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PRELIMINARY REPORT ON THE GEOLOGY OF THE COALMONT DISTRICT JACKSON COUNTY, COLORADO

By

C. E. Erdmann

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PRELIMINARY REPORT ON THE GEOLOGY OF THE

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SUMMARY AND CONCLUSIONS

The Coalmont district of Jackson County, Colorado, occupies about 6.75 square miles centered about Coalmont postoffice in the southwest corner of North Park, a large high-altitude intermontane valley. It is notable for a bed of sub-bituminous coal varying in thickness from 25 to 80 feet called the Riach (pronounced Rear) coal. Land status is about as follows: Government owned, 50 per cent; privately owned, 38 per cent; State owned, 11 per cent. Total area amounts to 4,320A., of which 55.2 per cent, or 2,385A. may be classified as coal land. In terms of total area, this land may be subdivided as follows: future reserve, coal under more than 500 feet of cover, 898A, or 20.7 per cent; present or immediate reserve, coal under less than 500 feet of cover, 1,496A., or 34.7 per cent. Some 586A., or 13.5 per cent are prospective stripping land.

This report concerns chiefly the economic geology of the immediate reserve. The geology is at a rather high level of difficulty; comparable to conditions in metaliferous districts elsewhere in Colorado. About 74 per cent of the map area is covered with residual material or alluvium, which renders exposures obscure and incomplete. Most of the problems are on the border-line between those which can be solved by conventional geologic methods and those requiring exploration work of some kind. Bed rock belongs to the Coalmont formation of Eocene age and consists of sandstone 14 per cent; siltstone 40 per cent; carbonaceous shale 15 per cent; shale or mudstone 3 per cent; coal 2 per cent; concealed 26 per cent (probably siltstone). About 2,500 feet of the formation are present in the district; 900 feet of beds below the coal, and about 1,500 feet above. This section is believed to occupy the middle part of the lower or coal-bearing member of the Coalmont formation.

An important conclusion is that only one bed of coal is present.

Regional dip is to the northeast and amounts to about 15 degrees, but there are local variations associated with drag and differential movement along faults.

With a few hundred feet of associated strata, the coal has been repeated three times by normal strike faults which have a throw of 250 to 300 feet. Dip averages 60 degrees and downthrow is to the southwest. Cutting them at nearly right angles are numerous steeply dipping strike-slip faults. There is reason to believe that many more are present than have been observed. Downthrow is to the northwest with one exception, and vertical throw is generally insufficient to offset the coal bed and thus restrict potential burning of the bed along its strike. Strike-slip, however, may amount to as much as 500 feet and effectively offsets the older normal strike faults. In most cases, the direction of movement in the downthrown blocks is to the southwest. The exception noted above is the Shear Zone, a small horst with vertical throw of about 100 feet, width of 300 or 400 feet, and strike-slip of about 500 feet. This feature is believed to bisect the district diagonally to the northeast, and to make an effective fire barrier. These strike-slip (transverse tear) faults suggest that the entire district is situated in an overthrust sheet, but the trace of the underlying fault does not occur within the district.

Coal mining operations began in 1909 with the development of Coalmont mine No. 1 and have continued to the present day. Total production of the district is estimated at 1,438,355 T., apportioned as follows: Coalmont mine No. One, 314,230 T.; Moore mine No. One, 874,125 T.; Moore Strip Pit, 250,000 T. Underground operations have been inefficient and wasteful, and have been followed by fires necessitating successive abandonment of the mines. Considering the amount of coal available, their life has been relatively short.

Tonnage estimates indicate that the original reserve of the district once amounted to about 177,450,000 short tons. The future reserve largely occupies the eastern part of the area and is thought to contain about 72,170,000 T. The immediate reserve of some 105,280,000 T. has been depleted by mining and fire loss to 101,565,000 T. Further deductions for coal rendered inaccessible by fire and valueless by weathering reduce the net tonnage of mineable coal in this reserve to about 88,200,000. Assuming no further loss by fire and a mining recovery of 60 per cent, nearly 53,000,000 T. should be recovered.

In terms of the original tonnage of the immediate reserve, the fire loss sustained by destruction of Coalmont mine No. 1 amounts to 4.9 per cent. If the dormant fire in Moore mine No. 1 breaks thru to the surface, the total probable loss will not exceed 27.3 per cent. The potential loss from fire threat in the Strip mine is not expected to exceed 25.3 per cent. Total possible fire loss thus amounts to 57.5 per cent, or about 60,500,000 T. To this should be added the negligible loss thru natural burning of only 0.58 per cent or 615,000 T., making a grand total of about 58 per cent or 61,150,000 T.

A series of appendices to the report include all available information on the churn drill exploration. More than 100 logs and locations have been annotated and studied.

PRELIMINARY REPORT ON THE GEOLOGY OF THE COALMONT DISTRICT JACKSON COUNTY, COLORADO

INTRODUCTION

Location and Extent of Area.- The Coalmont district is centered around the nearly extinct mining town of Coalmont in the southwest corner of the vast, high intermontane valley called North Park (figure 1). Postoffice and store stand near the E¼ corner of sec. 23, T. 7 N., R. 81 W., Jackson County, Colorado. As recently mapped topographically by the U. S. Geological Sur-[1]

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[1] Topographic map of the Coalmont district, Jackson County, Colorado. United States Department of the Interior, Geological Survey. Edition of 1939.

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vey, the 6-3/4 square miles within the district include:

T. 7 N., R. 80 W., sec. 29, W½
sec. 30
sec. 31, N½
T. 7 N., R. 81 W., sec. 23
sec. 24, NW¼; S½
sec. 25
sec. 26
sec. 35, N½
sec. 36, N½

Land Surveys.- Original cadastral surveys were made in 1881 and are inaccurate. Few original corners can be found. A resurvey of sections 23 and 26, with those portions of the Moore mine No. 1 in sections 24 and 25, was made in 1930. Land lines on the topographic map are based on this survey. Farther resurvey was carried on in 1939, and new corners were set in secs. 29, 30, 31, T. 7 N., R. 80 W. The new plat is not yet available and the boundaries of these sections as shown on the topographic sheet are thus in error.

Status of Land with Respect to Coal Ownership.-

Land Description		Coal Ownership
T. 7 N., R. 80 W.,	sec. 29, W½	Unknown. Probably private
	sec. 30, E½	Private
	sec. 30, SE¼NW¼	Private
	sec. 30, N½ and SW¼NW¼	U. S. Government
	sec. 30, E½SW¼	Private
	sec. 30, W½SW¼	U. S. Government
	sec. 31, E½NE¼	Private
	sec. 31, NW¼NE¼	U. S. Government
	sec. 31, SW¼NE¼	Private
	sec. 31, SE¼	Private
	sec. 31, NW¼	U. S. Government
	sec. 31, N½SW¼	U. S. Government
	sec. 31, S½SW¼	Private
T. 7 N., R. 81 W.,	sec. 23, E½	U. S. Government
	sec. 23, NE¼NW¼	Private
	sec. 23, W½NW¼	U. S. Government
	sec. 23, SE¼NW¼	U. S. Government
	sec. 23, SW¼	U. S. Government
	sec. 24,	Private
	sec. 25, E½	U. S. Government
	sec. 25, NW¼	Private
	sec. 25, SW¼	U. S. Government
T. 7 N., R. 81 W.,	sec. 26, E½	U. S. Government
	sec. 26, NW¼	U. S. Government
	sec. 26, N½SW¼	U. S. Government
	sec. 26, SE¼SW¼	U. S. Government
	sec. 26, SW¼SW¼	Private
	sec. 35, E½	U. S. Government
	sec. 35, E½NW¼	U. S. Government
	sec. 35, NE¼NW¼	Private
	sec. 35, SW¼NW¼	U. S. Government
	sec. 35, SW¼	U. S. Government
	sec. 36	State of Colorado

This land status amounts to about: Government land, 50 percent; private land, 38 percent; State land, 11 percent. As will appear from the accompanying map (figure 2), not all the lands designated as coal land in the withdrawal order contain coal. This condition exists because of the promulgation of the order before the structure and stratigraphy of the field were established. The total acreage of the district is about 4,320. A total of 2,385 or about 55.2 percent may be regarded as coal land. Of this amount, 889 acres or about 20.5

percent lie under more than 500 feet of cover and are classified as a future or potential reserve. The remainder, 1496 acres or 34.7 percent, make the present reserve. Some 586 acres or 13.5 percent are prospective stripping land, outcrop areas being included. Approximate ownership of the coal land is indicated under the coal estimates or can be determined from them.

Accessibility.- Accessibility to Coalmont from other districts in North Park is provided chiefly by State Highway No. 14, which passes 2 miles east of the settlement. Walden, the county seat of Jackson County, is about 17 miles north of Coalmont. Automobile travel to Denver is possible by way of Laramie, Wyoming, and although the longest route, under some conditions it is the fastest and most dependable. During summer months, the road over Cameron Pass to Fort Collins is open. Travel over Muddy Pass to Kremmling on U. S. Highway No. 40 is usually fair. However, the shortest, most direct route to Denver is over Willow Creek Pass via Granby, but when roads are soft or snow conditions are bad, this way can not be recommended.

Railroad service is provided thrice weekly by the Laramie, North Park, and Western Railway, whose southern terminus is at Coalmont.

Most of the valley floor in North Park is open country, and there are numerous side roads and trails. With care, in dry weather, an automobile can be driven cross-country almost anywhere.

Topography.- Although the Coalmont district lies well out upon the seemingly flat floor of North Park, total relief within the small area amounts surprisingly to 337 feet. What few land forms there are show considerable diversification. Pole Mountain, whose lower northeast slope falls just within the map area, dominates the local topography.

Grizzly and Little Grizzly Creeks drain the country and, respectively, limit the district to the southeast and northwest. Their divide trends north and bisects the field roughly. Highest land stands at 8,475 feet on this divide toward the south margin of the map. Lowest points are in the creek bottoms where they cross the north boundary of the map and both, by coincidence, are 8,138 feet.

Conspicuous among features of local relief is the moderately sharp, west-facing cuesta escarpment which makes the west side of the Grizzly Creek Divide. Most of the significant rock exposures are on or below this slope which breaks down somewhat irregularly into the Little Grizzly drainage. On top, the divide surface is smooth, with a noticeable inclination to the north. Surface slopes to the east are much less than the east dip of the strata so the dip slope of the cuesta is not well expressed. Exposures on this side are uncommon and usually too indistinct for identification.

Short, dry tributaries with width out of proportion to present length head into the east side of the divide and debouch onto the wide, flat alluvial plain of Grizzly Creek. Close study of these valleys and the intervening spurs shows a rather persistent parallelism of trend of stream courses, walls, and slopes which sometimes can be followed beyond the head of the valley. Numerous small tear faults trending northeast are believed to control these features.

Climate.- Because of the high altitude of the valley floor and the still higher enclosing mountain ranges, climatic conditions are severe in North Park. Frosts continue into June and usually resume again in late August or early September. During the short summer season, local weather is characterized by abrupt change, usually involving afternoon thunderstorms. Thus the field season is short and work is subject to numerous brief interruptions.

Climatic conditions exert a rigorous control over the vegetation. Scant rainfall over the valley floor limits plant growth to sage-brush. Groves of aspen stand on north-facing slopes or areas of moist soil. Willows and thick brush are found only along the banks of the streams.

Previous Investigations.- Although Beekley's report on the coal resources of North Park[1/] appeared more than 25 years ago, it still remains the most comprehensive source of information on the region. All previous literature is summarized. Considering that a relatively large area was covered with considerable rapidity, it is a very creditable piece of work. Numerous references will be made to it in the pages that follow.

1/Beekley, A. L., Geology and Coal Resources of North Park, Colorado. U. S. Geological Survey Bull. 596. Washington, 1915.

Present Investigation.- Study of the relation of the geology of the Coalmont district to the spread or control of coal mine fires has had a rather long and involved history. Actual field investigations were prefaced by a lengthy period of establishment of policy and preparation. The fire which destroyed the Northern Colorado Coal Company's Coalmont mine No. 1 may be credited with instigating the detailed study of the district. This property was opened in 1909, subsequent to wagon-mine operations. As near as can now be determined, fire originated in the workings sometime during 1915 or 1916; and after repeated failure to place it under control, the mine was abandoned in 1919. This same year the North Park Coal Company acquired the property from the Northern Colorado Coal Company, but made no effort to control the fire.

Under date of August 20, 1927, Mr. C. L. Duer, then District Mining Supervisor, U. S. Geological Survey for the Denver district, submitted two photographs of the surface fire at Coalmont mine No. 1 to Mr. H. I. Smith, Chief, Mining Division. In calling attention to the proximity of this fire, which was then estimated to have destroyed 500,000 tons of coal, to the Government land included in the coal lease of L. C. Moore (North Park Coal Company), Denver 027306, Mr. Duer stated he "believed that the increase in thickness of the overburden which sloughs off as the coal is burned out will smother the fire before it reaches the boundary of the Government land". In reply, Mr. Smith requested a description of the lands affected, and suggested that the fire be kept under observation.[1/]

1/Letter: H. I. Smith to C. L. Duer, Oct. 28, 1927.

About a year later, apparently at the instigation of Mr. Smith, the Acting Director of the Geological Survey, Dr. Julian D. Sears, called the attention of the Director of the Bureau of Mines to the Coalmont fire and to another fire in Wyoming, stating:

"I wish to get your reaction to a joint investigation of these two fires to determine whether it is practicable to try to extinguish or control them, and, if so, whether a special appropriation should be solicited for this work."[2/]

2/Letter: Julian D. Sears, Acting Director, U. S. Geological Survey, to the Director, U. S. Bureau of Mines. Nov. 5, 1928.

Following this correspondence, Mr. E. H. Denny, Mining Engineer, was assigned to the investigation by the Bureau of Mines, and Mr. Duer was designated to represent the Geological Survey.[1/] Owing, however, to the prevalence

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[1/]Letters: Mr. Scott Turner, Director, Bureau of Mines, to Dr. Julian D. Sears, Acting Director, U. S. Geological Survey, Nov. 7, 1928.
Geo. Otis Smith, Director, U. S. Geological Survey, to the Director, U. S. Bureau of Mines, Dec. 3, 1928.

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of winter conditions, immediate field work was postponed.

In the meantime, the General Land Office had been listing and reporting coal mine fires on both public and private land in the belief that solely from the viewpoint of conservation of natural resources the interest of the Federal Government in numerous fires on private land was greater than that of the owner because of threatened destruction of contiguous areas of Government land. Subsequently, on December 22, 1928, the Secretary of the Interior requested the Geological Survey for information in regard to outcrop fires on coal beds on the public domain. The Coalmont fire was again reported, along with several others within the Denver district.

Following the death of Mr. Duer in February, 1929, Mr. J. J. Bourquin was designated to succeed him on June 18, 1929.[2/] On September 25, following,

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[2/]Letter: H. I. Smith to J. J. Bourquin, June 18, 1929.

Messrs. Bourquin and Denny made a joint investigation of the Coalmont fire in pursuance of orders issued previously.

"The purpose of this examination was to acquire data relative to the quantity and quality of Government-owned coal endangered by this fire and to determine if conditions would justify the expenditure of public money in efforts to extinguish or control the fire."[1]

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[1] Report on the Coal Outcrop Fire in sec. 24, T. 7 N., R. 81 W., 6th P.M., Colorado, in North Park. J. J. Bourquin District Mining Supervisor, U. S. Geological Survey, and E. H. Denny, District Mining Engineer, U. S. Bureau of Mines, Denver, Colorado, Nov. 30, 1929.

This was the first direct action taken against the Coalmont fire by Federal authorities, but no further steps were taken for lack of funds.

With the establishment of the Public Works Administration in 1933, prospect of funds for safeguarding mine openings and controlling outcrop fires appeared imminent. The Coalmont fire was again cited as worthy of attention, and early in 1934, it was designated Geological Survey Public Works Project No. 5 in Colorado.

The writer was assigned to make the necessary geologic studies on April 2, 1934; and field work began on May 15 and was completed June 29. Under date of July 3, 1934, a memorandum[2] was submitted to Mr. Bourquin sum-

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[2] Memorandum to Mr. J. J. Bourquin from Chas. E. Erdmann. Subject: Geological Conditions Affecting the Coalmont Fire at Coalmont, Colorado, Denver, July 3, 1934.

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marizing the results of this work. The most important conclusion of this report was that:

"the area which will probably burn is small in comparison with that already destroyed. It appears that the fire has passed its peak, and while it may burn fiercely in one or more restricted localities, it seems that it has nearly burned itself out. The cost of extinguishing this fire will be far greater than any saving which might be accomplished. I therefore recommend that the fire be allowed to burn itself out."

This concluded the first phase of the geologic investigation of the Coalmont district.

While it was in progress, another fire in the North Park Coal Company's Moore mine No. 1 (North Park Coal Company's Rabbit Ear mine No. 1) about a mile south of Coalmont got out of control and, within a year, necessitated abandonment of the mine. In all probability, it is now dormant. Eventually, if it is not extinguished or controlled, it will burn to the surface and destroy or render inaccessible all of the coal not recovered from the fault-block in which the mine is situated.

Concurrently, still another fire hazard was developing in the stripping mine, S½NW¼ sec. 26, T. 7 N., R. 81 W., which was opened in 1931. With two active fires and one potential fire area, the geologic problem of determining whether the three localities were situated in the same bed or different beds became of increasing importance. Accordingly, in June, 1937, additional field investigation was requested by the District Mining Supervisor. In response,[1/]

[1/] Letter: C. E. Erdmann to Chief, Conservation Branch, June 23, 1937.

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the opinion was offered that all the mines in the Coalmont district were in the same coal seam; but proof could not be furnished. At the same time, it was pointed out that the growing complexity of the stratigraphic problem required enlargement of the original area surveyed. During the period August to October, inclusive, 1933, the entire district — both old and new — was mapped topographically by the Conservation Branch, U. S. Geological Survey, on a scale of 1:12,000, with a 5-foot contour interval. Preliminary copies of this map were available for field use in 1940, and during the period July 9-August 12, the ground previously mapped was restudied, and new mapping carried on east and south of Coalmont. This constituted the second phase of

the geologic investigation. Prior to field work in 1940, a thorough study was made of the earlier stratigraphic work, and the entire problem has been restudied in the office during the Fall of 1940 and Spring of 1941. The combined results of this field and office study are set forth in this report.

Nature and Extent of Problem.- Natural exposures of coal in the Coalmont district are the exception rather than the rule. Early exploration in the field resulted in the conclusion that four workable seams were present. According to the first description of the district in the reports of the State Coal Mine Inspector,[1] these were: Upper or Mammoth seam, 65 feet thick;

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[1] Fifteenth Biennial Report of the Inspector of Coal Mines of the State of Colorado, 1911-1912, page 91, Denver, 1913.

No. 2 seam, 12 feet thick and at a depth of 650 feet below the upper seam; No. 3 seam, 18 feet thick and 600 feet below No. 2 seam; and No. 4 seam, 20 feet thick and 350 feet below No. 3 seam. The Upper or Mammoth seam is known to have been worked in the Coalmont mine No. 1, NWSW sec. 24, T. 7 N., R. 81 W., but the locations of the outcrops of the other seams are not given. Beekley[2] also concluded that there were three or more beds in the district.

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[2] Op. cit. pp. 103-105.

According to his report, the Riach (pronounced Rear) bed at the Coalmont mine No. 1 would be identical with the Upper or Mammoth bed. No. 2 seam, 5 feet thick and 360 feet stratigraphically below the Riach bed is soft and shaly and has little or no commercial value. Exposures occur one-fourth mile south

of the Coalmont mine No. 1. No. 3 seam, 12 feet thick or more, is 1,000 feet stratigraphically below the No. 2 bed. At the time of his visit, it was observed in a prospect shaft near C NE SE NE sec. 26, T. 7 N., R. 81 W. No. 4 bed, 13 feet thick, 1,250 feet below the No. 3 bed, was seen in a prospect shaft in NW¼ sec. 26. Beckley also noted the seam at the old Spicer mine in the NE¼ sec. 31, T. 7 N., R. 80 W., which he correlated correctly with the Riach bed; and he made reference to the Taylor bed near S¼ corner sec. 21, T. 7 N., R. 81 W., and to coal exposures near Mexican Creek, SW¼ sec. 9, T. 6 N., R. 81 W., which lie without the area herein defined as the Coalmont district.

Belief in the occurrence of one or more beds in this district persisted for many years. While the investigations outlined in this report were being organized, the District Mining Supervisor wrote:

> "I endeavored to acquire some data concerning the relationship of the coal bed which is burning to the coal bed which is being developed in the Moore mine of the North Park Coal Company nearby, but no dependable data were available. Some people believe the fire and the Moore mine are in the same coal bed which has been faulted between the fire area and the mine; others believe the coal bed splits between the Moore mine and the site of the fire and that the fire is in the upper bench of the coal bed; still others hold of the opinion that the Moore mine and the fire are in entirely different beds of coal."[1]

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[1] Letter to H. I. Smith, Chief Mining Supervisor, March 26, 1934.

The problem thus resolved itself rather simply into a study of the stratigraphy and structure of the district with supplemental investigations of ground-water conditions. Its solution, however, was more troublesome.

Among the more formidable difficulties confronting the investigation as a whole were lack of significant exposures due to thin but widespread overburden; uniform resistance to erosion of the soft, poorly consolidated beds prohibiting preservation of structural features; lack of a complete, unbroken stratigraphic section due to its piece-meal distribution between various areas blocked out by faults; general similarity of the section above and below the coal, with lack of suitable "key" beds for following stratigraphic and structural changes and trouble in tracing them when found; abrupt changes in stratigraphy causing corresponding parts of the stratigraphic section in different fault blocks to have different appearance and intervals; and complexity of the fault system. A further difficulty is the uniform character of the coal, absence of distinctive partings or other means of recognition, making identification of isolated exposures questionable.

Such generally unfavorable conditions necessitated resolving the general problem into numerous smaller problems, usually several for each fault-bound area. An attempt was made to solve them simultaneously, but frequently solution of a difficulty in one locality was found to be dependent upon success in another. Deductive methods have been the principal mode of attack. Progress in both field and office has thus been slow, necessarily, but accelerated as analysis proceeded. In consequence, the order of accuracy of the work is variable. Portrayal of structural conditions by means of structure contours is possible for only about one-fourth of the map area, and they have been developed chiefly to determine the position of concealed portions of the coal bed; conditions in the remainder of the district are largely hypothetical and have been determined largely by means of cross sections.

For the most part, the problems of the Coalmont district are on the border line between those which can be solved by conventional geologic methods and those requiring development work, geophysics or drill-hole information for complete understanding. Many of the findings of this report would have been impossible without the use of the old churn drill records of the district; and many of the deductions remain to be tested by future drilling and prospecting. Determination of correct locations and elevations, not to mention stratigraphic correlations, has been a considerable problem in itself and has required much study. And still the records are incomplete. More than 100 have been examined and annotated, and are included in this report as a series of appendices.

Acknowledgments.- Many thanks are due those with whom the writer has been associated during the course of this investigation. Within the Geological Survey, particular mention should be made of the District Mining Supervisor, Mr. J. J. Bourquin, who at all times has appreciated fully the numerous difficulties, and aided in surmounting them by generous council and contributions of engineering data. Deputy Mining Supervisor, Mr. F. W. Calhoun, has contributed most of the information on the coal, which has been obtained from the many detailed sections he has measured in the stripping pit. Mr. J. D. Turner, Assistant Mining Engineer gave assistance with underground observations in some of the old mine workings. Mr. A. K. Thies assisted the writer in the field in 1934, and is particularly responsible for the resistivity determinations. The topographic map of the district which served as the base for the restudy of the area in 1940 was made by Mr. R. M. Doolittle. Without the Geological Survey, mention should be made of Mr. G. M. Kintz, Mining Engineer, U. S. Bureau of Mines, who assisted in the taking of moving pictures of some of the underground fire-fighting activity in

Moore mine No. 1 during June 1934. Prof. Clark B. Carpenter, Colorado School of Mines, loaned the thermo-couple with which were measured the higher temperatures in the fire pit of Coalmont mine No. 1. Mr. H. D. Pinkney, Superintendent, Rabbit Ear mine, North Park Fuel Company, furnished in confidence all of the churn drill logs listed in the Appendix, and without this information, many of the conclusions reached in both stratigraphic and structural geology would have been unattainable.

GEOLOGY

STRATIGRAPHY

COALMONT FORMATION

Definition and Distribution.- During his investigation of North Park, Colorado, Beekley observed 4,000 to 5,000 feet of fresh-water strata lying between the marine Cretaceous (Pierre shale) and the North Park formation (Tertiary) which comprise the uppermost stratified rocks of the region. This thick assemblage of beds appeared to be divisible into a lower member of 3,000 to 4,000 feet of dark-colored coal-bearing rocks, and some 2,000 feet of younger, lighter-colored sandstone and conglomerate. Beekley was unable to decide whether the two members constituted separate and distinct formations or belonged to a single formation, the lithologic differences being explained as varying phases of contemporaneous deposition. Accordingly, he wrote:

> "——— in default of a decisive solution of the problem, all the strata which rest unconformably upon the marine Cretaceous and are overlain by the North Park (Tertiary) formation are here treated as a single formation, to which the name Coalmont is applied. The formation is much better exposed along North Platte River than in the vicinity of Coalmont, but the name Coalmont is used as the most acceptable name not preoccupied or otherwise unsuitable."1/

1/Op. cit. p. 50.

General Character.- Only that portion of the formation in the vicinity of Coalmont will be considered in this report. The following general statements by Beekley are particularly pertinent:

"The slightly resistant character of the coal-bearing strata causes them to yield very readily to weathering, and in consequence, the exposures are small and patchy. The areas in which they outcrop are characterized mainly by large flats and well-rounded hills, practically all of which are thickly covered with a persistent mantle of gray to buff clay soil on which sagebrush grows abundantly. These areas are trenched to a considerable extent by stream channels, but even along these, the soft bedrock weathers down rapidly and covers the slopes with rock debris and soil. The outcrops are widely scattered, and most of them extend for less than 50 feet and few for more than 100 feet. In the absence of persistent horizon, markers by which the position of the exposed beds might be determined, the succession of beds must necessarily be determined by the location, altitude, and dip of the rocks exposed. Not withstanding the fact that considerable portions of the coal-bearing strata are covered and that the locations and altitudes of many of the exposures could be only approximately established, it is believed that by arranging the various groups of exposed strata as accurately as possible in a composite section, a good idea of the formation as a whole may be gained." (pp. 50-51).

"The coal-bearing strata exposed in the vicinity of Coalmont and along Grizzley and Chedsey Creeks, in the southwestern part of the field, are in general much like those which outcrop east of Walden, though they show notable differences in the character of some of the sandstones and in the number and distribution of the coal beds. The presence of a thick bed of brown, locally carbonaceous shale and black clay and the proportion of shale and sandstone in the beds above and below it are points of resemblance between the coal-bearing rocks near Coalmont and those on the east side of the field. The section at Coalmont contains five coal beds, which are distributed at fairly regular distances through approximately 2,000 feet of strata. Although the number and distribution of these beds discourage any attempt at correlation with the coal beds on the east side of the field, it is believed that the rocks exposed near Coalmont occupy the stratigraphic position of the lower coal-bearing strata, and that the Pole Mountain uplift brings the top of the Pierre shale very close to the surface at that locality. The sandstone associated with the upper coal beds in this vicinity is coarse, gray, and friable, and contains strikingly large amounts of white mica. It is more shaly and friable and contains much larger proportions of mica and black chert-like grains than any sandstone observed in the district east of Walden. At Coalmont, as in the eastern part of the field, all but the more resistant sandstones of the section are concealed by surface wash, which makes it impossible to trace the coal beds or sandstones more than a few hundred feet from actual exposures. The absence of coal beds and sandstones along Chedsey Creek, where, according to the strike of the rocks, the Coalmont formation should outcrop, may be considered strong evidence that both sandstone and coal beds were deposited under local and variable conditions and are lenticular in character. In view of

the covered condition of the intervening area, however, the disappearance of the coal beds might be attributed to concealed faults or other local structures." (pp. 52-53).

Age.- Beekley left open the question whether the Coalmont formation is of late Upper Cretaceous or early Tertiary age.[1] However, in 1932,

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1/ Op. cit. p. 58.

Miller collected fossil leaves from a sandstone in the Coalmont formation above the uppermost coal bed cropping out on the west flank of the South McCallum anticline. This coal bed is mined at the Conrad mine in sec. 29, T. 9 N., R. 78 W. These leaves were identified by R. W. Brown, of the U. S. Geological Survey, and are common to flora of Laramie Upper Cretaceous age.[2]

2/ Miller, J. C., Geology of the North and South McCallum Anticlines, Jackson County, Colorado, with Special Reference to Petroleum and Carbon Dioxide. U. S. Geological Survey, Circular No. 5, p. 16. Washington, 1934.

Stratigraphic details of the Coalmont district.- This report deals only with the Coalmont formation in the Coalmont district. Approximately 2,500 feet of formation is present, but since neither its base nor top are exposed, its stratigraphic position is unknown except in a most general way. The amount of section both above and below the coal suggest that it belongs somewhere near the middle of the coal-bearing member.

