

5M CORPORATION  
Hurricane, Utah

DEVELOPMENT OF COAL PROPERTIES  
John Henry Mine

KAIPAROWITS PLATEAU COAL FIELD

43-025-004

DEVELOPMENT OF COAL PROPERTIES

by

5M CORPORATION

KAIPAROWITS PLATEAU COAL FIELD

5M CORPORATION  
Hurricane, Utah

## FORWARD

The following report is a general description of the largest coal reserve in North America, and sets forth the programmed participation of 5M Corporation in the development of coal reserves in this area.

Although the Kaiparowits Plateau Coal Field has long been a subject for geologic study, it has only been during the past five years that road accessibility to the area has been developed. A complex of super, coal-fired, generating plants are planned for the area with production programmed to commence during this decade. The complexities of providing an excess of forty million tons of coal per year to fire these plants will require the combined efforts of many producers. 5M, Inc. proposes to be one of them.

The mining plan being considered by 5M Corporation will utilize the basic Longwall and continuous mining methods. This method, according to other studies, indicates that it is ideal for coal mining in the area described in this report.

The final mining plan will be based upon further studies of the specific properties held by 5M Inc. to determine exact mining conditions. This plan is not a part of this report. It will, however, be made available at a later date.

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DEVELOPMENT OF COAL PROPERTIES

by

5M CORPORATION

KAIPAROWITS PLATEAU COAL FIELD

Nipple Butte NE Quadrangle

John Henry/Tibbet Springs Bench

Utah State Mineral Lease No. 19359

Section 2, Township 42 South

Range 3 East

5M CORPORATION  
Hurricane, Utah

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KAIPAROWITS PLATEAU COAL FIELD

Part I - GENERAL

# KAIPAROWITS PLATEAU COAL FIELD

## Introduction

Southern Utah has Cretaceous coal - in great abundance! Approximately 2,500 square miles of the region contains five coal fields. This report will describe the largest deposit, known as the Kaiparowits Coal Field, and in which 5M Inc. has substantial holdings.

The Kaiparowits area is to support what is known as The Kaiparowits Project. This is to be one of the largest coal fired, steam electric generating plants in North America, with a complex capable of generating up to 3,000 megawatts of electricity and to be supported by an eight mine system producing coal for the project in excess of nine million tons annually. The primary participants are as follows:

|                                |         |
|--------------------------------|---------|
| Southern California Edison Co. | (40%)   |
| San Diego Gas and Electric Co. | (23.4%) |
| Arizona Public Service Co.     | (18%)   |
| Salt River Project             | (10%)   |
| Uncommitted                    | (8.6%)  |

Other large companies have holdings in the Kaiparowits Plateau Coal Field and include:

Atlantic-Richfield Co.  
Consolidated Coal Co.  
Hiko Bell Mgn. & Oil  
Peabody Coal Co.  
Sun Oil Co.  
Woods Petroleum Co.

Calculations of reserves in the field, including all classes, total 15.2 billion short tons of coal in which seams less than 4 ft. thick were omitted from the calculations. The rank of the coal ranges from subbituminous C to high-volatile bituminous A. Field averages for dry coal indicate 43.63% volatile matter, 47.25% fixed carbon, and 8.96% ash, with 11,712 Btu/lb. Sulphur content averages 0.8%, dry basis. The quality of coal lends itself well to gasification and liquefaction as well as power generation and other uses. The average coal to be utilized in the Kaiparowits Project steam generating plant will contain approximately  $\frac{1}{2}$  of 1%

sulphur as compared with much eastern coal currently being used for electrical generation which contains ten times as much, or 5% sulphur.

The geology of the Kaiparowits coal field deposits is such that most coal will have to be mined underground with adits being located in the sides of the plateaus.

#### Location and Extent:

The Kaiparowits Plateau Coal Field is located in south central Utah in Garfield and Kane counties. The plateau is about 54 miles across its greatest width at the south end and is 66 miles from north to south, an area of approximately 1,600 square miles. It is contiguous to the Alton coal field to the west and is separated from it by the prominent Paunsaugunt fault.

#### Topography and Drainage:

The area is one of undulating plateau surfaces, deeply incised by steep-walled canyons. Along these canyon walls the coal seams are exposed. The drainages in the south part of the field trend southeast toward the Colorado River. The southern part is also a natural geographic division useful in dividing coal areas and is designated the Smokey Mountain Area.

#### Population, Industries and Transportation:

The Kaiparowits Plateau has limited grazing from five small communities located on the fringes of the coal field. An oil field exists along the upper valley anticline in the Garfield county portion. The area has two paved roads, U. S. Highway 89 and Utah Highway 54. U. S. Highway 89 skirts the southmost edge of the Kaiparowits Plateau joining Kanab, Utah with Glen Canyon City, Utah, and Page, Arizona. A railhead can be found approximately 150 miles south at Flagstaff, Arizona by U. S. Highway 89.

### Climate:

Rainfall varies between 6 and 20 inches depending on the altitude, indicating a steppe climate where evaporation exceeds precipitation and water becomes scarce, especially in the lower altitudes. The average high temperature during July is between 90 and 100 degrees. The floor of the canyon is from 4000 to 4500 feet, with the average mine elevation between 4300 and 4600 feet. The plateau tops at approximately 5000 feet.

### Historical Outline:

Although the coal of the Kaiparowits was known and mined in early years, it was not systematically studied until Gregory and Moore studied the area and published their work in 1931. Mining has been limited to local needs since the early 1900's. All mines are closed and production is nil at the present time. During the past decade the need for power in the more populated areas of the west United States has heightened the interest in the Kaiparowits coal field. Many large and impressive programs have been undertaken to establish the exact quantities and distribution of the coal. Land set aside for coal leases has been acquired by large companies and small operators. Many of the early mine properties are still held by their original owners. The convenience of nearby Lake Powell as a source of water makes possible steam powered electric plants in the area.

## KAIPAROWITS PLATEAU COAL FIELD

### Geologic Setting, Stratigraphy, and Structure

The coal of the Kaiparowits Plateau Coal Field is confined to Cretaceous rocks. The stratigraphic units underlying the Cretaceous rocks are all of the Jurassic age and begin with the lower Jurassic Navajo Sandstone and ending with the Morrison Formation in the upper Jurassic. This report deals with the Cretaceous rocks starting with the lower Dakota Formation, a yellow-gray sandstone alternating with gray carbonaceous shale up to 250 feet thick.

Ascending from the Dakota Formation is the Tropic Shale Formation, a medium to dark-gray argillaceous to sandy shale containing thin yellow-gray sandstone beds at the top and base and ranging from 550 through 1000 feet.

Above the Tropic Shale lies the lower member of the all important Straight Cliffs Formation known as the Tibbet Canyon Member, 70 to 185 feet thick, and consisting of gray mudstone; cliff former.

The Smoky Hollow Member is the upper strata of the lower section of the Straight Cliffs Formation and hosts the lower seams of coal having economical value. The Smoky Hollow has interbedded white and yellow-gray sandstone, gray to dark-gray mudstone, and coal seams. This formation is 2400 to 2500 feet thick with a coal zone ranging up to 47 feet thick. It is of note that an unconformity sometimes exists between the Smoky Hollow Member and the John Henry Member immediately above.

The John Henry Member constitutes the lower portion of the upper Straight Cliffs Formation and is probably the most important member of the major coal zones of the entire Straight Cliffs Formation. Thickness of the John Henry Formation ranges from 500 to 900 feet with interbedded yellow-gray, white and orange medium-grained, sandstone, gray shale, carbonaceous mudstone, and coal. The formation forms ledgy outcrops; often exhibits reddish to black outcrops from clinker and burned sandstone due to natural burning of coal.

The lower coal strata of the John Henry Member is known as the Christensen Coal Zone with thickness up to 143.5 feet and overlaid by a middle barren zone, 104 feet thick, which then ascends to the upper Rees Coal Zone. The Christensen Coal Zone has economical coal beddings up to 28 feet thick. Several coal beddings 4 to 6 feet thick follow intermittently up through and including the Upper Rees Zone and completing the John Henry Member.

Above the John Henry Member is the cliff former and caprock known as the Drip Tank Member which completes the Straight Cliffs Formation and consists of yellow-brown to gray-orange, fine to medium gray, sandstone, with some grit-stone and conglomerate interbedded with subordinate gray shale 100 to 150 feet thick.

The Kaiparowits Plateau is generally a basin with an important system of asymmetrical anticline-syncline sets usually trending northwest and plunging into the central basin. Faults in the system are of two kinds: surface faults or collapsed structures, and important tectonic faults. Two such faults occur in T. 34S R. 1E, and trending north-northeast to form a graben at the north edge of the coal outcrops. The throw is as much as 200 feet and the length is the full diagonal of the township.

An en echelon set of four faults of varying throw lies in the far south of the plateau between T. 41 and 42S., at R. 1 and 2E. Each has its downthrown side to the north and trends northwest; extent is up to 5 miles.

The Kaiparowits Basin is arranged with numerous flexures and folds with a central downwarp acting generally as a focal point for other structures.

