CONTACT INFORMATION
Mining Records Curator
Arizona Geological Survey
1520 West Adams St.
Phoenix, AZ 85007
602-771-1601
http://www.azgs.az.gov
inquiries@azgs.az.gov

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Arizona Department of Mines and Mineral Resources Mining Collection

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PRINTED: 03/05/2003

ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES AZMILS DATA

PRIMARY NAME: KAYENTA

ALTERNATE NAMES:
KAVENTA 1 & 2
MALONEY

NAVAJO COUNTY MILS NUMBER: 169

LOCATION: TOWNSHIP 36 N RANGE 18 E SECTION 9 QUARTER SW
LATITUDE: N 36DEG 32MIN 00SEC LONGITUDE: W 110DEG 23MIN 30SEC
TOPO MAP NAME: LONG HOUSE VALLEY - 7.5 MIN

CURRENT STATUS: PRODUCER

COMMODITY:
COAL BITUMANOUS

BIBLIOGRAPHY:
ADMMR KAYENTA FILE
KIERSCH, G., MIN. RS. NAV-HOPI RES. VOL. I
ADDITIONAL WORKINGS SEC. 4,8,16,17,T36N-R18E
ADMMR PEABODY COAL COMPANY FILE - OPERATOR
ADMMR BLACK MESA FILE
OFFICE OF SURFACE MNG RECLAMATION & ENFORCEMT
"PROPOSED PERMIT APPL, BLACK MESA-KAYENTA
MINE, NAV & HOPI INDIAN RES., AZ"
NATIONS, J. D., SWIFT, R. I., AND HAVEN, H.H.
1998, ARIZONA COAL: IN ARIZONA GEOLOGY, ARIZ
GEOL SURVEY, VOL. 28, NO. 4, P 1-2
USGS PP1625B, NATIONAL ASSESSMENT COAL IN THE
COLORADO PLATEAU . . ., 2000

ABSTRACTED FROM ADMMR ACTIVE MINES DIRECTORY, 1992

Navajo County

PEABODY COAL COMPANY

Flagstaff Office
1300 S. Yale, Flagstaff, AZ 86001 - Phone 774-5253 - Employees: 80.
President Dennis L. Stevenson
General Supervisor, Operations Sil Perla
Director of Human Resources L. W. Bennett
Director of Engineering Frank Farnsworth
Division Materials Manager Merle Hendricks
Controller Rich Armstrong
Manager, Quality Control Charles J. Stenftenagel
Manager, Reclamation Wayne E. Hilgedick

Kayenta Mine T36W R18E Sec. 9
P.O. Box 606, Kayenta, AZ 86033 - Phone 677-5008 - Employees: 700 - Surface coal mine - Located 30 miles southwest of Kayenta.
Mine Superintendent Joe Johnson
Assistant Superintendent Robert D. Boone
Safety Supervisor Pete Craig

Date Printed: 12/11/97

ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES

INFORMATION SUMMARY

Information from: **Writer for "Coal Daily"**

Company:

Address:
City, State ZIP:
Phone:

MINE: **Kayenta**

ADMMR Mine File: Kayenta Mine File
County: **Navajo**
AzMILS Number: **169**

SUMMARY

A writer from Coal Daily called for information on coal production and quality in Arizona. He explained that Pacific Corp, an owner of power plants in the western United States is attempting to acquire the parent company of Peabody Coal; and that Salt River Project (SRP) has objected because their Navajo Power Plant is fed by Peabody coal from one of Peabody's largest mines, Kayenta. SRP will soon be competing with Pacific Corp for electricity customers and they are concerned that Pacific Corp would control a significant part their fuel supply.

Ken A. Phillips, Chief Engineer Date: December 11, 1997

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Manager, Quality Control ..... Charles J. Stenftenagel
Manager, Reclamation ..... Wayne E. Hilgedick
Kayenta Mine T36W R18E Sec. 9
P.O. Box 606, Kayenta, AZ 86033 - Phone 677-5008 - Employees: 509 - Surface coal mine - Located 30 miles southwest of Kayenta.
Mine Superintendent ..... Joe Johnson
Assistant Superintendent ..... Robert D. Boone
Safety Supervisor ..... Daniel Ashike, Jr.
Safety Supervisor ..... Martha Ignacio
Safety Supervisor ..... Joe Holgate

ABSTRACTED FROM ADMMR ACTIVE MINES DIRECTORY, 1990

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Manager, Quality Control ..... Charles J. Stenftenagel
Manager, Reclamation ..... Wayne E. Hilgedick

Kayenta Mine T36W R18E Sec. 9
P.O. Box 606, Kayenta 86033 - Phone 677-5208 - Employees 509 - Surface coal mine - Located 30 miles southwest of Kayenta.

Mine Superintendent ..... Joe Johnson
Assistant Superintendent ..... Robert D. Boone
Safety Supervisor ..... Daniel Ashike, Jr.
Safety Supervisor ..... Martha Descheenie
Safety Supervisor ..... Joe Holgate

ABSTRACTED FROM ADMMR ACTIVE MINES DIRECTORY, 1988

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Director of Engineering ..... Frank Farnsworth
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Manager, Quality Control ..... Charles J. Stenftenagel
Manager, Reclamation ..... Wayne E. Hilgedick

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P.O. Box 606, Kayenta 86033 - Phone 677-5208 - Employees 525 - Surface coal mine - Located 30 miles southwest of Kayenta.

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Assistant Superintendent ..... Robert D. Boone
Safety Supervisor ..... Daniel Ashike, Jr.
Safety Supervisor ..... Martha Descheenie
Safety Supervisor ..... Joe Holgate

BLACK MESA (P)
KAYENTA (P)

United States Department of the Interior

OFFICE OF SURFACE MINING
RECLAMATION AND ENFORCEMENT
BROOKS TOWERS
1020 15TH STREET
DENVER, COLORADO 80202

TAKE PRIDE IN AMERICA

In Reply Refer To:

December 29, 1989

Mr. John Jette
Arizona Department of Mines and Mineral
Mineral Building, Fairgrounds
Phoenix, Arizona 85007

Dear Mr. Jette:

This is to notify you that the United States Department of the Interior, Office of Surface Mining Reclamation and Enforcement (OSM), in accordance with the Federal Program for Indian Lands, has approved Peabody Coal Company's permit renewal application for renewal of OSM Permit AZ-0002A J-21 North Area at the Black Mesa-Kayenta mine.

Notification of this decision is pursuant to 30 CFR 773.19(b). Peabody Coal Company was notified of the decision, by letter, on December 21, 1989.

The J-21 North Area contains 4375 acres and is located within all or parts of:

Arizona Principal Meridian:
Township 35 North, Range 19 East:
Sections 1 through 4, 10 through 12, 13 through 15 and 22.
Township 36 North, Range 19 East:
Sections 33, 34, 35 and 36.

For information or clarification concerning the renewal of the J-21 North Area Permit AZ-0002A, please contact me at (303) 844-2938.

Sincerely,

Jerry D. Gavette

Jerry D. Gavette
Senior Project Manager
Federal & Indian Permitting Branch

KAYENTA (A)

United States Department of the Interior

OFFICE OF SURFACE MINING
RECLAMATION AND ENFORCEMENT
BROOKS TOWERS
1020 15TH STREET
DENVER, COLORADO 80202

TAKE PRIDE IN AMERICA

In Reply Refer To:

Send change to fax

July 6, 1990

RECEIVED
JUL 09 1990
DEPT. OF MINES & MINERAL RESOURCES

Mr. John Jette
Arizona Department of Mines and Mineral
Mineral Building, Fairgrounds
Phoenix, Arizona 85007

Dear Mr. Jette:

The United States Department of the Interior, Office of Surface Mining Reclamation and Enforcement (OSM), in accordance with the Indian Lands Program at 30 C.F.R. Part 750, today approved Peabody Coal Company's (PCC's) Permit Application Package (PAP) for the Black Mesa-Kayenta Mine as it applies to the Kayenta Mine. OSM also issued to PCC Permit No. AZ-0001C, with eighteen special conditions, for the Kayenta Mine. The permit authorizes those surface coal mining and reclamation operations described in the PAP as it applies to the Kayenta Mine.

OSM has not rendered an initial administrative decision on the PAP as it applies to the Black Mesa Mine, which will continue to operate under OSM Initial Program Permit No. AZ-0001, as provided by 30 C.F.R. § 750.11(c). OSM has postponed a decision on the PAP as it applies to the Black Mesa Mine for a reasonable amount of time pending the analysis of additional information concerning the effect of water withdrawal from the N-aquifer in the vicinity of the mine.

PCC was informed of OSM's decision on the PAP as it applies to the Kayenta Mine by newspaper notice published in the Gallup Independent, on July 6, 1990. This letter constitutes your notice of that decision as required by 30 C.F.R. § 773.19(b).

The Kayenta Mine, which covers approximately 42,197 acres, is located in Navajo County, Arizona, within all or parts of:

T35N, R18E:	Secs. 13, 14, 24, 25, and 36;
T35N, R19E:	Secs. 1-5 and 7-36;
T36N, R17E:	Secs. 1-5, 11, and 12;
T36N, R18E:	Secs. 1-18, 20, and 23-26;
T36N, R19E:	Secs. 15-22, 25-30, and 32-36;
T37N, R17E:	Sec. 33;
T37N, R18E:	Secs. 28, 29, and 32-36;

All north of the Gila Base and east of the Salt River Meridian

For information or clarification concerning either approval of PCC's PAP as it applies to the Kayenta Mine or issuance of the permit, please call me at (303) 844-2938.

Sincerely,

Jerry D. Gavette

Jerry D. Gavette
Senior Project Manager
Federal & Indian Permitting Branch

approx.

Kayenta

T36N R18E Sec 9 SW

Prospect

Prospect

Well

Prospects

Coal Well

Well

Well

Coal Mine Wash

Wild Ram Valley

6800

6760

6823

6745

6685

6747

6680

6600

6763

6715

6587

6817

6633

6651

6731

6563

4045

32'30"

4043

4042

4041

4040000m.N.

PINON 47 MI.

552

25'

554

555000m.E.

36°30'

110°22'30"

22½

INDIAN RESERVATION BDY

NAVAJO-HOPI JOINT USE AREA BDY

PINON 40 MI.

U.S. GOVERNMENT PRINTING OFFICE: 1973—486—610/9

Long House Valley 7.5'

1 MILE

7000 FEET

METER

ROAD CLASSIFICATION

Primary highway, hard surface

Light-duty road, hard or improved surface

Secondary highway, hard surface

Unimproved road

(YUCCA HILL) 3956 IV NE

Kayenta Mine (f)

Monday July 22, 12:50 pm Eastern Time
Reuters Company News
Peabody says ruling to add $20 mln to '02 profits

ST. LOUIS,, July 22 (Reuters) - Peabody Energy Corp. (NYSE:BTU - News), the world's largest private sector coal company, on Monday said a favorable arbitration ruling on sales to an Arizona generating station would add $20 million to profits in 2002.

The announcement follows a profit warning last week when the company slashed its 2002 earnings forecast because of soft market conditions and force majeure events affecting several customers.

Peabody, based in St. Louis, said the ruling, on July 20, increases pricing on 42 million tons coal sold to the Navajo Generating Station in Page, Arizona, from 1997 to 2002. The ruling also raises pricing on ongoing sales under a long-term sales agreement.

The benefit related to prior sales will be about 30 cents per share in increased profits in 2002, the company said. Analysts had expected the company to earn between $1.16 per share and $1.82 per share, with a consensus forecast of $1.73, according to tracking firm Thomson First Call.

Peabody and the participants in the Navajo Generating Station began arbitration proceedings in September 2000 to resolve a dispute over pricing provisions related to coal supplies beginning in January 1997, the company said. Following hearings in May, a three-member arbitration panel issued its final ruling, and the American Arbitration Association subsequently reviewed the proceedings and issued the final report, Peabody said.

Kayenta Mine (file) Navajo County

Black Mesa Mine (file) Navajo County

James (Jim) G. Schlenvogt, Engineering and Reclamation Manager, Peabody Western Coal Company, PO Box 605, Kayenta, Arizona 86003, phone (928) 677-5089 presented a program on *Operations and Reclamation at Peabody's Arizona Coal Mines* to the Maricopa Section SME, Thursday, March 21, 2002. He handed out extensive operations literature and program notes which will be included in the ADMMR mine files and I took a lot of notes that are summarized below. (Ken A. Phillips with Nyal Niemuth)

COAL AND ELECTRICAL ENERGY GENERATION

- Coal is one of the cheapest sources of energy for the generation of electricity with a cost of about $1.00 to $1.20 per million BTU, nuclear is about $1.20 to $1.30 per million BTU, and others such as natural gas and petroleum are much higher
- Coal supplies more than half the US electricity
  - 51% from coal
  - 20% from nuclear
  - 15% from natural gas
  - 8% from hydroelectric
  - 6% from "other" solar, wind, biomass, geothermal, and diesel oil

PEABODY

- Peabody is largest US coal mining company
- Peabody produces 16% of US coal production
- All of Peabody's production is for steam coal except the production from one small West Virginia mine still producing metallurgical coal for the iron and steel industry
- 40% of Peabody's production is from surface mines and 60% is from underground mines
- Peabody's US coal reserves are 9.3 billion tons

PEABODY WESTERN at BLACK MESA

- Peabody Western is the largest private employer of Native Americans. The an average salary is over $41,000 annually (although a video shown said it was $53,000)
- Peabody Western's reserves on Black Mesa are over 500 million tons
- Peabody Western at Black Mesa pays $45,000,000 in royalties to the Navajos and Hopis each year.
  - 40% of the Navajo Nation's income
  - 80% of the Hopi's income
- Peabody Western at Black Mesa pays $35,000,000 in taxes
- Peabody Western has 662 employees at their operations on Black Mesa: 236 at the Black Mesa Mine, 400 at the Kayenta Mine, and 26 at the central office.
- Over 90% of the employees are Native Americans, many are now third generation Peabody employees.
- 60 of the employees are involved in reclamation
- The coal contains slightly less than 1 lb of sulfur per 1 million BTU or about 0.6% S

- Although the exact price is confidential, he reported the value of the coal FOB the mine is between $20 and $25 per ton.
- Mined land is reclaimed by backfilling with overburden, contouring and covering with top soil and planting in permanent pasture for grazing.
- Reclaimed land is held for 10 years to assure establishment of forage before releasing it to the Navajos or Hopis for grazing
- Current reclamation bonds are $97 million

BLACK MESA MINE

- First leased in 1966
- Black Mesa was developed first on the west side of the "U" shaped leasehold and started in 1970
- 236 employees
- 150 acres have been stripped and reclaimed
- Currently producing from 2 pits
- Current production is 4.5 to 5 million tons per year
- Black Mesa Mine coal is crushed to minus 0.5", screened and then slurry pumped through an 18" pipeline to the Southern California Edison's Mohave Generating Station at Laughlin, Nevada
- About 3,000 acre-feet of water per year are used for the pipeline
- Total water use for both mines is about 4,000 acre-feet yearly (but even at this consumption level the coal mine complex is not among the top 100 water users in Arizona)
- The water is pumped from 3500 foot-deep wells in the Navajo Aquifer which are geologically separated from the shallow aquifers used by the local population and the mines' wells are sealed as they traverse through the upper aquifers
- The Navajo Aquifer contains 10,000,000 acre-feet of water. Over the projected 35 year life of the mine approximately 1.25% of that water will be used.
- The current mine plan and coal sales contract for the Black Mesa Mine ends in 2005. Peabody Western, Southern California Edison, and the slurry pipeline company are planning a 20 year extension that will require a nearly $1 billion recapitalization. It will involve permit and lease extensions for the coal mine, pipeline improvements for the slurry pipeline, and SO_2 scrubbers for the power plant.

KAYENTA MINE

- First leased in 1966
- Production is 8 million tons per year from 3 pits
- Kayenta Mine was developed on the east side of the "U" shaped leasehold and started in 1972
- 300-350 acres have been mined and reclaimed
- Mined coal is transported over a 17 mile conveyor to a railroad loading station
- Coal is then hauled 83 miles by rail to the Navajo Generating station operated by Salt River Project.
- The Kayenta mine workforce recently ended one of the longest accident free coal mine worker industry periods of over 1,700,000 hours without a lost time accident. This accident free stretch recently ended with a lost time accident
- Draglines are used to handle overburden and interburden.
- The two mines use 6 six draglines, the largest having a 100 cubic yard capacity.
- 20 million tons of topsoil and 80 million of overburden and interburden are handled annually.