Lithologic estimates based upon the stratigraphic sections which follow indicate that this portion of the formation contains the following approximate percentages of sediments: sandstone, 14; siltstone, 40; carbonaceous shale, 15; shale or mudstone, 3; coal, 2; concealed, 26. Soft, gray, buff-weathering siltstone is believed to constitute the bulk of the concealed section, making that facies total about 60 percent with the remainder probably assignable to the shale.

For convenience of description, the formation has been divided arbitrarily into the section below the coal and the section above the coal.

Beds below the Riach coal.- Several partial sections have been measured below the coal in the S½ sec. 25 and N½ sec. 35, T. 7 N., R. 81 W., and, after much study occasioned by the difficulties mentioned, it has been found possible to compile a composite section from the base of the Riach coal downward for about 1,000 feet. The basal part of the section terminates in an area of obscure exposures adjacent to the east Pole Mountain fault.

Section A

Partial Section of the Coalmont Formation, 400 feet SE of W¼ corner sec. 25, T. 7 N., R. 81 W.

Unit	Description Units numbered downward	Thickness Feet	 Inches
1	Base of Riach coal bed		
2	Mudstone, gray, soft	6	
3	Shale, carbonaceous, brown		1
4	Siltstone, brownish-buff, micaceous	28	6
5	Sandstone, dark-brown, harder than inclosing rocks		6
6	Siltstone, buff, as above	10	
7	Shale, carbonaceous, brown, flaky,		
	Sandy and light colored at top; nearly black at base	27	
8	Siltstone, gray	4	
9	Shale, carbonaceous, brown	18	
10	Sandstone, dark-brown, micaceous,		
	Thin, floggy layers. Hard; heavy	1	
11	Siltstone, buff, micaceous, soft, with occasional thin (6-inch) layers of papery brown carbonaceous shale	63	
12	Sandstone, dark-brown, micaceous. Like Unit No. 10	1	
13	Shale, carbonaceous, brown, papery	15 +	
	Section terminated by Moore fault		
	Total	174	1

Section B

Partial Section of the Coalmont Formation
SW side of ridge, SE NW SE sec. 26, T. 7
N., R. 81 W.

Unit	Description	Thickness Feet	Thickness Inches
	Units numbered downward		
	Concealed		
1	Sandstone, hard, resistant, dark-brown, micaceous, heavy, ferruginous		6
2	Siltstone, brownish-buff, poorly exposed	10±	
3	Sandstone, like Unit No. 1	1±	
4	Shale, carbonaceous, brown, papery	55	
5	Siltstone, gray, micaceous, soft	10	
6	Sandstone, fine-grained, micaceous, ferruginous, brown. Desert varnish		2
7	Siltstone, gray-buff, soft	1	6
8	Sandstone, brown, harder than inclosing beds. Thin bedded and cross-bedded	1	
9	Siltstone, gray, weathering buff	5±	
10	Sandstone, brown, thin, hard. Small thin chips with desert varnish litter surface	1	
	Concealed		
	Total	85	2

Section C

Partial Section of the Coalmont Formation NE¼ sec. 35, T. 7 N., R. 81 W.

Unit	Description	Thickness Feet	Thickness Inches
	Units numbered downward Concealed		
1	Sandstone, orange-brown, ferruginous	1	
2	Siltstone, light-gray, soft, micaceous	7	
3	Sandstone, brown, ferruginous. Desert varnish. Like Unit No. 1, micaceous. Thickness variable	1	
4	Clay, gray, poorly fissile	1	
5	Coal, weathered, soft, sooty. Non-persistent		2
6	Shale, carbonaceous, brown. Poorly exposed	30	
7	Interval, soft siltstone probably alternating with thin beds of carbonaceous shale. Largely concealed. Thickness estimated by subtraction of thickness of Units Nos. 6 and 8 from gross interval between Units Nos. 3 and 9	66	
8	Shale, carbonaceous, papery, black and brown at base, with some fissile gray shale	27	6
9	Sandstone, soft, orange, platy, micaceous		2-3
10	Shale, carbonaceous, papery	2	6
11	Sandstone, purplish-brown, hard		3
	Sandstone, buff, soft	1	6
	Sandstone, brown, hard		3
	Sandstone, soft, orange-brown to buff, micaceous. Coarse grained. Locally characterized by an abundance of milky white quartz	38	

Unit	Description	Thickness Feet	Thickness Inches
12	Shale, gray, carbonaceous, papery. Lower foot black	8	
13	Sandstone, brown, soft, micaceous, medium-grained	2	
14	Shale, gray, sandy, micaceous	7	
15	Sandstone, gray-buff. Hard, massive. Makes ledge. Weathers into rounded forms	5	6
16	Shale, gray and brown, carbonaceous. Largely concealed.	5	
17	Sandstone, orange-brown, ferruginous		6
18	Sandstone, light-grayish buff, very soft, micaceous	25	
19	Interval, largely concealed, but believed to be occupied by soft, buff-weathering siltstone and sandstone	90	
20	Sandstone and siltstone, buff-yellow, soft, poorly exposed in slope	103	
21	Sandstone, purplish, as below. Top may be brownish instead of purplish-brown		6 to 12
22	Shale, gray, carbonaceous, papery	3	
23	Sandstone: Brownish, micaceous, coarse-grained Purplish-brown, ferruginous, hard Gray, clayey		6 3 3
24	Shale, yellow-brown to brownish-gray to black. Carbonaceous. Fissile. Makes slope. Base poorly exposed.	50	
25	Siltstone, buff-weathering. Thickness uncertain	9(?)	
26	Shale, chocolate-brown, carbonaceous. Overall thickness of Units Nos. 24, 25, 26 is 100 feet	40	

Unit	Description	Thickness Feet	Thickness Inches
27	Sandstone: Weathered surface purplish-brown. Freshly broken surface orange-brown. Coarse, micaceous. Hard, brittle, resistant. Slabby beds 1/2 to 2 inches thick.	1½ to 6	
	Gray-buff, coarse, hard. Strongly cross-bedded. Micaceous.	10	
	Brownish-buff to drab. Soft, friable. Medium to fine-grained, micaceous.	39	
28	Siltstone, buff, soft. Surface checks on drying. Grades into bed above	15	
29	Shale, chocolate brown, carbonaceous. Papery	5	
30	Siltstone, gray, surface orange-buff. Checks on drying.	12	
31	Shale, chocolate-brown, carbonaceous	1	
32	Siltstone, gray, soft. Surface orange-buff. Like Unit No. 30, above	5	
33	Shale, chocolate-brown, carbonaceous	1	
34	Siltstone, gray, soft, weathers buff-gray. Surface checks on drying	20	
35	Interval, concealed in slope. Probably occupied by an alternation of soft, buff-weathering siltstone and thin beds of papery, brown carbonaceous shale	180±	
	Section terminated by east Pole Mountain fault		
	Total	816	

In the foregoing measurements, Units C 1, 2, and 3 are believed to be the direct equivalents of Units B 8, 9, and 10. Faulting and concealment by alluvium makes it impossible to trace one group into the other, but they can be followed to within 1,800 feet. The match in succession, thickness, and lithology of the units seems unmistakable. Another reason for regarding them identical is the nature of the interval from their base up to the coal. Four measurements at scattered localities gave 71, 74, 78, and 91 feet, respectively; and this variation is so small that there is no space for another similar series of beds in the same interval.

Matching Sections A and C on the top of Units A 10 and C 1, the total measurable section below the coal is about 909 feet, and combining Sections B and C it is about 900 feet.

Although the strata below the coal are fairly regular and observations on them were translated to the coal with little difficulty, some minor stratigraphic variations have been observed. Thus, in Sections A and B, Figure 3, beds of buff siltstone thin westward rapidly. Units A 4, 5, and 6 are believed to correlate with Units B 1, 2, and 3. Although the lithology is fairly constant, there is considerable variation in thickness. This discrepancy would be reduced if A 5 were to be matched with B 1. However, such a shift would destroy the very good match of the tops of A 8 and B 5, and the less perfect match of A 10 with B 8. Similar variations in thickness and lithology of the upper siltstone bed (A 4, 5, 6 and B 1, 2, 3) have been noted in churn drill records from NW¼ sec. 26, T. 7 N., R. 31 W., and locally, the bed lenses out completely into brown carbonaceous shale. Evidently the beds of siltstone and carbonaceous shale at this horizon interfinger closely, and more variations would be observable if it were possible to measure more sections.

Beds above the Riach Coal.- Combinations of surface measurements, particularly Sections F, G, and H following, make it possible to compile a composite section for about 625 feet above the Riach coal. Various thicknesses up to 303 feet (Appendix D, Log No. 15) of the lower part of this section have also been penetrated by numerous churn drill holes. Several short fragmentary sections in the eastern part of the district can not be tied-in accurately because of increasing amounts of cover; but a skeletonized section can be extended for another 825 feet making the total measurable thickness of the beds above the coal about 1,450 feet. Approximately 300 feet of this section has not been seen.

Section D

Partial Section of the Coalmont Formation immediately above the coal, E. face strip-pit, NW SE NW sec. 26, T. 7 N., R. 81 W., July 27, 1941.

Top

Unit	Description	Thickness Feet	Thickness Inches
	Surface, brown gumbo soil	3+	
1	Shale and siltstone, interbedded, gray and brown, but predominantly brown. Thinly bedded and laminated. Top not exposed	16+	
2	Sandstone, gray, fine to medium grained. Micaceous. Beds 2 to 8 inches thick, with an occasional siltstone parting	8	6
3	Siltstone, gray to brownish gray. Soft. Thinly laminated in places	3	10
4	Shale, black, carbonaceous, papery, with thin stringers of coal		6
5	Shale, black, carbonaceous, papery		9
6	Clay, sandy, brownish-gray. Carbonaceous. Compact; weathering into nodular forms		5
7	Shale, black, carbonaceous, papery		10
8	Clay, brown to black, carbonaceous		6
9	Coal, top of Riach bed. Woody black lignite with silicified logs. Usually stripped	2	2
10	Coal, Riach bed	30+	
	Total	63	4

This is the best available surface section of the beds immediately overlying the coal. Although short, it is given here to convey some idea of the character of the roof of the bed. Three quarters of a mile east, in Moore mine No. 1, Units Nos. 4 to 8 inclusive seemed to have disappeared and a fine-grained, soft, buff micaceous sandstone rests directly upon the coal. Without support, it caves readily, and some of these caves penetrated to the surface. Unit No. 2 D has been used as a "key" bed in the vicinity of the strip-pit.

Section E

Partial Section of Coalmont Formation immediately above the coal, NE of small lake C SE NW NW sec. 26, T. 7 N., R. 81 W.

Top

Unit	Description	Thickness Feet	Thickness Inches
	Soil		
1	Siltstone, buff, sandy	7	
2	Shale, gray and brown	20	
3	Sandstone	2	
4	Shale	3	
5	Coal, only top exposed	———	———
	Total	32	

This section is of no particular value, except, when compared to D, that it indicated the amount of detail to be expected in natural exposures.

Section F

Partial section of the Coalmont Formation SW NW and S NW NW sec. 25, T. 7 N., R. 81 W. Plane-table measurement across strike. Beds poorly exposed. General locality is east of shaft Moore Mine No. 1

Top

Unit	Description Units numbered downward	Thickness Feet	Inches
1	Interval, largely concealed, believed to consist chiefly of soft, gray-buff micaceous siltstone. Section G begins at the top of this unit, and the 10 feet of Unit No. 17 G should be added to it	136	
2	Sandstone, buff, massive, medium-grained. Upper 20-25 feet fairly well exposed. Lower part poorly exposed	56	
3	Siltstone, buff, interbedded with thin (2 to 3 ft.) layers of gray shale	12	
4	Shale, brown, carbonaceous	20	
5	Interval, largely concealed, believed to be occupied by gray carbonaceous shale and poorly fissile mudstone	32	
6	Sandstone, brownish-buff, coarse-grained, micaceous, massive, hard, resistant	2	
	Sandstone and siltstone, poorly exposed Irregular, lenticular bodies of coarse, hard, gray to gray-buff arkosic grit characterized by an abundance of large (up to 1/4 in.) sub-angular grains of milky white and translucent quartz, occur in soft, buff, micaceous siltstone which carries many thin, chippy layers of orange-brown ironstone. Exposures are generally poor	114	
7	Black coal	53	
	Total thickness	430	
	Thick. beds above coal	372	

Section G

Partial Section of Coalmont Formation above coal. SW Corner sec. 24 and NW Corner sec. 25

Unit	Description	Thickness Feet	Thickness Inches
	Units numbered downward Section terminates against Coalmont fault		
1	Sandstone, light gray, micaceous. Soft, with occasional thin, hard massive ledge. Discontinuous layer of ferruginous concretions at base	20+	
2	Mudstone, greenish gray, micaceous	2	3
3	Shale, carbonaceous, grading laterally into lense of light buff sandstone	5	
	Shale, carbonaceous, black, papery, with bony lignite and silicified wood	3	
	Mudstone, gray-green	1	
	Shale, carbonaceous, brown, flaky in lower part	6	
4	Concretions, ferruginous. Purplish brown to black (clay ironstone). Discontinuous layer		0-6
	Mudstone, carbonaceous, gray	2	
	Shale, carbonaceous, black	1	
	Mudstone, carbonaceous, gray	2	
	Concretions, ferruginous, as above		6
	Mudstone, carbonaceous, gray	10	
5	Shale, carbonaceous, black	2	
	Shale, carbonaceous, brown, papery	1	
6	Siltstone, gray		6
	Shale, carbonaceous		2
	Siltstone, gray		6
	Shale, carbonaceous, brown		8
	Siltstone, gray, micaceous		6
7	Shale, carbonaceous, brown, papery, with a few thin layers of black	4	
8	Siltstone, gray, flaky, and shale, weathering light gray. Ferruginous concretions near middle	4	6

Unit	Description	Thickness Feet	Thickness Inches
9	Shale, carbonaceous, brown, flaky		8
	Mudstone, gray		8
	Shale, carbonaceous, brown, flaky	1	
	Shale, carbonaceous, black, papery	2	2
	Shale, carbonaceous, brown	1	6
	Shale, carbonaceous, black, papery. Silicified wood (logs) occurs in the lower 5 feet of this unit	2	2
10	Sandstone, light gray to buff, micaceous. Silicified wood	1	6
	Shale, carbonaceous, dark gray		4
	Siltstone, as above, with local bed of hard gray grit at top. Flattened silicified logs. Ferruginous concretions at base	2	2
	Sandstone, coarse, ferruginous at top. Micaceous, coarse flakes muscovite		6
	Sandstone, light gray, micaceous	1	
11	Shale, carbonaceous, brown, papery	5	
12	Siltstone, light gray, micaceous	1	
	Concretions, ferruginous, purplish brown		6
	Siltstone, light gray, micaceous	2	6
	Concretions, ferruginous, as above. Discontinuous layer		6
	Siltstone, grayish buff, micaceous	2	
13	Brown bed:		
	Shale, carbonaceous, flaky, brown	1	6
	Mudstone, gray	1	
	Shale, carbonaceous, brown		8
	Shale, carbonaceous, black, bony	3	
	Mudstone and shale, carbonaceous. Orange brown (about 13 inches)	18	
	Shale, carbonaceous, and coal, bony. Dark brown to black; platy; woody	1	
	This bed, because of its thickness and persistence, is probably the best stratigraphic marker above the coal.		
14	Shale, grayish-green, fine-grained. Slightly carbonaceous. Bedding irregular. Breaks into thin plates. Fissility medium. Could also be described as micaceous siltstone.	2	

Unit	Description	Thickness Feet	Thickness Inches
14	Sandstone, light-grayish buff, medium grained, micaceous, with occasional lenses of coarse brownish silt near the middle. A thin (6-inch) layer of ferruginous concretions occurs about 10 feet below the top.	44	
	Sandstone, brown, cross-bedded, fine-grained, micaceous. Hard. (Rod on top this bed at sta. 14)	2	
15	Sandstone (siltstone) buff, grading from Sandstone, brownish orange, soft, micaceous	4 4	6
16	Shale, carbonaceous, papery. Black at base, brown at top. Slightly micaceous	4	
17	Siltstone, brownish-buff, micaceous, soft	10+	
	Base concealed		
	Total	252	11

Section G begins at the top of Section F and extends upward to the Coalmont fault, including the coal at the base of F, their combined thickness is about 683 feet. Section G is better exposed than any other group of beds above the coal.

Section H

Partial Section of the Coalmont Formation, W½ NW¼ sec. 24, T. 7 N., R. 81 W. Measurements by hand leveling and plane table.

Top

Unit	Description	Thickness Feet	Thickness Inches
	Top of bench Gravels	4 to 5	
1	Sandstone, soft, buff	6	
2	Shale, brown and black, carbonaceous	3	
	Sandstone, gray, soft		6
	Shale, dark gray, carbonaceous, soft, surface checks. Grades upward into gray shale	2	6
	Sandstone, soft, with orange-brown ironstone. Locally, this entire unit (2) may attain a thickness of 10 feet.	1	
3	Shale, black to dark gray, carbonaceous, papery. An occasional lentil of brown ironstone concretion	4	6
	Shale, brown, carbonaceous, flaky	4	
	Shale, as above	41	6
4	Siltstone, gray-buff, soft	8	
	Arkose, gray, lenticular body	3	
	Siltstone, gray-buff, as above (This represents the maximum thickness of this unit, locally it may be only 10 feet thick)	8	
5	Shale, brown, carbonaceous, flaky	15	
6	Siltstone, buff to brown, soft, containing some thin beds of fissile carbonaceous shale. Poorly exposed	100	
7	Shale, brown, carbonaceous	23	
8	Sandstone, gray-buff, arkosic and concretionary at top. Makes resistant ledge. Crops out about 50 feet E. of NW corner sec. 24, and can be traced southward for one-fourth mile. Lower part buff siltstone, with occasional thin beds of carbonaceous shale. Poorly exposed.	40	
	Base concealed		

Section I

Partial Section of Coalmont Formation. E. side of road, one-fourth mile N. of junction. SE. corner NE¼ NE¼ sec. 14, T. 7 N., R. 81 W. Below railway cut. Measurement by hand leveling.

Top

Unit	Description	Thickness Feet	Thickness Inches
	Surface		
1	Shale, carbonaceous	25	
2	Shale and sandstone in alternating beds 1 to 2 feet thick	10	
3	Sandstone, buff, micaceous. Makes ledge	2 to 3	
4	Shale, gray, silty. Fissile	6	
5	Sandstone, buff, medium-grained, medium-hard. When seen from a distance, Units Nos. 2, 3, 4, and 5 appear to make a single unit of moderately resistant buff siltstone. Forms a conspicuous bed in RR cut near water tank and to the south.		7
6	Shale, gray to brown, carbonaceous, silty. Thinly laminated. Fairly hard and resistant.	5	
7	Sandstone, brownish, fine-grained. Carbonized plant remains		3
8	Siltstone, gray, thinly laminated	1	1
9	Shale, olive and gray, fissile	1	
10	Shale, black, carbonaceous. Papery (Base RR embankment)	2	
11	Shale, brown to black, carbonaceous, papery. Interbedded with thin layers gray mudstone and sandy carbonaceous shale.	3	
12	Shale, brown, carbonaceous, papery	2	
13	Mudstone, lead gray, silty, weathers buff	1	

Unit	Description	Thickness Feet	Thickness Inches
14	Shale, brown to black, carbonaceous. Papery, grayer, slightly sandy and more resistant toward top	9 to 10	
	Base concealed		
	Thick.	63 to 70	

Unit No. 1 I correlates with the lower part of Unit No. 3 H; and Units Nos. 2, 3, 4, 5 I correspond to Unit No. 4 H.

Section J

Partial Section of the Coalmont Formation in SW NW sec. 30, T. 7 N., R. 80 W., and NE SE sec. 25, T. 7 N., R. 81 W. Section measured with folding rule.

	Thickness	
	Feet	Inches
Top concealed		
Shale, gray, flaky, weathering buff	2+	
Shale, carbonaceous, chocolate brown	1	2
Siltstone, gray, flaky, weathering buff. Ironstone concretions near base	4	6
Shale, carbonaceous, platy, chocolate brown		6
Clay, sandy, gray-buff		4
Lignite, woody, black, at top of layer of carbonaceous shale		6
Lignite, woody		7
Shale, carbonaceous		3
Lignite, woody, black	1	2
Shale, carbonaceous, chocolate-brown, flaky, with thin (2-to 3-inch) bands papery black carbonaceous shale	4	2
Shale, carbonaceous, black, papery, with thin layers of woody black lignite	1	7
Shale, carbonaceous, chocolate-brown	1	1
Claystone, gray, breaks into granular fragments. Discontinuous layer of clay-ironstone concretions 1 to 2 feet below top. Rounded, mammilary forms. Outside gray-green; inside dull maroon	4+	
Base concealed		
Total	21	10

The calculated interval to the top of the Riach(?) coal, NE NE SE sec. 25, T. 7 N., R. 81 W., is 255 feet. This relatively small interval suggests that the carbonaceous shale in the above section belongs to Unit No. 13 of Section G.

Section K

Partial Section of Coalmont Formation. Outbank on left bank of Grizzley Creek about 900 feet N. of SW corner sec. 29, T. 7 N., R. 81 W. Measurement by hand level and rule.

	Thickness Feet	Thickness Inches
Top concealed by alluvium		
Mudstone, gray, grading up into buff siltstone	4	
Shale, carbonaceous, brown, black, platy	2	9
Coal, lignitic, blac, bony, platy	5	
Shale, light gray, with brown carbonaceous films on bedding surfaces	2	
Shale, gray, flaky	5	6
Shale, carbonaceous, as below		7
Clay, gray, soft		1½
Shale, carbonaceous, black, platy	1	
Siltstone, gray, micaceous	6	
Base concealed		
Total	26	11½

Calculated interval from base of section to top of Riach(?) coal in Grizzley Creek at old Spicer mine is 535 feet. Solely on the basis of interval this short section appears to be referable to the carbonaceous shales of the upper part of Section G, but probably it is higher.

Section L

Partial Section of Coalmont Formation along right bank of wash in NE SE sec. 24, T. 7 N., R. 81 W. Section terminates near E¼ corner sec. 24. Thicknesses computed from map data

	Thickness feet
Top concealed	
Siltstone, gray, weathering buff, with numerous hackly fragments of clay ironstone	10+
Shale, gray, carbonaceous	14
Siltstone, gray, micaceous, weathering buff, with layer non-continuous concretionary sandstone at top	20
Siltstone, buff-weathering, soft as above. Poorly exposed	120
Interval, concealed. Probably same as above	70
Shale, carbonaceous, brown, fissile, poorly exposed	75
Intervals concealed. Probably same as underlying bed	50
Siltstone, buff-weathering, soft, poorly exposed	120
Shale, carbonaceous, brown fissile, exposed only in gopher hole diggings	15
Siltstone, buff-weathering, with ironstone concretions, poorly exposed	40
Total	530

Calculated inverval from base of section to top Hiach coal in churn drill hole No. 7, 262 feet W. and 80 feet N. of S¼ corner sec. 24, T. 7 N., R. 81 W., is 925 feet. The total thickness of this is thus 1,455 feet. None of the calculated interval is visible, but the lower 600 feet or so is exposed in Sections F, G, and H. This leaves about 300 feet of strata immediately below

Variations in interval between surface "Key" beds and Riach Coal.- The more significant of the measured sections above the coal are shown graphically in Figure 3, with several log sections to illustrate some of the recognizable stratigraphic changes. Unit No. G 13, sometimes called the "Brown bed" in my field notes, is a distinctive bed of carbonaceous shale that can be followed nearly a mile to the southeast across sec. 25, T. 7 N., R. 81 W., and more isolated exposures of possibly the same bed have been observed to the north in W½ NW¼ sec. 24, and to the east in SW NW sec. 30, T. 7 N., R. 80 W. During the period of field work, considerable dependence was placed upon it as a "key" bed. Office studies, however, indicated that the variation in interval between this bed and the coal below was so rapid, erratic, and unpredictable that it was of no value for this purpose. The nature of this variation is shown in the following tabulation:

Variation of interval between the top of Unit No. G 13 and the Riach coal.

Locality	Interval Feet
380 feet W. and 300 feet N. of SE corner sec. 23, T. 7 N., R. 81 W. Surface to mine entry in coal	122*
350 feet W. and 628 feet N. of SE corner sec. 23, T. 7 N., R. 81 W. Churn drill hole No. 2, Appendix D, page 203	141
400 feet W. and 715 feet N. of SE corner sec. 23, T. 7 N., R. 81 W. Churn drill hole No. 3, Appendix D, page 204	178
157 feet W. and 30 feet N. of E 1/16 corner of sec. 23, T. 7 N., R. 81 W. Churn drill hole No. 15, Appendix D, page 205. Interval corrected for dip	247

Locality	Interval Feet
870 feet E. and 180 feet N. of W¼ corner sec. 24, T. 7 N., R. 81 W. Plane table station 544 (1934). Projection 185 feet N. 78° 30' E. to churn drill hole No. 8-B, Appendix C. There is a possibility that this short interval may be due to faulting	136
345 feet E. and 900 feet N. of W¼ corner sec. 24, T. 7 N., R. 81 W. Plane table station 548 (1934). Projection 190 feet approximately east to churn drill hole No. 9-B, Appendix C	237
1,000 feet E. and 740 feet S. of NW corner section 25. Plane table station 22 (1934). Surface to mine working, 0 on 5th N. entry. No allowance for dip	415
Sections F and G, Figure 3. Surface measurement	472
890 feet E. and 150 feet S. of NW corner Section 25. Plane table station 29 (1934). Surface to 1st panel off 5th north, opposite Room 4. No allowance for dip	323 349
Section H, Figure 3. Surface measurement W½ NW¼ sec. 24, T. 7 N., R. 81 W.	251
Section J, Figure _____. Surface measurement SW NW sec. 30, T. 7 N., R. 80 W.	255

Replatting the upper part of Figure 3 with Unit No. G 13 as a datum illustrates the type of difficulty encountered. An entirely different relationship appears. The coal seems to be arched into an asymmetric fold which is truncated by the datum bed. Even though of restricted occurrence, such a feature might be regarded as evidence of deformation during the early part of Coalmont time. However, no sign of folding of this magnitude has been observed in the strata below the coal.

Whether these irregularities are due to sudden changes in sedimentation or to a local intra-formational, erosional unconformity can not be stated with assurance since the zone or horizon in which they take place can not be fully observed. Another possibility is that the changes are due to mechanical deformation after Coalmont time, a condition known to exist. This deformation, however, is chiefly by faulting; and the amount due to folding seems insufficient to cause variations in thickness of the scale known. Furthermore, if such deformation had occurred, the effect on the less competent coal should be considerable, but it is negligible. This cause, then, may also be ruled out.

Approaching the problem first from the viewpoint of rapid stratigraphic variation, for such changes are known to occur in the strata immediately below the coal, surface measurements and churn drill logs south of Coalmont Postoffice indicate that the beds are fairly regular for 55 to 60 feet below bed G 13. In the west-facing escarpment north of Coalmont Postoffice, the beds appear to be fairly regular for 200 feet or more above the sandstone (H 8) which crops out just up slope from the northeast corner of sec. 23, T. 7 N., R. 81 W. On the basis of projections of the coal from churn drill holes (Logs 8 B, 9B, 10 B, Appendix C) just east of where the lower part of Section H was measured, there is reason to believe that the Riach coal immediately underlies Unit No. H 8, although there are no surface indications of its presence. If this is true, H 8 correlates with F 6 to the south. Much lithologic similarity exists between them, but the difference in thickness is about 75 feet, H 8 being thinner. This is the only important stratigraphic variation that can be carried thru an area of variable interval, and it is only about one-fifth of the maximum variation of 350 feet. Evidently some other explanation is needed to account fully for these variations.

Projection of elevations on top of the coal by means of dips seems to give more consistent results than the use of intervals. Indeed, in one locality, structure contours on top of the coal strike nearly at right angles to the surface beds. This favors the idea that an intra-formational erosional unconformity occurs between the "Brown bed" and the coal; and the very lack of system in the variation of the interval is considered as supporting evidence. The latter condition prevents the preparation of a convergence sheet whereby a more or less regular deviation can be controlled. These constraints have rendered the preparation of a structure-contour map on the top of the coal impracticable except over limited areas where there are an adequate number of bore holes, or where it is possible to use beds below the coal. Figures 4, 5, and 6.

Surficial Deposits

Surficial deposits within the Coalmont district may be divided roughly into two classes: residual material or mantle rock, and alluvium. Locally, at the upper margin of the alluvial areas, gradation exists between them.

Residual Material.- The residual material is a product of weathering and decomposition of the poorly consolidated Coalmont formation, and, excepting soil creep and slump, has undergone little or no transportation. It consists of a tough, structureless, reddish-brown sandy clay. When wet, it softens and becomes a gumbo. Thickness seems to be related to topography, and the maximum observed is around 12 feet. The average, however, is around 5 feet, and it effectively conceals the underlying formation.

Areas underlain by coal sometimes show a faint trace of bloom, but usually even the coal can not be traced under this cover. Some of the churn drill holes show a stratified condition in the mantle rock above partial sections of coal. To some extent, this may be due to the development of a soil profile. The condition makes the actual top of the bed very difficult to determine, and structural observations on the top of the bed give evidence of slump, or are low when compared to structure contours determined from the base of the bed.

