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COAL RESOURCES OF THE DAKOTA SANDSTONE, SOUTHWESTERN COLORADO

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CONTENTS

	Page
ACKNOWLEDGMENTS	v
INTRODUCTION	1
PREVIOUS STUDIES	4
GENERAL GEOLOGY	6
Topography	6
Stratigraphy	6
Structural Geology	10
Depositional Environments	12
PROJECT FINDINGS	15
Drill Holes	15
Mines and Production	17
Water Wells	17
Miscellaneous Information	18
Analytical Information	18
Resource Estimates	21
ECONOMIC CONSIDERATIONS	60
Past Mining	60
Leasing Interest	60
Marketability	60
Fluidized-Bed Combustion	62
CONCLUSIONS	63
BIBLIOGRAPHY	64
APPENDIX	76
Explanation of additional material contained in Open File Report 86-1B	

FIGURES

Page

1. Index map of the study area..... 3
2. Generalized stratigraphic section of basal Cretaceous and Upper Jurassic rocks, southwestern Colorado..... 8
3. Major physiographic and structural elements, southwestern Colorado..... 11

TABLES

1. Drill hole information - Dakota coal, southwestern Colorado..... 24
2. Mine information - Dakota coal, southwestern Colorado..... 30
3. Water Well information - Dakota coal, southwestern Colorado..... 33
4. Miscellaneous information - Dakota coal, southwestern Colorado..... 37

5A. Coal analysis information - Dakota coal, southwestern Colorado..... 44

5B. Coal analysis information - Dakota coal, southwestern Colorado (continued)..... 50

6. Coal analysis information from AMAX Coal Co. - Dakota coal, southwestern Colorado..... 57
7. Lease information - Dakota Coal, southwestern Colorado..... 59

PLATES

(all in pocket)

1. Coal resource data, southwestern Colorado

2. Map A Coal resource data, Gunnison River Valley
   Map B Coal resource data, Montrose area
   Map C Coal resource data, Nucla Northwest area

3. Map A Coal resource data, Nucla-Naturita area
   Map B Coal resource data, Norwood area

4. Map A Coal resource data, Dove Creek area
   Map B Coal resource data, Yellow Jacket-Dolores area

5. Coal resource data, Cortez East area

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INTRODUCTION

This report is the result of a cooperative project performed by the Colorado Geological Survey and funded by the U.S. Geological Survey's Branch of Coal Resources (under Cooperative Agreement No. 14-08-0001-A0086).

Coals contained in the Dakota Sandstone underlie large areas of southwestern Colorado. Although vast resources of Dakota coal are known to exist in the area, they have never before been studied in detail. This project is a reconnaissance resource study of the Dakota coals within parts of the San Juan River Region where they are known to occur at strippable depths over large areas. The study area includes Montezuma, Dolores, San Miguel, Montrose, northern Ouray, southern Delta, and western Mesa Counties (see Figure 1). The southeastern part of the San Juan River Region, contained in La Plata and Archuleta Counties, has been excluded from the study due to the relatively small amount of strippable coal present in that area.

Previous studies on the geology of this region have primarily focused on uranium and petroleum resources rather than on the coal resources. However, these studies do contain some useful information, particularly relating to depositional environments of the Dakota Sandstone.

Coal studies which have been done in the past are local rather than regional in nature and provide useful data in the few localities where they were done. Depositional studies are important in locating economic coal deposits, since coal deposition in this area is erratic in nature. Information from this report may help geologists reconstruct the original conditions of deposition which are reflected in the present distribution of coal in the region.

Significant information on Dakota coals is scattered through company records, governmental agency files and the literature, but had never been compiled in one map or report. Drill hole information, mine data, outcrop measurements, and coal analyses have been incorporated into this report.

Coal mines have historically supplied domestic and local markets in the southwestern Colorado region, but in recent years the only significant production has been to supply the power plant at Nucla. Because of thicker and cheaper competing coals in nearby regions, quality problems, and lack of a

local market, coal resources in the area are mainly undeveloped and currently uneconomic. However, with the depletion of competing coals and changes in market conditions, these Dakota coals may provide an economic resource in the future.

The purpose of this report is to provide useful information to anyone conducting a coal evaluation, or planning coal exploration in this region. Planners and governmental land managers in the area should find this information helpful in making land use decisions. This resource information may lead to an increase in coal availability to homes, ranches, and businesses in the region.

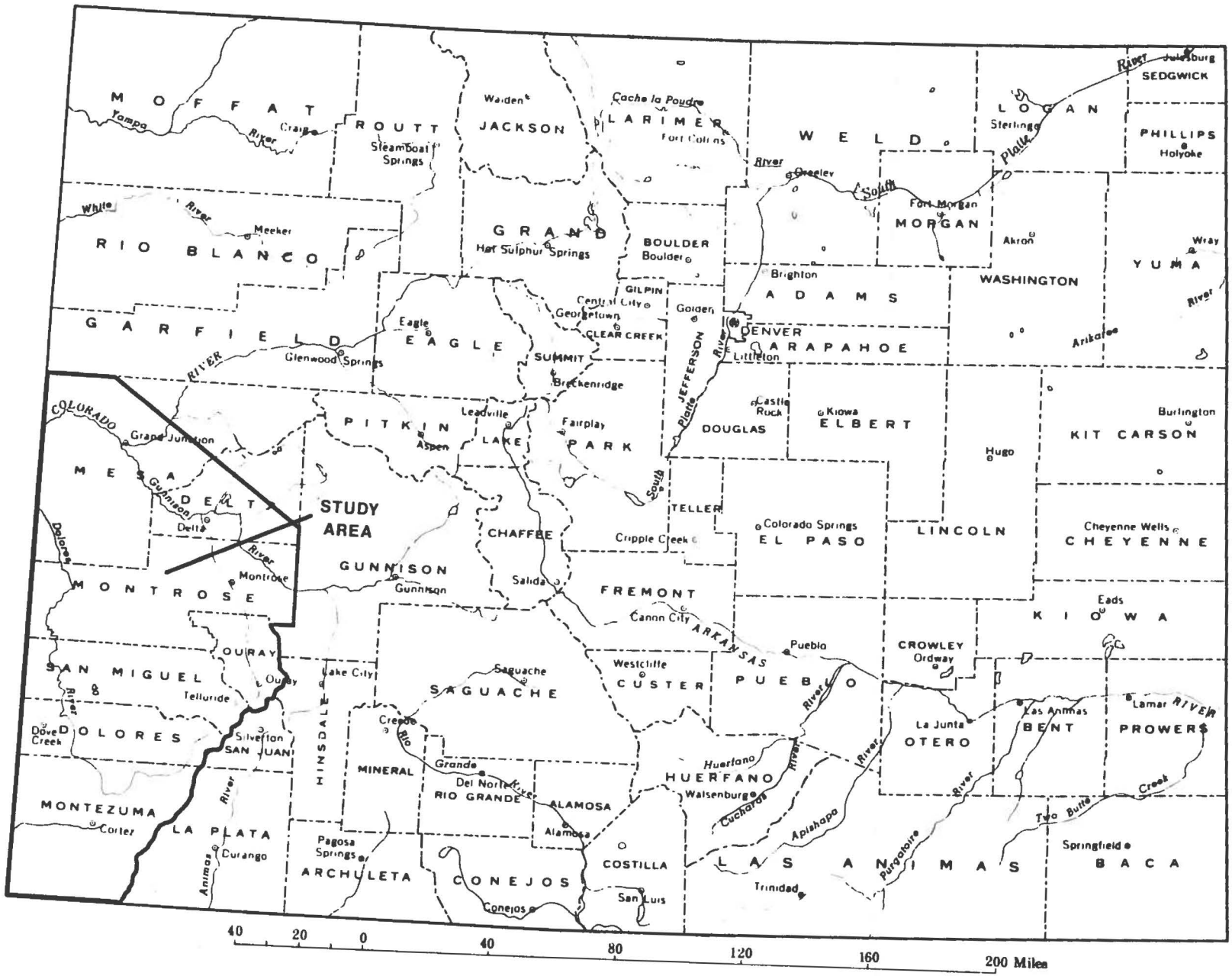

Figure 1. Index map of the study area.

PREVIOUS STUDIES

A significant amount of literature has been published on the geology of southwestern Colorado, much of it by the U.S. Geological Survey (USGS). Quadrangle mapping and various special studies were performed at a rapid rate during the 1950's in response to the sudden demand for the uranium resources of the area. USGS reports which contain general geological information, or focus on uranium, were authored by Boardman, Bromfield, Burbank, Bush, Cater, Eicher, Ekren, Finlay, Hackman, Haynes, Houser, Joesting, Luedke, Marshall, McKay, Rogers, Shawe, Shoemaker, Steven, Stokes, Vogel, Wanek, Weir, Williams and Withington. These reports do not focus on coal resources, but include stratigraphic information on the Dakota Sandstone and general coal occurrences within the unit. Geologic mapping, which was done by the USGS in the course of formulating these publications, delineates the extent of the Dakota Sandstone in the region, which is essential in the evaluation of the Dakota coal resources. These USGS reports are contained primarily within the GQ, MF, and Bulletin series.

Several USGS publications focus specifically on Dakota coal resources in the region. The report by Barnes and others (1954) primarily deals with coals of the Mesa Verde Group, but mentions several Dakota coal occurrences. Boyer and Lee (1925) studied Dakota coal occurrences in several areas of southwestern Colorado and southeastern Utah. Their unpublished manuscript contains many useful measured sections and mine measurements. Reports on drilling projects are contained in separate papers by Cullins and Bowers (1965) and Haines (1978). Drilling in the east Cortez coal area is summarized by Cullins and Bowers, whereas Haines provides information on a small drilling project in the Nucla Coal Field.

Ellis and Hopeck (1982) measured and mapped thin, dirty Dakota coal beds in a small area near the Colorado-Utah border. Dakota coal resources of southwestern Colorado are discussed in the 1959 and 1972 publications of Landis on coal resources of Colorado. Lee (1909) mentioned Dakota coals in his report on the Grand Mesa coal field. Dakota coals are also mentioned in Richardson's 1909 report on the Book Cliffs Coal Field and Shaler's 1907 survey of the Durango-Gallup Coal Field. The coal resources of the Gunnison Valley, which include Dakota coals, are described by Woodruff (1912).

Many publications other than those of the USGS contain useful information on the stratigraphy of the Dakota Sandstone in the region. Beaumont and others (1971), Fassett (1977), Kostura (1975), Owen (1963, 1969), Simmons (1957), Tyrell (1959), Wilson and Livingston (1980), and Young (1960), among others, authored papers on coal deposition and stratigraphy of the Dakota Sandstone. The Wilson and Livingston (1980) paper deals very specifically with depositional environments of Dakota coal within the region covered by this report. Boos (1950) wrote a report on Colorado coal which includes locations of Dakota coal exposures throughout southwestern Colorado, as well as pertinent information on mining activity in Dakota coal beds at that time. Coffin's report of 1921 discusses Dakota coal occurrences and early stratigraphic framework for the region. Duebrouck (1972) presents washability information on coals, which include those from the Dakota in southwestern Colorado.

In a report on coal fields of eastern and northern Utah, Doelling and Graham (1972) mention Dakota coals of southwestern Colorado, as did Gregory in a 1938 USGS paper. Analyses of Dakota coals are included in George's 1937 paper of Colorado coal analyses. A study of mineral resources and geologic hazards in Montezuma and Dolores Counties, by Johnson and others (1976), contains an abundance of useful information on Dakota coal occurrences. Schwochow's 1978 survey of mineral resources in Mesa County also provides some helpful information. Two coal resource studies authored by Shomaker and others contain significant information on Dakota coals in the region. Shomaker and others (1971) covers strippable low-sulfur coals of the San Juan Basin in Mew Mexico and Colorado, and includes drill hole data from drilling done in the Cortez area in conjunction with the study. Shomaker and Holt (1973) studied coal resources of the Southern Ute and Ute Mountain Ute Indian reservations in Colorado and New Mexico. Speltz (1976) calculated the strippable coal resources of Colorado, including strippable resources of the Dakota Sandstone in the region.

In addition to the vast amount of information obtained from the publicly available literature, further data on Dakota coals in southwestern Colorado was obtained from individuals, companies and governmental agencies. These information sources are discussed in the acknowledgements. Primary sources from published literature, from which significant data was compiled for use in the tables and maps, include the following: Boyer and Lee (1925), Cullins and Bowers (1965), Haines (1978), Johnson and others (1976), Lee (1929), Shomaker and others (1971) and Woodruff (1912).

GENERAL GEOLOGY

Topography

Southwestern Colorado is primarily within the Colorado Plateau physiographic province, and consists of dissected plateaus with moderate to strong relief. Four major rivers transect the area: the Colorado, Gunnison, San Miguel and Dolores Rivers.

Over most of its outcrop area, the Dakota Sandstone forms a slightly undulating surface. This is most noticeable in an area informally called the Sage Plain, a large, relatively flat area between Cortez and Dove Creek, as well as on the tops of numerous mesas and plateaus in the central part of the region. The Dakota is exposed at the surface over most of the Sage Plain except where it is masked by a thin cover of Quaternary deposits.

In general, the topography of the region reflects the underlying structure because the relatively resistant Dakota Sandstone has tended to retard erosion, whereas the overlying soft Mancos Shale, and the carbonaceous shale member of the Dakota, are very susceptible to erosion. One of the two resistant sandstone members of the Dakota Sandstone generally controls the surface topography.

The Dakota Sandstone is best exposed on canyon rims, where it forms one, and in some places, two resistant ledges in areas of relatively horizontal stratification. Hogbacks and cuestas are formed by the Dakota where it is relatively steeply dipping, such as along salt anticlines which are common in the Paradox Fault and Fold Belt.

Stratigraphy

The Dakota Sandstone is composed mostly of sandstone with lesser amounts of conglomerate, carbonaceous shale and mudstone, and coal. Sandstones in the Dakota are predominantly fine-to-medium grained, light brown to dark gray, and carbonaceous. They are thin bedded to massive and generally cross-bedded. The thickness of the Dakota varies, but is generally 150 to 200 feet thick in the region. Throughout the region, the Dakota can generally be divided into

an upper sandstone unit, a middle carbonaceous shale unit, and a lower conglomeratic sandstone unit. Extensive information on the stratigraphy of the Dakota Sandstone is drawn from Shawe (1968). Figure 2 is a generalized stratigraphic section of the basal Cretaceous and Upper Jurassic rock units in southwestern Colorado.

The Dakota grades transitionally upward into the Mancos Shale through a series of thin alternating sandstone beds and carbonaceous shale interbeds. The contact is conformable and gradational (Bromfield, 1967). Lagoonal and beach deposits of the uppermost Dakota Sandstone grade into the marine Mancos Shale, indicating transgression of the Cretaceous inland sea in the region. The basal Mancos beds commonly consist of reworked material from the Dakota Sandstone.

A regional unconformity separates the Dakota from underlying formations. The Dakota Sandstone disconformably overlies the Brushy Basin Shale Member of the Morrison Formation throughout most of the region. Lithologic dissimilarity between the Brushy Basin Member and the Dakota Sandstone facilitates identification of the formational boundary with the underlying Morrison Formation where it is present.

Where the Morrison Formation is not present, the Dakota Sandstone overlies the Burro Canyon Formation. The contact between the Dakota and Burro Canyon Formations, although disconformable, is not easily distinguished because the sandstones and conglomerates are similar in both formations. The presence of green mudstones in the Burro Canyon Formation, compared to dark gray or black mudstone of the Dakota Sandstone, is in some places a basis of distinction between the formations. The basal contact of the Dakota is generally a scour surface that in places contains boulders and pebbles derived from the Burro Canyon Formation (Carter and Gualtieri, 1957).

The lower sandstone unit of the Dakota Sandstone is composed of sandstone and conglomeratic sandstone, carbonaceous shale, siltstone and thin coal beds. Sandstones in the lower sandstone unit typically occur in lenses, are festoon cross-bedded, and show abundant scour-and-fill structures characteristic of fluvial sediments. The conglomerates in the Dakota contain rounded to sub-rounded pebbles of sandstone, quartzite, and chert, which in most places

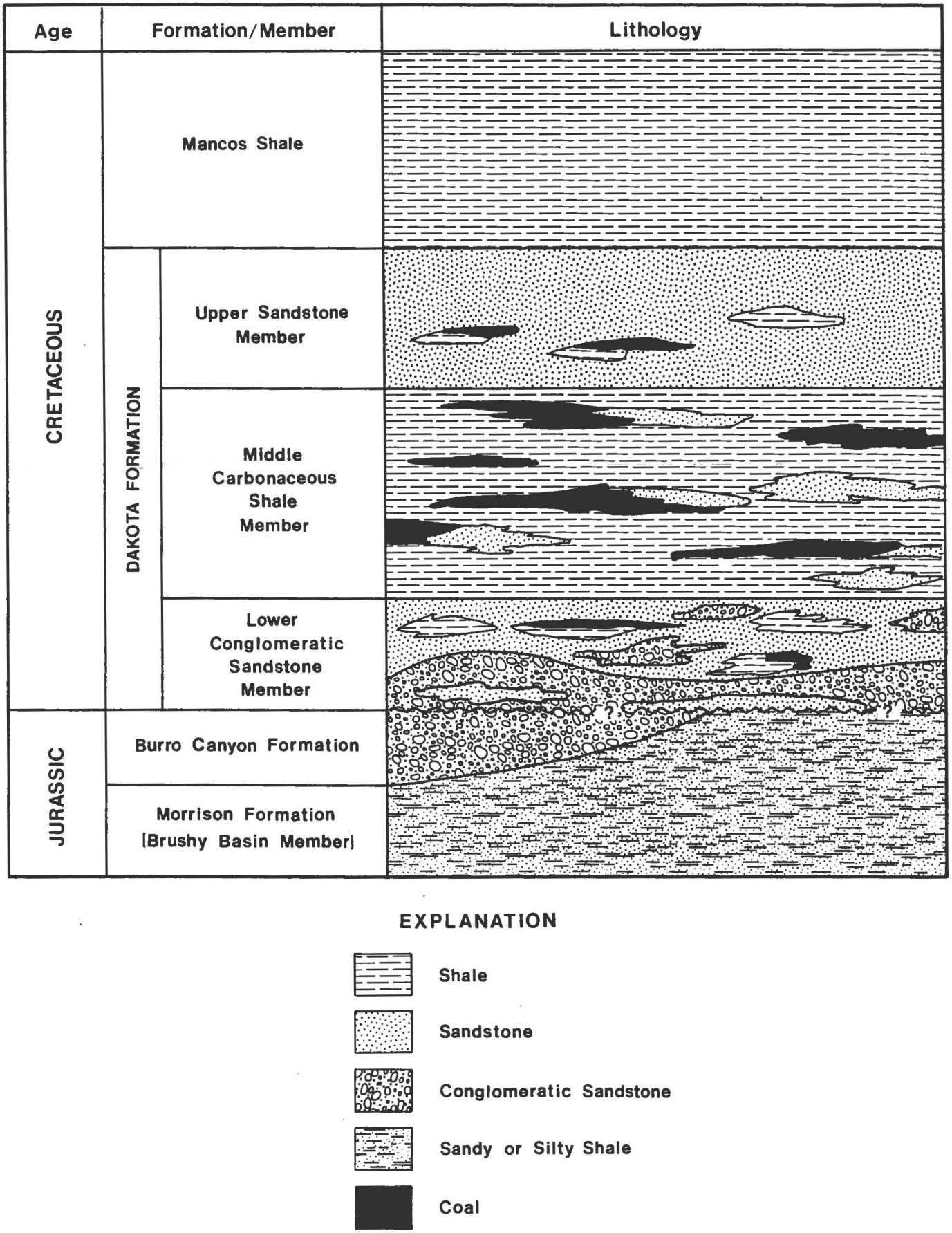

Figure 2. Generalized stratigraphic section of basal Cretaceous and Upper Jurassic rocks, southwestern Colorado.

are colored drab gray and brown. Locally, conglomerates at the base of the Dakota contain cobbles up to one foot in diameter. Other lithologic criteria should be used to distinguish the base of the Dakota Sandstone, although the occurrence and position of the basal conglomerate typically reflects the disconformity of the lower contact (Carter, 1957; Shawe, 1968).

The shale, mudstone and coal beds in the middle part of the Dakota are thin, but generally evenly bedded. The shale and mudstone are characterized by an abundance of carbonaceous material, and the mudstone contains appreciable silt and sand size particles. In many places these rock types grade laterally into sandstone, siltstone, and coal. The coal beds are characterized by extreme lenticularity and a large proportion of impurities in the form of shale, bone, and bony coal. Coal beds occur throughout the Dakota, but are generally more concentrated in the middle unit.

The sandstones in the upper sandstone unit tend to be more laterally extensive than those in the lower unit. These sands are primarily medium to fine-grained and cross-bedded. They contain ripple marks in places, and locally show abundant sand-filled "worm borings". These sandstones are interpreted as being predominantly of marine or marginal marine origin. The upper sandstone unit probably represents deposition in coastal and near-shore marine distributary channel environments during transgression of the Cretaceous sea from the north and southeast.

Regionally as a unit, the Dakota Sandstone grades from lenticular non-marine beds of sandstone and carbonaceous shale in the northwest part of the study area, to regularly stratified and more laterally persistent marine beds of shale and sandstone in the southeastern San Juan Basin, New Mexico. Vertical and horizontal lithologic sequences show changes in depositional environments as a result of a Cretaceous epicontinental sea transgressing across the basin from northeast to southwest.

The age of the Dakota Sandstone has not been definitely established because of the lack of fossil evidence. It is not the same age everywhere, since the beds were not deposited synchronously on the shores of the transgressing sea.

Structural Geology

The general structure of most of the region is relatively simple, although some local folding and faulting is present. The primary regional structures of southwestern Colorado and surrounding areas are shown in Figure 3. The area is primarily within the Colorado Plateau Province, which is characterized by gentle regional uplift. The San Juan Basin bounds the study area on the southeast, where due to the regional dip, Dakota coal beds occur at great depth and are therefore not economically recoverable. The east side of the southern part of the region is bounded by the San Juan Mountains. Some Dakota coal is exposed on the western side of the mountains. Significant deposits do not occur in this area because complex geologic structures, such as faulting and folding related to intrusives, result in discontinuities. The coals are locally upgraded in the area near Rico and Dunton.

The Gunnison Uplift and the Piceance Basin form the northeastern boundary of the Dakota coal region. In the Piceance Basin, Dakota coal occurs at considerable depths. The southern and western boundaries of the study area are the New Mexico and Utah state lines, but no major structural elements near these borders affect the southwestern Colorado region.

The study area falls within ten tectonic divisions of the Colorado Plateau (Kelley, 1955). The three primary tectonic divisions in the region are the Four Corners Platform, which includes the Cortez area, the Paradox Fault and Fold Belt, which includes the Nucla-Naturita and Norwood areas, and the Uncompaghre Uplift, between Nucla and Grand Junction. The Four Corners Platform generally dips gently to the southeast and is transitional into the San Juan Basin. The Paradox Fault and Fold Belt is generally considered to be within the Paradox Basin. The part of the belt within western San Miguel and southwestern Mesa Counties is often termed the Salt Anticline Region. Localized steep dips occur in association with the anticlinal structures. Coal is frequently exposed along the flanks and eroded from the crests of the folds. Uranium occurrences are abundant in this region. Along the Uncompahgre Plateau, the regional uplift causes rather steep dips of coal beds which are draped over the Plateau. Along the southwestern and northeastern margins of the uplift, faulted monoclines parallel the main axis and locally further steepen the strata. The other seven tectonic divisions of the region

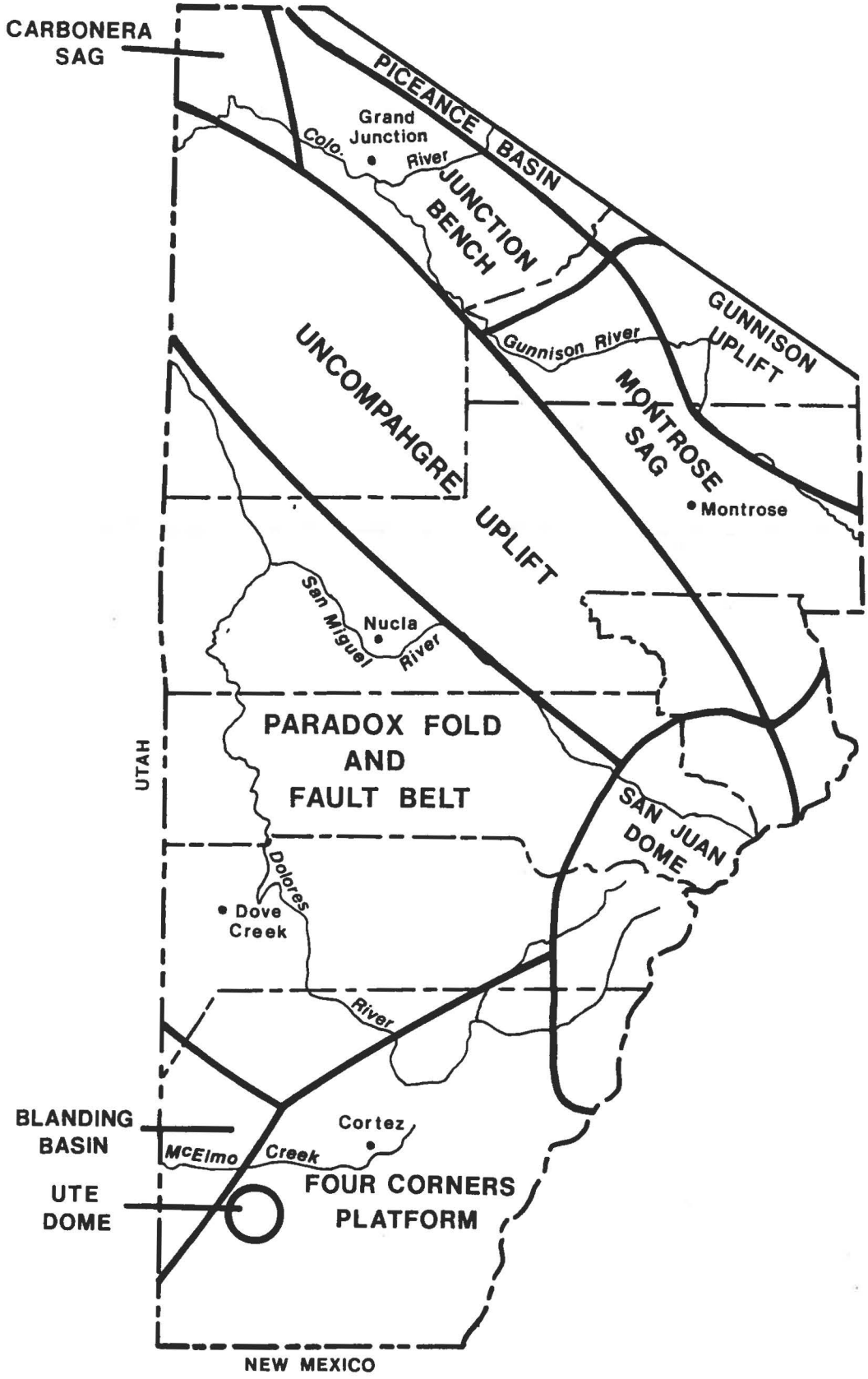

Figure 3. Major physiographic and structural elements, southwestern Colorado.

are the Blanding Basin, a small area at the southwest, the Ute Dome southwest of Cortez, the San Juan Dome, which forms the San Juan Mountains and along the northeast side the Montrose Sag, the Gunnison Uplift, the Junction Bench and the Carbonera Sag. Dakota coal in the Uncompahgre River Valley between Delta and Ouray, including the Montrose area, is within the Montrose Sag. Dakota coals found along Fruitland Mesa are on the western edge of the Gunnison Uplift. Coals along the Gunnison River Valley are within the Junction Bench, where dips are shallow. Many areas are certainly transitional between the defined tectonic divisions.

In general, there is little evidence of faulting within the region. Folding is primarily confined to the major structural features previously described. Steep dips which affect the coal are limited to the vicinity of the Ute Mountains, the Uncompahgre Plateau, and the Salt Anticline Region. Structural elements do not significantly affect the regional Dakota coal deposits in this area.

Depositional Environments

The Dakota Sandstone records a classic sequence of transgressive deposition that continued in front of, and at the margins of, an advancing epeiric sea.

The Dakota Sandstone was deposited on a broad coastal plain in front of the advancing Late Cretaceous sea in which the Mancos Shale was deposited. The Dakota resulted from the transitional environment between entirely continental deposits, represented by the underlying Morrison or Burro Canyon Formations, and entirely marine deposits of the overlying Mancos Shale. According to Owen (1963), the Dakota is almost totally marine in the southern part of the San Juan Basin and almost totally non-marine in the north.

The Burro Canyon Formation is a continental fluvial deposit with local lacustrine beds. The rocks indicate deposition by a series of meandering stream systems with adjacent terrestrial lakes (Young, 1960).

Owen (1963) states that the lower Dakota sandstones are fluvial in origin, the middle shale is derived from a swampy area, and the upper Dakota is the hardest to interpret and is probably indicative of nearshore environment,

possibly deltaic. From the interpretation of lithologies Owen determined that there are five primary depositional environments in the Dakota. These are:

1) braided-stream sandstone
2) meandering-stream complex
3) coastal shale
4) coastal sandstone
5) offshore shale

The basal Dakota was formed in dominantly fluvial conditions, based on sedimentary structures and the channeling nature of the basal conglomerates and sandstones. Owen interprets this as a braided-stream sandstone.

The middle Dakota Sandstone is characterized by thin, burrowed sandstones and by carbonaceous siltstones and shales deposited in fluvial and shallow marine environments. According to Owen (1973), deposition probably took place under a variety of floodplain, paludal and paralic conditions. Young uses different terminology, calling it a near-shore swamp or lacustrine environment. Wilson terms it a flood-plain/meandering stream complex with coal. This is indicative of the fact that interpretation of depositional environments can be varied according to the source of the interpretation.

The upper Dakota was formed in general by shoreface sand deposits. Owen defines a coastal shale, a coastal sandstone, and an offshore shale for the upper Dakota Sandstone.

One of the fundamental factors controlling coal distribution in the San Juan Basin is that the position of the shoreline was almost constantly changing. The sea advanced from the northeast, with many minor reversals, to some position beyond the present San Juan Basin, then retreated entirely. The cycle was repeated several times, and in each major cycle, as well as in the minor cycles, the coal swamp environment moved along with the shoreline. When the shoreline advanced rapidly, time was insufficient for a stable coal swamp to develop and a sand-rich sequence developed; conversely, if the shoreline was static for a long period, a stable swamp environment prevailed, resulting in a thick, areally extensive coal deposit. Thus, rapid shifts in shorelines resulted in the elimination of conditions favorable to accumulations of organic debris.

Sediment accumulation, although variable, was less than the rate of subsidence, which contributed to conditions of rapidly shifting shorelines,

little or no delta construction, and dirty, lenticular coals (Wilson and Livingston, 1980). Somewhat less rapid but constant changes formed persistent, but coal-poor carbonaceous sequences in the marginal marine environment. The organic material that eventually became coal, settled on the floors of infilled coastal lagoons, which resulted in the formation of swamps behind one-time barrier beach ridges. The swamps were narrow and irregular, and tended to be elongate parallel with the shoreline. Where streams entered the seaway, sand or silt was deposited, interrupting the linear continuity of the coal swamps (Shomaker and Holt, 1973).

Dakota coal was generally deposited in swamps of limited areal extent which developed along the flanks of streams rather than in lagoonal environments. The impure character of most Dakota coal beds indicates that the swamps received continuous input of non-organic matter. The lens-like shape and discontinuous nature of the coal bodies is a consequence of their forming in rather small, irregular swamps (Shomaker and Holt, 1973).

Correlations were not made in this report because of the lenticular character of the coals and the relatively wide spacing between data points. Data from a number of closely spaced drill holes throughout the region provides evidence of this lenticular nature. The lenticularity of the coals is observable in a good continuous exposure along the San Juan River near the Four Corners.

PROJECT FINDINGS

The information gathered on the Dakota Sandstone, and on Dakota coal in particular, indicates the extreme variability of the coal beds and associated lithologies throughout the region. Closely spaced drill holes are especially indicative of this high degree of variability. The primary sources of detailed information on Dakota coal were drill holes, mines, water wells, measured sections and miscellaneous observations of coal occurrences and coal prospects. Analytical information, principally derived from drill cores and mine samples, was also available.

Drill Holes

Information was available from approximately 240 drill holes which penetrated Dakota coal beds in the study area. This information is summarized in Table 1 and much of the source material is contained in CGS Open File Report 86-1B (see appendix). Areas of concentrated drilling are east of Cortez, the Sage Plain area, and the Nucla area.

