equipment sealed in the mine, and in order to recover their money they wanted to reopen the mine. The mine could undoubtedly have been reopened if, on the day the fire was discovered, the mine had been properly sealed and given time to cool. Good, tight fire doors in both entries would have been a big help to exclude air from the fire until permanent seals could be constructed.

Mr. Luciani had sealed and abandoned the No. 3 mine by April 5, 1940, and had moved to the No. 4 mine (LV15a, Fig. 160). The fire on the outcrop in the vicinity of the aircourse at the San Juan mine was still very active at the time of an inspection in late 1942 because the seals placed in the openings still leaked air.

The final appeal on the lease for the Luciani No. 3 mine was decided on April 14, 1943, with a decision to prohibit

FIGURE 181—Tipple at the Luciani Peacock No. 3 mine. This tipple was also used to accommodate the coal from the Peacock No. 4 mine on state land via track laid between the two portals. *Photo by R. D. Reeder about 1940.*

mining in the W1/2 of sec. 31 because the San Juan workings were never clearly defined on the existing maps, and past experience of allowing mining in its vicinity resulted in the reactivation of the old fire. Figure 181 shows the surface facilities at the Luciani Peacock No. 3 mine.

An analysis of a tipple sample representative of 10 tons taken from the 1/4 to 1 1/2 inch coal from the No. 3 mine, sampled on April 2, 1941, by H. Fowler, was described as follows:

Moisture	16.3%
Volatile matter	32.8%
Fixed carbon	40.6%
Ash	10.3%
Sulphur	0.5%
BTU	10,070

According to records found, the Luciani No. 3 mine produced only 1,349 tons of coal. Although production figures are very sketchy, it is known that several hundred tons of slack stored at the tipple eventually burned.

Fiske application

SF 078117 **2-11-46** **Application for lease**
E. W. Fiske, Santa Fe
SW1/4SW1/4 sec. 30, W1/2NW1/4, NW1/4SW1/4 sec. 31, T19N, R1W **(Fig. 160)**

E. W. Fiske, former secretary for the San Juan Coal and Coke Company, made application for a coal lease on part of the lands formerly covered under the San Juan Coal and Coke Company lease SF 042373. The San Juan mine, which caught on fire in 1937, was burning when this application was filed.

The lease application was rejected on July 15, 1946, by the General Land Office in Washington. (The General Land Office transferred its functions to the Bureau of Land Management effective July 16, 1946.) Mr. Fiske appealed the decision immediately because J. G. Cleary and Walter E. Wood, who were acquainted with the history and conditions of the mine, maintained that the fire had not existed for the previous 3 years.

R. H. Allport, District Mining Supervisor, accompanied by other government officials, made another field examination on September 22, 1946, and determined that the mine was still on fire. The appeal was therefore rejected on February 14, 1947, by the Office of the Secretary of the Interior.

FIGURE 182—H. W. Russell and T. R. Mark testing for fumes to determine if the San Juan mine was still on fire. *Photo by R. H. Allport, April 29, 1947.*

Following the rejection, additional information was submitted by Mr. Fiske and Paul Bidwell, who stated that they had examined the Luciani No. 4 mine and found no indications of fire. This information was evaluated, and the application for lease was again rejected on August 12, 1947.

On December 24, 1947, the Office of the Secretary of the Interior granted a motion for oral hearing on the lease application, to be held on January 14, 1948, at 10:00 at the office of the District Mining Supervisor in Carlsbad, New Mexico. The transcript of the proceeding was then to be forwarded to the Office of the Secretary of the Interior for a decision.

U.S. Bureau of Mines personnel H. W. Russell, Coal Mine Inspector, and T. R. Mark of the Safety Division had made an inspection of the fire on April 29 and 30, 1947 (Fig. 182), and these men were called as witnesses. Mr. Fiske's interests were represented by Charles B. Barker of Santa Fe, his attorney, and by J. G. Cleary, former manager of the San Juan Coal and Coke Company mine, who had been acquainted with the property for many years. The hearing was duly held. M. G. White, Solicitor for the Office of the Secretary of the Department of Interior, reviewed the findings of the hearing and on May 14, 1948, denied a motion for a rehearing. The case was closed.

Anderson-Sackett mine

NM 048323 **10-20-25** **Permit**
7-19-29 **Lease**
Clinton P. Anderson, Albuquerque
John E. Sackett, Albuquerque
Mrs. J. L. Roller, address unknown
Ametex Corporation, Albuquerque
SW1/4 sec. 26, SE1/4 sec. 27, secs. 34 and 35, T19N, R2W; sec. 3 and W1/2 sec. 2, T18N, R2W, 2,499.69 acres
3,000 ft NL, 1,800 ft EL, sec. 35

The Anderson mine is 2 mi west of La Ventana. In 1925 many prospecting permits were issued in the La Ventana area for large acreages of land. Clinton P. Anderson was one of a group of people that made such an application and was granted permit NM 048323 on October 20, 1925. The great interest in coal was created by the proposed Santa Fe, San Juan and Northern Railroad to the La Ventana area.

On June 20, 1926, Cuthbert C. Mather, Associate Mining Engineer, visited the permit site and found that two prospect slopes had been driven 200 ft and 50 ft, respectively. The first slope was 2,930 ft N39°W from the SE corner of sec. 35, and the second was 2,445 ft N41° 30 ft W from the same corner. The coal bed was 9 ft thick. The prospecting work was done under the direction of G. A. Kaseman of Albuquerque.

The prospect was on the west side of the Rio Puerco, and until a bridge could be built no coal could be sold and only a limited amount of development could be undertaken. A bridge was planned, and the expense was to be shared by the permittee, the county, and the State Highway Commission. Pending construction of the bridge, work practically ceased, except that seven short prospect tunnels were driven on the coal bed to determine its existence and workability. In October 1929 active development began. John James was hired to supervise the operation. He was well known and respected, and he had had many years of coal mining experience in New Mexico. An operating company, known as the Carbon Fuel Company was formed. Mr. Mather believed the company was a subsidiary of the Albuquerque and Cerrillos Coal Company of which G. A. Kaseman was President and General Manager.

On December 13, 1929, Mr. Mather measured the coal bed in the face of the first slope and found the following:

Shale	Roof
Bony coal	1' 6" to 2' left in the roof
Coal	6' 4"
Shale	Floor

Coal samples taken by Mr. Mather in 1928 and 1930 showed the following analyses:

	1928 sample (casement sample)	1930 sample (100 ft from the portal)
Moisture	14.8%	20.0%
Volatile matter	33.9%	32.5%
Fixed carbon	41.4%	42.6%
Ash	9.9%	4.9%
Sulphur	1.2%	0.7%
BTU	8,910	10,240

The coal stockpiled at that time is shown in Figure 183.

Because of delay in the railroad's completion to the mine, Mr. Anderson requested relief on expenditure and the minimum production requirements of the lease; it was granted on March 16, 1928. He also had the lease amended to reduce the lease acreage from 2,499.69 acres to 1,720.86 acres, eliminating the W1/2 sec. 34, SE1/4 sec. 27, T19N, R2W, and the W1/2 sec. 3, T18N, R2W. The action was approved in August of 1932.

By early 1931, the railroad spur had reached the mine site (Fig. 184). A tipple had been erected and equipped to load lump, nut, and slack coal, and a powerhouse had been constructed for a Fairbanks—Morse electric generator, which was directly connected to a Diesel engine. A new water well had been drilled near the mine that provided the camp with sufficient water. The minable coal was 5-6 ft thick, with 1.5-2 ft of bone left in the roof. The owners had expended $60,000 and the future of the mine looked good.

Then the reverses began. The railroad was plagued periodically with washouts, which delayed shipments, and the mine operated only sporadically. The coal stored during the development work, 1,351 tons, burned in early 1931. By May 1931 the mine was idle, and the only production from then until February 1932 was a few tons during the winter months for local trade. John James continued as manager and also had duties as a part-time caretaker at the mine. The railroad ceased operations in about May of 1931, was placed in the hands of a receiver, and never operated off this spur again. Suspension of operations was granted for 6 years beginning in 1932; the lessee owed no rent or minimum production during that time. Mr. Anderson relinquished all but the NE1/4, S1/2 sec. 35, T19N, R2W, and the NW1/4 sec. 2, T18N, R2W.

By October 1936 what equipment had not been sold had been stolen; the value of the stolen material was estimated to be $6,000. Roof conditions within the mine were good. It was estimated that 12 cars of rock had fallen on the tracks while the mine was idle. It was recommended several times that the portals to the mine be barricaded to prevent fire and theft; all the coal in the prospect dumps and the mine dump either had burned or was burning. The mine was not closed, but it remained virtually inactive and continued to deteriorate.

FIGURE 184—Railroad tipple and mine portals at the Anderson mine. *Photo by C. C. Mather, October 22, 1931.*

In November 1940 Mr. Anderson was elected to the U.S. Congress. According to the requirements of sec. 9 of the lease, he then had to divest himself of the lease. He filed an assignment of it on April 14, 1941, to John E. Sackett, his son-in-law and business associate. He also filed a relinquishment of all the lands except the SE1/4SW1/4, W1/2SE1/4 of sec. 35, which was approved on April 28, 1941.

Mr. Sackett, who was not a coal miner, entered into an agreement with Mariano G. Montoya of Bernalillo to operate the mine. Dan Kutz was hired to take charge of the mine, while Mr. Montoya supervised the coal sales. Production began in October 1940. Figure 185 shows the tipple at the Sackett mine. From May 2, 1941, to November 24, 1941, there was a temporary suspension of mining because the bridge across the Rio Puerco had washed out. After resumption of operations, mining continued during the coal-sale seasons to supply the domestic markets in the local area and as far away as Albuquerque. During the summers the mine was practically closed. Miners were difficult to hire during World War II, so there were occasional brief

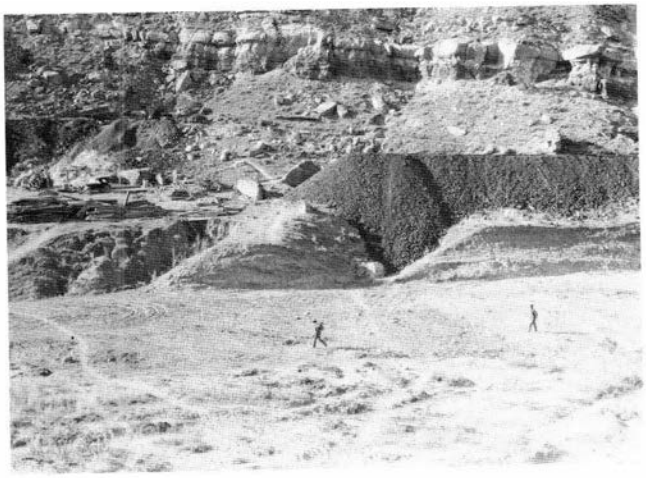


FIGURE 183—Coal stockpile at the Anderson mine before the railroad spur connection with the main line was completed. This coal fired and was destroyed. *Photo by C. C. Mather, December 13, 1929.*

FIGURE 185—Tipple used for the Sackett operations at the Anderson–Sackett mine. *Photo by R. D. Reeder, January 8, 1942.*

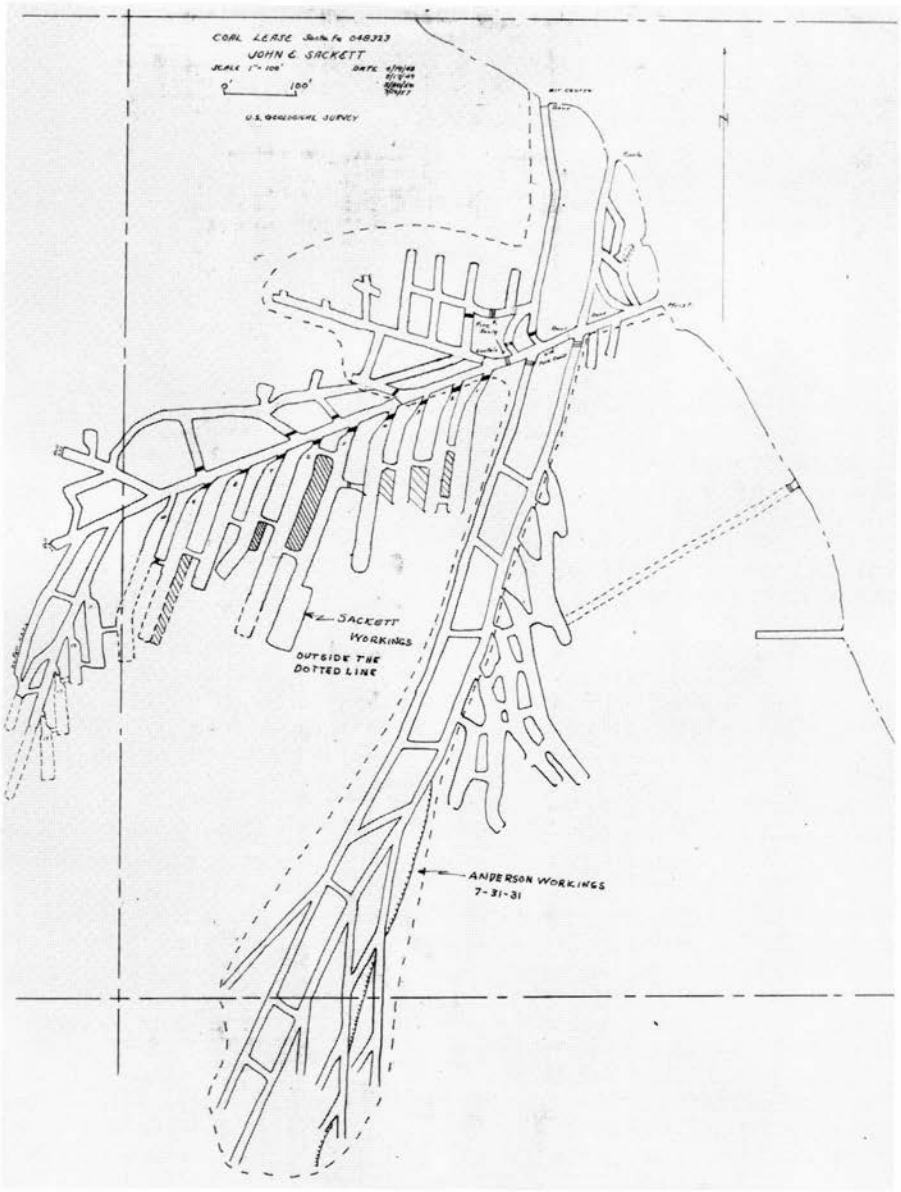


FIGURE 186—Map of the Anderson–Sackett mine. The dotted line shows the area mined before 1932 and the area mined by Mr. Sackett after 1940. Note the old and new fire doors.

periods of inactivity. The mine caught fire on February 12, 1945, during one of these short closures. Warren C. Bracewell, State Mine Inspector, was notified immediately. He supervised the installation of permanent stoppings. Pipes were put in the concrete in order to test the atmosphere in the fire areas later. Operations ceased until September 1945, at which time work was resumed outside of the sealed area. The mine was worked during the winter months from then until May 1950.

On September 22, 1950, residents of La Ventana noticed smoke issuing from the portals. Robert Fulton, Mining Engineer, John Garcia, State Mine Inspector, Angelo Pais, Deputy Inspector of Mines, and the lessee visited the mine and inspected the fire. They determined that it had probably been caused by spontaneous combustion in room 10 or in rooms inby. Permanent seals were built with concrete during the week of October 1, 1950.

The mine was again idle until October 12, 1955, when Nestor Arceo of Cerrillos began repairing the tipple and surface facilities. U.S. Bureau of Mines Inspector William Roberts collected gas samples behind the seals and determined that the atmosphere contained little oxygen, no methane, and no or small amounts of carbon monoxide. The State Mine Inspector opened the seals into the south entries, and a small amount of coal was mined; however, indications were that the mine would start on fire again, and the entries were resealed. Mr. Arceo relinquished his agreement with Mr. Sackett, who filed for suspension of operations for that year, which was granted on August 3, 1956. The later reduction of minimum production and the lowering of the bond requirement gave the lessee some monetary relief.

The mine has not produced since 1956. Figure 186 shows the extent of the underground workings. Experience had shown that this bed of coal fires easily because the Anderson—Sackett mine and the adjacent San Juan mine complex were both closed due to fires. These fires might be eliminated if the mining areas were kept small and sealed when mined out, and if the mine was kept in continuous operation with a daily fire inspection procedure.

On January 9, 1978, Mr. Sackett assigned the lease to Mrs. J. L. Roller, who on the same day assigned it to Ametex Corporation. The Bureau of Land Management approved the assignment on February 1, 1978, but it has since been cancelled. Production before 1932 was 8,744 tons, and total production was 41,583 tons.

Rhinehardt mine

Mr. Rhinehardt, 1935
Yardis-Gardenas, 1938
NW1/4NE1/4 sec. 2, T18N, R2W
200 ft NL, 1,600 ft EL

The Rhinehardt mine was opened on a 6-ft bed of coal bearing N80°W on a dip of 10° west. The slope was 35 ft long when C. H. Dane (1936, p. 149), Geologist, examined the workings and reported the above information. Because the portal was near the north boundary of the section near the middle of the NW1/4NE1/4, R. D. Reeder, Deputy Mining Supervisor of the USGS, visited the mine to determine if the workings were on or extended into federal land to the north. Apparently the mine was on Mr. Rhinehardt's state lease.

Another inspection was made on October 22, 1938, by Mr. Reeder, and at that time Joe Yardis and Nick Gardenas, who had subleased the mine, were operating it. Four loaders and a hoistman were employed. The sublessees were paid $3.00 per ton for all coal sold over a 1-inch screen; practically all of the slack was wasted. Mr. Reeder did not get a compass survey of the mine because the miners were not at the mine. Neither the date the mine closed nor the extent of its workings is available.

Brechtel prospect

SF 052742 **11-21-25** **Permit**
Ernest C. Brechtel, San Antonio
All of secs. 20, 21; parts of secs. 9, 17, 28, 29, T18N, R2W

Ernest C. Brechtel, Secretary-Treasurer of the New Mexico Midland Railroad Company, applied for a prospecting permit in the La Ventana area. The permit was issued on October 21, 1925. The records show that an opening 65 ft long was driven on a bed of coal 4 ft 5 inches thick. The only location given for the prospecting work was "on the west side of a box canyon running due north." The work was done by Jim Sander of La Ventana. The permit was cancelled on April 29, 1930, and there was no production from the prospect.

Stackhouse prospect

SF 052741 **1-7-26** Permit
1-11-29 Lease
Powell Stackhouse, San Antonio
Secs. E1/2 9, 10, 15, E1/2 16, E1/2 22, T18N, R2W, 2,560 acres

Powell Stackhouse, President of the New Mexico Midland Railway Company, was issued a prospecting permit on land in the La Ventana area on January 7, 1926. By September 1927 four prospecting drifts had been driven: No. 1 was driven for 148 ft and Nos. 2, 3, and 4 were driven for 25 ft each. According to a sketch submitted by the permittee, the No. 1 drift was in the NE1/4NE1/4 sec. 15; No. 2 was in the SE1/4SE1/4 sec. 10; No. 3 was in the NE1/4SE1/4 sec. 10; and No. 4 was in the NE1/4SEI/4 sec. 15. He also reported that the coal bed that he was prospecting was 6.5-7 ft thick in the No. 1 drift. No inspection reports from government engineers are in the files.

Mr. Stackhouse made application for a preference right lease, and it was granted on January 11, 1929. No more work was done on the property pending the completion and operation of the Santa Fe, San Juan and Northern Railway, but by 1931 the railway had ceased operations. Mr. Stackhouse died suddenly on February 29, 1932, as a result of influenza. Mrs. Stackhouse made application for relinquishment of the lease. The relinquishment was backdated and cancelled as of January 10, 1932. There was no production from the property.