Information Summary by ADMMR Engineers – Ken Phillips and Nyal Niemuth
Jim Schlenvogt, P.E., engineering and environmental engineer for
Peabody Western Coal Company's Kayenta Mine
Maricopa SME Program April 21, 2002

Facts and Figures - 40% of the United States' coal production comes from open pits mines, the other 60% is from underground mines.
Peabody became a publicly owned company in 2001 whose NYSE trading symbol is BTU. Peabody's coal reserves total 9.3 billion tons.

Lease - Peabody leased a U-shaped area containing the Black Mesa coal deposits in 1966.. The mine's contributes $45 million per year, 80% of the Hopi budget, and 40% of the Navajo budget. Kayenta mine has 3 active pit areas and has been in production since 1973. Black Mesa has 2 active pit areas. Peabody is currently trying to re-capitalize the Black Mesa mine for another 20 years. About 500 million tons of coal remains.

Employment – Productivity has climbed due to two factors. The introduction of bigger truck/shovel fleets and the workers have improved. The mines employee 90% Native American workers, many of whom now are the 3rd generation miners and are better educated and more widely speak English and who bring better education (some with college) and skills to the job. Average wage is 53,000 per year. Black Mesa has 236 employees and Kayenta 400 with an additional 26 in the office. The Arizona Black Mesa and Kayenta mines recently worked 1.7 million hours without a lost time accident. About 55 people are involved with permitting and reclamation.

Water- The mines use 4,000 acre-feet of water per year, 3,500 goes into the Black Mesa coal slurry pipeline. Eight deep wells supply the water. Water usage by the pipeline is currently about 3,000 acre feet with a 1:1 mix. The water is used again at the Laughlin Power plant for cooling. Total water usage represents less than 0.1% of Arizona water used per year. Less than 0.1% of the total water in the Navajo aquifer will be used over the 35 year life of the mines.

Mining and the Coal - The mines use 6 draglines - the largest has a 100 cubic yard bucket, 2 with 75 yard buckets, 2 with 36 yard buckets, and 1 with a 29 yard bucket. Overburden/waste is moved at the rate of 80(?) million yards per year.
It takes less than a minute to fill a train car and less than an hour to load an entire train. Under complex geologic conditions, coal is mined from multiple seams and splits of seams ranging in thickness from three to 18 feet. Transportation is a key. If there were additional corridors the coal could be provided to other markets as the coal is of high quality. It contains only 1 pounds of sulfur per 1 million BTU's of coal. Prices fob the mines are about $20-25 per ton. Coal from as far away as the Powder River Basin is now making its way into Arizona electric power plant markets. The mines (or just one?) supply enough power to supply 3.5 million homes.
An easily accessible place to see the mine operations turn off Highway 160 at the Black Mesa Trading Post and in about 6 miles can view mining operations.

Land use and reclamation - Over the life of the lease only 25,000 acres of the total 65,000-acre area will be disturbed. Total land disturbance is less than 1% of the tribe's land.
At the tribes request 95% of the land is reclaimed as grasslands. Future use is planned to be grazing for cattle and sheep. The remaining land is reclaimed with native plants, mostly shrubs and trees. The land is held for 10 years and then is released to the tribes to use. There have been problems with the Indians suing the OSM after the reclaimed lands are released and overgrazing. Progress is being made through education and improved rotation of the grazing herds.
The mine has a pre-SMCRA law area. After the law was passed in 1982 bonding was required. An EIS was completed about 1990. The total amount of bonds held is $45 million. Kayenta's share of the bond is about $19 million.

Also see handouts 1) Four Corner - coal lease boundary map, pipeline and train route map (8.5x11) 2) Peabody Energy at a Glance, 3) Kayenta Mine Operations and Environmental Report, 4) A Quarter Century on Black Mesa

Peabody

Peabody Energy at a Glance

Peabody Energy (NYSE: BTU) is the world's largest private-sector coal company. Its coal products fuel more than 9 percent of all electricity in the United States and more than 2 percent of all electricity in the world. For the year ended December 31, 2000, Peabody Energy generated total revenues of $2.35 billion.

CUSTOMERS: Peabody provides products and services to more than 290 electric generating and industrial plants in the United States, as well as customers in 11 other countries.

MINING OPERATIONS

Mines by type

Surface	21
Underground	13
Total	34

Tons sold by state (millions)

	FY 2001
Arizona	13.0
Colorado	1.6
Kentucky	9.2
Montana	1.4
New Mexico	5.3
West Virginia	17.7
Wyoming	97.3
Black Beauty*	21.9
COALTRADE	9.0
Peabody Energy	176.4

*Indiana and Illinois

Tons sold by market (millions)

		FY 2001 Tons	FY 2001 %
United States			
Domestic	Electric utilities	166.4	94.3
	Industrial/retail	4.7	2.7
Export	Steam & metallurgical coal	5.3	3.0
	Total	176.4	100.0

Tons sold by sulfur content

United States	Low (1% sulfur or less)	140.0	79.4
	High (above 1% sulfur)	36.4	20.6
	Total	176.4	100.0

12/20/2001

SALES AND MARKETING

Peabody COALSALES Company and Peabody COALTRADE sell coal produced by Peabody Energy's diverse portfolio of operations, broker coal sales of other coal producers, both as principal and agent, trade coal and emissions allowances, and provide transportation-related services. The companies also restructure third-party coal supply agreements by acquiring a customer's right to receive coal from another coal company under a coal supply agreement, resell that coal, and supply that customer with coal from our own operations.

TRANSFORMATION

	1990	2000	% Improvement
Sales Volume (million tons)	93.0	176.4	90
U.S. Market Share	9.1%	16.3%	79
Low Sulfur Sales Volume (million tons)	52.7	140.0	166
Total Coal Reserves (billion tons)	7.0	9.3	33
Low Sulfur Reserves (billion tons)	2.5	4.4	76
Safety (incidents per 200,000 hours)	16.1	3.9	76
Productivity (tons per miner shift)	33.5	101.5	203
Average Cost Per Ton Sold	$19.25	$12.13	37
Employees (approximate)	10,200	6,000	41

FOR MORE INFORMATION . . .

Visit Peabody's web site at www.peabodyenergy.com.

PEABODY WESTERN

Fact Sheet

ARIZONA OPERATING UNIT

Peabody Energy's two Arizona surface mines are located on American Indian lands known as Black Mesa, about 20 miles southwest of Kayenta. The Black Mesa and Kayenta mines have operated more than three decades, creating local jobs, providing tribal revenue and encouraging economic development in reservation communities. The mines produce about 13 million tons of coal each year from a large reserve leased from the Navajo Nation and the Hopi Tribe.

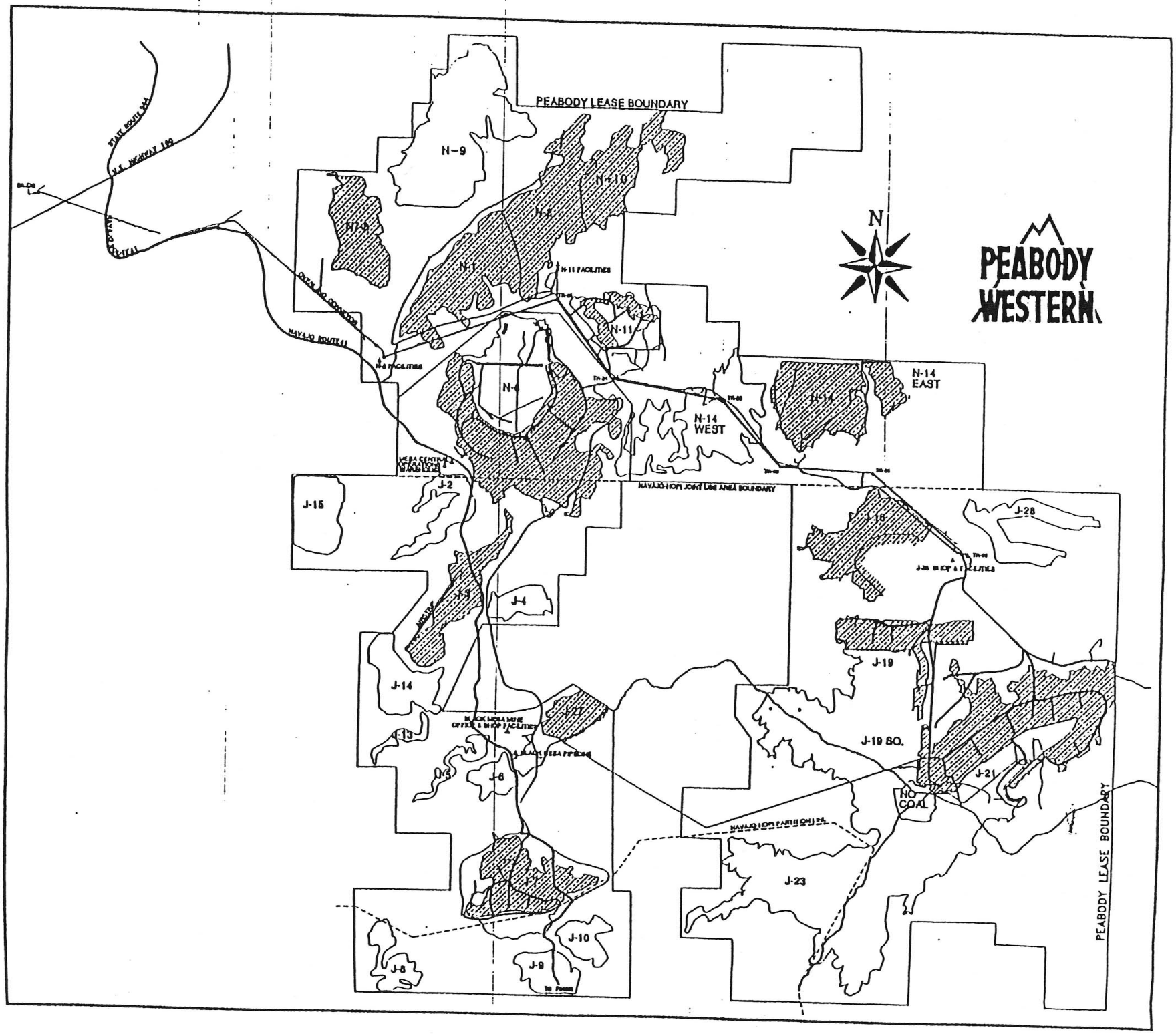
Mining occurs under complex geological conditions, with coal extracted from multiple seams and splits of seams ranging in size from three to 18 feet. Black Mesa's low-sulfur coal has a high heating value of approximately 10,700 British thermal units (Btu) per pound.

Each year, royalties, taxes and business payments generated from the mining operations provide the tribes with more than $45 million in revenue, which equates to about 80 percent of the Hopi's budget and nearly 40 percent of the Navajo's annual general budget. Mining operations provide nearly 640 jobs on reservation lands. More than 90 percent of the Black Mesa work force is American Indian, making Peabody one of the nation's largest private employers of tribal members. The company's payroll and benefits exceeded $51 million last year, and the typical coal miner's wage topped $45,000. This is eight times higher than the per capita income for the Navajo Nation.

Black Mesa Mine was opened in 1970 and shipped 4.7 million tons of steam coal during the year ended December 31, 2000. The mine employs about 240 workers, sells coal under a long-term contract that runs through 2005 and has options for up to 15 years of operations. Its coal is crushed and transported by conveyor to an independent company, the Black Mesa Pipeline Inc. There the coal is ground into a powder-like substance and mixed with water to form a coal-water mixture that flows through an underground pipeline 273 miles to the Mohave Generating Station near Laughlin, Nev.

Kayenta Mine is adjacent to the Black Mesa Mine and began operating in 1973. The mine shipped 8 million tons of steam coal during the year ended December 31, 2000. The mine employs approximately 400 workers and sells coal under a long-term contract with Salt River Project that is effective through 2011 and has options for up to 15 years of extensions. The coal is crushed, then carried via conveyor 17 miles to storage silos, where it is loaded on an electric train and transported 83 miles to the Navajo Generating Station near Page, Ariz.

The Arizona Operating Unit is part of St. Louis-based Peabody Energy, the world's largest coal company. Its coal products fuel more than 9 percent of all U.S. electricity generation and more than 2 percent of worldwide electricity generation.


PEABODY LEASE BOUNDARY
N-9
N-10
N-8
N-1
N-11 FACILITIES
N-11
N-6 FACILITIES
N-4
N-14 WEST
N-14 EAST
N-14
NAVAJO-HOPI JOINT USE AREA BOUNDARY
J-2
J-15
J-28
J-4
J-14
J-13
J-6
J-19
J-19 SO.
J-21
NO COAL
J-23
J-10
J-9
J-8
PEABODY LEASE BOUNDARY
N
PEABODY WESTERN

Participants in the Mohave and Navajo Generating Stations

Mohave Generating Station Participants

56% Southern California Edison Company (The Operating Agent)

20% Department of Water and Power of the City of Los Angeles

14% Nevada Power Company

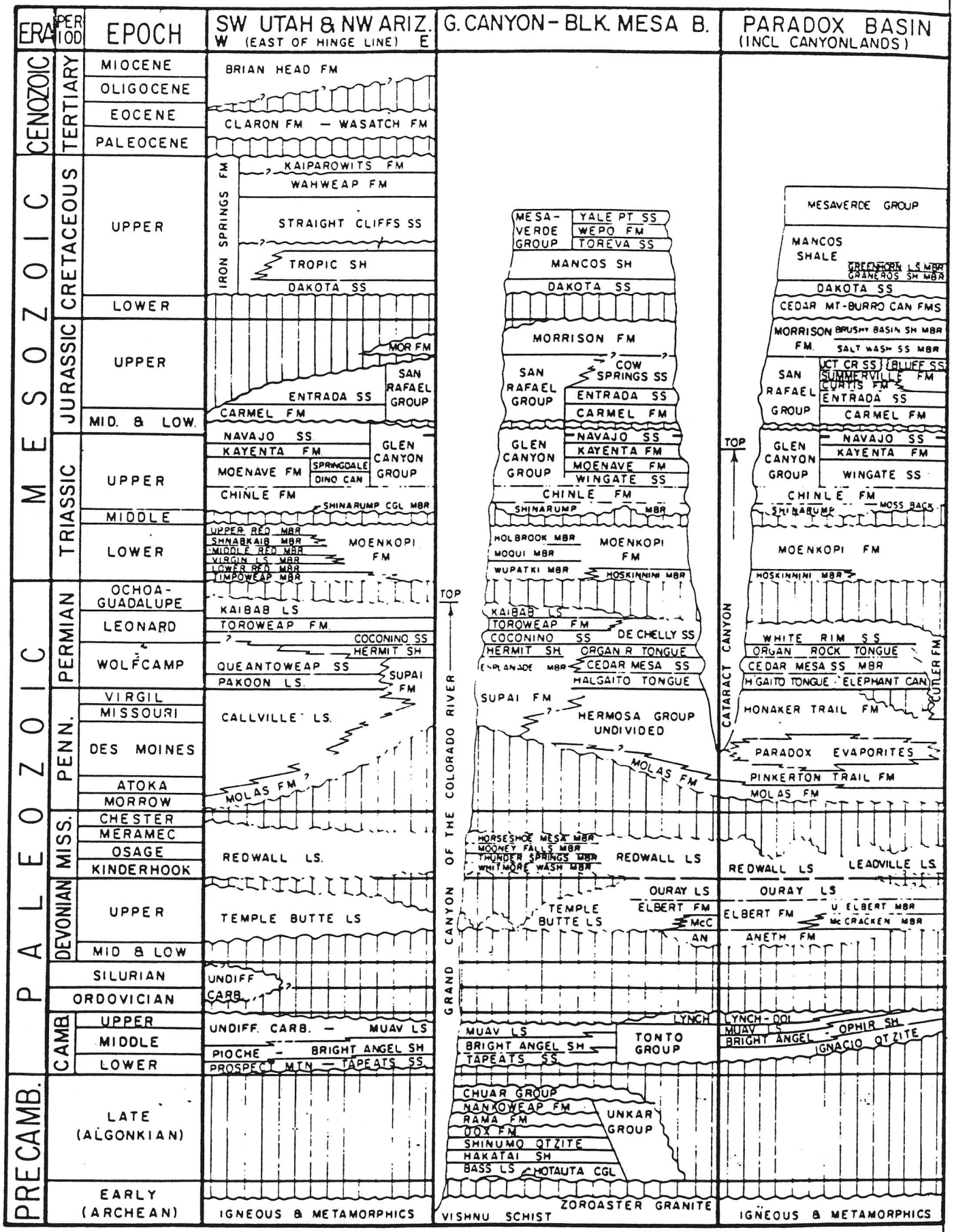
10% Salt River Project Agricultural Improvement and Power District

