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## *The McKinley mine*

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# THE MCKINLEY MINE

JOHN C. WILSON  
 The Pittsburg and Midway Coal Company  
 Gallup, New Mexico

## INTRODUCTION

The McKinley mine is located approximately 20 miles northwest of Gallup, New Mexico, and about 3 miles east of Window Rock, Arizona. It covers lands under leases held by Gulf Oil Corporation and operated by Pittsburg and Midway Coal Company.

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 the Navajo Tribe, 11,157 acres, all in New Mexico. The surface is owned by the Navajo Tribe (reservation only), 11,157 acres; public lands, 642 acres, Indian allotted, 7,514 acres; and private lands by various individuals, 7,613 acres. Figure 1 shows the leased area.

The mine is designed to meet the rapidly expanding demand for low sulphur coal throughout the Southwest. The mine is being expanded from 400,000 tons per year to 4,000,000 tons of coal per year. Plans are under construction to bring the mine to an ultimate capacity of 5,000,000 tons per year. Increased production started in January 1976, and full production should be reached by 1979; at this rate the reserves will be depleted in 30 to 37 years.

Arizona Public Service Company will be the prime cus-

tommer, requiring up to 3,000,000 tons per year for power generation at the Cholla plant near Joseph City, Arizona. The remainder of the coal produced will be sold to fill contracts to various customers for industrial uses. The principal customers are as follows: Arizona Public Service Company, Southwest Forest Industries, Kaiser Cement and Gypsum Corp., Hecla Mining Company and The Flintkote Company.

## HISTORY OF THE MCKINLEY MINE

The Pittsburg and Midway Coal Company (P&M), wholly owned by Spencer Chemical Company, obtained leases from the Santa Fe and Pacific Railroad Company on the odd-numbered sections and applied for federal coal prospecting permits on the even-numbered sections on lands in T. 16 N., R. 20 W.; T. 17 N., R. 20 W.; and T. 16 N., R. 21 W., N.M.P.M., during 1958 and 1959. The permits were assigned to Spencer Chemical Company in October 1960.

Exploration began about May 1, 1959, using one drill rig owned and operated by the company. Two rigs were later operated and the initial drilling was completed about November 1960. Sufficient reserves were found on the lands to interest the Arizona Public Service Company in building a power plant at Joseph City, Arizona. Construction began on this plant during the early part of 1961. A railroad spur from the Santa Fe mainline and power lines were soon constructed and strip mining began in July 1961 on sec. 13, T. 16 N., R. 21 W.

On November 9, 1961, the Advisory Committee of the Navajo Tribal Council passed a resolution giving Spencer Chemical Company a two-year drilling permit with an option to lease. The prospecting permit became effective May 25, 1962, for 49,920 acres of land, with an option to lease land containing a reserve of 150 million tons of coal. By March 1, 1964, 64,154 feet of drilling was completed.

Lease negotiations resulted in issuing a lease, having an effective date of September 18, 1964, for 11,157.00 acres to Pittsburg and Midway Coal Mining Company. Mining began on the reservation in June 1972. Production of approximately 400,000 tons per year has been sold almost entirely to the Cholla plant since the mine started in 1961.

## PLANT AND SERVICE FACILITIES

The construction required to mine, produce, store, process and transport the coal from the expanded mine required an extension of the railroad spur, additional haul roads, power lines, new loading facilities, service shops and offices. The new loading facilities, shops and office complex are located on the Navajo tribal lease. Site preparation began in 1974, and construction of the plant site and the new facilities was completed in mid-1976.

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.