KAIPAROWITS PLATEAU COAL FIELD  
Geological and Tectonic History

The geological events occurring since Mesozoic time in the Kaiparowits region aid in understanding deposition of the coal. During Triassic and Jurassic time the area was one of accumulating continental deposits; glacial, aeolian and even lacustrine deposits were laid down. A broad uplift took place toward the end of Jurassic time and the beginning of the Cretaceous, causing some of the Jurassic formations to be bevelled and even removed from some areas. Affected were the Morrison, Cow Springs and Entrada formations. This period of erosion lasted until the latest Lower Cretaceous time when another period of subsidence began.

It was during the next period of subsidence that all of the coal-bearing strata were deposited. This subsidence was first manifested by a flood of fluvial debris that was rather evenly and thinly distributed over the entire area. The fluvial debris had its source to the southwest. The floodplains received little clastic material and were often swampy, providing the environment for coal formation. The Tropic Shale was deposited under marine conditions. The area of better coal seams in the lower zones are located in the western part of the area and succeeding zones are more prominent farther east.

At the end of the Cretaceous, uplifts created periods of nondeposition and erosion and strata were tilted and bevelled. During the early Tertiary periods of alternating uplift, tilting, erosion and subsidence, continental and lacustrine deposits were received. Folding and volcanism followed and many of the Kaiparowits structures present today received their final form. The volcanism continued to the end of the Tertiary time. It is believed that the subterranean voids created by the emission of the lavas caused a regional collapse that created several major north-south faults and perhaps some complimentary folds. The Paunsaugunt

fault and the East Kaibab monoclinial fault are believed to belong to this group. Uplift and erosion have dominated since mid-Tertiary time and have produced the landforms as they exist today.

## KAIPAROWITS PLATEAU COAL FIELD

### Coal Deposits

The early work of Gregory and Moore (1913) and the work of private individuals who opened the mines were the only serious studies of the Kaiparowits coal field prior to 1960. At that time it became evident that the nation, in the face of increasing populations and higher energy demands, would soon require the exploitation of the large untapped coal resources of south Utah. As mentioned earlier in this report, lands were acquired by various companies and private exploration soon followed, principally in the form of drilling. Atlantic-Richfield, Peabody Coal Co., Resources Co., Sun Oil Co. and J. H. Knight have had extensive drilling programs on their properties and probably nearly 300 tests were made. Governmental agencies such as the U. S. Geological Survey, the U. S. Bureau of Mines and the Utah Geological and mineralogical Survey sent geologists to the Kaiparowits to gather surface data and to map the important parts of the region. Many studies are in progress. Knowledge of the area is still preliminary although in some areas the data are becoming detailed. Analytical data are available for the general area. More than 100 analyses of Kaiparowits Plateau coal are available. In general, the ash content is moderate, and the sulphur content is low to moderate. The rank ranges from subbituminous C to high-volatile bituminous A.

Land and minerals of the Kaiparowits Plateau coal field are owned by the U. S. Government and the state of Utah in a proportion of approximately 10 to 1. Land holdings by corporations and individuals are in the form of federal leases and permits and state leases.

## KAIPAROWITS PLATEAU COAL FIELD

### Reserves

Coal resources of the Kaiparowits Plateau coal field are contained in three formations: the Straight Cliffs, Dakota and the Tropic Shale. Geological work performed in the mid-1960's under the direction of Paul Averitt for the U. S. Geological Survey, estimates 40 billion short tons. However, it is not clear whether seams less than four feet were considered in the estimation.

Resources Co. (Arizona Public Service, Southern California Edison and San Diego Gas and Electric) estimated a total reserve of 1.855 billion tons of coal in its 71-square-mile holding, or 26,127,000 tons per square mile. This estimate is based on coal beds of four feet or more in thickness. A total of 372 square miles of Kaiparowits coal lands are under lease or permit. It then appears reasonable to assume that the total area contains proportionately as much as the Resources holdings because a substantial amount of the total area seems to contain equal or better surface indications of coal.

## KAIPAROWITS PLATEAU COAL FIELD

### Economic Consideration and Forcast

Most of the coal in the Kaiparowits Plateau coal field must be exploited by underground mining methods. Drilling programs are, however, accelerating and by 1975 it appears likely that a number of moderate-sized mines will be required to supply world markets. The Kaiparowits Plateau coal field is perhaps the least-known sizable coal reserve in the continental United States. This lack of information is due to its past remoteness prior to the construction of the Lake Powell dam.

The southwest and intermountain areas are growing rapidly and their use of power, as elsewhere, is expected to increase at a greater rate than population growth. It is forcast that coal will provide in the order of 30 - 40 percent of the energy for power production in the western states by the year 2,000. In 1960 coal provided less than 1% of the power generated west of the Continental Divide.

PART II

KAIPAROWITS PLATEAU COAL FIELD

Development of Coal Properties

by

5M Corporation

Utah State Mineral Lease No. 19359

Section 2, Township 42 South

Range 3 East

## KAIPAROWITS PLATEAU COAL FIELD - Part II

### Introduction

This report discusses recent data and findings of 5M Corporation regarding a most interesting coal deposit located in the Kaiparowits Plateau Coal Field, Kane County, Utah, consisting of Utah State Mineral Lease No. 19359, and comprising Sec. 2, T. 42S., R. 3E.

Access to the property is from U. S. Highway 89 at Glen Canyon City, Utah. A gravel road is then taken in a northeast direction to Warm Creek Canyon in the Nipple Butte NE Quadrangle. The distance is approximately 15 miles from Glen Canyon City.

Section 2 has many advantages from the standpoint of a mining program. It lies on a mesa with the main traveled mining road passing in Warm Creek Canyon along the east boundaries. The south edge and southeast corner are exposed by Tibbets Canyon and accessible by road. The Tibbets Canyon road extends to the top of the plateau where an access road to the mesa of Sec. 2 is available for drilling, mining, studies, etc.

### History

The mineral lease is a section of land retained by a company from a large block of holdings originally assumed in the 1950's. The owners have now negotiated the lease to the 5M Corporation in a joint operation. The lease is renewable with the state of Utah every 20 years; the next renewable period being 1982. Royalties to the state of Utah is 15 cents per ton.

### Geologic Setting

The coal seams having economical values in Sec. 2 are all contained in Cretaceous rocks. The most feasible approach to mining the property will be drifts going into the side hill from the northwest corner in the John Henry Canyon where erosion has exposed many of the beddings in

the Straight Cliffs Formation, and some exposure in the Tropic Shale Formation. The coal seams in the Dakota will require an inclined drift for mining below the surface. The mesa cap is a sandstone cliff former known as the Drip Tank Formation. Five major coal zones lie beneath the mesa cap, the first one starting 400 to 500 feet down. This is called the Alvey Zone, having a thickness of 100 feet and consisting of an upper and lower zone. The upper Alvey coal seam is generally 3 feet thick, while the lower Alvey averages 4 to 6 feet in the area. Seventy-five feet below the Alvey Zone is the Rees Coal Zone playing host to a coal seam averaging 5 feet. In some places two commercial coal seams occur.

The Christensen (John Henry) zone is coincident with a broad band of commercial coal zones and is generally found a little deeper at approximately 800 feet below the caprock in the Nipple Butte NE Quadrangle. The coal beds are as much as 10 to 25 feet thick. A lower coal zone in the Christensen runs 4 to 6 feet.

The Smoky Hollow Member under the Christensen zone begins at approximately 950 feet. An unconformity separates the two. Coal beds show 3 to 5 feet of thickness in the Smoky Hollow and sometimes thickening into the lower Tippet Canyon Member.

The top of the massive Tropic Shale is exposed at the canyon floor. This formation has been overlooked by many exploration programs because it is generally under the surface and the coal zones in the top of the formation have not always shown good quality coal. Recent studies indicate an almost unbelievable potential for coal may exist beyond the normal drilling depth cutoff at the top of the Tropic Shale. The contact zone between the lower portion of the Tropic Shale and on into the middle member of the Dakota Formation represent in some areas several hundred feet of coal seam. This condition would explain a statement made by the Utah Geological and Mineralogical Survey in the February, 1965 edition of the "Quarterly Review", Page 7,

that "the Utah Geological Survey is bold enough to presume that one half of the remaining 1,430 square-mile area in the Kaiparowits coal field could contain recoverable coal in excess of 700,000,000 tons per square mile, or as much as ten thousand million tons of recoverable coal, which vastly exceeds the U. S. Geological Survey's 1960 estimate". It is noteworthy that the area contained within Section 2 is a part of the general area referred to in the statement.

A new and valuable publication being sold by the Utah Geological and Mineralogical Survey, Monograph Series No. 1, 1972, Southwestern Utah Coal Fields, also reports on Page 105 that early papers reporting poor quality coal have been responsible for the limited exploration of the lower Tropic Shale and Dakota Formations in the area. The Dakota lying under the Tropic Shale is now showing up to 13.5 feet of good coal in the few areas being explored.

#### Drilling Program for Section 2

A recommended drilling program for Section 2 would include nine holes, some possibly extending to the base of the Dakota Formation, or to a depth not exceeding 1500 feet. Holes drilled to the base of the Smoky Hollow Member should not exceed 1100 feet.