In 1955, 53 holes were drilled east of Cortez for the Empire Electric Association to evaluate the proposed siting of a power plant. The drilling is discussed by Cullins and Bowers (1965).

The greatest number of holes, 77, was drilled for the U.S. Bureau of Reclamation during the period 1961 to 1985. These were primarily shallow core holes drilled for engineering studies at various proposed dam, tunnel or plant sites. The individual projects are itemized in the appendix. During 1984 and 1985, the U.S. Bureau of Reclamation drilled 27 holes specifically to determine the value of Dakota coal resources in the vicinity of Yellow Jacket, Colorado. The U.S. Bureau of Reclamation is building a canal which infringes on a coal leaseholding of Perma Resources, and the coal's value is in dispute.

For a report on strippable coal resources of the San Juan Basin, the New Mexico Bureau of Mines and Mineral Resources (see Shomaker and others, 1971) drilled and cored three coal exploration holes in the Cortez area.

Quinn Development Corporation conducted a mineral exploration project in the Montrose area in 1976. Good lithologic logs of four drill holes which penetrated Dakota coal were obtained from Bob Young.

Nine coal exploration holes were drilled and cored by the U.S. Geological Survey in the Nucla area during 1977. These were in response to a lease application by Peabody Coal Company in order to expand the Nucla Mine. A small tract was drilled with relatively close hole spacing (see Haines, 1978). Two continuous drill holes from Peabody Coal Company's Nucla Mine are contained in records of the Colorado Division of Mined Land Reclamation.

Ferret Exploration provided lithologic and geophysical logs of uranium holes which were drilled during 1977 and 1978. Twenty of these from an area northwest of Nucla provided useful information on Dakota coals.

AMAX Coal Company conducted a regional coal exploration program in the Sage Plain area during 1977 to 1979. The exploration was conducted because of the possibility of a power plant being built in the area by Colorado Ute Electric Association. Fifty holes were drilled and geophysically logged with a standard suite of logs for coal. Ash values were estimated for many coal beds and derived by analysis for others; these ash values are listed in Table 6.

In and around 1980, numerous coal exploration holes were drilled northeast and southeast of Dove Creek for Ed Baird of Dove Creek. Baird was trying to develop a coal mine to supply a uranium mill at Monticello, Utah. These drill holes were not accurately located, so they are not included in Table 1, but analytical information from them is listed in Tables 5-A and 5-B.

During 1982, 17 coal exploration holes were drilled and cored for Dorado Exploration (Bragonier, 1982). Dorado has since sold their interest to Western Energy. This project was conducted northeast of Cortez, between Cortez and Mancos. Due to the low quality, the study found the coal to be uneconomic to develop at that time.

Two uranium exploration drill holes described in USGS Professional Paper 576-A also contain useful data. Numerous uranium exploration drill holes from Cotter Corporation in the Radium Mountain area indicate thin coal beds. This drill hole information confirms the lenticularity of the coal in the area.

Mines and Production

The earliest production of Dakota coal was in the 1880's, but the peak period for most mining was from about 1920 to 1950. The last active Dakota coal mine in the region, the Nucla Mine, which was by far the largest, shut down temporarily in 1983. All Dakota coal mines were underground mines with the exception of the Nucla Mine. Most mines produced less than 10,000 tons of coal, and only four exceeded 100,000 tons of production. Two mines of the U.S. Vanadium Corporation, the U.S. Vanadium and the Liberty Bell, and the Fiddling Bill of the Vanadium Corporation of America, produced a combined total of about 375,000 tons of coal in the Nucla area. The Nucla Mine alone has produced about two million tons.

Most Dakota coal mines are located in one of three areas: the Cortez District, near Cortez and to the east, the Nucla-Naturita Coal Field, west and southwest of Nucla, and the Norwood area (formerly considered part of the Nucla-Norwood District) which is west of Norwood. A few mines were operated in the vicinity of Montrose and northwest of Dove Creek, an area which extends into Utah.

Table 2 lists 52 Dakota coal mines which have definitive location information. Twenty-nine others are also listed for which no location information was available. For many of these the formation from which the coal was produced is unknown. It is likely that many of these mined Mesa Verde Group coals.

An abundance of useful information about coal mining in this region is contained in Boyer and Lee (1925), and Boos (1950). These papers give fairly detailed accounts of coal mining which was being done at the time of their studies.

Water Wells

Coal information obtained from an examination of water well logs is shown in Table 3. About 175 well logs, most of which are concentrated in populated areas, are summarized in the table. Only information relating to coal is included. This information is derived from drillers' logs only, with no geologists' or geophysical logs for support. Thus, the validity of this

information must be evaluated in conjunction with other available information which might be considered more reliable.

Miscellaneous Information

Table 4 summarizes information on Dakota coal which was derived from miscellaneous information sources. These sources include observed coal occurrences, measured sections, coal prospects, unnamed mines and sites where the absence of coal was noted.

Eighty outcrop coal occurrences have been included. These were primarily derived from Johnson and others (1976), Shomaker and others (1971), and from field investigation done by the author during May, 1985. Boos (1950) described many coal occurrences throughout the region, including "along the edges of Dry Creek Basin, along the edges of Disappointment Valley (especially the south side), at the west end of Paradox Valley (near Coke Ovens), in the vicinity of McElmo Canyon, and between Nucla and the mouth of Tabeguatche Creek". Many specific coal occurrences have been described in the region, particularly in Montezuma County by Johnson and others (1976).

Measured sections are taken primarily from three sources. Boyer and Lee (1925) included numerous measured sections in their report, principally from the Nucla area. A large number of measured sections for the Gunnison River District are contained in Woodruff (1912). Shomaker and others (1971) includes some sections from the Cortez area.

Seventeen coal prospects which are listed in Table 4 originate from various sources. Data for twelve unnamed mines listed in Table 4 was derived primarily from Wilson (1985), Johnson and others (1976), and Boyer and Lee (1925). Four specific locations where no Dakota coal is present are also listed in Table 4.

Analytical Information

Extensive coal analysis data was available from various literature and company sources. Analytical information on Dakota coal has been summarized in Tables 5-A, 5-B and 6. Approximately 250 individual analyses are included in the tables, including those from different beds in the same core hole and/or

different analytical basis. These were taken from 76 different locations, and supplied primarily by eleven sources.

Woodruff (1912) and Lee (1909) give analyses of coal in the Gunnison River District. The coal ranges from high-volatile A to C bituminous. An increase in sulfur, fixed carbon and heat content is observed from north to south.

Information on coals west of Dove Creek, mostly from Utah, is provided by Gregory (1938). Gregory compares the quality of Dakota coal of southwestern Colorado and southeastern Utah. The Nucla area coals have the best quality; the Ucolo area (between Monticello, Utah and Dove Creek) has coals of intermediate quality; Cortez area coals are lowest in quality. Analyses of numerous Dakota coal mine samples are given in George's (1937) report.

Shomaker and Holt (1973) give analytical data on coals of the two Ute Indian Reservations, and washability data is included. The only other identified source of washability data is Godbe (1985).

Analyses of coal from a small tract of land in the Nucla area are reported in Haines (1978). Some data from the Cortez East area is provided by Canis and Krantz (1955).

Bragonier (1982) gives analysis data derived from a drilling project northeast of Cortez. This area has an excellent strip ratio, but the project was abandoned due to the low coal quality (generally 40 to 50 percent ash and low Btu).

Coal quality data from AMAX Coal Company (1985) drill holes is limited to ash content only (see Table 6). Ash ranges from about 22 to 55 percent, with a weighted average of about 34 percent. Ash was estimated from geophysical logs to be as high as 68 percent, however, beds with high ash contents were termed "coaly carbonaceous shale" by AMAX.

Numerous analyses were provided by Ed Baird (1985). Drill hole logs are not available, so no information is available on coal bed thicknesses and depths. Improper sampling may have contributed to erroneous analytical results. These data show that coal on the Disappointment Valley tract is generally 8,000 to 9,000 Btu/lb, but up to 10,300 Btu/lb in the southwest part of the State

section which was drilled. In the Dove Creek area drilled by Baird, the heating value of the coal is reported to be only about 7,000 Btu/lb.

Good analytical information was provided by the U.S. Bureau of Reclamation (1985) for an area in the vicinity of Yellow Jacket in Montezuma County.

Tables 5-A and 5-B contain most of the analytical information which was obtained in this investigation. Table 5-A lists the following information (where available) for each analytical data point:

1) location by county, 7.5' quadrangle, township, range, and section
2) information source
3) laboratory name and lab sample number
4) coal bed name, thickness and depth ranges
5) analytical basis
6) proximate analysis data: percentages of moisture, volatile matter, fixed carbon and ash

Table 5-B is a continuation of Table 5-A, and information on it is indexed to Table 5-A. The following information is listed on Table 5-B:

1) ultimate analysis: percentages of carbon, nitrogen, oxygen, hydrogen and sulfur
2) heating value in Btu/lb (as-received basis) and on a moisture and ash-free basis (MAF)
3) the Hardgrove Grindability Index (HGI)
4) the ash softening temperature (AST) in degrees Fahrenheit
5) remarks

Table 6 gives information from drilling done by AMAX Coal Company, for which ash values only are given. Most ash values are estimated (by AMAX) from lithological and geophysical logs only. Ten of the ash values are derived from analysis of coal cores. These values are reported in percentage to two decimal places, whereas the estimates are given to one percent. Table 6 contains the following information:

1) location by county, 7.5 quadrangle, township, range, and section
2) coal bed elevation and thickness
3) ash percentage, either estimated or from analysis
4) remarks: lithologic description from AMAX

To a limited extent, Dakota coal was formerly used for coking. Some coals from the Norwood area, the Coke Ovens field southwest of Nucla, and in the vicinity of Rico were coked around the turn of the century. Only isolated zones within coal beds were suitable for coking.

The coal beds of the Dakota Sandstone are generally high in ash content and will require significant preparation for use as fuel for traditional steam power generation. Several methods might be employed to improve the ultimate coal quality. Selective mining might be used to reduce the amount of waste in the mined product. For thin beds with numerous partings, as is typical for the Dakota coals, this alternative may be impractical in many instances. Coal cleaning would be necessary to increase the product quality to match boiler specifications. Separation of impurities by washing adds significantly to the final cost of the delivered product, especially considering the reduced volume of mined coal remaining after washing.

Alternate uses of the coal, such as in fluidized bed combustion, may require no preparation and the quality requirements may be reduced. This will be discussed later in this report.

Resource Estimates

Several reports on Dakota coal include estimates of the amount of coal in particular areas. These are summarized below. No resource estimates have been done in this report, due to the large area being discussed and the lenticular nature of the coal.

Landis (1959) calculated coal resources of 46 million tons (MT) for Montezuma County within T34-36N, R13-15W. This area includes coals from both the Mesa Verde Group and the Dakota Formation, which have not been differentiated. In a later report, Landis (1972) calculated 2.2 MT of coal for about one square mile within T36N, R16W east of Cortez. In the Nucla-Naturita Field, Landis calculated resources for four townships as follows: T46N, R15W: 14.8 MT; T46N, R16W: 54.9 MT; T47N, R15W: 13.6 MT; T47N, R16W: 31.0 MT. A total area of about 15 square miles was included in these calculations. In the Cortez area, Landis extended his area of calculation about one-half mile from known points of information. For the Nucla-Naturita area, a distance of one mile was used. These resources are therefore all in the measured and

indicated categories. No resources were inferred due to the geologic irregularity of the coals.

Speltz (1976) conducted a study of strippable coal resources throughout Colorado. For Dakota coal in southwestern Colorado he used water wells extensively as his information source and assumed a three foot thickness of coal where no information existed. Using this methodology, Speltz calculated strippable resources of 2.9 billion tons of Dakota coal within 502,000 acres.

The New Mexico Bureau of Mines and Mineral Resources (Shomaker and others, 1971) conducted exploratory drilling and coring in T36-37N, R14-16W, east and north of Cortez. They state that a reserve of 159 million tons exists from "fairly continuous" beds 3-13 feet thick in a 34 square mile area. Of this amount, 19 MT is strippable, or within 150 feet of the surface.

Canis and Krantz (1955) state that "unproven but known millions of tons of strippable coal" are within a five mile radius to the east and northeast of the area drilled by Empire Electric (see Plate 5). Three principal coal beds were identified in the drilling. The beds average three feet thick, with a maximum thickness of eight feet. The No. 1 bed is thin and dirty. About ten feet separate it from the No. 2 bed, which is six to eight feet in thickness, and the most uniform in quality and thickness. About 20 feet below the No. 2 bed is the No. 3 bed, which is generally not as thick, or of as good quality as the No. 2 bed. The beds are not present over the entire area, due to channel sandstones which cut them out, or facies changes into carbonaceous shales. Five sections which were drilled in T36N, R15W: 21, 22, 23, 27 and 28, have an average coal thickness of about five feet. It should be noted that core recovery was a problem in this drilling program, and that coal thicknesses reported from the drilling tend to be higher than nearby outcrop measurements.

For the area north and east of Cortez, reserve estimates have come from several sources. In the Canis and Krantz (1955) report to Empire Electric, 4.3 MT were calculated in a bed 3.5 to 13.5 feet thick, with an overburden of less than 56 feet. The USGS (Cullins and Bowers, 1965) estimates 10.5 MT of mineable coal (13.1 MT in place) in one bed under less than 90 feet of overburden. Shomaker and others (1971) gives an estimate of 50.4 MT under less than 150 feet of overburden, which includes measured, indicated and inferred coal and also coal in sections 32 through 35 of T36N, R15W.

In the Gunnison River District, Lee (1909) reports coal beds which are irregular in thickness, ranging from a few inches to almost four feet within short distances. Woodruff (1912) states that most coal is impure and resembles bone in this district. A few outliers of coal-bearing rocks occur on the dip slope of the Uncompahgre Plateau to the west. The coalbeds in this are are of little economic value because the beds are too thin.

Determining the areas which contain Dakota coals of the maximum thickness and quality is limited by locations of previous exploratory work. Available information is concentrated in several areas which have historically produced coal, plus a few other areas for which exploration drilling has been done. Maps which accompany this report are of varying scales as a consequence of the variability of data density throughout the region. Coal thickness isopach maps have not been compiled, since the lenticular coals cannot be correlated on a regional scale. Coal bed thickness and depth information is given where available.

Plate 1, at a scale of 1:250,000, shows the entire area of southwestern Colorado covered by this report. Data points which are in areas of relatively low data density are depicted on this plate. The eight areas covered on detail map on Plates 2-5, at various map scales, are identified. Plate 2, at a scale of 1:50,000, contains three maps. The Gunnison River Valley, the Montrose area and the Nucla Northwest area are depicted on Maps A, B and C respectively. Maps A and B of Plate 3 illustrate coal resource data for the Nucla-Naturita and Norwood areas at a scale of 1:24,000. A large area in parts of Montezuma, Dolores and San Miguel Counties is shown at a scale of 1:50,000 on Plate 4. Map A presents coal resource data for the Dove Creek area, and Map B covers data in the Yellow Jacket-Dolores area. Plate 5 is at a scale of 1:6,000 due to the high density of drill hole information in the Cortez East area.

TABLE 1

DRILL HOLE INFORMATION-DAKOTA COAL

SOUTHWESTERN COLORADO

Note: All depths and thicknesses are in feet. See end of table for explanation of abbreviations used and additional notes.

TWP	RGE	SEC	QTR	DATA POINT ID	SOURCE	CTY	7.5' QUAD NAME	SURF ELEV	TOTAL DEPTH	ANAL-YSIS	COAL THICKNESS AND DEPTH / REMARKS
003S	002E	19	SE	DH-7 to 10 (RB)	US Bur Rec	MS	Triangle Mesa				No coal in any of 4 drill holes; entire Dakota not penetrated
034S	025E	33	NE NE	43-037-312-001	AMAX Coal	SJ	Eastland (15')	6819.8	180.0	X	12.1 @ 31.9, core hole was offset (total depth 46 ft)
036N	014W	5	SW NE SW	MTZ-D-0019	Western Energy	MZ	Dolores East	7065.0	165.0	X	No coals analyzed; no thicknesses information
036N	014W	7	SE SW SE	MTZ-D-0010	Western Energy	MZ	Dolores East	6920.0	165.0	X	B seam 7.1 @ 90
036N	014W	17	SW NW SW	MTZ-D-0007	Western Energy	MZ	Dolores East	6865.0	112.0	X	B seam 7.5c/1.0p/3.3c @ 89
036N	014W	20	SE NW NW	MTZ-D-0008	Western Energy	MZ	Point Lookout	6780.0	170.0	X	No coals analyzed; no thickness information
036N	014W	18	NE corner	TH No.8	NMBM Mem 25	MZ	Dolores East	--	--	X	7.3 @ 75
036N	015W	1	NW SW SE SW	MTZ-D-0017	Western Energy	MZ	Dolores East	6868.0	126.0	X	A seam 1.4c/0.5p/1.1c/0.3p/0.7c @ 78, B seam 3.0c/2.6p/3.0c @ 84
036N	015W	5	SE NE NE	MTZ-D-0012	Western Energy	MZ	Dolores West	6580.0	155.0	X	A seam 2.9c/1.0p/0.6c/1.1p/0.8c @ 90, B seam 5.0c/0.4p/0.3c @ 106, C seam 2.5c/1.4p/2.3c at 125
036N	015W	8	NE SE SE NE	MTZ-D-0015	Western Energy	MZ	Dolores West	6380.0	155.0	X	Upper B seam 4.2 @ 92, Lower B seam 2.7 @ 103, Upper C seam 3.9 @ 113, Lower C seam 2.8 at 128
036N	015W	9	NW SW SW SE	MTZ-D-0016	Western Energy	MZ	Dolores West	6364.0	155.0	X	A seam 2.2 @ 83, B seam 2.1c/1.1p/4.0c @ 95
036N	015W	12	NE SE SE	MTZ-D-0009	Western Energy	MZ	Dolores East	6860.0	114.0	X	B seam 6.8 @ 82
036N	015W	12	NE NE NE	MTZ-D-0018	Western Energy	MZ	Dolores East	6880.0	195.0	X	Upper B seam 7.0 @ 40, Lower B seam 5.0 @ 52
036N	015W	12	NW NE NW	TH No.9	NMBM Mem 25	MZ	Dolores East	--	228.0		1.0 @ 41, 3.5 @ 60, 5.5c/2.0p/3.0c @ 125 (estimated from graphic log)
036N	015W	13	SE SE NE	MTZ-D-0011	Western Energy	MZ	Dolores East	6765.0	205.0	X	B seam 6.6c/1.5p/0.8c @ 101
036N	015W	21	C SE SE	E-40	Empire Elec	MZ	Cortez	6332.0			9.0 @ 14.0, 710 FEL, 440 FSL
036N	015W	21	NE SE SE	E-41	Empire Elec	MZ	Cortez	6348.0	69.0		1.0 @ 27.0, 7.0 @ 30.0, 2.0 @ 43.06.0 @ 51.0, 280 FEL, 860 FSL
036N	015W	21	E SE SE	E-56A	Empire Elec	MZ	Point Lookout	6353.0			7.5 @ 11.5, 20 FEL, 570 FSL
036N	015W	22	SW SW SW	E-15	Empire Elec	MZ	Point Lookout	6353.0	60.0		8.0 @ 17.0, 6.0 @ 52.0, 150 FWL, 420 FSL
036N	015W	22	NE SW SW	E-17	Empire Elec	MZ	Point Lookout	6367.0	58.0		7.0 @ 20.0, 3.0 @ 46.0, 1000 FWL, 1280 FSL
036N	015W	22	SW NE SW	E-18	Empire Elec	MZ	Point Lookout	6394.0	72.0		2.0 @ 17.0, 5.0 @ 29.0, 6.0 @ 51.0, 1500 FWL, 1650 FSL
036N	015W	22	N NE SW	E-19	Empire Elec	MZ	Point Lookout	6412.0	86.0		1.0 @ 9.0, 1.0 @ 14.0, 7.0 @ 24.0, 3.0 @ 77.0, 1880 FWL, 2080 FSL
036N	015W	22	NE NE SW	E-20	Empire Elec	MZ	Point Lookout	6428.0	57.0		1.0 @ 10.0, 1.0 @ 13.0, 7.0 @ 23.0, 3.0 @ 48.0
036N	015W	22	SE SE NW	E-21	Empire Elec	MZ	Point Lookout	6454.0	80.0		1.0 @ 24.0, 8.0 @ 34.0, 4.0 bony coal @ 54.0 & 73.0
036N	015W	22	NW SW NE	E-22	Empire Elec	MZ	Point Lookout	6468.0	61.0	X	6.0 @ 36.0, 6.0 @ 55.0
036N	015W	22	NE SW NE	E-23	Empire Elec	MZ	Point Lookout	6446.0	69.0		8.0 @ 31.0, 4.0 bony coal @ 52.0
036N	015W	22	SE NW NE	E-24	Empire Elec	MZ	Point Lookout	6484.0	56.0		8.0 @ 29.0, 4.0 @ 47.0
036N	015W	22	SW NE NE	E-25	Empire Elec	MZ	Point Lookout	6508.0	50.0		7.0 bony coal @ 21.0, 4.0 @ 42.0
036N	015W	22	NE NE SW	E-27	Empire Elec	MZ	Point Lookout	6400.0	64.0		2.0 @ 8.0, 2.0 @ 14.0, 1.0 @ 24.0, 3.0 @ 36.0, 4.0 bony coal @ 56.0, 1320 FWL, 930 FSL
036N	015W	22	W SE SW	E-28	Empire Elec	MZ	Point Lookout	6415.0	56.0		4.0 coal/3.0 bony coal @ 17.0, 4.0 @ 50.0, 1660 FWL, 560 FSL
036N	015W	22	S SE SW	E-29	Empire Elec	MZ	Point Lookout	6427.0	58.0		7.0 @ 20.0, 2.0 @ 55.0, 2000 FWL, 240 FSL
036N	015W	22	NW SW	E-42	Empire Elec	MZ	Point Lookout	6393.0			9.5 @ 28.0
036N	015W	22	SE NE SW	E-47	Empire Elec	MZ	Point Lookout	6452.0			5.0 @ 12.0, 2470 FWL, 1470 FSL
036N	015W	22	SE SE SW	E-54	Empire Elec	MZ	Point Lookout	6438.5			7.0 @ 17.0, 2530 FWL, 210 FSL
036N	015W	22	SE NW SW	E-55	Empire Elec	MZ	Point Lookout	6388.0	76.0		1.0 @ 34.0, 7.0 @ 43.0, 4.0 @ 72.0, 790 FWL, 1470 FSL
036N	015W	22	W NW SW	E-56	Empire Elec	MZ	Point Lookout	6393.0	53.5		9.0 @ 29.0, 0.5 @ 45.5
036N	015W	22	SW NW SE	MTZ-D-0002	Western Energy	MZ	Point Lookout	6460.0	230.0	X	A seam 7.7 @ 26
036N	015W	22	SE NE SE	MTZ-D-0003	Western Energy	MZ	Point Lookout	6455.0	84.0	X	A seam 5.0 @ 15, B seam 3.8 @ 39
036N	015W	23	NW NW SE	MTZ-D-0001	Western Energy	MZ	Point Lookout	6510.0	146.0	X	A seam 5.0 @ 51
036N	015W	27	N NW NW	E-46	Empire Elec	MZ	Point Lookout	6405.0	70.0		8.0 @ 45.0, 760 FWL, 210 FNL
036N	015W	27	SW SW NW	E-51	Empire Elec	MZ	Point Lookout	6335.0			3.5 @ 11.0, 170 FWL, 2120 FNL

TABLE 1 (cont.)

TWP	RGE	SEC	QTR	DATA POINT ID	SOURCE	CTY	7.5' QUAD NAME	SURF ELEV	TOTAL DEPTH	ANAL-YSIS	COAL THICKNESS AND DEPTH / REMARKS
036N	015W	27	N SW NW	E-52	Empire Elec	MZ	Point Lookout	6380.5			6.0 @ 30.0, 590 FWL, 1620 FNL
036N	015W	27	W NE NW	E-53	Empire Elec	MZ	Point Lookout	6419.0			7.0 @ 26.0, 1430 FWL, 880 FNL
036N	015W	28	NW NW SW	E-2	Empire Elec	MZ	Cortez	6219.0			7.5 @ 27.5, 170 FWL, 2250 FSL
036N	015W	28	SW SW NW	E-3	Empire Elec	MZ	Cortez	6251.0			9.0 @ 43.0, 240 FWL, 2350 FNL
036N	015W	28	W SW NW	E-4	Empire Elec	MZ	Cortez	6258.0			7.0 @ 37.0, 280 FWL, 1850 FNL
036N	015W	28	N NW SW	E-6	Empire Elec	MZ	Cortez	6224.0			5.0 @ 20.0, 770 FWL, 2200 FSL
036N	015W	28	S SW NW	E-7	Empire Elec	MZ	Cortez	6244.0			6.5 @ 33.0, 830 FWL, 2780 FSL
036N	015W	28	E NE SW	E-8	Empire Elec	MZ	Cortez	6229.0			No coal,, 1370 FWL, 2140 FSL
036N	015W	28	NW SW NE	E-9	Empire Elec	MZ	Cortez	6276.0	80.0		13.0 @ 11.0, 7.0 @ 31.0, 1.0 @ 48.0, 2400 FEL, 2050 FNL
036N	015W	28	NE SW NE	E-10	Empire Elec	MZ	Cortez	6289.0	54.0		8.0 @ 6.0, 3.0 @ 35.0, 1980 FEL, 1650 FNL
036N	015W	28	SE NW SE	E-11	Empire Elec	MZ	Cortez	6298.0	65.0		6.0 @ 16.0, 5.0 @ 43.0, 1540 FEL, 1250 FSL
036N	015W	28	NW NE NE	E-12	Empire Elec	MZ	Cortez	6303.0	41.0		5.0 @ 14.0, 7.0 @ 30.0, 1120 FEL, 800 FNL
036N	015W	28	NW NE NE	E-13	Empire Elec	MZ	Cortez	6326.0	62.0		7.0 @ 17.0, 8.0 @ 44.0, 2.0 @ 59.0, 700 FEL, 400 FNL
036N	015W	28	S NW NW	E-30	Empire Elec	MZ	Cortez	6301.0			12.0 @ 80.0, 780 FWL, 1300 FNL
036N	015W	28	SE NW NW	E-31	Empire Elec	MZ	Cortez	6306.0			5.0 @ 53.5, 1240 FWL, 920 FNL
036N	015W	28	W NE NW	E-32	Empire Elec	MZ	Cortez	6315.0			8.0 @ 63.0, 1710 FWL, 550 FNL
036N	015W	28	N SW NW	E-33	Empire Elec	MZ	Cortez	6270.0			6.0 @ 48.0, 980 FWL, 1760 FNL
036N	015W	28	S NE NW	E-34	Empire Elec	MZ	Cortez	6323.0			9.0 @ 66.0, 1920 FWL, 960 FNL
036N	015W	28	NW SE NW	E-35	Empire Elec	MZ	Cortez	6296.0			6.5 @ 56.5, 1700 FWL, 1700 FNL
036N	015W	28	E SW NW	E-36	Empire Elec	MZ	Cortez	6282.0			9.0 @ 55.0, 1230 FWL, 2080 FNL
036N	015W	28	SW NW NE	E-37	Empire Elec	MZ	Cortez	6298.0			7.0 @ 66.0, 2630 FEL, 970 FNL
036N	015W	28	C NW NE	E-38	Empire Elec	MZ	Cortez	6281.0	64.0		8.0 @ 24.0, 9.0 @ 42.0, 1980 FEL, 810 FNL
036N	015W	28	NE NW NE	E-39	Empire Elec	MZ	Cortez	6298.0	62.0		5.0 @ 25.0, 7.0 @ 45.0, 1550 FEL, 390 FNL
036N	015W	28	SE SW NW	E-43	Empire Elec	MZ	Cortez	6336.0			8.0 @ 10.0, 1350 FEL, 2400 FNL
036N	015W	28	W SE NE	E-44	Empire Elec	MZ	Cortez	6303.0			No coal, 870 FEL, 1880 FNL
036N	015W	28	SE NE NE	E-45	Empire Elec	MZ	Point Lookout	6375.0	62.0		1.0 @ 26.0, 9.0 @ 44.0, 80 FEL, 1030 FNL
036N	015W	28	N NW SE	E-48	Empire Elec	MZ	Cortez	6320.0	45.0		8.0 @ 15.0, 8.0 @ 37.0, 1770 FEL, 2530 FSL
036N	015W	28	W SW NE	E-49	Empire Elec	MZ	Cortez	6263.5			6.0 @ 23.5, 1980 FEL, 2580 FNL
036N	015W	28	SE NW NE	E-50	Empire Elec	MZ	Cortez	6276.0	53.0		6.0 @ 30.0, 1760 FEL, 1050 FNL
				E-58	Empire Elec	MZ				X	No location available
036N	015W	29	SE SE NE	MTZ-D-0004	Western Energy	MZ	Cortez	6260.0	179.0	X	A seam 6.7 @ 49, B seam 5.5c/1.7p/1.3c @ 77
037N	014W	30	NE SE SE	MTZ-D-0020	Western Energy	MZ	Dolores East	7265.0	112.0	X	B seam 2.7 @ 73
037N	015W	7	SW SE	DH-3ADT	US Bur Rec	MZ	Dolores West	6944.0	120.0		No coal, lower Dakota and into the Burro Canyon Formation
037N	015W	18	NW NW NE	DH-4DT	US Bur Rec	MZ	Dolores West	7053.5	310.0		0.8 @ 14.6, 1.0 @ 19.4, 2.4 @ 48.2, 4.8 @ 60.7, 1.5 @ 72.5, 1.7 @ 78.8, 1.9 @ 88.3, 0.7 @ 91.7, 1.9 @ 93.9, 0.6 @ 100.6, 1.2 @ 105.9, 2.8 @ 119.2
037N	015W	18	NW SW NE	DH-5DT	US Bur Rec	MZ	Dolores West	7022.5	274.5		1.4 @ 79.4, 1.1 @ 94.3, 0.3 @ 97.8, 2.3 @ 100.7, 0.8 @ 105.4
037N	015W	18	NW SE SW	DH-6DT	US Bur Rec	MZ	Dolores West	6917.8	100.0		0.2 @ 84.8, 0.6 @ 96.5
037N	015W	18	NW SE SW	DH-8DT	US Bur Rec	MZ	Dolores West	6877.9	68.0		7.0 @ 30.8, 0.3 @ 48.0, 0.9 @ 58.0, 0.7 @ 66.0
037N	015W	18	NW SE SW	DH-9DT	US Bur Rec	MZ	Dolores West	6898.6	98.0		1.1 @ 48.5, 0.8 @ 59.3, 1.0 @ 66.7, 0.2 @ 78.0, 1.6 @ 88.0
037N	015W	23	NW NE SW	MTZ-D-0023	Western Energy	MZ	Dolores East	7165.0	175.0	X	A seam 2.7 @ 117, C seam 1.6c/0.5p/1.9c @ 165
037N	016W	25	SW NW SW	DH-6TP	US Bur Rec	MZ	Dolores West	6498.3	72.0		1.9 @ 20.6, 0.5 @ 33.9, 1.0 @ 49.7, 1.2 @ 56.4
037N	016W	26	SE SE	DH-1TP	US Bur Rec	MZ	Dolores West	6374.1	31.5		0.9 @ 7.4, 1.1 @ 21.6
037N	016W	26	SE SE	DH-2TP	US Bur Rec	MZ	Dolores West	6387.5	31.1		2.0 @ 18.5
037N	016W	26	SE SE	DH-3TP	US Bur Rec	MZ	Dolores West	6372.0	50.0		2.8 @ 13.1, 1.4 @ 29.9, 0.5 @ 38.3, 2.5 @ 42.0
037N	016W	26	SE SE	DH-4TP	US Bur Rec	MZ	Dolores West	6371.6	50.0		1.2 @ 8.0, 1.3 @ 23.2, 0.6 @ 31.2, 2.3 @ 34.4, 1.7 @ 48.3, hole ends in coal @ 50.0
037N	016W	26	NE SE SE	DH-5TP	US Bur Rec	MZ	Dolores West	6433.5	60.0		3.7 @ 9.6, 1.6 @ 44.8, 1.6 @ 58.4

TABLE 1 (cont.)