Navajo Generating Station Participants

46.0%	Salt River Project Agricultural Improvement and Power District (The Operating Agent)
21.2%	Department of Water and Power of the City of Los Angeles
14.0%	Arizona Public Service Company
11.3%	Nevada Power Company
7.5%	Tucson Gas and Electric Company

Revised 01/25/02

NOMENCLATURE CHART OF THE CANYONLANDS & ADJACENT AREAS



NOTE: VERTICAL TIME SCALE NOT UNIFORM

COMPILED BY C.M MOLENAAR

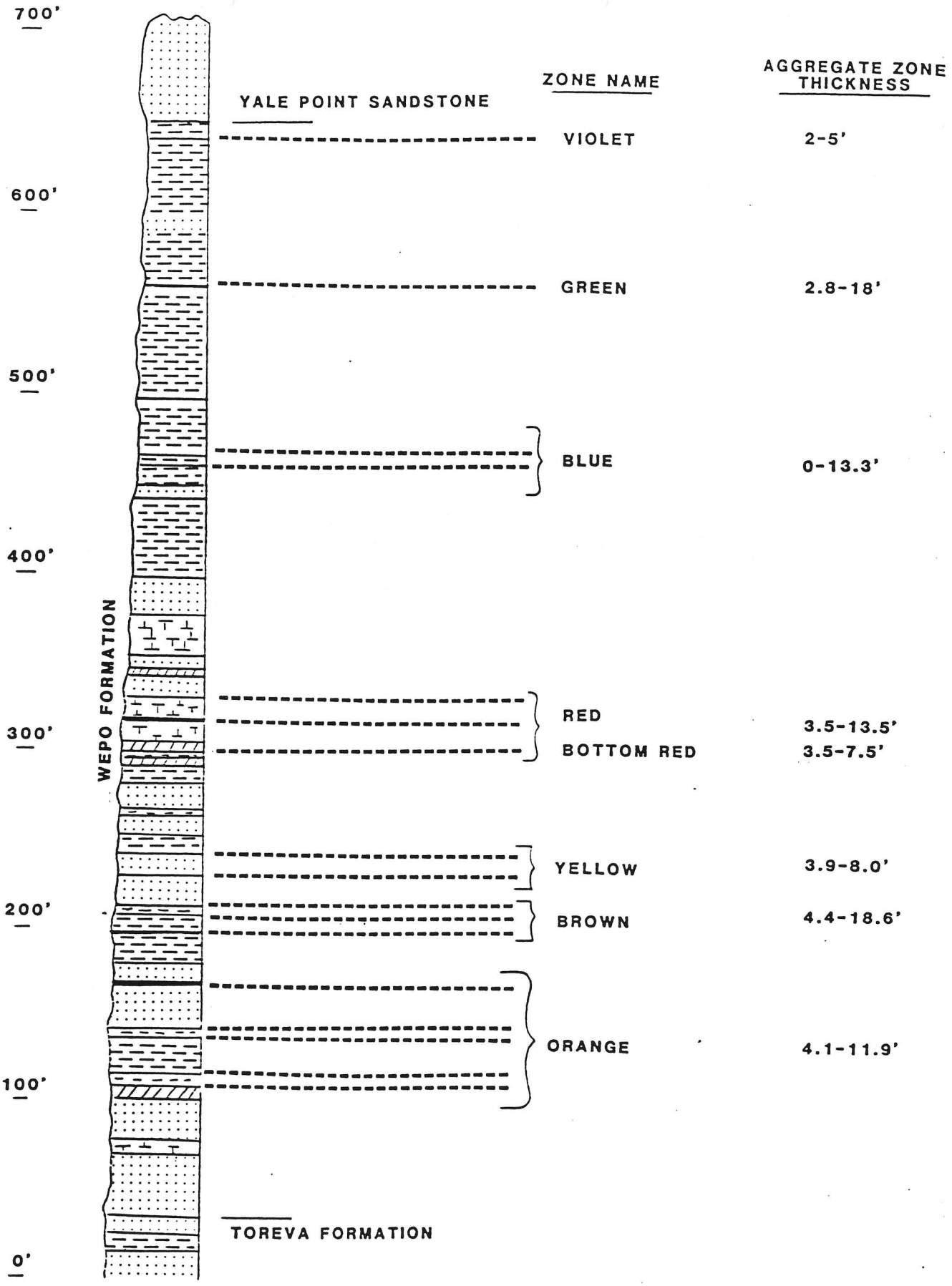


FIGURE 6
IDEALIZED STRATIGRAPHIC SECTION OF THE WEPO FORMATION
BLACK MESA, ARIZONA

Major Equipment List for Kayenta Mine*

Primary Excavation Equipment

Draglines:	Bucyrus-Erie, (1) Model 2570-W, (1) Model 1260-W
	Marion, (1) Model 8750, (1) Model 8200
Shovels:	Bucyrus-Erie, (2) Model 295B

Major Support Equipment

Blasthole Drills:	(1) Ingersoll-Rand DM25SP, (1) Ingersoll-Rand Model DMH,
	(1) Ingersoll-Rand DML, (2) Drill Tech D55SP
	(1) Ingersoll-Rand DM252SP
Haulage Trucks:	Bryan (2) 150-ton, bottom-dump
	Caterpillar 789, (6) 250-tons, bottom-dump
	Caterpillar 785, (4) 150-ton end-dump
Dozers:	Caterpillar, (2) Model D-6, (1) Model D-9, (11) Model D-10,
	(6) Model D-11
	Caterpillar, (2) Model 690
Scrapers:	Caterpillar, (3) Model 631
Loaders:	Caterpillar, (6) Model 992, (4) Model 910
Motor Graders:	Caterpillar, (3) Model 16
Water Trucks:	(3) Off-Highway Water Trucks

* As of January 4, 2002

Revised 01/25/02

Major Equipment List For Black Mesa Mine*

Primary Excavation Equipment

Draglines:	Marion, (1) Model 8750, (1) Model 7800

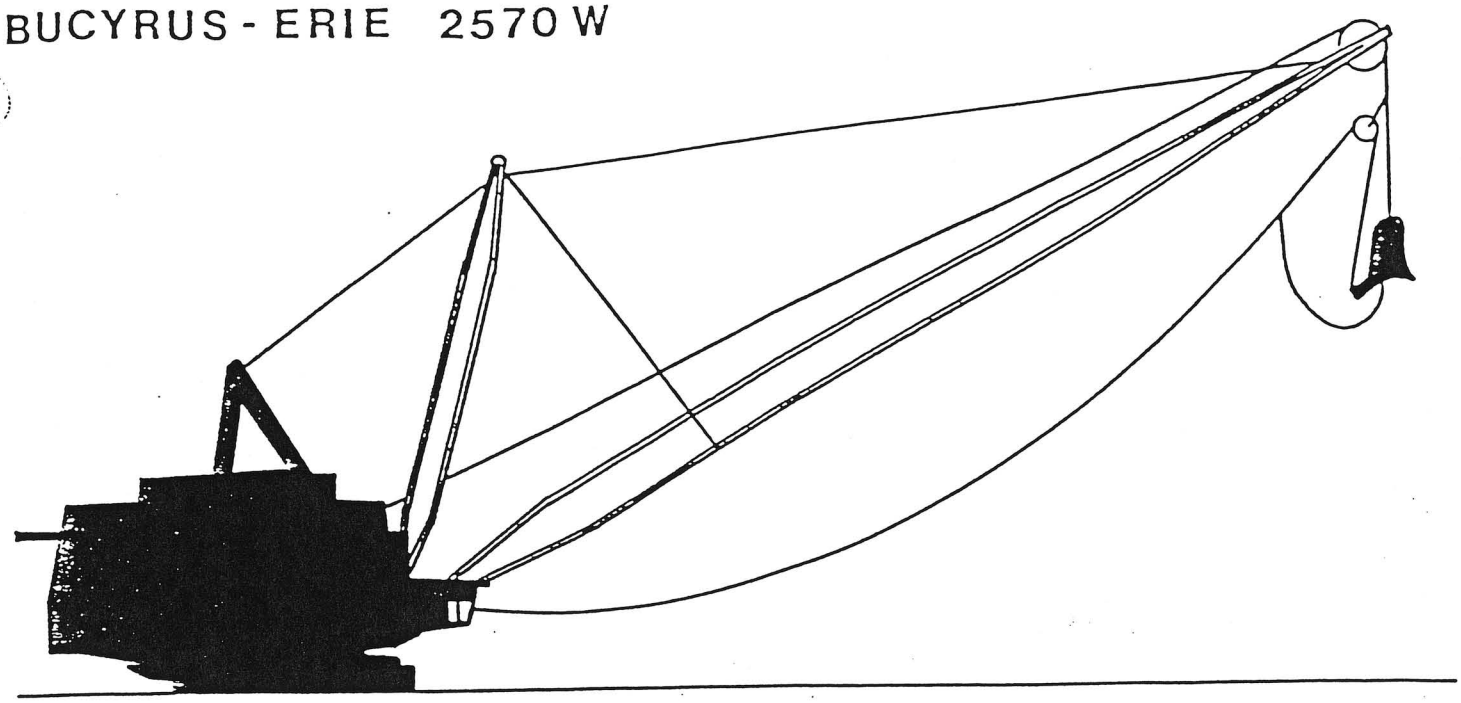
Major Support Equipment

Blasthole Drills:	Drilltech, (1) Model D55SP2L, (1) Model D245S
	Ingersoll-Rand, (1) Model DM25SP, (1) Model DM35SP,
	(1) Model DM50E, (1) Model DM3
Haulage Trucks:	(6) 150-ton, bottom-dump
	Caterpillar 789, (2) 250-tons, bottom-dump
	Caterpillar 785, (3) 150-tons, end-dump
	Rimpull, (2) 250-ton, bottom-dump
Dozers:	Caterpillar, (2) Model D-9, (6) Model D-10, (4) Model D-11
	Caterpillar, (1) Model 690
	Clark, (1) Model 380
Scrapers:	Caterpillar, (3) Model 631
	Caterpillar, (1) Model 637
Loaders:	Caterpillar, (1) Model 916, (5) Model 992
Motor Graders:	Caterpillar, (4) Model 16
Water Trucks:	(3) Off-Highway Water Trucks

*As of February 28, 2000

Revised 02/28/00

BUCYRUS - ERIE 2570 W



2570 WALKING DRAGLINE
SPECIFICATIONS

WEIGHTS:

NET WEIGHT*, DOMESTIC, APPROX. (WITH BUCKET + 80' BASE) LBS.....	10,430,000
WORKING WEIGHT, APPROX. (WITH BUCKET) LBS.....	11,180,000
BALLAST WEIGHT (FURNISHED BY PURCHASER) LBS.....	750,000

* ADD 90,000 LBS. FOR BLOCKING ON CARS WHEN ESTIMATING DOMESTIC FREIGHT.

ELECTRICAL EQUIPMENT:

HOIST MOTORS (BLOWN).....	EIGHT 500 HP
DRAG MOTORS (BLOWN).....	SIX 500 HP
SWING MOTORS (BLOWN).....	FOUR 625/1250 HP
WALKING MOTORS (BLOWN).....	FOUR 500/1000 HP

ALL ABOVE MOTORS RATED AT 75° CONTINUOUS AND AT 230/460V.
MT SET DRIVES: FOUR 2,500 HP SYNCHRONOUS MOTORS

WORKING DIMENSIONS

A	CLEARANCE RADIUS, FT.-IN.....	80-0
B	OPERATING RADIUS, FT.....	343
C	BOOM FOOT RADIUS, FT.-IN.....	30-0
D	CLEARANCE HEIGHT, FT.-IN.....	14-0
E	BOOM FOOT HEIGHT, FT.-IN.....	16-0
F	DUMPING CLEARANCE, FT.-IN.....	70-0
G	BOOM POINT HEIGHT, FT.....	204
H	DIGGING DEPTH, FT.....	160
J	POINT SHEAVE PITCH DIAMETER, IN.....	144
	BUCKET SIZE.....	90 C.Y.
	BOOM LENGTH, FT.....	360
	BOOM ANGLE.....	31.50°
	MAX. SUSPENDED LOAD (TONS).....	225

BASE:

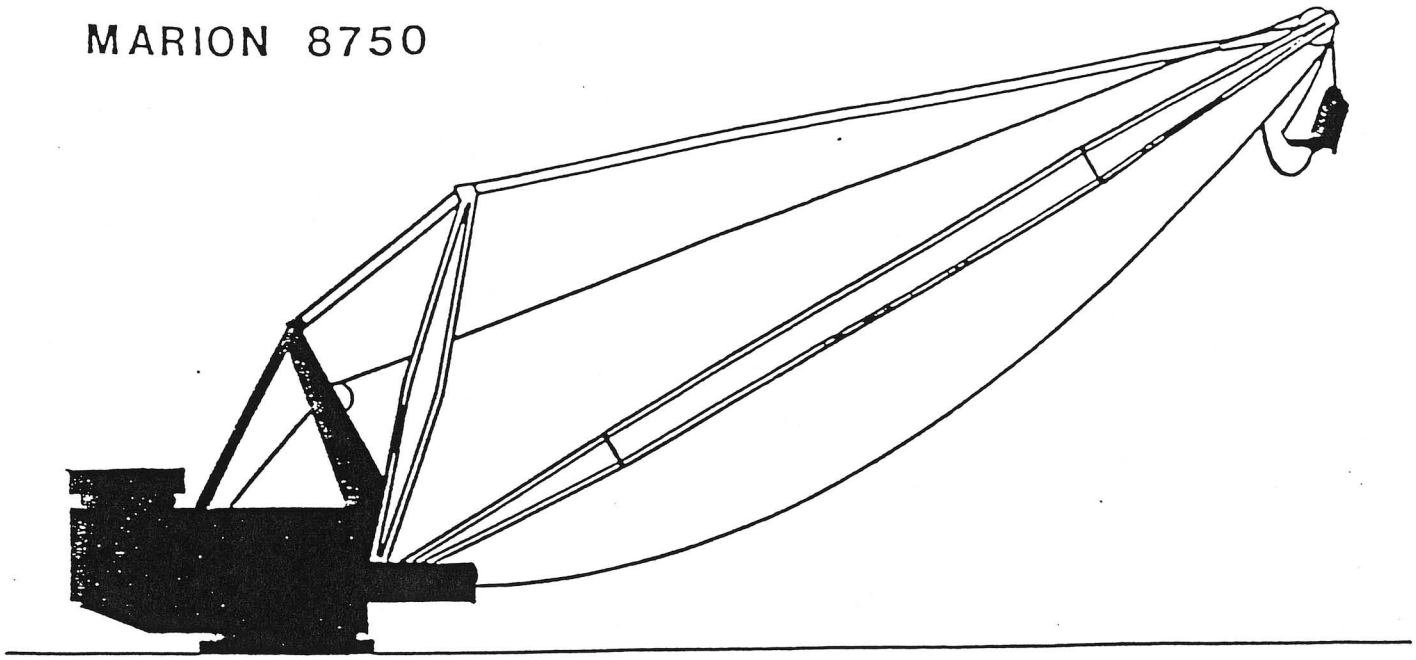
OUTSIDE DIAMETER, FT.-IN.....	80-0
BEARING AREA, SQ. FT.....	5026
CIRCLE RAIL DIAMETER, FT.-IN.....	54-0

WALKING MOUNTING:

SHOE WIDTH AND LENGTH, FT.....	14X72
COMBINED BEARING AREA, SQ. FT.....	2016
OVERALL WIDTH OVER SHOES, FT.-IN.....	110-6
LENGTH OF STEP, APPROX. FT.-IN.....	8-6
WALKING SPEED, APPROX. MPH.....	0.15

FIGURE 2

BUCYRUS-ERIE 2570 W



8750 WALKING DRAGLINE
SPECIFICATIONS

WEIGHTS

DOMESTIC SHIPPING WEIGHT (INC. BUCKET) LBS.....	9,200,000
WORKING WEIGHTS, LBS.....	9,800,000
BALLAST (FURNISHED BY PURCHASER), LBS.....	600,000

DIMENSIONS

BOOM LENGTH.....	300'-0"
A - BOOM ANGLE, APPROX.....	35-1/2°
B - DUMPING RADIUS.....	272'-6"
C - DUMPING HEIGHT.....	140'-0"
D - DEPTH.....	150'-0"
MAXIMUM ALLOWABLE LOAD, LBS.....	427,000
BUCKET SIZE.....	84 CU. YD.