#### Coal Reserves and Marketing

The large holdings of the Resources Co. in the Kaiparowits Plateau Coal Field are estimated to contain 1.855 billion tons in 71 square miles, or an average in excess of 26 million tons per square mile. This estimate represents coal seams in excess of 4 feet and only to the bottom of the Smoky Hollow Member. It is to be noted that the 71 square miles referred to above almost completely surrounds Section 2 and would leave one to deduct, short of a drilling program, that this Section would also have a minimum of 26 million tons of recoverable coal, and this without the massive potential in the Tropic Shale and Dakota Formations.

Recent explorations to the coal deposits of Section 2 by principals of 5M Corporation for purposes of surface study, have shown consistent thicknesses in the number of coal seams exposed, and very typical of the coal seams in the area of the Missing Canyon experimental mine of the Resources Co., some two miles to the north. The coal bedding at the mine site is approximately 16 feet thick and extends down canyon where it is again exposed in Section 2.

It is of significance that Section 2 lies midway between the proposed Nipple Bench Plant Site and the No. 1 Experimental Mine of the Resources Co. This should ensure a good road network in the area; also, a potential market for coal. A second potential market for coal may well be the proposed I.P.P., 3,000 mw generating plant to be constructed approximately 20 miles north of Section 2.

#### Mining Methods

Room and Pillar, along with Longwall mining techniques lend themselves to a vigorous, continuous mining program according to recent studies for mining on the Kaiparowits Plateau. Several thousand tons per day should be a feasible mining projection.

#### Transportation

The nearest railhead to the Kaiparowits Plateau is at Flagstaff, Arizona. Other rail facilities are at Cedar City, Utah, and Marysvale, Utah, any one of which would accommodate large volume coal shipments.

#### Quality of Coal

The quality of coal to be found in Section 2 is consistent with the better areas of the plateau and with the coal analysis given in PART I, Page 2, of this report.

KAIPAROWITS PLATEAU COAL FIELD

References

1. Doelling, H. H. and R. L. Graham, 1972, Southwestern Utah Coal Fields: Utah Geological and Mineralogical Survey affiliated with The College of Mines and Mineral Industries, University of Utah, Salt Lake City, Utah.
2. Doelling, Hellmut H., 1968, Carcass Canyon Coal Area, Kaiparowits Plateau, Garfield and Kane Counties, Utah: Utah Geological and Mineralogical Survey, Special Studies 25.
3. Halliday, Robert S., 1974, Utah on Threshold of Enormous Fuel Exploitation: The Salt Lake Tribune, July 7, Sec. B, p. 1.
4. -----, 1965, A Southern Utah Coal Start?; Utah Geological and Mineralogical Survey, Quarterly Review, Vol. 1, No. 3.
5. -----, 1971, Rocky Mountain Oil & Mining Journal, February 8, Salt Lake City.

## MAP EXPLANATION

### MAP NO. 1 - Nipple Butte Quadrangle

Section 2, colored in red, is the Utah State Mineral Lease No. 19359 held by 5M Inc. Coal tonnage in Section 2 is estimated in excess of 26 million tons.

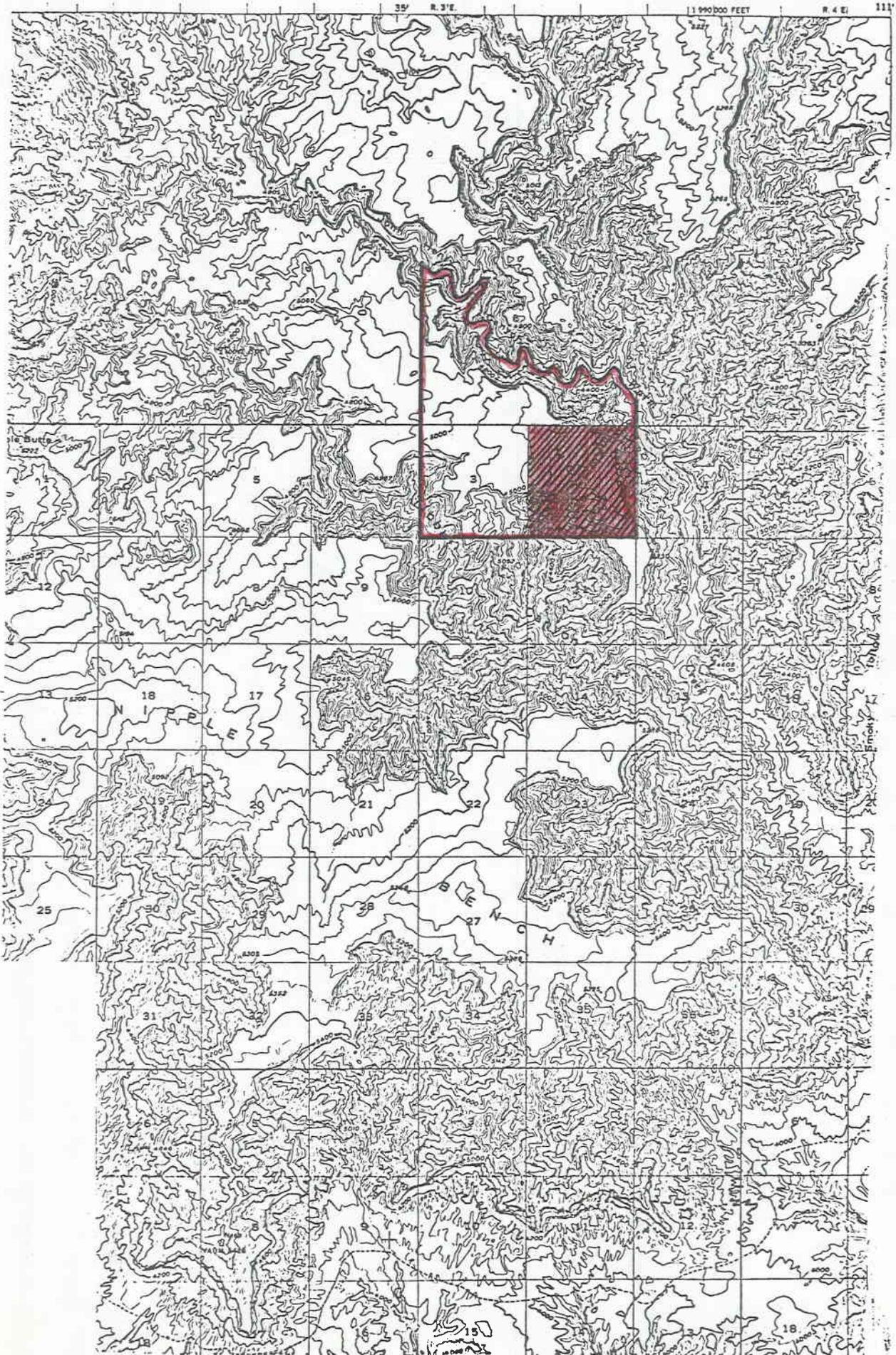
Contiguous to Section 2, outlined in red, are additional lands for which 5M Inc. has made application to the Bureau of Land Management. Until recently this land was held by the Bureau of Land Management in moritorium. At this time, negotiations are proceeding favorably, which would increase 5M Inc. estimated coal reserves in this area by 50 million tons.

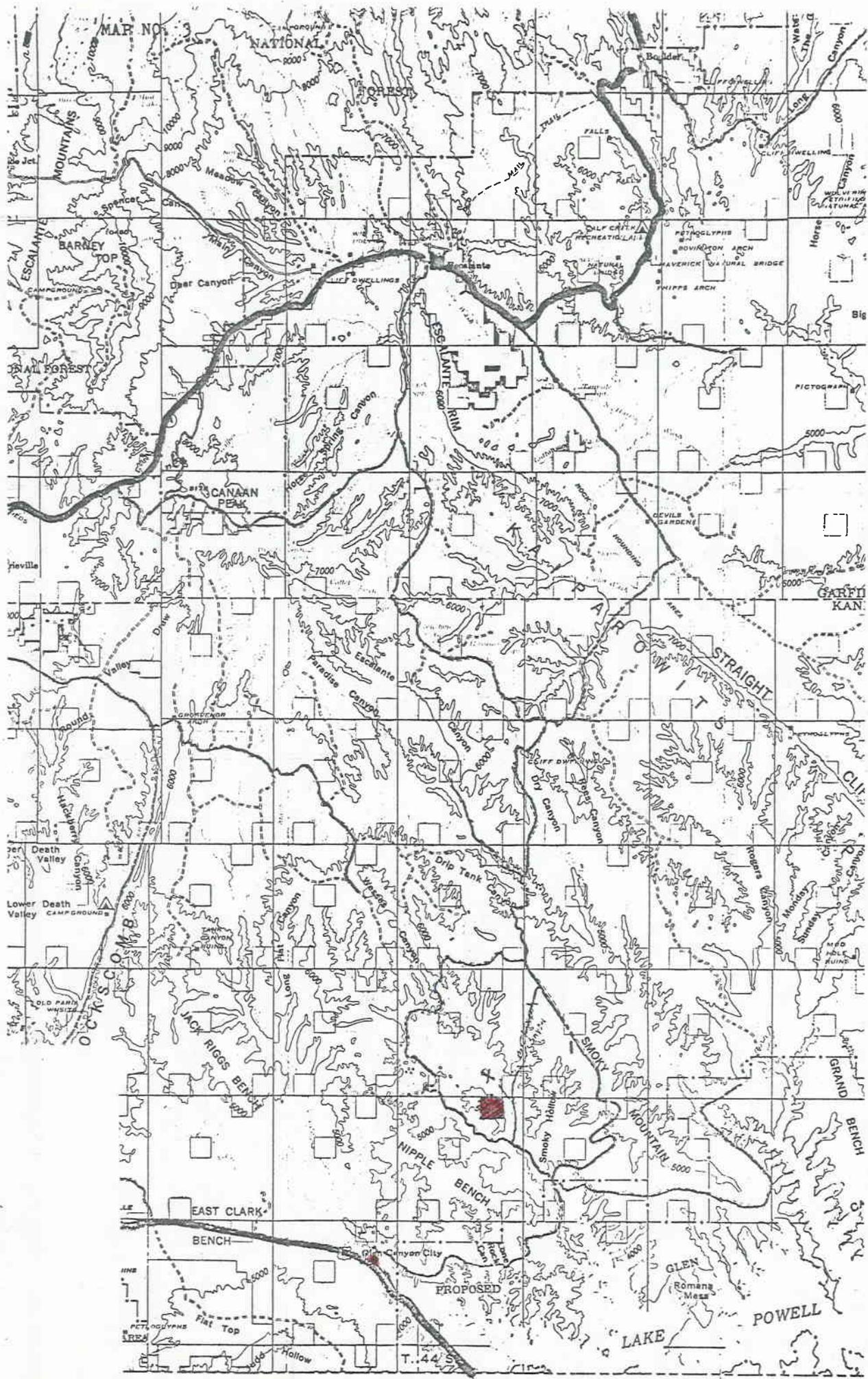
### MAP NO. 2 - Property ownership in the Kaiparowits coal field