Residual materials mantle the Big Grizzly - Little Grizzly Divide area, and most of the high ground in sec. 23, T. 7 N., R. 80 W. Approximately 3.25 square miles or 48 per cent of the map are covered effectively with this material.

Alluvium.- Alluvial deposits may be classified as active and inactive. The active material consists of mud, fine sand or gravel in process of transport or temporarily suspended transport. It is negligible in amount, and confined to the channels of the main creeks. Inactive alluvium consists of the flood plain deposits of Grizzly Creek in secs. 29 and 30, T. 7 N., R. 80 W., and the dry washes in secs. 23, 26, and 35, T. 7 N., R. 81 W., where, for practical purposes, transport is suspended indefinitely. Where gravels are present, they are chiefly derived from volcanic rocks, and the beds may be 5 feet thick. The finer silts and sands are gray in color and the deposits may be 20 or more feet in thickness. Approximately 1.5 square miles, or 23 per cent of the map area are occupied by alluvium.

The total area occupied by surficial deposits is thus nearly 5 square miles or 74 per cent of the map area.

STRUCTURAL GEOLOGY

Regional Features.- North Park is the northern part of a very large synclinal depression whose southern portion includes Middle Park. Structurally, this feature separates the Medicine Bow Range, the Never Summer Mountains, and the west flank of the Front Range south of the Never Summer Mountains on the east from the Park Range on the west. A narrow ridge of extrusive volcanic rock, sometimes called the Rabbit Ears Range, forms the topographic divide between North and Middle Parks, and is also a short segment of the Continental Divide. Underlying it is a "lesser uplift or swell"[1] which increases in relief eastward toward the south end of the Medicine Bow Range, and forms a structural divide between the North and Middle Park Basins. It is, therefore, not surprising to find some evidence of structural continuity between the two. All of the major features of North Park have been pointed out by Beekly, and Lovering[2] has described the salient features of Middle Park. Beekly, however, made little effort to ascertain the character of the minor structural features, "particularly those low down on the park floor" (p. 31), where lies the Coalmont district, and in consequence, failed to recognize the faulting there.

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[1] Beekly, A. L., Op. cit. p. 82, 83.

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[2] Lovering, T. S., The Granby Anticline, Grand County, Colorado. U. S. Geological Survey Bull. 822-B, Washington, 1931.

Structure of the Coalmont District.- Surface formations in the Coalmont district have a prevailing dip to the northeast, the average amount of dip being about 15 degrees. What exceptions there are appear to be due to drag along faults or differential movement between faults. Two distinct types of faults have been recognized: normal strike faults and transverse tear or high-angle strike-slip faults.

The normal faults strike northwest. Downthrow is to the southwest, and varies from 250 to 300 feet, causing repetion of the coal and associated strata. Three have been recognized so far, parallel to one another at distances of 4,000 to 4,500 feet. With a single exception to be mentioned in a moment, no attempt has been made to trace these faults outside the map area. Thus their relationship to the larger structural features of North Park is still conjectural. They appear to parallel the strike of the Sheep Mountain fault group to the north, and the axis of the North Park syncline to the northeast. They also parallel a series of basic igneous dikes to the south and southeast. Their trend is thus of regional significance, and they may possibly owe their origin to relaxative stresses following the folding of the North Park syncline (post-Miocene(?)).

The normal strike faults in the Coalmont district have been cut at nearly right angles by a series of high-angle tear faults which trend northeast. Three persistent faults of this class have been traced across the map area, and swarms of smaller ones occur locally. They do not seem to have resulted in any conspicuous regional expression, but apparently they do control the finer, northeast grain of the topography such as the course of Grizzly Creek and the small dry tributaries to its alluvial plain. These conditions suggest that many faults of this class have not been seen.

In most cases observed, the northwest side has moved down only 25 to 50 feet, but the relative horizontal displacement to the southwest (strike-slip) is 200 to 500 feet or more. This is their most distinguishing characteristic, and it effectively offsets the older normal faults, making prediction of their position under cover very difficult. Differential, and perhaps local scissor movement on the tear faults has resulted in arching or depression of the beds between them. In one instance, only has the north side apparently moved up, resulting in an upthrown block or horst. The relative horizontal displacement of the upthrown blocks is apparently to the northeast.

The mechanics of these faults has not been determined. Many geologists consider faults of this type to be limited to an overthrust plate. Lovering has mapped a similar fault pattern in Middle Park just west of the Granby anticline,[1/] and the recently completed Colorado Refining Company-

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1/ Op. cit. Plate 6.

Linke well No. 1, NE SW SW sec. 13, T. 1 N., R. 77 W., Grand County, on this structure is reported to have entered granite at a depth of 2,560 feet after drilling Hygiene sandstone. This condition suggests a thrust fault. Strong overthrusting to the west is known to exist in the vicinity of Cameron Pass east of the Coalmont district, and it is entirely possible that the Coalmont district is underlain by an overthrust fault.

Age of Faulting.- One of the strike faults has been observed to partially offset the volcanics on the north side of the Rabbit Ears Range, and also has seemed to tilt what may be an old erosion surface strewn with lava blocks on the northeast flank of Pole Mountain. The age of the faulting is, therefore, post-volcanic or late Tertiary -- possibly Pliocene -- or early Quaternary.

Normal Strike Faults.- In order from west to east, the three major strike faults of the Coalmont district are here named: East Pole Mountain fault, Little Grizzly fault, and Coalmont fault. They cause repetion of the coal and associated strata, and have sufficient displacement to serve as fire barries from one fault-block to another. Their economic importance is thus considerable. Future work may reveal others farther to the east.

East Pole Mountain Fault: This fault is not exposed in the map area of the Coalmont district, but appears to advantage on a small conical knob 1,650 feet southeast of the center of sec. 35, T. 7 N., R. 81 W. The fault surface can be observed on the north side of the knoll, and appears to have a general strike of N. 40-45° W., through a wash along the east base of Pole Mountain, and on through the basin of Pole Mountain Lake, SW corner sec. 22, T. 7 N., R. 81 W. Since a similar fault has been reported on good authority[1/] to pass along the west base of Pole Mountain, reasons

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1/Mr. Harry Aurand, Consulting geologist, Denver, Colorado.

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for the choice of name are obvious.

A contact measurement of the fault surface gave: strike N. 32° W., dip 58° to 60° SW. Drag effects indicate downthrow to the southwest. The fault is thus normal. The throw cannot be determined at this locality, but is probably 350 to 400 feet.

At the west base of the knob, the beds dip 13°, N. 15° E., but flatten as the fault is approached. Adjacent to it on the west side the beds seem nearly horizontal. On the east side of the fault, the beds dip into it 18°, S. 45° W. This is a drag effect, and the zone is at least 75 feet wide. Some 1,200 feet northeast of the summit of the knoll the beds dip 11°, N. 30° W., indicating a return to the general attitude west of the fault.

To the southeast, the fault can be seen in the right bank of Grizzly Creek, NE corner sec. 12, T. 5 N., R. 81 W., where the drag zone is especially well developed and exposed over a width of about 300 feet. Farther to the southeast, the fault cuts the north-facing volcanic escarpment of the Rabbit Ears Range in sec. 12, T. 5 N., R. 80 W. The East Pole Mountain fault can thus be traced over a distance of at least 11 miles in North Park. Its persistence and southeast trend suggest that it may carry through into Middle Park and correlate with the strong fault trending northwest across T. 2 N., R. 78 W. Most of the inferences in regard to the age of the faulting have been determined from the East Pole Mountain fault. Since it is largely without the district, it has not been observed to be cut by the transverse faults.

It may also be noted that the Producers and Refiners Corporation Hendershot well No. 1, Denver permit 027461, NW NW SE NE sec. 2, T. 6 N., R. 81 W., probably became involved in this fault with depth. The hole was dry at a total depth of 4,253 feet. Faults with the linear persistence of the East Pole Mountain fault, may also be expected to persist with depth, and may thus exert an important control on the oil possibilities of the region. However, there is an equal possibility that they may be cut off at depth by the overthrust fault which is presumed to underlie the Coalmont district. Hence, one of the important problems of petroleum geology in North Park is the relation of time of accumulation to faulting.

Little Grizzly Fault: This fault is so named because Little Grizzly Creek is the only named geographic feature in the district intersected by the fault. It is not particularly well exposed, and is offset three or four times by transverse faults. Nevertheless, there is reason to believe that its trace can be recognized more or less positively at two localities, and questionably, or within certain limits at a few others.

The first locality at which evidence of this fault was found was about 300 feet west of the E¼ corner sec. 26, T. 7 N., R. 81 W. At this place, the fault surface itself can not be seen, but its presence is inferred from drag effects in a thin sand layer on the upthrow side. This bed has been warped into a narrow, shallow syncline, which must have once connected with the main body to the east by a small anticlinal fold. Stratigraphic studies have determined that the carbonaceous shale east of the fault is below the coal, while the buff-weathering siltstone west of fault is above the coal.

What is believed to be the same fault appears in a shallow wash running S. 40° E., 2,200 feet E. and 1,450 feet S. of NW corner sec. 36, T. 7 N., R. 81 W. West of the wash a bed of gray carbonaceous mudstone is included between two thicker layers of buff-siltstone. There is some evidence of drag. East of the wash the rock is all brownish siltstone, and the carbonaceous mudstone appears to abut against it sharply. After making allowance for the offset of the Little Grizzly fault to the southwest by the fault on the south side of the shear zone, the wash appears to fall upon the southeast projection of the Little Grizzly fault. Coal is known to crop out near the NW corner of sec. 36, and the projection of the bed to the southeast terminates against the supposed fault at the head of the wash. No sign of coal was noted immediately east of the fault, although exposures are fair. See Figure 2.

Moving northwest to Section 26 (See fig. 5), churn drill hole No. 5 (Appendix A) is interpreted as passing thru the Little Grizzly fault, which cuts off the coal 8 feet below the top of the bed. Some of the argument for this conclusion is given in the annotated log. Perhaps the strongest opposing argument is that it indicates greater offsetting of the Little Grizzly fault by the South Pit Tear fault than local surface geology seems to indicate. Near this locality, the throw of the Little Grizzly fault is about 350 feet, Figure 7, Section B-B'.

Although named for Little Grizzly Creek, the trace of this fault has not been recognized in the creek floor, but its northwest projection must cross the creek. Six hundred feet east and 1,100 feet south of the NW corner of sec. 23, T. 7 N., R. 81 W., carbonaceous shale dips 36°, S. 42° W. This is considered to be drag effect of the fault, but it is not possible to say if the dip is into the fault or away from it. Some 900 feet S. the beds

dip 13° east. By analogy to the East Pole Mountain fault in the knob SE of the center of Section 35, the fault tentatively has been drawn between these two localities.

Coalmont Fault: This fault is so named because it passes through the town of Coalmont. About half a mile northwest of the post-office (800 feet S. and 300 feet E. of N¼ corner sec. 23, T. 7 N., R. 81 W.), limited exposures occur on the right bank of a dry wash. The strike at this place is N. 55° W. and dip is 82° SW. Downthrow is on the west. Adjacent to the fault on the west side, the strata dip 30°, S. 63° W. Following the fault to the southeast, the surface trace is again visible in a cave hole into the workings of the old Coalmont mine No. 1 (350 feet E. and 1,420 feet S. of W¼ corner, sec. 24, T. 7 N., R. 81 W.). At this place, the fault surface strikes N. 35° W. and dips 56° SW. Buff sandstone on the west or downthrow side dips 5° NE into the fault; and the strata on the east or upthrow side strike N. 55° E., and dip northwest. Two hundred feet S. of this locality the fault was encountered in the mine; and it has also been observed at Station 12, Second Panel, 5th entry, Moore mine No. 1. The stratigraphic throw in this vicinity is about 280 feet.

A short distance farther southeast (1,400 feet E. and 50 feet N. of SW corner sec. 24, T. 7 N., R. 81 W.), the fault is exposed at the head of a dry gulch. Strike is N. 17° W. and dip is 64° W. Downthrow is to the west, and the beds are dragged to dip 25°, N. 37° W. Those on the upthrow side dip 13° N. 17° W. Stratigraphic Section G terminates upward against this fault.

The fault is exposed for the last time another 300 feet to the southeast (1,500 feet E. and 175 feet S. of NW corner sec. 25, T. 7 N., R. 81 W.). Dip was not determinable; strike, N. 28° W. Beds on downthrow side (west) dip 22°, S. 80° W.; beds on upthrow side dip 20°, N. 29° W.

Projection of the fault to the southeast across Section 25 is largely by analogy to the Little Grizzly fault; but there is some evidence that a fault passes thru it. The coal exposures in the east half of Section 25 can be projected with ease southeast into those at the old Spicer mine on Grizzly Creek, C. NE NE sec. 31, T. 7 N., R. 80 W. The coal exposed in N N½ NW¼ sec. 36, T. 7 N., R. 81 W. should also crop out in the left bank of the Grizzly if projected southeast, but exposures of coal can not be found upstream from the Spicer mine locality. Either the bed lenses out or it is cut off by a fault. Massive, coarse arkosic sandstone in small lenticular bodies crops out on the left bank of Grizzly Creek just west of the center of sec. 31, T. 7 N., R. 80 W. These beds resemble the sandstone above the coal in the NW¼ sec. 35 and the SE corner of sec. 36, yet they appear to be below the coal at the old Spicer mine. Strike is N. 55° W. and dip 26° NE. The strike is regular, but the amount of dip is some 10 degrees greater than normal, suggesting disturbance. Since this locality falls on the southeast projection of the Coalmont fault, these irregularities may be interpreted as evidence of the fault.

High Angle Strike-Slip (Transverse Tear) Faults.-

South Pit Fault: This fault is so named because it limits the area of the present stripping pit to the south. Surface evidence at this place consists only of an anomalous dip 10°, N. 70° W., probably due to drag. Unmistakable evidence of offset amounting to about 500 feet occurs in the "Brown Bed" (stratigraphic Unit G 13) at the SW corner of sec. 24, T. 7 N., R. 81 W. This movement is also probably responsible for the pronounced change in direction of the 3rd north entry in Moore mine No. 1 at this same corner. Offsetting similar in direction and amount also occurs 1,300 feet southwest in stratigraphic Unit A 11. All of these points fall upon a line striking N. 60° E. Subsequent detailed studies of the altitude of the top of the coal confirmed the presence of a fault along this line. See Figure 5. The fault surface has not been seen, and the amount of dip is unknown. Drag effects previously mentioned suggest that it is to the north, and by analogy with other faults, it is probably in excess of 45°. Downthrow is also to the north and amounts to about 45 feet, or barely enough to separate the coal bed. Horizontal movement along this fault has been considerable. Naturally, the amount of offset of a stratigraphic unit depends on the dip of the bed. Since this varies from place to place, variable offsets appear. The coal has been offset 250 to 300 feet. Offsets on other beds appear greater as mentioned above. Offset of the Little Grizzly fault appears too large if the fault is passed through churn drill hole No. 5, and it is possible that the fault cutting the coal in this hole is a subordinate feature to the main fault 300 or 400 feet farther east. Offsetting of the Coalmont fault has not been observed, but by projecting its strike southeast and northwest into the northeast projection of the

South pit fault the north side of the block appears to have moved about 150 feet northeast. Exposures are insufficient to work out the details.

North Pit Fault: This fault has never been seen, and its existence is founded upon deductive methods of reasoning. Structural conditions at the north end of the strip pit suggest a fault that can be projected northeast into an area of anomalous structure north of Coalmont mine No. 1 that can be explained best by assuming the presence of a fault. Supporting evidence is meager, but consists of a shallow wash 1,100 feet north of the center of sec. 24 that strikes northeast, and may be the surface expression of the fault. Its presence also serves to explain an apparent variation in strike of the Coalmont fault at Coalmont. Downthrow is probably to the north, and the vertical displacement is thought to be 15 or 20 feet. The relative horizontal movement to the southwest of the downthrow block is of the order of 200 to 550 feet. Although the throw of this fault is negligible and insufficient to prevent burning of the coal along the strike of the bed, it probably has limited to the north the fire in the old Coalmont mine No. 1 by bringing the coal under comparatively heavy cover.

Shear Zone and Related Faults: This zone develops rather suddenly near the center of SE¼ sec. 26, T. 7 N., R. 81 W., and extends northeast into Section 25, where there is a swing to the east. It consists of three nearly parallel faults which converge to the southwest. In spite of their strength to the northeast, and evidence of strike slip, the movement seemingly has been absorbed in the thick body of carbonaceous shale and siltstone near the south ¼ corner of sec. 26, and does not dislocate sandstone Unit C 27 in NE NW sec. 35. This peculiarity of the tear faults makes them difficult to trace.

The northern fault of the group is exposed 150 feet E. of E¼ corner sec. 26, and again 1,180 feet south and 1,250 feet west of this ¼ corner. Here the strike is N. 43° E. and the dip is 50° NW. Downthrow is to the northwest, and amounts to about 35 feet, barely offsetting the coal. Strike-slip is southwest, offsetting the outcrop about 100 feet.

Relatively little information is available concerning the middle member of the group which marks the north boundary of the zone of actual shearing. Exposures occur 460 feet E. and 490 feet south of the E¼ corner of sec. 26. Downthrow is to the north and strike-slip to the southwest, but measurements are impracticable. At this place, the northern fault and the middle fault are essentially parallel and about 525 feet apart. It is interesting to note that their respective projections to the northeast flank the north and south sides of the sharp east-plunging spur in N½ NE¼ sec. 25. This gives rise to the observation that other spurs as that in SW¼ SE¼ sec. 25, and that just south of the E¼ corner sec. 25 may also be related to faults.

The third fault has been drawn along the south boundary of the crush zone, and its presence is thus largely inferred for the surface has not been seen. Downthrow is on the south, which has also moved to the southwest. Dips within the sheared mass vary up to 70 degrees. Width varies from 150 feet on the west to 400 feet on the east. All trace of the coal has disappeared within it. The total amount of horizontal displacement from north fault to south fault is about 500 feet. Total vertical displacement of the south fault is probably in excess of 100 feet. Figure 3, Section A-A'. Although Section 25 is largely covered with surficial deposits, the fact that the coal bed can not be traced north of the north flank of the small spur in

SE¼ NE¼ lends support to the belief that the fault on the south side of the shear zone persists to the northeast across the map area. The 50-foot south-facing escarpment in NW¼ NW¼ sec. 30, T. 7 N., R. 80 W., may also be construed as a modified fault scarp or fault-line scarp. This seeming persistence, in conjunction with its width, amount of disturbance and vertical displacement suggest that it may make a good fire-barrier for the coal to the southeast should the dormant fire in Moore mine No. 1 pass beyond control.

Minor Transverse Faults: Two faults of this group occur in the center of NE¼ sec. 26, where they parallel the South Pit fault on the south. A minor horst occurs between them, and the offset of the Little Grizzly fault appears to have moved northeast. The southern of the two faults seems to be related to a fold to the southwest. Figure 5. A half-mile south a swarm of these faults slice the thin sandstone capping the ridge in NW¼ SE¼ into numerous thin blocks, seven faults occurring in a distance of about 800 feet. Figure 6. This exposure is illustrative of what one might see if the formations were harder and cover less abundant.

Folds.- Two types of folds exist in the Coalmont district, and each seems to be related to faulting. Type 1 is chiefly a drag effect, and usually appears as a shallow syncline on the downthrow side of the normal strike faults. Figure 5 and Figure 8, Section B–B'. The block between the Coalmont and Little Grizzly faults north of the North Pit fault in Section 23 is also believed to have synclinal structure, but the details can not be worked out.

The second type of fold may be related to the tear faults. A broad plunging anticlinal nose trends a little east of north in NW¼ SE¼ sec. 26 (fig. 5), and a tear fault passes into the north limb and dies out. Which is the primary feature, the fold or the fault, is difficult to say. However, since the faults are more numerous and persistent than the folds, and the latter seem to be confined to areas bounded by faults, there is some reason to ascribe the folds to differential movements between the tear faults.

The largest and sharpest fold involving coal is the one which has brought the bed to the surface at the old Coalmont mine No. 1, NW SW sec. 24. Figure 4 and Figure 3, Sections B-B', C-C'. It is here named the Coalmont anticline. This feature is a strongly folded anticlinal nose plunging to the northeast. Closure on the west is against the Coalmont fault. The North Pit fault flanks it on the north, and there is a rather wide syncline about which little is known on the south, the axis seemingly being related to the South Pit fault. The distribution of the coal outcrops (fig. 2) suggest that these folds originated prior to the Coalmont fault, but their counterparts have not been identified in the downthrown block to the west. The relation of the tear faults to the flanking synclines is also suggestive, and it may be that both sets of faults and the fold are more or less contemporaneous.

Another large fold with somewhat similar relationships occurs in the south central part of Section 26, but its geology has not been developed because the strata which form it lie below the coal horizon.

Miscellaneous Faults: A small fault which can not be referred definitely to either of the above classes was observed in a ditch cut on the left bank of Grizzly Creek a few hundred feet north of the center of sec. 31, T. 7 N., R. 80 W. A contact observation gave: strike, N. 15° W., dip 71° W. Downthrow is to the west. The beds on the downthrow side are carbonaceous shale resting upon soft, brownish siltstone, and the horizon has not been identified. Away from the minor drag effect these beds dip into the fault 18°, N. 36° E. East of the fault the formation is a compact buff siltstone which seems not to have been completely offset. A few hundred feet northeast these beds dip 9°, N. 35° E. Just west of the fault, near the center of Section 31, the strata dip 26° N. 35° E. This locality has been described in connection with the southeast projection of the Coalmont fault. It is doubtful, however, if this fault is the Coalmont fault. More probably it is a minor sympathetic feature related to the greater fault.

Another small fault, difficult to classify, was observed at the mouth of the 1934 prospect entry 240 feet E. and 340 feet N. of W¼ corner sec. 25, T. 7 N., R. 81 W. The strike is S. 80°-84° E. and dip is 47°-58° N. Downthrow is to the north, and buff-micaceous siltstone has been thrown against the coal. Although the amount of throw is unknown, the coal bed is probably not offset completely. The movement has developed a gouge zone 18 to 24 inches thick in the soft rock. Dip of the coal on the south or upthrow side of the fault is 23½°, N. 15° E. Although the strike of this fault is to the southeast, it probably belongs to the group of transverse tear faults.

ECONOMIC GEOLOGY

Coal Deposits

Distribution of Exposures.- Natural exposures of coal are incomplete and scattered due to separation by faulting and because of the erratic distribution of the surficial deposits. Previous students of the district have had the tendency to regard each isolated exposure as a separate bed. Perhaps the most important factors contributing to this conclusion were lack of a detailed stratigraphic section and failure to recognize the faulting. The distribution of the natural exposures is shown upon Figure 2, together with the inferred position of the concealed outcrops. This report contends that without exception they belong to a single bed. This bed was first worked on the Riach (pronounced Rear) Bros. ranch at Coalmont, the diggings later developing into the Coalmont mine No. 1 NW¼ SW¼ sec. 24, T. 7 N., R. 81 W. For this reason, the name Riach has been applied to all coal referable to this bed.

Argument For A Single Bed Of Coal.- This argument consists of two parts, structural and stratigraphic. The structural geology of the district has been reviewed in some detail, and need not be mentioned further except to add that the mechanical conditions are such as to cause repetition of a certain part of the Coalmont formation several times. The stratigraphic section of the argument which now follows demonstrates that the repeated portion is the same and contains the Riach coal. It is divided into three parts: (1) The measured stratigraphic sections on Figure 3 show that some 900 feet of strata below the coal and 625 feet of beds above the coal have been studied with

considerable care. Although beds of carbonaceous shale, some of which are black and boney, are numerous, no coal comparable to the Riach bed was found. Since the amount of section measured both above and below the coal is two or three times greater than the throw of the faults, it is evident that if more than one bed of coal were present within the interval examined two or more coals should be present in the section. Reference to the sections shows that this condition does not exist, and that only one bed is present. (2) The stratigraphic position of the coal is the same with reference to other beds which can be correlated from one fault block to another. (3) Comparison of some minor details, such as the presence of silicified logs, at the top of the coal suggests identity of the coal in one fault block to that in another. The chemical character is also very uniform.

Judging from the thickness of the beds below the coal, the Riach bed is not the equivalent of the coal near the base of the formation on the McCallum anticline to the northeast.

Character Of Deposit.- Beekly has given an excellent general description of the Riach bed,[1] which needs no repetition. More recent work by Calhoun on

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[1] Op. cit. p. 110.

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the coal in the strip mine furnishes much additional information. Eighteen sections have been measured in detail. These vary in length from about 22 feet to 35 feet 7 inches, which is the full thickness of the bed at the pit mine. Character of the roof is shown by stratigraphic Section D. With slight modification, the following measurement was made by Calhoun on the working face of the strip mine, 385 feet E. and 100 feet S. of C NW¼ sec. 26, T. 7 N., R. 81 W.:

Description	Thickness Feet	Thickness Inches
Surface of stripped bench		
Coal, weathered, soft	2	2
Bone		1½
Coal	1	
Bone		1
Coal	4	2½
Shale, carbonaceous. Base upper bench		7
Coal	5	
Bone		2
Coal	1	3
Bone		1
Coal		1
Bone. Approximate base middle bench		4
Coal	2	6
Bone		3
Coal	2	6
Bone		5
Coal	1	
Bone		1
Coal	1	10
Bone		1
Coal	2	7½
Shale		2
Coal		8
Shale		1

Description		Thickness Feet	Thickness Inches
Coal		2	1½
Bone			3
Coal			8
Bone			7
Coal. Base concealed by water		4	8
	Total	35	7
	Coal	32	3½
	Rock	3	3½

The floor of the bed is brown carbonaceous shale 3 to 6 feet thick underlain by sandstone. See Log No. 3, Appendix A and stratigraphic Section A.

Shale and bone make up approximately 10 per cent of the above section, and the arithmetical average for all of the pit sections is 10.7 per cent. This material is distributed rather uniformly, and the two partings which separate the benches can be followed across the pit. They can not be observed elsewhere in the district because of the weathered character of natural exposures, the lack of detail in churn drill logs, and the relatively small size of the mine workings when compared with the thickness of the bed. It is evident that their close spacing makes the mining of clean coal difficult, and reduces the classifiable thickness of the bed by at least 20 per cent.

Chemical analyses of the coal have been taken by both the Bureau of Mines[1/]

[1/] Analyses of Colorado Coals. U. S. Bureau of Mines Tech. Paper 574, p. 84.

and the Geological Survey[2/], and a number of unpublished analyses are available

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2/Bull. 596, p. 113. Analysis Q.

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in the office of the District Mining Supervisor in Denver. Comparison of the proximate analyses on the "as received" basis indicates close similarity between the coals from the old Coalmont mine No. 1, the Moore (Rabbit Ear) mine No. 1, and the strip mine, as shown in the following table:

Comparison Of Analyses Of Riach Coal

	Strip Mine (Avg. of 6)	Moore Mine No. 1 (Avg. of 4)	Coalmont Mine No. 1 (I analysis only)
Moisture	16.2	21.3	22.8
Vol. Mat	32.7	32.7	36.2
Fixed Carbon	41.6	41.2	34.1
Ash.	9.5	4.6	6.9
S.	0.35	0.4	0.7
B.T.U.	9,554	9,617	9,010

Most of the differences are within the range of variations shown by the analyses from the strip pit. Some of them are easily explained. For example, the low moisture and high ash of the strip mine coal is because the coals sampled were above ground-water level, and the entire seam with the exception of the major partings was included in the sample. On the other hand, the high moisture content and low ash from the underground sample is because the workings were below ground-water level and were in the cleaner part of the bed. No effect of deformation is recognizable in the analyses, although the cleavages are controlled by the local fault pattern.

Thickness Of Coal.- Considerable variation in coal thickness occurs within the district and must be allowed for in tonnage estimates. The greater part of these variations are thought to be stratigraphic, but in a few instances, they may be due to deformation. In the vicinity of the strip mine in SE¼ NW¼ sec. 26, T. 7 N., R. 81 W., surface and churn drill hole measurements give an average thickness of about 33 ± 2 feet, or 59,697 short tons per acre. This thickness persists to the vicinity of churn drill hole No. 15 (Appendix D) where 34.5 feet of coal was found, and then begins to increase southward being 48 feet in churn drill hole No. 3 and 55 feet thick in churn drill hole No. 2 (SE corner sec. 23, T. 7 N., R. 81 W.). This increase extends to the southeast and thicknesses as great as 75 or 80 feet have been seen in the workings of Moore mine No. 1. The log of churn drill hole No. 15 just referred to shows a 2-foot parting of carbonaceous shale near the base of the bed, below which is another 2 feet of coal. What may be this same parting is recognizable in Logs 4A, 7B, and 8B (Appendix C), and the coal below it increases in thickness to 8 feet with an overall thickness of as much as 52 feet in Log 4B. However, there is much local variation in this locality east of Coalmont postoffice. Some holes, as 1B, 2B, and 3B penetrated 19, 28, and 14 feet of coal respectively; and 3B drilled 167 feet of shale below the bed proving beyond doubt that the bore did not stop in a parting.