Tonopah (Hinkley and Harris) mine

SF 077183 **10-23-43** **Permit**
10- 2-47 **Lease**
Steven T. Harris, Albuquerque
Leonard E. Hinkley, Albuquerque
NE1/4SW1/4, W1/2SE1/4, SE1/4 sec. 23; **NE1/4 sec. 26, T18N, R2W**
4,400 ft NL, 1,000 ft EL, sec. 23

L. E. Hinkley, Dr. S. T. Harris, and Otis M. Burnham formed the Hinkley Consolidated Mines Company, with offices in Albuquerque, to operate mines in New Mexico and Colorado.

The Tonopah mine is about 8 mi north of San Luis. At the time the prospect work began the road was at best a mere trail. By the end of December 1943 the permittees had opened a main slope 75 ft long and an air slope 60 ft long near the center of the SE1/4SE1/4 sec. 23, and they exposed a bed of coal about 7-8 ft thick. A cabin and tipple had been constructed, a hoist had been installed, and the road to the mine had been improved. Preparatory work continued until July 1944, and the permittees hoped to begin operations in September, but they were unable to obtain miners until January 1945. At that time the mine was worked for 2 months, then closed until November 1945 when operations were resumed and continued until October 1946. From then until April 1948 the mine was essentially closed, but some stockpiled slack was sold and some road repair and minor upkeep were accomplished. A small amount of mining was done in April 1948, and then the mining was stopped again until October 1949. Work then continued for a few months, and a new entry was driven about 155 ft south of the mine workings, but by April 1950 operations had practically ceased.

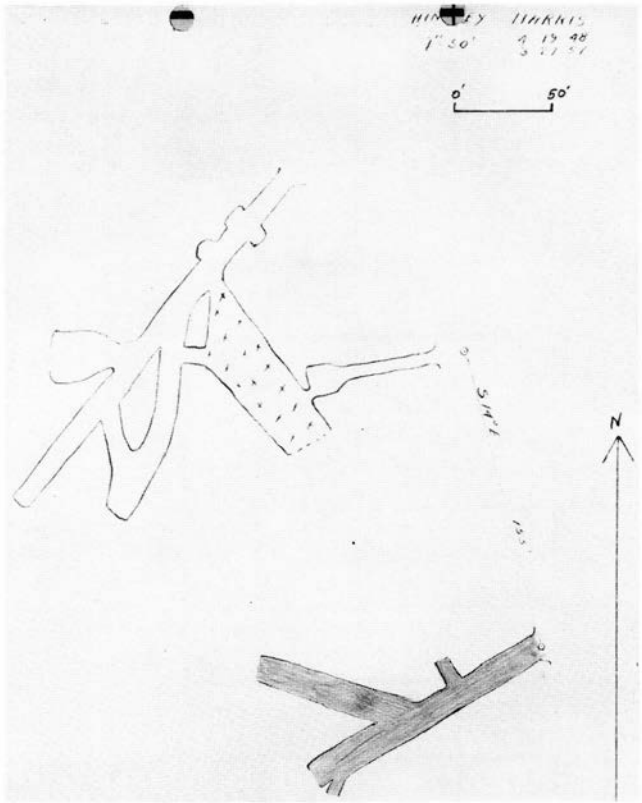


FIGURE 187—Map of the Tonopah mine. *Made by engineers from the Mining Supervisor's office.*

R. H. Allport, District Mining Supervisor, visited the property on April 19, 1948, and measured a coal section, which follows:

Top	Shale
Bone and shale	8"
Coal	3' 3"
Bone and shale	6"
Coal	3' 10"
Bottom	Shale

C. M. McConnell, Deputy Regional Mining Supervisor, visited the property on March 27, 1957, and added to the map made by Mr. Allport; their combined map (Fig. 187) shows the approximate total extent of the mine workings. The portal is near the center of the SE1/4SE1/4 sec. 23. Figure 188 shows the surface facilities.

A preference right lease was issued on October 2, 1947; it was modified to include only the SE1/4SE1/4 of sec. 23, and the bond was reduced to $1,000 on October 18, 1957. Dr. Harris died in April 1957, leaving his half interest in the mine to numerous heirs. The lessees requested the relinquishment of the lease on November 30, 1961, and the lease was cancelled on January 13, 1963. Production of 2,582 tons was reported.

Gallegos prospect

SF 052864 6-25-27 Permit
Adolfo Gallegos, Albuquerque
Parts of secs. 3, 4, T17N, R2W; secs. 33, 34, 35, T18N, R2W, 2,160 acres
1,700 ft NL, 3,300 ft EL, sec. 10, T17N, R2W

The Gallegos permit land is located approximately 8 mi southwest of La Ventana. The permittee drove two prospect drifts of approximately 50 ft each on two beds of coal. The upper bed showed 5 ft of clean coal, and the lower bed measured 4 ft 3 inches of coal and appeared to contain several bony partings. Cuthbert C. Mather, Associate Mining Engineer, could not locate the prospects accurately but thought they were on the N1/2 sec. 3. Since the advent of more accurate maps than were available to him, it has been established that the prospect was in sec. 10 at the above location. The prospecting work was done by Epifanio Gallegos of San Luis. The permit expired on June 24, 1931. There was no production.

Yarbrough mine

SF 077477 9-27-44 Permit
Clyde Yarbrough, Old Albuquerque
Roy F. Pogan, Old Albuquerque Sec. 3, N1/2 sec. 10, T17N, R2W 1,700 ft NL, 3,300 ft EL, sec. 10

The permit land is 3 mi northwest of San Luis. Part of the lands were held by Adolfo Gallegos under permit SF 052864.

A slope was started on a course N14°W on a bed of coal 5 ft 6 inches thick. The bed dipped 5° to the northwest, and its strike was N76°E. Mr. Yarbrough believed that his opening was in sec. 10; C. C. Mather, Associate Mining Engineer, thought that the Gallegos prospect was in the N1/2 of sec. 3. The Gallegos portal, 87 ft from the Yarbrough portal, was reopened to serve as an aircourse for Yarbrough's workings. A tipple and bin were built to facilitate the coal handling, and a hoist was installed (Fig. 189).

In April 1949 Jack Reese, Coal Mine Inspector, from the U.S. Bureau of Mines, reported that the underground work had ceased and that Mr. Yarbrough had started a strip mine in September 1948. The pit in April was about 300 ft in length and 40-45 ft wide. A cross section of the coal bed in the pit was measured as follows:

FIGURE 188—Tipple, coal bin, and portal at the Tonopah mine. *Photo by R. H. Allport, March 19, 1948.*

Coal	1'
Shale	2'
Coal	6'
Shale	Bottom

Mr. Yarbrough made application on August 31, 1948, for a preference right lease for the lands under the permit; Mr. Pogan had assigned his interest in the permit to Mr. Yarbrough on January 27, 1948. The application for a preference right lease was held up because a considerable amount of royalty had not been paid, and quarterly reports of production had not been submitted.

In April 1949 Mr. Yarbrough was fatally injured in an accident in Albuquerque. Mrs. Yarbrough wanted to proceed with the lease application, but the back royalty due and the costs of a lease were beyond her means. The royalty due was finally divided in monthly payments among seven members of the family until paid, and the case was closed on May 13, 1958. The mine produced 4,999 tons of coal.

Gallegos-Yarbrough-San Luis mine

NM 0175825 10-1-61 Lease
Gilbert Montoya, Bernalillo
NW1/4 sec. 10, T17N, R2W
1,400 ft NL, 3,000 ft EL

FIGURE 189—Portal, hoist, and small chute at the Yarbrough mine. *Photo by R. H. Allport, October 22, 1944.*

The mine is 3 mi northwest of San Luis. It originally was opened about 1927 by Adolfo Gallegos under permit SF 052864, and later Clyde Yarbrough and Roy F. Pogan developed several entries and mined almost 5,000 tons of coal under permit SF 077477. Because of the accidental death of Mr. Yarbrough in April 1949, the mine was closed.

On September 14, 1961, Gilbert Montoya was the successful (and only) bidder for the NW^1/4 of sec. 10. Because no sealed bids were presented, he asked for an oral bid, and the government accepted his offer of $1.00 per acre. Mr. Montoya opened a new entry into the coal bed for a distance of 35 ft, and a tram road from the new entry to a partly finished chute was built. Charles McConnell, Deputy Regional Mining Supervisor, mapped the Yarbrough mine workings and located the new entry in January 1962 (Fig. 190).

Because of nonproduction Mr. Montoya was unable to pay the yearly rent and was continually dunned for payment. The Office of the Solicitor took court action to collect the money owed and to cancel the lease. The court ruled in favor of the Office of the Solicitor on January 24, 1966. The underground openings were properly abandoned. No production is shown in the records.

Arroyo No. 1 mine

M 19316 **7-15-76** **State lease**
Transcontinental Coal and Export Company
A. J. Firchau, Bernalillo, New Mexico Sec. 16, T17N, R2W

A. J. Firchau opened a small strip mine on a state lease north of Cabezon Peak near San Luis. Production began in 1979, with 4,466 tons mined; 15,748 tons were produced in 1980, and production in 1982 was 37,000 tons. Jack Lawrence, General Manager of the operation, employed three regular machine operators and additional truck drivers when coal deliveries were made. Dozers equipped with rippers, scrapers, and front-end loaders were the major pieces of mining equipment (Fig. 191). The mine was located on the N^1/2 of the section and supplied coal to anyone who wanted to buy it in the quantity that could be produced. The mine was closed by the state and the permit revoked on June 14, 1984.

Looney prospect

SF 074852 **8-9-38** **Permit**
John Looney, Santa Fe
S1/2NE^1/4, SE1/4 sec. 1, T23N, R1W

John Looney opened the coal bed along several places with shallow cuts on the side of a steep hill about 300 ft above the floor of an arroyo. During the winter months the prospect was almost inaccessible because several arroyos had to be crossed by bridge to reach it, and the bridges washed out after every heavy rain. A cabin and a long, narrow chute were constructed on the prospect land (Fig. 192). Problems with the surface owner developed, and Mr. Looney's improvements were stolen or destroyed.

R. D. Reeder, Deputy Mining Supervisor, visited the property on August 19, 1939, and on November 15, 1940;

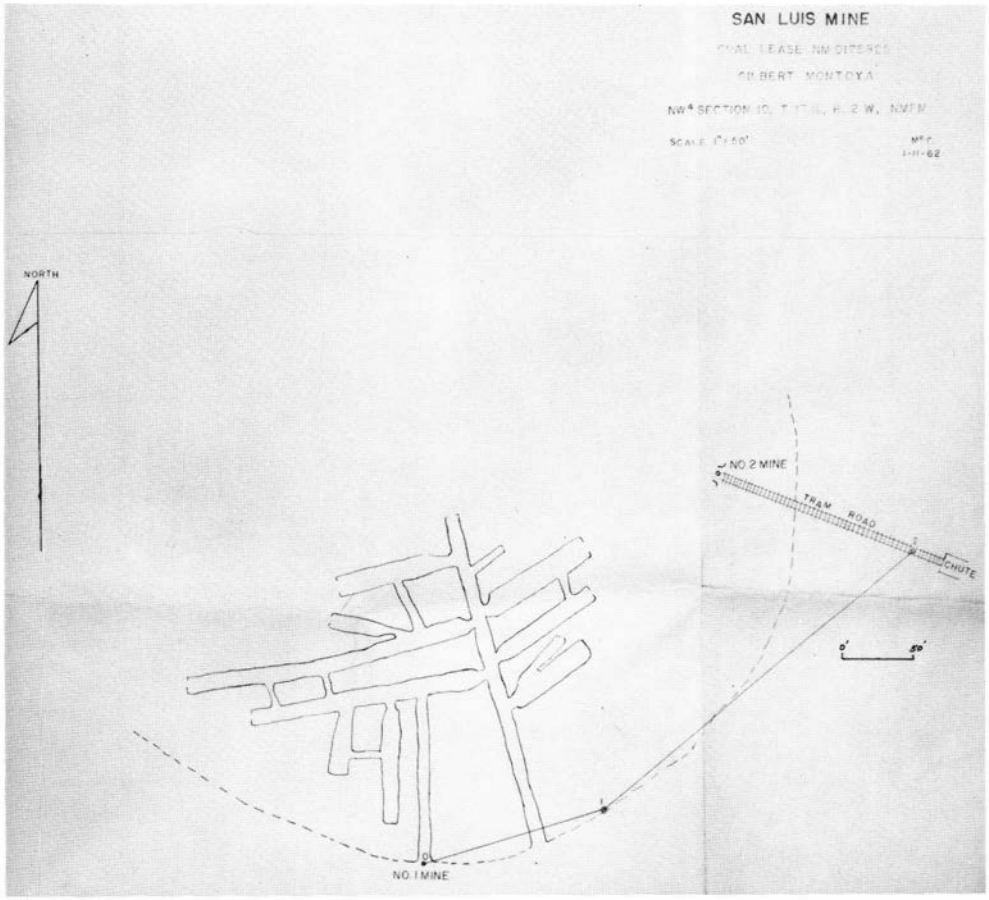


FIGURE 190—Map of the San Luis mine. Shown are the workings excavated by Mr. Yarbrough under permit SF 077477 from 1944–1948 and the new entry, mine No. 2, started by Mr. Montoya under permit NM 0175825. *Map was made from a survey done by Charles McConnell on January 11, 1962.*

FIGURE 191—Arroyo No. 1 mine pit with a dozer in operation. Note the coal storage pile at the left side of the photo and Cabezon Peak in the background. *Photo by New Mexico Surface Mine Inspectors, January 1981.*

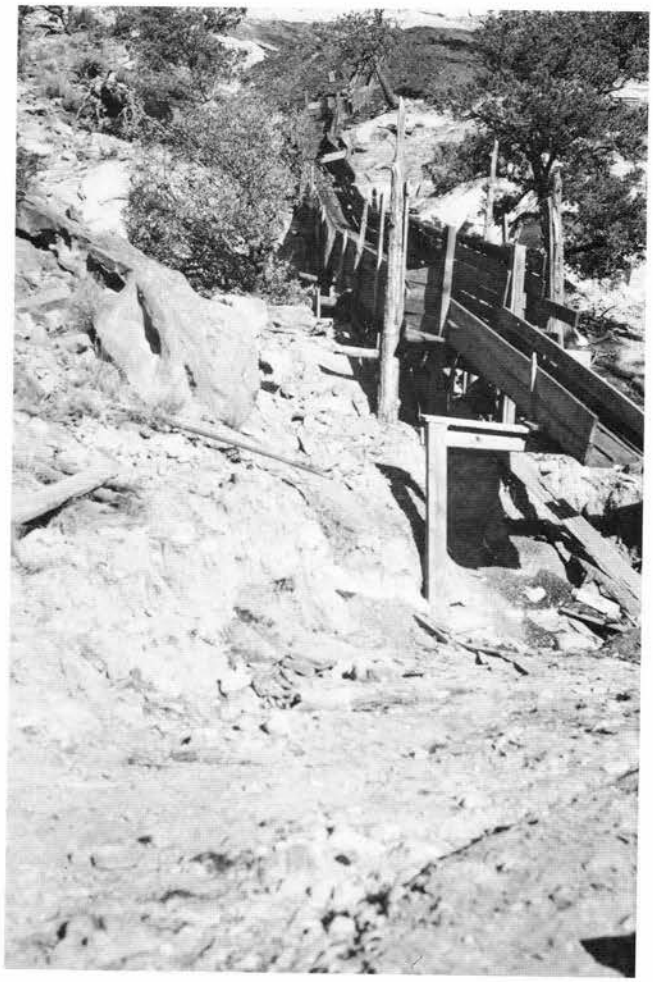


FIGURE 192—Chute built by Mr. Looney on the Looney prospect to transport the coal to the valley floor. *Photo by R. D. Reeder, August 19, 1939.*

FIGURE 193—Old Looney prospect portal and the new opening started by Mr. Jack on the Jack prospect. *Photo by R. H. Allport, June 14, 1946.*

he measured an exposed coal section on each trip. His sections (locations were not given) were described as follows:

The bed dips 22° north, exposed in short entry.	
100 ft ± white sandstone	
Weathered coal	2' 7"
Bone and shale	7"
Weathered coal	2' 0"
Shale	20' 2"
Coal	Not fully exposed
Exposure opened by a shallow trench 4 ft wide, 10 ft deep, and 6 ft long. The coal bed dipped 23°N10°W.	
Sandstone	
Hard black coal	3' 6"
Bone	6"
Hard black coal	1' 6"
Shale	2' 6"
Soft coal	8"
Shale	11' 2"
Coal	
Shale	5' 2"
Soft coal	2' 5"
Floor	Sandstone shales

The difficulties stemming from the inaccessible location, the high elevation, and the steeply dipping coal beds could not be overcome, and Mr. Looney was unable to continue prospecting. The permit expired on August 9, 1942, and there was no production from the property.

Jack prospect

SF 077619 **6-12-45** **Permit**
William J. Jack, Kirtland
Parts of secs. 1, 12, T23N, R1W

Mr. Jack reopened the John Looney prospect (permit SF 074852). He drove an entry N43°W for a distance of 56 ft on the coal bed; the bed dipped 34° northwest, and its strike was N55°E. Mr. Jack and his son, who helped him operate the property, constructed a tipple with a 1-inch screen (Figs. 193, 194) and built two bunk houses. The first production from the prospect was in December 1946, but operations were stopped after the mining of only 47 tons of coal. The permit expired by law on June 11, 1949, and the case was closed April 29, 1959, when delinquent royalty was paid.

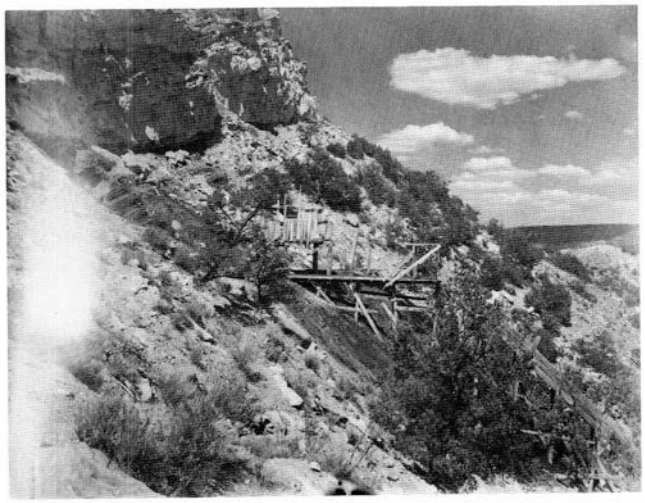


FIGURE 194—Hoist house, tipple, and chute built by Mr. Jack in the steep hillside of the Jack prospect. *Photo by R. H. Allport, June 14, 1946.*

Amick prospect

SF 077305 5-17-44 **Permit**
Ray Amick, Gallina
Sec. 23, T23N, R1W

Mr. Amick's prospect was 300 ft north of highway NM-96, 4.5 mi southwest of Gallina. The operator opened a coal bed with a cut near the SE¼NW1/4 of sec. 23. The bed dipped 73° to the west, and the strike was N3°W; a bed of clean coal 5 ft 7 inches thick with a shale hanging wall and footwall was exposed. In one of the more interesting small operations, Mr. Amick mined a small amount of coal with a wheelbarrow and a wash tub (Fig. 195). The permit expired on May 17, 1946, and before that time Mr. Amick had produced 76 tons of coal. He proudly called his prospect the Victory mine.

FIGURE 195—Small tipple, wheelbarrow, and wash tub used to operate the Amick prospect. *Photo by R. H. Allport, October 23, 1944.*

Standing Rock coal field

The Standing Rock coal field encompasses the outcrop of the Cleary Coal Member of the Menefee Formation in a broad east-west-trending band including all or parts of T17N, Rgs. 9 and 10W; T18N, Rgs. 9W through 17W; and T19N, Rgs. 9W through 17W, an area extending from 4 mi east of Tohatchi eastward to Hospah. The Cleary Coal Member overlies the well-known Gallup Sandstone, Dilco Coal Member, and Gibson Coal Member that have been and are mined in the Gallup coal field. The Gallup, Dilco, and Gibson coals crop out south of the Standing Rock field and make up the Crownpoint field. Figure 1 shows the Standing Rock coal field in relation to adjoining coal fields in the San Juan Basin.