5M Inc. is in process of being re-assigned approximately 1,000 additional acres shown in block 21, colored in red. By agreement this assignment should take place in the near future. Coal tonnage in this area, documented by drill records in our possession, is in excess of 50 million tons.

### MAP NO. 3 - General Area Map

Shows the general area of the Kaiparowits in relation to the town of Escalante to the north, and Glen Canyon City, to the south. Coal properties held by 5M, Inc. are shown in red.





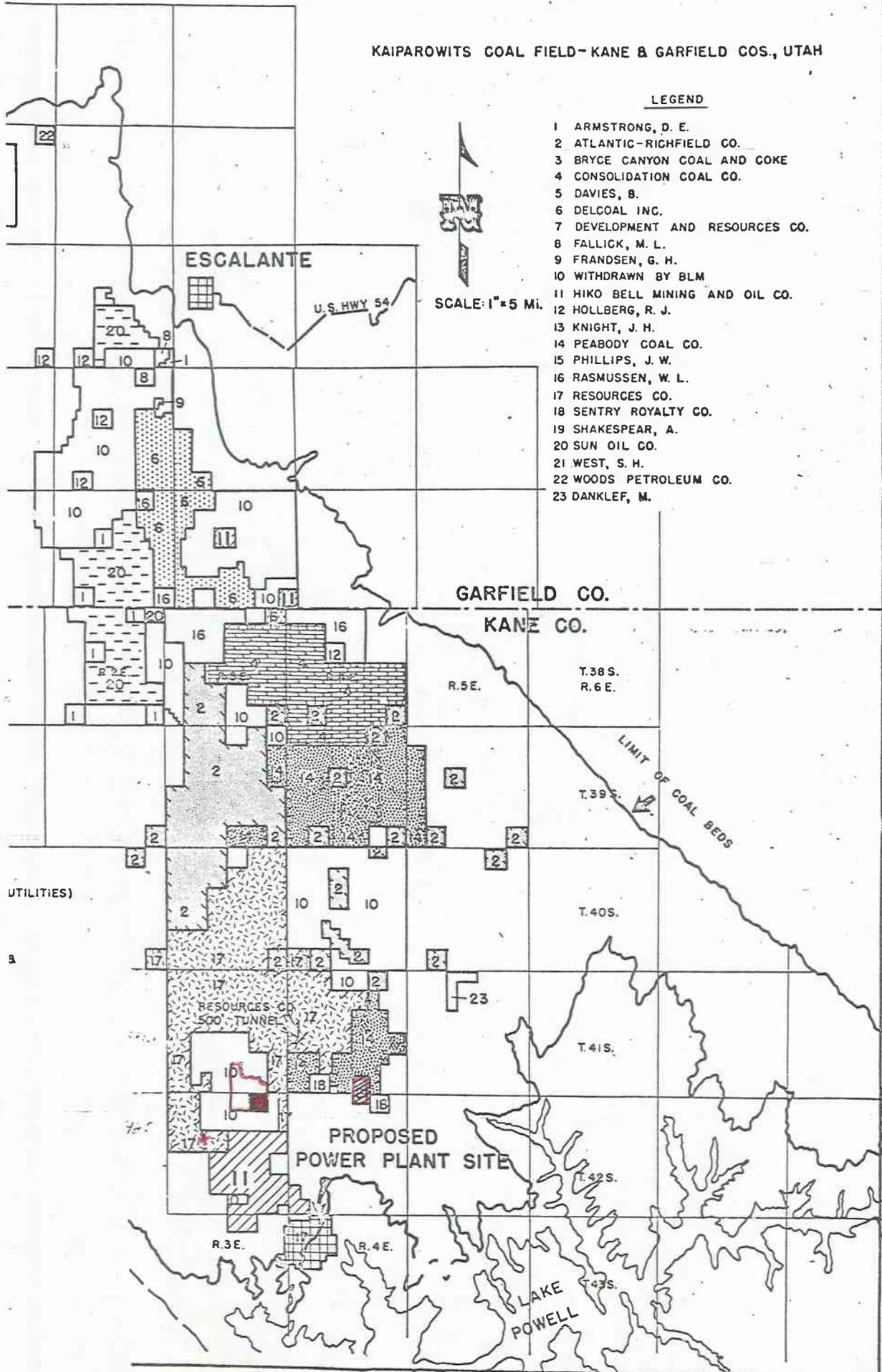
# MAP SHOWING COAL PROPERTIES

KAIPAROWITS COAL FIELD - KANE & GARFIELD COS., UTAH

### LEGEND

- 1 ARMSTRONG, D. E.
- 2 ATLANTIC-RICHFIELD CO.
- 3 BRYCE CANYON COAL AND COKE
- 4 CONSOLIDATION COAL CO.
- 5 DAVIES, B.
- 6 DELCOAL INC.
- 7 DEVELOPMENT AND RESOURCES CO.
- 8 FALICK, M. L.
- 9 FRANSEN, G. H.
- 10 WITHDRAWN BY BLM
- 11 HIKO BELL MINING AND OIL CO.
- 12 HOLLBERG, R. J.
- 13 KNIGHT, J. H.
- 14 PEABODY COAL CO.
- 15 PHILLIPS, J. W.
- 16 RASMUSSEN, W. L.
- 17 RESOURCES CO.
- 18 SENTRY ROYALTY CO.
- 19 SHAKESPEAR, A.
- 20 SUN OIL CO.
- 21 WEST, S. H.
- 22 WOODS PETROLEUM CO.
- 23 DANKLEF, M.

SCALE: 1" = 5 MI.



UTILITIES)

a

PROPOSED POWER PLANT SITE

LAKE POWELL

PROOF OF TITLE

The proof of title to Sec.. 2, T. 42 S., R. 3 E. is represented by photo copies set forth in Appendix B.

The history of title is as follows:

Document No. 1 - represents the original Utah state lease for coal No ML 19359 issued to W. L. & V. H. Rasmussen on May 11, 1962.

Document No. 2 - represents assignment to Atlantic Richfield Company by W. L. & V. H. Rasmussen on January 17, 1963.

Document No. 3 - represents re-assignment by Atlantic Richfield Company to the original owners, W. L. & V. H. Rasmussen.

Document No. 4 - represents a letter of substantiation confirming re-assignment of Utah state lease No. ML 19359 to W. L. & V. H. Rasmussen dated September 30, 1968.

Document No. 5 - represents a letter of acknowledgement by the state of Utah of re-assignment stated in Documents No's 3 & 4, dated April 7, 1969.

ARTICLE XII  
LESSEE'S PARTICULAR ATTENTION IS DRAWN TO SECTION 14 OF THIS LEASE.

DOCUMENT NO. 14  
1162762 H&P

MINERAL LEASE APPLICATION

MINERAL LEASE NO. 19359

NO. 19359

GRANT: School

# Utah State Lease for COAL

THIS INDENTURE OF LEASE AND AGREEMENT entered into in duplicate this 11th day of May, 19 62  
by and between the STATE LAND BOARD, acting in behalf of the State of Utah, hereinafter called the Lessor, and

W. L. RASMUSSEN and V. H. RASMUSSEN

P. O. Box 11

Veyo, Utah

party of the second part, hereinafter called the Lessee, under and Pursuant to Title 65, Utah Code Annotated, 1953.