TWP	RGE	SEC	QTR	DATA POINT ID	SOURCE	CTY	7.5' QUAD NAME	SURF ELEV	TOTAL DEPTH	ANAL-YSIS	COAL THICKNESS AND DEPTH / REMARKS
037N	016W	32	SW SW	TH No.10	NMBM Mem 25	MZ	Arriola		231.0		5.0 @ 76, 5.0 @ 132, 3.0 @ 155, 1.0c/1.0p/1.0c @ 169, 1.0 @ 182
037N	017W	3	NE NE NE	05-083-011-020	AMAX Coal	MZ	Arriola	6750.0	150.0		4.0 @ 41.0, 1.1 @ 61.0, 3.8 @ 75.7
037N	017W	5	NE NE NW NE	05-083-011-019	AMAX Coal	MZ	Yellow Jacket	6830.0	183.0		1.2 @ 70.0
037N	017W	6	S NE NE SE	05-083-312-005	AMAX Coal	MZ	Woods Canyon	6790.9	215.0		No coal
037N	017W	7	SE SE SE SW	05-083-312-004	AMAX Coal	MZ	Woods Canyon	6789.2	245.0	X	2.0 coaly carb shale @ 118.0
037N	017W	8	NW NW NE	DH-1M	Montelores Rpt	MZ	Arriola	6750.0			Depth to coal unknown
037N	017W	13	SE SW SW NW	05-083-312-006	AMAX Coal	MZ	Arriola	6633.0	185.0	X	1.5 coaly carb shale @ 86.7, 3.5 coal @ 128.4
037N	017W	14	W NE NE	DH-1DD	US Bur Rec	MZ	Arriola	6560.5	102.9		0.8 @ 19.5, 2.9 @ 35.5, 3.0 @ 41.0
037N	017W	14	E NW NE	DH-2DD	US Bur Rec	MZ	Arriola	6506.3	100.1		No coal
037N	017W	14	N NW NE	DH-3DD	US Bur Rec	MZ	Arriola	6551.6	103.7		1.3 @ 36.3, 2.0 @ 42.0, 2.5 @ 77.5
037N	017W	14	NW NW NE	DH-4DD	US Bur Rec	MZ	Arriola	6541.4	103.2		No coal
037N	017W	15	SW SE SE SE	DH-2M	Montelores Rpt	MZ	Arriola	6660.0			Depth to coal unknown
038N	016W	21	NW NW SE SW	05-083-312-008	AMAX Coal	MZ	Yellow Jacket	7101.7	245.0	X	3.8 coaly carb shale @ 120.2
038N	016W	22	NW NW NW SE	05-083-312-010	AMAX Coal	MZ	Trimble Point	7247.9	315.0	X	Coaly carb shale: 2.3 @ 124.7, 5.4 @ 160.0
038N	016W	27	SE SE SW	05-083-312-009	AMAX Coal	MZ	Trimble Point	6948.6	200.0	X	Coaly carb shale: 1.3 @ 88.3, 2.6 @ 99.0, 3.2 @ 116.4
038N	016W	27	NE NE SW NW	05-083-312-017	AMAX Coal	MZ	Yellow Jacket	7068.4	180.0	X	Core hole to 140 ft was offset, 3.1 @ 102.1, 3.2 @ 113.0, 1.5 coaly carb shale @ 129.5
038N	016W	29	C SW	05-083-312-007	AMAX Coal	MZ	Yellow Jacket	6902.6	185.0	X	Coaly carb shale: 2.3 @ 92.3, 5.9 @ 109.9
038N	016W	29	SE SE NE NE	05-083-312-016	AMAX Coal	MZ	Yellow Jacket	7012.1	200.0	X	5.1 coaly carb shale @ 135.4
038N	016W	32	SE SW SW NW	05-083-312-012	AMAX Coal	MZ	Yellow Jacket	6748.8	180.0	X	2.7 coaly carb shale @ 46.9
038N	016W	36	SE NW	DH-11GR	US Bur Rec	MZ	Trimble Point	6912.4	126.0		No coal. Great Cut Dike Project, 19 drill holes (all Mancos to Upper Dakota, w/ no coal)
038N	017W	5	NW NW NW SW	DCC-4	US Bur Rec	MZ	Yellow Jacket	6928.9	162.5	X	2.0 @ 63.2, 4.2 @ 104.2, 2.6 @ 126.7
038N	017W	5	NW NW NW SW	DCC-5	US Bur Rec	MZ	Yellow Jacket	6928.9	162.5	X	Companion hole to DCC-4, cored for washability testing
038N	017W	10	SW SW NW SW	DCC-6	US Bur Rec	MZ	Yellow Jacket	6942.2	200.0		2.5 @ 85.0, 1.0 @ 96.0, 4.0 @ 116.0
038N	017W	10	NW NW NW SW	DCC-7	US Bur Rec	MZ	Yellow Jacket	6976.6	198.1		2.2 @ 87.5, 1.0 @ 99.2, 2.6 @ 118.3
038N	017W	10	SW SW NW NW	OCC-8	US Bur Rec	MZ	Yellow Jacket	7008.3	199.0		4.5 @ 103.0, 1.0 @ 113.0, 2.0 @ 134.0
038N	017W	10	SW SW SE	05-083-011-001	AMAX Coal	MZ	Yellow Jacket	6939.5	170.0		4.0 @ 30.0, 9.5 @ 48.6, 0.7 @ 94.3
038N	017W	14	NW NW NE	05-083-011-002	AMAX Coal	MZ	Yellow Jacket	7011.3	167.0		3.9 @ 38.0, 6.8 @ 66.3, 1.0 @ 83.2, 1.3 @ 103.1
038N	017W	15	SW SW SW NW	DCC-1	US Bur Rec	MZ	Yellow Jacket	6950.3	159.8	X	6.4 @ 98.2, 6.4 @ 117.1, 1.0 @ 128.5, 0.8 @ 139.8, 1.8 @ 141.4
038N	017W	15	NE NW NW NW	DCC-13	US Bur Rec	MZ	Yellow Jacket	6966.3	200.2		3.7 @ 63.8, 5.6 Coal/Sh @ 79.9, 2.4 @ 105.4
038N	017W	16	NW NW NE NE	DCC-9	US Bur Rec	MZ	Yellow Jacket	6973.6	199.0		1.5 @ 80.0, 3.0 @ 133.0
038N	017W	16	NE NE NE NW	DCC-10	US Bur Rec	MZ	Yellow Jacket	6963.9	200.5		3.4 @ 93.5, 1.4 @ 133.0
038N	017W	16	NE NW NW NW	DCC-11	US Bur Rec	MZ	Yellow Jacket	6929.4	200.0		2.0 @ 68.0, 1.0 @ 83.0, 2.0 @ 100.5
038N	017W	16	NE NE NE NE	DCC-12	US Bur Rec	MZ	Yellow Jacket	6945.1	200.0		2.0 @ 51.0, 3.5 @ 56.5, 6.0 @ 70.0, 1.5 @ 79.5, 2.5 @ 97.5
038N	017W	16	SW NE NE NE	DCC-14	US Bur Rec	MZ	Yellow Jacket	6944.1	200.0		5.0 @ 55.0, 5.0 @ 73.0, 2.0 @ 105.0
038N	017W	16	SE NE SE	DH-3M	Montelores Rpt	MZ	Yellow Jacket	6925.0			Depths of coal beds unknown; thicknesses of 7.0, 6.0 and 1.0, see Occ-23
038N	017W	16	SE SE SW	05-083-011-004	AMAX Coal	MZ	Yellow Jacket	6931.2	167.0		5.5 @ 99.0, 5.6 @ 116.7, 1.6 @ 126.9, 4.0 @ 142.3
038N	017W	19	SW NW NW	05-083-011-003	AMAX Coal	MZ	Pleasant View	6878.0	158.0		2.4 @ 22.0, 1.2 @ 37.9, 8.2 @ 48.7, 3.2 @ 71.8
038N	017W	20	NE SE SE SE	FL-1	US Bur Rec	MZ	Yellow Jacket	6962.6	139.8	X	4.0 @ 47.9, 1.6 @ 57.4, 3.6 @ 61.3, 5.1 @ 92.7
038N	017W	20	NE NW NW SE	05-083-312-001	AMAX Coal	MZ	Yellow Jacket	6931.4	280.0	X	Core hole to 161 ft was offset; 4.2 @ 105.4, 6.3 @ 119.1, 0.8 @ 136.4, 3.4 @ 154.2
038N	017W	20	NW NW NW NE	05-083-312-002	AMAX Coal	MZ	Yellow Jacket	6957.5	245.0		3.3 @ 92.3
038N	017W	21	NE NW SE	05-083-011-009	AMAX Coal	MZ	Yellow Jacket	6880.0	148.0		1.3 @ 60.0, 4.7 @ 81.0, 7.4c/1.1p/2.0c @ 90.8, 3.6 @ 111.2
038N	017W	22	NW NW NE	05-083-011-005	AMAX Coal	MZ	Yellow Jacket	6867.0	218.0		10.6c/1.0p/1.0c @ 38.0, 3.8 @ 59.7
038N	017W	22	SE SE SE	05-083-011-010	AMAX Coal	MZ	Yellow Jacket	6887.1	207.0		2.8 @ 79.0, 11.8 @ 95.8, 2.2 @ 119.0
038N	017W	23	NW NW NW	05-083-011-006	AMAX Coal	MZ	Yellow Jacket	6947.5	172.0		0.3 @ 47.0, 3.8 @ 55.7, 7.7 @ 70.0, 2.1 @ 107.9
038N	017W	23	NW NW NW NW	DCC-2	US Bur Rec	MZ	Yellow Jacket	6930.7	133.5	X	3.4 @ 30.0, 8.8 @ 55.0, 0.4 @ 75.0, 2.9 @ 82.0, 4.4 @ 86.0
038N	017W	24	NE NE SE SE	DCC-3	US Bur Rec	MZ	Yellow Jacket	6938.2	105.0	X	1.2 @ 19.9, 4.8 @ 47.2, 1.3 @ 55.7, 3.4 @ 66.7, 0.2 @ 71.7, 0.2 @ 72.6, 6.2 @ 83.0

TABLE 1 (cont.)

TWP	RGE	SEC	QTR	DATA POINT ID	SOURCE	CTY	7.5' QUAD NAME	SURF ELEV	TOTAL DEPTH	ANAL-YSIS	COAL THICKNESS AND DEPTH / REMARKS
038N	017W	24	SE SE SW	05-083-011-007	AMAX Coal	MZ	Yellow Jacket	6988.8	178.0		5.3 @ 27.0, 2.0c/2.1p/3.5c @ 46.9, 1.4 @ 65.5, 2.5 @ 83.0
038N	017W	25	NW NW NW	05-083-011-011	AMAX Coal	MZ	Yellow Jacket	6932.1	159.5		4.5 @ 66.0, 8.6 @ 78.7, 2.8 @ 111.0
038N	017W	27	SE SE SE	05-083-011-016	AMAX Coal	MZ	Yellow Jacket	6812.5	220.0		4.8 @ 58.0, 8.9c/2.0p/1.8c @ 75.3, 1.4 @ 101.1
038N	017W	27	SW SW SW NW	05-083-312-003	AMAX Coal	MZ	Yellow Jacket	6862.3	230.0	X	6.4 @ 100.4, 7.0c/0.8p/4.2c @ 118.0, 1.6 @ 140.9
038N	017W	30	C NW NE	05-083-011-008	AMAX Coal	MZ	Pleasant View	6925.0	244.0		3.2 @ 66.0, 3.0 @ 85.2, 1.7 @ 99.7, 3.4 @ 117.3
038N	017W	30	SW SW SW	05-083-011-013	AMAX Coal	MZ	Pleasant View	6920.9	255.0		2.3 @ 103.0, 0.4 @ 138.5, 2.2 @ 154.0, 1.4 @ 215.2
038N	017W	31	NE NE NE	05-083-011-014	AMAX Coal	MZ	Pleasant View	6844.6	158.0		1.2 @ 95.0, 3.5 @ 103.3, 5.9 @ 122.2, 0.5 @ 134.5
038N	017W	31	SE SE SE	05-083-011-018	AMAX Coal	MZ	Pleasant View	6881.7	195.0		1.5 @ 101.0
038N	017W	36	N NW NW	05-083-312-011	AMAX Coal	MZ	Yellow Jacket	6834.9	232.0	X	4.6 @ 34.6, 3.2 @ 45.7, 2.6 coaly carb shale @ 97.0
038N	018W	9	SE SE SE SE	05-083-312-019	AMAX Coal	MZ	Arriola	6893.8	220.0	X	1.4 @ 60.2, 2.0 @ 64.0
038N	018W	36	SE SE SE	05-083-011-017	AMAX Coal	MZ	Pleasant View	6824.3	179.0		1.1 @ 57.0
039N	015W	28	C	DH-1CP	US Bur Rec	MZ	Trimble Point	8038.0	215.0		1.8 @ 85.0
039N	015W	33	C N	DH-2CP	US Bur Rec	MZ	Trimble Point	7927.0	322.0		No coal
039N	017W	6	SW SE	DH-1 (DCC)	US Bur Rec	DL	Cahone	6907.6	30.3		1.8 @ 23.6
039N	017W	28	SW SE SE SE	05-083-312-013	AMAX Coal	MZ	Yellow Jacket	7085.2	220.0		No coal
039N	017W	32	SE SE NE NE	05-083-312-014	AMAX Coal	MZ	Yellow Jacket	6996.8	180.0	X	Coaly carb shale: 2.7 @ 91.2, 2.2 @ 104.6, 2.9 @ 121.4
039N	018W	2	SW SE SE	05-033-312-006	AMAX Coal	DL	Cahone	6742.5	180.0	X	Coaly carb shale: 2.0 @ 57.0, 2.8 @ 105.9, 1.9 @ 124.0
039N	018W	13	C E NE NE	05-033-312-007	AMAX Coal	DL	Cahone	6820.7	180.0	X	Coaly carb shale: 1.7 @ 78.4, 2.7 @ 98.3
039N	018W	13	SW SE	05-033-312-008	AMAX Coal	DL	Cahone	6814.3	214.5	X	2.0 @ 63.0
039N	018W	16	NW SE	05-033-312-009	AMAX Coal	DL	Cahone	6628.3	180.0	X	2.6 @ 73.4
039N	018W	25	C SE	DH-1CA	US Bur Rec	MZ	Pleasant View		103.2		11.9 @ 28.8
039N	018W	25	C N SE	DH-2CA	US Bur Rec	MZ	Pleasant View		153.0		4.0 @ 16.4
039N	018W	25	NE NE NW SE	DH-3CA	US Bur Rec	MZ	Pleasant View		103.5		3.5 @ 13.5
039N	018W	30	SE SE NE	05-083-312-018	AMAX Coal	MZ	Pleasant View	6810.8	210.0	X	Coaly carb shale: 2.0 @ 48.0, 2.5 @ 74.3
039N	018W	32	SW SW NW NE	05-083-312-015	AMAX Coal	MZ	Pleasant View	6781.5	220.0		Coaly carb shale: 1.0 @ 80.0, 1.0 @ 131.0
040N	015W	35	C SE	DH-3PC	US Bur Rec	DL	Willow Spgs	7519.4	21.2		0.9 @ 17.7, 0.4 @ 20.8 (drill hole ends in coal @ 21.2)
040N	015W	35	C SE	DH-4PC	US Bur Rec	DL	Willow Spgs	7519.5	25.0		0.9 @ 14.6, 1.1 @ 17.7
040N	015W	35	C SE	DH-5PC	US Bur Rec	DL	Willow Spgs	7533.8	25.0		0.9 @ 18.4
040N	018W	3	SW SE NE	05-033-312-002	AMAX Coal	DL	Secret Canyon	7305.6	160.0	X	3.0 coaly carb shale @ 62.0
040N	018W	7	SE SE NE SE	DH-1CCPP	US Bur Rec	DL	Dove Creek	6867.8	40.0		No coal
040N	018W	7	SE SE SW NE	DH-6 (DCC)	US Bur Rec	DL	Cahone	6957.9	59.5		0.6 @ 17.6, 0.6 @ 19.3, 4.8 @ 39.2, 6.3 @ 45.3
040N	018W	8	SE SE SW	DH-12 (DCC)	US Bur Rec	DL	Cahone	6867.7	24.5		3.1 @ 17.2
040N	018W	16	SW NW	DH-7 (DCC)	US Bur Rec	DL	Cahone	6857.3	80.0		2.3 @ 32.7, 5.0 @ 37.0, 0.5 @ 54.8, 2.6 @ 57.5, 2.8+ @ 77.2 (hole ends in coal at 80.0)
040N	018W	16	W SE	DH-11 (DCC)	US Bur Rec	DL	Cahone	6860.6	146.8		6.6 @ 31.2, 3.0 @ 51.1, 4.4 @ 64.6, 13.2 @ 71.0
040N	018W	18	SW SW SW SE	05-033-312-003	AMAX Coal	DL	Champagne Spg	6704.9	180.0	X	Coaly carb shale: 2.3 @ 36.7, 2.8 @ 66.2
040N	018W	22	SW SW SE SW	05-033-312-004	AMAX Coal	DL	Cahone	6793.3	180.0	X	Coaly carb shale: 1.0 @ 52.0, 2.4 @ 81.0, 4.0 @ 111.4, 0.9 @ 136.5
040N	018W	22	SW SW SW NE	DH-10 (DCC)	US Bur Rec	DL	Cahone	6873.5	71.8		11.2 @ 17.8, 2.4 @ 33.8, 0.8 @ 41.0, 1.8C/0.9P/1.0C @ 49.1, 0.2 @ 56.2, 2.4 @ 69.4 (hole ends in coal at 71.8)
040N	018W	23	C SW	DH-8 (DCC)	US Bur Rec	DL	Cahone	6896.7	72.0		No coal
040N	018W	25	N NW	05-033-312-005	AMAX Coal	DL	Cahone	6969.7	140.0	X	2.5 coaly carb shale @ 65.4
040N	018W	25	SE NW	DH-3 (DCC)	US Bur Rec	DL	Cahone	6888.1	101.8		No coal
040N	018W	25	SW NW NW	DH-4 (DCC)	US Bur Rec	DL	Cahone	6895.7	96.2		No coal
040N	018W	36	NW NE	DH-2 (DCC)	US Bur Rec	DL	Cahone	6888.7	31.8		5.0 @ 16.8, 0.3 @ 26.8
040N	019W	1	S SE	DH-9 (DCC)	US Bur Rec	DL	Cahone	6804.8	81.8		6.2 @ 36.8
040N	019W	12	NE NE NE	DH-5 (DCC)	US Bur Rec	DL	Cahone	6738.2	39.2		No coal
041N	018W	8	SW SW NW SW	DH-2CCPP	US Bur Rec	DL	Dove Creek	6859.7	37.8		No coal

TABLE 1 (cont.)

TWP	RGE	SEC	QTR	DATA POINT ID	SOURCE	CTY	7.5' QUAD NAME	SURF ELEV	TOTAL DEPTH	ANAL-YSIS	COAL THICKNESS AND DEPTH / REMARKS
041N	019W	26	SW SW SW SE	DH-3MO	US Bur Rec	DL	Dove Creek	6807.0	153.0		11.2 @ 85.0
041N	019W	35	SW SW SW SE	DH-1MCP	US Bur Rec	DL	Dove Creek	6806.9	40.0		0.4 @ 21.0, 0.4 @ 22.8, 1.5 @ 31.9
041N	019W	35	SW SW SE	DH-2MCP	US Bur Rec	DL	Dove Creek	6810.0	40.0		0.9 @ 32.8
041N	019W	35	C N NE NW	DH-1MO	US Bur Rec	DL	Dove Creek	6796.4	151.5		0.8 @ 37.1, 12.4 @ 85.6
041N	019W	35	NE NE NE NW	DH-2MO	US Bur Rec	DL	Dove Creek	6773.3	154.0		11.5 @ 50.5
041N	020W	13	SW SW SW SE	05-033-312-001	AMAX Coal "	DL	Dove Creek	6678.8	160.0	X	2.2 coaly carb shale @ 53.3
042N	020W	11	SE SW SE	05-113-312-001	AMAX Coal	SM	Egnar	6957.6	160.0		2.4 @ 15.0, 3.7 coaly carb shale @ 35.1, 9.6 @ 43.4
042N	020W	14	C W SE	05-113-312-002	AMAX Coal	SM	Egnar	6887.3	180.0		8.5 coaly carb shale @ 31.4
042N	020W	24	NW	05-113-312-999	AMAX Coal	SM	Egnar	6840.0	395.0		No coal
043N	016W	30	--	DVR-1	USGS PP 576-A	SM	Dawson Draw		200.1		Core hole, 4.3c/0.3p/0/9c/0.8p/0.6c @ 107.6, 3.3 @ 125.0, 1.0c/0.1p/0.3c/0.7p/0.8c @ 137.1
044N	016W	10	C S NW NW	DH-6-RA	US Bur Rec	SM	Gypsum Gap	6331.6	100.0		0.7 @ 28.0, 1.7 @ 48.5, 1.8 @ 62.7, 2.2 @ 78.8
044N	016W	10	C NW	DH-7-RA	US Bur Rec	SM	Gypsum Gap	6275.5	100.0		1.9 @ 22.6
044N	016W	10	NW SE NW	DH-8-RA	US Bur Rec	SM	Gypsum Gap	6333.0	103.5		0.6 @ 36.8, 0.5 @ 48.5, 3.4 @ 58.0, 5.0 @ 63.5, 7.7 @ 77.5
044N	016W	10	C W SE NW	DH-9-RA	US Bur Rec	SM	Gypsum Gap	6336.3	78.0		1.0 @ 2.7
044N	016W	10	C SE	DH-10-RA	US Bur Rec	SM	Gypsum Gap	6325.7	75.6		0.2 @ 47.5, 0.6 @ 57.7
044N	016W	14	C NW	DH-11-RA	US Bur Rec	SM	Gypsum Gap	6344.3	76.6		0.5 @ 40.5
044N	018W	25	SW NW	DV-126	USGS PP 576-A	SM	Hamm Canyon				Dakota Formation is 180 ft thick here; no info on coal
045N	010W	13	SW SE	DH-4DDS	US Bur Rec	OU	Horsefly Peak	8787.2	100.0		0.5 @ 78.0
045N	010W	24	NW NW NW NE	DH-1DDS	US Bur Rec	MR	Horsefly Peak	8795.3	100.0		0.5 @ 86.0
045N	010W	24	C SW SW SE	DH-2DDS	US Bur Rec	OU	Horsefly Peak	8728.6	150.0		0.5 @ 36.0, 0.5 @ 73.5
045N	010W	24	C W SW SE	DH-3DDS	US Bur Rec	OU	Horsefly Peak	8721.6	100.0		0.5 @ 26.0
045N	016W	31	E E SW	DH-1-RA	US Bur Rec	SM	Gypsum Gap	6318.4	50.0		2.0 @ 40.9, 2.8 @ 46.4
045N	016W	31	C W SE	DH-2-RA	US Bur Rec	SM	Gypsum Gap	6310.7	75.3		1.5 @ 19.8, 1.0 @ 29.9, 0.4 @ 36.9, 3.6 @ 62.0, 2.6 @ 68.7
045N	016W	31	C SE	DH-3-RA	US Bur Rec	SM	Gypsum Gap	6308.9	100.0		2.2 @ 18.1, 5.6 @ 31.4, 5.8 @ 58.6
045N	016W	31	C SE	DH-3-RA @2	US Bur Rec	SM	Gypsum Gap	6308.9	19.8		0.4 @ 16.0, 0.2 @ 17.8
045N	016W	31	C SE	DH-4-RA	US Bur Rec	SM	Gypsum Gap	6265.7	102.6		No coal
045N	016W	31	C E SE	DH-5-RA	US Bur Rec	SM	Gypsum Gap	6318.3	102.9		5.1 @ 22.6, 3.5 @ 34.9, 1.8 @ 43.2, 1.0 @ 50.0, 9.1 @ 61.0, 0.4 @ 97.1
045N	017W	2	--	M-79-3	Ferret Expl	MR	Naturita NW		800.0		1.5 @ 18, 2.5 @ 21.5 (from geophysical log), no location within section available
045N	017W	3	--	M-77-2	Ferret Expl	MR	Naturita NW	6950.0	800.0		3 @ 15, 5 @ 37, no location within section available
045N	017W	10	--	M-78-8	Ferret Expl	MR	Naturita NW		880.0		4 @ 92, no location within section available
045N	017W	15	--	M-77-6	Ferret Expl	MR	Naturita NW	6755.0	760.0		4 @ 27.0, no location within section available
045N	018W	22	--	RM-77 series	Cotter Corp	SM	Bull Canyon				Radium Mountain uranium drill holes indicate thin coals here. See appendix for details.
046N	008W	16	C SW	DH-6 (RIDGWAY)	US Bur Rec	OU	Ridgway	7018.3	380.0		1.0 @ 133.0, 1.7 @ 152.5
046N	015W	8	NW SE SW	TH-Nuclog	Nuclear Logging	MR	Naturita				No coal in Dakota here, company test hole which penetrates through the Dakota
046N	016W	2	C S SW	CC-78-18	Ferret Expl	MR	Nucla		935.0		3 @ 21.5, 1140 FWL, 40 FSL
046N	016W	11	C N	CC-78-19	Ferret Expl	MR	Nucla		820.0		4.5 @ 31, 2170 FWL, 1180 FNL
046N	016W	21	--	P-78-3	Ferret Expl	MR	Naturita NW		825.0		5 @ 30 (from geophysical log), no location within section available
046N	016W	23	NW NW	CC-78-15	Ferret Expl	MR	Naturita		800.0		5 @ 35? (from geophysical log), 460 FWL, 510 FNL
046N	016W	28	--	P-77-1	Ferret Expl	MR	Naturita NW		720.0		3 @ 19 (from geophysical log), no location within section available
047N	015W	31	SW NW NW	GS-1	USGS OF 78-899	MR	Nucla	5778.3	31.2	X	0.7 @ 7.9, 5.3 @ 22.8
047N	015W	31	NW NW	GS-2	USGS OF 78-899	MR	Nucla	5802.6	27.8	X	0.8 @ 8.1, 6.4 @ 20.4
047N	015W	31	NE NW NW	GS-3	USGS OF 78-899	MR	Nucla	5826.4	26.0	X	1.8 @ 9.0, 6.7 @ 18.8
047N	015W	31	NW NW	GS-4	USGS OF 78-899	MR	Nucla	5783.3	20.0	X	6.7 @ 7.3
047N	015W	31	SE NW NW	GS-5	USGS OF 78-899	MR	Nucla	5789.5	12.2	X	6.3 @ 5.4
047N	015W	31	NE NW	GS-6	USGS OF 78-899	MR	Nucla	5824.6	40.5	X	0.2 @ 19.0, 1.5 @ 31.1, 1.3c/0.3p/0.2c @ 34.9
047N	015W	31	N NE NW	GS-7	USGS OF 78-899	MR	Nucla	5847.7	37.3	X	0.2 @ 18.5, 0.3c/0.3p/1.6c @ 30.0, 1.0c/0.3p/0.2c @ 34.5

TABLE 1 (cont.)

TWP	RGE	SEC	QTR	DATA POINT ID	SOURCE	CTY	7.5' QUAD NAME	SURF ELEV	TOTAL DEPTH	ANAL-YSIS	COAL THICKNESS AND DEPTH / REMARKS
047N	015W	31	NW NW	GS-8	USGS OF 78-899	MR	Nucla	5794.5	27.2	X	1.4 @ 6.0, 0.3c/0.3p/6.1c @ 20.5
047N	015W	31	N NW NW	GS-9	USGS OF 78-899	MR	Nucla	5815.6	24.3	X	1.4 @ 7.5, 5.5 @ 18.3
047N	016W	7	SW SW	CC-78-04	Ferret Expl	MR	Uravan		900.0		5 @ 59 (from geophysical log), 1500 FWL, 450 FSL
047N	016W	7	SE SE	CC-78-24	Ferret Expl	MR	Uravan		800.0		7.5 @ 41 (thickness questionable), 60- 80 coal and gray shale, 160 FEL, 110 FSL
047N	016W	7	SE NE	CC-78-38	Ferret Expl	MR	Uravan		680.0		2.0c/2.0p/2.5c @ 49 (from geophysical log), 820 FEL, 1050 FNL
047N	016W	14	SW SW	CC-78-16	Ferret Expl	MR	Nucla		800.0		5 @ 45, 270 FWL, 660 FSL
047N	016W	17	NW NW	CC-78-10	Ferret Expl	MR	Uravan		740.0		3 @ 16 (from geophysical log), 980 FWL, 30 FNL
047N	016W	17	SW NW	CC-79-08	Ferret Expl	MR	Uravan		740.0		5 @ 85 (looks thinner on geophysical log), 770 FWL, 2220 FNL
047N	016W	18	NW NW	CC-77-01	Ferret Expl	MR	Uravan		750.0		2 @ 16, 4.5 @ 42 (from geophysical log), 100 FWL, 500 FWL
047N	016W	18	C S	CC-78-02	Ferret Expl	MR	Uravan		845.0		Coal and gray siltstone 40-80 (no individual coal beds identified on geophysical log), 2720 FEL, 1320 FSL
047N	016W	18	SE NE	CC-78-43	Ferret Expl	MR	Uravan		800.0		2 @ 56, 5 @ 71, 870 FEL, 1900 FNL
047N	016W	18	C NE	CC-79-10	Ferret Expl	MR	Uravan		800.0		3 @ 93 (from gamma log), 1230 FEL, 1360 FNL
047N	016W	23	NW SW	CC-78-17	Ferret Expl	MR	Nucla		820.0		Some coal 40-85 (no individual seams identified on geophsical log), 100 FEL, 1590 FSL
047N	016W	25	SE SE	DH #2C-Ovbd	Colo MLRD	MR	Nucla		50.0		1.3 @ 28.8, 0.4 @ 38.0, 5.3 @ 39.9
047N	016W	36	NW	DH #1C-Ovbd	Colo MLRD	MR	Nucla		54.0		0.3c/0.3p/1.4c/0.4p/0.7c/0.2p/0.8c/0.2p/3.4c @ 40.3
048N	010W	3	SW SW	ALX No.2	Bob Young/QDC	MR	Montrose West		98.5		0.6 @ 45.9, 0.4 @ 66.1, 0.6 @ 72.3, 1.0 @ 73.7
048N	010W	3	SW NW	QDC No.1	Bob Young/QDC	MR	Montrose West		105.0		0.5 @ 57.5, 2.0c/0.8p/3.0c @ 78.9
049N	010W	33	NE SW	CLSN No.4	Bob Young/QDC	MR	Montrose West		113.0		0.5c/0.3p/0.4c @ 26.5, 0.9c/0.3p/0.3c/0.2p/0.6c/0.4p/0.3c/0.9p/1.1c @ 29.7
049N	010W	34	SW NE	WIL No.5	Bob Young/QDC	MR	Montrose West		235.0		0.4 @ 46.0, 0.6 @ 54.9, 0.3c/0.3p/0.5c @ 71.2

Note: See appendix for details on drill hole information.

EXPLANATION OF ABBREVIATIONS

Headings

TWP - township

RGE - range

SEC - section

QTR - section subdivision by quarter(s)

CTY - county

ELEV - elevation

Sources

Colo MLR - Colorado Division of Mined Land Reclamation

Empire Elec - Empire Electric Association

Ferret Expl - Ferret Exploration

Montelores Rpt - see Johnson and others, 1976, in bibliography

NMBM Mem 25 - New Mexico Bureau of Mines and Mineral Resources Memoir 25

Sources (cont'd)

QDC - Quinn Development Corporation

US BurRec - U.S. Bureau of Reclamation

USGS OF 78-899 - USGS Open File Report 78-899

Counties

DL - Dolores

MR - Montrose

MS - Mesa

MZ - Montezuma

OU - Ouray

SJ - San Juan, Utah

SM - San Miguel

Remarks

carb - carbonaceous

c - coal

p - parting

TABLE 2

MINE INFORMATION-DAKOTA COAL

SOUTHWESTERN COLORADO

Note: All thicknesses are in feet. See end of table for explanation of abbreviations used and additional notes.