Mining in the Standing Rock field has consisted of a small open pit mine at Standing Rock and other similar pits opened along the outcrops by the Navajos for their winter fuel. The New Mexico Bureau of Mines and Mineral Resources drilled three tests in the field in 1970 or 1971 (Shomaker et al., 1971). The outcrops are poorly exposed, and the beds are known to be lenticular and to thicken and thin erratically; test drilling is necessary to determine the coal potential. Rich uranium deposits have been discovered underlying the coal. The hundreds of electric logs obtained from uranium exploration could be evaluated for coal by geologists familiar with the area.

The field dips gently to the north with low relief, providing satisfactory conditions for strip mining. Shomaker et al. (1971, p. 69) indicate that commercial reserves of 6075 million tons exist in each of two areas, one about 1 mi northeast of Standing Rock and the other across R9W in Tps. 16N and 17N.

During the 1970's interest was shown in building a railroad across the Borrego Pass-Hospah area to transport Fruitland coal to markets. The Santa Fe Railroad went so far as to survey the route from the main line at Prewitt to the Fruitland field and contact the land owners for rights of way; however, title to the large Fruitland coal reserves still remains in U.S. government hands, and the reserves held by private companies hardly justify building this railroad. Undoubtedly interest would be shown in the Standing Rock coal field if a railroad were built near this area.

Toadlena No. 2-James Silent Man mine

Coal permit 24 **3-8-52** **Navajo Tribe**
James Silent Man, Two Grey Hills Trading Post

The mine is 8 mi north of Newcomb Trading Post on NM-666, then 2 mi east. Mr. Silent Man began the operation of the mine in 1952. The coal bed, measured by R. S. Fulton, Mining Engineer, was described as follows:

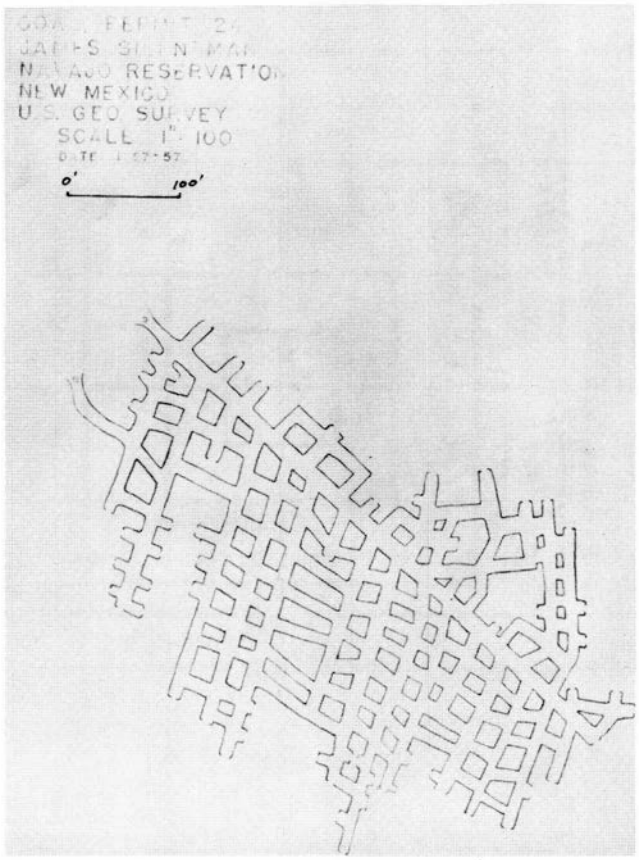


FIGURE 196—Map of the Toadlena No. 2–James Silent Man mine.

Roof coal	2' approximately
Coal	3'
Bone	0' 3"
Coal	1'
Shale	0' 3"
Coal	0' 6"
Bottom	Shale

The coal bed dipped 15°SE.

According to a report by J. W. Hager, Mining Engineer, the Simpson Coal Company took over the operation of the mine at some time in 1956. A map made by engineers from the Mining Supervisor's Office and updated to January 1957 is shown in Figure 196. The mine was operated very sporadically after 1958, and production is not known.

Crownpoint coal field

The first coal mines in the Crownpoint coal field (see Fig. 1) were opened to supply coal for the Navajo Indian schools and agency facilities, which were operated by the Office of Indian Affairs. The first mine probably was the Crownpoint mine, 0.5 mi south of Crownpoint, headquarters for the Eastern Navajo Reservation. It was opened in June 1918 and closed about 1951. The Tohatchi mine in the Coyote Canyon area was probably opened at about the same time to furnish coal to heat the Navajo Indian schools and agency facilities at Tohatchi, and this mine operated until about 1949.

From 1948 to 1951 four coal permits were issued for lands in the vicinity of the Tohatchi mine to Peter and Chee Martin, Alexi Detosi, Benson Tohe, and Sam Morgan by the Navajo Tribe. The Chee Martin and Sam Morgan mines operated until about 1962, and the other two mines operated only until the mid 1950's. Frank Hannah obtained a coal permit from the Navajo Tribe in 1952 and operated a mine until 1964 about 0.5 mi west of the Dalton Store (Shillingburg Store).

On the east end of the Crownpoint field, in the vicinity of Borrego Pass, R. C. Reid and Donald Smouse obtained federal coal prospecting permits in 1940, which remained active until 1949. They opened several small prospects a few miles west of Harvey's Trading Post. Some mining by a Spanish man and a Mr. George took place before 1939 to the east of the above prospecting permit lands.

On February 1, 1966, three prospecting permits were issued to William E. Roope of Oak Creek, Colorado, for more than 4,000 acres north and west of Borrego Pass, and he assigned these permits, together with two State of New Mexico leases, to United Electric Coal Companies of Chicago, Illinois. The lands were then prospected by drilling, but no coal beds thick enough to warrant further work were disclosed. No other great interest in these coal beds has been evinced since that time.

Tohatchi mine

Navajo Agency mine
Sec. 22, T17N, R17W, Coyote Canyon

The mine, 14 mi east of Tohatchi, was developed to supply coal to heat the Navajo Indian School at Tohatchi. In 1928 the Office of Indian Affairs informally requested that engineers from the Mineral Leasing Division or the Mining Supervisor's office inspect Indian mines and assist the superintendents of the various agencies with their mining problems. The Tohatchi mine was inspected on April 27, 1928, by J. **J.** Bourquin, Deputy Mining Supervisor, and B. W. Dyer, District Mining Supervisor. At that time a drift had been driven a few feet from the workings of an old mine, and several short rooms had been advanced to the right; the two workings were connected to provide ventilation. A section of the bed measured in the working was described as follows:

Roof	Shale
Coal	3' 1"
Bone	0' 3"
Coal	2' 3"
Bone	0' 3"
Coal	1' 6"
Floor	Shale

The strike of the bed was N80°E and its dip 5° NW. The coal was fairly bright and hard. An analysis by the U.S. Bureau of Mines showed the following: 10,830 BTU per pound, 0.7% sulphur, and 10.5% ash. The Navajo miners were paid $1.20 per ton delivered to the tipple, and the Indian Service paid for all of the mine materials. The cost of hiring Navajo laborers to haul the coal to the school was $6.40 per ton.

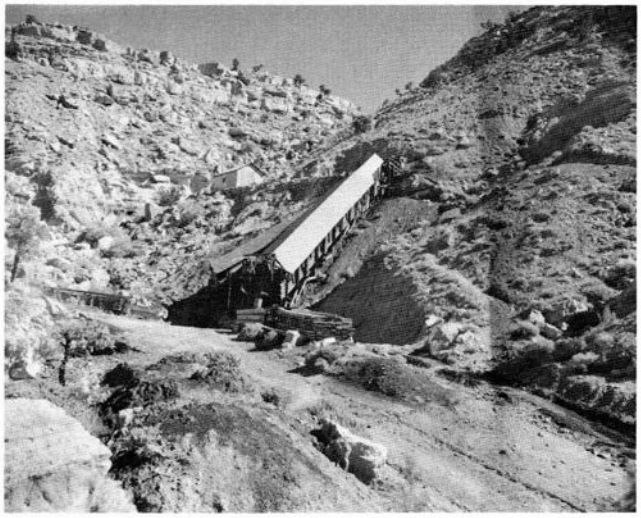


FIGURE 197—Surface facilities at the Tohatchi mine. *Photo by R. D. Reeder, October 4, 1943.*

The coal reserve in this working was sufficient to provide the 1,000 tons that were needed for the winter of 1928-1929, but a new mine had to be found for future coal needs. A new mine site, 0.25 mi north of the existing mine working, was suggested by Mr. Bourquin to Mr. Allison, principal of the Tohatchi School.

In an inspection report of October 16, 1937, Mr. Dyer stated that the new mine had been developed in an orderly manner and the safety conditions and the potential for economic production of coal were very good. During the previous winter the coal had frozen in the long chute from the mine portal to the road, and Mr. Dyer suggested that the chute be covered to eliminate this problem. He also recommended that burros be used to haul the coal from the mine because that might prevent a miner from having a hernia. In addition, Mr. Dyer tried to persuade officials at the powerplants to use mine-run coal in order to prevent the accumulation of slack coal at the mine; he was later successful in this endeavor.

Figure 197, a photograph taken in October 1943 of the surface facilities, shows that a new chute and bin had been built to handle production. The new chute was built beside the old coal-handling facility. By April 1947 another coal-handling facility had been built (Fig. 198). The extent of the underground workings is shown in Figure 199. The mine probably closed in 1949 or 1950; the last inspection date on the map by R. S. Fulton is September 29, 1949.

Martin mine

Coal permit **1949** Navajo Tribe permit
Peter Martin, Coyote Canyon area
Chee Martin, Coyote Canyon area

The Martin mine was opened on the same bed of coal as the Tohatchi mine, and the portal of the Martin mine is approximately 1,500 ft S25°W of the Tohatchi mine portal. The original permit was issued to Peter Martin by the Navajo Service in about 1949.

On September 29, 1949, Robert Fulton, Mining Engineer, and Dan P. King, Supervisor of Coal Mines on Indian Lands,

visited the property. The main entry had been driven 90 ft on a course of S22°E on a 12-ft bed of coal. A small wooden tipple and a 15-ton bin equipped with 1-inch angle iron screens were used to store the coal and to provide a method of loading the customers' trucks and wagons. The coal was sold to truckers, to the Navajo Agency schools, and to other installations.

By October 1950 the mine was operated by Chee Martin, who produced about 20-30 tons per day during the coal sale season, which was September through March. Three feet of top coal were left in the roof for support and ease of mining.

In 1957 Mr. Martin had a 400-ton per month contract with the Fort Wingate School, but the following year the school converted to gas, like many other coal-using facilities on or near the reservation. After the resultant loss of sales the safety conditions of the mine deteriorated until government and Navajo tribal officials recommended that the permit not be reissued until the mine safety improved. Navajo coal permits were issued for a period of 5 years and renewed if the tribe so recommended. The permit expired on March 1, 1956; however, Mr. Martin continued to operate until May of 1960. The mine was declared unsafe, and Leo Denetsone, Assistant to the Tribal Mining Engineer, persuaded Mr. Martin to open a new portal. The new portal was located 310 ft east of the old portals. The old chute was torn

FIGURE 198—Surface facilities at the Tohatchi mine. *Photo by R. H. Allport, April 25, 1947.*

FIGURE 200—The chute constructed about 1960 at the new portal of the Martin mine. *Photo by H. B. Nickelson, April 2, 1962.*

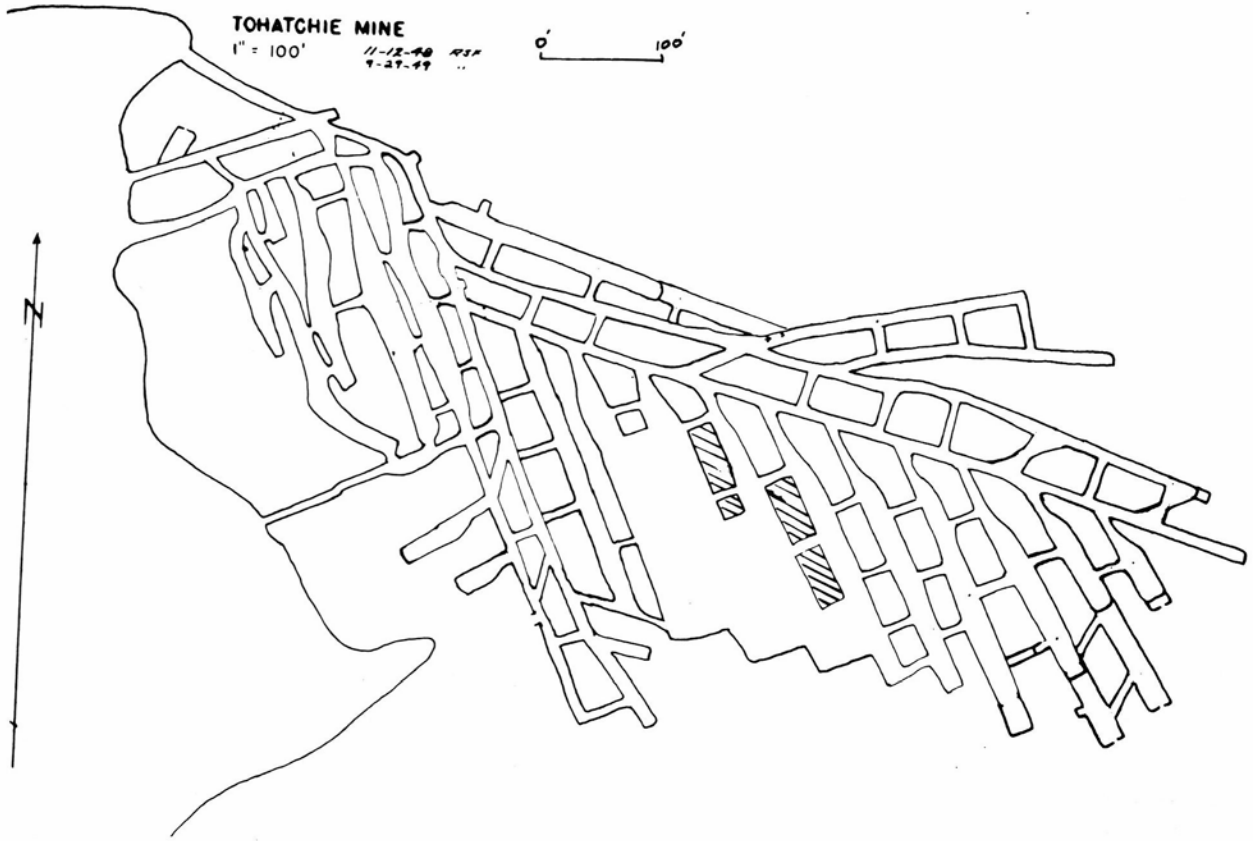


FIGURE 199—Map of the Tohatchi (sometimes spelled Tohatchie) mine. *Made by R. S. Fulton.*

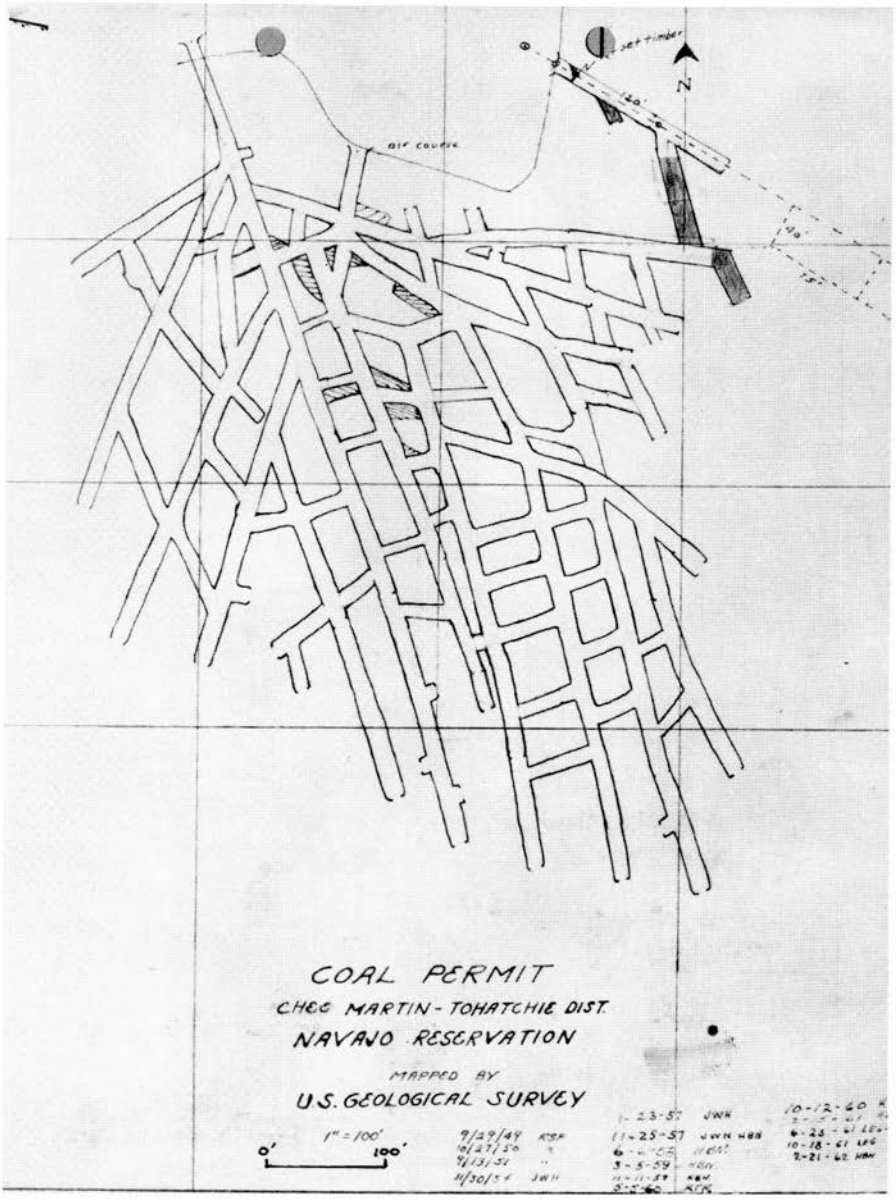


FIGURE 201—Map of the Chee Martin mine in the Coyote Canyon area. *Made by engineers from the Mining Supervisor's office.*

down, and the reclaimable material was used to construct a new chute at the new portal site. A short access road was graded to the bottom of the chute (Fig. 200). The extent of the old workings and the location of the new portal are shown in Figure 201.

A new Navajo coal permit, No. 43, was issued to Mr. Martin on October 28, 1960. A small amount of coal was produced during the next couple of years, but unsafe working conditions developed again in the mine. As a result, the Superintendent of the Tribe cancelled the permit on July 5, 1962. Production from small Navajo mines is not accurately known, although a small royalty was paid to the Navajo Tribe.

Coyote Canyon-Sam Morgan mine

Coal permit No. 12 3-1-51 Navajo Tribe permit
Sam Morgan, Tohatchi

The Coyote Canyon mine is located 13 mi east of NM-666, near the head of Coyote Canyon. It is on the same bed of coal as the Chee Martin mine, but about 2 mi west. The coal bed was approximately 12 ft thick and composed of clean coal that was relatively flat. Mr. Morgan mined 8 or 9 ft of the bottom coal and left approximately 3 ft of coal in the roof. The coal was sold to the Indian Agency schools and also marketed for domestic use. During the winter months production could reach about 30 tons per day. The extent of the mine workings is shown in Figure 202. The mine ceased operation in 1963.

Benson Tohe mine

Coal permit No. 2 3-1-51 Navajo Tribe permit
Benson Tohe, Tohatchi

The mine is 1 mi south of the Tohatchi mine and 16 mi southeast of Tohatchi. It was opened during the summer of 1949 to supply coal to Indian Agency schools and other installations and for domestic use.