WITNESSETH: That the Lessor, in consideration of the rents and royalties to be paid and the covenants to be observed by the Lessee, as hereinafter set forth, does hereby grant and lease to the Lessee the exclusive right and privilege to mine, remove, and dispose of all of the said minerals in, upon, or under the following described tract of land situated in Kane County, State of Utah, to-wit:

All of Section Two (2), Township Forty-two (42) South, Range Three (3) East,  
Salt Lake Meridian,

containing a total of 640.00 acres, more or less, together with the right to use and occupy so much of the surface of said land as may be required for all purposes reasonably incident to the mining, removal, and disposal of said minerals, according to the provisions of this lease, for the period ending ten years after the first day of January next succeeding the date hereof and as long thereafter as said minerals may be produced in commercial quantities from said lands, or Lessee shall continue to make the payments required by Article III hereof, upon condition that at the end of each twenty (20) year period succeeding the first day of the year in which this lease is issued, such readjustment of terms and conditions may be made as the Lessor may determine to be necessary in the interest of the State.

### ARTICLE I

This lease is granted subject in all respects to and under the conditions of the laws of the State of Utah and existing rules and regulations and such operating rules and regulations as may be hereafter approved and adopted by the State Land Board.

### ARTICLE II

This lease covers only the mining, removal, and disposal of the minerals specified in this lease, but the Lessee shall promptly notify the Lessor of the discovery of any minerals excepting those enumerated herein.

### ARTICLE III

The Lessee, in consideration of the granting of the rights and privileges aforesaid, hereby covenants and agrees as follows:

FIRST: To pay to the Lessor as rental for the land covered by this lease the sum of fifty (50) cents per acre per annum. All such annual payments of rental shall be made in advance on the 2nd day of January of each year, except the 1962 rental which is payable on the execution of this lease. All rentals shall be credited against royalties for the year in which they accrue.

SECOND: To pay to Lessor quarterly, on or before the 15th day of the month succeeding each quarter, royalty

(a) at the rate of 15¢ per ton of 2000 lbs. of coal produced from the leased premises sold or otherwise disposed of, or

(b) at the rate prevailing, at the beginning of the quarter for which payment is being made, for federal lessees of land of similar character under coal leases issued by the United States at that time,

whichever is higher, and, commencing with the year beginning the January 1 following two years from the date hereof, to pay annual royalty of at least \$1.00 multiplied by the number of acres hereby leased regardless of actual production, provided that Lessor may, at any time after the tenth anniversary date hereof, increase the minimum annual royalty by not to exceed 50%.

ENTRY NO. 10,430 RECORDED AT REQUEST OF  
DATE 4-26-63 AT LA BY John D. Davis  
DEPUTY, BOOK 11

FEE \$ 4.00  
KANE COUNTY RECORDER  
PAGE 202

If the coal produced from the leased premises is washed before sale or other disposition by Lessee, Lessee may pay royalty on the washed product only, provided Lessee maintains accurate record by which the weight of washed coal originating from the leased premises can be ascertained and complies with all regulations and directives issued by Lessor to prevent waste and to insure that royalty is paid on all washed coal originating from the leased premises.

THIRD: To prepare and forward to the State Land Office, on or before the 15th day of the month next succeeding the quarter in which the material is produced, a certified statement of the amount of production of all of the leased substances disposed of from said lands, and such other additional information as the State Land Board may from time to time require.

FOURTH: To keep at the mine office clear, accurate and detailed maps on tracing cloth, on a scale not more than 50 feet to the inch, of the workings in each section of the leased lands and on the lands adjacent, said maps to be coordinated with reference to a public land corner so that they can be readily and correctly superimposed, and to furnish to the Lessor annually, or upon demand, certified copies of such maps and such written statements of operations as may be called for. All surveys shall be made by a licensed engineer and all maps certified to by him.

FIFTH: Not to fence or otherwise make inaccessible to stock any watering place on the premises without first obtaining the written consent of Lessor, nor to permit or contribute to the pollution of any surface or subsurface water available or capable of being made available for domestic or irrigation use.

SIXTH: Not to assign this lease or any interest therein, nor sublet any portion of the leased premises, or any of the rights and privileges herein granted, without the written consent of the Lessor being first had and obtained.

#### ARTICLE IV

The Lessor hereby excepts and reserves from the operation of this lease:

FIRST: The right to permit for joint or several use such easements or rights-of-way upon, through, or in the land hereby leased as may be necessary or appropriate to the working of these or other lands belonging to or administered by the Lessor containing mineral deposits or for other use.

SECOND: The right to use, lease, sell, or otherwise dispose of the surface of said lands or any part thereof, under existing State laws or laws hereafter enacted, insofar as said surface is not necessary for the Lessee in the mining, removal, or disposal of the leased substances therein, and to lease mineral deposits, other than those leased hereby, which may be contained in said lands so long as the recovery of such deposits does not unreasonably interfere with Lessee's rights herein granted.

#### ARTICLE V

Upon failure or refusal of the Lessee to accept the readjustment of terms and conditions demanded by the Lessor at the end of any twenty-year period, such failure or refusal shall work a forfeiture of the lease and the same shall be canceled.

#### ARTICLE VI

In case of expiration, forfeiture, surrender or other termination of this lease, all underground timbering supports, shaft linings, rails and other installations necessary for the support of underground workings of any mines, and all rails or head frames and all installations which cannot be removed without permanent injury to the premises and all construction and equipment installed underground to provide ventilation for any mines, upon or in the said lands shall be and remain a part of the realty and shall revert to the Lessor without further consideration or compensation and shall be left by the Lessee in the lands.

All personal property of Lessee located within or upon the said lands, and all buildings, machinery, equipment and tools (other than the installations to become the property of Lessor as above provided), shall be and remain the property of Lessee and Lessee shall be entitled to, and may, within six (6) months after such expiration, forfeiture, surrender or other termination of said lease, or within such extension of time as may be granted by Lessor, remove from the said lands such personal property and improvements, other than those items which are to remain the property of the Lessor as above provided.

Lessee shall, upon termination, of this lease or abandonment of the leased premise for any reason, seal to Lessor's satisfaction all or such part of the mine openings on the premises as Lessor shall request be sealed.

#### ARTICLE VII

It shall be the responsibility of the Lessee to slope the sides of all operations of a surface nature to an angle of not less than 45° or to erect a barrier around such operation as the State Land Board may require. Such sloping or fencing shall become a normal part of the operation of the lease so as to keep pace with such operation to the extent that such operation shall not constitute a hazard.

#### ARTICLE VIII

Lessee shall not sell or otherwise dispose of any water rights acquired for use upon the leased premises except with Lessor's written permission. Upon termination of this lease for any reason, all such rights acquired by application to the Utah State Engineer shall revert to the Lessor as an appurtenance to the leased premises, and all such rights acquired by other means shall be offered to Lessor in writing for purchase at Lessee's acquisition costs, provided that Lessor shall be deemed to have rejected such offer if it does not accept the same within thirty days after receipt thereof.

#### ARTICLE IX

All of the terms, covenants, conditions, and obligations in this lease contained, shall be binding upon the heirs, executors, administrators, and assigns of the Lessee.

#### ARTICLE X

Lessee may terminate this lease at any time upon giving three (3) months' notice in writing to the Lessor and upon payment of all rents and royalties and other sums due and payable to the Lessor, and upon complying with the terms of this lease with respect to the preservation of the workings in such order and condition as to permit of the continued operation of the leased premises.

#### ARTICLE XI

Lessor, its officers, and agents, shall have the right at all times to go in and upon the leased lands and premises, during the term of said lease to inspect the work done and the progress thereof on said lands and the products obtained therefrom, and to post any notices on the said land that it may deem fit and proper; and also shall permit any authorized representatives of the Lessor to examine all books and records pertaining to operations under this lease, and to make copies of and extracts from the same, if desired.

If the Lessee shall initiate or establish any water right for the leased premises, such right shall become an appurtenance of the leased premises, and, upon the termination of the lease, the Lessee shall convey the right to the Lessor.

IN WITNESS WHEREOF, the parties have hereunto subscribed their names the day and year first above written.

STATE OF UTAH  
STATE LAND BOARD

By: Max C. Gardner  
DIRECTOR  
LESSOR

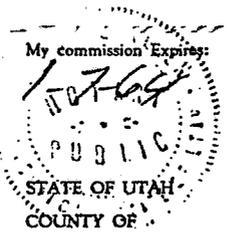
W.P. Rasmussen  
J.H. Rasmussen  
LESSEE

STATE OF UTAH  
COUNTY OF \_\_\_\_\_

LESSEE'S INDIVIDUAL ACKNOWLEDGEMENT

On the 10 day of July 1962, personally appeared before me W.P. and J.H. Rasmussen  
the signer of the above instrument, who duly acknowledged to me that they executed the same.  
Given under my hand and seal this 10 day of July 1962

Donald Collier  
Notary Public, residing at:



STATE OF UTAH  
COUNTY OF \_\_\_\_\_

LESSEE'S CORPORATE ACKNOWLEDGEMENT

On the \_\_\_\_\_ day of \_\_\_\_\_ 19\_\_\_\_, personally appeared before me \_\_\_\_\_  
who being duly sworn did say that he is an officer of \_\_\_\_\_ and that said instrument was signed  
in behalf of said corporation by resolution of its Board of Directors, and said \_\_\_\_\_ acknowl-  
edged to me that said corporation executed the same.