TWP	RGE	SEC	QTR	MINE NAME	SOURCE	CTY	7.5' QUAD NAME	THKN	ANAL-YSIS	YEARS OF OPERATION	TONNAGE	OPERATOR	REMARKS [( ) -- alternate mine name]
004S	003E	17	SE NW	Wells Gulch	Lee (1912)	DT	Dominguez	3.9	X				
033S	026E	35		Rasmussen	USGS PP 188	SJ	Eastland (15')						
036N	015W	28	NE SW	Bluebird	Kelly Wilson	MZ	Point Lookout	--					
036N	015W	28	SW SE	Carnegie	Kelly Wilson	MZ	Point Lookout	--					
036N	015W	28	NW NW	Glover	CDM	MZ	Cortez	--		1932	10	W.B. Glover	No location
036N	015W	28	NW NW NE	McGarish	CDM	MZ	Cortez	5.0	X	1931-1932	211	Ed McGarish	(Superior) See Superior Tunnel for analysis
036N	015W	29	NW SE NE	Lakeview	CDM	MZ	Cortez	3.5		See Remarks	1057	N.R. & G.B. Glover	1940-1942/ 1946-1947, Lakeview bed
036N	015W	29	SE NE	Moffat-Carlile	CDM	MZ	Cortez	6.0		1917-1920	1119	Moffat-Carlile Coal Co.	
036N	015W	29	NW SE NE	Montezuma No. 1	CDM	MZ	Cortez	4.0	X	See remarks	13893	---	1925-1927, 1937-1948, combined with Lakeview?
036N	015W	29	SE NE	Montezuma No. 2	CDM	MZ	Cortez	4.5	X	1948-1958	8220	---	1947 see Lakeview
036N	016W	35		Mowry	USBM TP574	MZ	Cortez	2.0			150/yr		Located 1.5 mi SE of Cortez, 70 ft cover, not in CDM recs
036N	016W	35	SE NW SW	Cortez	CDM, Boos	MZ	Cortez	Varies		See remarks	16789	A.F.Hopper	3.5 to 10.0 feet, 1892-1895/1925-1938, lowest bed in Dakota, roof--sandstone and shale, in Boos report 3.5 ft and Sec 23
036N	016W	23	NW	Cortez (2)	USBM TP574	MZ	Cortez	4.7				---	Located 1/2 mi E of Cortez, 6 deg NW dip, not mapped due to uncertainty of location, possibly different from other Cortez Mine
036N	016W	35	NE	Kelly	CDM, Boos	MZ	Cortez	4.0		1919-1924	7124	---	(Mc Elmo/ Kelly Sheddy)
036N	016W	35	SE NW SW	Mitchell Springs	CDM, Boos	MZ	Cortez	2.5		1915-1918	725	J.F. Mowry, operator	In Boos report 3.5 ft and sec. 23
037N	015W	17	NW NE NW	Morris	CDM	MZ	Dolores West	4.0		1927-1934	2930	G. W. Morris	
037N	015W	28	SW SW NW	Dolores	CDM, Boos	MZ	Dolores West	2.5		1931-1937	4414	Dominick Garabelli	7100 ft portal elevation
037N	015W	28	---	Summit Ridge	CDM	MZ	Dolores West	---		1947	15	J.W. Phelps, Jr.	Same location as Dolores?
037N	016W	21	NW NE	Bud Ince	CDM	MZ	Dolores West	2.5		1930-1933	410	Bud Ince	
038N	017W	34	SE NW	Black Ace	CDM	MZ	Yellow Jacket	7.5		1929-1934	1411	George Stakish	(Stakish)
039N	014W	17	NE SE NW	New Mexico	CDM	DL	Willow Spring	5.0		1926-1930	40591	New Mexico Lumber Co.	(North Star), NMLC located in McPhee, location from Everitt Johnson
045N	013W	17	NE SW SE	Gray	CDM, Boos	SM	Norwood	2.8		1925-1941	4662	W.H. Stoddard, L.J. Gray	Oberding zone, No. 2 bed
045N	013W	17	SE NE SW	Keck Reliance	CDM, Boos	SM	Norwood	Varies		1925-1957	10501	Wm R. Keck, Norwood	(Keck), thickness ranges 2.6-3.7 ft
045N	013W	20	NE SW	Braiser	CDM	SM	Norwood	--		1953	---	---	Licensed, no production; No. 2 bed (Oberding zone?)
045N	013W	20	NE NE NW	Crisp	CDM, Boos	SM	Norwood	5.5		1941-1947	971	V.W. Bankston	See Horton
045N	013W	20	NE NE	Elder	CDM, Boos	SM	Norwood	3.0		1930-1950	2650	Holland and Sons Mining Co	HSMC located in Norwood, Boos locates in sec. 2, Oberding zone No. 2 bed
045N	013W	20	NE NE NW	Horton	CDM	SM	Norwood	Varies		1930-1935	1524	Horton Coal Co, Norwood	(see Crisp), thickness ranges 3.1-5.5 ft, Oberding zone No. 2 bed
045N	013W	20	---	Mad Jack	CDM	SM	Norwood	--		1979	1152	Tri-Island Mining and Mins	Tri-Island Land and Cattle Co. (Larry Davis); Kenneth Spillman is property owner
045N	013W	20	S1/2 SE	Marriott	CDM, Boos	SM	Norwood	3.2		1927-1934	1384	Wm Marriott, Norwood	Oberding zone No. 2 bed
045N	013W	20	NE SW SE	O.K.	CDM, Boos	SM	Norwood	3.3		1935-1945	2069	Harold Archer	Oberding bed
045N	013W	21	SW NW	Nelson	CDM	SM	Norwood	3.0		1938	108	H.E.Hardman, Redvale	
045N	013W	21	NW NW	Spillman	CDM	SM	Norwood	--		1938-1941	0	Spillman Coal Co.	Licensed, no production; no thickness available, No. 3 bed
045N	013W	29	N1/2 NE	Royer	CDM, Boos	SM	Norwood	3.0		1925-1931	1550	Royers Coal Co.	Oberding bed
045N	014W	2	NW SE SW	Rice	COM	MR	Redvale	4.5		1932-1938	1818	A. J. Rice, Redvale	
046N	008W	4		Chaffee Gulch	CDM	OU	Colona	--		1927	61	Berle Herzinger	No thickness stated, Dakota?

TABLE 2 (cont.)

TWP	RGE	SEC	QTR	MINE NAME	SOURCE	CTY	7.5' QUAD NAME	THKN	ANAL-YSIS	YEARS OF OPERATION	TONNAGE	OPERATOR	REMARKS [( ) -- alternate mine name]
046N	015W	11	NW SE SE	Knauss	CDM, Boos	MR	Big Bucktail Cr	6.0		1915-1921	2607	W.J. Oberding, Nucla	Location uncertain, Oberding zone no. 2 bed, 50 ft cover
046N	016W	11	NE SW SE	U.S. Vanadium	CDM, Boos	MR	Nucla	Varies		1937-1942	166078	U.S. Vanadium Corp	See Liberty Bell and Oberding, thickness range 7-9 ft, Oberding bed
046N	016W	13	NW SW	Liberty Bell	CDM, Boos	MR	Naturita	Varies	X	1919-1950	102575	U.S. Vanadium Corp, Nucla	4.5-6.5 ft, 125-140 ft cover, No. 1 bed Drott Zone (lowest in Dakota), see Boos
046N	016W	13		Drott	USGS PP 188	MR	Naturita		X				May be the same as the Liberty Bell
046N	016W	14	SW SW NE	Fiddling Bill	CDM, Boos	MR	Naturita	7.0		1930-1950	105742	Vanadium Corp of America	VCA located in Naturita, Oberding bed
046N	016W	24	NW	Chatfield	CDM	MR	Naturita	Varies		1922	175	Ralph E Chatfield, Nucla	Thickness ranges 4-6 ft, Drott bed
047N	007W	25	S1/4 NW	Cimarron	CDM	MR	Washboard Rock	2.9		1938-1950	2530	Roy Roatcup	In Mesa Verde Fm?
047N	015W	31	SE SW	Independence	CDM	MR	Nucla	varies	X	1927-1960	39345	Ammon E. Nix, Nucla	4.5-6.1 ft, Oberding bed, also located in SENW and lot 2 of nwsesw, previous operators Oderding, Fagan, Newell, Boos reports 4-6 ft coal, 50 ft cover
047N	016W	rem		Nucla Strip	CDM	MR	Nucla	5.6	X	1959-1983	1997483	Peabody Coal Co.	See text for numerous comments, secs 25 and 31 (parts) Oberding bed
047N	016W	31	NE SE SW	Oberding	CDM, Boos	MR	Nucla	6.6	X	1924-1926	834	Wm J. Oberding, Nucla	Same loc as Independence, 2-6% pitch (1-3 deg), Boos locates in sec 11 and 5.5 ft, US Vanadium Corp, other Oberding mine 7-9 ft coal, Oberding bed
047N	016W	31											
047N	016W	31											
047N	016W	35	NW SE NW	Pleasant Valley	CDM, Boos	MR	Nucla	4.5		1924-1939	2096	Worth L. Holder, Nucla	(Rice-- according to Boos), two benches for 4.5 ft total, Oberding bed
047N	016W	36	C	Cloverdale	CDM, Boos	MR	Nucla	5.5		1916-1931	4119	C.E. Nix, Nucla	(Scott/ Peterson) (poss also Winkler), Oberding bed
047N	016W	36	SE NE SW	Missouri (Ranch)	CDM, Boos	MR	Nucla	6.0		1915-1927	5788	Gus Winkler, Nucla	Oberding bed, lower Dakota seam (Boos)
047N	016W	36	NW NE SE	Sunshine (Nix)	CDM, Boos	MR	Nucla	5.7		1935-1948	16433	Nix & Nix	(Nix), Boos gives no thickness, Oberding bed
047N	016W	36	NW NE	Winkler	CGS B16	MR	Nucla	5.9	X				Located 3 miles N of Nucla, not in CDM records, 0.2c/0.1p/0.8c/0.2p/4.6c
048N	009W	18	NE SW SE	Happy Canon	CDM	MR	Montrose West	2.3		1923-1928	3905	Happy Canon Coal Co.	Happy Canon Coal Co. located in Montrose
048N	009W	19	W SE,S NE	Ute	CDM	MR	Montrose West	2.0		1933-1935	181	Michael J. Babe	Dakota?, not in OF 79-1
NO LOCATION AVAILABLE				Newman	CDM	DT		14.0		1914	864	G.A. Clark	No location, Hotchkiss is nearest town, may be in Uinta Region
NO LOCATION AVAILABLE													
NO LOCATION AVAILABLE				Boughton	CDM	DL		2.5		1891-1896	11725	Boughton Coal Co, Rico	No location
NO LOCATION AVAILABLE				Grand View	CDM	DL		2.5		1883-1896	11240	Grand View Coal Co, Rico	No location
NO LOCATION AVAILABLE				Pasadena	CDM	DL		2.5		1891-1896	9985	Pasadena Coal Co, Rico	No location
NO LOCATION AVAILABLE				Rico	CDM	DL		1.7		1887	1000	G.V.M.&S. Co, Rico	No location
NO LOCATION AVAILABLE				Beal	CDM	MZ		--		1917	133	Henry Beal	No location
NO LOCATION AVAILABLE				Black Cat	CDM	MZ		4.5		1920-1921	267	Black Cat Coal Co.	No location, formation unknown, tonnage may be 723
NO LOCATION AVAILABLE				Bloom	CDM	MZ		7.0		1924	1500	F.W. Bloom	No location
NO LOCATION AVAILABLE				Braden	CDM	MZ		--		1931-1932	157	Olney Braden	No location, fm unknown, tonnage also shown as 304
NO LOCATION AVAILABLE				Colina	CDM	MZ		6.0		1892-1895	2175	G.M. Gau and Co.	No location, tonnage also shown as 3550
NO LOCATION AVAILABLE				Haller	USGS B316F	MZ	Millwood	6.7				---	1.2c/0.5p/3.6c/0.1p/1.3c, located 7 mi N of Mancos, not in CDM records
NO LOCATION AVAILABLE				Valley	CDM	MZ		4.5		1914	73	Frank Gross	No location
NO LOCATION AVAILABLE				Webber	CDM	MZ		4.0		1919-1920	520	Webber Coal Assoc	No location
NO LOCATION AVAILABLE				Blixt	CDM	MR		4.5		1921	200	Swan Blixt, Olathe	Location unknown
NO LOCATION AVAILABLE				Hutching's	CGS B16, Boos	MR	Nucla	5.9					Located near W end of High Mesa, W of Nucla, mines in First and Second Parks, not on CDM records, 1.3c/0.4p/1.3c/0.3p/0.3c/0.3p/2.0c
NO LOCATION AVAILABLE				Meek	CDM	MR		--		1932	25	Crystal Creek Coal Co	No location, no thickness, CCCC located in Maher,Colo.
NO LOCATION AVAILABLE				Mountain View	CDM	MR		--		1931	65	Mt View Coal Co, Colona	No location, no thickness

TABLE 2 (cont.)

TWP	RGE	SEC	QTR	MINE NAME	SOURCE	CTY	7.5' QUAD NAME	THKN	ANAL-YSIS	YEARS OF OPERATION	TONNAGE	OPERATOR	REMARKS [( ) -- alternate mine name]
NO LOCATION AVAILABLE				Royers	CDM	MR		3.5		1927	305	J.S. Royers	No location
NO LOCATION AVAILABLE				Specht	CDM	MR	Nucla	5.5		1916-1917	202	Nucla Coal Co.	No location (CGS Bull 16 states it is south of the Oberding mine)
NO LOCATION AVAILABLE				Tyler	CDM	MR		--		1929	180	Claude Johnson, Montrose	No location, not in OF 79-1, no thickness
NO LOCATION AVAILABLE				Arien	Grosvenor map	OU		25-30		1927-1928	185		Dakota?
NO LOCATION AVAILABLE				Colona	CDM	OU		3.0		1931-1934	1014	Colona Coal Co.	Location unknown, Dakota?
NO LOCATION AVAILABLE				Crumpley	Grosvenor map	OU		37.0		1927-1928	939		Dakota?
NO LOCATION AVAILABLE				Green Mountain	CDM	OU		--		1931	400	Lowery and Spence	Location unknown, Dakota?
NO LOCATION AVAILABLE				Miller	Grosvenor map	OU		22.0		1925	193		Dakota?
NO LOCATION AVAILABLE				Best	CDM	SM		3.5		1924	322	Best Coal Co, Norwood	No location
NO LOCATION AVAILABLE				Edgell	CDM	SM		4.0		1923	100	T.H. Edgell, Norwood	No location
NO LOCATION AVAILABLE				Galloway	CDM	SM		3.0		1919,1923	459	Louis Veo, Norwood	No location
NO LOCATION AVAILABLE				Wright's	CDM	SM		2.2		1923	210	---	No location, not in OF 79-1

Note: See miscellaneous information table (Table 4) for information on unnamed mines.

EXPLANATION OF ABBREVIATIONS

Headings

TWP - township

RGE - range

SEC - section

QTR - section subdivision by quarter(s)

CTY - county

THKN - thickness

Sources

CDM - Colorado Division of Mines

CGS B16 - Colorado Geological Survey Bulletin 16

USBM TP 574 - U.S. Bureau of Mines Technical Paper 574

USGS B 316F - USGS Bulletin 316F

USGS PP 188 - USGS Professional Paper 188

See bibliography for:

Boos

Grosvenor map

Sources (cont'd)

See bibliography for:

Kelly Wilson

Lee (1912)

Counties

DL - Dolores

DT - Delta

MR - Montrose

MZ - Montezuma

OU - Ouray

SJ - San Juan, Utah

SM - San Miguel

Remarks

c - coal

fm - formation

OF 79-1 - Colorado Geological Survey Open File Report 79-1

p - parting

TABLE 3

WATER WELL INFORMATION-DAKOTA COAL

SOUTHWESTERN COLORADO

Note: All depths and thicknesses are in feet and are derived solely from drillers' logs. See end of table for abbreviations used and additional notes.

TWP	RGE	SEC	QTR	PERMIT NO.	CTY	7.5' QUAD NAME	TOTAL DEPTH	COAL INTERVALS AND ASSOCIATED DATA / REMARKS
001S	001W	17	NW SE	3750-F	MS	Grand Junction	1060	40-47 interbedded carb shale and coal
002S	001E	14	SE NE	20320	MS	Whitewater	542	245-247
012S	101W	25	NE NE	17001	MS	Glade Park	1200	612-617
015S	096W	2	NW SW	30397	DT	North Delta	150	70-71 and 91-92
015S	096W	32	NE NE	18484	DT	Roubideau	230	80-95, thickness is questionable, 95-100 coal w/ streaks of sandstone
035N	016W	1	SE SW	1427	MZ	Cortez	610	321-324, 351-356, 424-433
036N	014W	11	SE NE	65642	MZ	Millwood	110	51-66 thin coal w/ brown and gray ss, 66-70 thin coal, 70-75 gray clay, thin coal on bottom, 105-110 coal and dark shales
036N	014W	29	SE SE	2478-F	MZ	Point Lookout	1370	603-606, 621-624
036N	015W	1	SW NW	64403	MZ	Dolores East	260	26-28, 52-54 (dirty), 64-75, 85-91, 96-99
036N	015W	30	SW NE	1426	MZ	Cortez	389	105-108
036N	017W	13	NE NE	30453	MZ	Arriola	352	21-119 blue shale and coal
036N	017W	17	NE NW	1425	MZ	Arriola	237	Streak of coal at 115, 161-165 coal
037N	014W	34	NE SE	5077	MZ	Millwood	134	60-66 black shale (low grade coal), sulphur water
037N	014W	34	SE SE	47567	MZ	Millwood	290	60-61.5 dark shale and coal shale, 128-131 fair coal
037N	014W	34	NE SE	47828	MZ	Millwood	275	63-70 thin coal shale and brownish gray ss, 70-81 coal shale
037N	014W	34	SE NE	59834	MZ	Millwood	125	26-28 coal shale, 52-54 coal, 59-61 good coal
037N	014W	35	SW NW	12358	MZ	Millwood	163	Streaks of coal at 38, 68, 93 ft
037N	015W	18	NE NE	14423	MZ	Dolores West	300	0-18 shale and clay w/ streak of low grade coal (black shale)
037N	015W	21	SE SE	13325	MZ	Dolores West	90	20-65 broken sand and shale with streak of coal at 46 ft, encountered small amount of sulphur water at 46 ft
037N	015W	26	SW NW	4285	MZ	Dolores East	502	44-50, 82-86, 111-115
037N	017W	13	NE SW	61003	MZ	Arriola	875	30-59 mixed clay, coal shale, and ss, 69-94 same
037N	018W	12	NE NE	22963	MZ	Woods Canyon	300	73-75 black shale and coal (damp)
037N	018W	24	SE NW	18230	MZ	Woods Canyon	210	71-72 black shale and coal (damp)
037N	019W	34	NE SE	47566	MZ	Negro Canyon	140	15-17 coal shale, 48-52 coal and coal shale, 102-104 coal and coal shale
038N	017W	21	SW SW	10590	MZ	Yellow Jacket	200	98-100
038N	017W	30	NW NW	73965	MZ	Pleasant View	275	108-110 good coal, 125-128 coal
038N	017W	32	SW SW	6148-F	MZ	Pleasant View	382	111-113, 150-153
038N	020W	2	SW SE	30526	MZ	Monu Cany (15')	85	7-20 brown and coal shale
039N	014W	8	SE SE	35965	DL	Willow Spring	155	30-31 coal shale, 34-40 coal shale, 40-55 gray thin coal shales, 66-70 coal shale, 81-84 coal and coal shale
039N	017W	35	NW SW	47829	MZ	Yellow Jacket	165	57-59 gray ss w/ some coal shale
039N	018W	13	NE NW	75831	DL	Cahone	140	24-27 coal shale, 42-47 coal and dark shale, 58-62 coal
039N	019W	9	SE NE	24657	OL	Champagne Spg	160	35-42 'gray clay, coal and coal shale'
039N	019W	30	SW*	17023	MZ	Ruin Canyon	110	24-28 white ss w/ coal streaks, 28-36 coal shale, *-- located in SW lots 15 and 16
039N	019W	30	NE SE	74001	MZ	Ruin Canyon	200	85-90 coal shale, 111-114 coal and coal shale, 118-135 coal and coal shale, 146-151 coal and coal shale
039N	020W	2	NE SW	32532	DL	Monu Cany (15')	80	48-50 coal shale
039N	020W	11	SE SE	24615	DL	Monu Cany (15')	85	27-31 coal shale, 34-39 coal and coal shale
039N	020W	11	NE NE	32533	DL	Monu Cany (15')	65	21-24 coal and gray sandy shale, 53-54 coal and brown shale, 60-62 coal shale
040N	018W	4	SE SW	37644	DL	Cahone	46	31-46 coal shale
040N	018W	6	SE NE	30409	DL	Dove Creek	150	18-20 coal shale, 38-47 coal and coal shale, 49-90 gray shale and coal shale
040N	018W	8	SE SE	17511	DL	Cahone	220	26-27 coal shale, 44-75 coal shale, 76-107 mixed blue and gray clay and coal shale
040N	018W	11	SW NE	21630	DL	Cahone	145	Coal shale in the following intervals: 5-8, 11-14, 48-52
040N	018W	16	NW SW	36330	DL	Cahone	260	Coal shale in the following intervals: 47-59, 66-78, 90-95
040N	018W	17	NW NW	17512	DL	Cahone	260	17-28 coal shale and blue gray shale, 68-69 coal shale, 69-85 mixed layers of coal & gray ss
040N	018W	17	NE SE	21880	DL	Cahone	120	14-18 coal shale, 18-21 coal, 35-40 coal shale, 40-46 coal

TABLE 3 (cont'd)

TWP	RGE	SEC	QTR	PERMIT NO.	CTY	7.5' QUAD NAME	TOTAL DEPTH	COAL INTERVALS AND ASSOCIATED DATA / REMARKS
040N	018W	17	SE SW	28179	DL	Cahone	210	18-20 coal shale, 27-34 coal and coal shale, 45-49 gray ss w/ thin layers of coal shale, 79-96 coal and gray-brown shale
040N	018W	27	NE SW	69124	DL	Cahone	395	46-50 coal and coal shale
040N	018W	34	NE NW	63894	DL	Cahone	395	36-50 blue, gray and coal shale
040N	019W	1	NE SE	39316	DL	Dove Creek	65	19-23 coal and coal shale, 45-65 gray clay and coal shale
040N	019W	7	NE SE	19931	DL	Champagne Spg	142	30-48 coal shale, 55-69 coal shale
040N	019W	7	SE NE	21144	DL	Champagne Spg	65	44-47 coal shale
040N	019W	11	SE NE	74012	DL	Champagne Spg	280	16-32 brown and coal shale, 63-67 coal and coal shale, 75-83 brown and coal shale
040N	019W	14	SW SW	9753	DL	Champagne Spg	120	17-23 coal shale, 25-31 coal shale, 43-45 'coal water'
040N	019W	14	SW SE	20518	DL	Champagne Spg	144	22-45 'coal, coal shale mixed with gray shales'
040N	019W	15	NW NW	8354	DL	Champagne Spg	150	18-34 brown and gray clay w/ coal shale, 85-95 coal and coal shale
040N	019W	15	SW SW	21631	DL	Champagne Spg	160	64-74 coal and coal shale
040N	019W	15	SW SW	41886	DL	Champagne Spg	170	7-14 coal shale, 80-90 dark gray clay and shale w/ thin coal
040N	019W	21	SE SW	37520	DL	Champagne Spg	210	93-98 coal shale
040N	019W	23	NW SW	11932	DL	Champagne Spg	120	6-33 coal shale, blue and gray mixed shale
040N	019W	23	NE SE	21557	DL	Champagne Spg	150	5-17 coal and brown & gray shale, 31-36 coal and brown shale, 46-52 coal and brown shale
040N	019W	23	NW NE	29764	DL	Champagne Spg	125	Coal and coal shale 8-10 and 11-15; 41-56 mixed dark gray clay and coal shale, 58-79 gray clay w/ 'lots of coal shale'
040N	019W	29	SE SE	12499	DL	Champagne Spg	240	15-18 coal shale, 25-29 thin coal shale, brown siltstone and clay
040N	019W	33	NW NW	35773	DL	Champagne Spg	275	11-13 coal shale, 24-38 mixed coal shale & blue-gray shale
040N	019W	34	SW SE	18345	DL	Champagne Spg	270	19-26 coal and coal shale, 36-39 brown coal shale and coal, 93-98 black shale w/ a little coal
040N	020W	36	SE SE	21879	DL	Monu Cany (15')	145	48-53 coal shale and blue-gray sandy shale, 60-66 coal shale, 67-85 thin coal shale in blue&gray shale, 85-89 coal
041N	018W	31	NW SW	49236	DL	Dove Creek	140	Coal shale at 67-71 and 80-84
041N	019W	5	SE NE	20695	DL	Dove Creek	100	17.5-22 coal and gray shale
041N	019W	10	SE SE	30277	DL	Dove Creek	160	Coal shale in the following intervals; 25-27, 33-38, 48-56; wet coal 38-41
041N	019W	11	SW NW	17211	DL	Dove Creek	285	14-22 coal shale, 27-29 coal, 47-53 coal shale
041N	019W	18	NW SW	A7601	DL	Dove Creek	141	20-22 coal shale, 28-45 coal shale and blue shale
041N	019W	20	NE SW	7601	DL	Dove Creek	274	Mixed coal, coal shale and gray clay 8-14 and 25-33
041N	019W	26	NW NW	37784	DL	Dove Creek	260	33-34 coal and brown sandy shale
041N	019W	27	SW SW	7695	DL	Dove Creek	135	18-21 coal shale and clay, 30-42 coal shale
041N	019W	31	NE SW	12135	DL	Dove Creek	150	47-52 coal shale, location is uncertain -- may be in T43N
041N	019W	32	SE SW	15708	DL	Dove Creek	155	Coal shale 26-50, 55-67, 116-118
041N	019W	32	NE NE	41667	DL	Dove Creek	155	Coal and coal shale 11-17 and 58-59
041N	019W	34	NE SW	20519	DL	Dove Creek	150	36-52 mixed layers of gray clay and coal shale, 88-90 fair coal
041N	019W	35	NW SW	15333	DL	Dove Creek	165	Coal shale 53-54, 82-97, 102-106
041N	019W	35	SE SW	17521-F	DL	Dove Creek	170	34-36 coal shale, 63-67 coal shale and dark clay, 88-106 coal shale
041N	020W	13	SE SE	7600	DL	Eastland (15')	153	Coal shale 42-43 and 45-50
041N	020W	13	NE NE	11212	DL	Eastland (15')	100	14-18 coal shale
042N	018W	8	SW SW	31170	SM	Egnar	265	32-40 coal shale
042N	018W	30	NW NW	15432	DL	Egnar	110	Coal shale 22-25, 45-50, 67-69, 71-74
042N	019W	2	SW SE	19993	SM	Egnar	160	'Good quality coal' 23-33
042N	019W	9	SW SE	65915	SM	Egnar	180	42-46 coal shale
042N	019W	11	SW SW	77161	SM	Egnar	155	54-62 coal, thin gray clays
042N	019W	11	NW SW	122204	SM	Egnar	113	41-48 coal shale
042N	019W	14	NW NW	15951	SM	Egnar	160	55-62 coal shale
042N	019W	14	SW NW	19045	SM	Egnar	100	32-60 gray ss/coal shale, 75-80 gray clay with carbon streaks
042N	019W	15	SE NE	39555	SM	Egnar	75	Coal and coal shale in the following intervals: 16-22, 25-30, 41-46, and 70-75
042N	019W	25	NW NW	15162	DL	Egnar	70	38-40 coal shale
042N	019W	26	SW SW	79004	DL	Dove Creek	170	26-28 coal shale
042N	019W	27	SE SE	24389	DL	Dove Creek	160	41-50 coal and coal shale w/ thin ss
042N	019W	27	SE NE	75829	DL	Dove Creek	200	40-44 'fairly clean coal', 56-62 coal and coal shale

TABLE 3 (cont'd)

TWP	RGE	SEC	QTR	PERMIT NO.	CTY	7.5' QUAD NAME	TOTAL DEPTH	COAL INTERVALS AND ASSOCIATED DATA / REMARKS
042N	019W	29	NW NE	24095	DL	Egnar	160	45-55 coal and coal shale, 59-63 brown & coal shale, 63-67 coal & brown shale
042N	019W	30	NE SW	21340	DL	Eastland (15')	160	9-13 coal shale
042N	019W	35	SW SW	32531	DL	Dove Creek	125	Coal shale 44-47 and 66-68
042N	019W	35	SW NW	39315	DL	Dove Creek	230	19-31 coal, thin gray shales
042N	020W	23	SW NE	42268	SM	Eastland (15')	170	16-23 coal and coal shale, 65-68 coal and coal shale
043N	013W	19	NE SE	42724	SM	Lone Cone	125	40-44 coal shale, possibly in Mancos Fm.
043N	013W	19	SE NE	42725	SM	Lone Cone	95	12-13 coal shale, 63-70 coal shale
043N	013W	19	NW NE	42726	SM	Lone Cone	80	26-28 dark shale and coal, 55-58 coal shale, possibly in Mancos Fm.
043N	020W	25	SE SE	66555	SM	Eastland (15')	170	32-34 coal and coal shale, 36-44 thin hard ss, dark clay and coal
044N	012W	7	NE NE	64685	SM	Gurley Canyon	94	12-14 clay-coal, 18-20 coal
044N	015W	14	SE SE	22863	SM	Barklew Draw	448	68-79 coal
044N	017W	12	SW NE	15429	SM	Gypsum Gap	210	29-30 shale and coal
045N	011W	17	NE SW	2040	SM	Hotchkiss Res	150	112-133 shale, coal and sandstone
045N	013W	14	SW SW	10548	SM	Norwood	61	60-61, log ends in coal
045N	013W	25	NW NW	61299	SM	Norwood	65	18-21 coal with black shale
045N	013W	26	SW NW	18160	SM	Norwood	74	62-66
045N	013W	34	NW NW	65346	SM	Oak Hill	102	16-20 coal shale
045N	013W	34	SE NW	74181	SM	Oak Hill	260	15-50 coal shale, 60-70 brown sand and coal shale
046N	010W	12	SW SW	480	OU	Horsefly Peak	250	78-107 'stratas shale, coal and sand'
046N	015W	4	NE SE	61468	MR	Nucla	125	No coal
046N	015W	5	NE SW	13592	MR	Nucla	116	28-31
046N	015W	5	SW NE	72723	MR	Nucla	210	45-70 coal and coal shale
046N	015W	8	SE SW	58765	MR	Nucla	345	No coal
046N	015W	8	SE SE	69012	MR	Nucla	290	No coal
046N	016W	1	SE NW	18275	MR	Nucla	220	64-105 coal with shale
046N	016W	12	SE SW	18993	MR	Naturita	240	116-149 coal (interbedded?), 157-163 coal, 175-176 coal
046N	016W	12	SW NE	58704	MR	Nucla	234	No coal shown on log: Jack Smith (driller) says '5-6 ft good coal' encountered; location on permit is in error
047N	008W	18	NW NW	19998	OU	Colona	268	211-213
047N	008W	20	SE NE	42833	OU	Colona	275	203-252 shale, rock and coal
047N	008W	29	SW NE	25006	OU	Colona	265	205-223 shale, rock and coal
047N	009W	1	NE SE	29588	MR	Colona	338	255-293 shale coal and rock
047N	009W	1	NE NW	19489	OU	Colona	405	355-361 coal and shale
047N	009W	2	NW NW	25585	MR	Colona	330	235-270 shale, rock and coal
047N	009W	2	NW SW	42328	MR	Colona	224	147-156 shale, coal and rock
047N	009W	12	NW NW	750	MR	Colona	360	332-348 'stratas of shale and coal'
047N	009W	15	SE SE	69687	OU	Colona	430	108-110 coal, 130-135 coal shale, 135-136 coal
047N	009W	24	NW NW	20755	OU	Colona	302	137-144 coal, shale and rock
047N	015W	30	SW NW	11767	MR	Nucla	200	20-25
047N	015W	31	SW SE	67337	MR	Nucla	195	20-90 'shale coal seams'
047N	016W	14	NW SW	67470	MR	Nucla	260	30-135 'Mancos shale and coal', driller Jack Smith says 5 ft 'good bright coal'
047N	016W	23	NW SE	75194	MR	Nucla	250	Coal and coal shale 30-38
047N	016W	24	SE SW	47673	MR	Nucla	220	14-18 and 50-55
047N	016W	24	NE SW	100101	MR	Nucla	360	Coal shale 10-95
047N	016W	24	NW SW	110789	MR	Nucla	300	Coal shale: 25-35 and 60-70
047N	016W	25	NE SE	74597	MR	Nucla	140	Coal shale: 20-30, 55-67, 93-110
047N	016W	26	NE SE	11801	MR	Nucla	178	16-25
047N	016W	27	NE NE	59104	MR	Nucla	490	18-110 shale and coal seams, best coal top 25 ft
048N	009W	3	NW NW	33490	MR	Montrose East	168	97-119 shale coal and rock
048N	009W	7	NW NW	22647	MR	Montrose West	245	182-196 coal shale and rock

TABLE 3 (cont'd)

TWP	RGE	SEC	QTR	PERMIT NO.	CTY	7.5' QUAD NAME	TOTAL DEPTH	COAL INTERVALS AND ASSOCIATED DATA / REMARKS
048N	009W	9	SW NW	7802	MR	Montrose East	480	405-412 coal and sandstone
048N	009W	10	SW SW	6332	MR	Montrose East	542	463-470
048N	009W	16	NE SE	46185	MR	Montrose East	410	365-385 shale coal and rock
048N	009W	36	SE SW	16001	MR	Colona	420	346-357 shale, coal and rock
048N	010W	1	NW SW	26383	MR	Montrose West	214	128-145 sandrock, coal and shale
048N	010W	2	SE SE	2039	MR	Montrose West	180	127-168 'stratas of coal, sand and shale'
048N	010W	2	SW SE	18663	MR	Montrose West	194	127-136 coal, shale and rock
048N	010W	2	NW SE	26642	MR	Montrose West	185	100-110 shale rock and coal
048N	010W	2	NW NW	49658	MR	Montrose West	135	84-125 shale coal and sandrock
048N	010W	2	NW SE	50961	MR	Montrose West	175	104-118 coal shale and rock
048N	010W	3	SE NE	38545	MR	Montrose West	175	72-114 sandrock, shale and coal
048N	010W	12	SW NE	2038	MR	Montrose West	180	121-163 'stratas of coal, sand and shale'
048N	010W	28	SW SW	19232	MR	Montrose West	262	60-61
048N	010W	36	SE NE	2035	MR	Colona	310	'Stratas of sand, coal and shale'
049N	009W	31	SE SE	479	MR	Montrose West	460	368-440 'stratas of sandstone, shale and coal'
049N	009W	35	NE SW	29384	MR	Montrose East	175	100-112 coal shale and rock
049N	009W	36	SW SW	17244	MR	Montrose East	148	91-110 'stratas of shale rock and coal'
049N	010W	22	SE NW	1243	MR	Montrose West	240	143-196 stratas of sand, coal and shale
049N	010W	24	NW NW	19148	MR	Olathe	565	483-488
049N	010W	26	NW SW	18803	MR	Montrose West	182	97-107 coal and shale
049N	010W	33	NW NE	23075	MR	Montrose West	245	70-80 coal w/ clay layers, 80-90 coal with sandstone layers
049N	010W	34	SE SE	15346	MR	Montrose West	157	102-118 'stratas of coal and shale'
049N	010W	34	SE NE	24541	MR	Montrose West	170	93-114 shale, coal and rock
049N	010W	35	NW NE	2742	MR	Montrose West	170	156-159
049N	010W	35	NW NW	19144	MR	Montrose West	310	90-100 coal and shale
049N	010W	35	SE NW	23361	MR	Montrose West	169	97-110 shale, coal and rock
049N	010W	35	SW NE	32540	MR	Montrose West	120	82-110 white shale rock and coal
049N	010W	35	SE SW	33486	MR	Montrose West	175	93-113 shale rock and coal
049N	010W	35	NE SE	34769	MR	Montrose West	168	105-112 shale, coal and rock
050N	010W	32	SW SW	36462	MR	Olathe	340	287-300 shale, rock and coal
050N	011W	9	NW NW	18596	MR	Hoovers Corner	262	62-75, thickness is questionable
050N	011W	23	NW SW	71752	MR	Hoovers Corner	90	73-75
050N	011W	25	SE SE	41231	MR	Hoovers Corner	195	145-160 shale coal and rock
051N	011W	19	NE SE	18822	DT	Roubideau		117-124

Note: Considering its source, this information should be used with caution. Drillers' terminology is used in remarks.