On September 30, 1949, Robert S. Fulton, Mining Engineer, and Dan P. King, Supervisor of Coal Mines on Indian

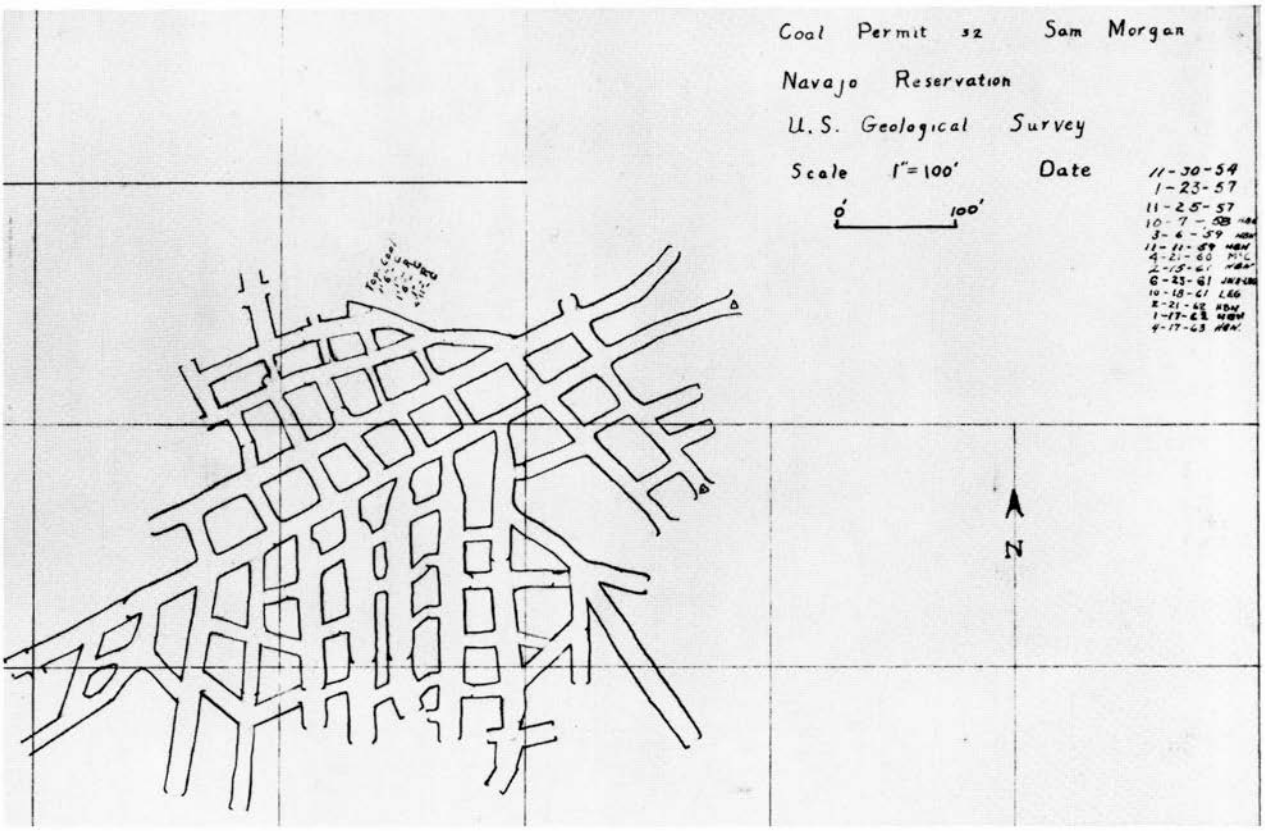
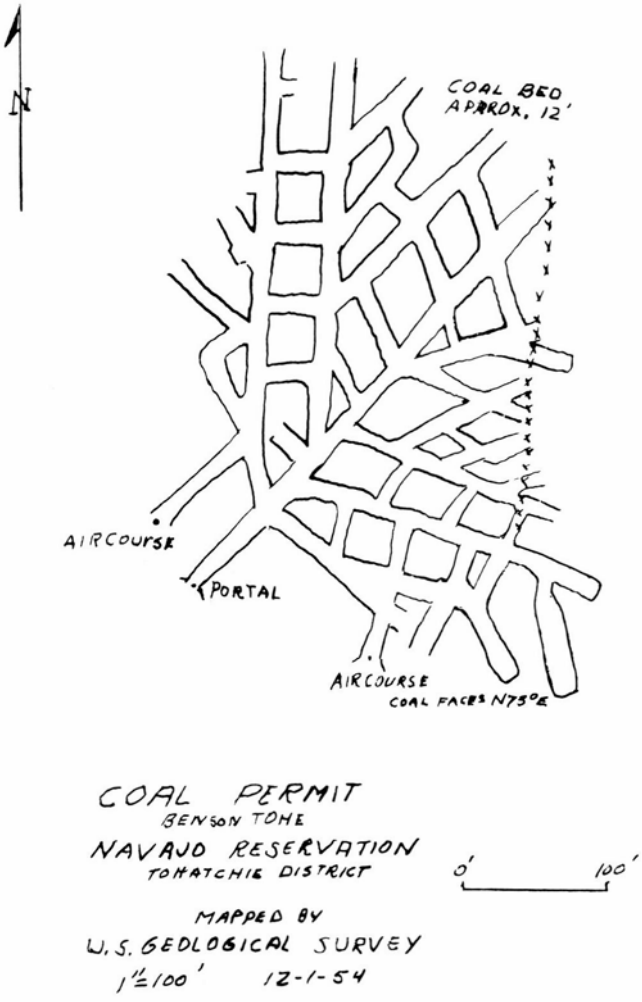


FIGURE 202—Map of the Coyote Canyon–Sam Morgan mine.



Lands, visited the operation and found that Mr. Tohe had begun an opening on a 12-ft bed of coal. Four to 5 ft of coal were left in the roof. A chute 115 ft long and 8 ft wide, equipped with a 1-inch angle-bar screen, had been built to transport the coal off the hill. A roll or fault along the west side of the mine prevented the mine from developing in that direction because of bad roof conditions (Fig. 203). The last inspection report in the file was made in May 1955. Apparently the mine was closed soon after that. The permit was cancelled in September 1958, and production is not known.

Detsoi prospect*

Coal permit No. 13 3-1-51 Navajo Tribe permit
Alexi Detsoi, Tohatchi
Coyote Canyon area

The original Navajo tribal permit for the above land was issued jointly to Alexi Detsoi and Mike Yazzie by the Navajo Service. It is not known why Mr. Yazzie withdrew from the operation at a later date, and Coal Permit No. 13 was issued to Mr. Detsoi only on the recommendation of Dewey Weddington, Acting Supervisor of Navajo Mines.

The mine was opened about 1948. Robert S. Fulton, Mining Engineer, inspected the mine with Dan P. King, Supervisor of Coal Mines on Indian Lands, on September 29, 1949, and at that time an opening had been driven 98 ft on a course of N23°W on a bed of coal 4 ft 5 inches thick that dipped 5° to the NW (Fig. 204). A 15-ton storage bin had been built with a 1-inch angle-iron screen to separate the slack coal from the lump coal.

FIGURE 203—Map of the Benson Tohe mine. *Made by engineers from the Mining Supervisor's office.*

Mr. Fulton, accompanied by Dewey Weddington, inspected the mine again on October 27, 1950, and found the roof conditions so bad that Mr. Weddington ordered the rail pulled and the portal closed. Apparently the order to close was not heeded. On February 28, 1952, between 1:00 and 4:30 p.m. Joe Johnson Tso, who was in the mine alone, was killed instantly by a fall of ground from the roof. Mr. Tso, although only recently hired, had had 3 years of experience in mining. He had decided he would load some lump coal, and was the only one at the mine until 4:30 p.m. when the truck driver who was to pick up the coal found him in the mine under the fall of roof. Mr. Tso's body was removed the next day by Mr. Detsoi and Mr. Weddington. The mine was apparently never operated again, and production from the prospect is not known.

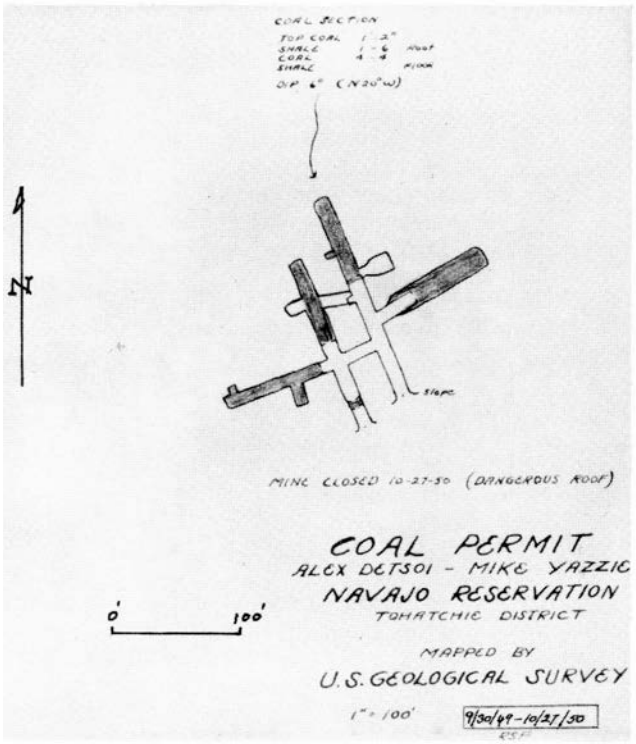


FIGURE 204—Map of the Detsoi mine.

Dalton-Hannah mine

Coal permit No. 29 Navajo Tribe permit
Dalton Store, 1906
Frank Hannah, 1952-1963
NW1/4 sec. 13, T17N, R14W

M. K. Shaler (1907, p. 411) mentioned a small prospect opened near the Dalton Store on a 3.5-ft bed of coal that dips about 3°NNE. The coal was reported to burn well without forming clinkers. The Dalton Store was an early-day trading post, sometimes known also as the Shillingburg Store, which has survived to the present day. There was apparently some sporadic mining for the store and for local sales until the 1950's, when Frank Hannah, a Navajo Indian, acquired the mine. For some years he operated the mine during the early fall and winter and sold the coal to local Navajo Agency schools.

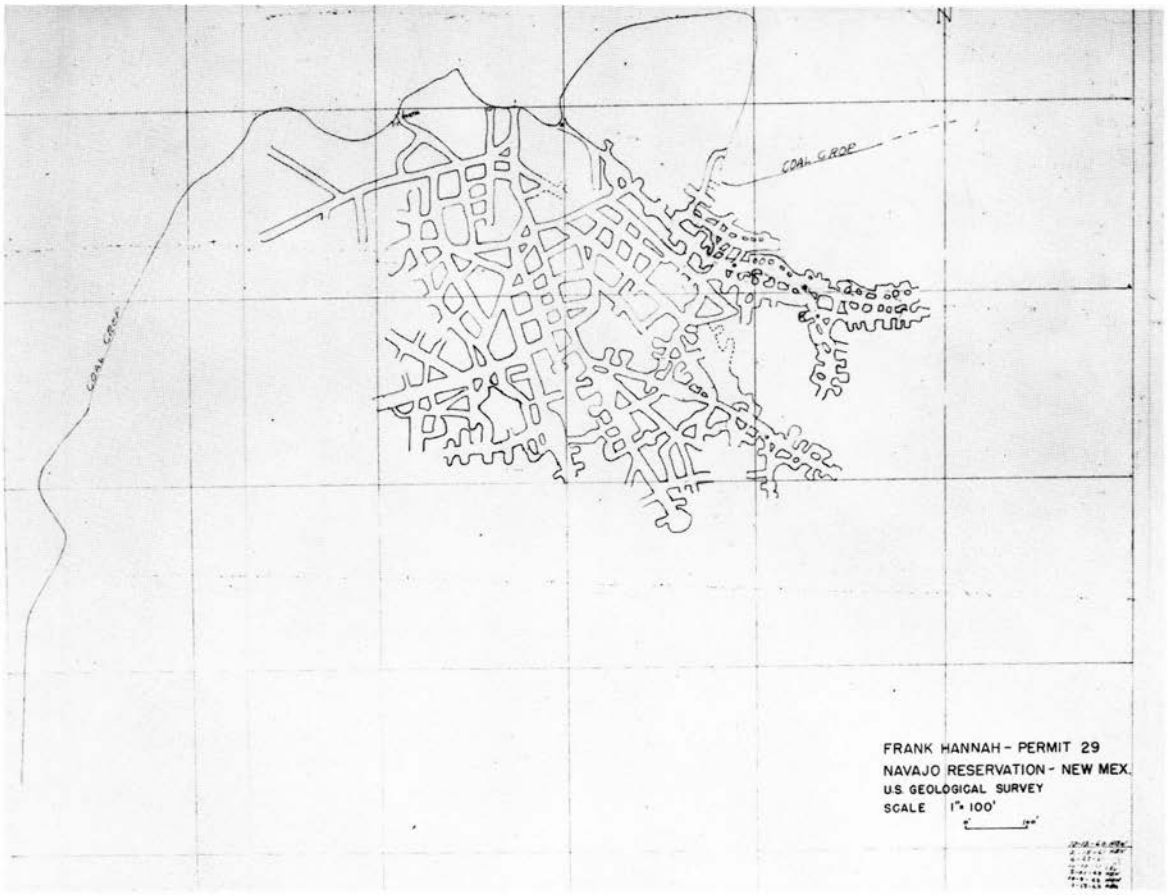


FIGURE 205—Map of the Frank Hannah mine.

Mr. Hannah had a unique method of mining. When a sizable order was obtained he would hire 12 or 15 Navajc Indians and would station two miners, staggered about 3C ft apart, on each side of an entry. They would start mining in a circle from the walls of the entry, shoveling the coal tc a car in the entry. A limited amount of timber was used. This mining method resulted in robbing too much coal from the pillars, and consequenty the entry and dog holes caved (Fig. 205). The number of openings on the map suggests that the Dalton Store and Hannah mines were the same. The installation of natural gas and oil in the schools gradually eliminated the use of coal, and the mine closed in 1963. Figure 206 shows the surface facilities when the mine closed.

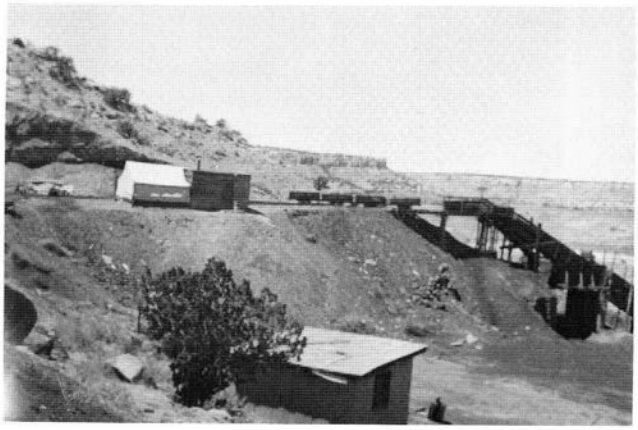


FIGURE 206—View looking south of the surface facilities of the Hannah mine. *Photo by H. B. Nickelson, 1963.*

Crownpoint mine*

Eastern Navajo Indian Agency 1918-1951(?)
Sec. 30, T17N, R12W
3,600 ft NL, 2,900 ft EL
5,000 ft NL, 3,600 ft EL

The Crownpoint coal mine was opened to provide coal to the government and Indian buildings, which served as headquarters for the Eastern Navajo Reservation, and to the Indian Agency schools. Although several openings exist at this mine, only one operated at a time. The first mine began operation in June 1918 under the direction of Samuel F. Stacher, Superintendent of the Agency. Two miners, who were paid $5.40 per day, and five top men, who were paid $3.00 per day, were employed; they produced about 400800 tons of coal per year. On September 23, 1921, Daniel P. King was hired to assume charge of the mine.

In 1924 a fire broke out in the mine, which had to be sealed and abandoned. A new mine was then opened with two parallel entries from which rooms with pillars were developed. The same year the mine increased its production to about 2,00 tons per year, and by 1930 it had a production of 3,500 tons per year. The mine was also known in its early history as the Pueblo Bonito coal mine.

The first records in the files in the Mining Supervisor's office are dated 1928. That year the Office of Indian Affairs requested that the mining engineers of the Mineral Leasing Division of the USGS determine the explosives used and assist the superintendents with any mining problems that might confront them.

B. W. Dyer, District Mining Supervisor, and J. J. Bourquin, Deputy Mining Supervisor, visited the property on April 25, 1928 (Fig. 207), at which time Daniel King, Miner-Foreman, was in charge of the mine. Mr. Dyer and Mr. Bourquin were highly impressed with the excellent overall conditions of the mine, which they attributed to Mr. King and the agency. The coal bed mined was one of the best of several beds in the Mesaverde Formation in this particular area, and it was capable of providing the 2,000 tons per year then required by the Crownpoint School. The bed had

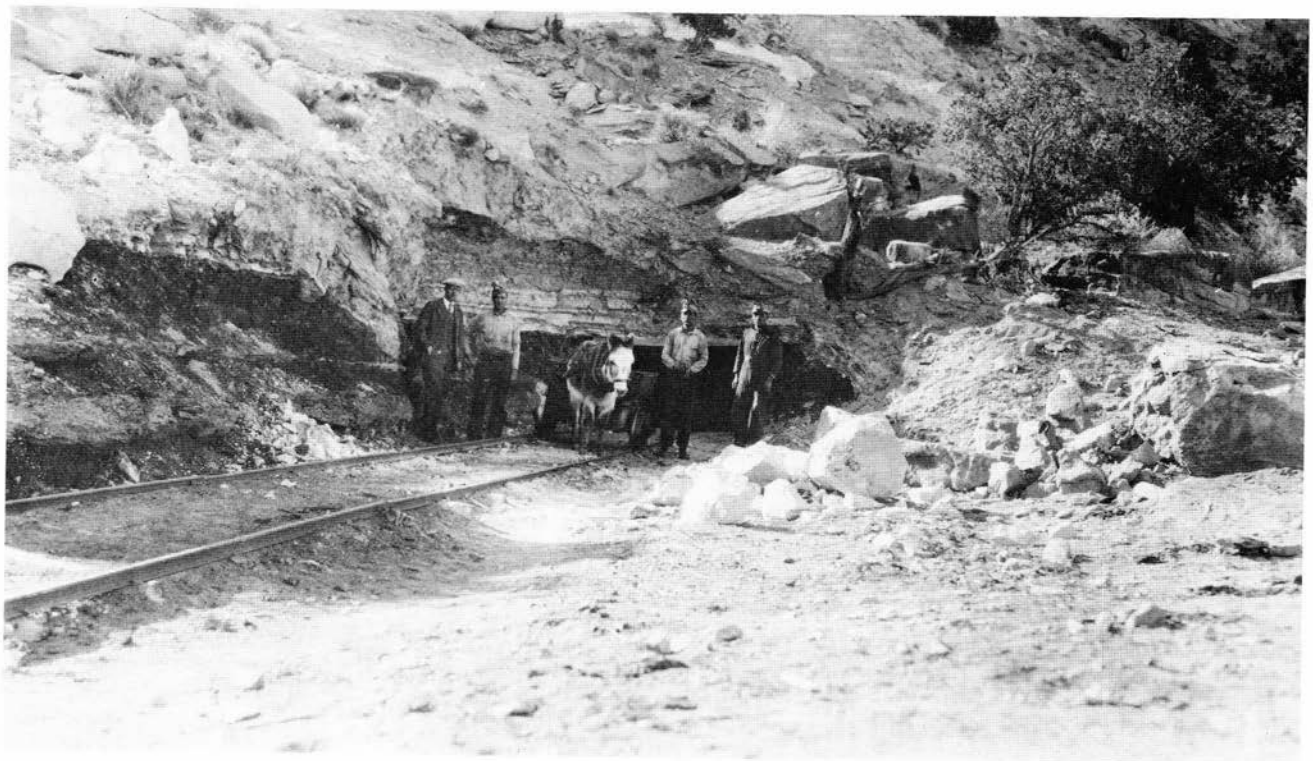


FIGURE 207—Mine portal of the Crownpoint mine. It is believed that Mr. Bourquin is on the viewer's left, next to Mr. King. The two Navajo miners are unidentified. *Photo by B. W. Dyer, April 25, 1928.*