BASE

E - OUTSIDE DIAMETER - NOMINAL.....	70'-0"
BEARING AREA - EFFECTIVE, SQ. FT.....	3,848
RAIL CIRCLE - MEAN DIA.....	55'-0"

ELECTRICAL EQUIPMENT

HOIST MOTORS, EIGHT, 1000 HP EACH @ 460 V, TOTAL HP....	8,000
DRAG MOTORS, SIX, 1000 HP EACH @ 460 V. , TOTAL HP.....	6,000
SWING MOTORS, FOUR, 1000 HP EACH @ 460 V., TOTAL HP....	4,000
PROPEL MOTORS, FOUR, 600 HP EACH @ 460 V., TOTAL HP....	2,400
AC DRIVING MOTORS, TOTAL HP.....	10,250

ROTATING FRAME

J - WIDTH @ REAR END.....	80'-0"
K - LENGTH.....	109'-0"
L - CLEARANCE RADIUS - REAR END.....	77'-0"
M - CLEARANCE UNDER FRAME.....	15'-10"
N - CENTER ROTATION TO BOOM FOOT.....	24'-0"
P - GROUND TO BOOM FOOT.....	21'-4"

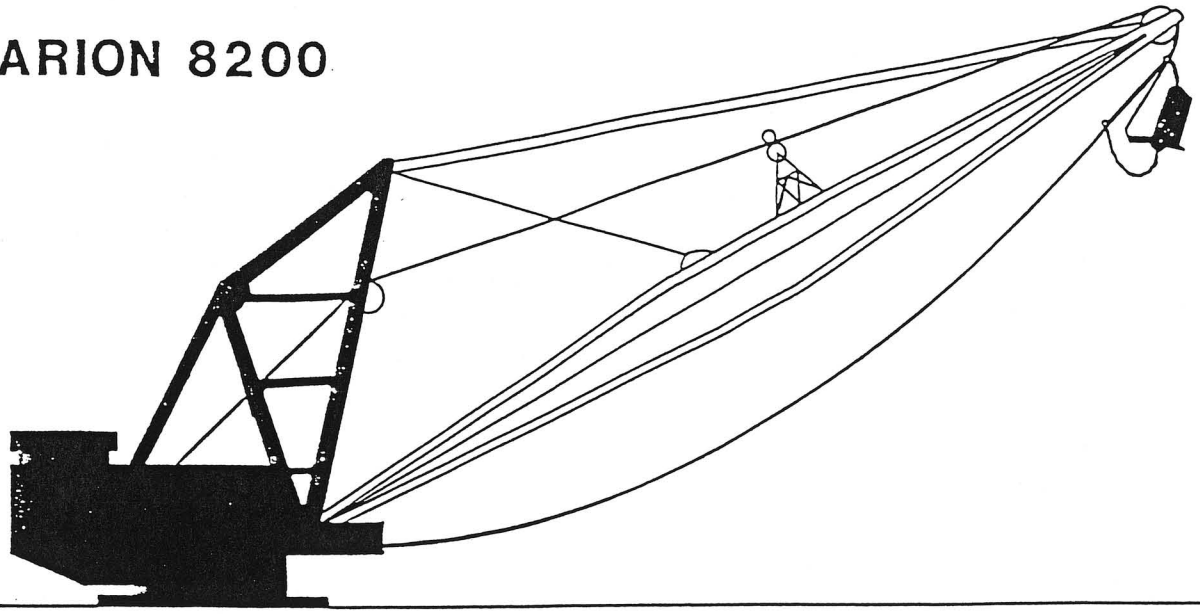
WALKING TRACTION

F - WIDTH OF SHOE.....	13'-6"
G - LENGTH OF SHOE.....	65'-0"
H - WIDTH OVER BOTH SHOES.....	101'-0"
BEARING AREA OF BOTH SHOES, SQ. FT.....	1,750
LENGTH OF STEP - APPROX.....	7'-0"
WALKING SPEED - APPROX.,MPH.....	0.14

FIGURE 3

MARION 8750

MARION 8200



8200 WALKLING DRAGLINE SPECIFICATIONS

DIMENSIONS

Boom Length	325'-0"
Boom Point Sheave, Pitch Diameter	120"
Boom Angle, Approx	35°
Dumping Radius	292'-0"
Dumping Height	135'-0"
Depth	160'-0"
Maximum Allowable Load, lbs	360,000

BASE

Outside Diameter - Nominal	68'-0"
Bearing Area - Effective, sq. ft	3630
Bearing Pressure, psi	15.9
Rail Circle - Mean Diameter	46'-6"

WALKING TRACTION

Width of Shoe	13'-6"
Length of Shoe	68'-0"
Width Over Both Shoes	98'-0"
Bearing Area of Both Shoes, sq. ft	1690
Length of Step - Approx	6'-0"

ROTATING FRAME

Width @ Rear End	67'-4"
Length	91'-0"
Clearance Radius - Rear End	68'-0"
Clearance Under Frame	11'-0"
Center Rotation to Boom Foot	21'-6"
Ground to Boom Foot	15'-1"

ELECTRICAL EQUIPMENT

Hoist Motors, Four, 1300 hp each @ 475 V. Total hp	5200
Drag Motors, Four, 1300 hp each @ 475 V. Total hp	5200
Swing Motors, Standard, Four, 800 hp each @ 475 V. Total hp.	3200
Propel Motors, Two, 1045 hp each @ 475 V. Total hp	2090
AC Driving Motors, Total hp	7000

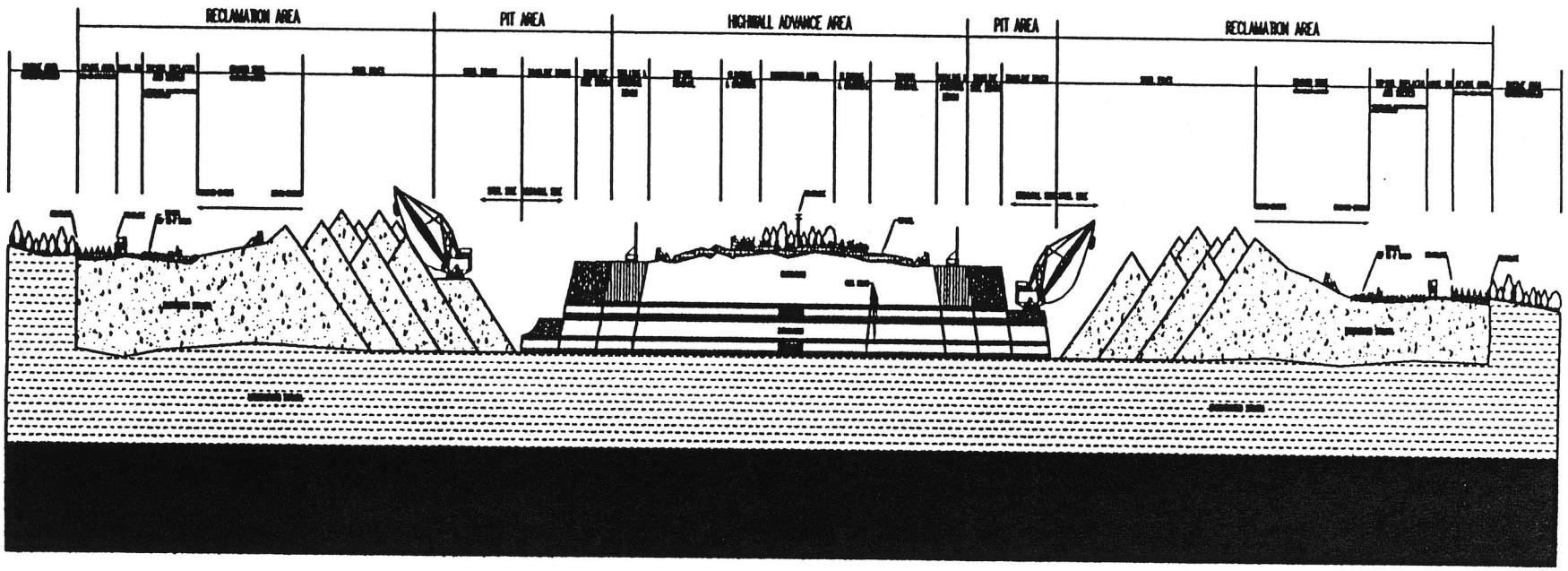
WEIGHTS

Domestic Shipping Weight, (inc. Bucket), lbs	6,600,000
Working Weight, lbs	7,750,000
Ballast (Furnished by Purchaser), lbs	1,150,000

FIGURE 4

MARION 8200

MINING AND RECLAMATION ACTIVITIES DIAGRAM



TYPICAL MINING AND RECLAMATION ACTIVITIES DIAGRAM
KAYSHTA MINE

NOT TO SCALE

VIS5.3

ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES

VERBAL INFORMATION SUMMARY

1. Information from: **"Nate" at the mine**

   Company: **Peabody Coal Company**

2. Mine: **Kayenta**

3. ADMMR Mine File: **Kayenta Mine**

4. County: **Navajo** MILS Number: **169**

5. Summary of information received, comments, etc.:

Nate reported that the combined production of coal from Peabody's Black Mesa and Kayenta mines for 1991 was 13,202,861 short tons. This quantity is their largest ever annual production from the two mines.

Date: **July 31, 1992** Engineer: **Diane Bain**

KA-NTA MINE (File)

PEABODY WESTERN

Fact Sheet

ECONOMIC IMPACT OF ARIZONA LOCATIONS*

TRIBAL PAYMENTS	
Coal Royalties - Navajo Tribe	$ 24,408,000
Coal Royalties - Hopi Tribe	9,028,000
Water Royalties - Navajo Tribe	1,429,000
Water Royalties - Hopi Tribe	1,429,000
Possessory Interest Tax - Navajo Tribe	1,845,000
Business Activity Tax - Navajo Tribe	2,228,000
Contributions	409,000
SUBTOTAL	$ 40,776,000
STATE AND COUNTY TAXES	
Ad Valorem on Personal Property	$ 5,957,000
Sales Taxes on Coal Sales	11,029,000
Sales and Use Taxes on Purchases	1,060,000
Other	87,000
SUBTOTAL	$ 18,133,000
WAGES AND FRINGES	$ 52,272,000
PURCHASES OF MATERIALS AND SERVICES	$ 76,829,000
TOTAL	$188,010,000

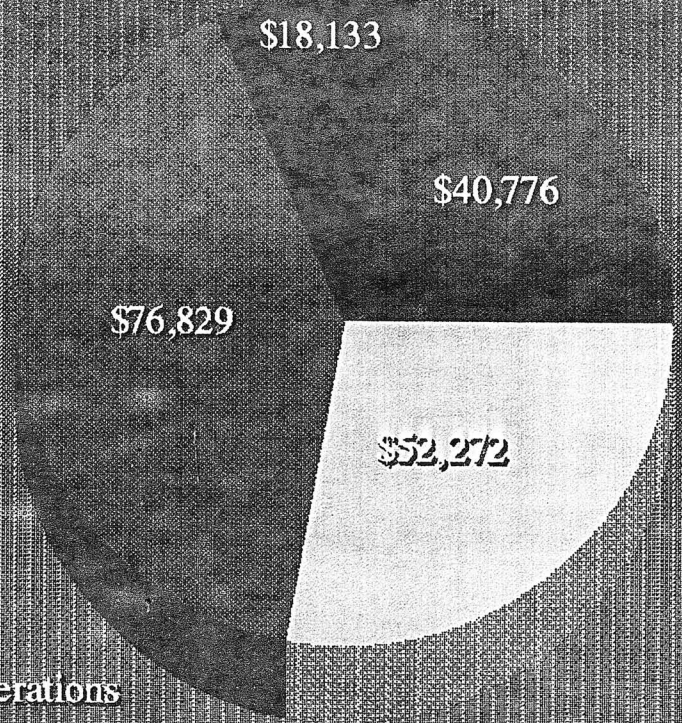
*Fiscal Year 1991

8/92

PEABODY WESTERN

ANNUAL ECONOMIC IMPACT OF ARIZONA LOCATIONS*

(In Thousands)



*Costs based on fiscal 1991 operations

Total $188,010

PEABODY WESTERN

Fact Sheet

NATIVE AMERICAN EMPLOYMENT

CURRENT EMPLOYMENT

	Native American	Total	Percent Native American
Black Mesa Mine	315	339	92.9
Kayenta Mine	507	547	92.7
Mesa Central Warehouse	7	8	87.5
Total	**829**	**894**	**92.7**

Peabody Western is the nation's largest private employer of Native Americans

EMPLOYEMENT TRENDS

Represented Employees

	January 1989	January 1990	January 1991	January 1992
Black Mesa Mine	96.0	97.6	98.2	98.2
Kayenta Mine	95.6	96.5	97.3	98.1
Average	**95.8**	**97.1**	**97.8**	**98.2**

2.4% Average Increase

Salaried Employees

	January 1989	January 1990	January 1991	January 1992
Black Mesa Mine	56.7	60.3	66.2	72.8
Kayenta Mine	60.9	62.5	69.0	67.0
Mesa Central Whse.	81.8	80.0	88.9	88.9
Average	**66.5**	**67.6**	**74.7**	**76.2**

9.8% Average Increase

Total Workforce

	January 1989	January 1990	January 1991	January 1992
Black Mesa Mine	88.7	90.4	91.5	92.9
Kayenta Mine	89.8	90.7	91.8	92.1
Mesa Central Whse.	81.8	80.0	88.9	88.9
Average	**86.8**	**87.0**	**90.7**	**91.3**

4.5% Average Increase

ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES

VERBAL INFORMATION SUMMARY

Information from: Leonard Swatell, Peabody Coal Co.

Address: 1300 S. Yale, Flagstaff, AZ 86001

Phone: 774-5253

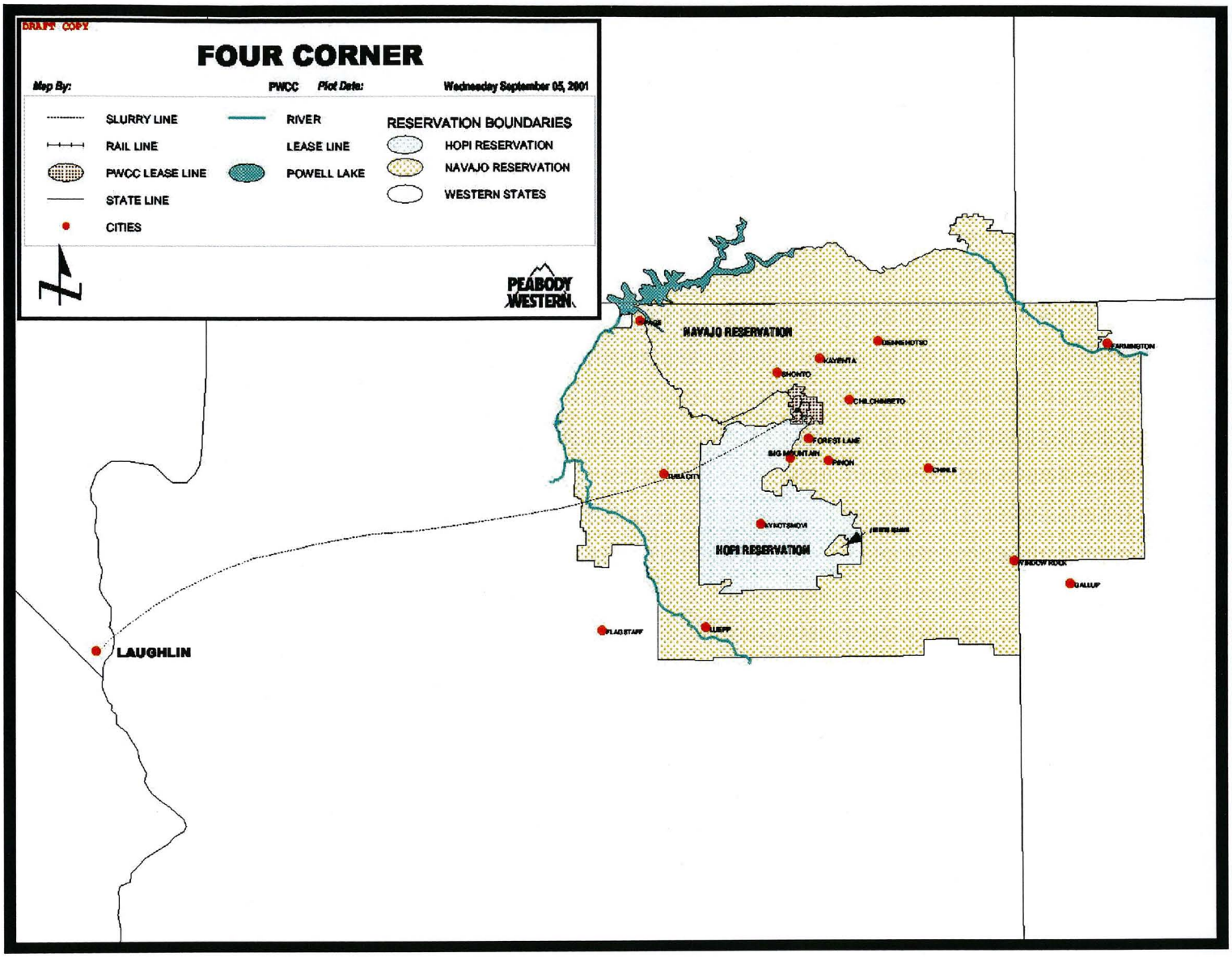
Mine: Kayenta Mine

Date: June 27, 1989

Engineer: Ken A. Phillips

Summary of information received:

The average stripping ratio for the Kayenta Mine is 4.7:1 expressed as (cubic yeards of waste): (tons of coal). This number is available for public release.