Natural exposures also reveal variable coal thicknesses. Estimates at these localities are probably low due to slump, and the difficulty of determining the exact top and base of the bed without trenching. An exposure in NE NE SE sec. 25, T. 7 N., R. 81 W. is 200 feet wide. On the assumption of a 15-degree dip, the nearest determinable with any accuracy, the estimated thickness

is about 48 feet. Farther south, NW NE NE sec. 36, T. 7 N., R. 81 W., the bed is at least 25 feet thick, and accurate measurements would probably result in a greater thickness. In the bed of Grizzly Creek below the old Spicer mine (700 feet W. and 900 feet S. of NE corner sec. 31, T. 7 N., R. 80 W.), the width of the exposure is at least 100 feet. Assuming a 15-degree dip, the thickness of the bed here is about 25 feet, another minimum figure. The general conclusion from these data is that the Riach coal is of unusual thickness, and perhaps 45 feet is an appropriate estimate for the district. Data are insufficient to permit drawing isopachs on the coal.

Tonnage Estimates.- Coal underground in this district has a specific gravity of 1.340 and that from the strip-pit is 1.328. The arithmetical average is 1.334. Taking 1.33 as the specific gravity, one cubic foot of coal weighs 82.93 pounds; and the number of cubic feet per ton (2,000 pounds) is 24.11. One acre foot of horizontal coal amounts to 1809.0 short tons. Where the bed is dipping 15 degrees and 50 feet thick, the amount of coal under one acre amounts to 94,350 tons. Where such large tonnages are the rule rather than the exception, it is necessary to make many adjustments to avoid serious over-estimates. In those which follow, allowance has been made for extent of bed in the various fault blocks, thickness of bed, amount of dip, gap of faults, weathering, mining depletion, destruction by fire, and so on. Coal cropping out is regarded as weathered to the base of the bed. Because of the width of the exposures, half the local thickness of the bed has been used to compute the amount of coal weathered on the outcrop. When under less than 50 feet of cover, the upper 5 feet of coal is regarded as weathered. Areas under such shallow cover are potential stripping ground. Estimated tonnages are probably not significant to more than five places.

In the estimates for sec. 24, T. 7 N., R. 81 W., in arriving at the net tonnage of mineable coal deduction has been made for the approximate tonnage destroyed by the fire in Coalmont mine No. 1, and also for the tonnage of good coal rendered inaccessible by the fire or the burned area. In the case of Moore mine No. 1, which occupies portions of secs. 23, 24, 25, and 26, no such allowance has been made even though the mine is abandoned on account of fire, because there is still a possible chance of saving much of the coal. This subject is treated further under the topic of Coal Mine Fires.

Depth limit of the immediate reserve has been set arbitrarily at the rather shallow figure of 500 feet. The principal argument for this is the great amount of coal readily available to stripping methods or shallow slope entries. For many years to come, there will be little reason to mine at greater depths. Coal under more than 500 feet of cover may be regarded as a future or potential reserve. Most of it lies in the east half of the map area and amounts to about 352 acres in the area covered by topographic mapping. Using the conservative figures of 15 degrees for dip and 40 feet for thickness of bed, the total tonnage within this area is around 64,300,000 short tons. In addition, there is a block of some 37 acres in NW¼ sec. 25 which probably contains 3,600,000 tons. Another small block under more than 500 feet of cover occurs west of the Coalmont fault and south of the Shear Zone in Section 25. Area is 8.8A and estimated tonnage is about 670,000.

The reserve of coal below the depth of 500 feet, however, is in excess of 72,170,000 tons. Originally the gross immediate reserve of coal under less than 500 feet of cover amounted to about 105,279,500 tons. This has been depleted by mining and fire to 101,565,705 tons. Hence, the grand total for the entire district amounts to about 173,700,000 tons. The following table, also given on Figure 2, contains other statistics on the coal reserves of the district:

Coal Reserve Estimates

	Short Tons
Original reserve	177,450,000
Future reserve (cover 500 feet or more)	72,170,000
Immediate reserve (cover less than 500 feet)	105,280,000
Coal mined out	(1,438,355
Coal burned	(2,277,000
Coal rendered inaccessible by fire and valueless by weathering	(13,365,000
	17,080,355
Immediate net reserve	88,200,000

Assuming no further loss by fire and a mining recovery of 60 per cent nearly 53,000,000 tons of coal should be recovered from the immediate reserve. Estimate of recovery from the future reserve is impracticable at this time.

Sec. 29, T. 7 N., R. 80 W.

The surface of this section is wholly occupied by alluvium. Except for about 13 acres making the south diagonal half of S½ SW¼ SW¼ whatever coal may be in this section is under 500 feet or more of cover. The 13 acres are near this limit, and are estimated to contain about 1,200,000 short tons of coal.

Sec. 30, T. 7 N., R. 80 W.

The resurvey of this township is not available, hence detailed land descriptions are inadvisable. The 500-foot cover line of this section runs from a point 700 feet N. of the SE corner northwest to a point 1,000 feet S. of the NW corner. Coal east of this line or under more than 500 feet of cover is not included in the estimate.

	Area	Short Tons
Coal weathered on outcrop	15.0A	237,000.0
Coal weathered under cover	16.5A	156,420.0
Total weathered coal		393,420.0
Unweathered coal under less than 50 feet of cover	16.5A	1,407,782.0
Unweathered coal under more than 50 feet of cover	202.0A	19,149,600.0
Total unweathered coal		20,557,382.0
Grand total		20,950,802.0
Total area coal land	233.5A	

Most of this coal is privately owned.

Sec. 31, T. 7 N., R. 60 W.

The resurvey of this township is not available, hence detailed land descriptions are inadvisable.

	Area	Short Tons
N½ NE¼ East of projection of Coalmont fault		
Coal weathered on outcrop	10.78A	510,972.0
Coal weathered under cover	12.4A	117,552.0
Total weathered coal		628,524.0
Unweathered coal under less than 50 feet cover	12.4A	1,057,968.0
Unweathered coal under more than 50 feet cover	24.1A	2,284,680.0
Total unweathered coal		3,342,648.0
Total coal		3,971,172.0

	Area	Short Tons
NW¼ West of projection of Coalmont fault		
Coal weathered on outcrop	0.91A	34,853.0
Coal weathered under cover	1.3A	12,447.0
Total weathered coal		47,300.0
Unweathered coal under cover	1.3A	87,132.0
Total coal		134,432.0
Summary: Total area of outcrop	11.7A	
Total area coal under less than 50 feet of cover	13.7A	
Total area coal under more than 50 feet of cover	24.1A	
	49.5	
Total coal weathered on outcrop		545,825.0
Total coal weathered under cover		129,999.0
Total weathered coal		675,824.0
Total unweathered coal under less than 50 feet cover		1,145,100.0
Total unweathered coal under more than 50 feet cover		2,284,680.0
Total unweathered coal		3,429,780.0
Grand total tonnage		4,105,604.0

Coal in NW¼ NW¼ and NW¼ NE¼ is Government owned. The bulk of the coal is in NE¼ NE¼ and is privately owned.

Summary for T. 7 N., R. 80 W.

Total area of coal outcrop	26.69A	
Area cover less than 50 feet	30.20A	
Area cover more than 50 feet (but less than 500 feet)	239.10A	
Total area of coal land	295.99A	
Coal weathered on outcrop	782,825.0	Short Tons
Coal weathered under cover	285,999.0	
Total weathered coal	1,068,824.0	
Unweathered coal under less than 50 feet cover	2,552,882.0	
Unweathered coal under more than 50 feet cover	22,634,280.0	
Total unweathered coal	25,187,162.0	
Grand total	26,255,986.0	Short Tons
Net tonnage mineable coal	25,187,162.0	

Sec. 23, T. 7 N., R. 81 W.

	Area	Short Tons
E½ NE¼		
Coal weathered on outcrop	3.8A	126,198.0
Coal weathered under cover	2.3A	21,217.0
Total weathered coal		147,415.0
Unweathered coal under less than 50 feet cover		127,305.0
Total		274,720.0
W½ NW¼		
West of Little Grizzly fault	37.53A	
Coal weathered under cover		344,525.0
Unweathered coal under less than 50 feet cover		1,963,119.0
Total		2,307,644.0
SW¼		
West of Little Grizzly fault	111.38A	
Coal weathered on outcrop	1.38A	76,010.0
Coal weathered under cover	110.0A	1,009,800.0
Total weathered coal		1,085,810.0
Unweathered coal under less than 50 feet cover	110.0A	5,753,880.0
Total		6,839,690.0
NE¼ SE¼ North of North Pit fault and east of Coalmont fault		
Coal weathered on outcrop	2.09A	64,409.0
Coal weathered under cover	3.78A	34,870.0
Total weathered coal		99,279.0
Unweathered coal under less than 50 feet cover	3.78A	209,223.0
Total		308,502.0

	Area	Short Tons
South of North Pit fault	16.7A	
Unweathered coal under more than 50 feet cover		1,126,448.0
SE¼ SE¼		
Unweathered coal under more than 50 feet cover	41.7A	3,062,448.0
SW¼ SE¼ South of North Pit fault		
Coal weathered on outcrop	6.71A	246,391.0
Coal weathered under cover	19.92A	119,340.0
Total weathered coal		365,731.0
Unweathered coal under less than 50 feet cover		1,345,054.0
Total		1,710,785.0

Note: The area between the Little Grizzly and Coalmont faults in the central part of the section is believed to be underlain partially by coal, but outcrops are too few and indistinct to determine the extent of the bed. Structure is thought to be synclinal, the coal dipping northeast from the Little Grizzly fault and dragged up by the Coalmont fault. The extent of the bed may thus be small, and it may be well weathered as two edges are turned up and the cover relatively light.

Summary:		
Total area of coal outcrop	13.98A	
Total area coal under less than 50 feet cover	173.53	
Total area coal under more than 50 feet cover	58.40	
Total area coal	245.91A	

Total coal weathered on outcrop	513,008.0 T
Total coal weathered under cover	1,529,752.0 T
Total weathered coal	2,042,760.0 T
Total coal unweathered under less than 50 feet cover	9,398,581.0
Total coal unweathered under more than 50 feet cover	4,188,896.0
Total unweathered coal	13,587,477.0
Grand total coal	15,630,257.0

All of this coal is Government owned.

Section 24

NW¼ Area north of North Pit fault and NW corner SW¼ north of North Pit fault	Area	Short Tons
Coal weathered on outcrop	4.9A	139,725.0
Coal weathered under cover	10.5A	97,807.0
Total weathered coal		237,532.0
Unweathered coal under less than 50 feet of cover	10.5A	578,340.0
Unweathered coal under more than 50 feet of cover	95.5A	6,149,722.0
Total unweathered coal		6,728,062.0
Total		6,965,594.0
SW¼ Area east of Coalmont fault and south of South Pit fault. No outcrop. No mining in this block		
Unweathered coal under more than 50 feet of cover	41.97A	3,962,700.0

	Area	Short Tons
SW¼ Area west of Coalmont fault and south of South Pit fault. Mining this block thru Moore mine No. 1, now abandoned.		
Weathered coal under more than 50 feet of cover	12.5A[1/]	1,164,000.0 T
1/ 0.5A deducted for gap of Coalmont fault		
SW¼ Area west of Coalmont fault between the North and South Pit faults. Mining in this block thru Moore mine No. 1, now abandoned.		
Unweathered coal under more than 50 feet cover	31.0A[1/]	2,276,640.0
1/ 1.0A deducted for gap of Coalmont fault		
SW¼ Coalmont mine No. 1, and adjacent areas in NW¼, east of Coalmont fault and between North and South Pit faults. Coalmont anticline: Area of burning and probable burning. Includes area of original outcrop.		
North side axis	11.12A	850,260.0
East side axis	10.07A	812,040.0
Total area burning	21.19A	
Total tons burned or subject to burning (includes mined coal)		1,662,300.0
Coalmont anticline: North flank between burned area and North Pit fault. Probably inaccessible except thru new slope from NW.		
Unweathered coal under more than 50 feet of cover	7.75A	693,650.0
East flank, east of burned area and north of South Pit fault. Now inaccessible except thru slope thru burned area or a new shaft.		
Unweathered coal under more than 50 feet of cover	45.4A	3,351,792.0

	Area	Short Tons
Total unweathered coal		4,045,442.0
Total original tonnage		5,707,742.0
Total coal mined		314,230.0
Approximate tonnage destroyed by fire		1,348,070.0

SE¼ Area between North and South Pit faults. No outcrop. Inaccessible except thru a shaft or a long slope from the southwest.

Unweathered coal under more than 50 feet of cover	26.8A	2,022,764.0

Summary:

Total area of outcrop	4.9A	
Total area coal under less than 50 feet of cover	10.5A	
Total area coal under more than 50 feet of cover	259.42A	
Total area burning or subject to burn	21.9A	
Total area coal land	274.82A	
Coal weathered on outcrop	139,725.0 T	
Coal weathered under less than 50 feet of cover	97,807.0 T	
Total weathered coal	237,532.0 T	
Coal burned or subject to burn	1,662,300.0	
Unweathered coal under less than 50 feet cover	578,340.0	
Unweathered coal under more than 50 feet cover	19,621,268.0	
Total unweathered coal	20,199,688.0	
Total original tonnage	22,099,440.0	
Total coal mined Coalmont mine No. 1	314,230.0	

Approximate tonnage destroyed by fire	1,348,070.0
Approximate tonnage rendered inaccessible by fire	4,045,442.0
Net tonnage unweathered, mineable coal	16,391,698.0

All of this coal is privately owned.

Sec. 25, T. 7 N., R. 81 W.

	Area	Short Tons
N. Center Area east of Coalmont fault and north of 2nd fault north of shear zone.		
Coal weathered on outcrop[1/]	2.9A	43,560.0
Unweathered coal under cover[2/]	33.7A	3,262,160.0
		3,305,720.0
NE¼ Area between the two parallel faults north of shear zone and east of Coalmont fault.		
Coal weathered on outcrop[1/]	1.65A	77,600.0
Unweathered coal under cover[2/]	20.1A	1,949,700.0
		2,027,300.0

1/This outcrop is hypothetical and is covered by surficial material.

2/Coal weathered under rock cover is negligible and is included with the unweathered coal estimate.

E½ Area east Coalmont fault and south of northeast projection of the shear zone		
Coal weathered on outcrop	8.7	410,380.0
Coal weathered under cover	12.04	113,760.0
Total weathered coal		524,140.0
Unweathered coal under less than 50 feet of cover	12.04	1,023,840.0
Unweathered coal under more than 50 feet of cover	23.0A	2,180,400.0
Total unweathered coal		3,204,240.0
Total		3,728,380.0

	Area	Short Tons
$W\frac{1}{2}$ Area west of Coalmont fault and north of 2nd fault north of shear zone. A part of the area is underlain by the workings of the Moore mine No. 1.		
Coal weathered on outcrop	1.4SA	90,600.0
Unweathered coal under cover[2/]	69.3A	6,708,240.0
		6,798,840.0
$NW\frac{1}{4}$ Area west of Coalmont fault and between the two parallel faults north of the shear zone. Some coal has been mined from this block in trespass through the slope entry 300 feet N. and 300 feet E. of the $W\frac{1}{4}$ corner sec. 25.		
Coal weathered on outcrop	1.9A	91,960.0
Unweathered coal under cover[2/]	18.9A	1,849,520.0
Total		1,941,480.0
$S\frac{1}{2}$ Area west of Coalmont fault and south of northeast projection of the shear zone.		
Coal weathered on outcrop	12.0A	455,040.0
Coal weathered under cover	24.5A	232,260.0
Total weathered coal		687,300.0
Unweathered coal under less than 50 feet of cover	24.5A	1,628,820.0
Unweathered coal under more than 50 feet of cover	108.0A	8,190,640.0
Total unweathered coal		9,819,460.0
Total		10,496,760.0

	Area	Short Tons
SW¼ Area west of Little Grizzly fault. No fault exposures.		
Coal weathered under cover	12.6A	118,158.0
Unweathered coal under cover	12.6A	709,128.0
Total		827,316.0

Shear Zone: It is assumed that the shear zone trends northeast across Section 25, and that the coal in it is unmineable. Hence, estimates for this area have not been made.

Summary:

Total area of outcrop	28.61A	
Total area coal under less than 50 feet of cover	49.14A	
Total area coal under more than 50 feet of cover	273.00A	
Total area of coal land	350.75A	
Total coal weathered on outcrop		1,169,140.0
Total coal weathered under cover		464,208.0
Total weathered coal		1,633,348.0
Total unweathered coal under less than 50 feet cover		3,361,788.0
Total unweathered coal under more than 50 feet cover		24,231,260.0
Total unweathered coal		27,593,048.0
Grand total		29,226,396.0

Approximately 18,900,000 T. of this coal is Government owned.

Approximately 10,300,000 T. are privately owned.

Sec. 26, T. 7 N., R. 81 W.

	Area	Short Tons
NE¼ Area north of South Pit fault		
Coal weathered on outcrop	6.69A	247,230.0
Coal weathered under cover	9.71A	89,482.0
Total weathered coal		336,712.0
Unweathered coal under cover	9.71A	626,377.0
Total		963,089.0
NE¼ Area south of South Pit fault and east of Little Grizzly fault		
Coal weathered on outcrop	7.48A	311,340.0
Coal weathered under cover	25.00A	230,625.0
Total weathered coal		541,965.0
Unweathered coal under cover	25.00A	1,845,000.0
Total		2,386,965.0
NE¼ Area south of South Pit fault and west of Little Grizzly fault		
Coal weathered on outcrop	15.7A	432,378.0
Coal weathered under cover	27.12A	248,962.0
Total weathered coal		681,330.0
Unweathered coal under cover	27.12A	1,492,770.0
Total		2,174,100.0
NW¼ Area north of North Pit fault		
Coal weathered on outcrop	10.55A	290,822.0
Coal weathered under cover	9.87A	90,607.0
Total weathered coal		381,429.0
Unweathered coal under cover	9.87A	506,410.0
Total		887,839.0

	Area	Short Tons
NW¼ Strip mine area. Between North and South Pit faults and east of Little Grizzly fault.		
Coal weathered on outcrop[1/]	17.33A	477,268.0
Coal weathered under cover[1/]	26.45A	252,811.0
Total weathered coal[1/]		730,079.0
Area under 50 or more feet of cover	46.49	
Unweathered coal under cover		4,173,333.0
Coal mined from strip pit[2/]		250,000.0
Total unweathered coal		3,923,333.0
Grand total		4,653,912.0

1/ An unknown amount has been stripped and burn. Figures refer to tonnage before mining operations began.

2/ Gross estimate to December 31, 1940. Operations began July 1931. Records prior to May 24, 1936 are incomplete and inaccurate.

NW¼ Area south of South Pit fault.		
Coal weathered on outcrop	4.99A	137,700.0
Coal weathered under cover	8.41A	77,204.0
Total weathered coal		214,904.0
Unweathered coal under cover	8.41A	1,436,624.0
Total		1,651,528.0
SE¼ Area west of Little Grizzly fault and north of 2nd fault north of shear zone.		
Coal weathered on outcrop	4.7A	129,370.0
Coal weathered under cover	7.4A	67,932.0
Total weathered coal		197,370.0
Unweathered coal under cover	7.4A	407,592.0
Total		504,962.0.

	Area	Short Tons
SE¼ Between the two faults north of the shear zone and west of the Little Grizzly fault.		
Coal weathered on outcrop[1/]	1.13A	30,934.0
Coal weathered under cover	6.00A	55,080.0
Total weathered coal		86,014.0
Unweathered coal under cover	6.00A	330,480.0
Total		416,494.0

1/ Extent of outcrop area uncertain. May be 50 per cent greater.

SE¼ South of shear zone and west of Little Grizzly fault.		
Coal weathered on outcrop[1/]	5.82	161,646.0
Coal weathered under cover	16.39	152,356.0
Total weathered coal		314,002.0
Unweathered coal under cover	16.39	914,136.0
Total		1,228,138.0

1/ Minor burning on upper part of outcrop at extreme southeast corner of section.

Summary: Total area of coal outcrop	74.40A	
Total area coal under 50 feet of cover or less	136.35A	
Total area coal under 50 feet cover or more	46.49A	
Total area coal	257.24A	
Total coal weathered on outcrop		2,218,688.0
Total coal weathered under cover		1,265,059.0
Total weathered coal		3,433,747.0
Total unweathered coal under cover		11,733,222.0
Grand total tonnage		15,216,969.0
Total tonnage mined		250,000.0
Net total tonnage		14,966,969.0

Sec. 35, T. 7 N., R. 81 W.

	Area	Short Tons
NE¼ NE¼		
Coal weathered on outcrop[1/]	5.44A	150,498.0
Coal weathered underground[2/]	1.13A	51,095.0
Total weathered coal		201,593.0
Coal underground[2/]	1.13A	613,140.0
Total		814,733.0
Total area	6.57A	

1/ Minor burning on upper part of outcrop.

2/ Probably burned out.

Useable coal probably does not exist in this section. All Government owned.

Sec. 36, T. 7 N., R. 81 W.

Only the N½ of this section falls within the map area.

	Area	Short Tons
NE¼ West of SE. projection of Coalmont fault.		
Coal weathered on outcrop	6.07A	229,800.0 T.
Coal weathered under cover	5.0A	47,875.0
Total weathered coal		227,675.0
Unweathered coal under cover	8.9A	663,865.0
Total		911,540.0
NW¼ West of Little Grizzly fault. Bed cut off by fault to SE.		
Coal weathered on outcrop	10.55A	296,877.0
Coal weathered under cover, locally burned	9.8A	91,924.0
Total weathered coal		388,801.0
Unweathered coal under cover		1,074,296.0

		Area	Short Tons
Summary:	Total area coal outcrop	16.62A	
	Total area coal under 50 feet of cover or less	14.80A	
	Total area coal under 50 feet of cover or more	11.10A	
	Total area coal	42.52A	
	Total coal weathered on outcrop	526,677.0	
	Total coal weathered under cover	139,799.0	
	Total weathered coal	666,476.0	
	Total unweathered coal under less than 50 feet cover	886,669.0	
	Total unweathered coal under more than 50 feet cover	771,492.0	
	Total unweathered coal	1,658,161.0	
	Grand total tonnage	2,324,637.0	

Owned by State of Colorado.

Summary for T. 7 N., R. 81 W.

Total area of coal outcrop	143.95A	
Total area with cover less than 50 feet	385.45A	
Total area with cover more than 50 feet	648.41A	
	1,177.81A	
Total area burning (Coalmont mine No. 1)	21.90A	
Total area coal land	1,199.71A	
Coal weathered on outcrop	4,717,736.0	Short Tons
Coal weathered under cover	3,547,720.0	
Total weathered coal	8,265,456.0	

Unweathered coal under less than 50 feet cover	20,784,767.0	
Unweathered coal under more than 50 feet cover	57,032,191.0	
Total unweathered coal	77,316,853.0	
Coal burning in Coalmont mine No. 1	1,662,300.0	
Coal burned naturally	613,140.0	
Coal destroyed by fire[1/]	2,275,440.0	
Grand total	78,357,754.0	

[1/] This does not include coal burned or burning in Moore mine No. 1.

Total weathered coal	8,265,456.0	
Total mined tonnage	1,438,355.0	
Coal destroyed by fire[1/]	2,275,440.0	
Tonnage inaccessible thru Coalmont mine fire	4,045,442.0	
	16,024,693.0	
Net tonnage mineable coal	62,333,061.0	Short Tons

Summary for District (Map Area)

Total area of coal outcrop	170.64A	
Total area with cover less than 50 feet	415.65A	
Total area with cover more than 50 feet, but less than 500 feet	887.51A	
Total area burning (Coalmont mine No. 1)	21.90A	
Total area coal land	1,495.70A	
Coal weathered on outcrop	5,500,561.0	Short Tons
Coal weathered under cover	3,833,719.0	
Total weathered coal	9,334,280.0	

Unweathered coal under less than 50 feet cover	23,337,589.0
Unweathered coal under more than 50 feet cover	79,666,471.0
Total unweathered coal	103,004,060.0
Coal destroyed by fire	2,275,440.0
Grand total	105,279,500.0
Total weathered coal	9,334,280.0
Total mined tonnage	1,433,355.0
Coal destroyed by fire	2,275,440.0
Tonnage inaccessible thru Coalmont mine fire	4,045,133.0
	17,093,208.0
Net tonnage mineable coal	88,186,292.0

CHARACTER AND EXTENT OF COAL MINE FIRES

The chemical nature of the coal in this district makes it very susceptible to fire by spontaneous combustion, and fire has been a more or less constant threat to mining operations ever since they began. At the present time, there are in the district an active fire, a dormant fire, and a potential fire threat. These conditions will be reviewed here briefly, particularly with respect to their limiting conditions and the probable resulting destruction.

Coalmont Mine No. 1.- This mine is situated on the Coalmont anticline, NW¼ SW¼ sec. 24, T. 7 N., R. 81 W., Patented. Development was started in 1909 by the Northern Colorado Coal Company, but commercial production was not reported until 1911. Records are incomplete, but as near as can be determined, fire originated in the workings sometime during 1915 or 1916. Peak production was reached in 1913 with an output of 62,905 T. The history of this endeavor is told by the following tabulation from the records of the State Inspector of Coal Mines:

Year	Production	
1911	1,000	Short Tons
1912	38,799	
1913	62,905	
1914	45,080	
1915	23,480	
1916	26,265	
1917	59,644	
1918	46,737	
1919	1,260	
	305,170	

Final abandonment was made in 1925. Total production amounted to 314,230 short tons.

According to the coal estimate given on a proceeding page, the original tonnage of the block in which the mine is situated is about 5,700,000 tons. Of this amount, the gross tonnage estimated to have burned or to be subject to burning is about 1,662,300 T. Most of the coal mined was taken from the burned area. Hence, the tonnage destroyed by fire is approximately 1,350,000 T. More than four times as much coal has burned as has been saved by mining. However, the much greater amount of about 4,050,000 T. has been rendered inaccessible thru burning of the areas of economical approach. Some of it may be recovered thru slopes entering from the northwest, but, even so, operations in the vicinity of the old workings will be hazardous.

Surface topography resulting from combination of fire and mining is shown on a small scale on Figure 2, and the same area is enlarged in Figure 9. Figure 4 shows the probable geologic structure of this area. The character of the surface fire in 1934 and controlling factors are shown on Figures 10 and 11.

A reconnaissance of the fire pit early in August 1940, suggests that the prediction that the fire will burn itself out without further damage will be verified. The fires on the south and east sides of the pit were out. Active fire areas were confined to the pit over the north flank of the Coalmont anticline. The fire at the west end of this pit (450 feet east and 750 feet south of W¼ corner sec. 24) has nearly burned up to the Coalmont fault. This feature is an effective barrier to the westward spread of the fire because the coal on the west side has been dropped about 250 feet. Future burning

will probably be northward. Cover increases rapidly in this direction, and the top of the coal is about 150 feet below the surface only 250 feet north of the present active fire. Burning will probably cease at this limit due to amount of cover and ground water. Perhaps the most active fire is just south of the old shaft east of Coalmont. Water level in the shaft stands about altitude 8,152 feet, and burning will cease about 100 feet south of the shaft. Surface formations in this locality are chiefly siltstone, and there is no tendency for the development of a surface fire in carbonaceous shale as was the case on the east side of the pit.

With these limiting conditions in mind, fairly positive assurance can be given that the fire will not burn thru the North Pit fault and up dip to the surface along the west line of Section 24. Hence, Government coal is not threatened by this fire.

Moore Mine No. 1 (Rabbit Ear Mine).- This mine was opened in 1914. The shaft is located 85 feet east and 1,310 feet south of NW corner sec. 25, T. 7 N., R. 81 W. See map of Rabbit Ear mines of North Park Fuel Company, January 1, 1934. Workings include E½ SE¼ SE¼ SE¼ sec. 23, W½ SW¼ SW¼ SW¼ sec. 24, NW¼ NW¼ sec. 25, and E½ NE¼ NE¼ sec. 26. Operations in Sections 23 and 26 are in Government Coal; the remainder is privately owned by the North Park Coal Company.

According to the records of the State Inspector of Coal Mines, the production history is as follows:

Year	Production
1914	680.0 Short Tons
1915	3,501.0
1916	17,391.0
1917	26,645.0
1918	37,767.0
1919	48,145.0
1920	50,039.0
1921	42,784.0
1922	57,801.0
1923	47,776.0
1924	63,981.0
1925	62,721.0
1926	56,692.0
1927	66,624.0
1928	64,472.0
1929	52,887.0
1930	44,208.0
1931	40,031.0
1932	41,127.0 1/
1933	26,105.0 1/
1934	22,748.0 1/ 2/
	874,125.0

1/ Includes some tonnage from strip pit.

2/ Includes some tonnage from slope C SW SW NW sec. 25.

Some time in 1923, a fire developed just north of the main slope in rooms off First North. This area is designated on the map of North Park Coal Company, Moore mine No. 1, Sheet No. 4, October 12, 1924, with suitable symbols, and the note: "Sealed fire area, Fire out". Later, during September 1933, a fire originated in Government coal in Fourth North entry or the farthest inby rooms off Fourth North entry. No report was made to the District Mining Inspector, who did not learn of the condition until March 23, 1934. Further inspection on May 16 indicated an increase of intensity of the fire. By June 6th, the situation had become more critical, and an active fire was discovered in Third North entry just off the main slope. During the period June 12-June 29, seals were erected at the portal of Third North entry. Fire burned thru the principal log seal at this entry the night of June 14. With the assistance of the U. S. Bureau of Mines, this fire was brought under control, and a new brick and concrete seal erected in the main slope above the burned-out seal inby Third North entry. This work was completed by 3:00 a.m., July 19, 1934. A board seal was also erected in the manway. The seal in the main slope was visited November 5, 1934 by the writer in company with Mr. H. D. Pinkney, and found to be warm. February 16, 1935, a squeeze on the coal surrounding the shaft was reported as developing, endangering the seal in the main slope. Fire broke thru this seal February 25, 1935, and considerable smoke billowed from the shaft. Repairs were completed February 25 and 26.