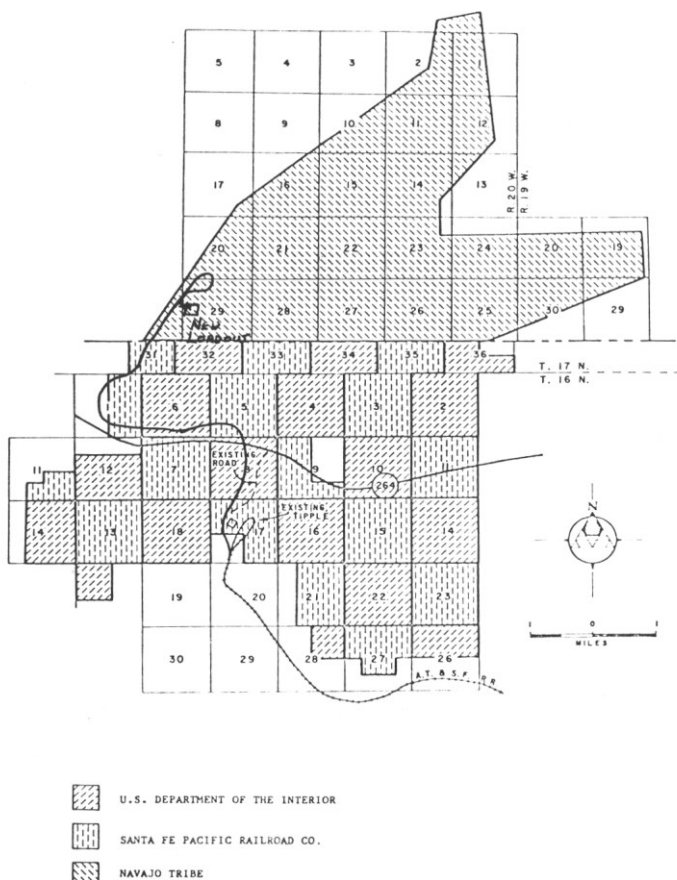


Figure 1. Coal ownership in vicinity of McKinley mine.

These facilities occupy an additional area of approximately 25 acres. Both areas required leveling and drainage culverts.

Over 5,000 cubic yards of concrete was used in the construction of the preparation plant. The upper half consists of a hopper, primary crusher, secondary crusher, vibrating screens, sample systems and traveling stacker. The coal is stockpiled at the rate of 2,000 tons per hour and sized at 3x0. 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. Initially a 70-car unit train having 100-ton cars will be flood-loaded at the rate of 3,000 tons per hour in just over two hours.

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 was 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 is 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.

What types of and how much equipment does it take to operate a 5-million-ton mine? The following operating information will give some idea of the mining equipment needed for this type of operation.



Figure 2. Mining operations at McKinley mine—H. L. James photo.

#### COAL SEAM

Names: Yellow, Fuchsia, Blue and Green  
Thickness: 18 inches to 15 feet

#### NUMBER OF EMPLOYEES

Estimate at full production-350

#### PRODUCTION

Annual: 5,000,000 tons

#### STRIPPING EQUIPMENT

Four Bucyrus Erie 1 370-W Draglines, 55 cubic yard  
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 8 1/2-foot 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 ground man  
Erection Information: Construction time-10 to 12 months; peak number of men employed, 70

#### DRILLING EQUIPMENT

Four vertical overburden drills

#### LOADING EQUIPMENT

Five rubber-tired front-end loaders, 20 cubic yards

#### HAULAGE UNITS

Twelve 100-ton end dump trucks

### RECLAMATION

The federal leases and also the Navajo lease must comply with requirements for reclamation under 30 CFR, part 211. Although the reclamation requirements were practically non-existent prior to the New Mexico Strip Mining Act, the company undertook to partly level the peaks of the spoil piles and experimented in planting small areas with various plants and shrubs.

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 (fig. 2). After two public hearings on the proposed mining and reclamation plan, P & M was granted a permit on December 17, 1973, to operate the McKinley mine. It was shown that the highest and best usage of the land following strip mining is for grazing.

Therefore, P & M's primary commitment is to reclaim the affected areas so that they produce as much or more usable herbage than was produced prior to mining. This covers all lands under their leases. The reclamation of the lands to date has been under the jurisdiction of the New Mexico state permit. The state of New Mexico inspects the results, advises, and enforces the terms of the permit. Considerable experimental work has been done to date by the U.S. Forest Service and New Mexico State University. The reclamation grading and

native species revegetation accomplished to date appears to be reasonably successful; and, as experience and knowledge are gained, the results should show marked improvement. The company has employed professional reclamation people to oversee the reclamation programs.

### GEOLOGY OF THE DEPOSITS

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 undermost in 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 95,000 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.

Coal is one of the important basic natural resources; and the production, distribution and utilization of coal as a source of energy directly and indirectly influences almost every phase of community, state and national well-being; Large reserves, easily accessible transportation and uniquely flexible facilities for the production of coal to meet current and long-term requirements of electric utilities and industrial plants make it possible for Pittsburg and Midway to help meet the demand for increased energy, and, by so doing, to make a significant contribution to the local and national economy.

### REFERENCE

- O'Sullivan, R. B., and Beaumont, E. C., 1957, Preliminary geologic map of western San Juan Basin, San Juan and McKinley Counties, New Mexico: U.S. Geol. Survey Oil and Gas Inv. Map OM-190.