DRAFT COPY
FOUR CORNER
Map By:
PWCC
Plot Date:
Wednesday September 05, 2001
SLURRY LINE
RAIL LINE
PWCC LEASE LINE
STATE LINE
CITIES
RIVER
LEASE LINE
POWELL LAKE
RESERVATION BOUNDARIES
HOPI RESERVATION
NAVAJO RESERVATION
WESTERN STATES
PEABODY WESTERN
NAVAJO RESERVATION
KAYENTA
SHONTO
CHILCHINBETO
FOREST LAKE
BIG MOUNTAIN
PINON
CHINLE
HOPI RESERVATION
FARMINGTON
WINDOW ROCK
GALLUP
FLAGSTAFF
LUPPP
LAUGHLIN

Tens of millions of years before the Grand Canyon was formed, warping of the earth gradually caused ancient seas to recede in what is now northern Arizona. In the millions of years it took the seas to withdraw, great basins and uplifts were created in the earth's surface.

That was how Black Mesa was born.

In the millennia since, Black Mesa has loomed above the surrounding desert floor with dark majesty. Its large mass, some 2.1 million acres, is easily visible to the south of Monument Valley.

At its rugged northern rim, elevations exceed 8,000 feet but average about 2,000 feet above the desert. From north to south, the Mesa slopes down gradually, becoming rolling plateau, covered with sagebrush and tufts of hardy grasses and cut by arroyos or washes. Stands of pinyon and juniper on its higher elevations give the Mesa its dark appearance and name.

Small groups of people have lived on this highland for more than 8,000 years. At some point, the early people discovered that Black Mesa held coal. More than a thousand years ago, Native Americans used Black Mesa coal to fire their pottery.

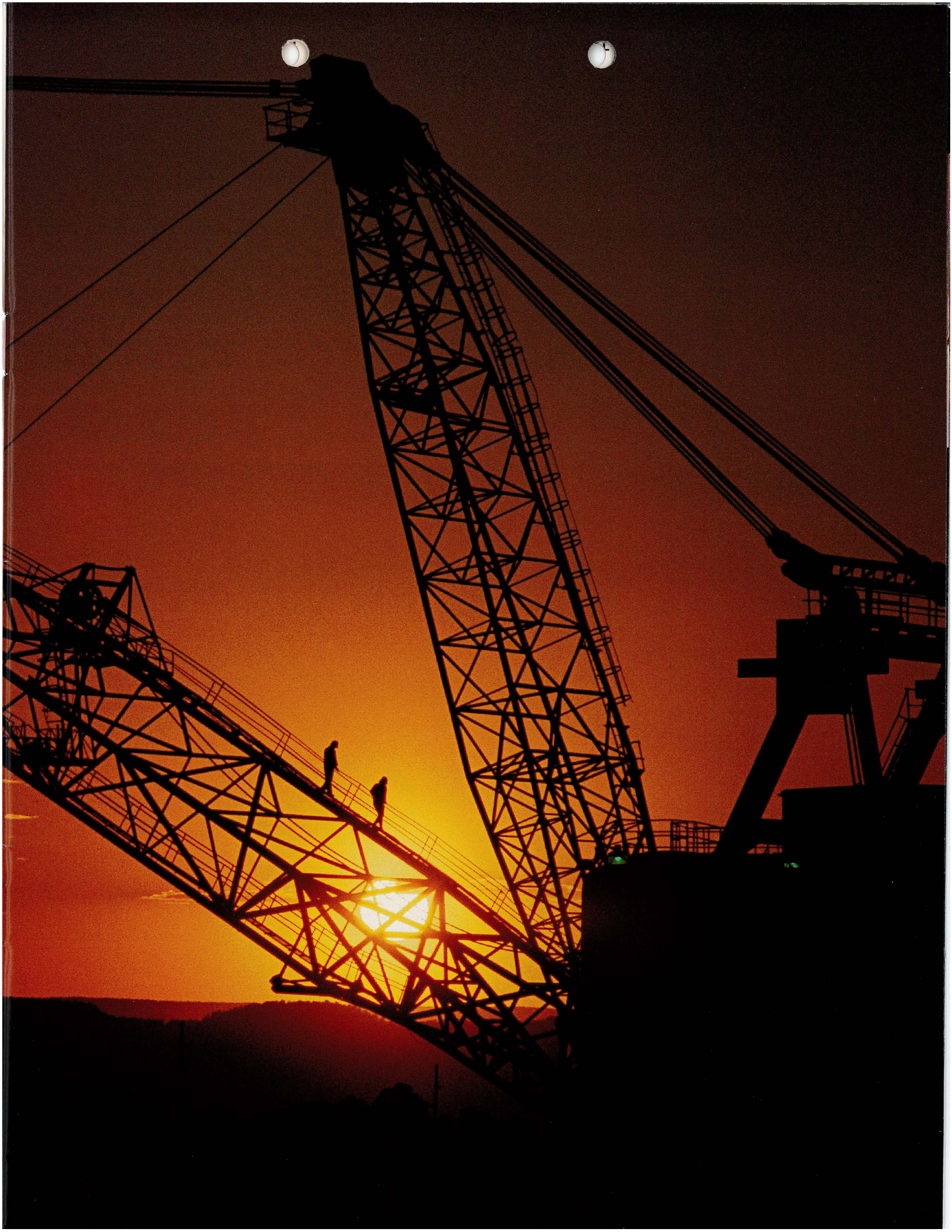
In the early 1960s, Peabody received permission from the Navajo and Hopi Tribes to explore the Mesa. Engineers discovered great quantities of coal, enough to propose surface mining to supply electric utilities in the rapidly developing Southwest.

Strong population growth in Arizona and Southern California had forced utilities to build new generating capacity. Black Mesa coal could fire these new plants and produce energy for millions of people throughout the Southwest. Also, coal mining would mean much-needed revenue for the Navajo and Hopi Tribes and high-paying jobs for their people.

These converging interests resulted in an agreement between the Navajo and Hopi Tribes and Peabody for surface mining on Black Mesa.

What has happened since then constitutes an important chapter in the history of the tribes, the Southwest and Black Mesa itself. For never before had an industrial complex of this size been built on American Indian lands. Never before had such a large project been developed principally by Native Americans. And never before had Native Americans benefited so much and in so many different ways from a partnership with industry.

This is a report to the public about how mining has been conducted on Black Mesa. And it is a story about different cultures coming together to pursue common interests and working as one for more than a quarter century.



The Mesa was, and is, a land of austere beauty. By necessity, its people have always been hardy and resourceful, because the Mesa supports little wildlife and only sparse vegetation. Average rainfall of less than 10 inches per year and poor soil make farming beyond family gardens impractical.

Before mining began, Black Mesa had no industrial activity. In fact, there was almost no commercial activity—no banks, grocery stores or gas stations. Bartering at trading posts was the only real commerce.

Black Mesa also had virtually no roads or utilities. The only electricity came from gas generators at trading posts. Food was cooked over wood fires. Homes were heated with wood or coal. Water had to be carried from springs.

There were no paved roads, and few were gravelled. Wagon trails led to family sites, traditional Navajo hogans made of wood and earth. Rain or snow could immobilize the entire Mesa. Among other things, this meant that school buses couldn't be used. So Black Mesa children typically attended boarding school off the Mesa, away from home and family for months at a time.

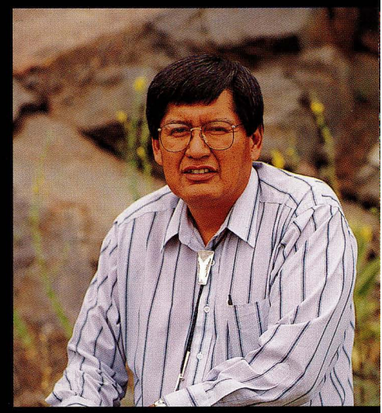
Health care was another problem. Emergency care was generally impossible, and even routine care wasn't easy, because there were no health care facilities or doctors on the Mesa. The lack of routine care meant that many people suffered from preventable illness.

Because of their physical isolation, residents of Black Mesa lived much as their ancestors had—herding goats, sheep and cattle and farming small plots. There were few vocational alternatives then. And those who sought them had to leave their families and the Mesa.

Physical isolation had another result. Few Black Mesa residents spoke or read English 25 years ago. Children who received a high school diploma were a minority. Almost no youngsters went on to college.

Put simply, as recently as 25 years ago, life on Black Mesa was as austere as the Mesa itself.

Encompassing 2.1 million acres, the Black Mesa in northeastern Arizona has remained virtually unchanged for centuries. Coal mining affects less than seven-tenths of 1 percent of its surface.



There were no jobs on the Mesa before the mining. People would barter trade with the trading posts—jewelry, blankets or the wool we sheared in the spring. Some men left the Mesa for jobs on railroad gangs. They might wind up in Chicago or San Francisco and be away from their families for years at a time.

Walter Begay

Tribal and Government Affairs Manager

Peabody Western

Coal mining has a long history on Black Mesa. Coal seams break through the surface in many places, and Native Americans dug it out with hand-fashioned tools. As early as A.D. 825, they used coal to fire pottery and for heating their homes.

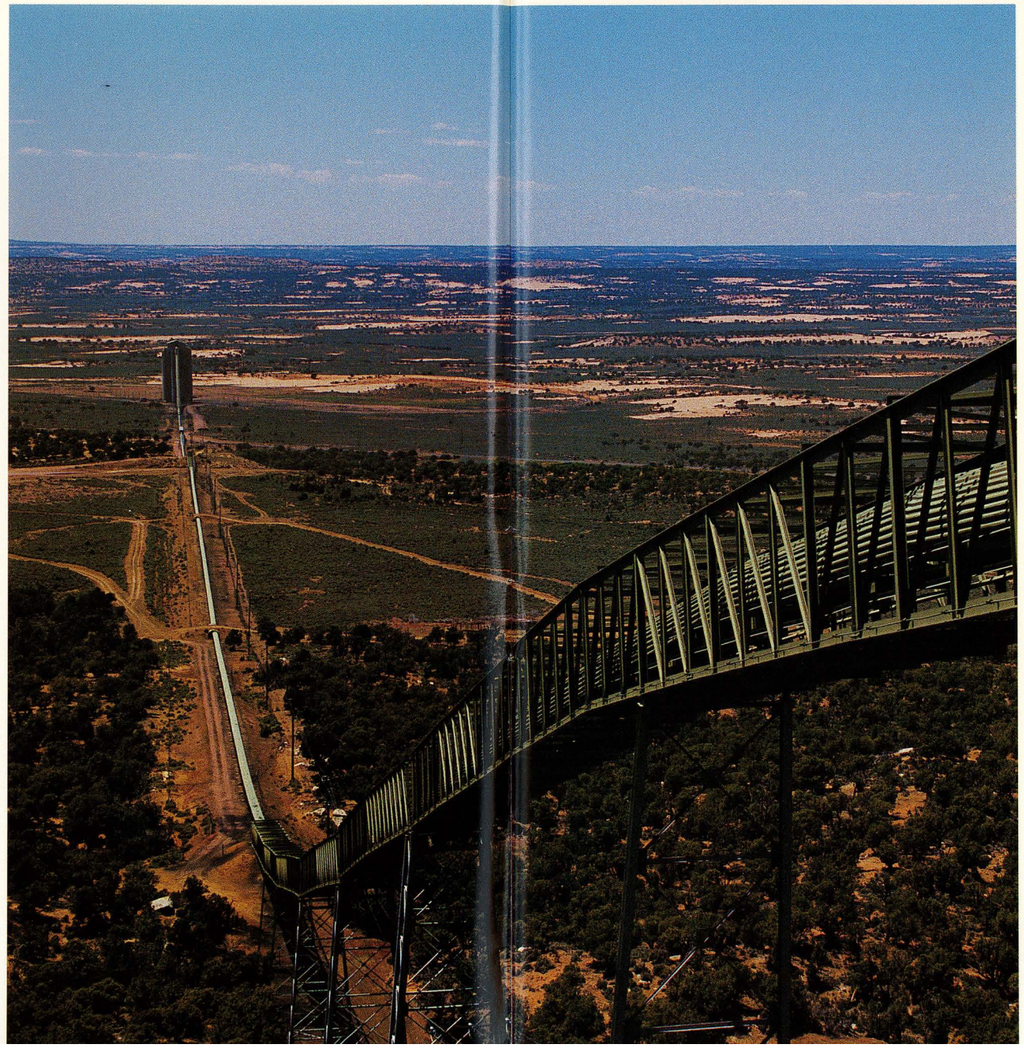
In the 1940s and 1950s, the Navajo dug coal from underground mines on northern Black Mesa. Mule-drawn wagons carted the coal to the school at Tuba City, some 60 miles to the south, and to what was then Arizona Teachers College in Flagstaff, about 150 miles to the southwest.

The difficulty—and the cost—of moving the coal off the Mesa made large-scale mining impractical without modern technology and a sizable capital investment.

In the early 1960s, when Peabody engineers obtained rights from the Navajo and Hopi Tribes to explore the coal field on northern Black Mesa, they found large quantities of high-quality coal. Peabody had the technology and capital to make mining on Black Mesa work.

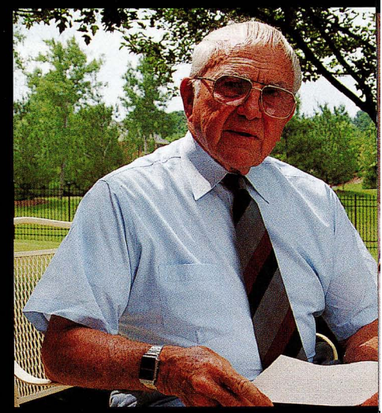
At that time, the Southwest was growing rapidly. Demand for electricity was doubling every decade. Black Mesa coal would give utilities the new capacity they needed. And it would give them a more inexpensive fuel than the oil and natural gas they had used. In turn, lower cost fuel would help utilities hold the line on rate increases.

Peabody engineers first explored Black Mesa for coal deposits in the early 1960s and discovered underground mine works dating back to the 1940s.



A 17-mile conveyor system carrying Kayenta Mine's coal to silos for loading into railcars has replaced the wagon and mules used by the earlier miners.

Since the first days, Peabody has hired and trained as many Navajo and Hopi as possible offering prevailing wages and benefits and providing bi-lingual instruction and cross-cultural training to all employees.



Soon after we started operating, I remember a fellow who wanted to be a driller, to drill holes for explosive charges. The problem was, he didn't speak English. I told the interpreter a driller had to keep really good records of the location of every hole. The fellow insisted he could do it, and the interpreter thought he could, too. So I hired him. After he was trained and went to work, I saw his records. They were perfect logs of holes' locations, and in good English. Later I found out his 12-year-old daughter would translate his work every night. They were hard workers, and they learned easily. I have a lot of respect for them.