Moore mine No. 1 is thus thoroughly conditioned for fire. Consensus of opinion is that the mine is lost. Nevertheless, the shaft has not been filled, nor have all of the surface cave-holes from the workings been filled to prevent intake of air to the mine. During the summer of 1940, the fire appeared to be dormant. Eventually, however, it will probably burn to the surface and consume or render inaccessible most of the coal in the fault block in which the mine is situated.

Reference to Figure 2 and the coal estimates for Sections 23, 25, and 26 indicates that if the fire escapes control and the transverse faults are incompetent to retard its spread along the strike resulting ultimate damage will be probably as follows: Fire will consume the outcrop and coal under less than 50 feet of cover in the area bounded on the west by the base of the bed, on the north by the North Pit fault, on the east by the Coalmont fault, and on the south by the Shear Zone. The total area is about 289A. Of this land, 24A are occupied by coal outcrop and all but 1.46A are Government owned. Coal under cover occupies 265A and 96A are Government owned and 169A privately owned. The total amount of coal in these tracts amounted to 22,904,247 short tons. Approximately 874,125 T. have been mined. Coal weathered on the outcrop and under less than 50 feet of cover amounts to 1,426,963 T. and 1,336,368 T. of this are Government owned. The remainder of 90,600 T. is on patented land. Unweathered coal under less than 50 feet of cover amounts to 2,816,431 T. and is all Government owned. All of this coal, 4,243,399 T., will probably be destroyed. However, only that under cover may be considered as valuable and a real loss. Fire will partially destroy and render inaccessible some 15,060,348 T., all of which is privately

owned and under more than 50 feet of cover. Most of the mined coal comes from this block, so the net tonnage threatened is 14,186,723. Fire will probably destroy all coal under less than 150 feet of cover, and that under heavier will be made inaccessible. To this should be some 37A of coal or 3,600,000 T., under more than 500 feet of cover on privately owned land. The ultimate loss to private ownership thus totals 17,736,723 T. and is more than five times the net loss to the Government. Plans for saving this coal have been outlined recently by J. J. Bourquin.[1/]

[1/] Bourquin, J. J., Suggestions for Control of Existing Coal Mine and Outcrop Fires in The Coalmont District, Jackson County, Colorado. Fifth Conference, Conservation Branch, U. S. Geological Survey, Tulsa, Okla., March 28, 1941.

Moore Strip Pit (See Figures 2, 6, and 8, B-B').- This operation was begun in July, 1931, following amendment of Denver coal lease 027306, and is the only property functioning in the field today. Operations are confined to the NW¼ sec. 26. The block of coal in which the pit is situated is bounded on the north by the North Pit fault, on the south by the South Pit fault, and on the east by the Little Grizzly fault. Production records are incomplete, but it seems probable that at least 250,000 T. have been mined to December 31, 1940.

A large tonnage (perhaps 30 per cent) has been wasted onto the gob pile west of the pit and is on fire. Inasmuch as there is some question if the floor of the pit is below the base of the bed, the gob-pile fire constitutes a potential threat to the main body of the coal.

On the assumption that the main body will burn some time and that the transverse faults are incompetent to retard spread of fire along the strike into adjacent fault blocks, ultimate resulting damage will probably be as follows: Fire will consume the outcrop and coal under less than 50 feet of cover in the area bounded on the west by the base of the bed, on the east by the Little Grizzly fault, on the south by the Shear Zone, and on the north by the ground-water level of Little Grizzly fault. Some burning may extend northwest out of the map area. Most of the damage will be confined to Section 26. Coal land west of the Little Grizzly fault in Section 26 amounts to about 166 A., classified as follows: Outcrop 54.3A., under less than 50 feet of cover, 65.3 A., under more than 50 feet of cover 46.5 A. All of the outcrop coal or 1,498,540 T. will probably burn, and also that under less than 50 feet of cover or 792,596 T. of weathered coal and 4,523,367 T. of unweathered coal. Some 3,817,342 T. under more than 50 feet of cover will probably be rendered inaccessible. Making allowance for coal mined, the total potential loss is about 6,600,000 T. Approximately 2,300,000 T. is weathered and of small value. Hence, most of the loss will be restricted to unweathered coal under less than 50 feet of cover and will amount to about 4,300,000 T.

Owing to a high ground-water level in Section 23 west of the Little Grizzly fault, destruction will be less complete. This tract is estimated to contain about 1,085,000 T. of weathered coal and 5,700,000 T. of unweathered coal.

The total possible net loss thus amounts to about 10,000,000 T. of stripping coal, and nearly 4,000,000 T. of coal obtainable only by underground mining.

Summary of Sustained and Potential Fire Loss.- In terms of original tonnage (105,280,000 T.) of the immediate reserve, these losses may be estimated as follows:

Actual loss, Coalmont mine No. 1 fire.	
Burned	1.1 Per cent
Rendered inaccessible	3.8
	4.9
Probable loss, Moore mine No. 1 fire.	
Likely to be burned	3.9
Likely to be partially burned and made inaccessible	13.4
	27.3
Possible loss, if Strip-pit mine fires.	
Likely to be burned	11.7
Made inaccessible	3.6
	25.3
Total possible loss	57.5
Coal lost by natural burning	0.58
	58.08

In conclusion, a real loss of 4.9 per cent has already taken place. Further loss of 27.3 threatens thru a fire known to be dormant, and is the most imminent danger to the field. The loss from a future fire in the strip-pit is largely a potential danger, not acute at present. The possibility exists, however, of more than half the total immediate reserve of the district being destroyed by fire.

APPENDIX A

Logs of churn drill holes with locations and remarks. Regular Series. Map reference — Rabbit Ear Mines of North Park Fuel Company, sec. 23, 24, 25, 26, T. 7 N., R. 81 W., 6th P.M. Coalmont, Jackson County, Colorado. Scale: 1 in. = 200 feet. Certified by H. D. Pinkney. Date: January 1, 1934.

LOCATION NO. 1

LOCATION: Unknown

SURFACE ELEVATION: Unknown

ELEVATION TOP COAL: Unknown

THICK COAL: 30.5 feet

FROM	TO	THICK	DESCRIPTION
0	7	7'	Brown shale
7	25	13'	Coal
25	30	5'	Shale
30	32	2'	Coal
32	33½	1½'	Shale
33½	37½	4'	Coal
37½	40		Hard and soft gray rock

REMARKS:

A point marked "1" falls in the strip pit 1,480 feet E. and 960 feet N. of W.¼ corner sec. 26, T. 7 N., R. 81 W. The locality has been mined out, so the surface elevation can not be restored. The amount of cover on the bed is of the right order for this location.

LOCATION NO. 2

LOCATION: Uncertain

SURFACE ELEVATION:

ELEVATION TOP COAL:

THICK COAL: 43 feet

FROM	TO	THICK	DESCRIPTION
0	7	7'	Surface
7	9	2'	Hard sandrock
9	12	3'	Brown shale
12	15	3'	Soft dirty coal
15	27	12'	Coal
27	28	1'	Soft dirty coal
28	44	16'	Coal
44	48	4'	Soft dirty coal
48	52	4'	Slate
52	55	3'	Coal
55	58	3'	Slate and dirt

REMARKS:

Near the strip pit, 1745 feet E. and 1085 feet N. of W.¼ corner section 26, there is a point marked "2" which may be the location of the hole. The original surface has been destroyed by stripping, but it was probably about 8177. This would make elevation of top of coal about 8165. Thickness of cover at this place is of the right order. However, the 43 foot coal thickness is greater than that found in the vicinity of the pit, and suggests that the log was obtained near the shaft mine. A bore hole marked No. 2 is situated 310 feet E. and 1050 N. of E.¼ corner sec. 26. However, the cover at this location is more than 12 feet thick. Two other "No. 2" locations are also known, but locations and logs are available.

LOCATION NO. 3

LOCATION: Uncertain. 2,080 feet E. and 900 feet N. of W.¼ corner sec. 26.
SURFACE ELEVATION: 8,213

ELEVATION TOP COAL: 8,185

THICK COAL: 35 feet

FROM	TO	THICK	DESCRIPTION
0	9	9'	Surface
9	12	3'	Brown shale
12	21	9'	Dirt
21	24	3'	Sandrock
24	25	1'	Shale
25	26	1'	Sandrock
26	28	2'	Brown shale
28	32	4'	Soft dirty coal
32	56	24'	Coal
56	57	1'	Dirty coal and rock
57	59	2'	Dirt
59	63	4'	Coal
63	67	4'	Dirt
67	70	3'	Sandrock
70	72	2'	Dirt

REMARKS:

The only reason for assigning this log to the above location is that the mine map shows a No. 2 hole in which the interval from the surface to the top of the coal is 28 feet. There are at least two other No. 3 holes in the area. There is also some discrepancy in the matter of elevation. That at this location on the mine map is 8,187, which would make the top of the coal 8,159, but the topographic map gives 8,213. This has been used although it makes the top of the coal high. However, there may be local uplift on a small fault. In some respects, the elevation of 8,159 on the top of the coal fits into the general structure picture in a most satisfactory manner.

LOCATION NO. 4

LOCATION: Unknown (?)

SURFACE ELEVATION:

ELEVATION TOP COAL:

THICK COAL: 26 feet

FROM	TO	THICK	DESCRIPTION
0	9	9'	Surface
9	13	4'	Sandrock - soft
13	14.5	1' 6"	Brown shale
14.5	23	8' 6"	Sandrock
23	28	5'	Blue clay
28	37	9'	Brown shale
37	41	4'	Blue clay
41	44	3'	Sandrock
44	46	2'	Brown shale
46	48.5	2' 6"	Dirty coal
48.5	50	1' 6"	Sandrock
50	65	15'	Coal
65	66	1'	Soft dirty coal
66	67	1'	Sandrock
67	69	2'	Brown shale
69	72	3'	Soft dirty coal
72	76	4'	Brown shale
76	78	2'	Sandrock

REMARKS:

A point marked "4" falls 2,112 feet E. and 1,175 feet N. of W.$\frac{1}{4}$ corner sec. 26. Surface elevation at this place is about 8,186 (topographic map). Elevation of top coal would be 8,140. This seems fairly well in line with information from adjacent holes.

LOCATION NO. 5

LOCATION: 2,700 feet W. and 1,280 feet S. of NE. corner sec. 26. P.T. station 352 (1934).
SURFACE ELEVATION: 8,201 (P.T.) 8,200 (Mine map).

ELEVATION TOP COAL: 8,114.

THICK. COAL: 8 feet (87 to 95 feet).

FROM	TO	THICK	DESCRIPTION
0	5	5'	Surface
5	6	1'	Sandrock
6	9	3'	Brown shale
9	10.5	1' 6"	Dirty coal
10.5	22	11' 6"	Dirt
22	28	6'	Brown shale
28	38	10'	Dirt
38	52	14'	Sandrock
52	57	5'	Blue clay
57	87	30'	Sandrock
87	95	8'	Soft dirty coal
95	96	1'	Blue clay
96	97	1'	Sandrock
97	104	7'	Blue clay
104	109	5'	Shale

REMARKS:

This log is interpreted as passing through a fault.

The reason for this conclusion is the abnormally thin coal section from 87 to 95 feet. This thickness of 8 feet is only about one-quarter of the normal thickness of the bed. Structure contours on top of the coal projected eastward into this locality correlate closely with the top of the coal at 8,114. A transverse fault 300 feet south of the hole is known to have a horizontal off-set to the southwest of at least 400 feet, and possibly more if this interpretation is correct. The fault which the bore hole is assumed to have penetrated is the strike fault between the pit and the shaft mine. The off-set on the transverse fault is thought to have shifted the strike fault to the southwest.

LOCATION NO. 6

LOCATION: Unknown

SURFACE ELEVATION: Unknown

ELEVATION TOP COAL:

THICK COAL:

FROM	TO	THICK	DESCRIPTION
0	10	10'	Surface
10	19	9'	Brown sandrock
19	29	10'	White sandrock

REMARKS:

The stratigraphic position of the beds drilled in this hole are unknown.

LOCATION NO. 7

LOCATION: 1,230 feet E. and 950 feet S. of NW¼ sec. 26.
P.T. station 309 (1934).
SURFACE ELEVATION: 8,234.1 (P.T.) 8,232.8 (Mine map).

ELEVATION TOP COAL: Hole starts below coal.

THICK COAL:

FROM	TO	THICK	DESCRIPTION
0	4	4'	Surface
4	10	6'	Sandrock
10	12	2'	Shale
12	18	6'	Sandrock
18	132	114'	Brown shale

REMARKS:

There are two possible interpretations of this section. The correlation which seems to be upheld by surface mapping is that the sandrock from 4 to 18 feet inclusive is the lower part of the layer of buff siltstone whose base is about 160 feet below the base of the coal. Allowing 35 feet for the thickness of the coal, the altitude of the top of the bed would be approximately 8,411 feet (no allowance being made for dip). The full thickness of the siltstone bed in which the hole starts is about 65 feet, but the location is somewhat below the top. This accounts for the partial section of sandrock.

The other interpretation is that the sandrock from 4 to 10 feet and 12 to 18 feet may be the equivalent of the thin siltstone bed whose top is 72 feet below the base of the coal. Using 35 feet for the thickness of the coal, the top of the bed would occur at 8,370 feet. This interpretation is not favored.

LOCATION NO. 8

LOCATION: 760 feet S. and 685 feet W. of NE. corner sec. 26.

SURFACE ELEVATION: 8,251.6 (Mine map).

ELEVATION TOP COAL: 8,216

THICK COAL: 47 feet (from 36 to 83 feet inclusive)

FROM	TO	THICK	DESCRIPTION
0	6	6'	Surface
6	6.5	0' 6"	Sandrock
6.5	12	5' 6"	Blue clay
12	18	6'	Sandrock
18	24	6'	Clay
24	33	9'	Sandrock, brown
33	35	2'	Clay
35	36	1'	Sandrock, white
36	37	1'	Soft coal
37	48	11'	Coal
48	51	3'	Sandrock
51	54	3'	Soft coal
54	55	1'	Sandrock
55	66	11'	Coal
66	67	1'	Sandrock, white
67	76	9'	Coal
76	79	2'	Blue clay
79	83	4'	Soft dirty coal
83	85	2'	Clay
85	88	3'	Sandrock
88	91	3'	Clay
91	94.5	3' 6"	Shale
94.5	97	2' 6"	Sandrock
97	98	1'	Blue clay
98	140	42'	Shale
140	160	20'	Sandrock
160	162	2'	Clay
162	163	1'	Sandrock
163	170	7'	Shale
170	186	16'	Sandrock
186	198	12'	Shale

REMARKS:

This is one of the few logs which gives a fairly long section below the base of the coal.

LOCATION NO. 9

LOCATION: 590 feet S. and 670 feet W. of NE. corner sec. 26.

SURFACE ELEVATION: 8,251.6 (Mine map)

ELEVATION TOP COAL: 8,216.6

THICK COAL: 35.5/ feet (from 35 to 70.5 feet)

FROM	TO	THICK	DESCRIPTION
0	3	3'	Surface
3	23	20'	Sandrock
23	25	2'	Yellow clay
25	28	3'	Blue clay
28	35	7'	Sandrock
35	54.5	19' 6"	Coal
54.5	55	0' 6"	Sandrock
55	70.5	15' 6"	Coal

REMARKS:

Full section of coal not drilled, but hole must have stopped very near base of bed.

LOCATION NO. 10

LOCATION: 2,105 feet E. and 1,435 feet N. of W¼ corner sec. 26.

ELEVATION: 8,184 (Mine map).

ELEVATION TOP COAL: 8,125.

THICK. COAL: 32 feet (59 to 91 feet, inclusive).

FROM	TO	THICK	DESCRIPTION
0	4	4'	Surface
4	6	2'	Sandrock
6	11	5'	Blue clay
11	15	4'	Brown shale
15	15.5	0' 6"	Sandrock
15.5	16.5	1'	Dirty soft coal
16.5	35	18' 6"	Sandrock
35	49	14'	Shale
49	55	6'	Sandrock
55	57	2'	Shale
57	58	1'	Soft dirty coal
58	59	1'	Sandrock
59	65	6'	Soft coal
65	66	1'	Shale
66	70	4'	Soft coal
70	71	1'	Shale
71	84	13'	Coal
84	85	1'	Shale
85	87	2'	Soft coal
87	88	1'	Shale
88	91	3'	Soft coal
91	92	1'	Shale
92	93	1'	Sandrock

REMARKS:

None.

LOCATION NO. 11

LOCATION: 1,850 feet E. and 1,450 feet N. of W¼ corner sec. 26.

SURFACE ELEVATION: 8,177.7 (Mine map).

ELEVATION TOP COAL: 8,149

THICK. COAL: 36 feet (29 to 65 feet, inclusive).

FROM	TO	THICK	DESCRIPTION
0	4	4'	Surface
4	18	14'	Gray shale
18	21	3'	Gray slate
21	26	5'	Shale
26	26.5	0' 6"	Soft coal
26.5	29	2' 6"	Brown shale
29	35	6'	Coal
35	35.5	0' 6"	Dark shale
35.5	40	4' 6"	Soft coal
40	41	1'	Dark shale
41	55	14'	Coal
55	62	7'	Dark shale
62	65	3'	Soft dirty coal
65	69	4'	Dark shale
69	72	3'	Sandrock
72	75	3'	Blue clay

REMARKS:

None.

LOCATION NO. 12

LOCATION: 1,538 feet E. and 1,460 feet N. of W¼ corner sec. 26.

SURFACE ELEVATION: 8,170.4 (Mine map).

ELEVATION TOP COAL: 8,161

THICK. COAL: 37 feet (9 to 46 feet, inclusive).

FROM	TO	THICK	DESCRIPTION
0	3	3'	Surface
3	5	2'	Light shale
5	9	4'	Brown shale
9	13	4'	Hard boney coal
13	15	2'	Brown shale
15	38	23'	Coal
38	41	3'	Brown shale
41	43	2'	Soft coal
43	45	2'	Brown shale
45	46	1'	Soft coal
46	52	6'	Brown shale
52	55	3'	Sandrock

REMARKS:

None

LOCATION NO. 13

LOCATION: Unknown.

SURFACE ELEVATION:

ELEVATION TOP COAL:

THICK. COAL: 38 feet (6 to 44 feet, inclusive).

FROM	TO	THICK.	DESCRIPTION
0	4	4'	Surface
4	6	2'	Brown shale
6	12	6'	Hard bony coal
12	17.5	5' 6"	Coal
17.5	19	1' 6"	Brown shale
19	23	4'	Soft coal
23	40	17'	Brown shale
40	44	4'	Soft coal
44	49	5'	Brown shale
50			Sandrock

REMARKS:

Log section resembles No. 14, which follows. In all probability, the location falls about midway between No. 12, whose location is known, and No. 14, whose location is uncertain. The amount of cover on the bed is an approximate indication of proximity to the outcrop. The locality is believed to have been destroyed by stripping.

LOCATION NO. 14

LOCATION: Uncertain. A point marked "14" falls 790 feet E. and 1,450 feet N. of W¼ sec. 26.
SURFACE ELEVATION: 8,170 (?)

ELEVATION TOP COAL: 8,194

THICK. COAL:

FROM	TO	THICK	DESCRIPTION
0	12	12'	Surface
12	12.5	0' 6"	Brown sandrock
12.5	14	1' 6"	Brown shale
14	16	2'	Blue clay
16	17	1'	Soft dirty coal
17	19	2'	Blue clay
19	19.5	0' 6"	Soft dirty coal
19.5	21	2' 6"	Blue clay
21	21.5	0' 6"	Soft dirty coal
21.5	23	1' 6"	Brown shale
23	26	3'	Coal
26	58	32'	

REMARKS:

Two interpretations of this log are possible.

The first is to accept the section logged as normal. This leads to the conclusion that the coal has thinned westward until it is practically non-existent. Even an altitude on the highest bed is structurally low. If it is assumed that the base of the bed is at 26 feet and 33 feet is used for the thickness of coal, the restored altitude of the top of the bed is still structurally low at 8,177 feet. Furthermore, the unbroken section of 32 feet of "brown shale" below the lowest coal seam does not correspond to the log of the strata below the coal in bore holes farther north.

An interpretation more consistent with other logs and the general structural position is to assume that the hole begins near or below the base of the coal. It appears that the "Brown shale" from 12.0 to 12.5 feet is the equivalent of the thin sandstone which usually occurs 3 feet below the base of the coal in so many logs, and which is probably identical with the one cropping out at P.T. station 396 (1934) and elsewhere. According to this idea, the coal has been eroded entirely, and partially replaced by 12 feet of alluvium or mantle rock. The elevation of the restored base of the bed is 8,161 feet. Using 33 feet for the thickness of the coal, the restored altitude of the top of the bed is 8,194.

LOCATION NO. 15

LOCATION: 735 feet E. and 815 feet S. of NW. corner sec. 26.

SURFACE ELEVATION: 8,157.5 (Mine map).

ELEVATION TOP COAL: 8,185.

THICK. COAL:

FROM	TO	THICK	DESCRIPTION
		8'	Surface
0	8	2'	Water sand
8	10	6'	Brown sandrock
10	16	2'	Brown shale
16	18	8'	Gray slate
18	26	3'	Gray sandrock
26	29	10'	Gray slate
29	39	11'	Gray sandrock
39	50	10'	Dark shale
50	60	1' 6"	Soft dirty coal
60	61.5	7' 6"	Brown shale
61.5	69		

REMARKS:

This hole appears to have started below the base of the coal. Actually, however, this is not the case. The water sand at 8 feet is regarded as the sandstone bed 3 feet below the base of the coal. Hence, the restored elevation of the base of the bed is 8,152 feet, or 5 feet below the surface. But, there is no coal. What has happened is that the bed was eroded and replaced by alluvium or mantle rock. Using 33 feet as the average thickness of the coal, the restored elevation of the top is 8,185. This seems high, but seems to fit into the general structure picture.

LOCATION NO. 16

LOCATION: 1,247 feet E. and 855 feet S. of NW. corner sec. 26.

SURFACE ELEVATION: 8,170.9 (Mine map).

ELEVATION TOP COAL: 8,154.

THICK. COAL: 33.5 feet (16.5 to 50 feet, inclusive).

FROM	TO	THICK	DESCRIPTION
0	3	3'	Surface
3	7	4'	Brown shale
7	9	2'	Hard blue sandrock
9	11	2'	Brown shale
11	11.5	0' 6"	Brown sandrock
11.5	15	3' 6"	Brown shale
15	15.5	0' 6"	Dirty coal
15.5	16.5	1'	Brown shale
16.5	17.5	1'	Soft coal
17.5	25	7' 6"	Coal
25	26	1'	Bony coal
26	35	9'	Coal
35	36	1'	Bony coal
36	50	14'	Coal
50	51	1'	Brown sandrock
51	52	1'	Brown shale

REMARKS:

The thin layer of dirty coal from 15 to 15.5 feet is a rather extensive unit, but it is not regarded as the top of the main body.

LOCATION NO. 17

LOCATION: 1,565 feet E. and 848 feet S. of NW. corner of sec. 26.

SURFACE ELEVATION: 8,181.9 (Mine map).

ELEVATION TOP COAL: 8,144.

THICK. COAL: 36 feet. (38 to 74 feet, inclusive).

FROM	TO	THICK.	DESCRIPTION
0	7	7'	Surface
7	9	2'	Brown shale
9	14	5'	Brown sandrock
14	19	5'	Brown shale
19	20	1'	Brown sandrock
20	29	9'	Brown shale
29	30	1'	Brown sandrock
30	32	2'	Blue shale, streak of blue rock
32	33	1'	Blue sandrock
33	35	2'	Blue shale
35	36	1'	Soft coal
36	38	2'	Shale
38	45	7'	Coal
45	46	1'	Soft dirty coal
46	59	13'	Coal
59	60	1'	Soft dirty coal
60	66	6'	Coal
66	72	6'	Shale
72	74	2'	Bony coal
74	78	4'	Brown shale
78	79	1'	Soft coal
79	80	1'	Brown shale
80	81	1'	Sandrock

REMARKS:

The main body of coal extends from 38 to 74 feet. It appears evident that the thickness can be increased by variations in thickness of the carbonaceous shale at both the top and base of the bed. The over-all thickness is 45 feet. The sandrock from 80 to 81 feet is regarded as the "marker" bed immediately underlying the coal.

LOCATION NO. 18

LOCATION: 1,850 feet W. and 840 feet S. of NW. corner sec. 26.

SURFACE ELEVATION: 8,188.1 (Mine map).

ELEVATION TOP COAL: 8,134.

THICK. COAL: 27 feet (54 to 81 feet, inclusive).

FROM	TO	THICK.	DESCRIPTION
0	10	10'	Surface
10	21	11'	Blue shale
21	23	2'	Brown sandrock
23	29	6'	Brown shale
29	47	18'	Blue clay
47	49	2'	Blue sandrock
49	51	2'	Shale
51	52	1'	Soft coal
52	54	2'	Shale
54	56	2'	Soft coal
56	63	7'	Shale
63	67	4'	Dirty coal
67	81	14'	Coal
81	89	8'	Brown shale

REMARKS:

None.

LOCATION NO. 19

LOCATION: 588 feet W. and 850 feet S. of N¼ corner sec. 26.

SURFACE ELEVATION: 8,189.6 (Mine map).

ELEVATION TOP COAL:

THICK. COAL:

FROM	TO	THICK	DESCRIPTION
0	7	7'	Surface
7	19	12'	Blue shale
19	20	1'	Brown sandrock
20	27	7'	Brown shale
27	31	4'	Blue clay
31	38	7'	Blue shale
38	40	2'	Blue clay
40	46	6'	Sand

REMARKS:

This hole was not deep enough to reach the top of the coal. According to the structure contour map on the top of the coal, the altitude of the top of the bed at this locality is about 8,102 feet. This elevation is approximately 42 feet below the bottom of the hole.

LOCATION NO. 20

LOCATION: 272 feet W. and 853 feet S. of N¼ corner sec. 26.

SURFACE ELEVATION: 8,190.8 (Mine map).

ELEVATION TOP COAL:

THICK. COAL:

FROM	TO	THICK	DESCRIPTION
0	8	8'	Surface
8	26	18'	Brown shale

REMARKS:

This hole was not deep enough to reach the top of the coal. According to the structure contour map on the top of the coal, the altitude of the top of the bed at this locality is about 8,070 feet. This elevation is approximately 95 feet below the base of the hole.

LOCATION NO. 21

LOCATION: 275 feet W. and 530 feet S. of N¼ corner sec. 26.

SURFACE ELEVATION: 8,187.1 (Mine map).

ELEVATION TOP COAL:

THICK. COAL:

FROM	TO	THICK.	DESCRIPTION
0	2	2'	Surface
2	8	6'	White sand

REMARKS:

This hole was not deep enough to reach the top of the coal. According to the structure contour map on the top of the coal, the altitude of the top of the bed at this locality is about 8,040 feet. This elevation is approximately 139 feet below the bottom of the hole.

LOCATION NO. 22

LOCATION: 595 feet W. and 548 feet S. of NW¼ corner sec. 26.

SURFACE ELEVATION: 8,182.1 (Mine map).

ELEVATION TOP COAL: 8,086.

THICK. COAL: 34 feet (73 to 109 feet, inclusive).

FROM	TO	THICK.	DESCRIPTION
0	7	7'	Surface
7	30	23'	Brown shale
30	52	22'	Blue clay
52	55	3'	Slate
55	58	3'	Blue shale
58	66	8'	Blue clay
66	69	3'	Blue sandrock
69	72	3'	Blue slate
72	90	18'	Blue shale
90	94	4'	Sandrock
94	96	2'	Clay
96	98	2'	Soft dirty coal
98	108	10'	Coal
108	109	1'	Soft dirty coal
109	119	10'	Coal
119	125	6'	Soft dirty coal
125	130	5'	Coal
130	133	3'	Blue clay

REMARKS:

None.

LOCATION NO. 23

LOCATION: 1,845 feet E. and 550 feet S. of NW corner sec. 26.

SURFACE ELEVATION: 8,181.1 (Mine map).

ELEVATION TOP COAL: 8,108.

THICK. COAL: 36 feet (73 to 109 feet, inclusive).

FROM	TO	THICK.	DESCRIPTION
0	7	7'	Surface
7	26	19'	Brown shale
26	37	11'	Blue clay
37	44	7'	Brown shale
44	63	19'	Blue clay
63	65	2'	Blue sandrock
65	69	4'	Gray slate
68	69	1'	Gray sandrock
69	70	1'	Brown shale
70	71	1'	Soft coal
71	73	2'	Shale
73	98	25'	Coal
98	103	5'	Clay
103	104	1'	Soft coal
104	109	5'	Coal
109	112	3'	Clay

REMARKS:

None.

LOCATION NO. 24

LOCATION: 1,535 feet E. and 540 feet S. of NW. corner sec. 26.