EXPLANATION OF ABBREVIATIONS

Headings

TWP - township

RGE - range

SEC - section

QTR - section subdivision by quarter(s)

CTY - county

Counties

DL - Dolores

DT - Delta

MR - Montrose

MS - Mesa

MZ - Montezuma

OU - Ouray

SM - San Miguel

Remarks

Fm - formation

ss - sandstone

TABLE 4

MISCELLANEOUS INFORMATION-DAKOTA COAL

SOUTHWESTERN COLORADO

Note: All thicknesses are in feet. See end of table for explanation of abbreviations used.

TWP	RGE	SEC	QTR	DATA POINT ID	SOURCE	CTY	7.5 QUAD NAME	COAL THKN	ANAL-YSIS	REMARKS
001N	003W	9	NW NW	CP-6	CGS RS-2	MS	Mack			Trench in ridgetop 1.5 mi S of Loma is either a clay pit or coal prospect, no activity noted in Dakota coals in the Redlands area or W of Loma
001S	001E	31	SW NW NW	MS-40	USGS Bull 471	MS	Grand Junction	1.9		1.1c/0.4p/0.4; Woodruff's no. 6
001S	001E	31	SW NW	MS-41	USGS Bull 471	MS	Grand Junction	0.7		Woodruff's no. 7
001S	001E	31	NW SW	MS-42	USGS Bull 471	MS	Grand Junction	0.5/0.7		0.5c/2.0p/0.7c -- parting is carb sh and bony coal; Woodruff's no. 8
001S	001W	16		Occ-14a	Bob Young	MS	Grand Junction			Outcrops in subdivision, Redlands area, also exposed in draws
001S	001W	22	SW	MS-11	USGS Bull 341	MS	Grand Junction	4.5	X	See p. 333 for analysis info, located at 'junction of Grand and Gunnison Rivers', also two very thin coals
001S	001W	23	SW	MS-38	USGS Bull. 471	MS	Grand Junction	2.9/3.0	X	Analysis nearby, see Grand Junction area #1 and #2; railroad cut, thickest exposure of coal in the Mesa-Delta County area, at least one adit, Woodruff's no.1, see log for parting information
001S	001W	26	C	MS-39	USGS Bull 471	MS	Grand Junction	0.8		Woodruff's no.2
001S	001W	36	NW NE	CP-12	USGS Bull 471	MS	Grand Junction	0		10 ft deep coal prospect dug; 2.0 ft carbonaceous shale only, Woodruff's no. 5
002S	001E	5	SE SW	CP-13	USGS Bull 471	MS	Grand Junction	2.5/2.7	X	100 ft deep prospect; top bed was analyzed; 1.2c/0.3p/1.0c/22.2IB/1.2c/0.6p/0.9c -- see detailed log, Woodruff's no.11
002S	001E	5	SE SW	Misc-3	CGS RS-2	MS	Whitewater	2.25/2.2		100 ft entry on a river meander,2.25c/22.0p/2.2c (thinner partings not shown),adit not found by Schwochow, landfill blocks access
002S	001E	5	SW SE	MS-43	USGS Bull 471	MS	Grand Junction	0.9		Only small part measured; Woodruff's no. 12
002S	001E	8	NW NE NE	MS-44	USGS Bull 471	MS	Grand Junction	1.0		0.6 carb sh/1.0 coal; Woodruff's no. 13
002S	001E	35	SW NE	MS-47	USGS Bull 471	MS	Whitewater	1.0		Woodruff's no. 22
002S	001E	36	SW NW	MS-48	USGS Bull 471	MS	Whitewater	1.2		Woodruff's no. 23
002S	001E	36	SW NE	MS-49	USGS Bull 471	MS	Whitewater	v. thin		0.2c/0.3p/0.2c/0.3p/0.1c; Woodruff's no. 24
003S	002E	6	NW NE NE	MS-50	USGS Bull 471	MS	Whitewater	1.5		Woodruff's no. 26
003S	002E	18	SW SW	MS-51	USGS Bull 471	MS	Whitewater	1.0		Woodruff's no. 31
003S	002E	19	SW NE	MS-52	USGS Bull 471	MS	Whitewater	0.8		Woodruff's no. 33
003S	002E	25	NW SE	CP-5	CGS RS-2	MS	Dominguez			Possible prospect pit, 2 coaly seams crop out about 20-40 ft below ss ledge on rim of canyon, located on N side of Deer Creek near Delta Co. line
003S	002E	29	SW SE NE	MS-45	USGS Bull 471	MS	Triangle Mesa	0.5		Woodruff's no. 35, 0.2 ft coals in outcrops between nos. 35 and 39
003S	002E	35	SW SW	MS-37	USGS Bull 471	MS	Dominguez	0.4		Woodruff's no. 39
004S	003E	17	SW NW	Occ-9a	field inv	DT	Dominguez	3.0		Fools Hill roadcut, site of Wells Gulch Mine?, also thinner beds exposed
004S	003E	17	NW NE	Wells Gulch-A	USGS Bull 471	DT	Dominguez	1.6		Woodruff's no. 47-a; 100 ft from mine entrance
004S	003E	17	NW NE	Wells Gulch-B	USGS Bull 471	DT	Dominguez	3.9	X	Woodruff's no. 47-b; shown as 1.7 coal/2.2 carb sh, however all 3.9 ft analyzed as coal
004S	003E	28	SW SW SW	MS-28	USGS Bull 471	DT	Dominguez	0.5		Woodruff's no. 52
004S	003E	29	SW NW	MS-27	USGS Bull 471	DT	Dominguez	0.7		Woodruff's no. 57
004S	003E	33	C NE	MS-29	USGS Bull 471	DT	Dominguez	0.7		Woodruff's no. 53
004S	003E	35	SE NE	MS-30	USGS Bull 471	DT	Point Creek	1.2		0.2c/0.7p/0.3c/15.5IB/1.2c; Woodruff's no. 56, see detailed log
012S	099W	28	SE SW SW	MS-46	USGS Bull 471	MS	Whitewater	0.8		0.2c/0.2p/0.2c/0.2p/0.4c/1.0p/0.8c; Woodruff's no. 19
012S	099W	28	SE NE	Occ-8a	field inv	MS	Whitewater	thin		Exposure to E of Hwy 141
012S	100W	15		CP-10	CGS RS-2	MS	Grand Junction			'Barren prospect'
014S	098W	23	NW NE	MS-26	USGS Bull 471	DT	Dominguez	0.3		Woodruff's no. 44
015S	092W	30	SW SE	Occ-6a	field inv	DT	Grand View Mesa	thin		0.2-0.5 ft very dirty coal exposed in roadcut
015S	092W	35	S1/2 SE	Occ-7a	field inv	DT	Grand View Mesa	thin		Less than 1.0 ft coal exposed in roadcut, below upper sandstone
015S	096W	19	SW NE NE	MS-36	USGS Bull 471	DT	Roubideau	1.1		Woodruff's no. 62
015S	097W	13	NW SW NW	MS-34	USGS Bull 471	DT	Point Creek	0.7		Woodruff's no. 60
015S	097W	13	SE SW SW	MS-35	USGS Bull 471	DT	Roubideau	0.5		Woodruff's no. 61

TABLE 4 (cont'd)

TWP	RGE	SEC	QTR	DATA POINT ID	SOURCE	CTY	7.5' QUAD NAME	COAL THKN	ANAL-YSIS	REMARKS
015S	097W	14	NW NW NW	MS-32	USGS Bull 471	DT	Point Creek	1.3		Woodruff's no. 58
015S	097W	14	NE NE NW	MS-33	USGS Bull 471	DT	Point Creek	1.4/0.8		Woodruff's no. 59, 1.4c/2.7p/0.8c
015S	097W	15	NE NE	MS-31	USGS Bull 471	DT	Point Creek	1.1		Woodruff's no. 57, 1.1 coal/0.4 carb sh
019S	026E	5	SE SE SW	MS-15	USGS MF 1800	GR	Bitter Cr Well	1.1/4.5		Coal has large partings and some is 'impure'; 0.2c/0.2p/0.3ic/11.0IB/0.8ic/0.2p/0.7c/0.3p/0.3c/0.2p/ 0.3ic/0.8p/0.9c, no. BCSC 17
032N	020W	22		MS-6	NMBM Circ 134	MZ	Aneth (15')	6.9*		* Within 3000 ft bed is 3.5/1.0 ft in 2 directions, single beds up to 20 ft thick in oil and gas logs
033S	026E	22	SW SW	CP-2	Utah GMS Mono-2	SJ	Eastland (15')	2.6		1.4c/0.5p/0.7c
033S	026E	27	C NW	MS-19	Boyer report	SJ	Eastland (15')	0		Ucolo area, Boyer's no. 15, 1.5 carb sh/0.3 sh, along Paiute Creek
033S	026E	28	NE NE	MS-20	Boyer report	SJ	Eastland (15')	0.5		Ucolo area, Boyer's no. 16, 1.4 carb sh/0.5 coal, along Paiute Creek
034N	018W	6		MS-4	USGS PP 481	MZ	Mariano Wash E	2.5		No. 8 - Yucca Section, located along wash, poss in Moqui Wash West quad?
034S	025E	26		CP-7	GEM report	SJ	Eastland (15')			Open pit
034S	026E	2	N 1/2	MS-16	Boyer report	SJ	Eastland (15')	3.2		Ucolo area, Boyer's no. 11, located near state line, numerous partings of carb sh (0.7 ft total)
034S	026E	9	SW SW NE	CP-8	Boyer report	SJ	Eastland (15')			Ucolo area, Boyer's no. 5, no description, along west fork of Coal Bed Canyon
034S	026E	9	NE NE SW	MS-17	Boyer report	SJ	Eastland (15')			Ucolo area, Boyer's no. 4, no description, along west fork of Coal Bed Canyon
034S	026E	10	SE SW NW	MS-18	Boyer report	SJ	Eastland (15')	0		Ucolo area, Boyer's no. 6, 0.8 ft black shale, slightly carbonaceous
034S	026E	10	NW SE	UM-1a	Boyer report	SJ	Eastland (15')	2.4		Ucolo area, Boyer's no. 7, 0.5 carb sh/0.8 gray sh/0.8 bone coal/0.6 sh/1.0 poor coal
035N	16-20W			NC-1	NMBM Memoir 25	MZ	mult			No coal of commercial thickness found; several complete sections were measured
035N	018W	11	SW SW	MS-9	CGS Bull 16	MZ	Battle Rock			Coal shown in section, S side of Mc Elmo Canyon along Pine Creek, 2.5 mi from its mouth
035N	018W	17		MS-53	Boyer report	MZ	Battle Rock			Boyer's no. 16
035S	026E	5	SE SE SE	CP-4	Utah GMS Mono-2	SJ	Eastland (15')	1.0		
036N	012W	24	SE	MS-14	Boyer report	LP	Hesperus			Boyer's no. 19
036N	12-13W			NC-2	NMBM Memoir 25	MZ	mult			No coal found or reported. Dakota is exposed in deep canyons; dense timber and brush a problem.
036N	014W	rem		NC-3	NMBM Memoir 25	MZ	Mancos/Millwood			No coal found, heavy timber and brush cover (East part of township).
036N	014W	6		Occ-71	NMBM Memoir 25	MZ	Dolores East	4.1		
036N	014W	7	NW SW NW	Occ-60	Montelores Rpt	MZ	Dolores East			
036N	014W	7	SW SW NW	Occ-61	Montelores Rpt	MZ	Dolores East			
036N	014W	7		Occ-72	NMBM Memoir 25	MZ	Dolores East	5.0+		
036N	014W	18	SE SE SE	Occ-29	Montelores Rpt	MZ	Point Lookout	3.0		
036N	014W	18	SE	Occ-73	NMBM Memoir 25	MZ	Dolores East	3.5+		
036N	014W	24	SE	UM-6	Wayne Denny	MZ	Mancos			Location from Wayne Denny of Cortez
036N	014W	36	W1/2	Occ-11a	field inv	MZ	Mancos			Exposure in roadcut, formerly within a state coal lease
036N	015W	1	NE NE SE	Occ-69	Montelores Rpt	MZ	Oolores East			
036N	015W	4	SW SE	Occ-16	Montelores Rpt	MZ	Dolores West			
036N	015W	9	NW NE	Occ-17	Montelores Rpt	MZ	Dolores West			
036N	015W	9	SW SE SE	Occ-18	Montelores Rpt	MZ	Dolores West	5.0		
036N	015W	9	NE SE SE	Occ-62	Montelores Rpt	MZ	Oolores East	3.2		Cash Canyon
036N	015W	10		MS-54	Boyer report	MZ	Dolores East			Boyer's no. 17
036N	015W	10		MS-55	Boyer report	MZ	Dolores East			Boyer's no. 18, 700-800 ft from no. 17, direction not specified
036N	015W	10	C NW SW	Occ-63	Montelores Rpt	MZ	Dolores East	3.2		Cash Canyon
036N	015W	10	S NE SW	Occ-64	Montelores Rpt	MZ	Dolores East			Cash Canyon
036N	015W	10	C SW NE	Occ-65	Montelores Rpt	MZ	Dolores East			Cash Canyon
036N	015W	10	NW NE NE	Occ-66	Montelores Rpt	MZ	Dolores East			Cash Canyon
036N	015W	11	NE NW	Occ-67	Montelores Rpt	MZ	Dolores East			
036N	015W	12	C SW NE	Occ-68	Montelores Rpt	MZ	Dolores East			
036N	015W	14	C NW	UM-4	Montelores Rpt	MZ	Dolores East			
036N	015W	15	C SE NE	Occ-70	Montelores Rpt	MZ	Dolores East			

TABLE 4 (cont'd)

TWP	RGE	SEC	QTR	DATA POINT ID	SOURCE	CTY	7.5' QUAD NAME	COAL THKN	ANAL-YSIS	REMARKS
036N	015W	22	C SE SE	Occ-25	Montelores Rpt	MZ	Point Lookout			
036N	015W	23	SE NW SE	Occ-26	Montelores Rpt	MZ	Point Lookout			
036N	015W	23	SE SE NE	Occ-27	Montelores Rpt	MZ	Point Lookout			
036N	015W	27	NW SW NW	Occ-28	Montelores Rpt	MZ	Point Lookout			
036N	015W	28		MS-5	USGS Bull 1072-M	MZ	Cortez	2.8		Very little coal present 'a few miles to the West'
036N	015W	28	NW NE NE	Occ-10	Montelores Rpt	MZ	Cortez			
036N	015W	28	C SW NE	Occ-11	Montelores Rpt	MZ	Cortez			
036N	015W	28	NW NW SE	Occ-15	Montelores Rpt	MZ	Cortez	4.0 & 6.0		Depths to 2 coals unknown
036N	015W	29	NE NE SE	Occ-12	Montelores Rpt	MZ	Cortez			
036N	015W	33	NW NW	UM-14	Kelly Wilson	MZ	Cortez			
036N	015W	34	NW NE SW	Occ-59	Montelores Rpt	MZ	Dolores East	2.0		
036N	015W	rem		Misc-12	BLM file info	MZ	mult			Coal lease appl. 2/11/85; Cecil Gustin, Box 270, Dolores, CO; T36N R15W secs 14,15,21,22,24
036N	016W	23	SW NW SW	Occ-13	Montelores Rpt	MZ	Cortez			
036N	016W	23	SW SW NW	Occ-14	Montelores Rpt	MZ	Cortez	2.5 & 0.6		Depths to 2 coals unknown
036N	016W			Occ-55	NMBM Memoir 25	MZ	Cortez			Several thin coals measured, mostly just NW of Cortez, none of commercial thickness, not mapped
036N	016W	27	NW SE	UM-12	Kelly Wilson	MZ	Cortez			East side of Hartman Draw
036N	016W	27	SW SE SW	UM-13	Kelly Wilson	MZ	Cortez			East side of Hartman Draw
036N	16-18W			Occ-49	Boos, M.F.	MZ	mult			Mc Elmo Anticline (E-W axis) -- crossed by several canyons that expose sections with Dakota coal
036N	017W			MS-59	NMBM Memoir 25	MZ	mult			Sections measured in several of the canyons, no coal of commercial thickness found
036N	18-20W			NC-4	NMBM Memoir 25	MZ	mult			No sections measured, access difficult
037N	12-13W			Occ-74	NMBM Memoir 25	MZ	mult			Occasional indications of coal in canyon walls; no extensive investigation due to thick brush cover
037N	014W	10	SE SW SW	UM-2	Montelores Rpt	MZ	Dolores East	3.0		Abondoned mine in Carver Canyon
037N	014W	10	SW SE SW	UM-3	Montelores Rpt	MZ	Dolores East	3.0		Abondoned mine in Carver Canyon
037N	014W	31		MS-56	NMBM Memoir 25	MZ	Dolores East	4.5		Isolated measurement
037N	014W			Occ-56	NMBM Memoir 25	MZ	mult			Numerous outcrops and abandoned adits in canyons of Lost Creek and Dolores River
037N	015W	10	C NE	Occ-57	Montelores Rpt	MZ	Dolores East	3.1		
037N	015W	11	C SE SW	Occ-58	Montelores Rpt	MZ	Dolores East			
037N	015W	33		MS-58	NMBM Memoir 25	MZ	Dolores West	3.5		
037N	015W	33	SW NW SW	Occ-19	Montelores Rpt	MZ	Dolores West	3.0		
037N	015W	SE		MS-57	NMBM Memoir 25	MZ	Dolores East	(3.0		Info from Cullins and Bowers report, less than 3.0 ft in SE part of township
037N	016W	31		UM-1	NMBM Memoir 25	MZ	Arriola			Small abandoned mine
037N	017W	11	SW SE	Occ-1	Montelores Rpt	MZ	Arriola			
038N	016W	18	NW SE	Occ-36	Montelores Rpt	MZ	Yellow Jacket			
038N	016W	29	NE NW NW	Occ-37	Montelores Rpt	MZ	Yellow Jacket			
038N	016W	30	C NE NW	Occ-38	Montelores Rpt	MZ	Yellow Jacket			
038N	016W	30	NW SW NW	Occ-39	Montelores Rpt	MZ	Yellow Jacket			
038N	017W	4	SW SW N	Occ-40	Montelores Rpt	MZ	Yellow Jacket	1.0		
038N	017W	5	SW SW SW	Occ-21	Montelores Rpt	MZ	Pleasant View	3.3		
038N	017W	5		Occ-84	US Bur Recl	MZ	Pleasant View	7.0		Trench cut coal across Sandstone Canyon near Hwy 666, about 8 feet deep, info from Dave Simrak
038N	017W	7	SE NW	Occ-22	Montelores Rpt	MZ	Pleasant View	3.3		
038N	017W	13	E NE NE	Occ-41	Montelores Rpt	MZ	Yellow Jacket			
038N	017W	25	SE NE NE	Occ-42	Montelores Rpt	MZ	Yellow Jacket	2.0		
038N	017W	30	SW NW NW	Occ-23	Montelores Rpt	MZ	Pleasant View			Drill hole with 'coal' (no thickness)
039N	017W	5	SE	CP-1	USGS PP 576-A	DL	Doe Canyon			Located 1 mi N of Bradfield Ranch, W side of Dolores R Canyon, 31700 ft S of 37. 45'N and 3500 ft E of 108. 45'W
039N	017W	21	N SW SW	Occ-75	Montelores Rpt	MZ	Yellow Jacket			

TABLE 4 (cont'd)

TWP	RGE	SEC	QTR	DATA POINT ID	SOURCE	CTY	7.5' QUAD NAME	COAL THKN	ANAL-YSIS	REMARKS
039N	017W	21	SW SE SE	UM-5	Montelores Rpt	MZ	Yellow Jacket			
039N	017W	27	C NW	Occ-77	Montelores Rpt	MZ	Yellow Jacket			
039N	017W	27	NE SE SE	Occ-78	Montelores Rpt	MZ	Yellow Jacket			
039N	017W	27	SW SE SE	Occ-79	Montelores Rpt	MZ	Yellow Jacket			
039N	017W	28	SW SW SW	Occ-76	Montelores Rpt	MZ	Yellow Jacket	5.0		
039N	017W	---	---	MS-1	USGS PP 576-A	DL	Doe Canyon			N of Bradfield Ranch and W of Dolores (near CP-1?), may be in Cahone Quad
039N	018W	3	SE NE NW	Occ-7	Montelores Rpt	DL	Cahone			
039N	018W	3	SE NW NE	Occ-8	Montelores Rpt	OL	Cahone			
039N	018W	11	C SW SW	Occ-9	Montelores Rpt	DL	Cahone			
039N	018W	25	NE NW SE	Occ-24	Montelores Rpt	MZ	Pleasant View	11.9		
040N	018W	21	SE NW	Occ-2	Montelores Rpt	DL	Cahone			
040N	018W	21	NW SE	Occ-3	Montelores Rpt	DL	Cahone			
040N	018W	21	SE NW SE	Occ-4	Montelores Rpt	DL	Cahone			
040N	018W	27	NE SE SW	Occ-5	Montelores Rpt	DL	Cahone			
040N	018W	34	SW SE NE	Occ-6	Montelores Rpt	DL	Cahone			
40-41N	18W	rem		Misc-4	BLM file info	DL	mult			Coal lease appl. 2/11/85; Joe Underwood, Mayer,AZ, T41N R18W secs 35,36, T40N R18W secs 1,2,12, 13,22,24,25,26,35
041N	018W	22		MS-2	USGS PP 576-A	DL	Secret Canyon			In Big Canyon, poor exposure of middle carb shale unit
041N	019W	2	NW NW NW	Occ-82	field inv	DL	Dove Creek			In roadcut
041N	019W	20	SW SW N	Occ-20	Montelores Rpt	DL	Dove Creek	4.0		Drill hole? -- no outcrop
041N	020W	1	C SE	MS-23	Boyer report	DL	Eastland (15')	0.8		Ucolo area, Boyer's no. 10
041N	020W	2	NW NE	CP-23	field inv	DL	Eastland (15')	8+?		Coal appears to be over 8 ft thick here where exposed in prospect pit
041N	020W	2	SE SW	Occ-53	Boyer report	DL	Eastland (15')			Ucolo area, Boyer's no. 8, 'x' on map but no info
041N	020W	12	NE SE	Occ-54	Boyer report	OL	Eastland (15')			Ucolo area, Boyer's no. 9, 'x' on map but no info
041N	020W	35	SW SE	MS-21	Boyer report	DL	Eastland (15')			Boyer's no. 13, no coal?, Coal Bed Canyon
41-42N	018W	rem		Misc-2	BLM file info	DL	mult			Coal lease appl. 2/11/85; Cecil B. Taylor, Box 270, Dolores,CO, T42N R18W secs 28,29,32,33, T41N R18W secs 4,5,9,10,15,16,17,20,22,27,28 (parts)
41-47N	12-17W			Occ-52	Boos, M.F.	MR	mult			Nucla-Norwood Coal Field, numerous small streams cut sharp, narrow canyons exposing coal of 'workable thickness'
042N	016W	rem		Misc-5	BLM file info	DL	mult			Coal lease appl. 2/11/85; Gene Gustin, Box 826, Kirtland,NM, T42N R16W secs 20,21,28,29
042N	016W	8	SE SE	Occ-3a	field inv	SM	Dawson Draw			Coal exposed on SW side of Disappointment Creek
042N	016W	16	SE	CP-1a	field inv	SM	Dawson Draw			Former state lease, drill holes and prospect opening by dozer
042N	016W	16	SE SW	Occ-4a	field inv	SM	Dawson Draw	8.0?		Coal exposed on SW side of Disappointment Creek, thickness is estimated
042N	18-19W	rem		Misc-1	BLM file info	SM	mult			Coal lease appl. 2/11/85; Minnie Gustin, T42N R19W secs 12,13, T42N R18W secs 7,8,17,18,19,21
042N	020W	14	SE SW	CP-3	Utah GMS Mono-2	SM	Eastland (15')	9.0		
042N	020W	14	C N1/2	MS-24	Boyer report	SM	Eastland (15')			Ucolo area, Boyer's no. 17, 3 ft carb shale and bone
042N	020W	25	SE SW	CP-9	Boyer report	OR	Eastland (15')			Ucolo area, Boyer's no. 14
042N	020W	35	SW NW	MS-22	Boyer report	OR	Eastland (15')	2.8		Ucolo area, Boyer's no. 13, 3 inch bone parting
043N	010W	25	SW SE	MS-25	Boyer report	SM	Gray Head			Boyer's no. 10, N side of San Miguel River, across from Bilk Creek
043N	016W	17	SE	MS-3	USGS PP 576-A	SM	Dawson Draw	2.0		Disappointment Valley--branch of Andy Draw, state lease
043N	017W	2	NW SE	Occ-2a	field inv	SM	Gypsum Gap			Coal exposure in roadcut, Disappointment Valley
044N	016W	28	SW	Occ-1a	field inv	SM	Gypsum Gap	2.0		Good 2ft bed, other thinner coals exposed, Big Gypsum Valley
044N	018W	34	E SE	Occ-83	field inv	SM	Hamm Canyon			Exposed in Nicolas Wash just south of State Highway 141
045N	012W	19	SW SE	Occ-10a	field inv	SM	Sandborn Park	thin		Exposure in roadcut near top of Norwood Hill, Colo. Hwy 145
045N	013W	17	SE SW	MS-1a	field inv	SM	Norwood			Measured section by Young
045N	016W	2	C NE NE	MS-67	Boyer report	MR	Naturita	0.8		Coke Ovens coal field, Boyer's no. 21, upper bed, 0.5 carb sh/0.7 fire clay/0.8 coal

TABLE 4 (cont'd)

CONTINUATION OF MISC DATA TABLE

TWP	RGE	SEC	QTR	DATA POINT ID	SOURCE	CTY	7.5' QUAD NAME	COAL THKN	ANAL-YSIS	REMARKS
045N	016W	3	C NE SW	MS-66	Boyer report	MR	Naturita	1.5		Coke Ovens coal field, Boyer's no. 25, lower bed, 3 inch fire clay parting
045N	016W	11	SE NE NW	MS-68	Boyer report	MR	Naturita	2.1		Coke Ovens coal field, Boyer's no. 22, upper bed, 2 thin fire clay partings
046N	015W	3	SW cor	MS-86	Boyer report	MR	Nucla	1.6		Nucla Coal Field, Boyer's no. 24, Oberding zone, 0.5c/0.7p/0.8c (poor)/2.8p/0.3c/0.2p/1.1c
046N	015W	10	SW NW SE	CP-20	Boyer report	MR	Nucla	0.8		Nucla Coal Field, Boyer's no. 25, Oberding zone, W side of creek
046N	015W	14	SW NE	MS-88	Boyer report	MR	Redvale			Boyer's no. 8, 4 mi NE of Naturita, E side of San Miguel River
046N	015W	14		MS-90	Boyer report	MR	Redvale	0.3		Nucla Coal Field, Boyer's no. 31, Lens no. 3 Oberding zone
046N	015W	14	C NE	MS-91	Boyer report	MR	Redvale	0.7		Nucla Coal Field, Boyer's no. 32, Lens no. 3 Oberding zone, poor coal
046N	015W	14	NE SE	MS-92	Boyer report	MR	Redvale	1.3		Nucla Coal Field, Boyer's no. 33b, Lens no. 3 Oberding zone, thin parting in center of bed
046N	015W	14	SW NW	UM-10	Boyer report	MR	Redvale	1.3		Nucla Coal Field, Boyer's no. 28 & 29, Lens no. 3 Oberding zone, 0.8c/0.8p/1.3c
046N	015W	14	SW SE SW	UM-11	Boyer report	MR	Redvale	1.7		Nucla Coal Field, Boyer's no. 30, Drott bed
046N	015W	15	NE NW	CP-15	Boyer report	MR	Naturita	0.7		Nucla Coal Field, Boyer's no. 26, Oberding zone
046N	015W	15	SW SE NW	MS-69	Boyer report	MR	Naturita	1.5		Nucla Coal Field, Boyer's no. 27, Lens no. 3 Oberding zone,measured at a road cut
046N	015W	15	SE SE NW	Occ-81	field inv	MR	Naturita			Coal exposed in roadcut above power plant
046N	008W	16	W 1/2	CP-21	USGS Atl Fol 153	MR	Ridgeway	thin		Coal prospects are 'near where Cow Creek joins the Uncompahgre River, on the west side of the mesa between the two'
046N	015W	19		MS-61	Boyer report	MR	Naturita			Boyer's no. 6, 1/2 mi N of Naturita, N side of San Miguel River
046N	015W	19	SE SE SE	MS-70	Boyer report	MR	Naturita	2.4		Nucla Coal Field, Boyer's no. 33a, Drott bed
046N	015W	23	NW NW	MS-89	Boyer report	MR	Redvale			Boyer's no. 9
046N	016W	2	SE SE NW	MS-84	Boyer report	MR	Nucla	0.3		Nucla Coal Field, Boyer's no. 8, Lens 2 of Oberding zone, S side of Tuttle Draw
046N	016W	4		MS-8	CGS Bull 16	MR	Uravan			Coal shown in section, N side of San Miguel River, 7 mi below Naturita
046N	016W	13	S NW SW	Liberty Bell	Boyer report	MR	Naturita	5.7		Nucla Coal Field, Boyer's no. 35, Drott bed, 1.3c/0.2p/4.2c
046N	016W	14	C NE SE	CP-14	Boyer report	MR	Redvale	1.5/6.3		Nucla Coal Field, Boyer's no. 10, Oberding zone, 1.5c (with partings)/2.6p/1.4c/0.5p/1.2c/0.2p/0.3c/0.4p/2.3c
046N	016W	24	NW	MS-7	CGS Bull 16	MR	Naturita			Coal shown in section, McIntyre Dist along Dolores River, 3/4 mi E of American Rare Metals Co. mill
046N	016W	24	NW SE NE	UM-6	Boyer report	MR	Naturita	6.4		Nucla Coal Field, Boyer's no. 34, Drott bed, 0.9c/0.3p/1.6c/0.2p/0.6c/0.3p/2.5+c
046N	016W	26	C SE SE	MS-64	Boyer report	MR	Naturita	4.7		Coke Ovens coal field, Boyer's no. 20b, lower bed, thin partings of fire clay, w/ bone and carb shale
046N	016W	27	SE NW NW	MS-71	Boyer report	MR	Naturita NW	2.2		Coke Ovens coal field, Boyer's no. 12, lower bed, clay roof and fire clay parting near top
046N	016W	27?		MS-60	Boyer report	MR	Naturita			Dry Creek, near Coke Ovens
046N	016W	28	NW NE NE	MS-72	Boyer report	MR	Naturita NW	2.4		Coke Ovens coal field, Boyer's no. 13, lower bed, clay roof and fire clay parting near top
046N	016W	34	SW NW SW	MS-73	Boyer report	MR	Naturita NW			Coke Ovens coal field, Boyer's no. 26, lower bed, no coal -- 10 inch carb shale
046N	016W	35	SE NE NW	MS-62	Boyer report	MR	Naturita	1.1		Coke Ovens coal field, Boyer's no. 20, lower bed
046N	016W	35	C NW NE	MS-63	Boyer report	MR	Naturita	0.9		Coke Ovens coal field, Boyer's no. 20a, lower bed
046N	016W	35	C SE NE	MS-65	Boyer report	MR	Naturita	1.0		Coke Ovens coal field, Boyer's no. 20c, lower bed
046N	016W	rem		MS-85	Boyer report	MR	Nucla	2.0		Nucla Coal Field, Boyer's no. 12b, Oberding zone, 0.7c (poor)/0.5p/0.8c/1.2p/2.0c, loc uncertain
46-47N	15-16W			Occ-43	CGS Bull 16	MR	mult			Between Nucla and mouth of Tabequatche Creek, Nucla/Uravan quads
047N	015W	31	NE SE SW	Oberding	Boyer report	MR	Nucla	5.0		Nucla Coal Field, Boyer's no. 21, Oberding zone, 0.9 bony coal/0.3p/0.6c/0.2p/1.7c/0.1p/2.4c
047N	015W	31	NE SE SW	Oberding	Boyer report	MR	Nucla	4.1		Nucla Coal Field, Boyer's no. 22, Oberding zone, mine roof/2.2c/0.2p/1.7c
047N	016W	11	NW NW	MS-78	Boyer report	MR	Nucla	0		Nucla Coal Field, Boyer's no. 1, Lens 1 of Oberding zone, no coal
047N	016W	11	C SE	UM-14	Boyer report	MR	Nucla			
047N	016W	14	NE	MS-76	Boyer report	MR	Nucla			Boyer's No. 5, S side of Tabeguache Canyon, location questionable
047N	016W	14	SE	MS-77	Boyer report	MR	Nucla			Boyer's no. 7, 4.5 mi NW of Nucla, in Coal Canyon
047N	016W	14	SW SE SE	MS-81	Boyer report	MR	Nucla	0		Nucla Coal Field, Boyer's no. 3, Drott bed, no coal (1.5 ft carb shale), N side of Coal Canyon
047N	016W	15	NE NE NW	MS-79	Boyer report	MR	Nucla	1.3		Nucla Coal Field, Boyer's no. 2, Lens 1 of Oberding zone, 1.3c/1.2p/0.7c, N side of Box Canyon
047N	016W	22	NE NE	MS-80	Boyer report	MR	Nucla	3.9		Nucla Coal Field, Boyer's no. 4, Lens 1 of Oberding zone,1.0c/0.2p/2.7c, N side of Coal Canyon