Edwin R. Phelps

Retired President

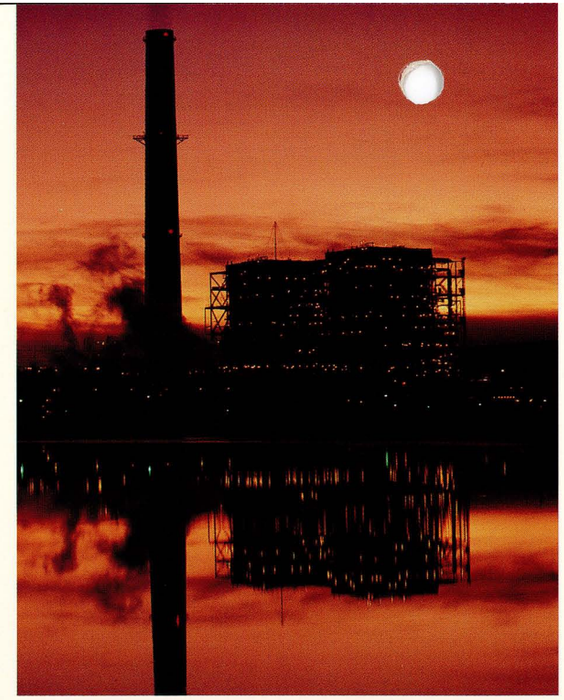
Peabody Coal Company

ıent could begin, the Navajo and
ree to allow mining on Black Mesa.
t was necessary because the area
ıine fell partly in an area where the
y the Navajo and Hopi Tribes.
ıl represented significant econom-
ıs. Coal mining would bring contin-
for both coal and water, high-pay-
had been none, new tax revenue
nfrastructure built at Peabody's
ıts for tribe-supplied services.
o years of negotiations, an initial
with the Navajo Tribal Council. By
ı agreements were signed by the
al Councils and approved by the
ı Interior.
d to Peabody the mineral rights,
r 64,858 acres of Navajo and Hopi
ı conducted on only about 14,000
d within the leasehold, or about
cent of Black Mesa. The additional
ded for facilities to support mining
resource areas.
viding for royalty payments to the
agreed to hire and train as many
possible, at prevailing wages and
ions guaranteed that mined lands
ı a condition at least as productive
and that Black Mesa water users
nd the tribes paid a royalty for all

ements were finalized, Peabody
es contract for Black Mesa coal in
ntract called for Peabody to deliv-
California Edison's new Mohave

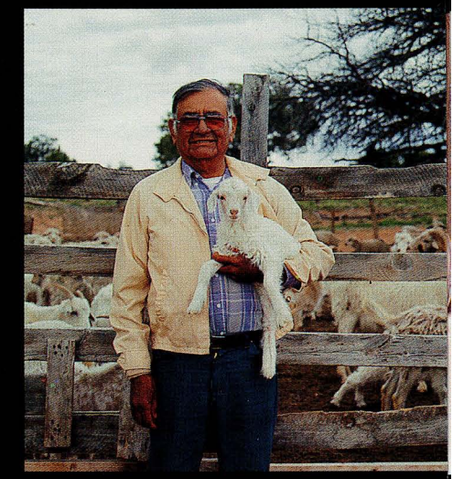
Mesa Mine was built to supply that coal. In 1970, a second long-term agreement was executed to provide coal to the Salt River Project's Navajo Generating Station near Page, Arizona. The Kayenta Mine was built to meet this contract.

Work began to prepare the lease area and, for the first time, there were good jobs on Black Mesa. Indeed, Peabody offered not only the first major employment opportunity on the Mesa, but also the first major opportunity for industrial employment in the western area of the reservation.



Southern California Edison's Mohave Generating Station near Laughlin, Nev., is supplied by Black Mesa Mine.

Kayenta Mine's coal goes to the Salt River Project's Navajo Generating Station near Page, Arizona.



Those of us who live on Black Mesa saw coal mining as an opportunity for jobs. We were glad to have jobs here rather than farther away in Flagstaff or Phoenix where we would have to pay more for housing and transportation. In the early days, a majority of the supervisors were Anglos. Now our people have key jobs in mine management. I've seen people with limited education pick up skills and apply them. From that, they are able to support families. I worked at the mine for 18 years, and it's allowed me to enjoy my retirement on Black

Black Mesa surface mining operations are unique in several respects. First, the coal itself is of very high quality. It's rated at 11,000 Btu per pound, with an ash content of 10 percent and sulfur content of 0.5 percent. Most Western coal has significantly lower Btu ratings and produces less heat per pound. Some Eastern and Midwestern coals have higher Btu ratings than Black Mesa coal, but their sulfur content generally is eight to 10 times as high.

A second unique characteristic is that Black Mesa mining operations involve multiple coal seams in several pits. Most surface mines have only one or two seams and one or two pits. Combined, the Black Mesa and Kayenta Mines have five active pits with coal being removed from up to six major seams in a single pit.

Black Mesa's actual mining process is a methodical, continuous operation. It begins with the removal of topsoil from the area to be mined. (Fewer than 500 acres are mined each year.) Topsoil is either stockpiled to be used later for reclamation or redistributed immediately onto areas that have been mined and are ready to be reclaimed.

The next step is to remove the material between the topsoil and the coal. At Black Mesa, coal seams are generally covered by shale and rock up to 180 feet deep. This overburden, as it's called, is drilled and then blasted to break it up. A dragline, one of the world's largest land-based machines, removes overburden in buckets that hold up to 90 cubic yards. Seven draglines work constantly on Black Mesa.

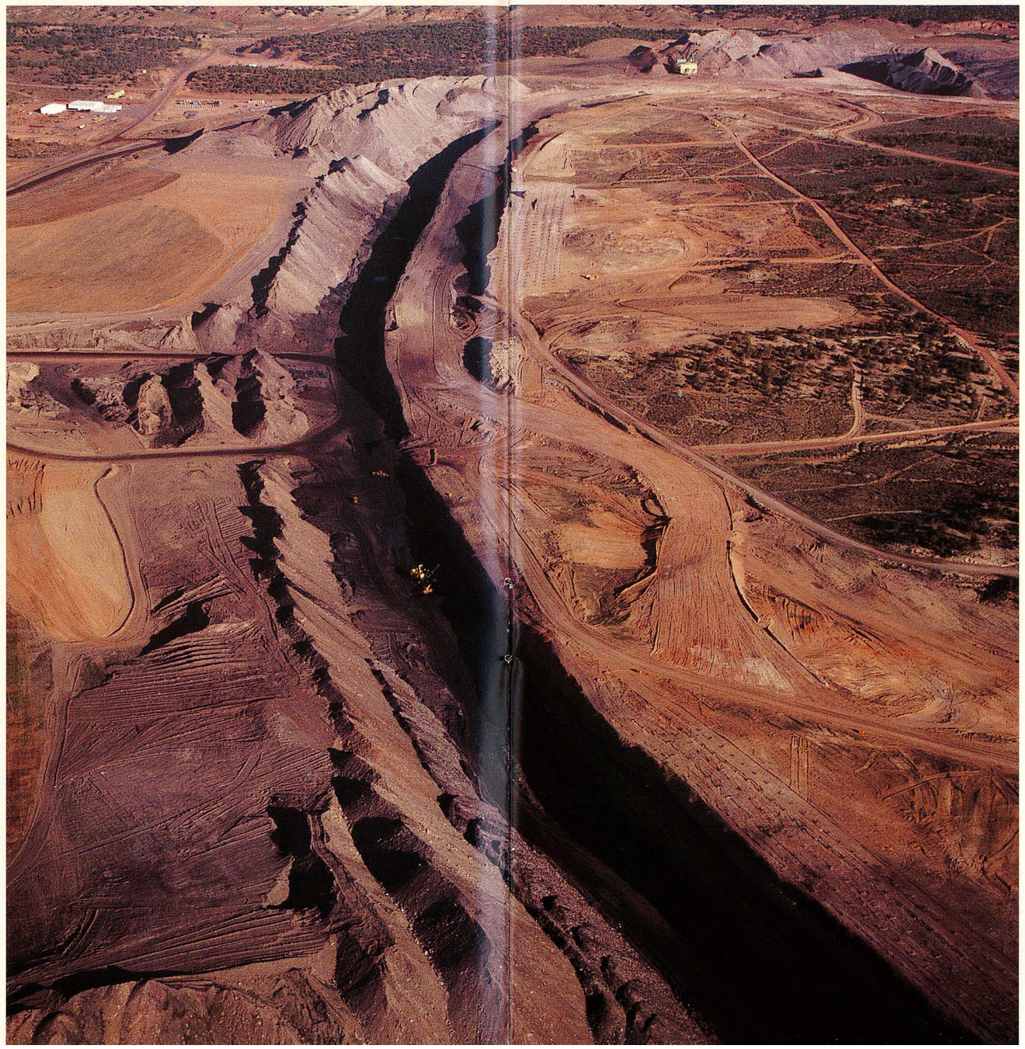
Partings, the rock between coal seams, range from six inches to more than 50 feet in thickness. They also must be removed during mining. Pits can be up to four miles long and 80 to 150 feet in width. Black Mesa's coal seams are four to 20 feet thick.

Once seams are uncovered, they're drilled and blasted to break up the coal. Power shovels and front-end loaders dig out the coal and load it into off-highway trucks that each carry up to 300 tons.

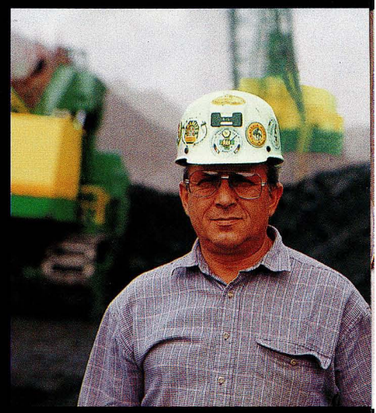
Trucks transport the coal to a hopper, where it's crushed and weighed. Then coal from the Kayenta Mine is taken off the Mesa to holding silos by a 17-mile-long conveyor.

From the silos, coal is loaded on a 50- to 70-car electric unit train for an 83-mile trip to the Navajo Generating Station. Coal from the Black Mesa Mine goes by conveyor to the Black Mesa Pipeline, Inc., facilities, where it is converted to a coal-water slurry.

Haul trucks carry up to 300 tons of coal per load from active mining pits to hoppers for crushing and weighing.



Coal lies up to 180 feet below topsoil, shale and rock. Once this material is removed, the coal is loaded onto trucks from the pit, which may stretch for 4 miles and be 80 to 150 feet wide.



Our mines here are unique. We're in a remote location in the heart of the reservation. There are no major urban areas nearby so we have to be self-sufficient in every part of the operation. Mining multiple seams in several different pits requires a lot of support equipment and sophisticated planning. Every day is a challenge because of the topography, the irregular coal seams and the variances in quality. We use a complex blending system to keep coal quality consistent and meet customer emissions standards. We couldn't do it without the people—they're cooperative, willing to work and loyal.

Silvano J. Perla

General Superintendent-Surface Operations

Peabody Western

Coal has no value unless it can be delivered to the customer at a reasonable cost. Sometimes power plants are located near a mine, which makes delivery inexpensive and efficient. Usually, though, coal is transported by rail or barge.

Neither rail nor barge was feasible for Black Mesa's coal. Studies determined that the cost of building a railroad through the rugged terrain from the Mesa to Nevada would be prohibitive. And the lack of a nearby river excluded barge delivery. Another way had to be found to move the coal 273 miles from Black Mesa Mine to the Mohave Generating Station at Laughlin, Nevada.

Engineers proposed an unconventional solution: that coal be mixed with water and moved through an underground slurry pipeline. No slurry pipeline like this had ever been built.

Construction was challenging because the pipeline had to be buried under some of the most rugged terrain in the country. The pipeline would have to cross desert, mountain ranges and go under the Colorado River to reach the Mohave Plant. Another problem was that its course runs from a 6,600-foot elevation at the mine down to 4,200 feet and then back up to 6,500 feet before it descends the final 500 feet to the Mohave facility.

These weren't the only problems. To keep the coal and water slurry moving properly through the pipeline, the coal had to be ground to an exact, powder-like consistency, and the slurry's flow speed had to be precisely controlled. The solution called for a flow speed of about four miles an hour—for an almost three-day trip from Black Mesa to Mohave. This flow rate would give the pipeline a capacity of about 660 tons of coal per hour.

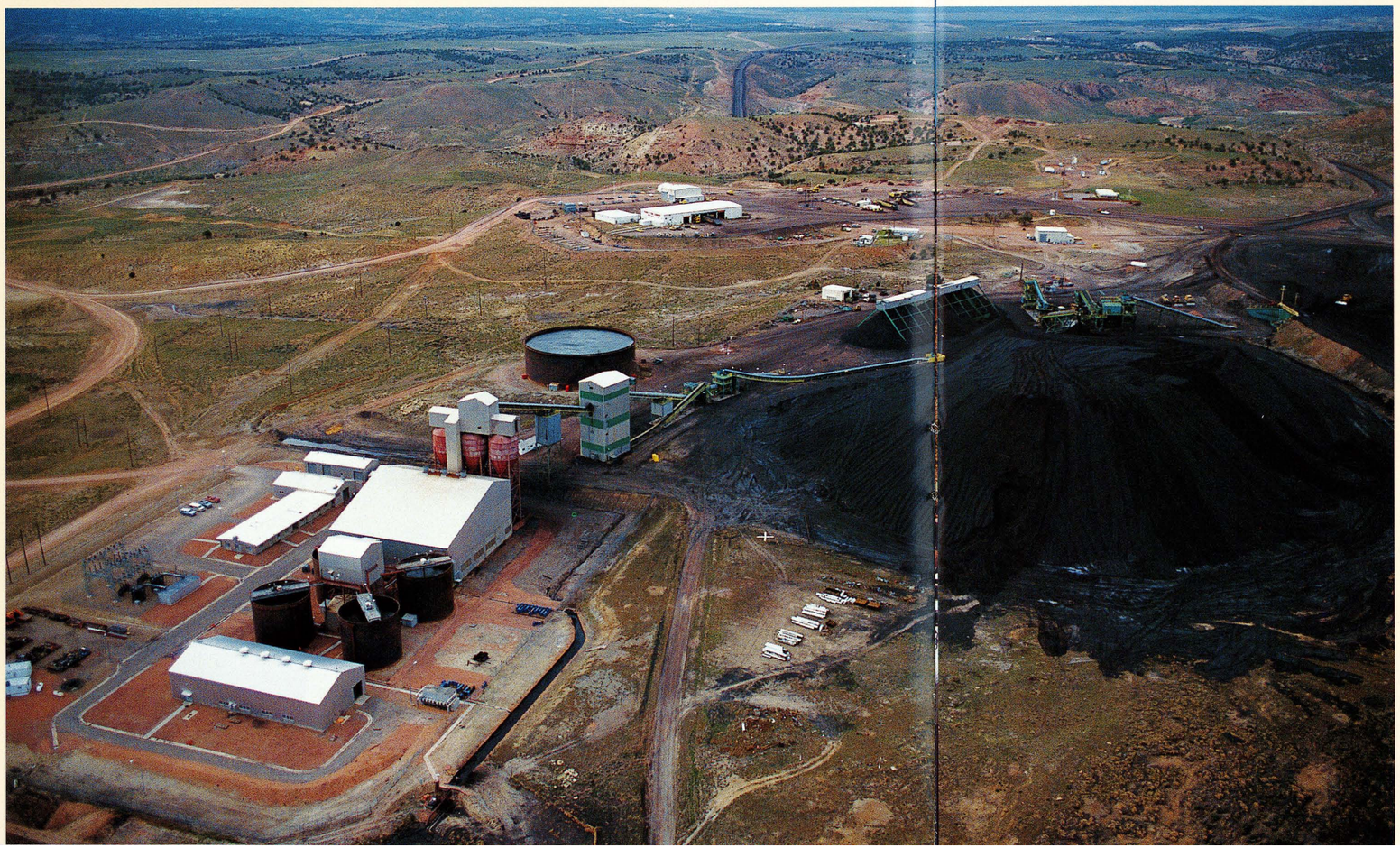
To keep the slurry moving, the world's largest positive displacement pump was developed. To monitor pipeline flow, a network of sensors relays information to the Black Mesa control station constantly via microwave communications. One operator at Black Mesa controls the slurry's 273-mile journey.