SURFACE ELEVATION: 8,181.2 (Mine map).

ELEVATION TOP COAL: 8,120.

THICK. COAL: 31 feet (63 to 94 feet, inclusive).

FROM	TO	THICK.	DESCRIPTION
0	9	9'	Surface
9	27	18'	Brown shale
27	31	4'	Blue clay
31	36	5'	Blue shale
36	38	2'	Gray slate
38	46	8'	Blue clay
46	54	8'	Blue shale
54	55	1'	Blue sandrock
55	58	3'	Gray slate
58	60	2'	Brown shale
60	61	1'	Soft coal
61	63	2'	Brown shale
63	76	13'	Coal
76	77.5	1' 6"	Soft coal
77.5	88	10' 6"	Coal
88	89	1'	Hard bone
89	94	5'	Coal
94	98	4'	Shale

REMARKS:

None.

LOCATION NO. 25

LOCATION: 1,240 feet E. and 550 feet S. of NW. corner sec. 26.

SURFACE ELEVATION: 8,180.7.

ELEVATION TOP COAL: 8,131.

THICK. COAL: 31 feet (50 to 81 feet, inclusive).

FROM	TO	THICK.	DESCRIPTION
0	12	12'	Surface
12	15	3'	Blue shale
15	23	8'	Blue clay
23	28	5'	Brown shale
28	31	3'	Brown sandrock
31	34	3'	Blue clay
34	39	5'	Brown shale
39	43	4'	Hard brown rock
43	46	3'	Blue clay
46	47	1'	Soft dirty coal
47	50	3'	Brown shale
50	52	2'	Soft coal
52	57	5'	Coal
57	59	2'	Soft coal
59	71	12'	Coal
71	72	1'	Soft coal
72	81	9'	Coal
81	84	3'	Clay

REMARKS:

None.

LOCATION NO. 26

LOCATION: 820 feet E. and 570 feet S. of NW. corner sec. 26.

SURFACE ELEVATION: 8,159.7 (Mine map).

ELEVATION TOP COAL: 8,168 (?).

THICK. COAL:

FROM	TO	THICK	DESCRIPTION
0	4	4'	Surface
4	6	2'	Soft dirty coal
6	8	2'	Brown shale
8	13	5'	Dirty coal
13	14	1'	Blue clay
14	15	1'	Sandrock
15	17	2'	Clay
17	18	1'	Soft dirty coal
18	20	2'	Sandrock
20	24	4'	Brown shale
24	25	1'	Soft coal
25	28	3'	Clay
28	29	1'	Sandrock
29	46	17'	Soft gray sandrock
46	48	2'	Hard gray sandrock
48	51	3'	Soft gray sandrock
51	53	2'	Hard gray sandrock
53	58	5'	Clay

REMARKS:

Poorly logged. Placing base of coal bed at 25 feet, and using a thickness of 33 feet for the coal, the restored elevation of the top of the bed becomes 8,168. This elevation is but a few feet above the surface. The 3 feet of clay immediately below the coal, and the 25 feet of "hard gray sandrock" beneath are thought to correspond to the 6 feet of clay or mudstone and the 28.5 feet of siltstone below the coal as measured near P.T. station 126 (1934).

LOCATION NO. 27

LOCATION: Uncertain. See remarks.

SURFACE ELEVATION: 8,160.3 (Mine map): 8,161.8 P.T.

ELEVATION TOP COAL: 8,151 (?).

THICK. COAL: 35 feet, upper bench; 5 feet, lower bench.
Overall 7 feet to 52 feet.

FROM	TO	THICK.	DESCRIPTION
0	4	4'	Surface
4	7	3'	Brown shale
7	9	2'	Soft dirty coal
9	15	6'	Coal
15	17	2'	Soft coal
17	25	8'	Coal
25	27	2'	Soft coal
27	31	4'	Coal
31	32	1'	Soft coal
32	42	10'	Coal
42	47	5'	Blue clay
47	52	5'	Coal
52	58	6'	Clay
58	66	8'	Gray sandrock

REMARKS:

Churn drill hole No. 27 does not appear on the mine map, but a location for N. 27 is given at S50 feet E. and 220 feet S. of NW. corner sec. 26. Plane-table station 418 (1934) was very near this point, which was marked with a stake numbered "27". P.T. station 418 (1934) is very near the top of the coal, and the above log seems to fit local conditions. The meaning of the prefix N on certain holes in this locality is unknown.

LOCATION NO. 28

LOCATION: Uncertain. See remarks.

SURFACE ELEVATION: 8,167.5 (Mine map) ?.

ELEVATION TOP COAL: 8,101.5 (?).

THICK. COAL: 27 feet (66 to 93 feet, inclusive).

FROM	TO	THICK.	DESCRIPTION
0	9	9'	Surface
9	21	12'	Brown shale
21	54	33'	Clay
54	56	2'	Sandrock
56	58	2'	Brown shale
58	61	3'	Clay
61	62	1'	Soft dirty coal
62	63	1'	Clay
63	63.5	0' 6"	Sandrock
63.5	66	2' 6"	Brown shale
66	68	2'	Soft coal
68	68.5	0' 6"	Hard sandrock
68.5	71	2' 6"	Coal
71	76	5'	Dark brown shale
76	77	1'	Dirty coal
77	78	1'	Shale
78	80	2'	Dirty coal
80	93	13'	Coal
93	95	2'	Hard sandrock

REMARKS:

Churn drill hole No. N. 30 is shown on the mine map at 1,225 feet E. and 250 feet S. of NW. corner sec. 26. The following notation is given at this place in addition to the above elevation, "T.C. 8,101.5 B.C. 8,074.5". The difference between the top and base of the coal is 27 feet. In the above log, the coal thickness is 27 feet. For this reason, and no other, the log is tentatively referred to location N. 30. The correspondence in coal thickness may be wholly fortuitous. However, the amount of cover and the structural position are in accord with the general picture.

LOCATION NO. 29

LOCATION: 1,220 feet W. and 230 feet S. of N¼ corner sec. 26.

SURFACE ELEVATION: 8,167.0 (Mine map).

ELEVATION TOP COAL: 8,086.0

THICK. COAL: 32 feet (81 to 113 feet, inclusive).

FROM	TO	THICK.	DESCRIPTION
0	2	2'	Surface
2	5	3'	Sandrock
5	6	1'	Brown clay
6	9	3'	Soft sandrock
9	20	11'	Light clay
20	21	1'	Sandrock
21	72	51'	Dark clay
59, 62, 65, 68			Small bands of sandrock
72	77	5'	Sandrock
77	78	1'	Dark clay
78	79	1'	Dirty coal
79	80	1'	Sandrock
80	81	1'	Dark shale
81	82	1'	Soft dirty coal
82	93	11'	Hard bony coal
93	95	2'	Sandrock
95	97	2'	Hard bony coal
97	98	1'	Sandrock
98	100	2'	Coal
100	103	3'	Dirty coal
103	113	10'	Coal
113	115	2'	Clay
115	117	2'	Sandrock

REMARKS:

None.

LOCATION NO. 30

LOCATION: 915 feet W. and 210 feet S. of N¼ corner sec. 26.

SURFACE ELEVATION: 8,181.3 (Mine map).

ELEVATION TOP COAL: 8,075.3.

THICK. COAL: 33 feet (106 to 139 feet, inclusive).

FROM	TO	THICK.	DESCRIPTION
0	6	6'	Surface
6	13	7'	Gray sandrock
13	17	4'	Brown sandrock
17	26	9'	Light clay
26	79	53'	Dark clay
79	82	3'	Hard sand shale brown
82	86	4'	Dark clay
86	88	2'	Hard blue sandrock
88	90	2'	Gray sand rock
90	98	8'	Dark clay
94 and 97			Streaks of sandrock
98	101	3'	Hard blue sandrock
101	104	3'	Brown shale
104	105	1'	Soft dirty coal
105	106	1'	Brown shale
106	107	1'	Soft dirty coal
107	110.5	3' 6"	Coal
110.5	111	0' 6"	Sandrock
111	119	8'	Coal
117			Mud slip
119	120	1'	Dirty coal
120	122	2'	Hard sandrock
122	131	9'	Coal
131	132	1'	Hard sandrock
132	136	4'	Dirty coal
136	137	1'	Black coal shale
137	139	2'	Soft dirty coal
139	140	1'	Clay
140	143	3'	Hard sandrock

REMARKS:

None.

LOCATION NO. 31

LOCATION: 655 feet W. and 260 feet S. of N¼ corner sec. 26.

SURFACE ELEVATION: 8,182.8 (Mine map).

ELEVATION TOP COAL: 8,065.8.

THICK. COAL: 37 feet (117 to 154 feet, inclusive).

FROM	TO	THICK.	DESCRIPTION
0	4	4'	Surface
4	22	18'	Soft sandrock
22	26	4'	Light sandy clay
26	85	59'	Dark clay
85	89	4'	Sandrock
89	92	3'	Dark clay
92	98	6'	Gray sandrock
98	108	10'	Dark clay
108	110	2'	Light sandy clay
110	113	3'	Hard blue sandrock
113	116	3'	Brown shale
116			Streak dirty coal
116	117	1'	Dark clay
117	119	2'	Dirty coal
119	131	12'	Coal
131	131-6	6"	Sandrock
131-6	132	6"	Coal shale
132	134	2'	Coal
134	135	1'	Dirty coal
135	145	10'	Coal
145	146	1'	Dirty coal
146		3"	Hard sandrock
146	149	3'	Dirty coal
149	150	1'	Dark shale
150	154	4'	Coal
154	155	1'	Dark shale
155	158	3'	Hard light clay

REMARKS:

None.

LOCATION NO. 32

LOCATION: 300 feet W. and 230 feet S. of NW¼ corner sec. 26.

SURFACE ELEVATION: 8,191.4 (Mine map).

ELEVATION TOP COAL: 8,013.4

THICK. COAL: 36 feet (178 to 214 feet, inclusive).

FROM	TO	THICK.	DESCRIPTION
0	6	6'	Surface
6	9	3'	Light shale
9	23	14'	Light clay
23	33	10'	Sandrock
33	36	3'	Sandy shale
36	40	4'	Brown shale
40	43	3'	Blue shale
43	47	4'	Brown shale
47	53	6'	Blue sandrock
53	70	17'	Gray sandrock
70	78	8'	Dark clay
78	88	10'	Sandrock
88	149	61'	Dark clay
149	152	3'	Hard sandy clay
152	155	3'	Dark clay
155	158	3'	Light clay
158	163	5'	Hard sandrock
163	166	3'	Light clay
166	172	6'	Dark clay
172	175	3'	Sandrock
175	177	2'	Hard sandy clay
177			Streak dirty coal
177	178	1'	Light clay
178	185	7'	Coal
185	186	1'	Dark clay
186	190	4'	Coal
190	196	6'	Dirty coal
196*	198	2'	Sandrock
198	205	7'	Coal
205	206	1'	Soft dirty coal

REMARKS:

None.

*Sandrock at 196 is doubtful as the water was all sandy. It may be hard coal.

LOCATION NO. 33

LOCATION: 315 feet W. and 50 feet N. of S¼ corner sec. 23.

SURFACE ELEVATION: 8,210.0 (Mine map).

ELEVATION TOP COAL:

THICK. COAL:

FROM	TO	THICK.	DESCRIPTION
0	8	8'	Surface
8	11	3'	Sand
11	13	2'	Light clay
13	18	5'	Sandy clay
18	23	5'	Sandrock
23	31	8'	Sandy clay
31	35	4'	Light clay

REMARKS:

This location falls at P.T. station 332 (1934). The hole was not deep enough to reach the coal. Reference to the structure contour map indicates that the altitude of the top of the coal at this place is close to 8,000 feet, or 175 feet below the bottom of the hole.

LOCATION NO. 34

LOCATION: 610 feet W. and 70 feet N. of S¼ corner sec. 23.

SURFACE ELEVATION: 8,195.3 (Mine map).

ELEVATION TOP COAL:

THICK. COAL:

FROM	TO	THICK.	DESCRIPTION
0	4	4'	Surface
4	12	8'	Sandy clay
16	19	3'	Light clay
19	34	15'	Dark sandy clay
34	38	4'	Sandrock

REMARKS:

This hole was not drilled deep enough to reach the coal. Reference to the structure contour map on the top of the coal indicates that the altitude of the top of the coal at this place is about 8,035 feet or 122 feet below the bottom of the hole.

LOCATION NO. 35

LOCATION: 913 feet W. and 97 feet N. of S¼ corner of sec. 23.

SURFACE ELEVATION: 8,184.3 (Mine map).

ELEVATION TOP COAL: 8,027.

THICK. COAL: 35 feet (157 to 192 feet, inclusive).

FROM	TO	THICK.	DESCRIPTION
0	1	1'	Surface
1	3	2'	Sandy clay
3	15	12'	Light clay
15	18	3'	Fine sand
18	30	12'	Coarse sand
30	32	2'	Brown shale
32	35	3'	Dark clay
35	37	2'	Light sandy clay
37	50	13'	Dark clay
50	60	10'	Light sandy clay
60	77	17'	Light sandrock
77	103	26'	Dark clay
103	112	9'	Brown shale
112	134	22'	Dark clay
134	135	1'	Sandrock
135	136	1'	Light clay
136	138	2'	Brown shale
138	140	2'	Hard sandrock
140	148	8'	Dark clay
148	151	3'	Hard sandrock
151	153	2'	Light clay
153	154	1'	Soft dirty coal
154	155	1'	Light clay
155	157	2'	Coal shale
157	164	7'	Coal
164	165	1'	Dirty coal
165	170	5'	Coal
170	171	1'	Coal shale
171	187	16'	Coal
187	189	2'	Dark clay
189	190	1'	Coal
190	192	2'	Dirty coal
192	195	3'	Sandrock

REMARKS:

None.

LOCATION NO. 36

LOCATION: 1,190 feet W. and 110 feet N. of S¼ corner sec. 23.

SURFACE ELEVATION: 8,177.5 (Mine map).

ELEVATION TOP COAL: 8,041.5.

THICK. COAL: 32 feet (136 to 168 feet, inclusive).

FROM	TO	THICK.	DESCRIPTION
0	3	3'	Surface
3	8	5'	Sandrock
8	15	7'	Light clay
15	35	20'	Sandrock
35	37	2'	Blue clay
37	38	1'	Sandrock
38	46	8'	Hard clay
46	55	9'	Fine sandrock
55	57	2'	Light clay
57	72	15'	Sandrock
72	115	43'	Dark clay
115	116	1'	Gray sandrock
116	118	2'	Dark shale
118	119	1'	Blue sandrock
119	120	1'	Light clay
120	126	6'	Dark clay
126	130	4'	Hard rock
130	131	1'	Dark clay
131	132	1'	Gray sandrock
132	133	1'	Soft dirty coal
133	135	2'	Light clay
135	136	1'	Dark clay
136	142	6'	Coal
142	144	2'	Soft dirty coal
144	150	6'	Coal
150	152	2'	Dark clay
152	155	3'	Coal
155	156	1'	Soft dirty coal
156	168	12'	Coal
168	170	2'	Light clay
170	172	2'	Hard sandrock

REMARKS:

None.

LOCATION NO. 37

LOCATION: 1,260 feet E. and 130 feet N. of SW corner sec. 23.

SURFACE ELEVATION: 8,176.0

ELEVATION TOP COAL: 8,073.0

THICK. COAL: 33 feet (103 to 136 feet, inclusive).

FROM	TO	THICK.	DESCRIPTION
0	6	6'	Surface
6	9	3'	Brown shale
9	12	3'	Hard rock
12	19	7'	Hard gray sandrock
19	22	3'	Light clay
22	24	2'	Brown shale
24	25	1'	Dark clay
25	27	2'	Brown clay
27	30	3'	Dark clay
30	32	2'	Light clay
32	36	4'	Brown shale
36	38	2'	Soft blue sandrock
38	41	3'	Brown shale
41	43	2'	Blue clay
43	46	3'	Brown sandy shale
46	48	2'	Gray sandrock
48	50	2'	Blue clay
50	53	3'	Blue sandrock
53	54	1'	Brown shale
54	58	4'	Gray sandrock
58	68	10'	Dark brown shale
68	94	26'	Dark clay
94	96	2'	Hard blue sandrock
96	99	3'	Hard light clay
			4" hardrock at 98' 8"
99	100	1'	Soft dirty coal
100	101	1'	Light clay
101	102	1'	Soft dirty coal
102	103	1'	Light clay
103	109	6'	Coal
109	110	1'	Soft dirty coal
110	111	1'	Coal
111	112	1'	Dark clay
112	116	4'	Coal
116	117	1'	Sand
117	118	1'	Dirty coal
118	119	1'	Light clay
119	124	5'	Coal
124	125	1'	Light clay
125	127	2'	Coal

LOCATION NO. 37 (Con't.)

FROM	TO	THICK.	DESCRIPTION
127	128	1'	Light clay
128	130	2'	Coal
130	131	1'	Dark clay
131	136	5'	Coal
136	138	2'	Light clay

REMARKS:

None.

LOCATION NO. 38

LOCATION: 885 feet E. and 160 feet N. of SW corner sec. 23.

SURFACE ELEVATION: 8,177.9 (Mine map).

ELEVATION TOP COAL:

THICK. COAL:

FROM	TO	THICK.	DESCRIPTION
0	3	3'	Surface
3	16	13'	Soft gray sandrock
16	26	10'	Light clay
26	34	8'	Soft gray sandrock
34	35	1'	Hard blue sandrock
35	38	3'	Gray sandrock

REMARKS:

This hole was not drilled deep enough to reach the coal. Reference to the structure contour map on the top of the coal indicates that the altitude of the top of the coal at this place is about 8,110 feet or 30 feet below the bottom of the hole.

LOCATION NO. 39

LOCATION: 580 feet E. and 170 feet N. of SW Corner sec. 23.

SURFACE ELEVATION: 8,165.7 (Mine map).

ELEVATION TOP COAL: 8,137 (?) as reported on Mine map.

THICK. COAL: 17 feet (29 to 47 feet, inclusive).

FROM	TO	THICK.	DESCRIPTION
0	3	3'	Surface
3	7	4'	Light clay
7	15	8'	Brown shale, light clay mixed
15	17	2'	Light clay
17	19	2'	Dark clay
19	22	3'	Hard blue clay
22	24	2'	Dark clay
24	25	1'	Soft dirty coal
25	26	1'	Light clay
26	27	1'	Dark clay
27	29	2'	Coal shale and slate
29	35	6'	Coal
35	37	2'	Hard dirty coal
37	38	1'	Coal
38	40	2'	Dark clay
40	42	2'	Coal
42	43	1'	Dark clay
43	47	4'	Coal
47	51	4'	Light clay
51	53	2'	Dark clay
53	55	2'	Hard sandrock

REMARKS:

The mine map reports the top of coal in this hole at altitude 8,136.7 feet or at a depth of 29 feet. There is reason to believe that this is not the true top of the bed. The base of the bed is distinct at a depth of 47 feet, and the underlying section is normal. Applying the average thickness of 33 feet or coal to the altitude of the base, the altitude of the top becomes 8,152 feet. This elevation is 14 feet below the surface. The "bedded" character of the section above 29 feet is of interest in illustrating how a normal coal section can be replaced by soil, alluvium, and mantle rock in stratified layers. Soil creep is probably responsible.

LOCATION NO. 40

LOCATION: 265 feet E. and 175 feet N. of SW. corner sec. 23.

SURFACE ELEVATION: 8,160.0 (Mine map).

ELEVATION TOP COAL: 8,151.0 (Restored).

THICK. COAL: 23 feet (19 to 42 feet, inclusive).

FROM	TO	THICK.	DESCRIPTION
0	5	5'	Surface
5	7	2'	Brown shale
7	9	2'	Hard rust colored shale
9	10	1'	Light clay
10	12	2'	Brown shale
12	15	3'	Light clay
15	19	4'	Dark clay
19	22	3'	Coal
22	23	1'	Soft dirty coal
23	24	1'	Hard bony coal
24	25	1'	Light clay
25	34	9'	Dark clay
34	35	1'	Hard slate
35	38	3'	Light clay
38	39	1'	Bony coal
39	42	3'	Dirty coal
42	47	5'	Dark clay
47	48	1'	White sand
48	51	3'	Hard gray sandrock

REMARKS:

This log illustrates the same condition as No. 39. The elevation of the present land surface is very near that of the original top of the coal. Using 33 feet for the thickness of the coal and measuring up from the base, which is quite definite at 42 feet, the restored altitude of the top is 8,151 feet. The 5 feet of dark clay (42 to 47 feet) and the sandstone (47 to 51 feet) correspond to the beds below the coal in the log of No. 26.

LOCATION NO. 41

LOCATION: 260 feet E. and 470 feet N. of SW. corner sec. 23.

SURFACE ELEVATION: 8,172.7 (Mine map).

ELEVATION TOP COAL: 8,155.

THICK. COAL: 27 feet (19 to 46 feet, inclusive).

FROM	TO	THICK.	DESCRIPTION
0	5	5'	Surface
5	11	6'	Brown clay
11	15	4'	Light clay
15	18	3'	Dark clay
18	19	1'	Hard brown shale
19	20	1'	Dirty coal
20	21	1'	Hard brown shale
21	24	3'	Dark clay
24	25	1'	Dirty coal
25	26	1'	Brown shale
26	30	4'	Coal
30	31	1'	Brown shale
31	33	2'	Dirty coal
33	34	1'	Light clay
34	38	4'	Dirty coal
38	40	2'	Brown shale
40	44	4'	Coal
44	45	1'	Light clay
45	46	1'	Coal
46	47	1'	Dark clay
47	48	1'	Light clay
48	55	7'	Dark clay
55	58	3'	Light clay

REMARKS:

Near outcrop. Bed is apparently much weathered. Found wooden stake in field at P.T. station 421 (1934).

LOCATION NO. 42

LOCATION: Unknown.

SURFACE ELEVATION:

ELEVATION TOP COAL:

THICK. COAL:

FROM	TO	THICK.	DESCRIPTION
0	4	4'	Surface
4	34	30'	Gray sandrock
34	37	3'	Light clay
37	42	5'	Dark clay
42	43	1'	Hard sandrock
43	53	10'	Light clay
53	58	5'	Dark clay
58	59	1'	Hard sandrock
59	68	9'	Light clay

REMARKS:

This section is thought to be above the coal in the Moore mine No. 1 block, but this is only our opinion. The precise stratigraphic horizon can not be recognized.

LOCATION NO. 43

LOCATION: Unknown.

SURFACE ELEVATION:

ELEVATION TOP COAL:

THICK. COAL:

FROM	TO	THICK.	DESCRIPTION
0	3	3'	Surface
3	12	9'	Red sandrock
12	13-6	1' 6"	Hard rock
13-6	23	9' 6"	Gray sandrock
23	24	1'	Hard rock

REMARKS:

This section is thought to be above the coal in the Moore mine No. 1 block, but this is only our opinion. The precise stratigraphic horizon can not be recognized. The "Red Sandrock" from 3 to 12 feet has been observed in other sections as No. 44 and No. 45, but it has not been identified at the surface.

LOCATION NO. 44

LOCATION: Unknown.

SURFACE ELEVATION:

ELEVATION TOP COAL:

THICK. COAL: 24 feet (84 to 108 feet, inclusive).

FROM	TO	THICK.	DESCRIPTION
0	3		Surface
3	4	1'	Red sandrock
4	30	26'	Gray sandrock
30	32	2'	Hard rock
32	35	3'	Blue sandrock
35	40	5'	Fire clay
40	43	3'	Gray sandrock
43	45	2'	Dark clay
45	47	2'	Gray sandrock
47	58	11'	Dark clay
53		6"	Hard rock
58	59	1'	Hard sandrock
59	61	2'	Light clay
61	70	9'	Dark clay
68			Trace of coal
70	77	7'	Light clay
77	81	4'	Dark clay
81	84	3'	Light clay
84	87	3'	Dirty coal
87	97	10'	Coal
97	98	1'	Dark clay
98	103	5'	Bony coal
103	107	4'	Coal
107	108	1'	Dirty coal
108	109	1'	Light clay
109	111	2'	Dark clay
111	112	1'	Hard sandrock

REMARKS:

At P.T. station 378 (1934), a wooden stake was marked "Old #90. New #44". This location is 1,970 feet E. and 685 feet N. of W¼ corner sec. 26. However, the depth to the top of the coal at this place is much less than the 84 feet given in the log. Hence, it is probably not the new No. 44. The log section has the appearance of other logs in the neighborhood of the stripping pit.

LOCATION NO. 45

LOCATION: Unknown.

SURFACE ELEVATION:

ELEVATION TOP COAL:

THICK. COAL: 22 feet.

FROM	TO	THICK.	DESCRIPTION
0	2	2'	Surface
2	5	3'	Gray sandrock
5	12	7'	Red sandrock
12	17	5'	Light clay
17	27	10'	Gray sandrock
27	34	7'	Dark clay
34	34-6	6"	Hard sandrock
34-6	47	12' 6"	Dark clay
47	48	1'	Dirty coal
48	55	7'	Light clay
55	60	5'	Dark clay
60	62	2'	Hard rock
62	75	13'	Light clay
75	89	14'	White sandrock
89	93	4'	Hard sandrock
93	94	1'	Dirty coal
94	95	1'	Brown shale
95	105	10'	Coal
105	106	1'	Light clay
106	117	11'	Coal
117	119	2'	Brown shale
119	120	1'	Hard sandrock

REMARKS:

This log section, particularly the lower part, bears some resemblance to the strata in the vicinity of the stripping pit.

LOCATION NO. 46

LOCATION: Unknown.

SURFACE ELEVATION:

ELEVATION TOP COAL:

THICK. COAL: 32 feet (70 to 102 feet, inclusive).

FROM	TO	THICK.	DESCRIPTION
0	3	3'	Surface
3	12	9'	Gray sandrock
12	14	2'	Dark clay
14	20	6'	Gray sand
20	44	24'	Dark clay
44	45	1'	Dirty coal
45	50	5'	Light clay
50	51	1'	Sandrock
51	58	7'	Dark clay
58	62	4'	Hard sandrock
62	66	4'	Light clay
66	70	4'	Brown shale
70	71	1'	Dirty coal
71	72	1'	Brown shale
72	73	1'	Dirty coal
73	75	2'	Brown shale
75	78	3'	Coal
78	80	2'	Light clay
80	81	1'	Coal
81	82	1'	Light clay
82	83	1'	Dark clay
83	85	2'	Dirty coal
85	94	9'	Coal
94	97	3'	Sandy clay
97	100	3'	Coal
100	101	1'	Light clay
101	102	1'	Coal
102	104	2'	Brown shale

REMARKS:

The coal in this section is either very dirty, much weathered, or poorly logged. One would not expect weathering at a depth of 70 feet, however.

LOCATION NO. 47

LOCATION: 200 feet E. and 1,110 feet N. of SW. corner sec. 24.

SURFACE ELEVATION: 8,223.6 (Mine map).

ELEVATION TOP COAL: 8,021.

THICK. COAL: 43 feet (203 to 246 feet, inclusive). Corrected measurement.

FROM	TO	THICK.	DESCRIPTION
0	5	5'	Surface
5	7	2'	Brown shale
7	23	16'	Clay
23	24	1'	Hard sandrock
24	25	1'	Light clay
25	26	1'	Dark clay
26		3' 4"	Coal
26	27	1'	Light clay
27	30	3'	Coal shale
30	31	1'	Dark clay
31	38	7'	Coal
38	42	4'	Hard coal
42	49	7'	Light clay
49	52	3'	Coal
52	55	3'	Dirty coal
55	57	2'	Coal
57	59	2'	Dark clay
59	64	5'	Light clay
64	65	1'	Dark clay
65	67	2'	Dirty coal
67	72	5'	Light clay
72	73	1'	Hard gray sandrock
73	76	3'	Dark clay
76	79	3'	Light clay
79	80	1'	Coa l
80	81	1'	Hard sandrock
81	83	2'	Coal
83	85	2'	Soft dirty coal
85	88	3'	Light clay
83		6"	Hard sandrock
88	99	11'	Dark clay
99	105	6'	Dirty coal
105	115	10'	Light clay
108- 111-113			Streaks dirty coal

LOCATION NO. 47 (Con't.)

FROM	TO	THICK.	DESCRIPTION
115	117	2'	Hard sandrock
117	119	2'	Light clay
119	120	1'	Dirty coal
120	122	2'	Dark clay
122	124	2'	Light clay
124	125	1'	Coal
125	126	1'	Light clay
126	130	4'	Hard clay sandrock
130	151	21'	Light clay hard
125	151		Streaks of dark brown shale
151	152	1'	Hard brown shale
152	153	1'	Soft dirty coal
153	159	6'	Light clay
159	163	4'	Dark clay
163	164	1'	Hard rock
164	165	1'	Dark clay
165	166	1'	Dirty coal
166	179	13'	Clay, streaks dirty coal
179	181	2'	Hard sandrock
181	184	3'	White clay
184	185	1'	Dirty coal
185	187	2'	White clay
187	188	1'	Hard sandrock
188	192	4'	Light clay
192	193	1'	Coal
193	194	1'	Light clay
194	237	43'	Coal
237	239	2'	Clay

REMARKS:

This hole starts in the Moore Mine No. 1 block, above the bed of brown carbonaceous shale used as a marked bed. There is a possibility that the "Coal shale" at 27 feet marks the top of this bed. Hence, the "coal" reported to 57 feet is probably carbonaceous shale. The thickness of this bed at the surface is 25 feet, while that in the log is 30 feet, no corrections being made for dip. Surface observations indicate a fairly steep dip, and the top of the bed is obscured. For this reason, it is not easy to project it into the bore hole. The fact that it occurs at so shallow a depth suggests the unreliability of surface dips. If the above correlation is correct, the interval from the top of the carbonaceous shale marker bed to the top of the coal is 176 feet.