TABLE 4 (cont'd)

TWP	RGE	SEC	QTR	DATA POINT ID	SOURCE	CTY	7.5' QUAD NAME	COAL THKN	ANAL-YSIS	REMARKS
047N	016W	23	SE NW	MS-82	Boyer report	MR	Nucla	0.7		Nucla Coal Field, Boyer's no. 5, Lens 1 of Oberding zone, 0.4c/1.9p/0.7c, S side of Coal Canyon
047N	016W	25		MS-74	Boyer report	MR	Nucla			
047N	016W	26	NW NW NW	MS-83	Boyer report	MR	Nucla	1.4		Nucla Coal Field, Boyer's no. 6, Lens 2 of Oberding zone, 0.5c/1.5p/0.8c/0.2p/0.4c
047N	016W	34	NW SW NE	CP-16	Boyer report	MR	Nucla	4.4		Nucla Coal Field, Boyer's no. 7, Lens 2 of Oberding zone, 3.0c/0.3p/0.3c/0.3p/0.5c
047N	016W	35	C SE	CP-17	Boyer report	MR	Nucla	1.8/2.2		Nucla Coal Field, Boyer's no. 11, Oberding zone, 0.6c/0.2p/1.0c/1.7p/2.2c, N side of Tuttle Draw
047N	016W	35	SW SW	MS-75	Boyer report	MR	Nucla			Boyer's no. 4, 3.5 mi W of Nucla
047N	016W	35	NE SW SE	MS-87	Boyer report	MR	Nucla	5.0		Nucla Coal Field, Boyer's no. 12a, Drott bed, 5 feet thickness was reported to Boyer -- 'probably shale and clay partings'
047N	016W	35	SE NE SE	UM-8	Boyer report	MR	Nucla	2.0/2.0		Nucla Coal Field, Boyer's no. 12 & 13, Oberding zone, 1.1c/0.2p/0.7c/1.2p/2.0c, S side of Tuttle Draw
047N	016W	36	SW SE NE	CP-18	Boyer report	MR	Nucla	2.5		Nucla Coal Field, Boyer's no. 19, Oberding zone, 0.7 bony coal/1.2c/0.4p/0.9c
047N	016W	36	NW NE NE	CP-19	Boyer report	MR	Nucla	4.0		Nucla Coal Field, Boyer's no. 20, Oberding zone, 1.0c/0.3p/2.7c
047N	016W	36	NE SW	Missouri Ranch	Boyer report	MR	Nucla	6.4		Nucla Coal Field, Boyer's no. 17, Oberding zone, 0.7c/0.4p/0.9c/0.2p/0.8c/0.2p/3.2c
047N	016W	36	SW NE SE	UM-9	Boyer report	MR	Nucla	5.8		Nucla Coal Field, Boyer's no. 15, Oberding zone, 0.7c/0.2p/1.0c/0.8p/3.1c
047N	016W	36	NW SE	Winkler Mine	Boyer report	MR	Nucla	4.0		Nucla Coal Field, Boyer's no. 18, Oberding zone, 0.7 bony clay/0.6p/0.1c/0.2p/4.0c
048N	016W	31	C	CP-22	Boyer report	MR	Uravan			Spring Canyon Coal Prospect
NO SPECIFIC LOCATION				CP-11	USGS Bull 371	MS	Grand Junction			Creek midway between Grand Jct and Fruita; 1.6c/1.0p/2.6c/0.5p/0.7c; several coal prospects in the area
NO SPECIFIC LOCATION				MS-10	CGS Bull 16	MZ				No coal shown, N of McElmo canyon on divide between Cutthroat Gulch and Hovenweep Canyon -- location not known (not mapped)
NO SPECIFIC LOCATION				MS-13	USGS Min Res 1892	OU	Dallas	2.0		'Near Dallas, on the Uncompahgre', locally altered to semi-anthracite, mined 'in a small way', location uncertain
NO SPECIFIC LOCATION				Misc-6	USGS Atl Fol 130	DL	Rico (15')	--		Mined on W bank of Dolores R just N of Rico quad, also occurs at several places in western part of quad, vicinity of Lost Canyon
NO SPECIFIC LOCATION				Misc-7	USGS Bull 227	DL	Mt Wilson	1.4-2.0		2 abandoned mines--- S side of Dolores R just E of Barlow Creek and N side of river just E of Coal Creek
NO SPECIFIC LOCATION				Misc-8	USGS Bull 843	M	Telluride (15')			Coal mined near Rico (Rico 7.5'), in SW part of 15' quad (Mt Wilson 7.5') and near Ouray (Ouray 7.5')
NO SPECIFIC LOCATION				Misc-9	USGS Bull 1072-M	MZ	(Mesa Verde Area)			One measured section, general info of little use
NO SPECIFIC LOCATION				Occ-44	CGS Bull 16	MR	mult			East end of Paradox Valley, near Coke Ovens, along edge of Dry Creek Basin
NO SPECIFIC LOCATION				Occ-46	CGS Bull 16	M	mult			Coal occurs at many points in Dry Creek Basin
NO SPECIFIC LOCATION				Occ-47	CGS Bull 16	M	mult			Coal occurs at many points along edges of Disappointment Valley
NO SPECIFIC LOCATION				Occ-48	CGS Bull 16	MZ	mult			
NO SPECIFIC LOCATION				Occ-50	Boos, M.F.	M	mult			Exposures of Kd coal along highway between Dolores and Naturita
NO SPECIFIC LOCATION				Occ-51	Boos, M.F.	M	mult			Oil and gas explorers report that coal is exposed in every canyon that cuts the Kd

TABLE 4 (cont'd)

EXPLANATION OF ABBREVIATIONS

Headings

TWP - township

RGE - range

SEC - section

QTR - section subdivision by quarter(s)

CTY - county

COAL THKN - coal thickness

Data Point ID

CP - coal prospect

Misc - miscellaneous data

MS - measured section

NC - site of no coal (observed)

Occ - coal occurrence

UM - unnamed mine

Sources

Atl Fol - Atlas Folio

Bull - Bulletin

field inv - field investigation (Wynn Eakins)

GMS - Geological and Mineral Survey

Montelores Rpt - see Johnson and others, 1976, in bibliography

NMBM - New Mexico Bureau of Mines and Mineral Resources

PP - Professional Paper

RS - Resource Series

See bibliography for:

Kelly Wilson

Wayne Denny

Counties

DL - Dolores

DT - Delta

GR - Grand, Utah

LP - La Plata

M - Multiple

MR - Montrose

MS - Mesa

MZ - Montezuma

OU - Ouray

SJ - San Juan, Utah

SM - San Miguel

Remarks

c - coal

IB - interburden

ic - impure coal

p - parting

TABLE 5A

COAL ANALYSIS INFORMATION-DAKOTA COAL

SOUTHWESTERN COLORADO

Note: All depths and thicknesses are in feet. See end of Table 5B for explanation of abbreviations used and additional notes.

INDEX NO.	TWP	RGE	SEC	QTR	DATA POINT ID	SOURCE	CTY	7.5' QUAD NAME	LAB	LAB NO.	THKN	BED NAME	DEPTH LIMITS	BASIS	PROXIMATE ANALYSIS MOISTURE	VOLATILE MATTER	FIXED CARBON	ASH
1	001S	001W	22	SW	MS-11	USGS Bull 341	MS	Grand Junction	USBM	5530	4.3			ARB	5.96	26.41	41.21	26.42
2					MS-11									AD	3.94	26.98	42.09	26.99
3	001S	001W	26	SW	Grand Jct area-1	USGS Bull 471	MS	Grand Junction	USBM	11108	1.9			ARB	5.10	27.90	38.80	28.20
4					Grand Jct area-1									AD	3.30	28.50	39.50	28.70
5					Grand Jct area-1									MF	--	29.50	40.80	29.70
6					Grand Jct area-1									MAF	--	41.90	58.10	--
7	001S	001W	26	SW	Grand Jct area-2	USGS Bull 471	MS	Grand Junction	USBM	11109	0.8			ARB	5.70	26.30	34.20	33.80
8					Grand Jct area-2									AD	3.70	26.90	34.90	34.50
9					Grand Jct area-2									MF	--	27.90	36.30	35.80
10					Grand Jct area-2									MAF	--	43.50	56.50	--
11	002S	001E	5	SE SW	CP-13	USGS Bull 471	MS	Whitewater	USBM	11104	1.3			ARB	3.50	39.20	51.30	6.00
12					CP-13									AD	2.80	39.50	51.70	6.00
13					CP-13									MF	--	40.60	53.20	6.20
14					CP-13									MAF	--	43.30	56.70	--
15					CP-13	USGS Bull 471	MS	Whitewater	USBM	11105	1.0			ARB	3.20	29.10	45.30	22.40
16					CP-13									AD	2.50	29.30	45.60	22.60
17					CP-13									MF	--	30.10	46.80	23.10
18					CP-13									MAF	--	39.10	60.90	--
19	004S	003E	17		Wells Gulch area-A	USGS Bull 341	DT	Dominguez	USBM	5534	1.5			ARB	6.53	33.85	50.95	8.67
20					Wells Gulch area-A									AD	4.52	34.58	52.04	8.86
21	004S	003E	17	NW NE	Wells Gulch area-B	USGS Bull 471	DT	Dominguez	USBM	11106	1.7			ARB	3.50	38.80	51.70	6.00
22					Wells Gulch area-B									AD	3.00	39.00	52.00	6.00
23					Wells Gulch area-B									MF	--	40.20	53.60	6.20
24					Wells Gulch area-B									MAF	--	42.90	57.10	--
25	004S	003E	17	NW NE	Wells Gulch area-B	USGS Bull 471	DT	Dominguez	USBM	11107	2.3			ARB	3.10	31.20	48.40	17.30
26					Wells Gulch area-B									AD	2.60	31.40	48.60	17.40
27					Wells Gulch area-B									MF	--	40.20	53.60	6.20
28					Wells Gulch area-B									MAF	--	39.30	60.70	--
29	033S	026E	35		Rasmussen Mine-1	USGS PP 188	SJ	Eastland	USBM	86825					2.70	24.10	42.30	30.90
30	033S	026E	35		Rasmussen Mine-2	USGS PP 188	SJ	Eastland	USBM	86825					4.30	32.30	52.30	11.10
31	036N	014W	7	SW SE	MTZ-D-0010	Western Energy	MZ	Dolores East			7.1	B		ARB	3.97	22.51	43.69	29.84
32	036N	014W	17	NW SW	MTZ-D-0007	Western Energy	MZ	Dolores East			10.9	B		ARB	3.45	21.02	36.16	39.37
33	036N	014W	18	NE NE	TH No. 8	NMBM Circ 134	MZ	Dolores East	USBM	J-63511				ARB	3.50	19.10	31.00	46.40

TABLE 5A (cont'd)

INDEX NO.	TWP	RGE	SEC	QTR	DATA POINT ID	SOURCE	CTY	7.5' QUAD NAME	LAB	LAB NO.	THKN	BED NAME	DEPTH LIMITS	BASIS	PROXIMATE ANALYSIS			
															MOISTURE	VOLATILE MATTER	FIXED CARBON	ASH
34	036N	015W	1	SE SW	MTZ-D-0017	Western Energy	MZ	Dolores West			4.0	A		ARB	2.47	24.84	42.81	29.88
35					MTZ-D-0017						12.2	B		ARB	1.58	20.82	29.86	47.73
36	036N	015W	5	NE NE	MTZ-D-0012	Western Energy	MZ	Dolores West			6.4	A		ARB	2.76	21.06	29.39	46.79
37					MTZ-D-0012						5.7	B		ARB	1.79	22.96	38.52	36.73
38					MTZ-D-0012						6.3	C		ARB	1.83	19.45	30.02	48.70
39	036N	015W	8	SE NE	MTZ-D-0015	Western Energy	MZ	Dolores West			4.3	Upper B		ARB	2.16	22.13	34.70	40.51
40					MTZ-D-0015						2.7	Lower B		ARB	1.61	23.44	44.16	30.79
41					MTZ-D-0015						3.8	Upper C		ARB	2.98	20.56	35.07	41.39
42					MTZ-D-0015						2.8	Lower C		ARB	3.22	21.58	31.79	43.40
43	036N	015W	9	SW SE	MTZ-D-0016	Western Energy	MZ	Dolores West			2.2	A		ARB	2.56	25.43	38.17	33.84
44					MTZ-D-0016	Western Energy	MZ	Dolores West			7.3	B		ARB	2.10	19.63	30.37	47.89
45	036N	015W	12	SE SE	MTZ-D-0009	Western Energy	MZ	Dolores East			6.8	B		ARB	3.69	26.70	50.81	18.81
46	036N	015W	12	NE NE	MTZ-D-0018	Western Energy	MZ	Dolores East			7.0	Upper B		ARB	1.94	24.72	48.41	24.92
47					MTZ-D-0018						5.0	Lower B		ARB	1.58	22.38	35.68	40.35
48	036N	015W	13	SE NE	MTZ-D-0011	Western Energy	MZ	Dolores East			5.2	B		ARB	5.23	19.45	32.62	42.70
49	036N	015W	15	NE	E-SP	Empire Elec rpt	MZ	Dolores West	USBM	E-71439				ARB	5.60	23.60	46.30	24.50
50					E-SP									MF	--	25.00	49.00	26.00
51					E-SP									MAF	--	33.70	66.30	--
52	036N	015W	22	SW NE	E-22	Empire Elec rpt	MZ	Point Lookout	ITL	80313	6.0	(top)	36-42	ARB	1.70	30.70	49.00	18.60
53	036N	015W	22	NW SE	MTZ-D-0002	Western Energy	MZ	Point Lookout			7.7	A		MF	--	23.97	36.27	39.40
54	036N	015W	22	NE SE	MTZ-D-0003	Western Energy	MZ	Point Lookout			5.0	A		ARB	10.40	25.36	30.05	34.20
55					MTZ-D-0003						3.8	B		ARB	3.73	23.01	40.04	33.23
56					MTZ-D-0003									MF	--	31.25	49.79	18.96
57	036N	015W	23	NW SE	MTZ-D-0001	Western Energy	MZ	Point Lookout			5.0	A		ARB	4.54	23.43	42.75	29.28
58	036N	015W	28	SW NE	Pit 10	Empire Elec rpt	MZ	Cortez	COPC		7.6			ARB	13.10	33.70	47.00	6.20
59	036N	015W	28	NE NE	Pit 13	Empire Elec rpt	MZ	Cortez	COPC		5.8			ARB	5.60	37.20	45.00	12.10
60	036N	015W	28		McGarish	Empire Elec rpt	MZ	Cortez	COPC		5.0			ARB	5.80	36.30	49.80	8.10
61	036N	015W	29	SE NE	Montezuma-1	NMBM Circ 134	MZ	Point Lookout	USBM	C-28505				ARB	6.80	33.30	54.00	5.90
62	036N	015W	29	SE NE	Montezuma-2	NMBM Circ 134	MZ	Point Lookout	USBM	C-28504				ARB	7.70	32.00	56.80	3.50
63	036N	015W	29	SE NE	Montezuma-3	NMBM Circ 134	MZ	Point Lookout	USBM	E-58657				ARB	4.80	33.90	56.50	4.80
64	036N	015W	29	SE NE	Montezuma-4	NMBM Circ 134	MZ	Point Lookout	USBM	F-44727				ARB	5.00	39.80	49.00	16.20
65	036N	015W	29	SE NE	Montezuma-5	NMBM Circ 134	MZ	Point Lookout	USBM	F-44726				ARB	5.50	30.50	52.70	11.30
66	036N	015W	29	SE NE	Montezuma-6	Empire Elec rpt	MZ	Point Lookout	USBM	E-58658		#2		ARB	6.60	30.60	49.90	12.90
67					Montezuma-6									MF	--	32.80	53.40	13.80
68					Montezuma-6									MAF	--	38.10	61.90	--
69	036N	015W	29	SE NE	Montezuma-7	Empire Elec rpt	MZ	Point Lookout	USBM	E-58567		#2		ARB	4.80	33.90	56.90	4.80
70					Montezuma-7									MF	--	35.60	59.40	5.00
71					Montezuma-7									MAF	--	37.50	62.50	--
72	036N	015W	29	SE NE	Montezuma-8	Empire Elec rpt	MZ	Cortez	COPC		5.7			ARB	5.20	39.40	50.10	5.20
73	036N	015W	29	SE NE	MTZ-D-0004	Western Energy	MZ	Point Lookout			6.7	A		ARB	3.78	26.11	43.24	26.87
74					MTZ-D-0004						8.6	B		ARB	3.58	21.23	32.33	42.86
75	036N	015W	rem		E-58	Empire Elec rpt	MZ	Point Lookout	ITL	80384	7.0	(top)	50-57	ARB	2.80	28.10	47.10	22.10

TABLE 5A (cont'd)

INDEX NO.	TWP	RGE	SEC	QTR	DATA POINT ID	SOURCE	CTY	7.5' QUAD NAME	LAB	LAB NO.	THKN	BED NAME	DEPTH LIMITS	BASIS	PROXIMATE ANALYSIS MOISTURE	VOLATILE MATTER	FIXED CARBON	ASH
76	036N	016W	23	NW	Cortez Mine	USBM TP 574	MZ	Cortez	USBM	12785	1.2			ARB	8.10	32.30	45.40	14.20
77					Cortez Mine									MF	--	35.10	49.50	15.40
78					Cortez Mine									MAF	--	41.50	58.50	--
79	036N	016W	35		Mowry Mine	USBM TP 574	MZ	Cortez	USBM	12586	2.2			ARB	4.80	34.60	42.30	18.30
80					Mowry Mine									MF	--	36.30	44.50	19.20
81					Mowry Mine									MAF	--	45.00	55.00	--
82	037N	014W	30	SE SE	MTZ-D-0020	Western Energy	MZ	Dolores East			4.1	B		ARB	2.10	24.49	38.30	35.11
83	037N	015W	23	NE SW	MTZ-D-0023	Western Energy	MZ	Dolores East			4.3	A		ARB	5.01	20.19	26.07	48.11
84					MTZ-D-0023	Western Energy	MZ	Dolores East			4.0	C		ARB	1.70	21.97	33.21	43.11
85					A Seam Composite	Western Energy	MZ				--	A		ARB	4.60	23.74	36.05	36.34
86					B Seam Composite	Western Energy	MZ				--	B		ARB	2.85	22.09	37.27	37.74
87					C Seam Composite	Western Energy	MZ				--	C		ARB	2.29	20.65	32.22	44.84
88					A,B,C Seams Composite	Western Energy	MZ				--	Comp		ARB	3.19	22.38	36.28	38.15
89	038N	017W	5	NW SW	DCC-4-A	US Bur Rec	MZ	Yellow Jacket	CTE	57-18436	2.0		63.2-65.2	ARB	4.08	30.09	44.79	21.04
90					DCC-4-A									DB	--	31.37	46.69	21.94
91					DCC-4-B				CTE	57-18437	4.2		106.2-110.4	ARB	5.75	28.78	49.05	16.42
92					DCC-4-B									DB	--	30.54	52.04	17.42
93					DCC-4-C				CTE	57-18483	0.9		123.0-123.9	ARB	4.69	15.53	14.83	64.95
94					DCC-4-C									DB	--	16.29	15.56	68.15
95					DCC-4-D				CTE	57-18484	2.6		128.7-131.3	ARB	3.76	18.91	27.79	49.54
96					DCC-4-D									DB	--	19.65	28.87	51.48
97	038N	017W	5	NW SW	DCC-5	US Bur Rec	MZ	Yellow Jacket	CTE	57-18679	6.2		82.8-89.0	ARB				
98	038N	017W	15	NW NW	DCC-1-A	US Bur Rec	MZ	Yellow Jacket	CTE	57-18279	6.4		77.1-83.5	ARB	6.40	26.54	35.59	31.47
99					DCC-1-A									DB	--	28.35	38.03	33.62
00					DCC-1-B				CTE	57-18280	6.4		96.0-102.4	ARB	5.31	25.01	44.52	25.16
01					DCC-1-B									DB	--	26.41	47.02	26.57
02					DCC-1-C				CTE	57-18281	1.9		120.3-122.2	ARB	6.81	28.43	49.79	14.97
03					DCC-1-C									DB	--	30.51	53.43	16.06
04	038N	017W	20	SE SE	FL-1-A	US Bur Rec	MZ	Yellow Jacket	CTE	57-18358	4.0		47.9-51.9	ARB	6.23	28.14	37.95	27.68
05					FL-1-A									DB	--	30.01	40.47	29.52
06					FL-1-B				CTE	57-18359	3.6		61.3-64.9	ARB	5.59	29.12	43.47	21.82
07					FL-1-B									DB	--	30.84	46.05	23.11
08					FL-1-C				CTE	57-18360	5.1		92.7-97.8	ARB	3.86	25.93	29.85	40.36
09					FL-1-C									DB	--	26.97	31.05	41.98
10	038N	017W	23	NW NW	DCC-2-A	US Bur Rec	MZ	Yellow Jacket	CTE	57-18079	3.4		40.0-43.4	ARB	6.04	22.29	39.97	31.70
11					DCC-2-A									DB	--	23.72	42.54	33.74
12					DCC-2-B				CTE	57-18143	2.0		65.0-67.0	ARB	4.22	22.80	42.45	30.53
13					DCC-2-B									DB	--	23.80	44.33	31.87
14					DCC-2-C				CTE	57-18140	5.0		67.0-72.0	ARB	6.01	26.28	36.88	30.83
15					DCC-2-C									DB	--	27.96	39.24	32.80
16					DCC-2-D				CTE	57-18142	2.0		72.0-73.0	ARB	4.38	25.07	35.03	35.52
17					DCC-2-D									DB	--	26.22	36.63	37.15
18					DCC-2-E				CTE	57-18141	3.0		92.0-95.0	ARB	4.75	23.70	34.91	36.64
19					DCC-2-E									DB	--	24.88	36.65	38.47
20					DCC-2-F				CTE	57-18282	4.4		96.0-100.4	ARB	4.26	16.90	12.65	66.19
21					DCC-2-F									DB	--	17.65	13.21	69.14

TABLE 5A (cont'd)

INDEX NO.	TWP	RGE	SEC	QTR	DATA POINT ID	SOURCE	CTY	7.5' QUAD NAME	LAB	LAB NO.	THKN	BED NAME	DEPTH LIMITS	BASIS	PROXIMATE ANALYSIS MOISTURE	VOLATILE MATTER	FIXED CARBON	ASH
22	038N	017W	24	SE SE	DCC-3-A	US Bur Rec	MZ	Yellow Jacket	CTE	57-18006	4.8		42.2-47.0	ARB	6.73	24.14	35.84	33.29
23					DCC-3-A									DB	--	25.88	38.43	35.69
24					DCC-3-B				CTE	57-18007	0.5		55.5-56.0	ARB	6.85	36.50	44.31	12.34
25					DCC-3-B									DB	--	39.18	47.57	13.25
26					DCC-3-C				CTE	57-18041	0.8		56.0-56.8	ARB	5.45	25.14	32.07	37.34
27					DCC-3-C									DB	--	26.59	33.92	39.49
28					DCC-3-D				CTE	57-18042	3.4		66.5-69.9	ARB	3.95	20.54	33.54	41.97
29					DCC-3-D									DB	--	21.38	34.92	43.70
30					DCC-3-E				CTE	57-18043	1.1		71.5-72.6	ARB	3.80	17.86	20.64	57.70
31					DCC-3-E									DB	--	18.57	21.45	59.98
32					DCC-3-F				CTE	57-18044	6.2		82.8-89.0	ARB	5.63	24.98	36.07	33.32
33					DCC-3-F									DB	--	26.47	38.22	35.31
34	040N	018W	5	NE NE	DH-1E	Ed Baird	DL	Secret Canyon	GJL	3046				WB	3.30	16.79	16.66	63.25
35					DH-1E									DB	--	17.37	17.23	65.41
36	040N	018W	4	NE SW	DH-2E	Ed Baird	DL	Secret Canyon	GJL	3046				WB	2.75	21.27	29.54	46.44
37					DH-2E									DB	--	21.88	30.37	47.78
38	040N	018W	4	SW NE	DH-3E	Ed Baird	DL	Secret Canyon	GJL	3046				WB	0.70	17.35	18.64	63.31
39					DH-3E									DB	--	17.48	18.77	63.76
40	040N	018W	17	SE	DH-4E	Ed Baird	DL	Dawson Draw	GJL	3046				WB	16.75	13.19	15.47	54.59
41					DH-4E									DB	--	15.86	18.58	65.62
42	040N	018W	17	SE	EB-2	Ed Baird	DL	Dawson Draw	GJL	3670				ARB	1.20	29.29	36.47	33.03
43					EB-2									DB	--	29.65	36.91	33.45
44	041N	020W	2	NW NE	CP-23	Ed Baird	DL	Dawson Draw	GJL	3670				ARB	8.80	27.29	40.03	23.88
45					CP-23									DB	--	29.92	43.87	26.18
46	042N	016W	16	NE	DH-4	Ed Baird	SM	Dawson Draw	GJL	3181				ARB	3.80	8.33	59.82	27.28
47					DH-4									DB	--	8.66	62.17	28.36
48	042N	016W	16	NE	DH-6	Ed Baird	SM	Dawson Draw	GJL	3181				ARB	4.00	10.71	42.83	40.56
49					DH-6									DB	--	11.16	44.61	42.25
50	042N	016W	16	NE	DH-8	Ed Baird	SM	Dawson Draw	GJL	3183				ARB	2.35	19.69	24.89	49.63
51					DH-8									DB	--	20.18	25.49	50.85
52	042N	016W	16	NE	DH-13	Ed Baird	SM	Dawson Draw	GJL	3183				ARB	2.40	19.17	27.86	47.49
53														DB	--	19.64	28.55	48.66
54	042N	016W	16	SW	DH-15	Ed Baird	SM	Dawson Draw	GJL	3313	14.0			WB	5.65	27.27	53.61	13.47
55					DH-15									DB	--	29.02	56.82	14.33
56	042N	016W	16	NE	DH-16	Ed Baird	SM	Dawson Draw	GJL	3313				WB	12.45	30.06	45.38	12.11
57					DH-16									DB	--	34.35	51.73	13.84
58	042N	016W	16	SW	EB-1	Ed Baird	SM	Dawson Draw	GJL	3670				ARB	7.20	33.00	47.72	12.08
59					EB-1									DB	--	35.57	51.39	13.02
60	042N	016W	16	NE	EB-3	Ed Baird	SM	Dawson Draw	GJL	6931				WB	14.80	32.05	34.28	6.26
61					EB-3									DB	--	37.62	40.23	7.35
62	042N	016W	16	NE	EFN-1	Ed Baird	SM	Dawson Draw	EFL					ARB	11.71			8.95
63					EFN-1									MF	--			10.16

TABLE 5A (cont'd)

INDEX NO.	TWP	RGE	SEC	QTR	DATA POINT ID	SOURCE	CTY	7.5' QUAD NAME	LAB	LAB NO.	THKN	BED NAME	DEPTH LIMITS	BASIS	PROXIMATE ANALYSIS MOISTURE	VOLATILE MATTER	FIXED CARBON	ASH
64	042N	016W	16	NE	EFN-2	Ed Baird	SM	Dawson Draw	EFL					ARB	10.97			3.33
65					EFN-2									MF	--			3.74
66	042N	016W	16	SW	EFN-3	Ed Baird	SM	Dawson Draw	EFL					ARB	12.95			7.12
67					EFN-3									MF	--			8.18
68	042N	016W	16	SW	EFN-4	Ed Baird	SM	Dawson Draw	EFL					ARB	9.88			2.31
69					EFN-4									MF	--			2.57
70	046N	016W	13	NW SW	Liberty Bell	USBM TP 574	MR	Nucla	USBM	A14443	5.4			ARB	2.90	34.30	53.70	9.10
71					Liberty Bell									MF	--	35.30	55.40	9.30
72					Liberty Bell									MAF	--	38.90	61.10	--
73	046N	016W	13		Drott Mine	USGS PP 188	MR	Nucla	USBM	A14442					2.50	32.50	52.90	12.10
74	047N	015W	31	NW NW	GS-1	USGS OF 78-899	MR	Nucla	USBM	K73808	2.0	#2	23.9-25.9	ARB	23.30	25.80	35.70	15.20
75					GS-1									MF	--	33.60	46.60	19.80
76					GS-1									MAF	--	42.00	58.00	--
77					GS-1				USBM	K73809	2.0	#2	25.9-27.9	ARB	25.70	27.20	39.90	7.20
78					GS-1									MF	--	36.60	53.70	9.70
79					GS-1									MAF	--	40.50	59.50	--
80					GS-1				USBM	K73810	2.3	#2	27.9-30.2	ARB	24.60	27.40	41.50	6.50
81					GS-1									MF	--	36.40	55.00	8.60
82					GS-1									MAF	--	39.80	60.20	--
83	047N	015W	31	NW NW	GS-2	USGS OF 78-899	MR	Nucla	USBM	K73813	2.3	#2	20.5-22.8	ARB	24.10	25.40	34.30	16.20
84					GS-2									MF	--	33.40	45.20	21.40
85					GS-2									MAF	--	42.50	57.50	--
86					GS-2				USBM	K73812	2.0	#2	22.8-24.8	ARB	25.80	27.00	39.40	7.80
87					GS-2									MF	--	36.40	53.10	10.50
88					GS-2									MAF	--	40.60	59.40	--
89					GS-2				USBM	K73811	2.0	#2	24.8-26.8	ARB	24.40	26.80	41.60	7.20
90					GS-2									MF	--	35.50	55.00	9.50
91					GS-2									MAF	--	39.20	60.80	--
92	047N	015W	31	NW NW	GS-3	USGS OF 78-899	MR	Nucla	USBM	K73816	2.6	#2	18.8-21.4	ARB	18.10	24.20	36.60	21.10
93					GS-3									MF	--	29.60	44.70	25.70
94					GS-3									MAF	--	39.80	60.20	--
95					GS-3				USBM	K73815	2.0	#2	21.4-23.4	ARB	18.10	28.90	46.20	6.80
96					GS-3									MF	--	35.30	56.40	8.30
97					GS-3									MAF	--	38.50	61.50	--
98					GS-3				USBM	K73814	2.0	#2	23.4-25.4	ARB	16.70	28.90	47.20	7.20
99					GS-3									MF	--	34.70	56.50	8.70
00					GS-3									MAF	--	38.00	62.00	--
01	047N	015W	31	NW NW	GS-4	USGS OF 78-899	MR	Nucla	USBM	K73817	6.7	#2	7.3-14.0	ARB	23.90	25.80	39.10	11.20
02					GS-4									MF	--	33.90	51.30	14.80
03					GS-4									MAF	--	39.80	60.20	--
04	047N	015W	31	NW NW	GS-5	USGS OF 78-899	MR	Nucla	USBM	K73818	6.3	#2	5.4-11.7	ARB	27.50	24.60	34.60	13.30
05					GS-5									MF	--	34.00	47.60	48.40
06					GS-5									MAF	--	41.60	58.40	