This pioneering effort has worked superbly. Since it was put into operation in 1970, Black Mesa Pipeline has moved more than 80 million tons of coal without a major interruption.

There are other strong advantages to the Black Mesa Pipeline. Because it is underground, it's protected from weather and accidents. It doesn't preclude any other use of the land. It doesn't interfere with wildlife, livestock or plant life. And even though it moves the equivalent of about 50,000 railcars of coal each year, it doesn't mar the environment.

Coal is processed at Black Mesa Mine's Preparation Plant before being ground to a powder-like texture and mixed with water into a slurry at Black Mesa Pipeline.

The equivalent of 50,000 railcars of coal per year travel 273 miles in an underground pipeline, leaving the environment undisturbed by not interfering with human, animal or plant life.



This is not just any pipeline. Black Mesa Pipeline is the only long-distance coal slurry pipeline operating in the world. Over 22 years, we've had an operating reliability of more than 99 percent and an outstanding environmental record. The pipeline has proven its long-term viability as a low-cost transportation method for coal. Black Mesa is the only supplier of coal to the Mohave Generating Plant, and the plant has never been shut down because of lack of coal inventory.

H.J. Brolick

Vice President

Williams Techologies, Inc.

The Black Mesa slurry pipeline raises the issue of water—a perennial source of concern in the American West.

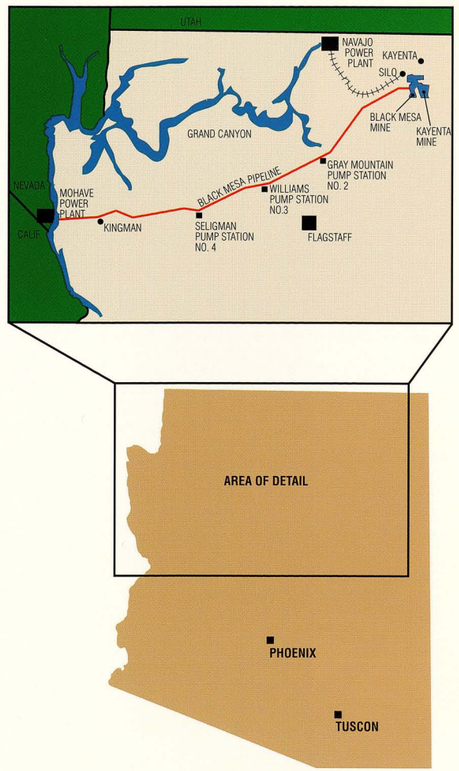
Peabody uses water not only for the slurry pipeline but also for the suppression of mining dust and, to a much lesser extent, for sanitary uses and drinking water. To put the quantity of water used in perspective, Arizona's total annual water consumption is estimated by the U.S. Geological Survey at about 6 million acre-feet. (An acre-foot is a one-acre area covered with one foot of water.) Black Mesa uses only about 3,867 acre-feet annually—or about .06 percent of the total state's use.

Another useful perspective comes from analyzing consumption in Arizona's four Active Management Areas for water. Black Mesa doesn't happen to be in any of the Active Management Areas (Prescott, Phoenix, Pinal and Tucson), but because state regulation requires large water users in these areas to be metered, there is a data base that identifies water users and their purposes. The data show that Black Mesa isn't even in the top 100 water users in Arizona. And if consumption figures for large water users located outside Active Management Areas were known, Black Mesa would probably rank below the top 200.

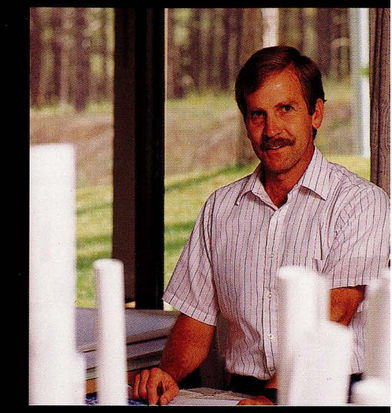
None of the sophisticated studies of the effects of Peabody's water use on Black Mesa have identified any significant impacts. A U.S. Geological Survey monitoring program has been in place since 1972 to ensure that Peabody operations do not disturb local water supplies.

Significant drought in recent years has reduced the Mesa's surface water and spring water. For example, throughout the 1980s, Black Mesa got about nine inches of rain a year. But for five consecutive years—1987 though 1991—rainfall dipped even lower, dropping in 1989 to less than half the average.

Black Mesa Pipeline crosses rugged mountain ranges and desert, then goes under the Colorado River to reach the Mohave Plant.



Mohave Generating Station is uniquely designed to handle coal in slurry form. Water is spun out of the slurry and cleaned for reuse in the plant's cooling towers, thus reducing the amount of water needed from the Colorado River.



Water pumped from Peabody's deep wells is monitored at the mining complex and more broadly in the Black Mesa region. Federal agencies have performed their own very sophisticated, technical studies. In fact, these studies include the most detailed hydrologic analysis ever performed by the Federal Office of Surface Mining. No significant negative impacts—either to the hydrologic system or to water users—have been identified. Studies will continue, to make certain the system and users are protected.

Ted Smith

Senior Hydrologist

Peabody Coal Company

Even in these dry years, Peabody's water use doesn't impact surface or spring water, because its water doesn't come from these sources. The water used for mining comes from eight wells on the leasehold that range from 3,417 to 3,719 feet in depth. These wells were designed specifically to prevent any effect on local water sources. They tap into water in the Navajo Sandstone (Navajo Aquifer) formation, thousands of feet below the formation that local wells access with their average 400-foot depth.

Peabody's Navajo Sandstone source is separated from local wells' water source by nature and by man. Nature has provided layers of impervious shale hundreds of feet thick between the two aquifers. Engineers have provided additional separation in the form of concrete that seals well shafts to depths greater than 2,000 feet.

In the long term, what effect will Peabody wells have on the Navajo Sandstone Aquifer?

All studies to date indicate that there will be no significant, long-term effects on the aquifer. Over the life of the Black Mesa lease, about 100,000 acre-feet of water will be used for mining. That represents less than one-tenth of 1 percent of the more than 10 million acre-feet estimated to be stored in the Navajo Sandstone Aquifer. For perspective, taking that much water from the aquifer over the life of the mines is comparable to taking a little more than half a soda can of water from a 55-gallon barrel.

This comparison doesn't take into account natural recharging of the aquifer. Obviously, rainfall will further reduce the effect of Peabody's water use. In fact, an estimated decade after mining ends on Black Mesa, natural recharging will have replenished virtually all water taken by pumping.

Peabody has initiated a new study of the Navajo Sandstone Aquifer with the Navajo and Hopi Tribes. This study will be completed by 1996 or before.

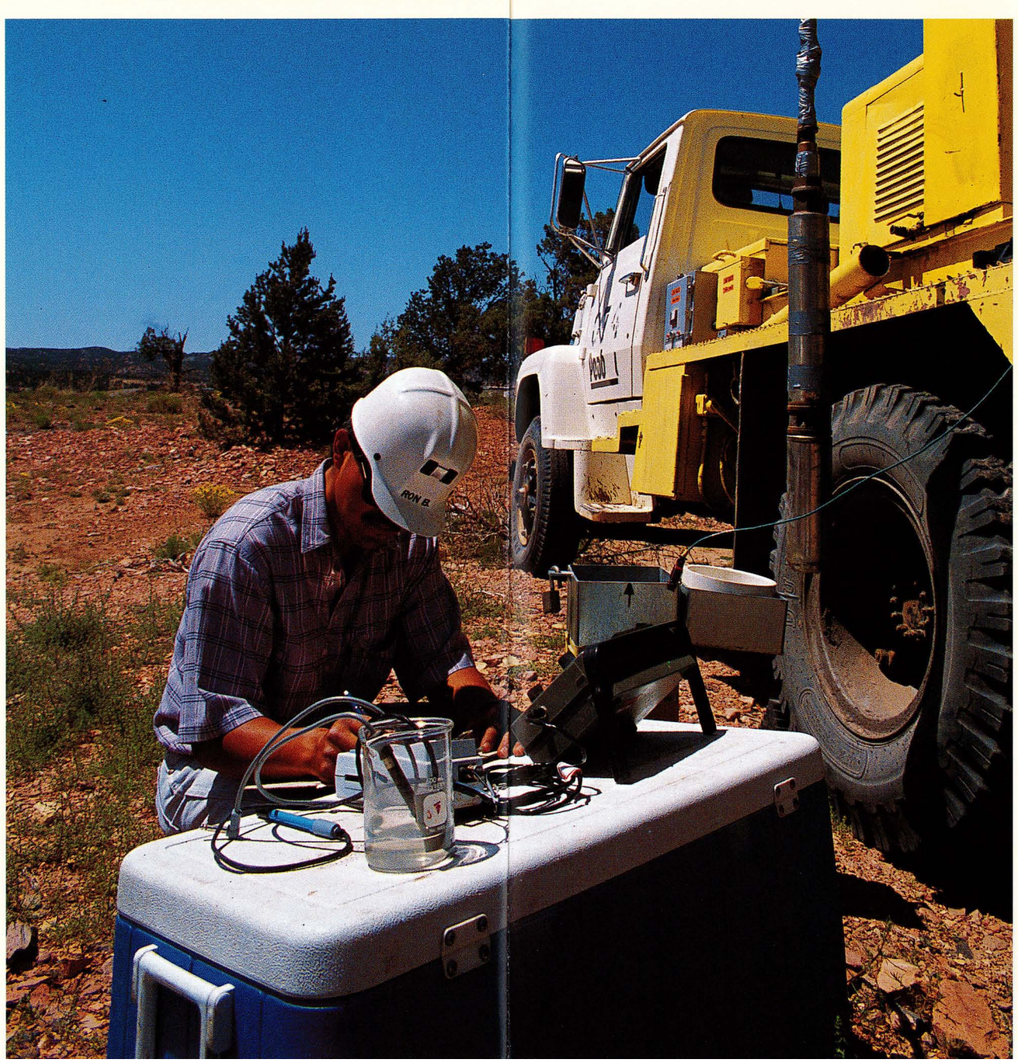
Also, new technologies are being tested to conserve water. In recent years, these efforts have resulted in an approximate 10 percent reduction in water used for the Black Mesa Pipeline and another 10 percent reduction for mining operations.

In addition, Peabody will continue to pay the Navajo and Hopi Tribes for water, a strong incentive in itself for conservation. The royalty rate depends on the amount used. It can exceed $800 per acre-foot, for an annual total of more than $3 million, half of which goes to each tribe.

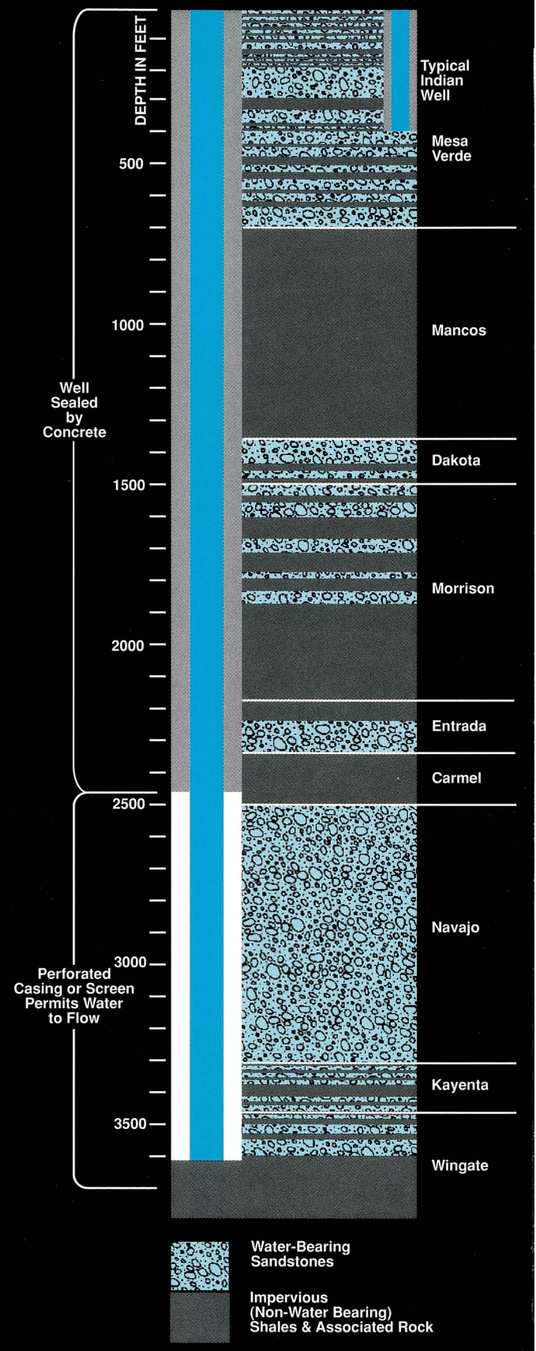
Strong regulatory safeguards also protect against any adverse effects of Peabody's water use. For example, if the Secretary of the Interior finds that local water supplies are endangered, the company is required to provide Native Americans with water of comparable quantity and quality—or to obtain water for slurry operations from another source.

In short, Peabody has every reason to continue to protect Mesa water supplies carefully.

As for the water used in the Black Mesa Pipeline, it isn't wasted when it arrives at the Mohave plant. Once water and coal are separated by high-speed centrifuges and a cleaning process, the Mohave plant reuses the water in its cooling towers. This means the facility takes considerably less water from the neighboring Colorado River than it otherwise would. And it means that water from the Navajo Sandstone Aquifer thus performs two vital functions in helping to bring electrical power to the Southwest.



Peabody's water use is regularly monitored, and new technologies are tested to conserve water. All studies indicate that there will be no significant long-term effects on the Navajo Aquifer.



Shortly after Peabody began mining Black Mesa's great coal seams, company reclamation specialists began working with local residents and government officials to study the land and its vegetation.

At that time, there were no federal regulations requiring land reclamation after mining. But Peabody's lease agreements explicitly required mined lands to be restored and returned to tribes "in as good condition as received." That condition has been met—and improved upon.

The reclamation process used on Black Mesa follows these steps.

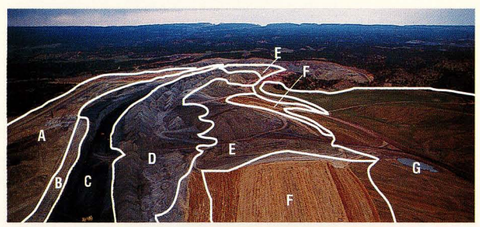
Once coal is removed, overburden and partings are returned to the mined pit. They're graded to approximate the land's original contours. Then stockpiled topsoil is brought in to cover the overburden. The surface is disked to hold moisture and prevent erosion. Then it's fertilized, seeded and mulched to start the revegetation process. Seeded areas are also fenced to prevent accidental damage and premature grazing.

Mined areas are reseeded with a mixture of warm- and cool-season plants and with native and introduced species. Additional grasses have been introduced because of their superior adaptability to the Mesa's poor soil and their higher nutritive value for livestock grazing. Legume's also have been added because they provide nitrogen that nourishes grasses. And shrubs have been planted to enhance reclaimed land for wildlife.

Reclaimed areas are monitored by environmental specialists who track reclamation progress and thereby establish a data base. These computerized measurements help specialists adjust reclamation methods as necessary to achieve maximum results.

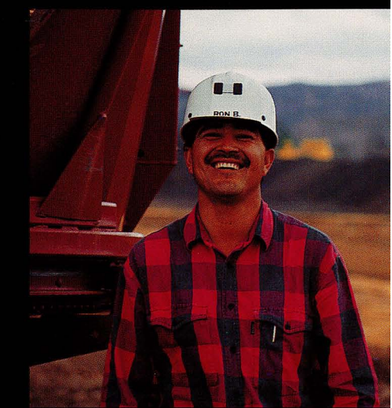
Even though relatively little land actually is mined, reclamation is an expensive process, with the cost ranging from $8,000 to $20,000 an acre. However, the investment has paid off. Reclaimed lands are estimated to have two to three times more grazing capacity today than before being mined.

The coal is gone from the earth, but reclaimed land remains for continued productive use.



The mining and reclamation sequence as it proceeds from left to right: A) topsoil removal, B) drilled highwall, C) active pit, D) spoil piles, E) grading of spoil, F) topsoil replaced and G) revegetated land.

Reclaimed land (left side of fence) returned to the Tribe will support two to three times more grazing than it originally did.