LOCATION NO. 48

LOCATION: 210 feet E. and 1,220 feet N. of SW. corner sec. 24.

SURFACE ELEVATION: 8,223.1 (Mine map).

ELEVATION TOP COAL: 8,011.1.

THICK. COAL: 86 feet (212 to 298 feet, inclusive. Corrected measurement).

FROM	TO	THICK.	DESCRIPTION
0	4	4'	Surface
4	30	26'	Clay
26 and 28			Streaks of coal
30	31	1'	Hard sandrock
31	44	13'	Clay
39 6"			Hard sandrock
40			Streak of coal
44	47	3'	Coal shale
47	48	1'	Hard sandrock
48	55	7'	Coal
55	56	1'	Hard sandrock
56	57	1'	Brown shale
57	62	5'	Clay
62	67	5'	Coal
67	72	5'	Dirty coal
72	79	7'	Clay
79	80	1'	Coal
80	81	1'	Hard rock
81	91	10'	Clay
91	95	4'	Coal
95	101	6'	Clay
101	102	1'	Hard sandrock
102	103	1'	Dirty coal
103	112	9'	Clay
112	113	1'	Hard sandrock
113	116	3'	Coal
116	117	1'	Dark clay
117	127	10'	Light clay
127	128	1'	Hard sandrock
128	132	4'	Light clay
132			Streak of coal
132	137	5'	Dark clay
137	141	4'	Light clay

LOCATION NO. 49

LOCATION: 212 feet E. and 1,320 feet N. of SW. corner sec. 24.

SURFACE ELEVATION: 8,220.5.

ELEVATION TOP COAL: 7,985.

THICK. COAL: 50 feet plus (235 to 285 feet, inclusive. Corrected measurement).

FROM	TO	THICK.	DESCRIPTION
0	4	4'	Surface
4	14	10'	Light clay
14	17	3'	Coal shale
17	20	3'	Light clay
20	23	3'	Hard sandrock
23	33	10'	Light clay
33	34	1'	Sandrock
34	50	16'	Clay
50	51	1'	Coal shale
51	60	9'	Coal shale and clay
60	64	4'	Coal
64	66	2'	Light clay
66	68	2'	Hard sandrock
68	72	4'	Light clay
72	75	3'	Coal
75	76	1'	Dark clay
76	77	1'	Hard sandrock
77	79	2'	Dark clay
79	84	5'	Coal shale
84	88	4'	Light clay
88	92	4'	Dark clay
92	98	6'	Light clay
98	102	4'	Coal
102	103	1'	Dark clay
103	118	15'	Light clay
118	119	1'	Dirty coal
119	120	1'	Sandrock
120	124	4'	Bony coal
124	125	1'	Dark clay
125	127	2'	Light clay
127	128-6	1' 6"	Extra hard sandrock
128-6	132	3' 6"	Light clay
132	134	2'	Bony coal
134	138	4'	White clay
138	140	2'	Dirty coal
140	145	5'	Dark clay

LOCATION NO. 49 (Con't.)

FROM	TO	THICK.	DESCRIPTION
145	157	12'	White clay
148	150		Streaks of sandrock
157	159	2'	Extra hard rock
159	161	2'	Light clay
161	162	1'	Dark clay
162	165	3'	Light clay
165	166	1'	Hard sandrock
166	179	13'	Light clay
179	181	2'	Coal
181	183	2'	Dark clay
183	186	3'	Light clay
186	187	1'	Coal shale
187	197	10'	Dark clay
197	198	1'	White sandy clay
198	199	1'	Hard rock
199	200	1'	White sandy clay
200	202	2'	Dark clay
202	206	4'	White clay
206	207	1'	Coal
207	209	2'	White sandy clay
209	211	2'	Light gray sandrock
211	213	2'	White clay
213	217	4'	Gray sandrock
217	218	1'	Light clay
218	219	1'	Hard brown shale
219	221	2'	White sandy shale
221	222	1'	Dark clay
222	227	5'	Coal
227	228	1'	Dark clay
228	241	13'	Coal
241	242	1'	Dark clay
242	270	28'	Coal

REMARKS:

LOCATION NO. 50

LOCATION: Uncertain.

SURFACE ELEVATION:

ELEVATION TOP COAL: 8,171 (?).

THICK. COAL: 33 feet (8 to 41 feet, inclusive).

FROM	TO	THICK.	DESCRIPTION
0	2	2'	Surface
2	8	8'	Light clay
8	9	1'	Light clay and dirty coal
9	10	1'	Light clay
10	11	1'	Mixed dark clay, dark shale and dirty coal
11	16	5'	Coal
16	17	1'	Dirty coal
17	40	23'	Coal
40	41	1'	Dirty coal
41	45	4'	Clay

REMARKS:

The mine map shows a point 1,670 feet E. and 1,030 feet N. of W¼ corner section 26, but there is no CDH symbol. This may be the location of this log, since the original amount of cover is of the right order. However, the original land surface has been destroyed by stripping. P.T. station 379 (1934), whose surface elevation is 8,179 feet, falls about 75 feet NE of the point referred to. Assuming the ground elevation at both places to be the same, the estimated altitude of the top of the coal is 8,171 feet. This requires putting the top of the coal at 8 feet in the log. The reason for using 8 rather than 11 feet is that the latter results in a figure structurally low.

LOCATION NO. 51

LOCATION: Uncertain.

SURFACE ELEVATION:

ELEVATION TOP COAL:

THICK. COAL: 28 feet (9 to 37 feet, inclusive).

FROM	TO	THICK.	DESCRIPTION
0	5	5'	Light clay
5	6	1'	Light clay and coal shale
6	9	3'	Light brown shale
9	11	2'	Bony coal
11	37	26'	Coal
37	40	3'	Clay

REMARKS:

The mine map indicates a point 1,580 feet E. and 985 feet N. of W¼ corner section 26, but there is no CDH symbol. The original surface at this place has been destroyed by stripping. The point marked "51" falls about midway between P.T. stations 379 and 400 (1934), and the interpolated surface elevation is about 3,177 feet. It seems obvious that the upper part of the bed has been weathered and that the cover is mantle rock. Using 33 feet as the thickness of the bed and measuring up from the base, the estimated elevation of the top is 8,184 feet.

LOCATION NO. 52

LOCATION: Uncertain.

SURFACE ELEVATION:

ELEVATION TOP COAL: 8,182 (?).

THICK. COAL: 10.5 feet (7.5 to 18 feet, inclusive).

FROM	TO	THICK.	DESCRIPTION
0	5	5'	Light clay
5	6	1'	Coal shale
6	7-6	1' 6"	Light clay
7-6	17	9' 6"	Coal
17	18	1'	Dirty coal
18	27	9'	Clay

REMARKS:

The mine map shows a point marked "52" 1,405 feet E. and 910 feet N. of W¼ corner of section 26, but there is no CDH symbol. The original surface has been destroyed by mining operations and the locality is now in the gob pile, elevation 8,175 feet. Point "52" falls very near P.T. station 400 (1934), 1,395 feet E. and 910 feet N. of W¼ corner section 26, and was on the apparent top of the coal at altitude 8,175 feet. No sign of a core drill hole was noted in the vicinity of station 400.

According to surface mapping, the top of the coal stands at 8,175 feet near this point. However, using the average thickness of 33 feet and measuring up from the base of the bed, the top falls at 8,182 feet. Either there has been slump, or the point selected as the top is not the true top. 8,182 feet was used as the elevation of the top of the bed in preparing the structure contour map.

LOCATION NO. 53

LOCATION: Uncertain.

SURFACE ELEVATION:

ELEVATION TOP COAL:

THICK. COAL:

FROM	TO	THICK.	DESCRIPTION
0	5	5'	Light clay
5	6	1'	Coal shale
6	11	5'	Bony coal
11	21	10'	Clay

REMARKS:

The mine map shows a point marked "53" 1,320 feet E. and 870 feet N. of W¼ corner of section 26, but there is no CDH symbol. The original surface at this place has been destroyed. P.T. stations 400 and 401 (1934) fall, respectively, to the NE and NW of this point. Both are on the apparent top of the coal, the surface beds having been stripped. Their elevations are: 400, 8,175 feet; 401, 8,170 feet; and are structurally low. Only the basal part of the bed remains, the rest having eroded. This log was not used in preparing the structure contour map of section 26.

LOCATION NO. 54

LOCATION: Uncertain.

SURFACE ELEVATION:

ELEVATION TOP COAL:

THICK. COAL:

FROM	TO	THICK.	DESCRIPTION
0	7	7'	Light clay
7			Coal blossom
7	17	10'	Dark clay
17	20	3'	Bony coal
20	27	7'	Clay

REMARKS:

The mine map shows a point marked "54" 1,230 feet E. and 820 feet N. of W¼ corner of section 26, but there is no CDH symbol. Although the original surface has been covered with the gob pile, a fragment remained in 1934 at P.T. station 402. Surface elevation was 8,169. If the original surface at point "54" was the same as that at station 402, the elevation of the base of the bed would be 8,149, and that of the top 8,182. This checks the restored elevation at P.T. station 403 to 1.0 foot. Only the lower 3 feet of the coal bed remains, and approximately 30 feet has been removed by erosion. This log was not used in preparing the structure contour map of the strip pit area in section 26.

LOCATION NO. 55

LOCATION:

SURFACE ELEVATION:

ELEVATION TOP COAL:

THICK. COAL:

FROM	TO	THICK.	DESCRIPTION
0	4"	4'	Clay
4"	3'	2' 8"	Coal
3	6	3'	Clay
6	7	1'	Sandrock
7	11	4'	Clay
11	16	5'	Brown shale
16	18	2'	Light clay

REMARKS:

The mine map shows a point marked "55" 1,140 feet E. and 770 feet N. of W¼ corner of section 26, but there is no CDH symbol. The original surface at this place has been covered with the gob pile. At P.T. station 396 (1934), about 170 feet NW, the altitude of the original surface is 8,185 feet. At point "55", the original surface evidently was higher for the ground slopes westward into a wash, but it probably did not exceed 8,190. Using a surface elevation of 8,187, the base of the coal would fall at 8,184 feet, and the restored top at 8,217 feet.

Point "55" is very near the base of the bed, and the sandstone cropping out at P.T. stations 257 and 396 (1934) is probably the 1-foot bed drilled at 6 feet.

LOCATION NO. 56

LOCATION:

SURFACE ELEVATION:

ELEVATION TOP COAL:

THICK. COAL:

FROM	TO	THICK.	DESCRIPTION
0	2	2'	Brown shale
2	3	1'	Sandrock
3	5	2'	Light clay
5	13	8'	Brown shale
13	14	1'	Light clay
14	20	6'	Brown shale

REMARKS:

The mine map shows a point marked "56" 1,187 feet E. and 695 feet N. of $\frac{7}{4}$ corner of section 26, but there is no CDH symbol. The original surface is covered with the gob pile, and the elevation is not determinable.

This hole starts below the base of the coal bed. The sandrock from 2 to 3 feet is probably the same bed as that from 6 to 7 feet in the log of hole No. 55.

Log No. 56 was not used in preparing the structure contour map of the strip mine in section 26.

LOCATION NO. 57

LOCATION: Uncertain.

SURFACE ELEVATION:

ELEVATION TOP COAL:

THICK. COAL:

FROM	TO	THICK.	DESCRIPTION
0	2	2'	Brown shale
2	5	3'	Clay
5	11	6'	Coal
11	20	9'	Clay

REMARKS:

There is a point marked "57" on the mine map 1,270 feet E. and 725 feet N. of W¼ corner of section 26, but there is no CDH symbol. The original surface is covered with the gob pile and its elevation is not determinable. The hole starts near the base of the bed, and at least 27 feet of coal has been eroded. Note that the thin sand 3 feet below base of coal at holes 55 and 56 was not logged. This variability of lithologic units within short distances is typical.

Log No. "57" was not used in preparing the structure contour map of the pit.

LOCATION NO. 58

LOCATION: 1,360 feet E. and 775 feet N. of W¼ corner of sec. 26.

SURFACE ELEVATION:

ELEVATION TOP COAL:

THICK. COAL:

FROM	TO	THICK.	DESCRIPTION
0	4	4'	Light clay
4	6	2'	Streaks coal and clay
6	11	5'	Light clay
11	13	2'	Dark clay
13	14	1'	Light clay
14	16	2'	Dark clay, streaks of coal shale
16	22	6'	Coal
22	32	10'	Light clay

REMARKS:

Surface elevation not determinable. Original ground surface stripped and covered with gob pile. Only 6 feet of the basal part of the bed remains. Note how upper part of bed has been replaced with some 16 feet of stratified mantle rock. The thin sandstone just below the base of the coal was not recognized in this hole.

Not used in structure contour map of pit area.

LOCATION NO. 59

LOCATION: 1,450 feet E. and 813 feet N. of W¼ corner of sec. 26.

SURFACE ELEVATION:

ELEVATION TOP COAL:

THICK. COAL:

FROM	TO	THICK.	DESCRIPTION
0	5	5'	Light clay
5	14	9'	Coal
14	16	2'	Bony coal
16	17	1'	Dark coal
17	21	4'	Light clay
18			Streak of coal

REMARKS:

Surface elevation not determinable. Original surface has been stripped and covered with gob pile, but it must have been higher than 8,175 feet. A thickness of at least 12 feet of coal is indicated, but it is much weathered. Since the base of the bed was not drilled, it is impossible to say how much coal has been eroded.

This log was not used in preparing the structure contour map of the pit area.

LOCATION NO. 60

LOCATION: 1,540 feet E. and 863 feet N. of W¼ corner of sec. 26.

SURFACE ELEVATION:

ELEVATION TOP COAL:

THICK. COAL:

FROM	TO	THICK.	DESCRIPTION
0	3	3'	Light clay
3	4	1'	Dark clay
4	26	22'	Coal
26	27	1'	Dirty coal
27	30	3'	Light clay

REMARKS:

Surface elevation not determinable. Original ground destroyed by stripping. Twenty-three feet of coal is present, and at least 10 feet has been removed by erosion.

This log was not used in preparing the structure contour map of the pit area.

LOCATION NO. 61

LOCATION: 1,622 feet E. and 910 feet N. of W¼ corner of sec. 26.

SURFACE ELEVATION:

ELEVATION TOP COAL:

THICK. COAL: 32 feet (7 to 24 feet, inclusive).

FROM	TO	THICK.	DESCRIPTION
0	4	4'	Light brown shale
4			Streaks of dirty coal
4	7	3'	Mixed light and dark clay
7	14	7'	Coal
14	15	1'	Dark clay and dirty coal
15	39	24'	Coal
39	40	1'	Dark clay
40	42	2'	Light clay

REMARKS:

Surface elevation not determinable. Original ground destroyed by stripping.

The entire bed was probably drilled in this hole. Since the top was within 6 or 7 feet of the original surface, the upper part was affected by weathering.

LOCATION NO. 62

LOCATION: 1,724 feet E. and 965 feet N. of W¼ corner of sec. 26.

SURFACE ELEVATION: 8,179.5 (Mine map).

ELEVATION TOP COAL: 8,165.

THICK. COAL: 31 feet (15 to 46 feet, inclusive).

FROM	TO	THICK.	DESCRIPTION
0	4	4'	Light sandy clay
4	7	3'	Soft gray sandrock
7	8	1'	Light brown shale
8	12	4'	Light clay
12	13	1'	Coal shale
13	14	1'	Light clay
14			Streaks of coal
14	15	1'	Dark clay
15	22	7'	Coal
22	23	1'	Soft dirty coal
23	29	6'	Coal
29	30	1'	Clay
30	46	16'	Coal
46	47	1'	Dark clay
47	50	3'	Light clay

REMARKS:

Practically the entire bed is represented in this log, but the upper three feet (12 to 15 feet) are modified by weathering.

LOCATION NO. 63

LOCATION: 1,813 feet E. and 990 feet N. of NW¼ corner sec. 26.

SURFACE ELEVATION: 8,180 (topographic map).

ELEVATION TOP COAL: 8,161.

THICK. COAL: 32 feet (19 to 51 feet, inclusive).

FROM	TO	THICK.	DESCRIPTION
0	5	5'	Light clay
5	14	9'	Brown shale
14	19	5'	Light clay
19	20	1'	Dirty coal
20	27	7'	Coal
27	28	1'	Dirty coal
28	51	23'	Coal
51	54	3'	Clay
54	55	1'	Hard sand

REMARKS:

None.

LOCATION NO. 64

LOCATION: 1,900 feet E. and 1,020 feet N. of W¼ corner of sec. 26.

SURFACE ELEVATION: 8,130.5 (Mine map).

ELEVATION TOP COAL: 8,157.

THICK. COAL: 30 feet (23 to 53 feet, inclusive).

FROM	TO	THICK.	DESCRIPTION
0	5	5'	Light clay
5	9	4'	Brown shale
9	15	6'	Light clay
15	17	2'	Soft sandrock
17	21	4'	Light clay
21	23	2'	Dark clay with streaks of coal
23	30	7'	Coal
30	32	2'	Dark clay
32	53	21'	Coal
53	57	4'	Dark clay
57	59	2'	Dirty coal
59	63	4'	Light clay

REMARKS:

Top and base of bed not well defined.

LOCATION NO. 65

LOCATION: 1,990 feet E. and 1,082 feet N. of W½ corner sec. 26.

SURFACE ELEVATION: 8,186 (topographic map).

ELEVATION TOP COAL: 8,160.

THICK. COAL: 32 feet (26 to 58 feet, inclusive).

FROM	TO	THICK.	DESCRIPTION
0	19	19'	Light clay
19	26	7'	Fine, soft, gray sand
26	31	5'	Streak of coal
31	32	1'	Dark clay
32	37	5'	Coal
37	39	2'	Dark clay
39	58	19'	Coal
58	59	1'	Dark clay
59	62	3'	Light clay

REMARKS:

None.

LOCATION NO. 66

LOCATION: 2,069 feet E. and 1,140 feet N. of W¼ corner sec. 26.

SURFACE ELEVATION: 8,185.0 (topographic map).

ELEVATION TOP COAL: 8,145.0.

THICK. COAL: 26 feet (42 to 68 feet, inclusive).

FROM	TO	THICK.	DESCRIPTION
0	2	2'	Dark clay
2	4	2'	Light clay
4	7	3'	Soft gray sand
7	10	3'	Hard gray sandrock
10	19	9'	Soft gray sandrock
19	34	15'	Light clay
34	40	6'	Fine, soft, gray sand
40	42	2'	Dark clay, streaks of coal
42	48	6'	Coal
48	50	2'	Clay
50	66	16'	Coal
66	68	2'	Dirty coal
68	70	2'	Light clay
70	72	2'	Dark clay

REMARKS:

Top of bed indistinct in interval 40-42 feet. For purposes of structure mapping, top was placed at 40 feet.

LOCATION NO. 67

LOCATION: 2,115 feet E. and 1,040 feet N. of W¼ corner sec. 26.

SURFACE ELEVATION: 8,188.0 (topographic map).

ELEVATION TOP COAL: 8,149.0.

THICK. COAL: 25 feet (39 to 64 feet, inclusive).

FROM	TO	THICK.	DESCRIPTION
0	3	3'	Light clay
3	18	15'	Soft gray sand
18	30	12'	Light clay
30	37	7'	Soft gray sand
37	39	2'	Light clay
39	45	6'	Coal
45	49	4'	Dark and dirty clay
49	61	12'	Coal
61	62	1'	Dark clay and dirty coal
62	63	1'	Light clay
63	64	1'	Coal
64	65	5'	Light clay

REMARKS:

None.

LOCATION NO. 68

LOCATION: 2,023 feet E. and 1,000 feet N. of W¼ corner of sec. 26.

SURFACE ELEVATION: 8,189.0 (topographic map).

ELEVATION TOP COAL: 8,155.0.

THICK. COAL: 30 feet (34 to 64 feet, inclusive)

FROM	TO	THICK.	DESCRIPTION
0	2	2'	Dark clay
2	5	3'	Light clay
5	6	1'	Gray sand (soft)
6	21	15'	Light clay
21	26	5'	Dark clay
26	34	8'	Soft gray sand
34			Streak of coal
34	36	2'	Dark clay
36	42	6'	Coal
42	43	1'	Dark clay
43	64	21'	Coal
64	67	3'	Clay

REMARKS:

None.

LOCATION NO. 69

LOCATION: 1,936 feet E. and 945 feet N. of W¼ corner sec. 26.

SURFACE ELEVATION: 8,189 (?)

ELEVATION TOP COAL: 8,161 (?)

THICK. COAL: 30 feet (27 to 57 feet, inclusive)

FROM	TO	THICK.	DESCRIPTION
0	3	3'	Yellow clay
3	5	2'	Shale
5	7	2'	Yellow clay
7	20	13'	Yellow clay
20	21	1'	White sand
21	24	3'	Gray sand
24	27	3'	Slate
27	28	1'	Coal
28	30	2'	Slate
30	57	27'	Coal
57	58	1'	Dirty brown clay

REMARKS:

Original surface disturbed by road grade. Elevation 8,189.0 approximately, from topographic map.

LOCATION NO. 70

LOCATION: 1,850 feet E. and 900 feet N. of W¼ corner of sec. 26.

SURFACE ELEVATION: 8,190.0 (Topographic map).

ELEVATION TOP COAL: 8,161.0.

THICK. COAL: 29 feet + (entire thickness not drilled).

FROM	TO	THICK.	DESCRIPTION
0	3	3'	Yellow clay
3	7	4'	Yellow clay
7	9	2'	Shale
9	21	12'	Shale
21	24	3'	Gray sand
24	27	3'	Dark brown sand
27	28	1'	Coal
28	29	1'	Sand rock
29	58	29'	Coal

REMARKS:

None.

LOCATION NO. 71

LOCATION: 1,765 feet E. and 855 feet N. of W¼ corner of sec. 26.

SURFACE ELEVATION: 8,187.0 (?)

ELEVATION TOP COAL: 8,164.0 (?)

THICK. COAL: 28 feet (23 to 51 feet, inclusive).

FROM	TO	THICK.	DESCRIPTION
0	4	4'	Yellow clay
4	7	3'	Shale
7	11	4'	Yellow clay
11	17	6'	White sand
17	23	6'	Dark brown clay
23	51	28'	Coal
51	54	3'	Dark brown clay

REMARKS:

The original ground surface has been destroyed by stripping. The surface elevation given above has been estimated from the 1934 plane-table sheet.

LOCATION NO. 72

LOCATION: 1,670 feet E. and 810 feet N. of W¼ corner sec. 26.

SURFACE ELEVATION: 8,184.0 (?)

ELEVATION TOP COAL: 8,172.0 (?)

THICK. COAL: 30 feet (12 to 42 feet, inclusive).

FROM	TO	THICK.	DESCRIPTION
0	7	7'	Yellow clay
7	12	5'	Dark brown clay
12	42	30'	Coal
42	45	3'	Dark brown clay

REMARKS:

The original surface has been destroyed by stripping and the elevation is not determinable. It has been estimated as 8,184.0 feet by interpolation between P.T. stations 70 and 71 (1934).

LOCATION NO. 73

LOCATION: 1,600 feet E. and 780 feet N. of W¼ corner of sec. 26.

SURFACE ELEVATION: 8,180.0 (?).

ELEVATION TOP COAL: 8,175.0 (?).

THICK. COAL: 27 feet (5 to 32 feet, inclusive).

FROM	TO	THICK.	DESCRIPTION
0	5	5'	Dark brown clay
5	32	27'	Coal
32	36	4'	Dark brown clay

REMARKS:

The original surface has been destroyed by stripping, and the elevation is not determinable. It has been estimated to be about 8,180.0 feet from nearby points.

The 5 feet of surface formation is probably mantle rock; and the hole started just below the top of the bed.

LOCATION NO. 74

LOCATION: 1,504 feet E. and 725 feet N. of W¼ corner of sec. 26.

SURFACE ELEVATION:

ELEVATION TOP COAL: 8,180.0 (?).

THICK. COAL: 12 feet (5 to 17 feet, inclusive).

FROM	TO	THICK.	DESCRIPTION
0	5	5'	Dark brown clay
5	17	12'	Coal
17	33	16'	Dark brown clay

REMARKS:

The original surface has been destroyed by stripping and the elevation can not be recovered. P.T. station 399 (1934) is 25 feet south of this hole, and the elevation of the apparent top of the coal there is 8,180.0 feet.

It is obvious that this hole started approximately near the top of the lower third of the bed.

This log has not been used in preparing the structure contour map of the pit area.

LOCATION NO. 75

LOCATION: 1,412 feet E. and 685 feet N. of W¼ corner of sec. 26.

SURFACE ELEVATION:

ELEVATION TOP COAL:

THICK. COAL: 15 feet (4 to 19 feet, inclusive).

FROM	TO	THICK.	DESCRIPTION
0	4	4'	Dark brown clay
4	6	2'	Coal
6	13	7'	Dark brown clay
13	14	1'	Coal
14	15	1'	Dark brown clay
15	19	4'	Coal
19	23	4'	Dark brown clay
23	24	1'	Sand

REMARKS:

The original surface has been destroyed by stripping and the locality buried by the gob pile so its elevation can not be determined.

This hole started approximately in the middle of the bed, and it is evident that what coal remained was much weathered. The 1-foot sandstone bed in which hole bottomed may be the same bed as that noted at the surface at P.T. stations257 and 396 (1934).

No use was made of this log in preparing the structure contour map of the pit area.

LOCATION NO. 76

LOCATION: 1,330 feet E. and 648 feet N. of W¼ corner of sec. 26.

SURFACE ELEVATION:

ELEVATION TOP COAL:

THICK. COAL:

FROM	TO	THICK.	DESCRIPTION
0	2	2'	Yellow clay
2	4	2'	Dark brown clay
4	9	5'	Coal
9	15	6'	Dark brown clay
15	16	1'	Coal
16	19	3'	Dark brown clay
19	21	2'	Coal

REMARKS:

The original surface has been destroyed by stripping and the locality covered by the gob pile so its elevation can not be determined.

This hole evidently starts in the bed, but since it did not penetrate the base, its precise position is in doubt.

This log was not used in preparing the structure contour map of the pit area.

LOCATION NO. 77

LOCATION: Unknown.

SURFACE ELEVATION:

ELEVATION TOP COAL:

THICK. COAL: 16 feet (6 to 22 feet, inclusive).

FROM	TO	THICK.	DESCRIPTION
0	3	3'	Yellow clay
3	6	3'	Dark brown clay
6	22	16'	Coal
22	24	2'	Dark brown clay

REMARKS:

In all probability, the locality of this log is southwest of the stripping pit. The base of the bed evidently at 22 feet.

LOCATION NO. 78

LOCATION: Unknown.

SURFACE ELEVATION:

ELEVATION TOP COAL:

THICK. COAL: 16 feet (5 to 21 feet, inclusive).

FROM	TO	THICK.	DESCRIPTION
0	3	3'	Yellow clay
3	5	2'	Dark brown clay
5	21	16'	Coal
21	24	3'	Dark brown clay

REMARKS:

The locality of this log is believed to be some place southwest of the pit. The hole started near the middle of the bed and at least half has been eroded. The base of the bed is evidently at 21 feet.

LOCATION NO. 79

LOCATION: Unknown.

SURFACE ELEVATION:

ELEVATION TOP COAL:

THICK. COAL: 15 feet (4 to 19 feet, inclusive).

FROM	TO	THICK.	DESCRIPTION
0	3	3'	Yellow clay
3	4	1'	Dark brown clay
4	19	15'	Coal
19	21	2'	Dark brown clay

REMARKS:

The locality of this log is probably some place southwest of the stripping pit. The hole started near the middle of the bed, and the base is probably at 19 feet.

LOCATION NO. 80

LOCATION: Unknown.

SURFACE ELEVATION:

ELEVATION TOP COAL:

THICK. COAL:

FROM	TO	THICK.	DESCRIPTION
0	2	2'	Yellow clay
2	4	2'	Dark brown clay
4	13	9'	Coal
13	20	7'	Dark brown clay
20	21	1'	Sand
21	23	2'	Coal
23	24	1'	Dark brown clay

REMARKS:

The locality of this log is thought to be southwest of the stripping pit. It is evident that the hole started near the base of the bed and that all of the coal is highly weathered. The base of the bed may be at 23 feet.

List of logs of regular churn drill holes whose location is unknown.

The following list summarizes the unknown locations in the foregoing catalog of drill records:

LOCATION	CONTENTS
No. 6	No coal
" 13	Contains coal
" 42	No coal
" 43	No coal
" 44	Contains coal
" 45	Contains coal
" 46	Contains coal
" 77	Contains coal
" 78	Contains coal
" 79	Contains coal
" 80	Contains coal

List of regular churn drill hole locations in sec. 26, T. 7 N., R. 81 W., for which logs can not be found.