Given under my hand and seal this \_\_\_\_\_ day of \_\_\_\_\_ 19\_\_\_\_

My commission Expires:

Notary Public, residing at:

STATE OF UTAH  
COUNTY OF SALT LAKE

On the 20<sup>th</sup> day of July 1962, personally appeared before me Max C. Gardner  
say that he is the Director of the State Land Board of the State of Utah and that said instrument was signed in behalf of said Board by resolu-  
tion of the Board, and said Frank J. Allen acknowledged to me that said Board executed the same in behalf of the State of Utah.

Given under my hand and seal this 20<sup>th</sup> day of July 1962

Donald J. France  
Notary Public, residing at:  
Salt Lake City, Utah

My commission Expires:  
8-4-62

HSP

# ASSIGNMENT

Certificate No. ....  
 Grazing Lease No. .... Application No. ....  
 Mineral Lease No. ML 19359 .....

The undersigned, as owner of record title interest as hereinafter specified in and to ML# 19359.....; GL# .....; Cert. # .....; as designated for good and valuable consideration and TEN and NO/100-----DOLLARS does hereby assign to Richfield Oil Corporation, (Name and Address) A Delaware Corporation, 555 South Flower Street, Los Angeles 17, California

the right, title, and interest in and to the lands embraced in such lease to specified below, giving and granting to assignee rights and privileges as lessee in such lands, to the extent indicated, subject to the reservations of overriding royalties as herein noted:

1. Lands affected by this assignment:

TOWNSHIP 42 SOUTH, RANGE 3 EAST, S. L. M.  
 Section 2: All  
 Containing 640.00 Acres, More or Less

County of Kane ..... State of Utah.

- 2. Interest of assignor in such lands 100% .....
- 3. Extent of such interest conveyed to assignee 100% .....
- 4. Overriding royalty reserved herein to assignor 5¢ Per. Ton ..... (State percentage only)
- 5. Overriding royalties previously reserved None ..... (State percentage only)

It is hereby certified that the statements made herein are true, complete, and correct to the best of the undersigned's knowledge and belief, and are made in good faith.

Executed and witnessed this 17<sup>TH</sup> day of January ....., 1963.

WITNESS:

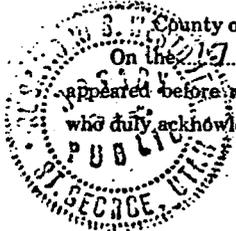
*W.L. Rasmussen*  
 W.L. RASMUSSEN  
*V.H. Rasmussen*  
 V.H. RASMUSSEN

STATE OF UTAH

County of WASHINGTON } ss.

On the 17<sup>TH</sup> day of January ....., A.D. 1963, personally

appeared before me W.L. and V.H. Rasmussen the signer(s) of the above instrument, who duly acknowledged to me that they executed the same.



*Edward J. Whitcomb*  
 Notary Public

Acceptance of Assignment and  
 Affidavit of Citizenship of Assignee

I, (we) ..... on oath, do solemnly swear that I am (we are) at the present time (a) \* ..... Citizen (s) of the United States of America and over the age of twenty-one years, and I (we) hereby assume and agree to perform all of the covenants and obligations of said lease on the part of the lessee (s) to be kept and performed, and accept the foregoing assignment.

Subscribed and sworn to before me this ..... day of ....., 19.....

Notary Public

My commission expires.....

NOTE..... \* Insert here whether native born or naturalized. If naturalized, it will be necessary to file with this office Proof of Citizenship or declaration of Intention to become a citizen, in the form of a letter or certificate of verification from Court of Issuance, and registration fee of \$1.00.

INSTRUCTIONS..... Assignment must be submitted in duplicate. The original Certificate, Grazing Lease, or Mineral Lease must be produced with the Assignment- Partial Assignments permitted on Mineral Leases only. Fee Total Assignment, \$2.00; Partial Assignment, \$7.00.

If a Corporation, see other side for Acceptance of Assignment.

UTAH STATE LAND OFFICE

ENTRY NO. 10437 RECORDED AT REQUEST OF  
 DATE 4-26-63 AT 14. M. 9:30 P.M. Adaa. KANE COUNTY RECORDER  
 DEPUTY, BOOK 011 PAGE 205

# Acceptance of Assignment

Certificate No. ....

Grazing Lease No. ....

Mineral Lease No. 19359 .....

Comes now RICHFIELD OIL CORPORATION a corporation of the State of Delaware, and hereby accepts the Assignment from W. L. Rasmussen and V. H. Rasmussen of Vevo, Utah

assigning to Richfield Oil Corporation, 555 So. Flower St., Los Angeles 17, Calif. Cert. # .....; GL# .....; ML# 19359 .....

which Assignment is dated January 17, 1963, subject to all of the covenants and obligations of said Lease.

IN WITNESS WHEREOF, Richfield Oil Corporation has executed this Acceptance this 14th day of February, 1963



RICHFIELD OIL CORPORATION

By [Signature]  
Its Attorney in Fact

State of .....  
County of ..... ss.

On this ..... day of ....., A.D. 19....., personally appeared before me ..... and ..... who being by me duly sworn did say, each for himself, that he, the said ..... is the ..... and he, the said ..... (officer) is the ..... (officer) of ..... and that the within and foregoing instrument was signed in behalf of said corporation by authority of a resolution of its Board of Directors, and said ..... and ..... each duly acknowledged to me that said corporation executed the same and that the seal affixed is the seal of said corporation.

My commission expires ..... Notary Public  
Residence: .....

RECORDED IN OFFICE OF COUNTY CLERK

UTAH-644

ASSIGNMENT

THE STATE OF UTAH     |  
COUNTY OF KANE       |

KNOW ALL MEN BY THESE PRESENTS: That

For and in consideration of the sum of Ten Dollars (\$10.00) and other good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, ATLANTIC RICHFIELD COMPANY (successor by merger and subsequent change of name to Richfield Oil Corporation, a Delaware corporation, and The Atlantic Refining Company, a Pennsylvania corporation), as Assignor, hereby transfers, assigns and conveys unto V. H. RASMUSSEN and W. L. RASMUSSEN (whose address is Veyo Star Route Box 80, Central, Utah 84722), as Assignee, that certain State of Utah Coal Lease No. 19359 dated May 11, 1962, by and between the State of Utah, as Lessor, and W. L. Rasmussen and V. H. Rasmussen, as Lessee, which lease covers the following described land in Kane County, Utah, to-wit:

Township 42 South, Range 3 East, Salt Lake Meridian

Section 2: All

Containing 640 acres, more or less.

This Assignment is executed by Assignor without any warranty of title, either express or implied.

IN WITNESS WHEREOF, this Assignment is executed this 24th day of September, 1968.

ATTEST:

ATLANTIC RICHFIELD COMPANY

*Miriam M. Lewis*  
Assistant Secretary

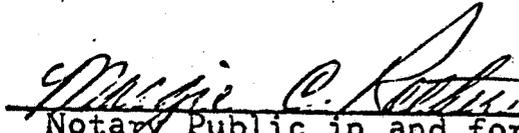
By *S. C. Mut*  
S. C. Mut, Vice President

113  
45C  
652

THE STATE OF TEXAS |

COUNTY OF DALLAS |

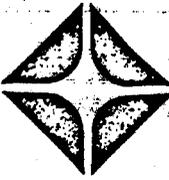
On the 24th day of September, 1968, personally appeared before me S. C. MUT, who being by me duly sworn, did say that he is the Vice President of ATLANTIC RICHFIELD COMPANY, and that said instrument was signed in behalf of said corporation by authority of a resolution of its Board of Directors, and said T. C. FRICK acknowledged to me that said corporation executed the same.

  
\_\_\_\_\_  
Notary Public in and for  
Dallas County, Texas

MARGIE C. ROTHER

Atlantic Richfield Company North American Producing Division  
Land and Acquisitions Department  
Post Office Box 2819  
Dallas, Texas 75221  
Telephone 214 747 6484

DOCUMENT NO. A



B. F. Sutherland  
Supervisor, Lease Records

September 30, 1968

UTAH-644 and 692  
State Lease No. ML-19359 & ML-20628  
Kane County, Utah

V. H. and W. L. Rasmussen  
Veyo Star Route, Box 80  
Central, Utah 84722

Gentlemen:

Pursuant to your request of September 14th,  
enclosed is the original and three executed  
copies of the assignments of the captioned  
leases.

Yours very truly,

B. F. Sutherland

By W. E. Craft  
W. E. Craft

WEC/es  
encls.



THE STATE OF UTAH

DEPARTMENT OF NATURAL RESOURCES  
DIVISION OF STATE LANDS  
SALT LAKE CITY, UTAH 84114

BOARD MEMBERS

C.S. Thompson, Chairman  
T. H. Bell  
Phillip V. Christensen  
J. Whitney Floyd  
M. V. Hatch  
J. Harold Reese  
Don Showalter

CHARLES R. HANSEN  
Director

April 7, 1969

V. H. Rasmussen & W. L. Rasmussen  
Veyo Star Route Box 80  
Central, Utah 84722

Gentlemen:

The Director, on February 28, 1969, approved assignment of ML 19359  
to you by Atlantic Richfield Company. No override.

Our records have been noted, and we herewith enclose the original  
lease.