TABLE 5A (cont'd)

INDEX NO.	TWP	RGE	SEC	QTR	DATA POINT ID	SOURCE	CTY	7.5' QUAD NAME	LAB	LAB NO.	THKN	BED NAME	DEPTH LIMITS	BASIS	PROXIMATE ANALYSIS MOISTURE	VOLATILE MATTER	FIXED CARBON	ASH
07	047N	015W	31	NE NW	GS-6	USGS OF 78-899	MR	Nucla	USBM	K73820	1.4	#3	31.0-32.4	ARB	3.90	32.90	51.20	12.00
08					GS-6									MF	--	34.20	53.30	12.50
09					GS-6									MAF	--	39.10	60.90	--
10					GS-6				USBM	K73819	1.3	#3	34.8-36.1	ARB	2.90	29.40	39.30	28.40
11					GS-6									MF	--	30.30	40.40	29.30
12					GS-6									MAF	--	42.80	57.20	--
13	047N	015W	31	NE NW	GS-7	USGS OF 78-899	MR	Nucla	USBM	K73822	1.5	#3	30.8-32.3	ARB	3.00	32.10	43.10	21.80
14					GS-7									MF	--	33.10	44.40	22.50
15					GS-7									MAF	--	42.70	57.30	--
16					GS-7				USBM	K73821	1.0	#3	34.6-35.6	ARB	2.80	27.80	40.20	29.20
17					GS-7									MF	--	28.60	41.30	30.10
18					GS-7									MAF	--	40.90	59.10	--
19	047N	015W	31	NW NW	GS-8	USGS OF 78-899	MR	Nucla	USBM	K73825	2.6	#2	20.3-22.9	ARB	21.40	25.50	38.30	14.80
20					GS-8									MF	--	32.40	48.80	18.80
21					GS-8									MAF	--	39.90	60.10	--
22					GS-8				USBM	K73824	2.0	#2	22.9-24.9	ARB	23.70	27.80	42.50	6.00
23					GS-8									MF	--	36.40	55.70	7.90
24					GS-8									MAF	--	39.60	60.40	--
25					GS-8				USBM	K73823	2.0	#2	24.9-26.9	ARB	19.10	28.10	43.30	9.50
26					GS-8									MF	--	34.80	53.50	11.70
27					GS-8									MAF	--	39.40	60.60	--
28	047N	015W	31	NW NW	GS-9	USGS OF 78-899	MR	Nucla	USBM	K73828	1.6	#2	18.3-19.9	ARB	21.10	24.10	31.30	23.50
29					GS-9									MF	--	30.50	39.70	29.80
30					GS-9									MAF	--	43.50	56.50	--
31					GS-9				USBM	K73827	2.0	#2	19.9-21.9	ARB	22.60	27.60	42.50	7.30
32					GS-9									MF	--	35.70	54.80	9.50
33					GS-9									MAF	--	39.40	60.60	--
34					GS-9				USBM	K73826	2.0	#2	21.9-23.9	ARB	20.70	29.50	43.20	6.60
35					GS-9									MF	--	37.20	54.40	8.40
36					GS-9									MAF	--	40.60	59.40	--
37	D47N	015W	31	SE SW	Independent	USBM TP 574	MR	Nucla	USBM	A14444	4.0			ARB	6.50	33.00	50.70	9.80
38					Independent									MF	--	35.20	54.30	10.50
39	047N	016W	36		Oberding Mine	USGS PP 188	MR	Nucla	USBM	A14444					6.50	33.00	50.70	9.80
40	047N	016W	36	NW SE	Winkler Mine	CGS Bull 16	MR	Nucla							4.90	32.00	54.00	8.60
41	047N	016W	rem		Nucla Strip	CGS MS-23	MR	Nucla			rem	#2			6.70	30.70	47.00	15.10
42					AMAX (general)	Wilson paper								AVG	4.30			36.00
43														RANGE	3.45-5.23			

TABLE 5B

COAL ANALYSIS INFORMATION-DAKOTA COAL
SOUTHWESTERN COLORADO (CONT'D)

Note: Use index number at left to relate to Table 5A. See end of table for explanation of abbreviations used for Tables 5A and 5B, and additional notes.

INDEX NO.	ULTIMATE ANALYSIS					HEATING VALUE			REMARKS
	CARBON	NITROGEN	OXYGEN	HYDROGEN	SULFUR	BTU/LB	MAF BTU	HGI AST (F)	
1					0.80	8455			From near Grand Junction, formation considered as Mancos, weathered coal
2					0.82	8636			ADL of 2.1%
3					1.14	9270			1.9c/0.1+p/0.8c total bed here, ADL of 1.9%
4					1.16	9450			
5					1.20	9770			
6					1.72	13890	13890		
7					0.80	8370			ADL of 2.1%
8					0.82	8550			
9					0.85	8870			
10					1.32	13820			
11					1.67	13050			1.25c/0.25p/1.0c, two samples from this locality, this represents the upper 1.25 ft, see below for lower bench
12					1.68	13140			analysis, ADL of 0.7%
13					1.73	13530			
14					1.84	14420	14420		
15					1.19	10510			1.25c/0.25p/1.0c, two samples from this locality, this represents the lower 1.0 ft, see above for upper bench
16					1.20	10590			analysis, ADL of 0.7%
17					1.23	10860			
18					1.60	14470	14470		
19					1.11	10940			From East side of district -- near Wells Gulch mine?
20					1.13	11175			ADL of 2.1
21					0.98	13110			No parting between samples -- 3.9 ft total coal, this represents the upper 1.7 ft, see below for analysis of
22					0.98	13170			the lower 2.2 ft, ADL of 0.5%
23					1.01	13570			
24					1.08	14470	14470		
25					1.89	11270			Shown on log as shale, this represents the lower 2.2 ft of 3.9 ft coal seam, see above for analysis of the
26					1.90	11330			upper 1.7 ft, ADL of 0.5%
27					1.95	11630			
28					2.37	14160	14160		
29					2.00	9300	14000		Mine located near Ucolo, this sample is from 'bone and bituminous-shale layers'
30					3.80	12480	14750		
31					0.42	9297			Composite of 3 sampled intervals, see appendix for more detailed analytical information
32					0.39	7904			Composite of 4 sampled intervals, see appendix for more detailed analytical information
33	41.60	0.50	9.50	3.10	0.33	6810		2910+	NMBM core sample

TABLE 5B (cont'd)

INDEX NO.	ULTIMATE ANALYSIS					HEATING VALUE				REMARKS
	CARBON	NITROGEN	OXYGEN	HYDROGEN	SULFUR	BTU/LB	MAF BTU	HGI	AST (F)	
4					0.73	9656				Composite of 4 sampled intervals, see appendix for more detailed analytical info, 2 zones are over 11,000 Btu
5					0.44	6728				Composite of 4 sampled intervals, includes 2.6 ft shale interval, see appendix for more detailed analytical info
6					1.08	6589				Composite of 5 sampled intervals, see appendix for more detailed analytical info, 2 zones are over 11,000 Btu
7					0.43	8554				Composite of 4 sampled intervals, see appendix for more detailed analytical information
8					0.32	6660				Composite of 3 sampled intervals, see appendix for more detailed analytical information
9					0.29	7880				Composite of 3 sampled intervals, see appendix for more detailed analytical info, 8526 Btu with shale removed
10					0.34	9707				Composite of 2 sampled intervals, see appendix for more detailed analytical information
11					0.29	7519				Composite of 2 sampled intervals, see appendix for more detailed analytical information
12					0.27	7188				Composite of 3 sampled intervals, see appendix for more detailed analytical information
13					0.37	9062				
14					0.41	6702				Composite of 3 sampled intervals, see appendix for more detailed analytical information
15					0.53	11382				Composite of 2 sampled intervals, washability tested (not obtained), see appendix for more detailed analytical info
16					0.48	10537				Composite of 2 sampled intervals, see appendix for more detailed analytical information
17					0.44	8168				Composite of 2 sampled intervals, see appendix for more detailed analytical information
18					0.77	7162				Composite of 5 sampled intervals, see appendix for more detailed analytical info, 8495 Btu with shale removed
19	53.00	0.70	17.80	3.70	0.30	8970				Face sample from surface pit, specific gravity 1.65
20	56.10	0.70	13.60	3.20	0.40	9500				
21	75.90	1.00	18.20	4.40	0.50	12840				
22					0.69	11812				Drill hole no. 22; sampled 7/22/55; Industrial Testing Lab., Kansas City,MO
23					0.42	8165				Composite of 4 sampled intervals, washability tested (not obtained), see appendix for more detailed analytical info
24					0.32	5971				Composite of 4 sampled intervals, see appendix for more detailed analytical information
25					0.35	8706				Composite of 3 sampled intervals, see appendix for more detailed analytical information
26					0.70	12021				
27					0.40	9371				Composite of 5 sampled intervals, see appendix for more detailed analytical information
28						11510				From supplemental report; analysis by Charles O. Parker & Co., Denver, located 100 ft SE of E-10
29						11540				From supplemental report, located 115 ft SE of E-13, dry basis BTU value is 12227
30						12585				From supplemental report
31					0.50	12860			2910+ init	Tipple sample 1 inch slack
32	74.80	1.20	14.40	5.50	0.60	13190			2850-2910+	Tipple sample 1 inch slack
33	76.50	1.30	11.30	5.50	0.60	13650			2760-2910+	Tipple sample 1 1/2 inch lump
34					0.60	11580		59	2910+	Tipple sample of 1 1/2 inch x 0 coal
35					0.50	12400		59	2910+	Tipple sample, 1 1/2 inch lump, equilibrium moisture 3.75%
36					0.70	11930		58	2910+	Tipple sample, 1 1/2 x 0 inch coal
37					0.80	12780				
38					0.90	14820	14820			
39	76.50	1.30	11.30	5.50	0.60	13650			2890	Tipple sample, 1 1/2 inch lump high volatile A bituminous coal
40	80.40	1.30	7.50	5.20	0.60	14340				
41	84.70	1.40	7.70	5.50	0.70	15100	15100			
42						12960				From supplemental report
43					0.46	9986				Composite of 3 sampled intervals, see appendix for more detailed analytical info, middle zone is over 12,000 Btu
44					0.42	7231				Composite of 3 sampled intervals, see appendix for more detailed analytical information
45					0.70	10949				Drill hole no. 58; sampled 8/9/55, no location available

TABLE 5B (cont'd)

INDEX NO.	ULTIMATE ANALYSIS					HEATING VALUE				REMARKS
	CARBON	NITROGEN	OXYGEN	HYDROGEN	SULFUR	BTU/LB	MAF BTU	HGI	AST (F)	
6	60.30	1.00	19.20	4.70	0.60	10440			2980	Located 1/2 mi W of Cortez, 4.7 ft total bed, ADL of 4.5%
7	65.60	1.10	13.10	5.20	0.60	11350				
8	77.50	1.30	15.60	4.90	0.70	13420	13420			
9	59.90	1.10	8.20	4.90	7.60	11070			2130	ADL of 3.1%
10	63.00	1.20	4.20	4.50	7.90	11630				
11	77.90	1.50	5.20	5.60	9.80	14400	14400			
12					1.02	8963				Composite of 3 sampled intervals, includes 1.0 ft shale interval, see appendix for more detailed analytical info
13					1.02	5999				Composite of 3 sampled intervals, see appendix for more detailed analytical information
14					0.58	7466				Composite of 3 sampled intervals, see appendix for more detailed analytical information
15					0.60	8066				Moisture value for MTZ-D-0002 not available
16					0.48	8260				
17					0.37	7133				
18					0.50	8082				
19	61.39	1.12	4.53	4.14	3.58	10803	14429	55	2640 init	
20	64.00	1.17	4.71	4.32	3.73	11263				
21	64.49	0.99	7.64	4.13	0.46	11386	14629	54	2700+	
22	68.42	1.05	8.11	4.38	0.49	12081				
23	20.05	0.37	6.90	2.15	0.74	2560	8433	53	2700+	
24	21.04	0.39	7.22	2.26	0.78	2686				
25	35.70	0.55	7.29	2.65	0.38	5472	11719	58	2700+	
26	37.09	0.57	7.57	2.75	0.40	5686				
27										Screen analysis for washability, SEE APPENDIX FOR INFO
28	49.26	0.83	7.89	3.59	0.52	8716	14028	58	2700+	
29	52.63	0.89	8.42	3.84	0.56	9312				
30	56.97	0.84	7.58	3.64	0.45	9827	14133	56	2700+	
31	60.17	0.89	8.00	3.84	0.48	10378				
32	65.76	1.02	6.76	4.10	0.51	11477	14672	57	2700+	
33	70.57	1.09	7.26	4.40	0.55	12316				
34	53.01	0.86	7.82	3.81	0.57	9294	14064	57	2700+	More detailed analytical information is available, from 1985 drilling on Perma block
35	56.53	0.92	8.34	4.06	0.61	9912				
36	59.22	0.88	7.75	3.99	0.71	10404	14332	54	2700+	
37	62.73	0.93	8.21	4.23	0.75	11020				
38	42.96	0.62	8.60	3.13	0.45	7583	13594	50	2700+	
39	44.69	0.65	8.93	3.26	0.47	7887				
40	49.86	1.59	6.50	3.42	0.88	8630	13862	58	2700+	
41	53.07	1.69	6.91	3.64	0.94	9185				
42	53.61	0.56	7.37	3.32	0.38	9044	13859	60	2700+	
43	55.97	0.58	7.70	3.47	0.40	9442				
44	50.57	0.65	7.97	3.53	0.42	8776	13894	59	2700+	
45	53.80	0.69	8.48	3.76	0.45	9337				
46	48.02	0.69	7.74	3.29	0.36	8241	13714	53	2700+	
47	50.22	0.72	8.09	3.44	0.38	8619				
48	47.00	0.63	7.39	3.21	0.38	8071	13772	53	2700+	
49	49.34	0.66	7.76	3.37	0.40	8474				
50	19.30	0.39	7.38	2.16	0.28	3187	10787	51	2700+	
51	20.16	0.41	7.70	2.26	0.29	3329				

TABLE 5B (cont'd)

INDEX NO.	ULTIMATE ANALYSIS					HEATING VALUE				
	CARBON	NITROGEN	OXYGEN	HYDROGEN	SULFUR	BTU/LB	MAF BTU	HGI	AST (F)	REMARKS
2	47.59	0.94	7.64	3.32	0.47	8298	13835	57	2700+	
3	47.59	1.01	8.20	3.56	0.50	8897				
4	67.38	1.15	7.40	4.30	0.54	11641	14406	57	--	
5	72.33	1.23	7.95	4.62	0.58	12497				
6	45.53	0.82	7.17	3.10	0.58	7931	13862	53	2440 init	
7	48.15	0.87	7.59	3.28	0.61	8388				
8	42.05	0.63	8.03	2.98	0.39	7234	13378	49	2700+	
9	43.78	0.66	8.35	3.10	0.41	7532				
0	26.92	0.47	8.66	2.21	0.24	3973	10320	46	2700+	
1	27.98	0.49	9.00	2.30	0.25	4130				
2	49.20	0.74	7.68	2.93	0.49	8563	14027	54	2700+	
3	52.13	0.78	8.14	3.11	0.52	9074				
4					0.86	3665				
5					0.88	3790				
6					0.46	6666				
7					0.47	6858				
8					1.48	4147				
9					1.50	4177				
0					0.35	3143				
1					0.42	3778				
2					0.43	8822				
3					0.43	8929				
4					0.37	7055				
5					0.40	7736				
6					0.77	2976				
7					0.81	3094				
8					1.90	5046				
9					1.98	5256				
0					3.44	6555				Analysis by Grand Junction Laboratories, 1980
1					3.52	6716				
2					3.05	5984				
3					3.12	6131				
4					0.52	9484				
5					0.55	10089				
6					0.41	8540				
7					0.47	9760				
8					0.66	10313				
9					0.72	11113				
0					0.34	8645				
1					0.40	10147				
2					0.71	9455				
3					0.81	10734	11948			

TABLE 5B (cont'd)

INDEX NO.	ULTIMATE ANALYSIS					HEATING VALUE				
	CARBON	NITROGEN	OXYGEN	HYDROGEN	SULFUR	BTU/LB	MAF BTU	HGI	AST (F)	REMARKS
64					0.76	10566				Exact location and information on coal bed are unavailable
65					0.84	11868	12329			
66					0.65	9660				
67					0.75	11097	12088			
68					0.75	10854				
69					0.83	12033	12361			
70	72.40	1.20	11.30	5.20	0.80	12860			2850	Located 3 mi S of Nucla, composite of 2 samples, 6.0 ft total bed, ADL of 1.3%
71	74.60	1.20	9.00	5.00	0.90	13240				
72	82.20	1.30	10.10	5.50	0.90	14600	14600			
73					0.80	12480	14620			
74					0.30	6497				
75					0.40	8473				
76					0.50	10567	10567			
77					0.30	7285				
78					0.40	9803				
79					0.50	10861	10861			
80					0.40	7699				
81					0.50	10206				
82					0.60	11170	11170			
83	41.00	0.70	37.00	4.80	0.30	6230				
84	54.00	0.90	20.60	2.80	0.30	8205				
85	68.70	1.20	26.10	3.60	0.40	10439	10439			
86	46.70	0.80	39.20	5.20	0.30	7200				
87	62.90	1.10	22.00	3.10	0.40	9702				
88	70.30	1.30	24.50	3.50	0.50	10838	10838			
89	48.40	0.80	38.10	5.20	0.30	7514				
90	64.10	1.10	21.70	3.30	0.40	9938				
91	70.80	1.20	24.00	3.60	0.40	10985	10985			
92					0.30	6715				
93					0.30	8196				
94					0.40	11033	11033			
95					0.40	8772				
96					0.40	10710				
97					0.50	11684	11684			
98					0.40	9026				
99					0.50	10834				
00					0.50	11862	11862			
01					0.30	7145				Drill CUTTINGS (not core) were analyzed
02					0.40	9392				
03					0.40	11022	11022			
04					0.20	6192				Drill CUTTINGS (not core) were analyzed
05					0.30	8538				
06					0.40	10463	10463			

TABLE 5B (cont'd)

INDEX NO.	ULTIMATE ANALYSIS					HEATING VALUE				
	CARBON	NITROGEN	OXYGEN	HYDROGEN	SULFUR	BTU/LB	MAF BTU	HGT	AST (F)	REMARKS
107	69.50	1.10	11.70	5.10	0.60	12266				
108	72.40	1.10	8.50	4.90	0.60	12768				
109	82.70	1.30	9.80	5.60	0.70	14594	14594			
110	55.00	0.90	10.50	4.30	0.90	9678				
111	56.70	0.90	8.10	4.10	0.90	9971				
112	80.10	1.30	11.50	5.80	1.30	14101	14101			
113					0.80	10826				
114					0.80	11163				
115					1.00	14466	14466			
116					0.50	9656				
117					0.50	9932				
118					0.80	14199	14199			
119					0.30	6955				
120					0.30	8853				
121					0.40	10904	10904			
122					0.30	7876				
123					0.40	10322				
124					0.50	11202	11202			
125					0.40	8209				
126					0.40	10149				
127					0.50	11492	11492			
128					0.20	5765				
129					0.30	7303				
130					0.40	10405	10405			
131					0.30	7860				
132					0.40	10156				
133					0.40	11218	11218			
134					0.40	8393				
135					0.40	10586				
136					0.50	11551	11551			
137					1.10	12350			2620	Located 1 mi NW of Nucla, ADL of 4.2%
138					1.10	13210				
139					1.10	12350	14760			
140						12057				See p.222
141					0.81	11680			2750	Data from mine permit application, located in parts of sections 25,31, and 36, thickness ranges from 5.7 to 7.9 ft
142					1.09	8985 (MF)				Quality is generalized from core samples for AMAX, 55% wash recovery at 1.65 Sp Grav float with only half ash
143					0.5-2.92	5723-11216				removed, from 12 samples from 4 core holes. rank ranges from high volatile B to C bituminous

Note: See appendix for additional information. Proximate and ultimate analyses are in percent.
Ed Baird analyses are all questionable due to unknown sampling methods.

TABLE 5B (cont'd)

EXPLANATION OF ABBREVIATIONS

Headings

TWP - township
RGE - range
SEC - section
QTR - section subdivision by quarter(s)
CTY - county
THKN - thickness of coal analyzed
MAF - Moisture and ash free
HGI - Hardgrove Grindability Index
AST - Ash Softening Temperature

Sources

Bull - Bulletin
PP - Professional Paper
Circ - Circular
Empire Elec. - Empire Electric Association
TP - Technical Paper
US BurRec - U.S. Bureau of Reclamation
OF - Open File Report
MS - Map Series

Counties

DL - Dolores
DT - Delta
MR - Montrose
MS - Mesa
MZ - Montezuma
SM - San Miguel
SJ - San Juan, Utah

Lab

USBM - U.S. Bureau of Mines
ITL - Industrial Testing Lab, Kansas City, MO
COPC - Charles O. Parker & Co., Denver, CO
CTE - Commercial Testing and Engineering
GJL - Grand Junction Labs
EFL - Energy Fuels Co. Lab

Basis

ARB - as-received basis
AD - air-dried basis
MF - moisture-free basis
MAF - moisture and ash-free basis
DB - dry basis
WB - wet basis

Remarks

ADL - air-dry loss
init (for AST) - initial temperature

TABLE 6

COAL ANALYSIS INFORMATION FROM AMAX COAL CO.

DAKOTA COAL, SOUTHWESTERN COLORADO

Note: Elevations and thicknesses are in feet. See end of table for explanation of abbreviations used.

TWP	RGE	SEC	QTR	DATA POINT ID	CTY	7.5' QUAD NAME	ELEV	THKN	ASH%	REMARKS
034S	025E	33	NE NE	43-037-312-001	SJ	Eastland	6787.9	12.1	45.26	Dirty coal
037N	016W	13	SE SW SW NW	05-083-312-006	MZ	Arriola	6504.6	3.5	41	Dirty coal
037N	017W	7	SE SE SE SW	05-083-312-004	MZ	Woods Canyon	6671.2	2.0	67	Coaly carb shale
038N	016W	21	NW NW SE SW	05-083-312-008	MZ	Yellow Jacket	6981.5	3.8	59	Coaly carb shale
038N	016W	22	NW NW NW SE	05-083-312-010	MZ	Trimble Point	7087.9	5.4	62	Coaly carb shale
038N	016W	27	SE SE SW	05-083-312-009	MZ	Trimble Point	6849.6	2.6	63	Coaly carb shale
038N	016W	27	SE SE SW	05-083-312-009	MZ	Trimble Point	6832.2	3.2	61	Coaly carb shale
038N	016W	27	NE NE SE NW	05-083-312-017	MZ	Yellow Jacket	6966.3	3.1	30.74	Dirty coal
038N	016W	27	NE NE SE NW	05-083-312-017	MZ	Yellow Jacket	6955.4	3.2	21.92	Dirty coal
038N	016W	27	NE NE SE NW	05-083-312-017	MZ	Yellow Jacket	6938.9	1.5	55.14	Coaly carb shale
038N	016W	29	C SW	05-083-312-007	MZ	Yellow Jacket	6810.3	2.3	67	Coaly carb shale
038N	016W	29	C SW	05-083-312-007	MZ	Yellow Jacket	6792.7	5.9	58	Coaly carb shale
038N	016W	29	SE SE NE NE	05-083-312-016	MZ	Yellow Jacket	6876.7	5.1	54	Coaly carb shale
038N	016W	32	SE SW SW NW	05-083-312-012	MZ	Yellow Jacket	6701.9	2.7	65	Coaly carb shale
038N	017W	20	NE NW NW SE	05-083-312-001	MZ	Yellow Jacket	6826.0	4.2	39.53	Dirty coal
038N	017W	20	NE NW NW SE	05-083-312-001	MZ	Yellow Jacket	6812.3	6.3	39.15	Dirty coal
038N	017W	20	NE NW NW SE	05-083-312-001	MZ	Yellow Jacket	6779.8	3.4	23.42	Dirty coal
038N	017W	27	SW SW SW NW	05-083-312-003	MZ	Yellow Jacket	6761.9	6.4	37	Dirty coal
038N	017W	27	SW SW SW NW	05-083-312-003	MZ	Yellow Jacket	6744.3	12.0	35	Dirty coal
038N	017W	36	N NW NW	05-083-312-011	MZ	Yellow Jacket	6800.3	4.6	29.41	Dirty coal
038N	017W	36	N NW NW	05-083-312-011	MZ	Yellow Jacket	6789.2	3.2	21.69	Dirty coal
038N	017W	36	N NW NW	05-083-312-011	MZ	Yellow Jacket	6737.9	2.6	51.75	Coaly carb shale
038N	018W	9	SE SE SE SE	05-083-312-019	MZ	Arriola	6833.6	1.4	40	Dirty coal
038N	018W	9	SE SE SE SE	05-083-312-019	MZ	Arriola	6829.8	2.0	47	Dirty coal
039N	017W	32	SE SE NE NE	05-083-312-014	MZ	Yellow Jacket	6905.6	2.7	62	Coaly carb shale
039N	017W	32	SE SE NE NE	05-083-312-014	MZ	Yellow Jacket	6892.2	2.2	68	Coaly carb shale
039N	017W	32	SE SE NE NE	05-083-312-014	MZ	Yellow Jacket	6878.3	2.9	65	Coaly carb shale
039N	018W	2	SW SE SE	05-033-312-006	DL	Cahone	6685.5	2.0	62	Coaly carb shale
039N	018W	13	C E NE NE	05-033-312-007	DL	Cahone	6742.5	1.7	68	Coaly carb shale
039N	018W	13	C E NE NE	05-033-312-007	DL	Cahone	6722.4	2.7	55	Coaly carb shale
039N	018W	13	SW SE	05-033-312-008	DL	Cahone	6751.3	2.0	34	Dirty coal
039N	018W	16	NW SE	05-033-312-009	DL	Cahone	6554.9	2.6	36	Dirty coal
039N	018W	30	SE SE NE	05-083-312-018	MZ	Pleasant View	6762.8	2.0	65	Coaly carb shale
039N	018W	30	SE SE NE	05-083-312-018	MZ	Pleasant View	6736.5	2.5	63	Coaly carb shale
040N	018W	3	SW SE NE	05-033-312-002	DL	Secret Canyon	7243.6	3.0	59	Coaly carb shale
040N	018W	18	SW SW SW SE	05-033-312-003	DL	Champagne Spring	6668.2	2.3	64	Coaly carb shale
040N	018W	18	SW SW SW SE	05-033-312-003	DL	Champagne Spring	6638.7	2.8	60	Coaly carb shale
040N	018W	22	SW SW SE SW	05-033-312-004	DL	Cahone	6741.3	2.4	57	Coaly carb shale
040N	018W	22	SW SW SE SW	05-033-312-004	DL	Cahone	6712.3	4.0	54	Coaly carb shale
040N	018W	25	N NW	05-033-312-005	DL	Cahone	6904.3	2.5	58	Coaly carb shale
041N	020W	13	SW SW SW SE	05-033-312-001	DL	Dove Creek	6625.5	2.2	64	Coaly carb shale
042N	020W	11	SE SW SE	05-113-312-001	SM	Egnar	6942.6	2.4	43	Dirty coal
042N	020W	11	SE SW SE	05-113-312-001	SM	Egnar	6922.5	3.7	54	Coaly carb shale
042N	020W	11	SE SW SE	05-113-312-001	SM	Egnar	6914.2	9.6	41	Dirty coal
042N	020W	14	C W SE	05-113-312-002	SM	Egnar	6855.9	8.5	51	Coaly carb shale

TABLE 6 (cont'd)

EXPLANATION OF ABBREVIATIONS

Headings

TWP - township

RGE - range

SEC - section

QTR - section subdivision by quarter(s)

CTY - county

ELEV - elevation

THKN - coal thickness

Counties

DL - Dolores

MZ - Montezuma

SJ - San Juan, Utah

SM - San Miguel

TABLE 7
LEASE INFORMATION-DAKOTA COAL
SOUTHWESTERN COLORADO

NAME	LEASE NO.	DATES	DESCRIPTION OF AREA	COMMENTS
EXPIRED STATE COAL LEASES				
Glen E. Wilson	211-13	1955-1975	T36N R15W Sec 26 N 1/2, Sec 27 all, Sec 28 E 1/2	
Utah Construction and Mining	283-13	1966-1967	T36N R15W Sec 26 N 1/2, Sec 27 all, Sec 28 E 1/2	Now Utah International
Chandler and Associates	310-13A	1968-1978	T36N R15W Sec 26 N 1/2, Sec 27 all, Sec 28 E 1/2, Sec 34 NE	
Eason Oil Co.	330-13-S	1970-1978	T36-37N R15W, see plat book for lease land details	Summit Ridge area, W of Puett Reservoir
W.E. Haley	381/13	1973-1974	T38N R16W Sec 16 all, Sec 30 SWNE, S1/2NW, N1/2SW,SWSW,NWSE; T38N R17W Sec 35 NE partial; T38N R18W Sec 1 NE	Montezuma County, assigned to Exxon
W.E. Haley	382/13	1973-1974	T41N R18W Sec 32 SW; T41N R19W Sec 18 SW, Sec 19 W1/2,SE; T40N R19W Sec 6 SWNE, SE NW, E1/2SW, SE	Dolores County, assigned to Exxon
Williams and Knuckles	400/13	1973-1982	T42N R16W Sec 16 NW, S 1/2	Drilling and dozing done
Williams and Knuckles	405/13	1974-1982	T42N R16W Sec 16 NE	Drilling and dozing done
Ralph W. Ball	500/13	1977-1978	T36N R14W Sec 36 W 1/2	Exposed coal here
Kenai Oil and Gas Co.	503/13	1977-1982	T38N R13W Sec 36 all	Originally leased by Internorth
Baumgartner Companies	509/13	1977-1984	T37N R15W Sec 32 W1/2NE, E1/2NW, N1/2SE	
Baumgartner Companies	510/13	1977-1984	T37N R16W Sec 16 all	
Baumgartner Companies	511/13	1977-1984	T37N R17W Sec 13 S 1/2	
W.R. Grace & Co.	521/13	1979-1983	T43N R16W Sec 16	San Miguel County
W.R. Grace & Co.	522/13	1979-1983	T43N R16W Sec 36	San Miguel County
W.R. Grace & Co.	523/13	1979-1983	T44N R16W Sec 16	Montrose County
W.R. Grace & Co.	524/13	1979-1983	T45N R16W Sec 36	Montrose County
LARGE PRIVATE COAL LEASES				
Meadowlark Farms, Inc.		1977-1979	Dolores and Montezuma Counties	AMAX Coal Co. division
Calder & Co.		1975-1979	Montezuma County	Now held by Perma Resources of Colorado Springs, CO, dates shown are recording dates
Midcontinent Oil & Gas Reserves		late 1970's	Dolores County	Leased about 15,000 acres as 'Dove Creek Unit', Midcontinent is in Richardson, TX

ECONOMIC CONSIDERATIONS

Past Mining

Extensive mining of Dakota coal took place during the latter part of the 19th century and the first half of this century. Most of the production was from the Cortez Coal District in Montezuma County and the Nucla-Norwood Field in Montrose and northern San Miguel Counties (see Table 2). In the early days of mining, coal seams were exploited for use in smelting operations at Rico, Norwood, and Coke Ovens. Coal from the region was also used for supplying local power, industrial needs, and for household heating. Use of the coals in this area was gradually abandoned when a railway connection with Durango gave access to the better coals of that area. Competition with other coals of Colorado and the rest of the Rocky Mountain region has increased through the years as transportation has continued to progress.