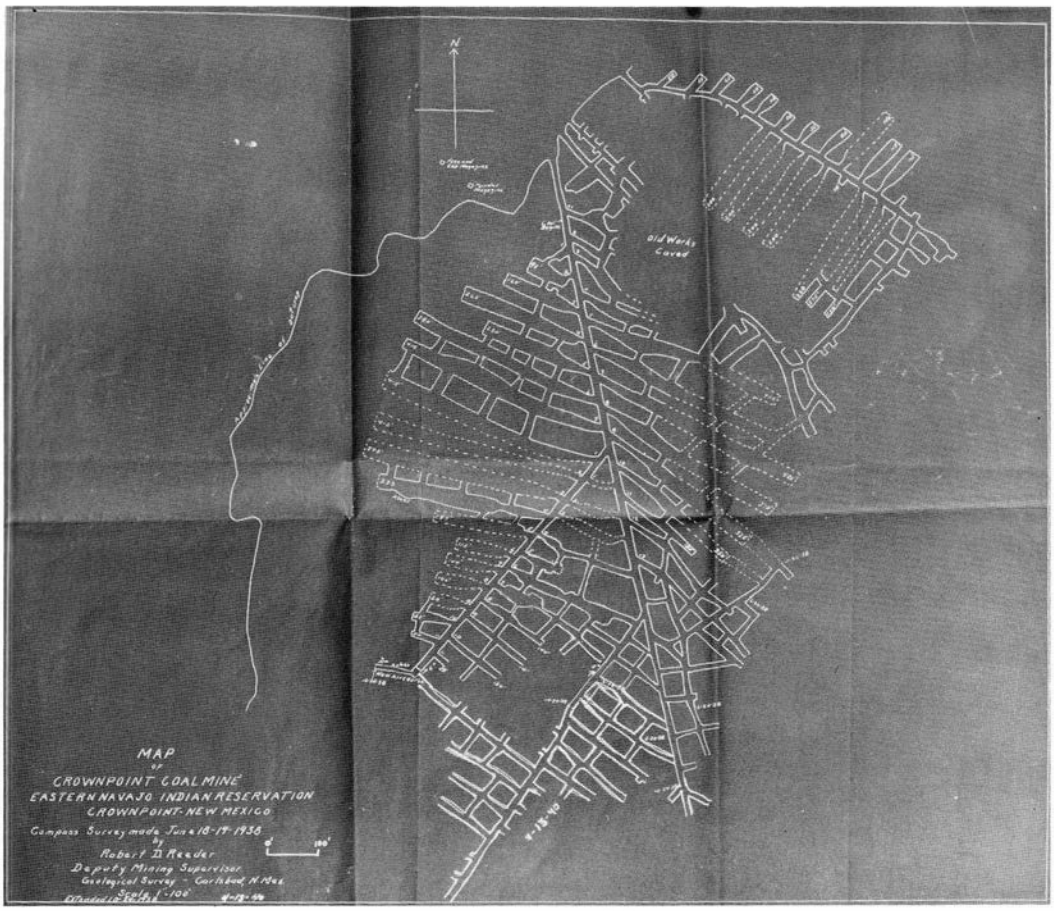


FIGURE 208—Map of the Crownpoint mine. *Surveyed and mapped by R. D. Reeder in June 1938 and updated through 1940.*

a strike N70°E and a dip of about 1°N. The mine was developed by a 700-ft single entry from which the rooms were turned both left and right. The rooms driven on the right were extended to a burn, and the rooms on the left were mined to old workings. Below is a cross section of the bed:

Sandstone	Roof
Coal	1' 10"
Bone	0' 2½"
Coal	1' 3"
Bone	0' 5"
Coal	0' 2"

During October 1928 Mr. Dyer cut two samples from the mine and constructed a composite analysis:

Moisture	15.4%
Volatile matter	36.1%
Fixed carbon	39.0%
Ash	9.5%
Sulphur	1.3%
BTU	10,520

J. J. Bourquin examined the property on May 2, 1935. At that time the mine, which had been expanded greatly, was in unusually good condition. Coal was produced for the agency for $2.50 or less per ton, which was then an excellent cost for an agency-operated mine. The fuel supply from the mine powered the electric generator for the pumps that provided the water needed for Crownpoint. In his report Mr. Bourquin wrote the following about Samuel F. Stacher, Superintendent of the Crown Point Agency, Daniel P. King, Foreman of the Crownpoint mine, and the mine:

> The Crown Point coal mine might well be designated the "model mine" or the "picture mine" of the Indian Service in the Southwest. Conditions of development, of maintenance and mining practices are

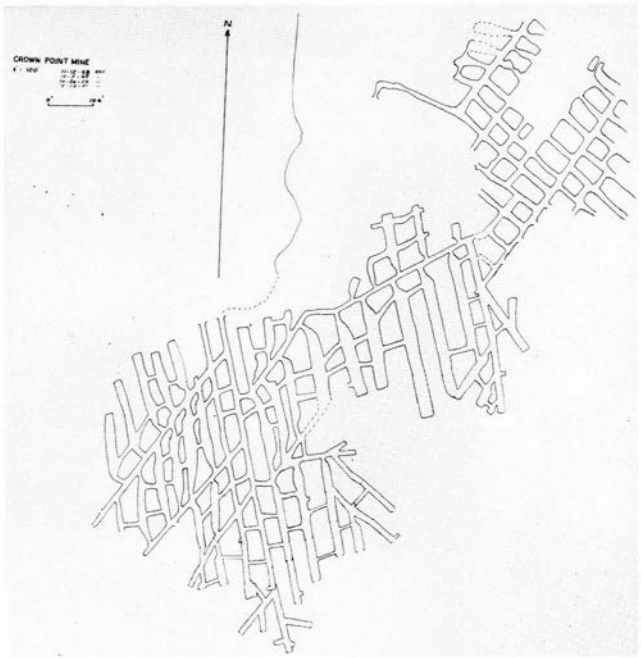


FIGURE 209—Map of the Crownpoint mine, 1948–1951. This map is a continuation of Reeder's map (see Fig. 208); the single entry at the north end of this map corresponds to the southernmost entry of Reeder's map. *Made by R. S. Fulton.*

such that there appears to be no necessity for the preparation of a long, detailed report concerning the property. The writer has examined mining properties throughout the United States, practically from coast to coast, and never has examined a small coal mine more deserving of a high rating for standards of safe and efficient operation than the Crown Point mine. In view of that fact, the writer believes that Mr. Samuel F. Stacher, Superintendent of the Crown Point Agency, and Mr. Daniel P. King, foreman of the Crown Point mine, are deserving of special letters of commendation or other evidence of appreciation of services rendered, from appropriate sources with the Indian Service.

* * *

The successful development, operation, and maintenance of the Crown Point mine has been due primarily to two facts; viz:

(1) Able men were placed in charge of the property on a wage and/or salary basis, and (2) the management of the mine was not been subject to annual or seasonal changes such as have prevailed at some other coal mines of the Indian Service.

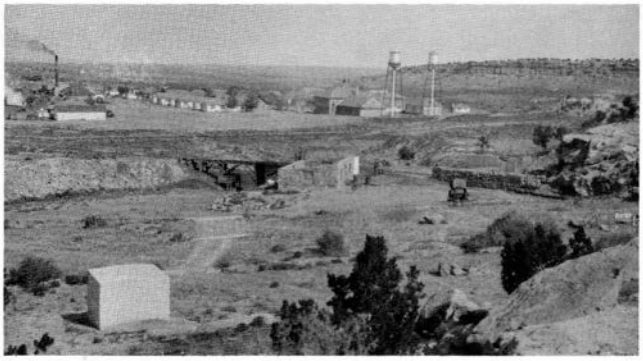


FIGURE 210—The school, powerhouse, community, and coal mine at Crownpoint, headquarters for the Eastern Navajo Reservation. *Photo by F. W. Calhoun, October 24, 1936.*

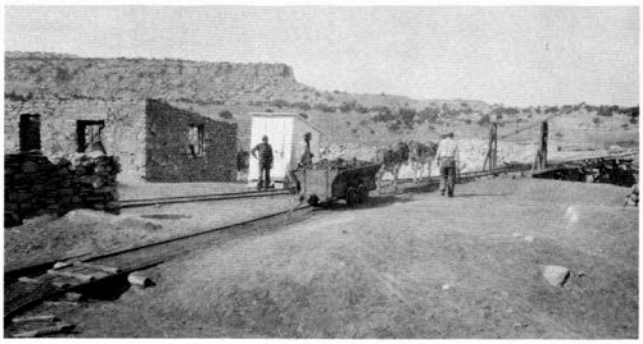


FIGURE 211—Tipple and mine yard at the Crownpoint mine. *Photo by F. W. Calhoun, October 24, 1936.*

The high praise of Mr. Bourquin was instrumental in Mr. King being considered as a recipient of the Holmes Safety Award. F. W. Calhoun, Associate Mining Engineer, describes the presentation of that award to King as follows:

The examination on October 24, 1936, was made in company with Mr. E. H. Denny, District Engineer, United States Bureau of Mines, Denver, Colorado, and Mr. Dan P. King. Mr. Denny, as representative of Dr. John N. Finch, Director, U. S. Bureau of Mines, and president of the Joseph A. Holmes Safety Association, visited Crownpoint for the purpose of presenting a certificate of honor awarded to Mr. Dan P. King for meritorious achievements in safety. The award was based upon the operation of the Crownpoint coal mine by Mr. King for 14 years to June 30, 1935, and the production of 41,100 tons of coal, without a single lost time accident. Navajo Indians were employed and trained as miners and mine laborers during this period. The perfect "no lost time" accident record has been continued through October 24, 1936. The record for 15 years 3 months to September 30, 1936 shows the production of 48,910 tons of coal without a single lost time accident at the mine. The award reflects great credit upon each officer and employee of the Agency, who for more than 15 years have contributed their time, leadership and cooperation toward making this record possible.

FIGURE 212—Employees of the Crownpoint mine at the check board preparing to enter the mine. Tony Pardich, Mine Foreman, is on the viewer's left. *Photo by Dan King, September 1938.*

FIGURE 213—Crownpoint mine storage bin and tipple. *Photo by R. H. Allport, winter 1943.*

During the years the engineers from the Mining Supervisor's office inspected the Crownpoint mine they recommended that the agency have a map made of the mine workings, but it was never accomplished; therefore, R. D. Reeder, Deputy Mining Supervisor, surveyed the mine and made a map in June 1938. He also mapped the mine in 1940, and those additions were added to his 1938 blueprint (Fig. 208). In 1948 Robert Fulton, Mining Engineer, began updating Reeder's map (Fig. 208) to show the extent of the underground workings, and he continued this mapping until the mine closed in 1951 (Fig. 209). Figures 210-213 are photographs taken from 1936 to 1943 at Crownpoint mine.

Mr. King became Supervisor of all the Navajo coal mines in late 1938, a position he held for a number of years. The records of the Crownpoint mine after 1938 could not be found in the files except for a production record of 2,974 tons for 1949. Production from July 1, 1921, through September 30, 1936, amounted to about 48,000 tons (Table 61). It is believed that the mine ceased operation about 1951.

One fatality is known to have occurred at the Crownpoint mine. On March 25, 1920, Wayne Barboan, a Navajo Indian, age 18, and a teamster, was killed by a fall of rock when he went into the mine to push a car of coal to the chute.

During the Abandoned Mine Lands project in 1979, the mine was found to be on fire, and it was recommended that the open portals be sealed to subdue the fire.

TABLE 61—Production and employment record of the Crownpoint mines; *estimated; there are no further records in the State Mine Inspector's annual reports.

Year	Production (tons)	Employment		Days operated
		Miners	Top men	
1918	800*			
1919	800*	2	5	120
1920	400*	2		261
1921	500*	2		260
1922	400*			
1924	2,000*			
1925	2,000*			
1927	2,000*	3		303
1929	2,500*	3		303
1930	3,500*	3	2	303
1931	4,000*	5	2	
1932	4,500*	5	1	306

United Electric Coal Companies' Crownpoint project

William E. Roope, Oak Creek, Colorado
United Electric Coal Companies, Chicago, Illinois

NM 0558315 2-1-66 Permit
Sec. 4, T16N, R11W; secs. 28, 30, and 34, T17N, R11W, 1,919 acres

NM 0558316 2-1-66 Permit
Secs. 10, 14, and 24; NE1/4 sec. 11; E1/2, SW1/4 sec. 22, T16N, R11W, 2,560 acres

NM 0558317 2-1-66 Permit
N1/2, N1/2SW1/4, SE1/4 sec. 22; NE1/4, N1/2SE1/4, SW1/4SE1/4 sec. 26, T17N, R12W, 840 acres

State of New Mexico lands Lease
Secs. 32 and 36, T17N, R11W

The applications for the permits were made by William E. Roope of Oak Creek, Colorado, and on November 29, 1965, he assigned the applications to the United Electric Coal Companies of Chicago, Illinois. The area of the permit lands is a few miles east of Crownpoint, and the lands are in the checkerboard area where the lands were controlled by the government and the Atlantic and Pacific Railroad, the original land grant company. The major part of the surface of these lands is owned by the Navajo Tribe or by individual Navajo Indians, and there is a question on most of the lands concerning ownership of the mineral rights.

The lands were drilled during April 1966, with James Reid in charge. The permits were relinquished on December 20, 1966. The results of the drilling indicate that although the beds found are thin, much of the coal may at some time be strip mined. If the proposed railroad to Star Lake is built, and if the problems of coal and land ownerships can be resolved, the area will be come more attractive.

The holes were drilled with air, and the results should be valid. The logs of the drill holes follow (T.D. = total depth).

Hole 11
Location: SE corner sec. 4, T16N, R11W

0′–6′	Sand
6′–18′	Shale
18′–59′ 6″	Sandstone
59′ 6″–61′	Shale
61′–66′	Sandstone
66′–86′	Sandy shale
86′–100′	Sandstone T.D.

Hole 15
Location: NW corner of sec. 4, T16N, R11W

0′–2′	Clay
2′–7′ 5″	Shale
7′ 5″–9′ 0″	Soft coal 1′ 7″
9′–12′	Shale
12′–12′ 8″	Coal 8″
12′ 8″–18′6″	Shale
18′ 6″–19′ 2″	Burned shale
19′ 2″–20′ 5″	Shale
20′ 5″–21′ 6″	Coal 1′ 1″
21′ 6″–29′ 10″	Shale
29′ 10″–31′	Coal 1′ 2″
31′–31′ 2″	Shale
31′ 2″–32′	Coal 10″
32′–35′ 1″	Shale
35′ 1″–36′	Coal 11″
36′–37′ 6″	Shale
37′ 6″–38′ 5″	Coal 11″
38′ 5″–48′ 6″	Shale
48′ 6″–49′ 7″	Coal 1′ 1″
49′ 7″–54′	Shale
54′–79′	Sandstone
79′–92′	Shale
92′–100′	Sandstone T.D.

Hole 11
Location: SW corner sec. 28, T17N, R11W

0′–8′	Clay
8′–18′	Sand

18′–21′	Sandy shale
21′–35′	Sand
35′–38′	Shale
38′–52′	Sand
52′–80′	Sticky clay T.D.

Driller note: too much water to drill deeper

Hole 15
Location: NW corner sec. 28, T17N, R11W

0′–3′	Sand
3′–35′ 6″	Sandstone
35′ 6″–37′ 4″	Shale
37′ 4″–39′ 11″	Coal 2′ 7″
39′ 11″–42′ 6″	Shale
42′ 6″–44′	Coal 1′ 6″
44′–53′ 6″	Shale
53′ 6″–54′ 8″	Coal 1′ 2″
54′ 8″–74′	Shale
74′–74′ 5″	Coal 5″
74′ 5″–80′	Shale
80′–81′ 10″	Coal 1′ 10″
81′ 10″–90′ 2″	Shale
90′ 2″–91′ 6″	Coal 1′ 4″
91′ 6″–93′	Shale
93′–94′ 7″	Coal 1′ 7″
94′ 7″–99′ 8″	Shale
99′ 8″–100′ 7″	Coal 11″
100′ 7″–105′	Shale T.D.

Hole 35
Location: S1/4 corner sec. 28, T17N, R11W

0′–8′	Sand
8′–11′	Sandstone
11′–14′ 6″	Shale
14′ 6″–17′	Coal 2′ 6″
17′–23′ 6″	Shale
23′ 6″–25′	Coal 1′ 6″
25′–39′	Shale
39′–41′ 6″	Sandstone
41′ 6″–56′	Shale
56′–70′ 6″	Sandstone
70′ 6″–95′	Sandy shale
95′–97′	Shale
97′–98′ 6″	Coal 1′ 6″
98′ 6″–99′ 8″	Shale
99′ 8″–100′ 5″	Coal 9″
100′ 5″–105′	Shale T.D.

Hole 55
Location: NE corner sec. 28, T17N, R11W

0′–3′ 6″	Sandy clay
3′ 6″–65′	Shale
65′–78′ 8″	Sandstone
78′ 8″–79′	Shale
79′–81′ 1″	Coal 2′ 1″
81′ 1″–84′	Shale
84′–90′ 6″	Sandstone
90′ 6″–100′	Shale T.D.

Hole 35
Location: N1/4 corner sec. 30, T17N, R11W

0′–3′ 6″	Sandy clay
3′ 6″–58′	Shale
58′–66′	Sandstone
66′–83′ 6″	Shale
83′ 6″–83′ 10″	Coal 4″
83′ 10″–84′ 6″	Shale
84′ 6″–85′ 1″	Coal 7″
85′ 1″–94′	Shale
94′–100′	Sandstone T.D.

Hole 51
Location: SE corner sec. 30, T17N, R11W

0′–83′	Sandstone
83′–87′	Shale
87′–100′	Sandstone T.D.

Hole 11
Location: SW corner sec. 34, T17N, R11W

0′–33′	Sandstone
33′–45′	Shale
45′–51′	Sandstone
51′–72′	Shale
72′–93′ 10″	Sandstone
93′ 10″–95′	Coal 1′ 2″
95′–100′	Shale T.D.

Hole 51
Location: SE corner sec. 34, T17N, R11W

0′–8′	Sandstone
8′–17′ 11″	Shale
17′ 11″–18′ 5″	Coal 6″
18′ 5″–19′ 6″	Shale
19′ 6″–27′	Sandstone
27′–36′	Shale
36′–80′ 2″	Sandstone
80′ 2″–80′ 6″	Coal 4″
80′ 6″–85′	Shale
85′–88′ 2″	Coal 3′ 2″
88′ 2″–88′ 5″	Dark shale
88′ 5″–89′	Coal 7″
89′–89′ 4″	Shale
89′ 4″–89′ 11″	Coal 7″
89′ 11″–91′	Shale
91′–92′ 2″	Coal 1′ 2″
92′ 2″–100′	Shale T.D.

Hole 55
Location: NE corner sec. 34, T17N, R11W

0′–8′	Sandy clay
8′–32′	Shale
32′–46′	Sandstone
46′–46′ 11″	Coal 11″
46′ 11″–52′	Shale
52′–61′	Sandstone
61′–64′	Shale
64′–67′ 10″	Sandstone
67′ 10″–68′ 2″	Coal 4″
68′ 2″–68′ 6″	Shale
68′ 6″–70′ 8″	Coal 2′ 2″
70′ 8″–84′	Shale
84′–86′ 1″	Coal 2′ 1″
86′ 1″–88′	Shale
88′–88′ 7″	Coal 7″
88′ 7″–100′	Shale T.D.

Hole 11
Location: SW corner sec. 10, T16N, R11W

0′–5′ 6″	Sandy clay
5′ 6″–12′	Sandstone
12′–25′	Shale
25′–100′	Sandstone T.D.

Hole 55
Location: NE corner sec. 10, T16N, R11W

0′–6′	Sandstone
6′–22′ 10″	Shale
22′ 10″–23′ 1″	Coal 3″
23′ 1″–27′ 6″	Shale
27′ 6″–28′ 7″	Coal 1′ 1″
28′ 7″–31′	Shale
31′–45′ 6″	Sandstone
45′ 6″–47′ 11″	Shale
47′ 11″–50′ 10″	Coal 2′ 11″
50′ 10″–62′ 7″	Shale
62′ 7″–64′	Sandy limestone
64′–67′ 10″	Shale
67′ 10″–70′ 11″	Coal 3′ 1″
70′ 11″–76′	Shale
76′–78′ 10″	Coal 2′ 10″
78′ 10″–86′ 6″	Shale
86′ 6″–93′	Sandstone T.D.; hole wet

Hole 55
Location: NE corner of sec. 11, T16N, R11W

0′–15′	Sand
15′–18′	Sandstone
18′–97′ 5″	Shale
97′ 5″–98′	Sandstone
98′–100′	Coal 2′
100′–100′ 6″	Shale T.D.