NUMBER	LOCATION	SURFACE ELEVATION
88	1,670 feet E. and 1,120 feet N. of W¼ corner section 26.	8176.1
89	1,615 feet E. and 1,210 feet N. of W¼ corner section 26.	8172.3
90	1,875 feet E. and 680 feet N. of W¼ corner section 26.	8192.6
94	2,075 feet E. and 400 feet N. of W¼ corner section 26. Elevation bottom of hole 8161.0. Note: If this hole was drilled 3 feet below base of coal, as most are, the addition of 35 feet to that elevation should give the approximate elevation of the top of the coal, 8197 feet.	8199.0
95	2,050 feet E. and 535 feet N. of W¼ corner section 26. Elevation bottom of hole 8153.0. Note: If this hole was drilled 3 feet below base of coal, as most holes are, the addition of 35 feet to that elevation should give the approximate elevation of the top of the coal, 8,189 feet.	8198.0
97	1,910 feet E. and 580 feet N. of W¼ corner section 26.	8200.0
99	1,340 feet E. and 1,330 feet N. of W¼ corner section 26.	8166.4
102	2,175 feet E. and 705 feet N. of W¼ corner of section 26.	8200.0

NUMBER	LOCATION	SURFACE ELEVATION
105	1,510 feet E. and 1,150 feet N. of W¼ corner of section 26.	8171.4
107	2,008 feet E. and 615 feet N. of W¼ corner of section 26.	8195.4
110	2,150 feet E. and 805 feet N. of W¼ corner of section 26.	8196.6
115	1,965 feet E. and 725 feet N. of W¼ corner of section 26. Note: No. 115 is apparently the highest number of the series.	8191.6

List of regular churn drill hole locations for which neither locations nor logs are available.

The following numbers are missing from the preceeding catalog and lists:

81	100
82	101
83	103
84	104
85	106
86	108
87	109
91	111
92	112
93	113
96	114
98	

APPENDIX B

Map reference same as for Appendix A.

List of churn drill hole locations, "Series N", for which logs can not be found.

Sec. 26, T. 7 N., R. 81 W.

The significance of the prefix "N" is unknown.

NUMBER	LOCATION	SURFACE ELEVATION
N 11	1,275 feet E. and 1,145 feet N. of W¼ corner section 26.	
N 13	1,160 feet E. and 1,215 feet N. of W¼ corner section 26.	8165.9
N 15	1,160 feet E. and 1,210 feet S. of NW corner section 26.	8163.7
N 18	1,100 feet E. and 1,010 feet S. of NW corner section 26.	8162.1
N 21	955 feet E. and 695 feet S. of NW corner section 26.	8164.9
N 22	970 feet E. and 600 feet S. of NW corner section 26.	8165.8
N 24	900 feet E. and 400 feet S. of NW corner section 26.	8163.8
N 25	910 feet E. and 300 feet S. of NW corner section 26.	8162.0
N 26	850 feet E. and 315 feet S. of NW corner section 26.	8159.7
N 27	860 feet E. and 220 feet S. of NW corner section 26.	8160.3
N 28	1,000 feet E. and 220 feet S. of NW corner section 26.	8163.1
N 29	1,235 feet E. and 320 feet S. of NW corner section 26.	8167.7

NUMBER	LOCATION	SURFACE ELEVATION
N 30	1,230 feet E. and 250 feet S. of NW corner section 26. Note: The data for this hole correspond to that for CDH No. 28, regular series. The two series may overlap at this place. See N 44 in following list.	8167.5
N 34	1,385 feet E. and 1,170 feet N. of W¼ corner section 26.	8168.4
N 41	1,900 feet E. and 425 feet N. of W¼ corner section 26.	8187.6
N 49	1,530 feet E. and 1,085 feet N. of W¼ corner section 26.	8173.1

List of churn drill hole locations, "Series N", for which neither locations nor logs are available.

If there was a complete series of "N" holes, the locations and logs of the following are missing:

N 1	N 31
N 2	N 32
N 3	N 33
N 4	N 35
N 5	N 36
N 6	N 37
N 7	N 38
N 8	N 39
N 9	N 40
N 10	N 42
N 12	N 43
N 14	N 44 (Same as old No. 90)
N 16	N 45
N 17	N 46
N 19	N 47
N 20	N 48
N 23	

APPENDIX C

Drill hole series 1916 (A) and 1918 (B)

Sec. 24, T. 7 N., R. 81 W.

Map reference same as for Appendix A.

SERIES OF 1916

NO. 4-A

LOCATION: 1,220 feet E. and 85 feet N. of W¼ corner sec. 24.

SURFACE ELEVATION: 8,235.1.

ELEVATION TOP COAL: 8,136.

THICK. COAL: 39 feet (150 to 189 feet, inclusive).

FROM	TO	THICK.	DESCRIPTION
0	150	150'	Shale and sand rock
150	179	29'	Coal, good
179	181	2'	Dirt
181	189	8'	Coal, good
189	191	2'	Shale

REMARKS:

None.

NO. 5-A

LOCATION: 1,620 feet E. and 695 feet south of W¼ corner sec. 24.

SURFACE ELEVATION: 8,297.98.

ELEVATION TOP COAL: 7,918.0.

THICK. COAL: 20 feet (380-400 feet, inclusive).

FROM	TO	THICK.	DESCRIPTION
0	380	380'	Shale and sand rock
380	400	20'	Coal
400	402	2'	Shale

REMARKS:

This hole may have drilled only the upper bench of the coal.

There is no record of the locations of holes No. 1-A, 2-A, and 3-A.

SERIES OF 1918

NO. 1-B

LOCATION: 378 feet E. and 330 feet S. of W¼ corner sec. 24.

SURFACE ELEVATION: 8,225.0.

ELEVATION TOP COAL: 8,045.0.

THICK. COAL: 19 feet (180 to 194 feet, inclusive).

FROM	TO	THICK.	DESCRIPTION
0	180	180'	Shale and sand rock
180	194	19'	Coal
194	280	86'	Shale

REMARKS:

This locality is on the north limb of a plunging anticlinal nose, and the comparative thinness of the bed may be due to deformation. It is also only 90 feet SE of a fault which cuts off the limb of the fold, and this too may have affected the thickness of the bed. See No. 2-B.

NO. 2-B

LOCATION: 198 feet S. and 596 feet E. of W¼ corner of sec. 24.

SURFACE ELEVATION: 8,232.0.

ELEVATION TOP COAL: 8,077.0.

THICK. COAL: 28 feet (155 to 183 feet, inclusive).

FROM	TO	THICK.	DESCRIPTION
0	155	155'	Shale and sand rock
155	183	28'	Coal
183	209	26'	Shale

REMARKS:

Note increase in thickness of coal compared to 1-B, although the structural setting of the holes is the same.

NO. 3-B

LOCATION: 1,450 feet E. and 750 feet S. of W¼ corner sec. 24.

SURFACE ELEVATION: 8,303.0.

ELEVATION TOP COAL: 7,999.0.

THICK. COAL: 14 feet (304 to 318 feet, inclusive).

FROM	TO	THICK.	DESCRIPTION
0	304	304'	Shale and sand rock
304	318	14'	Coal
318	485	167'	Shale

REMARKS:

Comparison with No. 4-B about 90 feet distant shows a marked discrepancy in the thickness of the coal. A suitable explanation is not easily found. The difference of 38 feet may be depositional, due to deformation or to failure to make a complete record.

NO. 4-B

LOCATION: 1,370 feet E. and 730 feet S. of W¼ corner of sec. 24.

SURFACE ELEVATION: 8,302.0.

ELEVATION TOP COAL: 8,030.

THICK. COAL: 52 feet (272 to 324 feet, inclusive).

FROM	TO	THICK.	DESCRIPTION
0	272	272'	Shale and sand rock
272	319	47'	Coal
319	321	2'	Dirt
321	324	3'	Coal
324	326	2'	Shale

REMARKS:

Compare with 3-B.

NO. 5-B

LOCATION: 1,393 feet E. and 855 feet S. of W¼ corner sec. 24.

SURFACE ELEVATION: 8,306.0.

ELEVATION TOP COAL:

THICK. COAL:

FROM	TO	THICK.	DESCRIPTION
0	55	55'	Shale

REMARKS:

This hole is not deep enough to reach the coal. According to the structure contour map, the top of the coal is at least 225 feet below the bottom of the hole.

NO. 6-B

LOCATION: 685 feet E. and 770 feet S. of W¼ corner of sec. 24.

SURFACE ELEVATION: 8,246.0.

ELEVATION TOP COAL:

THICK. COAL:

FROM	TO	THICK.	DESCRIPTION
0	47	47'	Shale

REMARKS:

This hole just failed to reach the top of the coal. The locality is destroyed by slumping in the fire pit east of the Coalmont store. There is some confusion as to the location, the map of Moore Mine No. 2, dated October 18, 1922, indicating the above locality as 5-B. However, the map of the original mine at this locality. Coalmont Mine No. 1, October 20, 1918, shows it as 6-B, and this designation has been followed.

NO. 7-B

LOCATION: 800 feet E. and 637 feet S. of W¼ corner sec. 24.

SURFACE ELEVATION:

ELEVATION TOP COAL:

THICK. COAL:

FROM	TO	THICK.	DESCRIPTION
0	22	22'	Shale and sand rock
22	204	182'	No record
204	232	28'	Coal
232	336	104'	No record
336	340	4'	Shale

REMARKS:

The present surface at the above locality stands at 8,225, and may be low due to slump, but the original ground could not have been much higher than 8,231.

This log does not fit into the structural picture at this locality. If 8,231 is used for the elevation, the top of the coal would be 8,027. Structure contours developed by other information indicate that the elevation on the top of the coal should be about 8,200, a discrepancy of 193 feet.

There is a possibility that this log should be assigned to locality No. 7, 2,380 feet E. and 75 feet N. of SW corner section 24. Here, at least, it seems to better fit the general structural picture. However, the record for locality 7 in Appendix D indicates that the hole was drilled 242 feet without reaching coal. There may be more than one locality No. 7.

Note also the correspondence of the depth to coal in this log to the depth in No. 8-B. The depth and thickness of the upper bench are identical. Hence, there may be a typographical error in No. 7-B.

This log was not used in preparing the structure contour map of the west side of section 24.

NO. 8-B

LOCATION: 1,050 feet E. and 215 feet N. of W¼ corner of sec. 24.

SURFACE ELEVATION: 3,281.81.

ELEVATION TOP COAL: 3,078.0.

THICK. COAL: 36 feet (232 to 240 feet, inclusive).

FROM	TO	THICK.	DESCRIPTION
0	204	204'	Shale and sand rock
204	232	28'	Coal
232	233	1'	Dirt
233	240	7'	Coal

REMARKS:

This hole is about 40 feet SE of a fault, but there is no evidence of thinning due to deformation, rather the opposite for in plan view at least the locality is approaching the axis of a plunging anticlinal nose.

NO. 9-B

LOCATION: 1,140 feet E. and 920 feet N. of W¼ corner of sec. 24.

SURFACE ELEVATION: 3,281.71.

ELEVATION TOP COAL: 7,959.0.

THICK. COAL: 21 feet (323-348 feet, inclusive).

FROM	TO	THICK.	DESCRIPTION
0	323	323'	Shale
323	344	21'	Soft, dirty coal
344	348	4'	Shale

REMARKS:

This is the only drill hole north of the fault just north of the Coalmont Mine No. 1.

NO. 10-B

LOCATION: 1,490 feet E. and 560 feet N. of W¼ corner sec. 24.

SURFACE ELEVATION: 3,284.31.

ELEVATION TOP COAL: 3,002.0.

THICK. COAL: 40 feet (283 to 323 feet, inclusive).

FROM	TO	THICK.	DESCRIPTION
0	283	283'	Shale and sand rock
283	298	15'	Coal, soft
298	318	20'	Coal, hard
318	323	5'	Coal, soft

REMARKS:

The coal in this hole shows unusual thickening. This may be because it is located on the axis of the plunging anticlinal nose.

APPENDIX D - Clays E & F

Miscellaneous churn drill records

Note that there are two sets of logs numbered 1, 2, and 3. In the entire district, there are at least five different sets of drill hole records.

NO. 1

LOCATION: 1,165 feet N. and 1,320 feet W. of E¼ corner sec. 23.

SURFACE ELEVATION: 8,152.09.

ELEVATION TOP COAL:

THICK. COAL:

FROM	TO	THICK.	DESCRIPTION
0	14	14'	Surface
14	17	3'	Bony coal
17	20	3'	Coal
20	20' 4"	4"	Bone
20' 4"	35'	14' 8"	Coal
35	38	3'	Coal
38	41	3'	Coal
41	44	3'	Coal
44	47	3'	Coal
47	50	3'	Coal
50	51	1'	Coal
51	58	7'	Shale and clay

REMARKS:

P.T. station 489 (1934) is at this location. The rock formations have been logged erroneously as coal, whereas they are probably carbonaceous shale. It is estimated that the surface at this locality is approximately 380 feet stratigraphically below the top of the coal. Based on this erroneous concept, a large prospect pit or slope entry was excavated at this locality some time during the period 1935-1939 inclusive. A bed of coaly carbonaceous shale crops out at the west end of the cut, but no other coal was noted. The strata at this locality dip 10°, N. 79° E.

NO. 2

LOCATION: 1,500 feet N. and 1,755 feet W. of E¼ corner sec. 23.

SURFACE ELEVATION: 8,147.7.

ELEVATION TOP COAL:

THICK. COAL:

FROM	TO	THICK.	DESCRIPTION
1	5	4'	Clay
5	6	1'	Coal and shale
6	9	3'	Coal and shale
9	12	3'	Coal and shale
12	15	3'	Coal and shale
15	17	2'	Coal and shale
17	18	1'	Clay
18	20	2'	Clay and shale
20	22	2'	Shale
22	23	1'	Bony coal
23	26	3'	Coal and shale
26	29	3'	Coal shale
29	32	3'	Sand rock
32	35	3'	Sand rock
35	38	3'	Sand rock
38	39	1'	Sand rock
39	41	2'	Shale
41	44	3'	Blue shale
44	56	12'	Blue shale

REMARKS:

P.T. station 492 (1934) is at this location. The rock formations have been logged erroneously as coal, whereas they are probably carbonaceous shale. It is estimated that the ground surface at this locality is more than 400 feet stratigraphically below the top of the coal.

NO. 3

LOCATION: 840 feet W. and 1,710 feet N. of E¼ corner sec. 23.

SURFACE ELEVATION: 8,165.2.

ELEVATION TOP COAL:

THICK. COAL:

FROM	TO	THICK.	DESCRIPTION
1	3	2'	Clay
3	4	1'	Shale
4	6	2'	Coal
6	7	1'	Bony coal
7	9	2'	Coal
9	12	3'	Coal
12	13.5	1.5'	Coal
13.5	15	1.5'	Blue shale
15	17	2'	Blue shale
17	18	1'	Soft sand rock
18	21	3'	Soft sand rock
21	24	3'	Soft sand rock
24	27	3'	Blue shale
27	30	3'	Brown shale
30	33	3'	Brown shale

REMARKS:

P.T. station 559 (1934) is on the location. The rock formations have been logged erroneously as coal, whereas they are probably carbonaceous shale. It is estimated that the ground surface at this locality is about 250 feet stratigraphically below the top of the coal. An old prospect shaft is about 80 feet south. Black, papery, carbonaceous shale was on the dump but no coal. A layer of gumbo 5 feet thick mantles the surface. In 1934, depth to water level was 6.3 feet and depth to shaft bottom was 16 feet.

NO. 1

LOCATION: Uncertain.

SURFACE ELEVATION: 8,318.19 (?).

ELEVATION TOP COAL: 8,089.0 (?).

THICK. COAL: 25 feet (229 to 254 feet, inclusive).

FROM	TO	THICK.	DESCRIPTION
0	60	60'	Shale
60	63	3'	Hard rock
63	175	112'	Shale and sandstone
175	177	2'	Hard rock
177	229	52'	Shale and sandstone
229	254	25'	Coal
254	314	60'	No record

REMARKS:

The only clue to the location of this log are the words "No. 1. Top of Hill". This suggests that it may be referable to a location marked No. 1 in the SW corner of the road Y, 710 feet W. and 130 feet S. of N.$\frac{1}{4}$ corner section 25. The surface elevation of this point is 8,318.19, and it is on the crest of the west-facing escarpment which overlooks the Coalmont district. This is certainly the "top of hill". Accepting this location as correct, the elevation of the top of the coal is 8,089 feet.

NO. 2

LOCATION: 350 feet W. and 628 feet N. of SE. corner of sec. 23.

SURFACE ELEVATION: 8,224.2 (Mine map).

ELEVATION TOP COAL: 8,083.0.

THICK. COAL: 55 feet (141.5 to 196.5 feet, inclusive).

FROM	TO	THICK.	DESCRIPTION
0	24	24'	Shale and coal
24	28	4'	Coal
28	60	32'	Coal and shale
60	63	3'	Hard rock
63	81	18'	Sand, slate, and shale
81	83	2'	Hard rock
83	141.5	58.5'	Sand, slate, and shale
141.5	196.5	55'	Coal
196.5	199.0	2.5'	No record

Note: A slate parting was reported 24 feet in the coal, and another 43 feet in the coal.

REMARKS:

This is one of the few logs which can be correlated with a section measured on the surface, and has subsurface correlations with nearby logs. The hole starts in a thick bed of brown carbonaceous shale which can be followed for some distance on the surface. The "coal" from 24 to 28 feet is a bed of coaly carbonaceous shale at the base of the bed. The "hard rock" from 60 to 63 feet correlates fairly well with a similar bed at 44 to 47.5 feet in Log No. 3 following, and with 2 feet of hard rock from 99 to 101 feet in Log 15 following. Using the base of the "coal" at 28 feet as a datum, there is a good match with Log No. 3 on the 2-foot layer of hard rock at 81 to 83 feet. There is, however, a wide difference in interval in these two logs from the datum to the top of the coal.

NO. 3

LOCATION: 400 feet W. and 715 feet N. of SE. corner of sec. 23.

SURFACE ELEVATION: 8,220.0 (Mine map).

ELEVATION TOP COAL: 8,055.0.

THICK. COAL: 48 feet (167 to 215 feet, inclusive).

FROM	TO	THICK.	DESCRIPTION
0	17	17.0	No record
17	22	5.0	Coal
22	44	22.0	Shale and coal
44	47.5	3.5	Hard rock
47.5	72	24.5	Sand, slate, and shale
72	74	2.0	Hard rock
74	83	9.0	Sand and slate
83	98	15.0	Hard sandstone
98	167	69.0	No record
167	215	48.0	Coal

Note: Slate partings reported in the coal at 30 and 38 feet respectively.

REMARKS:

P.T. station 525 (1934) is on this location. The "coal" from 17 to 22 feet is coaly carbonaceous shale at the base of the bed referred to in Log No. 2, preceeding. Using the base of this shallow "coal" as a datum, the "hard rock" from 44.0 to 47.5 correlates well with a similar bed at 99 to 101 feet in Log 15 following. Other correlations are mentioned in the remarks on Log No. 2.

NO. 15

LOCATION: 157 feet W. and 30 feet N. of E.1/16 corner of sec. 23.

SURFACE ELEVATION: 8,215.0 (?).

ELEVATION TOP COAL: 7,912.0.

THICK. COAL: 34.51 feet (303 to 337.51 feet, inclusive).

FROM	TO	THICK.	DESCRIPTION
0	3	3'	Surface
3	4	1'	Sand
4	12	8'	Shale
12	16	4'	Soft coal
16	18	2'	Shale
18	38	10'	Sand; slate
38	42	4'	Iron
42	44	2'	Slate
44	45	1'	Black slate
45	48	3'	Coal
48	70	22'	Slate
70	80	10'	Black slate
80	82	2'	Slate
82	83	1'	Coal
83	85	2'	Sand; slate
85	99	14'	Slate
99	101	2'	Iron
101	119	18'	Slate
119	120	1'	Iron
120	136	16'	Slate
136	143	7'	Sand; slate
143	145	2'	Sandstone
145	152	7'	Sand; slate
152	153	1'	Black slate
153	198	45'	Sand; slate
198	202	4'	Brown slate
202	232	30'	Slate
232	303	71'	Sand; slate
303	304	1'	Smut
304	308.07	4.07'	Coal
308.07	308.47	.40'	Slate
308.47	331.51	23.04'	Coal
331.51	333.51	2'	Brown shale
333.51	335.51	2'	Coal
335.51	337.51	2'	Brown slate

APPENDIX E

A series of 25 skeleton churn drill hole records were copied from a mounted map of the Coalmont district in the office of the North Park Coal Company, June 25, 1934. Elevations on this map are on a datum 373 feet higher than sea-level datum. Correction to sea-level datum was made in copying the notes. However, there is some question as to the identity of the locations. Most of them are in the vicinity of the old Coalmont mine No. 1, NW SW sec. 24, T. 7 N., R. 81 W. Because of their fragmentary character and the general uncertainty as to their location, they have been used but little. Date of drilling is unknown. In order to avoid confusion, the records will not be listed in this appendix until their locations have been determined with greater accuracy.

APPENDIX F

List of churn drill hole locations without number or log.

Location: 1,582 feet E. and 1,315 feet N. of W¼ corner sec. 26, T. 7 N., R. 81 W.

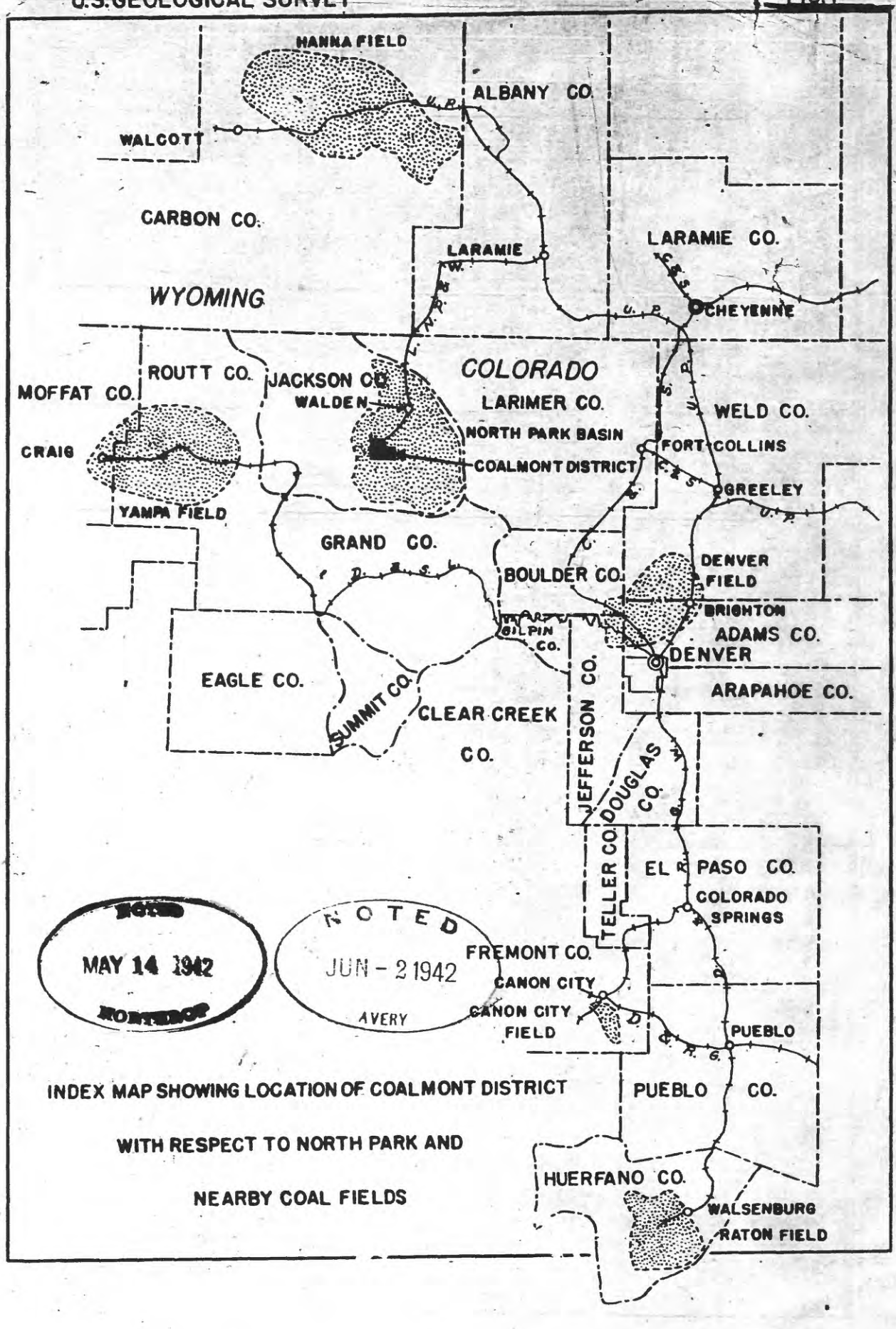
Location: 2,065 feet E. and 765 feet N. of W¼ corner sec. 26, T. 7 N., R. 81 W.

Location: 2,085 feet E. and 665 feet N. of W¼ corner sec. 26, T. 7 N., R. 81 W.

41-2

U.S. GEOLOGICAL SURVEY

FIG. 1



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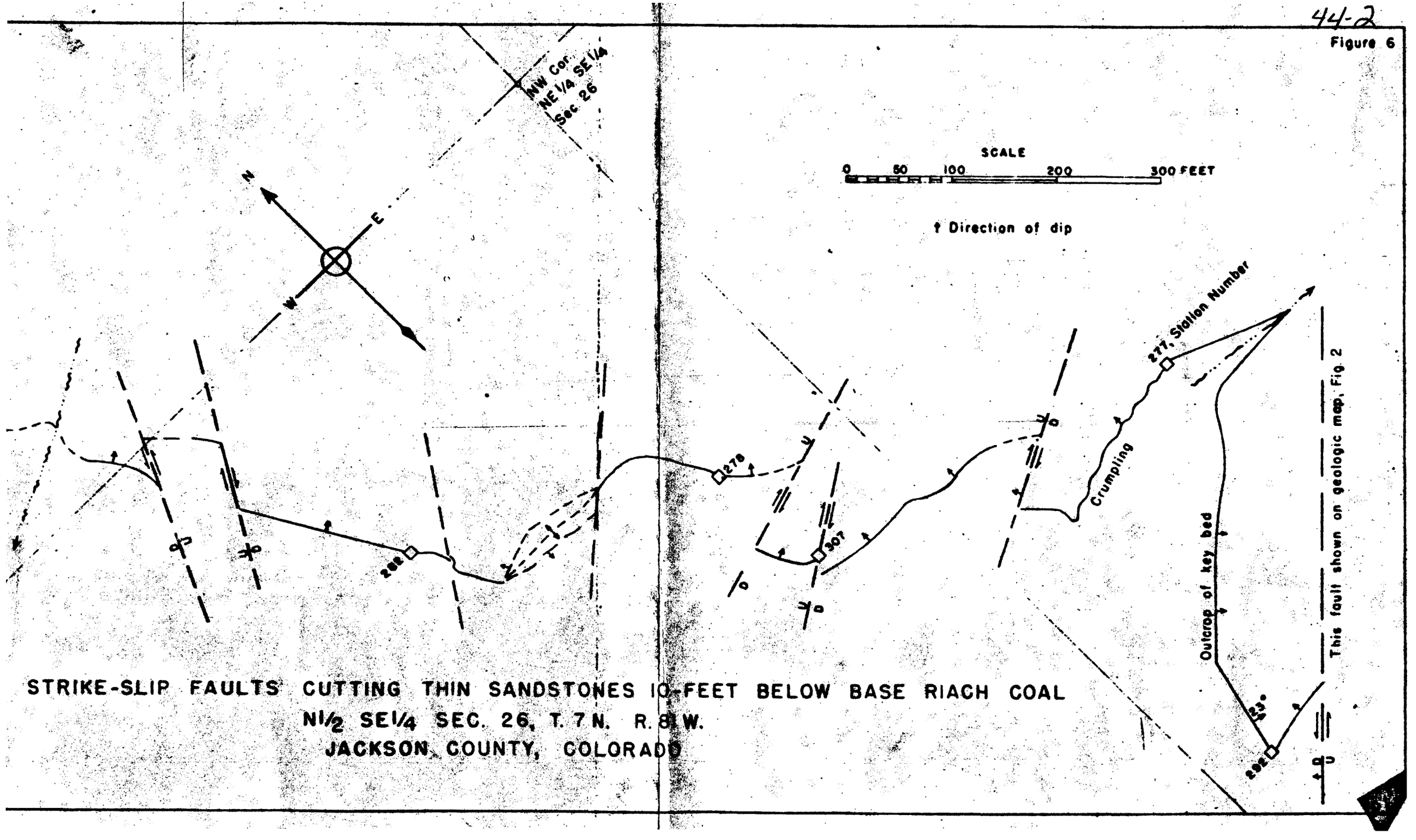
INDEX MAP SHOWING LOCATION OF COALMONT DISTRICT WITH RESPECT TO NORTH PARK AND NEARBY COAL FIELDS

Figure 6



STRIKE-SLIP FAULTS CUTTING THIN SANDSTONES 10-FEET BELOW BASE RIACH COAL
N1/2 SE1/4 SEC. 26, T. 7 N. R. 81 W.
JACKSON COUNTY, COLORADO