The Nucla Strip Mine was in operation from 1959 to 1983 to supply a local power plant. No mines producing Dakota coal are currently active in the region, though it is anticipated that mining in the Nucla area will commence when the power plant resumes production in 1987.

Leasing Interest

Coal leasing took place in the Dove Creek area in 1979 and Perma Resources has looked into development of a mine in northern Montezuma County since about 1975. During this time Perma has contended with such obstacles as water rights, a major pipeline, a large canal project and overall economic problems. Perma has no firm plans for mine development at this time. The Cortez Sentinel has reported on various activities related to potential coal development in the Montezuma and Dolores County area since the middle 1970's. Large-scale private coal leasing activity has been summarized on Table 7. State coal leases which were formerly held by various companies and individuals are also listed.

Marketability

The potential for coal development in this region is dependent on many economic, technological, and political factors. Some of these factors are

area-specific while others are general in nature. Area-specific factors include location, transportation, recovery method, geologic conditions, size of reserve blocks, and coal quality. General factors include legal and regulatory constraints, political climate, competitive energy availability and technology, economic and technological characteristics of the coal industry, and general economic factors.

Location and transportation, which are somewhat interdependent factors, are currently strong disadvantages to the development of Dakota coals in this region. The absence of a major railroad in southwestern Colorado severely limits the potential market for any coal produced. Even with improved transportation in the future, the low quality of Dakota coal will place limitations on the economics of transportation over large distances. A coal slurry line using carbon dioxide as the slurry medium has been discussed. It could use southwestern Colorado coals and carbon dioxide and provide an extensive market opportunity.

The poor quality and erratic distribution of reserves of Dakota coal may prevent it from becoming competitive in any markets other than local ones. Within local markets, coals from this region have a competitive advantage over coals from other regions due to the location and transportation factors. This advantage may be enhanced with the advent of fluidized-bed combustion technology and other technologies which may be developed in the future. The proximity of relatively high quality coals of the San Juan River Region in the vicinity of Durango, and of the Uinta Region to the northeast, partially negates this competitive advantage.

The reserve size factor may be another disadvantage of Dakota coals, due to their erratic distribution and lateral discontinuities. Considering the enormous area for which the coals are at strippable depths, however, locally thick areas where mining might be feasible are likely to be located.

General factors affecting the entire coal industry often have marked effects on local industry, and are often too erratic to enable prediction of their future effect on this local industry. Technological innovations involving combustion of low quality coals are likely to preferentially benefit the development of Dakota coals.

Fluidized-Bed Combustion

One technological innovation for using low-quality coal is in the implementation stage at the Nucla Plant. This is the fluidized-bed combustion (FBC) process.

In this process the fuel is suspended in a strong upward flow of air as it burns. Any partially burned particles are captured at the top of the boiler and recirculated into the combustion zone. This allows a choice of fuels and permits a high level of fuel efficiency to be obtained while producing low emissions of oxides of nitrogen. Limestone or other materials that absorb sulfur dioxide can be mixed with the fuel, controlling sulfur dioxide emissions without the need for expensive add-on equipment. Fabric-filter bag-houses can be used to control fly ash and other particulates, resulting in the removal of more than 99.9 percent of all particulates from the flue gases. FBC technology may permit the use of low grade coals that are not now economically mineable. Higher ash content coals can be used, coal washing eliminated, mine reject material utilized and limestone or calcium in the fuel or parting material can be advantageous rather than detrimental. In addition to FBC's advantages of fuel flexibility and environmental protection, it appears to be extremely cost effective with its increased combustion efficiency and predicted availability of about 95 percent.

In February, 1984, the Nucla Plant was granted $740,000 from the Electric Power and Research Institute for construction of a circulating fluidized-bed combustion facility. The overall project is estimated to cost about $100 million and the Colorado Ute Electric Association has sought financing from other utilities, equipment manufacturers, and fuel suppliers. The retrofitted plant is scheduled to start production of electricity in the fall of 1987 and begin commercial operation in 1990. It will be the first plant of its type to be built on a utility scale, and generating capacity will be increased from its former 36,000 Kw to 110,000 Kw while the plant life is extended by 30 years. The fuel will consist of "anything that will burn", so that coal quality is not of such crucial importance as with typical power plants. Limestone, coal and various miscellaneous combustible products to be used will be supplied from local sources. Criteria for the Nucla Plant will be a minimum of 8,000 Btu/lb, with no limits on ash and sulfur contents. It is anticipated that the plant will have an annual requirement of 300,000 to 400,000 tons of coal.

CONCLUSIONS

Available information sources delineate a large area of Dakota coal at shallow, strip-mineable depths within southwestern Colorado. Geologic conditions in the region are favorable for Dakota coal in that occurrences are generally at shallow depths, but are unfavorable in terms of coal bed continuity and quality. Further closely-spaced drilling will be necessary to determine the continuity of coal beds in many areas. Analytical data for these coals indicate they are generally high-volatile B and C bituminous, with typically high ash contents.

Dakota coal has many disadvantages which are presently preventing its development. Future uses will be limited primarily by the area's isolation and the poor quality of the coal. Advances in technology may stimulate development, depending on other economic and political factors. The low quality, generally thin coal beds of the Dakota Formation in southwestern Colorado may become economic in the future with improvements in combustion technology such as fluidized-bed combustion.

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APPENDIX

SUPPLEMENTAL INFORMATION CONTAINED IN COLORADO GEOLOGICAL SURVEY OPEN FILE REPORT 86-1B

The following information is available for inspection in the files of the Colorado Geological Survey. It consists of geologic and geophysical logs of drill holes, maps and reports which contain data on Dakota coal in southwestern Colorado. The bibliography includes much of this information.

AMAX Coal Company - 3 files

Maps, letters of request and transmittal
Geophysical logs (2 files)

Cotter Corporation

Radium Mountain (RM) drill holes
USTRAT forms with interpretations of lithologic and geophysical logs

Empire Electric Association (EEA)

Coal report (Canis and Krantz, 1955)
Logs from Cullins and Bowers (1965), on USTRAT forms

Ferret Exploration

Geophysical logs of uranium drill holes

Miscellaneous Drill Hole Information

Colorado MLRD - 2 logs from Nucla Mine area
USGS PP 576-A - one drill hole log (USTRAT)
Young/QDC - 4 drill hole logs, Quinn Development Corp.

Quality Data

Ed Baird
U.S. Bureau of Reclamation (DCC project)
USGS Open-file Report 78-899 (Haines, 1978)

U.S. Bureau of Reclamation - 2 files

Dove Creek Canal (DCC) logs -

geologic logs of drill holes

geophysical logs

Other logs - geologic logs from projects other than Dove Creek Canal:

Cahone Dam Site (CA), 1972

Campbell Forebay Area (CP), 1982

Cross Canyon Pumping Plant (CCPP), 1984

Dallas Divide Dam Site, 1961

Dawson Draw Dam Site (DD), 1974

Dolores Tunnel Site (DT), 1979

Fairview Pumping Plant

Great Cut Dike (GR), 1979

Monument Creek Dam Site (MO), 1974

Monument Creek Pumping Plant (MCP), 1984

Plateau Creek Bridge Site (PC), 1981

Radium Dam (RA), 1975

Ridgway Dam Site, 1972

Rim Basin Dam (no coal info)

Towaoc Power Plant (TP), 1983

USTRAT Forms (from National Coal Resources Data System, US Stratigraphic forms)

AMAX drill holes

U.S. Bureau of Reclamation drill holes

USGS Open-file Report 78-899 drill holes (Haines, 1978)

NOTE: these forms will later be replaced with a printout of this data

Water Well Data - 2 files

Water well drillers' logs (photocopies of logs used in the report):

Delta through Mesa Counties

Montezuma through San Miguel Counties

0717

DEPARTMENT OF NATURAL RESOURCES
COLORADO GEOLOGICAL SURVEY
JOHN W. ROLD, DIRECTOR

COAL RESOURCES OF THE DAKOTA SANDSTONE, SOUTHWESTERN COLORADO

OPEN FILE 86-1A
PLATE 1 OF 5
1986

BY WYNN EAKINS

Plate 2 Map A 1:50,000

Plate 2 Map B 1:50,000

Plate 2 Map C 1:50,000

Plate 3 Map A 1:24,000

Plate 3 Map B 1:24,000

Plate 4 Map A 1:50,000

Plate 4 Map B 1:50,000

Plate 5 1:6,000

Drafted by P. Kelly

Scale 1:250,000

COAL RESOURCE DATA, SOUTHWESTERN COLORADO

DEPARTMENT OF NATURAL RESOURCES
COLORADO GEOLOGICAL SURVEY
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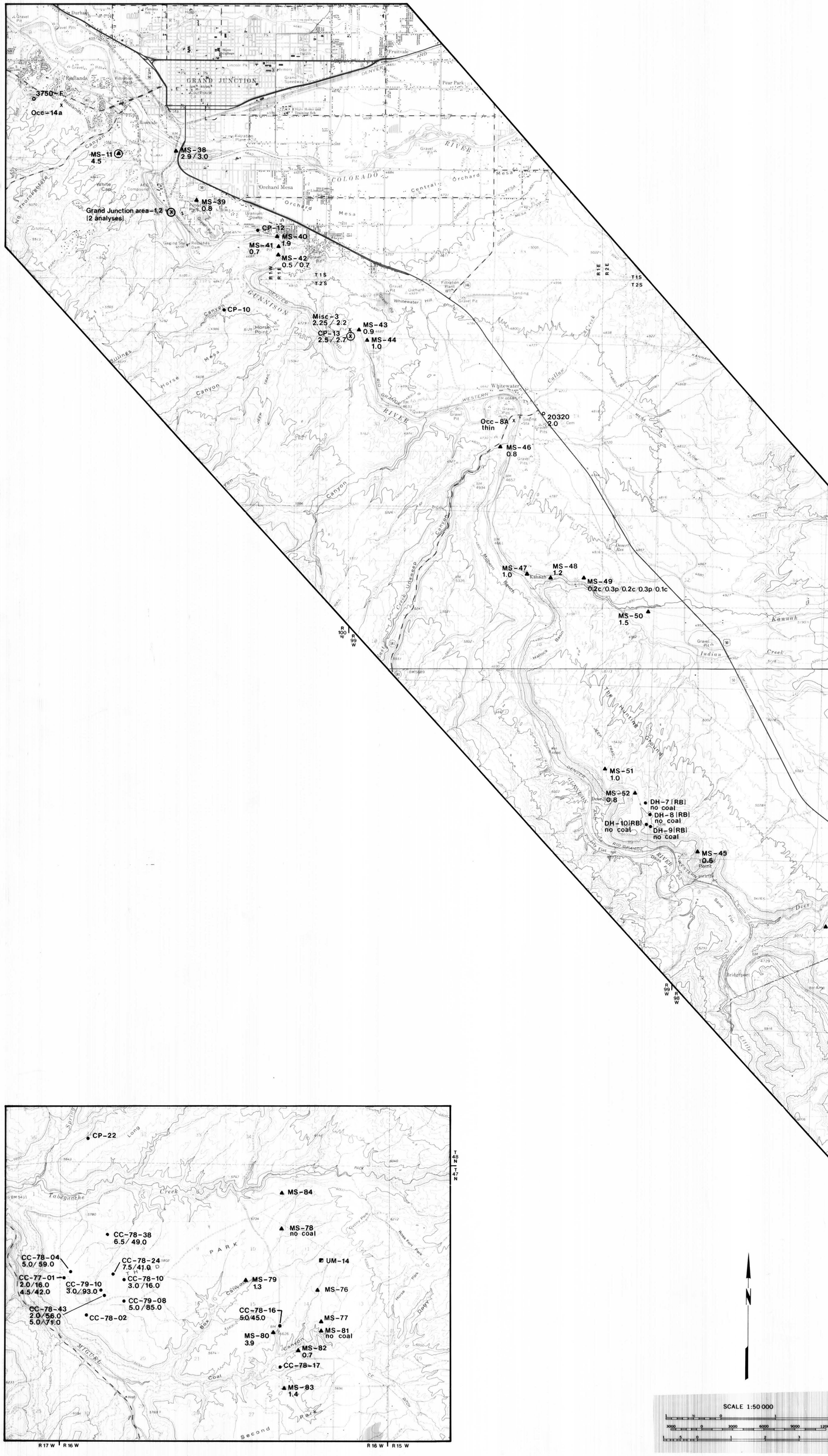
COAL RESOURCES OF THE DAKOTA SANDSTONE, SOUTHWESTERN COLORADO

OPEN FILE 86-1A
PLATE 2 OF 5
1986

BY WYNN EAKINS



MAP A. COAL RESOURCE DATA, GUNNISON RIVER VALLEY

MAP B. COAL RESOURCE DATA, MONTROSE AREA

EXPLANATION

- ● Drill hole
- ◙ Underground mine
- x Coal Occurence
- ▲ Measured section
- o Water well
- ○ Coal analysis site
- 5.0/76.0 Coal thickness/depth

Note: The Principal Meridian changes on Map A. Most of Mesa County Northeast of the Colorado River is within the Ute Principal Meridian.

MAP C. COAL RESOURCE DATA, NUCLA NORTHWEST AREA

SCALE 1:50 000

1 0 1 2 MILES
3000 0 3000 6000 9000 12000 FEET
1 2 0 1 2 3 4 KILOMETERS

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OPEN FILE 86-1A
PLATE 3 OF 5
1986

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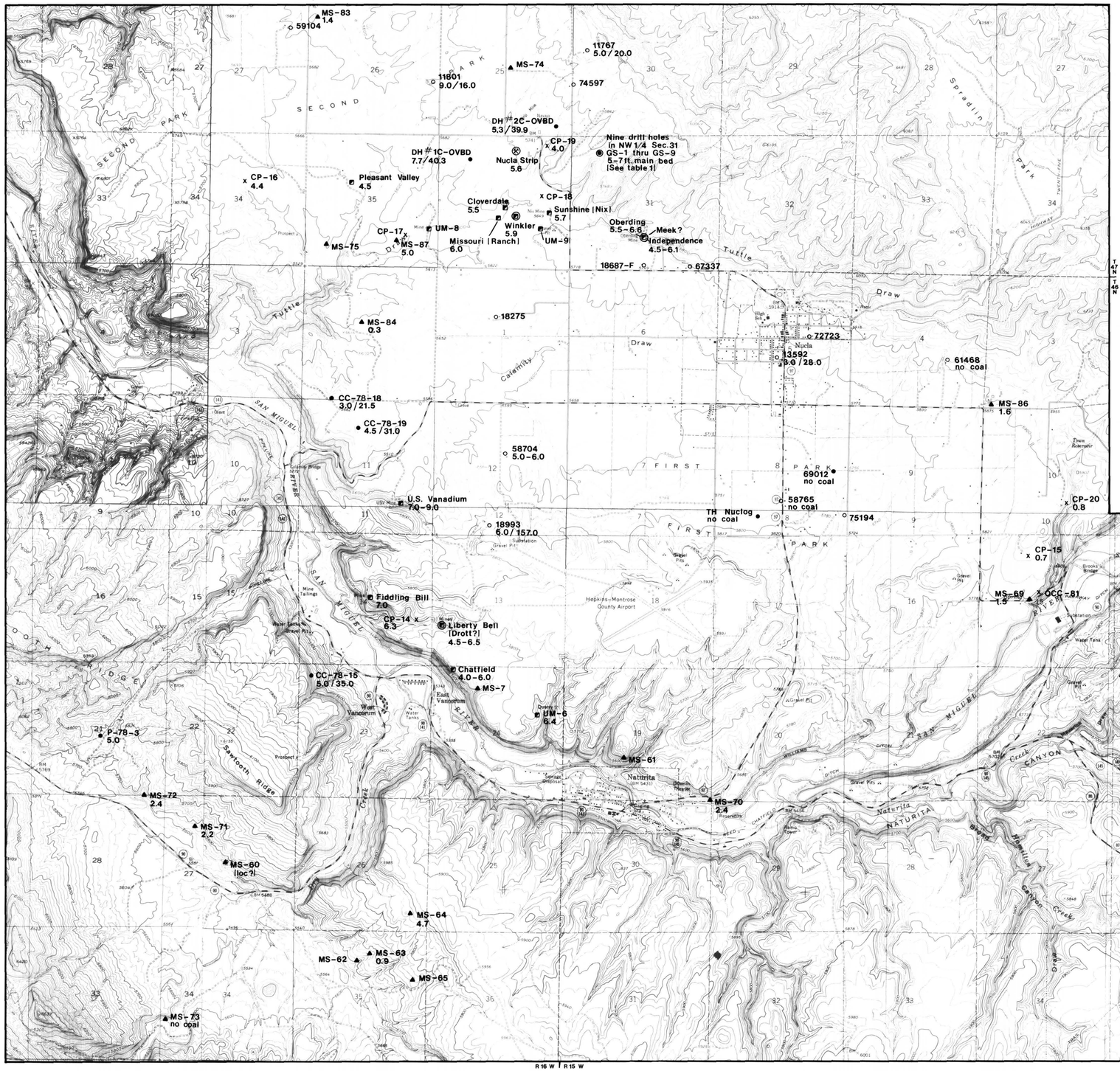
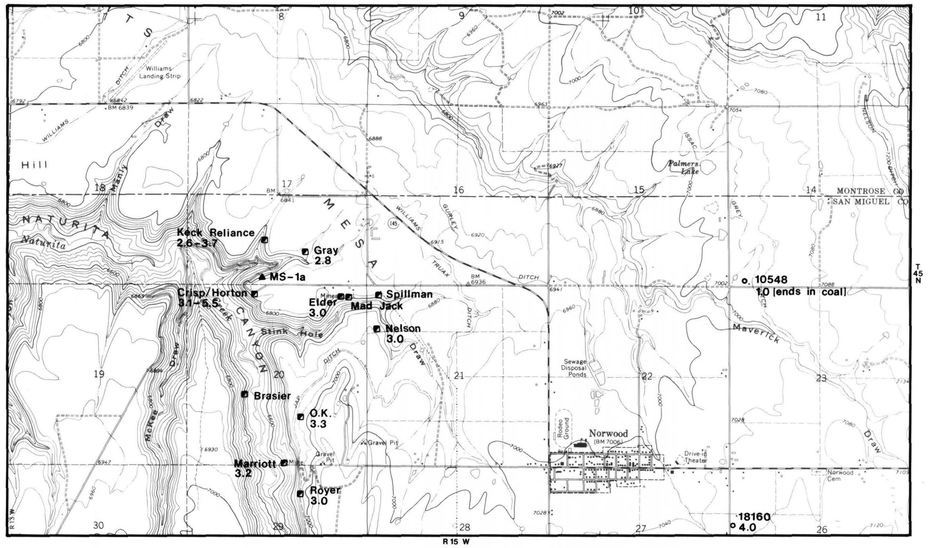


MAP A. COAL RESOURCE DATA, NUCLA-NATURITA AREA



MAP B. COAL RESOURCE DATA, NORWOOD AREA

EXPLANATION

- Drill hole
- Underground mine
- x Coal occurence
- ▲ Measured section
- o Water well
- ⚒ Surface mine
- ○ Coal analysis site
- 6.7/49.0 Coal thickness/depth

N

SCALE 1:24 000

1 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 5 0 1 KILOMETRE

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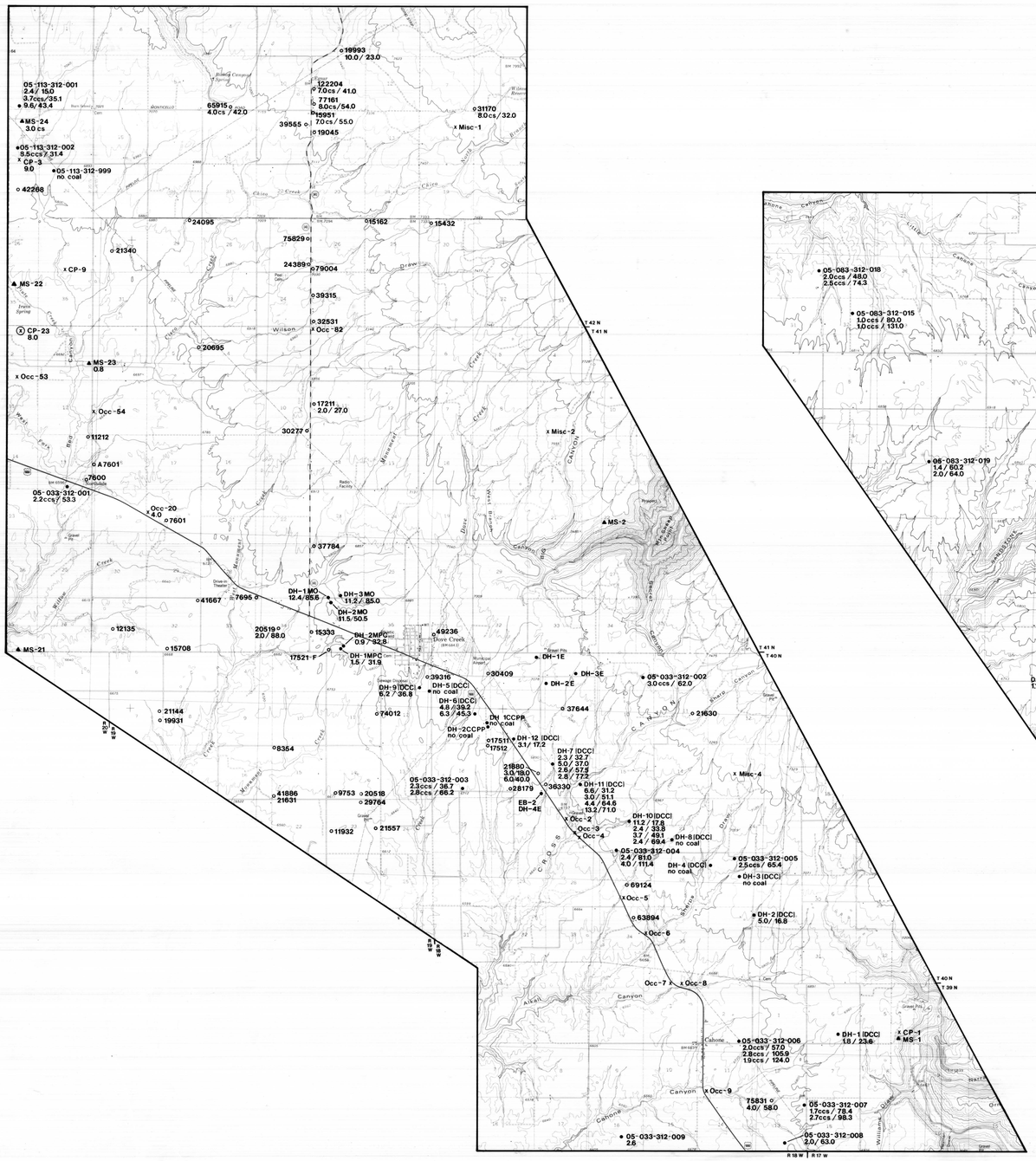
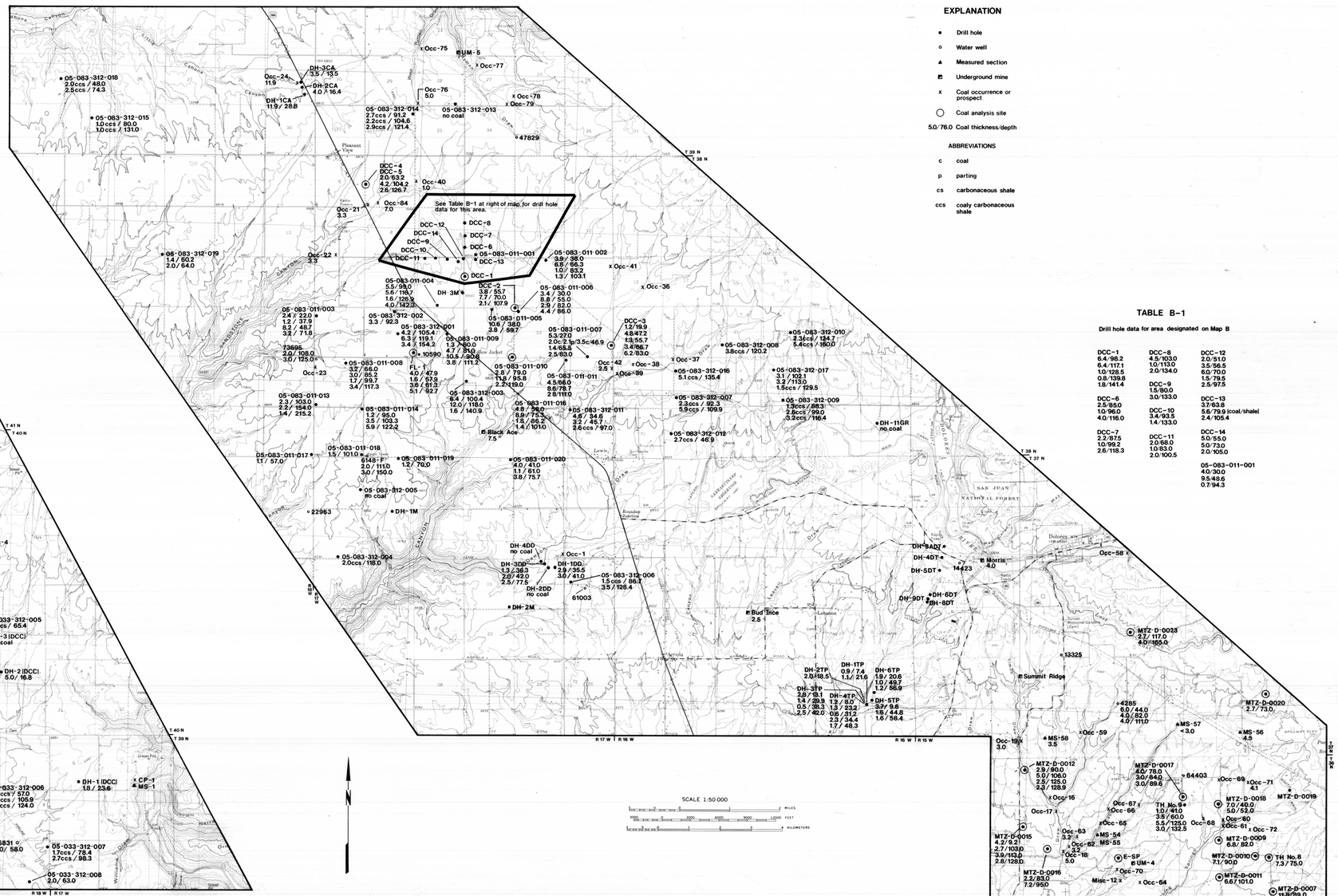
COAL RESOURCES OF THE DAKOTA SANDSTONE, SOUTHWESTERN COLORADO

BY WYNN EAKINS

OPEN FILE 86-1A
PLATE 4 OF 5
1986



MAP A. COAL RESOURCE DATA, DOVE CREEK AREA



MAP B. COAL RESOURCE DATA, YELLOW JACKET-DOLORES AREA

EXPLANATION

- Drill hole
- Water well
- Measured section
- Underground mine
- x Coal occurrence or prospect
- Coal analysis site
- 5.0/76.0 Coal thickness/depth

ABBREVIATIONS

- c coal
- p parting
- cs carbonaceous shale
- ccs coaly carbonaceous shale

TABLE B-1

Drill hole data for area designated on Map B

DCC-1
6.4 / 98.2
6.4 / 117.1
1.0 / 128.5
0.8 / 139.8
1.8 / 141.4

DCC-6
2.5 / 85.0
1.0 / 96.0
4.0 / 116.0

DCC-7
2.2 / 87.5
1.0 / 99.2
2.6 / 118.3

DCC-8
4.5 / 103.0
1.0 / 113.0
2.0 / 134.0

DCC-9
1.5 / 80.0
3.0 / 133.0

DCC-10
3.4 / 93.5
1.4 / 133.0

DCC-11
2.0 / 68.0
1.0 / 83.0
2.0 / 100.5

DCC-12
2.0 / 51.0
3.5 / 56.5
6.0 / 70.0
1.5 / 79.5
2.5 / 97.5

DCC-13
3.7 / 63.8
5.6 / 79.9 |coal/shale|
2.4 / 105.4

DCC-14
5.0 / 55.0
5.0 / 73.0
2.0 / 105.0

05-083-011-001
4.0 / 30.0
9.5 / 48.6
0.7 / 94.3

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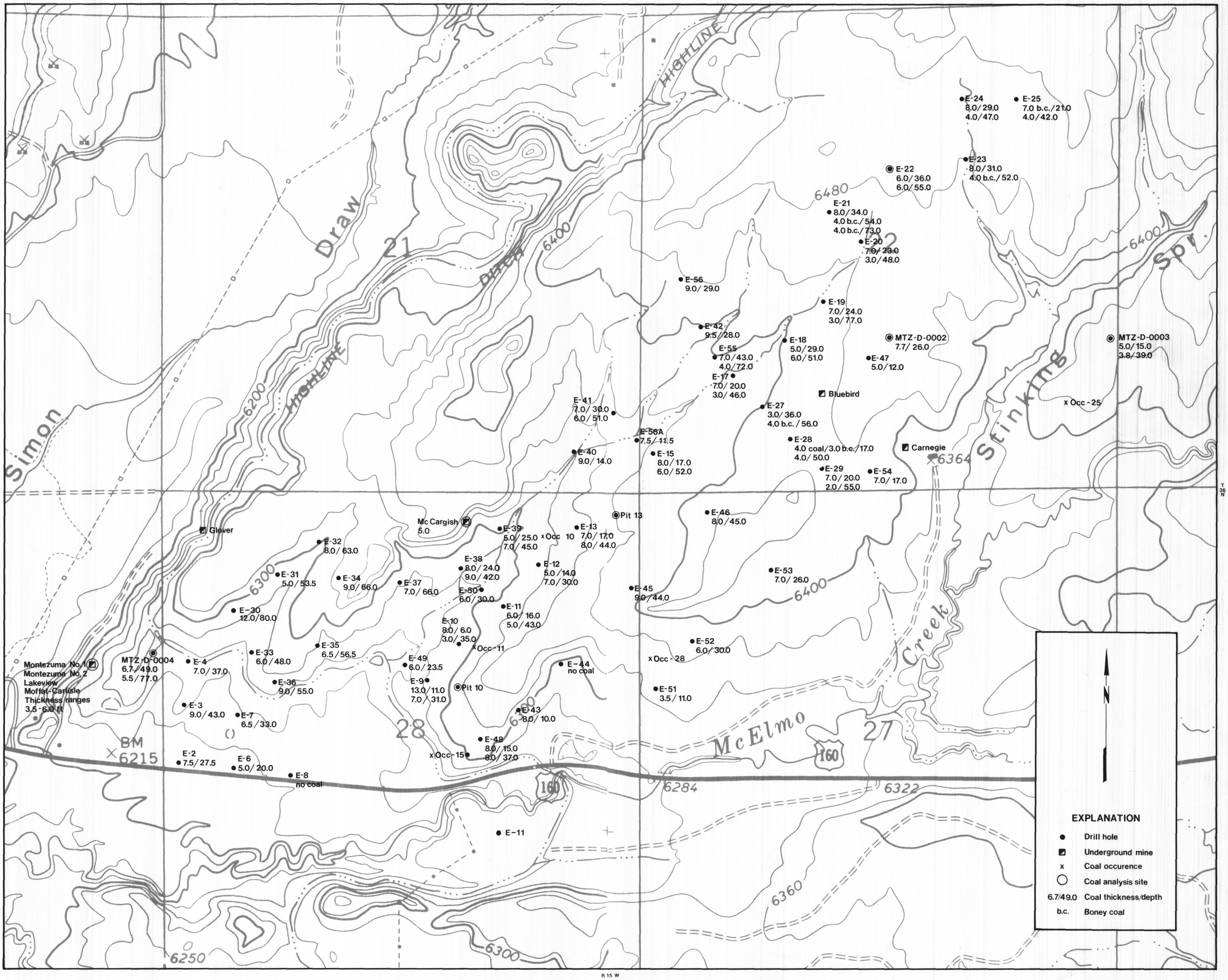
COAL RESOURCES OF THE DAKOTA SANDSTONE, SOUTHWESTERN COLORADO

OPEN FILE 86-1A
PLATE 5 OF 5
1986

BY WYNN EAKINS



SCALE 1:6 000

500 0 500 1000 1500 2000 2500 3000 FEET

0 500 1000 METERS

COAL RESOURCE DATA, CORTEZ EAST AREA