Hole 11
Location: SW corner sec. 14, T16N, R11W

0′–9′ 6″	Sandy clay
9′ 6″–18′	Shale
18′–23′	Sandstone
23′–28′ 6″	Shale
28′ 6″–29′	Coal 6″
29′–33′ 2″	Shale
33′ 2″–34′	Coal 10″
34′–34′ 2″	Shale
34′ 2″–37′ 5″	Coal 3′ 3″
37′ 5″–39′	Shale
39′–41′ 6″	Sandstone
41′ 6″–52′ 10″	Shale
52′ 10″–53′ 2″	Coal 4″
53′ 2″–62′	Shale
62′–62′ 5″	Coal 5″
62′ 5″–73′	Shale
73′–100′	Sandstone T.D.

Hole 15
Location: NW corner sec. 14, T16N, R11W

0′–5′	Clay
5′–11′ 7″	Sandstone
11′ 7″–14′	Coal 2′ 5″
14′–28′	Shale
28′–51′	Sandstone
51′–51′ 7″	Shale
51′ 7″–52′ 10″	Coal 1′ 3″
52′ 10″–56′	Shale
56′–61′ 6″	Sandstone
61′ 6″–65′	Shale
65′–75′	Sandstone
75′–79′ 5″	Shale
79′ 5″–80′ 6″	Coal 1′ 1″
80′ 6″–86′	Shale
86′–87′	Coal 1′
87′–99′ 4″	Shale
99′ 4″–100′	Coal 8″
100′–101′	Shale T.D.

Hole 55
Location: NE corner sec. 14, T16N, R11W

0′–5′	Sandy clay
5′–24′ 10″	Shale
24′ 10″–28′ 1″	Coal 3′ 3″
28′ 1″–46′	Shale
46′–68′	Sandstone
68′–68′ 7″	Shale
68′ 7″–69′ 2″	Coal 7″
69′ 2″–71′ 1″	Shale
71′ 1″–74′ 11″	Coal 3′ 10″
74′ 11″–79′ 5″	Shale
79′ 5″–79′ 10″	Coal 5″
79′ 10″–86′ 8″	Shale
86′ 8″–87′ 2″	Coal 6″
87′ 2″–100′	Shale T.D.

Hole 13
Location: W1/4 corner sec. 22, T16N, R11W

0′–46′	Sandstone
46′–54′ 6″	Shale
54′ 6″–61′	Sandstone
61′–94′	Shale
94′–100′	Sandstone T.D.

Hole 51
Location: SE corner sec. 22, T16N, R11W

0′–18′	Sand and clay
18′–43′	Shale
43′–44′ 4″	Coal 1′ 4″
44′ 4″–58′	Shale
58′–59′ 10″	Coal 1′ 10″
59′ 10″–65′ 2″	Shale
65′ 2″–65′ 7″	Coal 5″
65′ 7″–78′	Shale
78′–100′	Sandstone T.D.

Hole 15
Location: NW corner sec. 24, T16N, R11W

0′–3′	Sandy clay
3′–21′	Sandstone
21′–38′ 10″	Shale
38′ 10″–41′	Coal 2′ 2″
41′–45′ 1″	Shale
45′ 1″–46′ 7″	Coal 1′ 6″
46′ 7″–55′	Shale
55′–87′	Sandstone
87′–100′	Shale T.D.

Hole 31
Location: S1/4 corner sec. 24, T16N, R11W

0′–27′	Sandy clay
27′–35′	Shale
35′–35′ 5″	Coal 5″
35′ 5″–44′ 11″	Shale
44′ 11″–47′ 4″	Coal 2′ 5″
47′ 4″–48′	Shale
48′–50′	Coal 2′ 0″
50′–77′	Shale
77′–83′ 11″	Sandstone
83′ 11″–85′	Coal 1′ 1″
85′–85′ 6″	Shale
85′ 6″–87′	Coal 1′ 6″
87′–95′ 2″	Shale
95′ 2″–95′ 10″	Coal 8″
95′ 10″–100′	Shale T.D.

Hole 55
Location: NE corner sec. 24, T16N, R11W

0′–6′	Sandy clay
6′–17′ 4″	Shale
17′ 4″–17′ 8″	Coal 4″
17′ 8″–26′ 6″	Shale
26′ 6″–27′ 1″	Coal 7″
27′ 1″–36′ 6″	Shale
36′ 6″–38′ 10″	Coal 2′ 4″
38′ 10″–42′ 2″	Shale
42′ 2″–42′ 10″	Coal 8″
42′ 10″–50′	Shale
50′–65′	Sandstone
65′–70′ 2″	Shale
70′ 2″–73′	Coal 2′ 10″
73′–75′	Shale
75′–82′	Sandstone
82′–82′ 8″	Coal 8″
82′ 8″–83′ 6″	Shale
83′ 6″–84′ 2″	Coal 8″
84′ 2″–84′ 8″	Shale
84′ 8″–85′	Coal 4″
85′–100′	Shale T.D.

Hole 12
Location:
0 ft WL, 1,320 ft SL sec. 22, T17N, R12W

0′–8′	Sandy clay
8′–19′ 2″	Shale
19′ 2″–19′ 10″	Coal 8″
19′ 10″–20′ 5″	Shale
20′ 5″–20′ 10″	Coal 5″
20′ 10″–27′ 2″	Shale
27′ 2″–29′	Coal 1′ 10″
29′–31′	Shale
31′–35′	Sandstone
35′–43′ 6″	Shale
43′ 6″–44′	Coal 6″
44′–48′ 10″	Shale
48′ 10″–49′ 2″	Coal 4″
49′ 2″–52′ 1″	Shale
52′ 1″–53′ 7″	Coal 1′ 6″
53′ 7″–57′ 7″	Shale
57′ 7″–58′ 1″	Coal 6″
58′ 1″–64′ 6″	Shale
64′ 6″–64′ 11″	Coal
64′ 11″–69′	Shale
69′–69′ 8″	Coal 8″
69′ 8″–84′ 10″	Shale
84′ 10″–86′ 11″	Coal 2′ 1″
86′ 11″–87′	Shale
87′–87′ 2″	Coal 2″
87′ 2″–89′ 1″	Shale
89′ 1″–89′ 10″	Coal 9″
89′ 10″–93′ 8″	Shale
93′ 8″–95′	Coal 1′ 4″
95′–99′	Shale
99′–100′ 2″	Coal 1′ 2″
100′ 2″–101′	Shale T.D.

Hole 15
Location: NW corner sec. 22, T17N, R12W

0′–3′	Clay
3′–95′	Shale
95′–100′	Sandstone T.D.

Hole 51
Location: SE corner sec. 22, T17N, R12W

0′–13′	Sand
13′–28′ 6″	Shale
28′ 6″–37′	Sandstone
37′–40′ 7″	Shale
40′ 7″–43′	Coal 2′ 5″
43′–50′ 8″	Shale
50′ 8″–53′ 6″	Coal 2′ 10″
53′ 6″–74′	Shale
74′–74′ 5″	Coal 5″
74′ 5″–79′ 2″	Shale
79′ 2″–81′ 6″	Coal 2′ 4″
81′ 6″–90′ 5″	Shale
90′ 5″–91′	Coal 7″
91′–92′	Shale
92′–92′ 10″	Coal 10″
92′ 10″–98′ 6″	Shale
98′ 6″–99′ 8″	Coal 1′ 2″
99′ 8″–101′	Shale T.D.

Hole 55
Location: NE corner sec. 22, T17N, R12W

0′–6′	Sandy clay
6′–12′	Sand
12′–20′	Sandy clay
20′–38′	Wet sand
38′–60′	Sandy clay T.D.

Lost the hole, moved drilling 300 ft, lost hole again.

Hole 31
Location: S1/4 corner sec. 26, T17N, R12W

0′–13′ 6″	Sandstone
13′ 6″–22′	Shale
22′–22′ 11″	Coal 11″
22′ 11″–34′	Shale
34′–41′ 6″	Sandstone
41′ 6″–49′	Shale
49′–81′	Sandstone
81′–83′	Shale
83′–100′	Sandstone T.D.

Hole 55
Location: NE corner sec. 26, T17N, R12W

0′–26′ 6″	Sandy clay
26′ 6″–27′	Coal 6″
27′–38′ 10″	Shale
38′ 10″–41′	Coal 2′ 2″
41′–53′	Shale
53′–53′ 2″	Coal 2″
53′ 2″–69′ 11″	Shale
69′ 11″–73′ 2″	Coal 3′ 3″
73′ 2″–76′ 10″	Shale
76′ 10″–78′ 5″	Coal 1′ 7″
78′ 5″–82′ 8″	Shale
82′ 8″–83′ 8″	Coal 1′
83′ 8″–90′ 4″	Shale
90′ 4″–92′	Coal 1′ 8″
92′–92′ 4″	Shale
92′ 4″–93′	Coal 8″
93′–100′	Shale T.D.

Hole 11
Location: SW corner sec. 32, T17N, R11W

0′–53′	Sandstone
53′–100′	Shale T.D.

Hole 33
Location: center sec. 32, T17N, R11W

0′–3′	Sandy clay
3′–28′	Gravel and sand
28′–38′	Sandy clay
38′–100′	Sandstone T.D.

Hole 11
Location: SW corner sec. 36, T17N, R11W

0′–5′ 8″	Sandstone
5′ 8″–87′	Sandy shale
87′–100′	Sandstone T.D.

Hole 55
Location: NE corner sec. 36, T17N, R11W

0′–7′	Sand
7′–12′	Shale
12′–84′	Sandstone
84′–97′	Shale
97′–100′	Sandstone T.D.

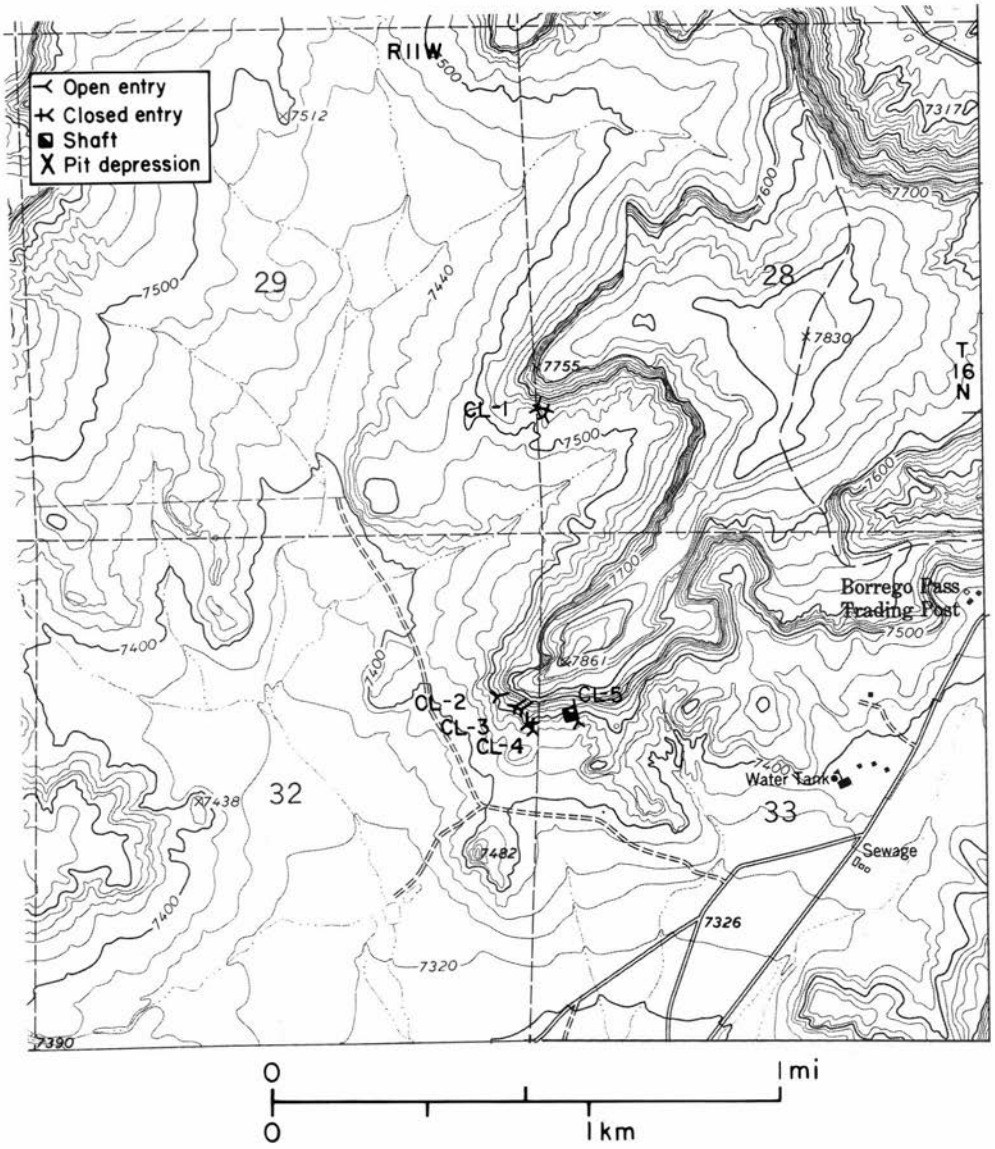


FIGURE 214—Mines near Borrego Pass on the Casamero Lake 7½-min quadrangle.

CL–1—Smouse prospect
CL–2, 3—George mine
CL–4—Spanish Man mine
CL–5—Reid prospect

Reid prospect

SF 075758 **7-10-40** **Permit**
R. C. Reid, Grants
NW1/4 sec. 33, T16N, R11W
2,000 ft NL, 4,850 ft EL **(C-5, Fig. 214)**

The prospect land is near Harvey's Trading Post (Smouse) at Borrego Pass. The area had been prospected previously, according to a sketch made by R. D. Reeder, Acting District Mining Supervisor, on May 18, 1941. The operations on the Reid prospect were first under the direction of Raymond Smouse, and later, after his entry into the Army, continued under the supervision of Edward Harris.

Work on the permit began with the driving of an entry inclined about 4° northwesterly on the dip of a coal bed. By November 1942 the entry had been extended to a length of 134 ft, and a 30-ft wide room had been opened to the left 116 ft inby the portal. A simple chute was constructed (Fig. 215). The coal was 3 ft 5 inches thick. The shale roof was very bad and contained numerous pots.

It is not known how long the mine operated, because the

FIGURE 215—Coal chute at the Reid prospect. *Photo by R. D. Reeder, October 27, 1942.*

permittee, Mr. Reid, obtained work at Fort Wingate for the Army, and it is assumed that he ceased operations in the mid 1940's. Cancellation of the permit did not become final until March 19, 1959. Production of 110 tons of coal was reported from the permit land.

Smouse prospect

SF 077768 **7-23-45** **Permit**
Donald R. Smouse, Prewitt
Sec. 28, T16N, R11W
4,000 ft NL, 5,200 ft EL **(C-1, Fig.** 214)

The permit land is near Harvey's Trading Post at Borrego Pass. The NW1/4 of sec. 33 was prospected by R. C. Reid under permit SF 075758 in 1940. Raymond Smouse, brother of the applicant, did the mining work on both Mr. Reid's and his brother Donald's permits until he was drafted into the Army.

Two parallel entries were started near the northwest corner of the SW1/4SW1/4 sec. 28, on a bearing N15°E. By August 1949 they were driven 220 ft, and two rooms approximately 50 ft long were driven east off the main entry. A measured coal section taken across the face of the main entry by R. S. Fulton, Mining Engineer, was described as follows:

Shale	Roof
Coal	1' 2"
Shale	0' 6"
Coal	2' 10"
Bone	0' 3"
Coal	0' 7"
Shale	Floor

The bed is flat at the face.

A tipple and bin were erected, and two buildings were constructed (Fig. 216). Application for a preference right lease was submitted for the section, but recommendations were made by the government that rent and minimum production on this amount of land would constitute a hardship on the lessee. No action was taken by Mr. Smouse, and the permit expired by law on July 23, 1949. Production of 778 tons of coal from the permit was reported.

FIGURE 216—Abandoned tipple and coal chute at the Smouse prospect. *Photo by R. S. Fulton, August 15, 1949.*

George mine and Spanish Man mine

Mr. George
Spanish **man**
Before 1939
Sec. 32, T16N, R11W
1,800 ft NL, 400 ft EL **(C-2, 3, and 4, Fig. 214)**

There are five openings at the above location along a distance of about 500 ft from the westernmost entry toward the southeast. Don Smouse of the Borrego Trading Post told the writer that the first three openings were dug by a Mr. George and the last two were dug by a Spanish man, and that both mines were opened before 1939. The mines are on state of New Mexico lands. The coal is probably about 3.5 ft thick because the same bed on the Reid prospect, about 400 ft to the east, is 3.5 ft thick. The coal was sold to local people.

San Mateo coal field

The San Mateo coal field is the eastern extension of the Standing Rock coal field (see Fig. 1). Both fields encompass outcrops of the Cleary Coal Member of the Menefee Formation. Coal was reported in the San Mateo field by Gardner (1910) and Hunt (1936). Walter Pierce and John Shomaker reported strippable coal in the San Mateo field (Shomaker et al., 1971). Pierce and Shomaker combined data from Gardner and Hunt with data from their own field work, which was facilitated by the availability of aerial photographs and $7^1/2$-min topographic quadrangle maps.

I visited the area during the early 1970's and found several small, abandoned mines that had produced coal for local use. In the late 1970's Santa Fe Mining Company began extensive exploration in the San Mateo coal field. Substantial reserves were proven, and after contracts were signed for new generating plants the Lee Ranch mine was developed and put into operation in 1984.

Lee Ranch mine

M 18933, M 18929	**5-15-80**	**Lease**
	10-1-81	**Permit**

Santa *Fe* Mining
Santa Fe Coal Corporation **1-30-81**
Sec. 36, T15N, R8W; sec. 32, T16N, R8W, 8,750 acres
Secs. 23-28, 33-36, T15N, R8W; sec. 19, T15N, R7W; secs. 21, 29, 31, 32, T16N, R8W

In 1979 Santa Fe Mining Company began a program to evaluate the coal resources north-northwest of San Mateo, New Mexico, on Santa Fe Industry land holdings. In 1980 Santa Fe Mining acquired two state leases (M 18933 and M 18929) for sec. 36, T15N, R8W and sec. 32, T16N, R8W. In March of 1980, Fernandez Co., who owns Lee Ranch and has considerable land holdings in the area, granted Santa Fe Pacific Railroad the right to conduct surface mining on certain designated lands.

In February 1981 Santa Fe Coal Corporation submitted a mine plan to the state of New Mexico. The state issued a permit in October 1981, and a permit was issued for an amendment in December 1982. In May 1982 Santa Fe Coal signed a contract with Tucson Electric Power Co. to supply coal to the Springerville generating plants. This contract, along with a contract with Western Fuels Association, Inc., to provide coal to the generating station at Prewitt, allowed construction of the mine to begin. A 27-mile-long spur from the mine to the main line of the Santa Fe Railroad was constructed to ship coal for both contracts. The first shipments of coal began in 1984 from the Lee Ranch mine (Mining and Engineering, 1984).

The Lee Ranch mine is a truck and shovel operation; three seams, located in Tps. 15 and 16N, Rgs. 6-8W, in the Cleary Member of the Menefee Formation are being mined. The coal has variable BTU and sulphur content; therefore, it is blended to maintain the standards needed for the powerplants. The coal at the Lee Ranch mine averages 9,200 BTU/ lb, with an ash content of 15% and a sulphur content of 1%. The mine contains more than 240 million tons of surface-recoverable coal. Peak production for the mine is estimated to be 5 million tons per year.