Yours very truly,

DONALD G. PRINCE  
ECONOMIC GEOGRAPHER

1b  
Enclosure



## INTERMOUNTAIN POWER PROJECT

P.O. Box BB  
Sandy, Utah - 84070  
Telephone 255-2903

August 2, 1974

Mr. Nick Scholzen  
5-M Incorporated  
P. O. Box 628  
Hurricane, Utah 84737

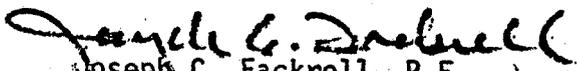
Dear Mr. Scholzen:

This is in regard to our discussing about our coal requirements in the south central Utah area.

The Intermountain Power Project is interested in your organization furnishing all or a part of our coal requirements, for our proposed power plant project now under study. We are now making a feasibility study, which includes other locations, for a 3,000 MW plant and a coal commitment is essential to prove feasibility. The plant will require an estimated 10,000,000 tons of coal a year from one or more suppliers.

The Intermountain Power Project represents, among others, 31 public power agencies in the State of Utah which in turn supply retail electric service to about 15% of the Utah population. We feel that the utilization of Utah resources to serve Utah people is an important factor to consider in the leasing and marketing of coal reserves.

Sincerely,

  
Joseph C. Fackrell, P.E.  
Project Manager

JCF:dj

cc: Bruce Campbell

# Utah on Threshold Of Enormous Fuel Exploitation— Economic, Social Impact Staggering

The big word in Utah's future: Energy. And it means an economic, environmental and sociological upheaval which may change the character of the state forever.

Tribune Environmental Specialist Robert S. Halliday takes a look, here and on Pages B-2 and B-3, at the coming energy boom and what it means to Utah — and you.

By Robert S. Halliday  
Tribune Environmental Specialist

The pattern of an enormous assault on Utah's fossil fuel and water resources is emerging.

Crude oil and natural gas production is increasing and exploration accelerating. Seismograph crews are probing strata formation throughout the state, prelude to an expected surge in wildcat drilling. Test wells and new techniques are being pushed to tap the virgin giants . . . Utah's 25-billion-barrel tar sand deposits.

A new oil shale industry is on the launch pad.

#### Offer Leases

For the first time, the Bureau of Land Management will offer geothermal leases in Utah later this year.

Casification of coal to supplement natural gas supplies is under way in the Four Corners area and scheduled in Utah. Exportation of Utah coal by rail is skyrocketing, and additional outflow by slurry lines is contemplated.

With additional new coal demands by six projected electric power plants, Utah's annual coal production by 1985 could soar to more than 10 times its record high of 7,429,000 tons in 1947.

This volume of exploitation pres-

ges tax revenues and other economic rewards unprecedented in Utah. It also heralds social disruption and environmental wounds, intensified pollution problems, a dearth of qualified labor and a battle for Utah's remaining allocation of Colorado River water.

#### Staggering Impact

It signals a staggering impact on the social and physical character of eastern and southern Utah, with repercussions on the Wasatch Front.

It could further diminish Utah's agricultural role, speed up and lastingly shape its major national contribution as mining-industrial and have an undetermined, possibly adverse, effect on another of its major industries . . . tourism.

Six new electric power plants projected in Utah would involve investment estimated at \$4.7 billion and, if completed as proposed, would generate an estimated \$42.7 million annually in new state and county revenues.

#### National Demand

And just for openers, Utah gets \$45.26 million as its share of royalties in the pair of initial federal leases on a tiny portion of the Uintah Basin oil shale lands. If the state obtains long-sought title to the leased lands, its royalty on just the two leases could

## The Salt Lake Tribune

Business Local News  
Highlights Sports

Sunday Morning,  
July 7, 1974

Section B Page One



Robert S. Halliday  
A Look at Energy

almost triple, according to Utah Geological and Mineralogical Survey.

The national demand for oil and natural gas exceeding domestic supplies, the soaring price of Arab and domestic oil making extraction from oil shale and tar sands commercially attractive, the application of air pollution standards making western coal (lower in sulfur and ash content than eastern coal) a coveted fuel for

power plants . . . all combine to intensify industrial development of energy resources in the Colorado River Basin, particularly the tri-state treasure-house of Utah, Colorado and Wyoming.

If just the projects already surfacing are brought to fruition, the boom will be unprecedented and the economic potential astronomical by past Utah standards.

It makes the gold rush of the mid-1800s look like a neighborhood clam dig.

#### Mosaic Incomplete

The mosaic of proposed energy extraction, just beginning and by no means complete, was pieced together for this report from data and interviews with representatives of federal and state agencies and industry spokesmen.

It involves projects in eastern and southern Utah, all with tentative target dates for on-line production within 10 years, now in phases ranging from initial feasibility studies to construction and production. All are in the Colorado River drainage area of the state, where any new water allocations are subject to limitations of Utah's allotment of the river supply.

With unknown or uncertain factors,

some resource requirement figures are approximations, others extrapolated from similar operations, and some projects could fail to materialize due to changes in market conditions or obstacles such as water supply, labor or environmental conflicts. Water is considered the most critical factor.

#### New Power Plants

Six new power plant projects in Utah, if fully realized, would consume an estimated 171,200 acre feet of water and 37,600,000 tons of coal annually, with present technology.

A three-unit coal-gasification plant, tentatively pegged for production start in 1982, would reportedly require about 45,000 acre feet of water and 33 million tons of coal annually.

The prototype oil shale project in Uintah County will take an estimated 9,000 acre feet of water annually and, if the industry reaches its maximum potential, it reportedly would need more than 100,000 acre feet a year.

Under a recently announced \$1 billion contract between McCulloch Oil Co. and American Electric Power Co., new extraction and shipment of coal from the Helper area of Carbon County (by rail to American's eastern

power plant complex) will attain an annual rate of 6.5 million tons by 1982.

#### Unused Water

All combined, the above projects could ultimately require about 309,200 acre feet of water annually.

Utah has only 107,000 acre feet of uncommitted water available for them, representing the state's Colorado River allotment still unused and unallocated, according to BLM calculations.

Combined new coal extraction for these projects could reach a rate of 77,100,000 tons per year.

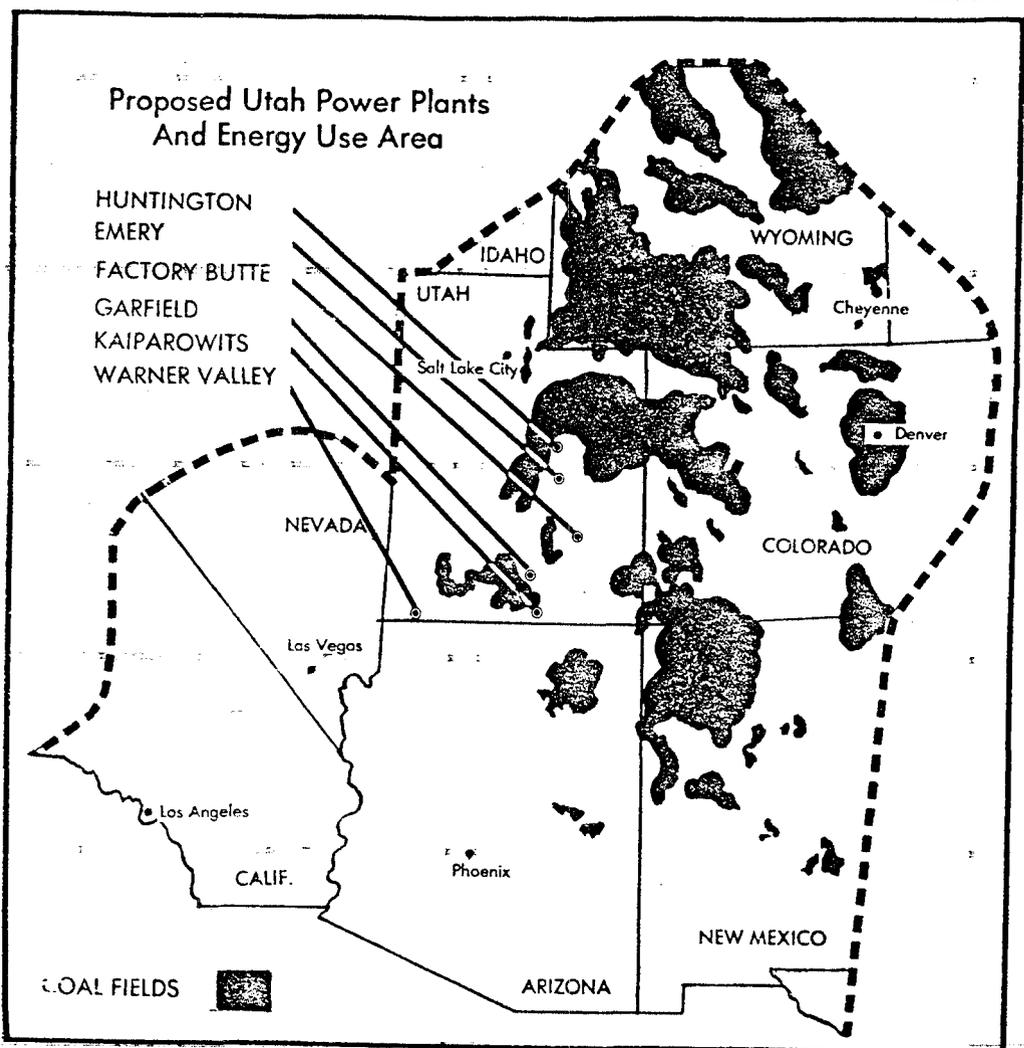
That's more than 10 times as much coal as Utah has ever produced in a year, although it is the largest coal-producing state west of the Mississippi.