When I got a job at the mine 12 years ago, I never thought I could become a supervisor. I worked hard. I'm still learning. The last two years supervising a staff of 20 has been a challenge. I study on my own to further my education and to help me do the job better. I try to pass on what I learn. It doesn't do any good to keep it to yourself. Most of the revegetation staff are Native Americans. We were taught to help others. That's what it's all about—giving each other a hand.

Ronnie Bradley

Revegetation Supervisor

Black Mesa and Kayenta Mines

Even though it has supported people for 8,000 years, Black Mesa was largely an archaeological mystery before mining plans were made. The only other time archaeologists had studied the area was in the 1930s, as a cursory part of a larger expedition.

Black Mesa's first comprehensive exploration occurred because federal law required that public lands' archaeological value must be professionally evaluated before the land is disturbed. So, in 1967, Peabody retained Prescott College in Arizona to conduct an evaluation. In 1975, the project was transferred to the Center for Archaeological Investigations at Southern Illinois University-Carbondale.

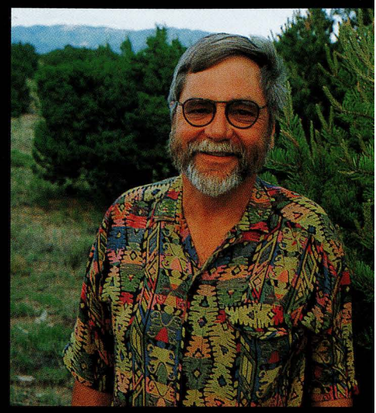
In 17 years of fieldwork, archaeologists excavated 220 sites on the Black Mesa. The $7 million study was one of the largest and longest-running archaeological investigations in North America.

The resulting study became one of the largest and longest-running archaeological investigations in North America, involving a dozen colleges and universities and more than 700 people. Fieldwork on Black Mesa by a team of professional archaelogists, graduate students and local Native Americans spanned 17 years, every summer from 1967 through 1983.

At a cost to Peabody of more than $7 million, all 64,858 acres of the leasehold were explored, and some 2,500 sites were identified, mapped and surface-collected. Some 220 of those sites were also excavated, producing more than a million artifacts. All artifacts remain the property of the Navajo and Hopi Tribes.

After each season's fieldwork, a report conforming to government regulations was written. In addition to these reports, more than 300 books, papers and articles have been published. For non-scientists interested in the Mesa's archaeology, Peabody underwrote publication of People of the Mesa: The Archaeology of Black Mesa, Arizona.

More than a million artifacts were found. They remain the property of the Navajo and Hopi Tribes.



The unusual aspect of the Black Mesa Archaeological Project is that Peabody went beyond the letter of the law in exploring and collecting the artifacts of the extinct peoples of Black Mesa. Peabody helped us discover how people really lived, and it changed the way we looked at people of the pre-historic Southwest. Too often, archaeologists search for the oldest, the most spectacular, the most exotic. This project gave us a social history of how average people lived back then and helped us understand their day-to-day lives. It brought the average Anasazi to life.

George J. Gumerman, Ph.D.

Director

Center for Archaeological Investigations

Southern Illinois University-Carbondale

The last quarter century has brought change to Black Mesa—change not so significant to the land itself, perhaps, as to the people of the Mesa and the surrounding reservations of the Navajo and Hopi.

For example, before mining, no Native Americans had industrial or commercial jobs on the Mesa. Today, Peabody has become the nation's largest private employer of Native Americans.

Peabody employs more than 850 Native Americans, representing 93 percent of the total employees at the Black Mesa complex. Their average pay exceeds $41,000 per year, a wage about twice the national average, and eight times as high as the average for non-mining jobs on the reservation. Peabody benefit programs add another $12,000 to the average employee's annual compensation.

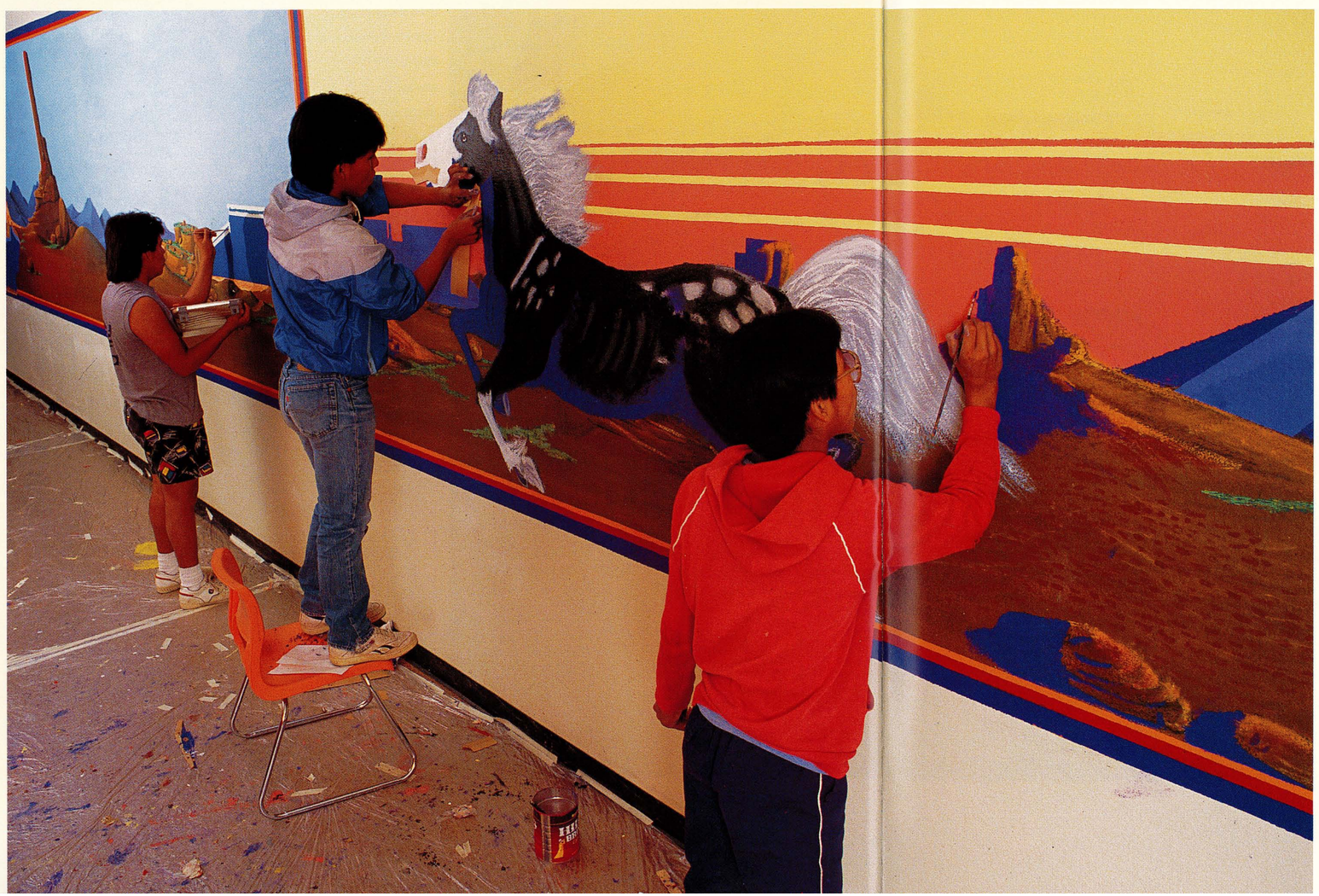
Peabody's Arizona operations contribute more than $100 million annually to local economies in wages, fringe benefits, and purchased goods and services.

Royalties on coal and water amount to an additional $36 million annual payment to the Hopi and Navajo Tribes, a significant percentage of both tribes' total annual revenues.

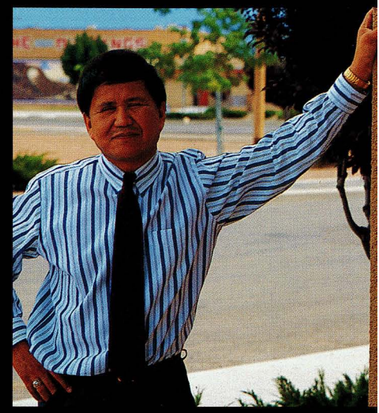
Peabody's tax payments exceed $35 million and support community services in the districts in which we operate. For example, about half the annual operating budget of the local Kayenta School District comes from Peabody taxes. This school district serves 2,700 students from a 2,130 square-mile area of the reservation.

Corporate contributions to tribal programs and surrounding communities are another important economic impact. In recent years, contributions have averaged more than $500,000 annually, with a substantial percentage going toward scholarships for Native American students.

Beyond these direct economic inputs, indirect effects of mining operations are substantial. For example, Peabody, its employees, vendors and subcontractors account for 50 percent or more of the revenues of



High-quality educational opportunities are now available to area youngsters in Kayenta. Peabody taxes represent about half of the school district's budget.



The tax revenues Peabody pays to the state and county allows us to build and grow. In the last few years, we've improved the quality of our facilities and classroom equipment, we've expanded bus routes, and we're attracting kids who were going to boarding schools. Our student body numbers 2,700, up by 600 since 1986. The impact of Peabody taxes on our bonding capacity means we can generate more money for capital improvements. In addition, Peabody employees help student groups with field trips and serve as resource speakers. And we use Peabody people to help us brainstorm improvements in curriculum offerings and to help us anticipate what skills will be needed in the job market.

Dr. Joseph Martin

Superintendent of Schools

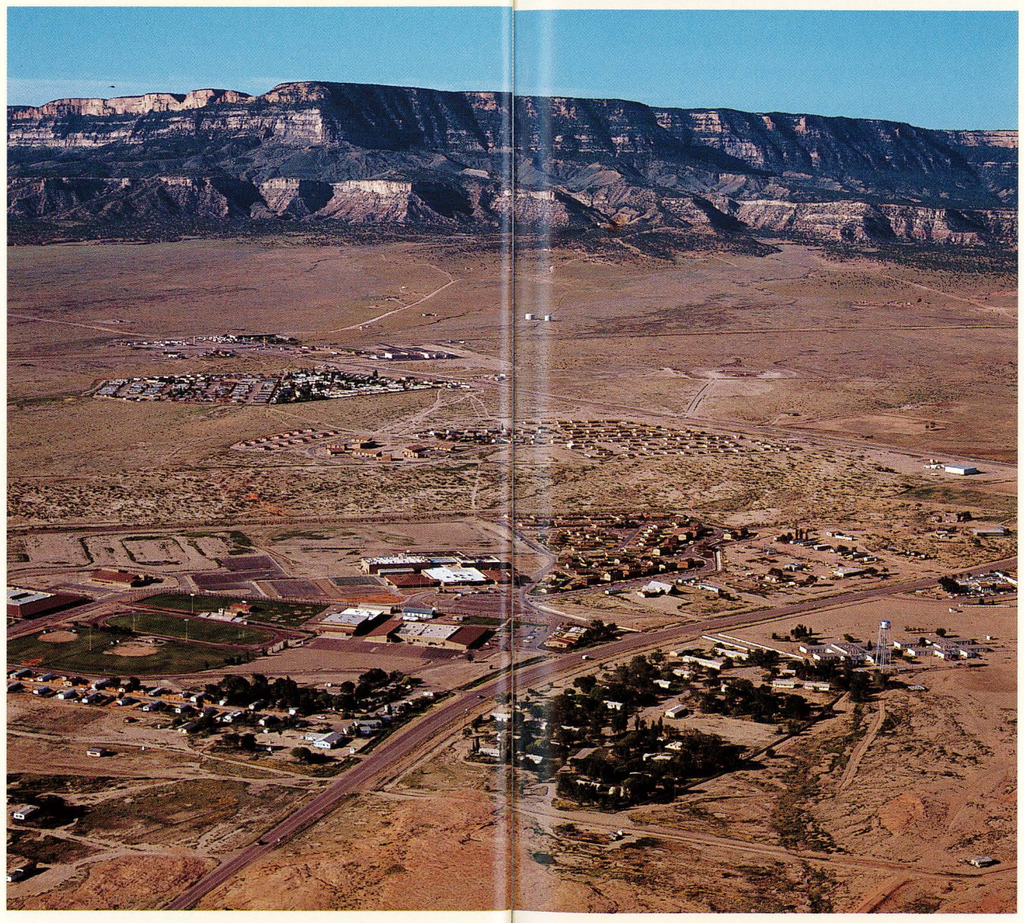
Kayenta Unified School District

area businesses, which have grown dramatically since mining began. These businesses provide additional job opportunities for Native American residents.

Once practically non-existent, Black Mesa's infrastructure has changed significantly since mining began. Where there were no paved roads, there are now dependable, all-weather access routes to the Mesa. Where once people had to carry water from springs, they now can get free water from Peabody wells.

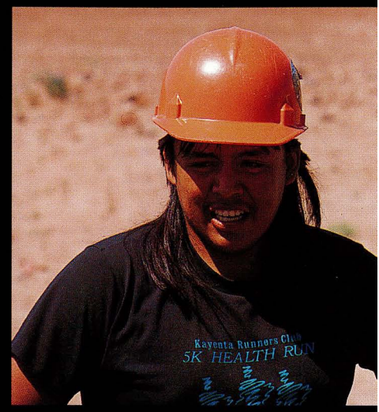
Health care on the Mesa and surrounding plain has been much improved. On the Mesa, Peabody maintains a 24-hour, seven-day-a-week emergency clinic staffed by a registered nurse and certified emergency medical technician (EMT). An ambulance, a four-wheel drive rescue truck, a fire truck and more than 40 EMTs and other trained emergency personnel are on call. Off the Mesa, in Kayenta, there now is a Community Health Service Center that has received substantial Peabody funding. Easy access to continuing care means that fewer people suffer from preventable illness.

Peabody employees plan the annual Coal Miner's Stampede Rodeo in Kayenta. The company is a major contributor to community activities.



The town of Kayenta, just north of Black Mesa, has experienced dramatic growth since Peabody began mining. New businesses there have created even more job opportunities for Native Americans.

Peabody contributions to the Kayenta Community Health Service Center have helped make possible continuing preventive care for local residents.

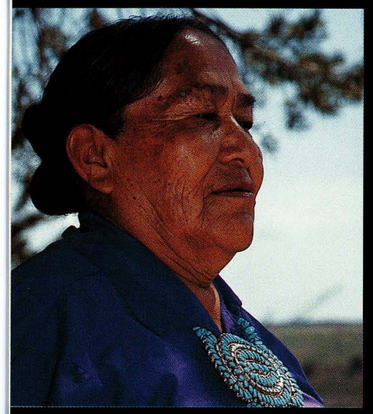


I would like to come back to Peabody to work after college (Mesa Community College) so I could stay on the reservation. Too often people get a degree and leave. Peabody offers professionals a chance to stay on the reservation—to stay home. I get tired of the city. I like the scarcity of people here.

Lorenzo Dugi

Summer Intern

Kayenta, Arizona



I've lived on Black Mesa my whole life—63 years. Without the mines, life would still be rough up here. Before, to sustain ourselves, we had to grow as many agricultural products as possible to use for trade. The only jobs were off the reservation. Most children were sent off to boarding school for the whole school season. If you got sick, you relied on home remedies. We traveled by horseback. It took a day or two to bring barrels of water in by wagon. Mining may have reduced grazing areas, but in return, life is easier. Reclamation is bringing back grazing plots, and I'm grateful for that. I may not use it before my passing, but it's there for my grandchildren. I appreciate what's come about. We've gone from a harsh way of life to a gentler one.

Lily Crank

Black Mesa Resident

No one can say with certainty to what degree change on Black Mesa would have occurred without mining. What we can say with confidence is that Peabody is proud to have worked with the people of Black Mesa for the last quarter century.

More than 25 years' experience in the largest industrial project ever undertaken on Native American land has proved that different cultures can work together as equal partners, learning from one another and sharing responsibility to realize mutual benefits. We have proved that industrial technology and a spiritual reverence for the earth can be compatible. Indeed, in the last 25 years, we have demonstrated that the interests of a corporate entity and the people of Black Mesa are inseparable.

After Black Mesa gives up the last of its coal, sheep and goats again will roam and graze where men and machines once worked. The ancient Black Mesa still will loom darkly over the plain as it has for millions of years. Mining will have touched its rugged expanse lightly and its history only briefly.

It is our privilege today to work with respect for Black Mesa's future and with honor for its people.

Peabody Western
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Flagstaff, Arizona 86001

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