In 1984 production for the Lee Ranch mine was 244,562 tons. Production for 1985 was 2,158,692 tons, and production for 1986 was expected to be 1.6 million tons. The slowdown in production is due to the decrease in demand for electricity from the two powerplants being served by the mine. The Lee Ranch mine employs 166 people.

East Mount Taylor—Crevasse Canyon coal field

The following information is summarized from Shomaker et al. (1971, pp. 89-92). The location of the East Mount Taylor—Crevasse Canyon coal field is shown in Figure 1.

Coal beds in the East Mount Taylor area occur only in the Gibson Coal Member of the Crevasse Canyon Formation. The coals are subbituminous to bituminous, highly lenticular, and difficult to correlate. Flow sheets of basalt and beds of tuff as much as 100 ft thick overlie the coal beds, and no stripping coal is known. The beds crop out along the steep slopes of the lava-capped mesas. Few exposures of more than 3 ft thick have been reported in the literature, and these exposures extend for only short distances. Analyses of the Gibson coals indicate high-volatile C bituminous coal with about 11,000 BTU and 0.6% sulphur.

Coal has been mined on a small scale on the northeast wall of Seboyeta (Cebolleta) Canyon 2 mi north of Seboyeta. The mines, on two beds 1.9 ft and 2.5 ft thick, respectively, are separated by 15-20 ft of sandy shale. They were opened to supply coal for the village. These coal beds, although locally thin and split into several lenses, are relatively persistent in the upper part of the Gibson Coal Member. Beaumont (Shomaker et al., 1971, p. 92) reported that drill hole data obtained by Valencia Coal Corporation show thicknesses of 3-5 ft for these two beds and the presence of a lower bed ranging from 4-6.5 ft in thickness.

Strip mining in the area is precluded because the coal crops out on steep slopes, which are overlain by thick overburden. The lenticular nature of the beds prohibits development of underground mines of reasonable size, but if the philosophy of federal and state governments about small individual coal mines to supply fuel to local areas were changed, this type of mining might occur again in this field.

King and Boone mine

Daniel P. King and D. A. Boone, 1930-1936
SE¼ sec. 6, T11N, R8W

The mine was opened in 1930 by D. A. Boone and Daniel P. King to supply coal to the town of Grants and the vicinity. At that time Mr. King was Mine Manager of the Crownpoint mine; he later became Supervisor of all the Navajo coal mines. He managed this mine, and Mr. Boone was apparently in charge of mining the coal. A slope was driven for 300 ft and a room-and-pillar system of mining was used off this slope. Two men were employed as miners, and 400500 tons were mined each year in about 100-150 days. It is assumed that the mine closed in 1936 because no later records were found.

Lopez—Gonzales prospect

SF 057642 **3-2-29** **Permit**
Alberto Lopez, Phoenix, Arizona
Parts of secs. 4, 6, and 8, T11N, R8W
Parts of secs, 32 and 36, T12N, R9W, 2,544 acres
Forest Service Permit **1938 or 1939**
Tony Gonzales, Grants SE¼SE¼ sec. 6, T11N, R8W

The prospect was 11 mi north of Grants on the east side of Lobo Canyon in the SE¼SE¼ sec. 6, T11N, R8W in the Manzano National Forest. The first prospecting was done by Daniel P. King and D. A. Boone, who had obtained a permit from the Forest Service before the Lopez permit was issued. Mr. King, Supervisor for all coal mines on the Navajo Indian Reservation, and Mr. Boone had mined coal on the SE¼SE¼ of sec. 6 for a number of years. The subject land was a part of a Forest Service Executive Withdrawal.

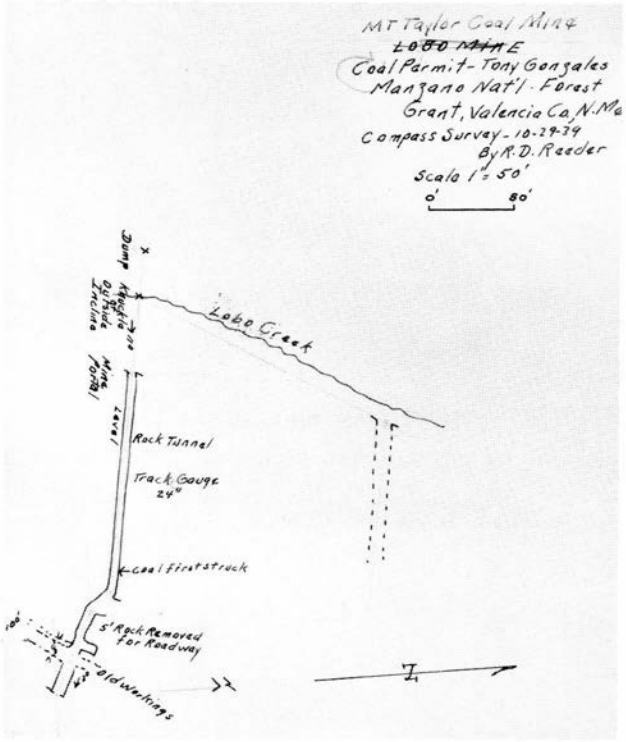


FIGURE 217—Map of the Lopez–Gonzales prospect, which is also known as the Mt. Taylor mine.

Part of the land (the SE¼SE¼ sec. 6) of the Lopez permit, SF 057642, was in conflict with land in the King—Boone permit. **J. J.** Bourquin, District Mining Supervisor, attempted to visit the property but could not find the prospect. The permit expired by law on March 2, 1933, and it is not known if Mr. Lopez did any work on the permit.

At some time in 1938 or 1939 the Forest Service gave Tony Gonzales a permit to mine coal on the SE¼SE¼ of **sec. 6.** Mr. Gonzales began a portal just off the road on an incline of 11° to provide sufficient height for a mine chute and screens, which were built. The first 115 ft of the main entry were driven in rock before the coal bed was intersected. The top was taken down for the next 52 ft of entry to provide head room. Twenty ft beyond, the coal measured 3 ft 3 inches thick. Figure 217 shows the extent of the workings as of October 29, 1939. Mr. Gonzales and the miners lived at the mine.

Mr. Gonzales also owned the Mateo coal mine on private land about 1 mi west of the Forest Service permit land, which he sublet. Royalty of 250 per ton was paid to the Forest Service for coal mined on the permit land, but production is unknown because the Forest Service did the accounting for the records. Production from the Mateo mine is also unknown. The two Gonzales mines were also known as the Mt. Taylor mines.

Rath prospect

SF 046807 **11-17-23** Prospecting permit
Charles M. Rath, Denver, Colorado Part of sec. 20, T15N, R6W, ±240 acres

The only information available in the records on this small operation is that an entry 25 ft long was opened in a room 10 x 30 ft on a bed of coal 3.5-4 ft thick. Mr. Rath paid royalty to the government on 672 tons of coal and relinquished the permit on September 8, 1924.

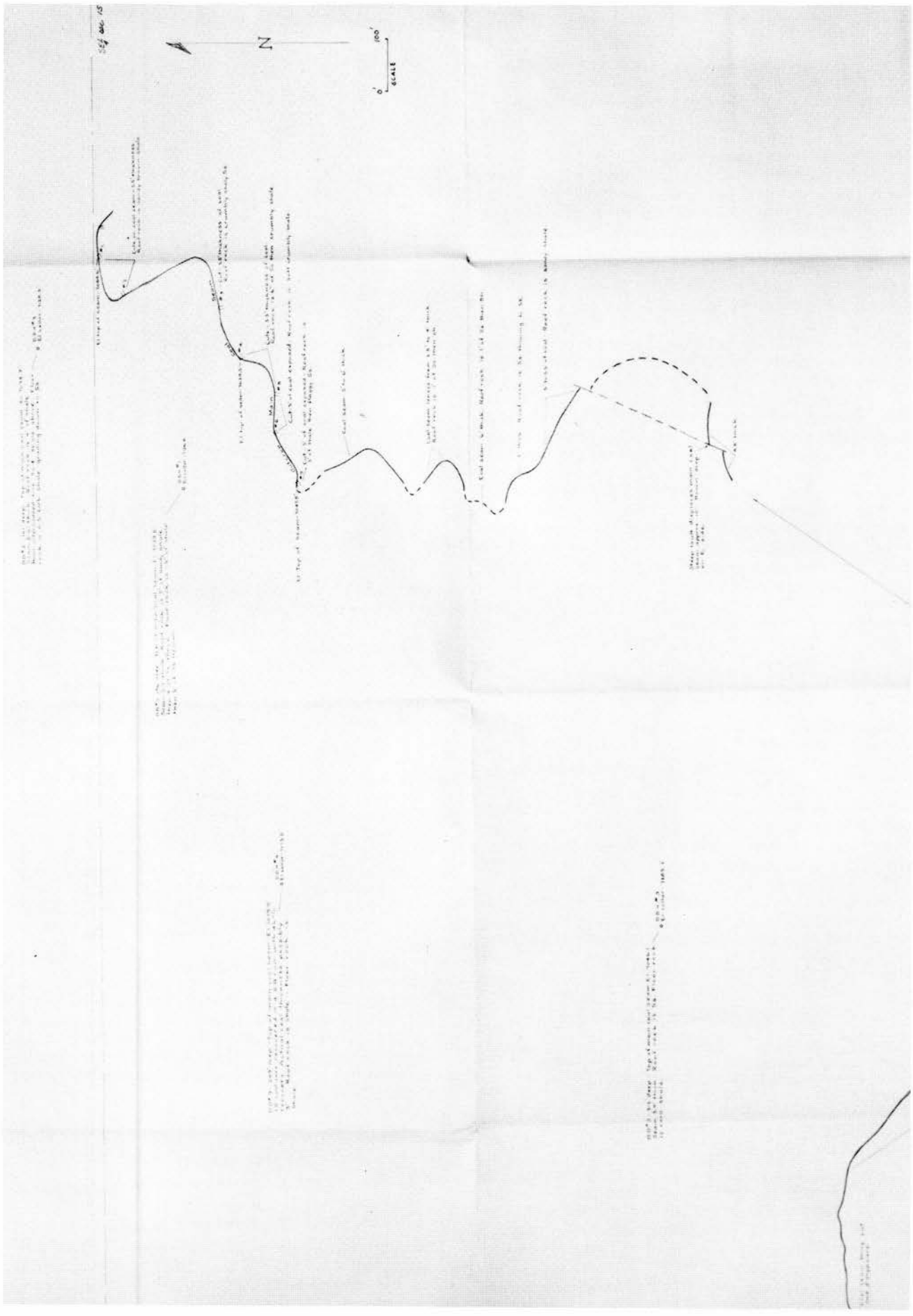


FIGURE 218—Map of the Rinconada mine coal seam.

Rinconada mine

NM 06061 10-18-51 Permit
2-10-53 Lease

John B. Knaebel, Grants
Anaconda Mining Company, Bluewater
Sec. 15, T11N, R8W

Section 15 is on the south side of Mt. Taylor, a few miles north of San Fidel. In 1951 John B. Knaebel was manager for Anaconda Mining Company's New Mexico uranium operations. He applied for the permit in order to furnish coal to fuel boilers and power facilities for the uranium mill at Bluewater.

After receiving the permit, the company immediately began prospecting by bulldozing the alluvium off the coal outcrop. Four drill holes were located a short distance in back of the outcrop to determine the thickness of the coal bed; the prospecting work opened a 5-6 ft bed of coal across the SE¼ of sec. 15. The extent of this prospecting is shown on Figure 218. The analysis of the coal bed cut in the first three drill holes is shown in Table 62. The locations of the drill holes are shown on Figure 218.

During October 1952 a Cardox coal mining auger 32 inches in diameter was tried, and it proved to be very successful. All the mining was then carried out with the machine. With this auger the operators were able to drill 100-120 ft into the coal bed, and more than 600 holes were drilled (Figs. 219, 220).

A lease was issued on February 10, 1953, to the Anaconda Mining Company. On December 13, 1954, the company requested that the lease be relinquished; the coal apparently did not burn properly in the boilers at the Bluewater concentrator, and the fuel source was changed to natural gas. The auger produced 11,197 tons of coal.

TABLE 62—Coal bed analysis of three drill holes at the Rinconada mine.

	Drill Hole No. 1 112.3–117 ft	Drill Hole No. 2 89.7–95.3 ft	Drill Hole No. 3 239.1–243 ft
Moisture	4.99%	5.52%	5.35%
Volatile matter	38.03%	40.11%	39.66%
Fixed carbon	45.12%	45.03%	46.92%
Ash	11.86%	9.34%	8.07%
Sulphur	0.97%	0.84%	1.20%
BTU	11,689	12,214	12,161
Fusion point of ash	2,800°F+	2,815°F	2,800°F+

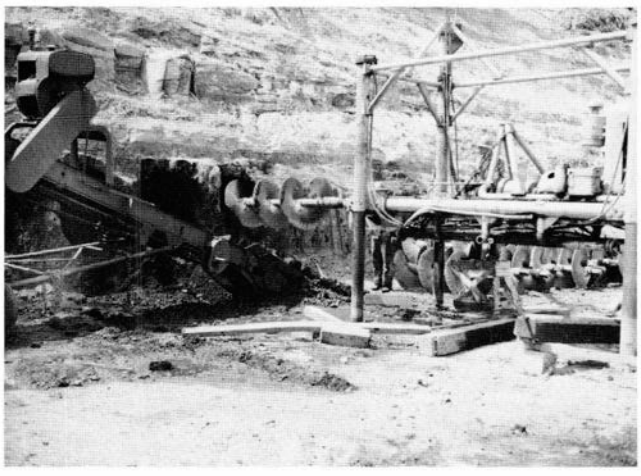


FIGURE 219—Cardox auger and conveyor belt used to load the coal into storage bins or trucks at the Rinconada mine. *Photo by R. H. Allport, August 26, 1953.*

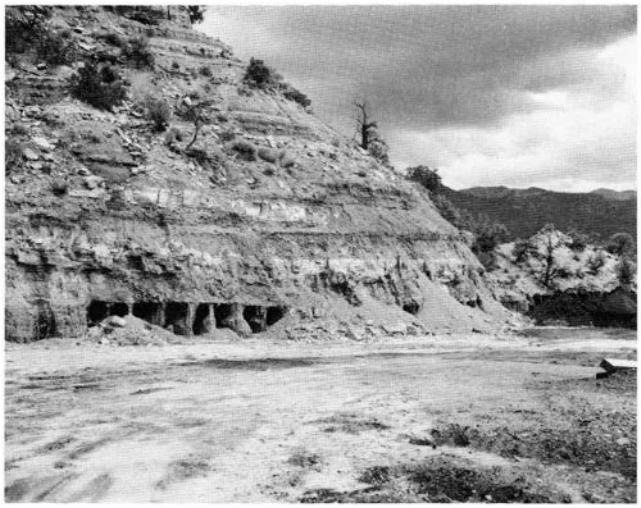


FIGURE 220—The auger holes in the coal bed at the Rinconada mine. *Photo by R. H. Allport, August 26, 1953.*

Public Service Coal Company's Seboyeta Grant project

Seboyeta Grant, 1961-1965

A. E. Rhodes, formerly with the Public Service Coal Company, submitted the following information concerning that company's examination of the Seboyeta Grant area.

> In 1958 and 1959, Public Service Company of New Mexico looked at many areas in the State of New Mexico for potential coal reserves for powerplant development. One of the areas explored was on the Seboyeta Grant about 50 miles west of Albuquerque. Mr. E. C. Anderson, a Consulting Mining Engineer and Geologist, did the majority of the exploration for the Public Service Company in those early years. By studying old mining records, outcrop indications and a meager amount of information developed by drilling, Mr. Anderson estimated a reserve of about 35 million tons of coal on an area of some 16,000 acres of land on the Seboyeta Grant. This area was explored over a period of time and Public Service Company finally made the decision to take a sublease on the reserve from Mr. Tom Morrow and the Valencia Coal Company which Mr. Morrow represented. The sublease was taken from Mr. Morrow in 1961 and was held until September 30, 1965. In further evaluation of the reserve, Public Service Company determined that the reserve was not of sufficient size and that the mining cost would be more than other reserves available due to the fact that the Seboyeta reserve was overlain with a layer of basalt which precluded any of the area from strip mining.
>
> . . . the reserve was subleased from Mr. Morrow in the name of Public Service Coal Company which had been organized prior to the time that the lease was actually taken.

Pittsburg and Midway Coal Mining Company's Pueblo of Acoma study

Pueblo of Acoma 9-16-65 Permit
Pittsburg and Midway Coal Mining Company, Kansas City, Missouri
Most Pueblo of Acoma lands

Pittsburg and Midway Coal Mining Company (P & M) acquired a prospecting permit from the Pueblo of Acoma

to prospect for coal on all of the Pueblo land except religious areas, villages, and prehistoric or scientific areas. The company was given the right to apply for an exclusive coal mining lease not to exceed 46,000 acres. The P & M Company began drilling on September 28, 1965, and completed 32 holes by October 26, 1965. The results of the drilling did not warrant application for a lease. The results of the drilling follow (T.D. = total depth).

Hole 1
Location: 1,350 ft S and 2,500 ft W of NE corner sec. 33, T8N, R9W
Elevation: 8,055 ft

0′–2′ 6″	Soil and clay
2′ 6″–5′ 6″	Soft sandstone
5′ 6″–15′ 6″	Basalt
15′ 6″–28′	Sandy clay
28′–63′ 6″	Basalt
63′ 6″–70′	Burned clay
70′–73′	Basalt; lost the return water in the burned material; pumped 450 gal of mud in the hole without success. T.D.

Hole 2
Location: 2,250 ft N and 1,600 ft E of SW corner, sec. 15, T8N, R9W
Elevation: 7,800 ft

0′–15′ 6″	Soil and clay
15′ 6″–18′ 6″	Sandstone
18′ 6″–30′	Sandy clay
30′–72′	Gray and dark-gray shale
72′–83′	Soft sandstone
83′–97′	Gray and dark shale
97′–105′	Soft sandstone
105′–137′	Gray shale
137′–139′	Sandstone
139′–150′ 6″	Gray shale
150′ 6″–152′	Coal, dirty 1′ 6″
152′–152′ 4″	Shale
152′ 4″–153′ 6″	Coal, dirty 1′ 2″
153′ 6″–180′	Sandy gray shale
180′–200′	Sandstone, soft
200′–230′	Gray shale
230′–250′	Sandstone T.D.

Hole 3
Location: 2,600 ft S and 1,400 ft E of NW corner sec. 12, T7N, R9W
Elevation: 7,825 ft

0′–3′	Soil and clay
3′–7′	Sandstone
7′–14′	Basalt
14′–17′	Clay
17′–48′	Soft sandstone
48′–66′	Brown and gray shale
66′–68′	Coal 2′
68′–82′ 6″	Gray shale
82′ 6″–83′	Coal 6″
83′–83′ 8″	Shale
83′ 8″–85′	Coal 1′ 4″
85′–97′	Sandstone
97′–100′ 3″	Coal 3′ 3″
100′ 3″–117′	Sandstone, soft
117′–133′	Gray shale
133′–152′	Sandstone, soft
152′–156′	Gray shale
156′–159′ 6″	Sandstone, hard
159′ 6″–200′	Gray shale T.D.

Drilled with water from 115′

Hole 4
Location: 200 ft E of NW corner sec. 10, T7N, R9W
Elevation: 7,945 ft

0′–27′	Basalt
27′–32′	Burned clay
32′–52′	Soft sandstone
52′–92′	Shale
92′–93′	Coal 1′
93′–93′ 3″	Shale
93′ 3″–94′ 11″	Coal 1′ 8″
94′ 11″–125′	Sandstone
125′–127′ 6″	Shale
127′ 6″–129′ 6″	Coal 2′
129′ 6″–135′	Sandstone
135′–144′	Sandy gray shale
144′–194′	Sandstone
194′–202′	Gray shale
202′–254′	Alternate beds of sandstone and sandy shales T.D.