Utah's highest was 7,429,000 tons in 1947.

In 1973, total state production was 5,650,000 tons, accomplished with 1,578 coal miners (1,242 underground).

#### Potential Output

On a strictly mathematical projection, disregarding any technology changes, the potential output of more than 77 million tons annually in Utah



The outline illustrates existing coal fields in the energy use area, and proposed power plants throughout Utah. Six new electric power plants in state would cost an estimated \$42.7 million.

by 1985 would require more than 21,000 miners.

And the demand for trained miners is already critical in the state, according to a study released in April by College of Eastern Utah, Department of Employment Security and Utah State Board of Education.

The report said all physically able, experienced miners in Utah are now employed, but "30 to 40 percent of them are past the retirement eligibility age of 55." It pointed out "there are few miners between the ages of 30 and 50."

#### Recruit Miners

Coal mining concerns currently are having to recruit potential miners from any available source, the mines have reached their capacity of unskilled recruits underground, and an extensive training program is urgently needed to cope with burgeoning production, the report stressed.

Due to overburden and the nature of Utah coal deposits . . . fortunately from an environmental standpoint from a percentage-recovery standpoint . . . they do not generally lend themselves economically to strip mining. Of the projected power plant

projects, all but one would involve underground mining. The lone strip-mine operation, a BLM spokesman said, would be at Alton, northwest Kane County, viewed as a possible supplier for a coal slurry line to new power plants near St. George and Las Vegas.

The anticipated population increases in Carbon-Emery and in the Uintah Basin will strain already overloaded facilities for water supply and wastewater treatment, according to the Environmental Health Bureau, State Health Division. The agency is giving high priority to pollution control expansion in these areas, a spokesman said.

Oil exploration is gaining momentum in Utah, according to Paul W. Burchell, chief petroleum engineer, State Division of Oil and Gas Conservation.

"There are seismograph crews all over the state now. A lot of wildcat drilling is sure to follow," he said.

Present drilling is significant, he pointed out, because it is tapping the "hidden giants," Utah's huge tar sand deposits, with tests planned for removal of these less-fluid deposits through thermal methods such as the fireflood technique.

"All kinds of core holes are being drilled in asphalt deposits now. Exploration activity also is moving from known oil fields in Uintah Basin onto the Great Basin range, such as under Great Salt Lake and the desert west of it," he commented.

## In 5-State Area

# Coal 'Most Practical' Source of Power

The 800 billion tons of coal in Utah, Wyoming, Colorado, northern Arizona and New Mexico "are the most practical and feasible source" of increasing electrical power to meet demands for the next 15 years in these states, as well as south portions of Nevada and California, according to a Southwest Energy Task Force report.

The two-year study, under auspices of the Department of Interior, found that the 1970 needs of this Southwest area were met by installed generating capacity of 27,800 megawatts (mw). It estimated the area need would jump to an estimated 58,600 mw by 1980, and double again to a 109,900 mw requirement by 1990. . . Southern California's needs amounting to 61 percent of the 1980 total and 59 percent of the 1990 total.

The task force commented that "alternatives to reduce the waste of energy . . . by the ultimate consumer have not been explored to any appreciable extent and appear to offer significant possibilities."

### Reclamation Costs

Among comments on environmental impact of the power developments in the Colorado Basin, the task force said:

- land reclamation costs in the Southwest are estimated to add only a few cents per ton to the cost of coal.

- addition of transmission lines adjacent to existing facilities or in new corridors will adversely affect Southwest vistas and landscapes and will bring attendant problems such as increased access and erosion.

- with minor exceptions, properly enforced state regulations are adequate to insure performance of power plants with national air quality standards for particulate matter and nitrogen oxides. Adequate removal systems for sulfur dioxide are expected to be available by 1977.

An industry spokesman said he has seen estimates of up to 40 new power projects for the Colorado Plateau.

Six new coal-fired plants are pegged for Utah so far. These include two Utah Power and Light Co. installations in Emery County and one proposed in Garfield County; the Kaiparowits plant in Kane County; Warner Valley plant near St. George, Washington County; and the sixth, which will be built on one of three sites under consideration, two near Caineville, Wayne County,

one near Escalante, Garfield County.

In addition, El Paso Natural Gas Co. is considering a coal gasification installation in the Kaiparowits area.

John McFall, spokesman for the company in El Paso, said:

"El Paso does have coal leases on the Kaiparowits Plain and we're investigating all aspects of developing these properties. However, we do not have any definitive plans at this time."

In Salt Lake City, a spokesman for the Bureau of Land Management said the El Paso firm has indicated it is considering installation of three coal gasification units on Kaiparowits, each to produce 288 million cubic feet of gas per day to be piped to southwest U.S. markets, with a production target date of 1982 for the first unit, the other two by 1990.

The three units would require an estimated 45,000 acre feet of water and 33 million tons of coal annually for full production, according to an energy industry specialist, who based calculations on production figures reported for a gasification plant now operating in the Four Corners area.

### Coal, Slurry Pipeline

Northwest Pipeline Corp., Salt Lake City, and Gulf Interstate Engineering, Houston, recently announced the possibility of building an 800-mile coal-slurry pipeline to the Pacific Northwest from "one of the coal-rich Rocky Mountain states," to convey coal equivalent to 650 million cubic feet of natural gas per day.

If this project also taps Utah coal resources, using the same calculations as above, it would take an estimated 30,000 acre feet of water and more than 20 million tons of coal annually. With other projects listed, this would swell potential coal production requirements in Utah to about 100 million tons a year.

Following are profiles of the six power plants projected in Utah, their location, rated capacity, resource requirements, cost, tax revenue potential and on-line target dates:

**HUNTINGTON PLANT.** Emery County, Utah Power & Light Co. First 430-megawatt unit now in service, second scheduled on-line in 1977. Two other units contemplated, depending on several factors, including environmental safeguards, for ultimate total of 2,000 mw. Four units would require estimated 24,000 acre feet of water and 4,800,000 tons of coal annually, and 4,800,000 tons of coal annually, with present technology. Total cost estimate, \$550 million; generating estimated \$4.8 million annually in new state-county revenue.

**EMERY PLANT.** Emery County, Dole and Ferron, Emery County,

Utah Power & Light Co. Two 415-megawatt units; Draft Environmental Impact Statement in preparation; on-line target dates, 1978 for first unit, 1980 second unit. Would require 7,000 acre feet of water (using new wet-dry cooling process, which cuts water needs in half) and two million tons of coal annually; plant cost estimated \$245 million; to generate estimated \$4.8 million in new state-county revenues yearly.

**GARFIELD PLANT.** seven miles south of Escalante, Garfield County (other sites under consideration), Utah Power & Light Co. Four units, total 2,000 megawatts, requiring estimated 30,000 acre feet of water and five million tons of coal annually. Plant cost estimate (at current rates) \$620 million; generating new state-county revenues of approximately \$4.8 million. On-line target dates, first two units between 1982 and 1985.

**KAIPAROWITS PLANT.** Maple Bench or Fourmile Bench, Kaiparowits Plateau, Kane County, 15 miles northwest of Glen Canyon Dam, owned jointly by Southern California Edison Co. (40 percent), San Diego Gas and Electric Co. (23.4 percent), Arizona Public Service Co. (18 percent), Salt River Project (10 percent) and 8.6 percent uncommitted. Four units, total 3,000 megawatts, requiring estimated 42,000 acre feet of water and nine million tons of coal annually. Plant cost estimated \$1.5 billion; generating approximately \$10.7 million annually in new state-county revenues. On-line target dates, first unit 1982, all units 1982.

**INTERMOUNTAIN POWER PROJECT.** owned jointly by City of Los

Angeles (50 percent), Intermountain Consumers Power Assn. (24 Utah municipal and cooperative power systems) 15 percent; the remainder owned in varying percentages by California cities . . . Anaheim, Riverside, Burbank, Glendale and Pasadena. Three sites under consideration; two near Caineville, Wayne County, one near Escalante, Garfield County. Four units, total 3,000 megawatts, requiring estimated 50,000 acre feet of water and about nine million tons of coal annually. Plant cost presumably in the Kaiparowits bracket, about \$1.5 billion, with \$10.7 million to be generated in new state-county revenues annually. On-line target dates, first unit 1981, all units by 1985.

**WARNER VALLEY PLANT.** just east of St. George, Washington County, owned by Nevada Power Co. (75 percent) and City of St. George (25 percent), planned in conjunction with another new Nevada Power plant near Las Vegas. Warner Valley plant, 500 megawatts, to require estimated 10,000 acre feet of water annually. Coal for both plants, estimated at eight million tons annually, proposed for conveyance by slurry pipeline from coal field in northwest Kane County, at the head of the Virgin River. Slurry line (requiring equal volumes of water and coal) would call for additional 7,200 acre feet of water per year, running about 146 miles from source to St. George to Las Vegas. Warner Valley plant cost estimated \$250 million, generating new state-county revenues estimated between \$2.5 and \$3 million. On-line target dates, Warner Valley units, 1978 and 1979.

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