Hole 5
Location: 950 ft N and 1,650 ft W of SE corner sec. 25, T7N, R9W
Elevation: 7,810 ft

0′–24′ 6″	Sandstone
24′ 6″–46′	Brown and gray shale
46′–53′	Sandstone
53′–107′	Sandy gray shale
107′–120′	Sandstone
120′–134′	Gray shale
134′–160′	Sandstone T.D.

Hole 6
Location: 1,550 ft S and 1,650 ft E of NW corner sec. 7, T7N, R8W
Elevation: 7,610 ft

0′–10′	Clay
10′–100′	Alternate beds of sandstone and shale T.D.

Hole 7
Location: 300 ft S and 300 ft E of NW corner sec. 13, T7N, R9W
Elevation: 7,830 ft

0′–3′	Soil
3′–16′	Basalt
16′–23′	Burned clay
23′–39′	Sandstone
39′–68′	Gray shale (mud)
68′–70′	Dark shale
70′–70′ 6″	Shale and coal
70′ 6″–105′	Gray shale
105′–108′	Sandstone
108′–116′ 8″	Shale
116′ 8″–119′ 11″	Coal 3′ 3″
119′ 11″–137′	Gray shale
137′–138′	Coal 1′
138′–149′	Gray shale T.D.

Hole 8
Location: 800 ft S and 1,400 ft W of NE corner sec. 27, T7N, R8W
Elevation: 7,620 ft

0′–8′	Soil
8′–15′	Gray shale
15′–23′	Sandstone
23′–43′	Gray shale
43′–45′	Sandstone
45′–50′ 6″	Shale
50′ 6″–51′ 10″	Coal, dirty 1′ 4″
51′ 10″–51′ 11″	Shale
51′ 11″–52′ 7″	Coal 8″
52′ 7″–53′ 11″	Rash 1′ 4″
53′ 11″–54′ 3″	Coal 4″
54′ 3″–80′	Alternate bands of shale and sandstone
80′–100′	Sandstone
100′–109′	Shale and sandstone T.D.

Hole 9
Location: 1,600 ft N and 200 ft W of SE corner sec. 33, T7N, R8W
Elevation: 7,700 ft

0′–3′	Soil
3′–84′	Brown and gray shale
84′–102′	Sandstone
102′–123′	Sandy gray shale
123′–174′	Sandstone

174′–176′	Dirty coal 2′
176′–186′	Sandstone
186′–190′	Shale
190′–200′	Sandstone T.D.

Hole 10
Location: 1,500 ft N and 250 ft E of SW corner sec. 35, T7N, R8W
Elevation: 7,480 ft

0′–9′	Soil
9′–170′	Brown to gray shale T.D.

Hole 11
Location: 2,640 ft N and 2,640 ft W of SE corner sec. 32, T7N, R8W at the road Y
Elevation: 7,795 ft

0′–63′	Sandstone
63′–170′	Sandy gray shale with a few thin sandstone lenses T.D.

Hole 12
Location: 2,200 ft W of NE corner sec. 29, T7N, R8W
Elevation: 7,695 ft

0′–84′	Sandstone
84′–164′	Sandy gray shale
164′–180′	Sandstone
180′–200′	Sandy gray shale T.D.

Hole 13
Location: 1,000 ft N and 875 ft W of SE corner sec. 26, T7N, R8W
Elevation: 7,310 ft

0′–70′	Sandstone
70′–170′	Dark, sandy gray shale T.D.

Hole 14
Location: NE corner sec. 1, T6N, R9W
Elevation: 7,808 ft

0′–4′	Soil
4′–61′	Sandstone
61′–126′	Sandy gray shale
126′–147′	Sandstone
147′–174′	Sandy gray shale
174′–180′	Hard sandstone
180′–190′	Sandy gray shale, hit water T.D.

Hole 15
Location: NE corner sec. 2, T6N, R8W
Elevation: 7,391 ft

0′–8′	Soil
8′–26′	Brown shale
26′–90′	Soft sandstone, lost circulation at 30′ T.D.

Hole 16
Location: NE corner sec. 11, T6N, R8W
Elevation: 7,347 ft

0′–67′	Sandstone
67′–140′	Gray shale
140′–200′	Sandstone T.D.

Hole 17
Location: SE corner sec. 11, T6N, R8W
Elevation: 7,317 ft

0′–17′	Soil
17′–75′	Sandstone
75′–149′	Dark sandy gray shale T.D.

Hole 18
Location: NE corner sec. 23, T6N, R8W
Elevation: none given

0′–63′	Sandstone
63′–165′	Sandy gray shale
165′–180′	Sandstone, hit water T.D.

Hole 19
Location: NE corner sec. 26, T6N, R8W
Elevation: none given

0′–5′	Soil
5′–13′	Gray shale
13′–82′	Sandstone
82′–144′	Sandy gray shale
144′–200′	Sandstone T.D.

Hole 20
Location: 1,000 ft E and 660 ft N of SW corner sec. 26, T6N, R8W at Y in the road
Elevation: none given

0′–8′	Soil
8′–17′	Brown shale
17′–93′	Sandstone
93′–120′	Gray shale T.D.

Hole 21
Location: NW corner sec. 25, T7N, R9W
Elevation: 7,835 ft

0′–36′	Basalt
36′–47′	Burned clay
47′–150′	Sandstone, lost the return under basalt due partly to water in the sandstone T.D.

Hole 22
Location: SW corner sec. 1, T6N, R8W
Elevation: 7,347 ft

0′–16′	Soil and clay
16′–38′	Sand and gravel
38′–45′	Brown shale
45′–50′	Soft sandstone
50′–79′	Shale
79′–102′ 6″	Sandstone
102′ 6″–119′	Gray shale
119′–149′	Sandstone T.D.

Hole 23
Location: NW corner sec. 1, T6N, R9W
Elevation: 7,839 ft

0′–17′	Basalt
17′–22′	Burned clay
22′–30′ 6″	Basalt
30′ 6″–33′ 6″	Sandstone, soft
33′ 6″–39′	Red mud
39′–53′	Sand and gravel, lost circulation T.D.

Hole 24
Location: 400 ft E of SW corner sec. 34, T7N, R9W
Elevation: 7,880 ft

0′–10′	Soil
10′–30′	Basalt
30′–31′	Burned clay
31′–36′ 6″	Green shale
36′ 6″–45′	Sandstone
45′–58′	Gray mud
58′–59′	Coal smut
59′–99′	Gray shales T.D.

Hole 25
Location: 2,400 ft N of SW corner sec. 5, T6N, R9W
Elevation: 8,905 ft

0′–58′	Basalt, lost the water in a crevice in the basalt T.D.

Hole 26
Location: SE corner sec. 17, T7N, R9W
Elevation: 7,899 ft

0′–5′	Clay
5′–54′	Basalt
54′–58′	Burned clay
58′–62′	Crevice
62′–69′	? T.D.

Hole 27
Location: 300 ft W of SE corner sec. 29, T7N, R9W
Elevation: 7,932 ft

0′–28′	Basalt, lost return in crevice in the basalt

Hole 28
Location: SW corner sec 11, T9N, R8W
Elevation: 6,328 ft

0′–3′	Soil

3′–11′ 6″	Gray shale
11′ 6″–56′	Sandstone
56′–92′	Gray shale
92′–119′	Sandstone
119′–152′	Gray shale
152′–153′ 8″	Coal 1′ 8″, dirty
153′ 8″–180′	Alternate beds of shale and sandstone T.D.

Hole 29
Location: SE corner sec. 12, T9N, R8W
Elevation: 6,286 ft

0′–3′	Soil
3′–29′	Sandstone
29′–73′	Gray shale
73′–94′	Hard sandstone
94′–140′	Gray shale T.D.

Used three sets of bits

Hole 30
Location: 1,900 ft E of SW corner sec. 4, T9N, R7W
Elevation: 6,318 ft

0′–3′	Soil
3′–52′	Sandstone
52′–83′	Gray shale
83′–111′	Hard sandstone
111′–132′	Gray shale
132′–200′	Alternate beds of sandstone and gray shale T.D.

Hole 31
Location: 1,320 ft W and 1,320 ft S of NE corner sec. 6, T9N, R8W
Elevation: 6,540 ft

0′–3′	Soil
3′–44′	Brown shale
44′–130′	Sandstone T.D.

Hole 32
Location: SW corner sec. 9, T9N, R8W
Elevation: 6,605 ft

0′–61′	Sandstone
61′–126′	Gray shale
126′–200′	Sandstone T.D.

Zuni coal field

The Zuni coal field is the southern extension of the Gallup coal field (Fig. 1). Coal on the Zuni tribal lands occurs in the Gallup Sandstone and Crevasse Canyon Formation as thin lenticular beds, which are minable in some areas. The need for coal to heat the Zuni Agency schools and administration buildings and for use on the Blackrock Dam was the impetus for Mr. Harper to open a small mine. For several years the mine provided 200-300 tons of coal per year. Then a better bed of coal was found about 0.5 mi from the Harper mine, and it was mined by the agency. These two mines were located east of the Zuni-Gallup road (NM-32) in secs. 6 and 7, T11N, R17W. The second mine, called the School mine, operated until about 1913 when a new opening was started in sec. 16, T1ON, R17W. Access there was more favorable, and a better bed of coal was developed. Two adjacent mines were opened, which provided about 700 tons of coal per year, until 1958 when the agency changed to other, cleaner fuels.

In 1976 the Zuni Tribe issued some coal prospecting permits for the determination of mining feasibility. Several individuals became interested and drilled numerous holes; subsequently these permits were transferred to Carbon Coal Company, which continued the exploration. Minable coal was found in several locations, but the tribe has not been granted any leases on the lands.

Harper mine

Mr. Harper, 1905-1908
N1/4 sec. 7, T11N, R17W

Shaler (1907, p. 418) reported that the Harper mine was opened in about 1905 or 1906 with an opening about 300 ft long along the lowest of three beds of coal, called the Pescado coals, in the lower Gallup Sandstone (now called the Tres Hermanos Formation). The mine was opened to provide coal for the Zuni Agency schools at Blackrock and to provide steam coal during the construction of the Blackrock Dam. A section measured by Shaler (1907) showed the bed to be rather dirty (i.e., high ash content). The secton from top to bottom follows:

Shale	Roof
Bony coal	0.3'
Coal	0.4'
Bony coal	0.4'
Coal	1.2'
Bony coal	0.4'
Coal	0.9'
Bony coal	0.4'
Coal	0.8'
Clay	Floor

The bed was 4.8 ft thick with the 0.9-ft interval reported to be good "blacksmith coal."

Approximately 70 ft above this bed a higher quality coal bed 3.3 ft thick with a 2-inch band of bone near the roof was developed about 0.5 mi away. Once this lower-ash coal bed was put into production, the Harper mine was closed; the new mine was known as the School mine.

School mine

U.S. Bureau of Indian Affairs-Zuni Agency, 1906-1913?
SE1/4NW1/4 sec. 6, T11N, R17W

About 1906 the School mine was opened under the direction of William J. Oliver, Superintendent of the Zuni Agency, to supply coal for heating the Zuni schools and Agency buildings at Blackrock (Shaler, 1907, p. 418). The coal bed in the Gallup Sandstone was about 70 ft higher in this geologic section than in the bed mined in the Harper mine. The bed was about 3.3 ft thick with a 2-inch parting near the top.

In fiscal year 1907-1908 the Territorial Mine Inspector visited the property and reported that the main entry was 200 ft long. An Italian miner and a Zuni Indian were employed, and they produced from 500-1,000 tons in about 100 days during the fall and winter months. In fiscal year 1910-1911 R. J. Bauman was made Superintendent of the agency and took charge of the mine. It is not known how long this mine operated, but it is assumed that it continued until the Zuni-Blackrock mines, which were closer to the agency, were opened in about 1913.

Zuni—Blackrock mines

U.S. Bureau of Indian Affairs-Zuni Agency, 1913?-1958
SE1/4 sec. 9, NW1/4 sec. 16, T1ON, R17W

A coal bed was found at the above location along the rim about 0.5 mi south of US-60, which leads to Blackrock and Zuni. This location was closer than the School mine to these settlements and offered less travel over dirt road. It is believed that the mine was opened about 1913 or 1914. It was under the direction of R. J. Bauman, Superintendent of the agency, who kept the mine in good shape. Over the years two mines were developed: the original one was opened on the west side of a small gulch, and the later one was opened on the east side. A well-constructed tipple storage bin of squared timber was used to store and size the coal. The mines provided all the coal needed for the schools and the agency buildings until about 1958 when other fuels became available for agency needs, and the mines were closed. A partial record of employment and production is shown in Table 63.

TABLE 63—Production and employment record of the Zuni–Blackrock mines.

Year	Production (tons)	Employment	Days operated
1917	563	2	133
1918	300–500		
1919	800	2 miners 5 top men	120
1920	575	2	157
1921	600	2	150
1922–1924	Operated, but no records available		
1925	700		
1926–1958	No records available; closed about 1958		

References

Anderson, 0. J., and Reddy, R., 1986, Some geological observations at Carbon Coal Company's No. 2 mine-a small but unique operation: New Mexico Geology, v. 8, no. 3, pp. 51-53.

Anderson, 0. J., and Wolberg, D. L., 1987, The economics of coal production cycles in New Mexico: New Mexico Geology, v. 9, no. 3, pp. 45-49.

Annual reports of the State Inspector of Coal Mines to the Governor of New Mexico (issued from 1912 on).

Balzer, J. L., Crouch, D. B., Poyser, R. W., and Sowards, W., 1975, A venture into reclamation: Mining Congress Journal, v. 61, no. 1, pp. 24-29.

Bauer, C. M., and Reeside, J. B., Jr., 1921, Coal in the middle and eastern parts of San Juan County, New Mexico: U.S. Geological Survey, Bulletin 716-G, pp. 155-237.

Boatright, C. C., 1966, Transportation and communications in New Mexico: State Planning Office, Santa Fe, 58 pp.

Brevoort, Elias, 1874, New Mexico: her natural resources and attractions: Elias Brevoort, Santa Fe, New Mexico, 176 pp.

Coal Age, 1966a, P&M surface mining: equipment, methods, results: Coal Age, v. 71, no. 10, pp. 88-99.

Coal Age, 1966b, P&M's coal preparation . . . market directed: Coal Age, v. 71, no. 10, pp. 116-126.

Coan, C. F., 1925, A history of New Mexico: The American Historical Society, Inc., Chicago and New York, v. 2, 523 pp. Consol, 1980, The Burnham mine: Consol, 10 pp.

Dane, C. H., 1936, The La Ventana-Chacra Mesa coal field: U.S. Geological Survey, Bulletin 860-C, pp. i-v, 81-166.

Energy and Minerals Department, 1980, New Mexico's reclamation plan for abandoned mine lands: Energy and Minerals Department, Mining and Minerals Division.

Gardner, J. H., 1910, The coal field between San Mateo and Cuba, New Mexico; *in* Coal fields in Colorado and New Mexico: U.S. Geological Survey, Bulletin 381-C, pp. 461-473.

Hayes, P. T., and Zapp, A. D., 1955, Geology and fuel resources of the Upper Cretaceous rocks of the Barker dome-Fruitland area, San Juan County, New Mexico: U.S. Geological Survey, Oil and Gas Investigations Map, OM-144.

History of New Mexico, family and personal history, 1961: Lewis Historical Publishing Company, Inc., New York, v. 3, 668 pp.

History of New Mexico, its resources and people, 1907: Pacific States Publishing Company, Los Angeles, Chicago, and New York, v. II, pp. 525-1047.

Hunt, C. B., 1936, The Mount Taylor coal field: U.S. Geological Survey, Bulletin 860-B, pp. 31-80.

Jones, F. A., 1904, New Mexico mines and minerals: New Mexican Printing Company, Santa Fe, 349 pp.

Kaanta, Carter, and Cory, Virgil, 1963, Navajo power project: The Mines Magazine, v. 53, no. 10, pp. 17-20.

Landis, E. R., and Dane, C. H., 1969, The Tierra Amarilla coal field, Rio Arriba County, New Mexico: New Mexico Bureau of Mines and Mineral Resources, Circular 100, 14 pp.

Lee, W. T., and Knowlton, F. H., 1917, Geology and paleontology of the Raton Mesa and other regions in Colorado and New Mexico: U.S. Geological Survey, Professional Paper 101, 450 pp.

Martinez, L. B., 1980, Coal; *in* Arnold, E. C. (compiler), New Mexico's Energy Resources '80-annual report of Bureau of Geology in the Mining and Minerals Division of New Mexico Energy and Minerals Department: New Mexico Bureau of Mines and Mineral Resources, Circular 181, pp. 22-34.

Mineral resources of the United States, calendar year 1885: U.S. Geological Survey, Division of Mining Statistics and Technology, Washington Government Printing Office, 1886.

Mining Engineering, 1984, Lee Ranch mine is on time and under budget: Mining Engineering, pp. 121-122.

Nauman, Talli, 1984, Sunbelt mining releases land for proposed Bisti Wilderness: Albuquerque Journal, September 28, 1984.

Pearce, T. M. (editor), 1965, New Mexico place names-a geographical dictionary: University of New Mexico Press, Albuquerque, 187 pp.

Peele, Robert, 1941, Mining engineers' handbook: John Wiley & Sons, Inc., New York, v. II, sections 15-45.

Raymond, R. W., 1870, Statistics of mines and mining in the states and territories west of the Rocky Mountains: House Executive Document No. 207, 41st Congress, second session, pp. 1-805.

Reports of the United States Coal Mine Inspector for the Territory of New Mexico to the Secretary of the Interior (issued annually 1893-1912).

Schrader, F. C,. 1906, The Durango-Gallup coal field of Colorado and New Mexico: U.S. Geological Survey, Bulletin 285, pp. 241-257.

Sears, J. D., 1925, Geology and coal resources of the Gallup-Zuni Basin, New Mexico: U.S. Geological Survey, Bulletin 767, 53 pp.

Sears, J. D., 1934, Geology and fuel resources of the southern part of the San Juan Basin, New Mexico; part 1, The coal field from Gallup eastward toward Mount Taylor, with a measured section of pre-Dakota(?) rocks near Navajo Church: U.S. Geological Survey, Bulletin 860-A, pp. 1-29.

Shaler, M. K., 1907, A reconnaissance study of the western part of the Durango-Gallup coal field of Colorado and New Mexico: U.S. Geological Survey, Bulletin 316, pp. 376-426.

Shomaker, J. W., Beaumont, E. C., and Kottlowski, F. E. (compilers and editors), 1971, Strippable low-sulfur coal resources of the San Juan Basin in New Mexico and Colorado: New Mexico Bureau of Mines and Mineral Resources, Memoir 25, 189 pp.

Shomaker, J. W., and Holt, R. D., 1973, Coal resources of southern Ute and Ute Mountain, Ute Indian Reservations, Colorado and New Mexico: New Mexico Bureau of Mines and Mineral Resources, Circular 134, 22 pp.

Smith, G. 0. et al., 1913, The classification of public lands: U.S. Geological Survey, Bulletin 537, 197 pp.

Stacher, H. C., 1978, Gallup Southwestern Coal Company: unpublished manuscript, 153 pp.

Stevenson, J. J., 1881, Report upon geological examinations in southern Colorado and northern New Mexico during the years 1878 and 1879: U.S. Geographic Surveys W 100th Meridian Report, vol. 3, supplement, 420 pp., 3 maps.

Tabet, D. E., and Frost, S. J., 1979, Coal geology of Torreon Wash area, southeast San Juan Basin, New Mexico: New Mexico Bureau of Mines and Mineral Resources, Geologic Map 49, 3 sheets, scale 1:24,000.

Unpublished coal files of the U.S. Geological Survey, Conservation Branch, Southwest Region.

Wilson, J. C., 1977, The McKinley mine: New Mexico Geological Society, Guidebook to 28th Field Conference, pp. 253-256.

Index of the mines and prospects

Editor: Deborah A. Shaw
Drafter: Monte M. Brown

Typeface: Palatino

Presswork: Miehle Single Color Offset
Harris Single Color Offset

Binding: Smyth sewn with softbound cover

Paper: Cover on 17 pt. Kivar
Text on 70 lb white matte

Ink: Cover—PMS 320
Text—Black

Quantity: 1,000