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Report of Investigations 4838

BITUMINOUS-COAL DEPOSITS IN THE VICINITY OF ESKA, MATANUSKA VALLEY COAL FIELD, ALASKA

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United States Department of the Interior — February 1952

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UNITED STATES DEPARTMENT OF THE INTERIOR
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Theodore R. Jolley,[1] Albert L. Toenges,[2] and Louis A. Turnbull[3]

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1/ Mining engineer, Coal Branch, Fuels and Explosives Division, Bureau of Mines, Pittsburgh, Pa.

2/ Principal coal mining engineer, Fuels and Explosives Division, Bureau of Mines, Pittsburgh, Pa.

3/ Senior mining engineer, Coal Branch, Fuels and Explosives Division, Bureau of Mines, Pittsburgh, Pa.

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INTRODUCTION

In recent years, the production of coal in Alaska has been less than the requirements, especially in the highly populated Anchorage area. As bituminous coal stores well and has a higher heating value than subbituminous coal and lignite, it is in great demand. The Matanuska Valley coal field, which is approximately 60 miles northeast of Anchorage, is the only source of bituminous coal in the rail belt. The minable reserves of bituminous coal in the Matanuska coal field are not known, and investigations to determine these reserves were begun in 1943. At that time, three mines were in operation in this coal field: The Evan Jones mine at Jonesville, the Eska 2 mine of the Alaska Railroad at Eska, and the Buffalo mine at Moose Creek. Reserves at the Buffalo mine were developed and reported by G. A. Apell.4/ The Buffalo mine discontinued operations in 1945. The known reserves at the Eska 2 mine were limited and development of new reserves was of primary importance. Investigations by diamond drilling to develop reserves in the north limb of the syncline of this mine were begun in 1945, and the results of this investigation are described in this report. The Eska 2 mine was abandoned on June 30, 1946; since that date, the only producing mine in the Matanuska field is the Evan Jones mine. The minable reserves of coal that can be economically recovered from this opening are limited. As this is the only bituminous-coal mine in Alaska, development of a new modern mine in this field is important to the future development of the Territory.

A geological report5/ on an area east of Eska Creek and adjacent to Eska 1 mine indicated a potential reserve of coal that could be developed should minable reserves be proved by diamond drilling. Part of this area had been investigated by churn drilling and reported by Tuck.6/ This report shows structural conditions favorable for the installation of mechanical mining equipment. The area also is accessible to the surface plant and washery of the Eska 2 mine. An investigation of the area was begun in 1947 and the results are given in this report.

SUMMARY AND CONCLUSIONS

The estimated recoverable reserves in the area in the vicinity of Eska 2 mine are 699,300 tons in the Chapin and Emery beds of the Maitland group. These recoverable reserves are in the area between the Eska fault zone and Jonesville fault and extend down dip from the outcrops. No reserves were developed by the Eska 2 entry or by drill hole 14-16 in the Eska fault zone. The small quantity of reserves in the vicinity of the Eska 2 mine is insufficient to justify development of a new, modern mine in this area.

4/ Apell, G. A., Moose Creek District of Matanuska Coal Fields, Alaska: Bureau of Mines Rept. of Investigations 3784, 1944, 36 pp.

5/ Barnes, F. F., and Byers, F. M., Jr., Geology and Coal Resources of the Eastern Part of the Lower Matanuska Valley Coal Field: Geol. Survey, Mim. Rept., 1945, 21 pp.

6/ Tuck, Ralph, The Eska Creek Coal Deposits, Matanuska Valley, Alaska: Geol. Survey Bull. 880-D, 1937, 214 pp.

The estimated recoverable reserves in the area east of Eska Creek are 974,500 tons in the Eska, Shaw, and Martin beds of the Eska group. Most of these reserves occur in the south limb of the syncline. It will be necessary to practice subjacent mining methods to recover these reserves in the Eska group. The Eska bed developed by the diamond drilling in this area comprises coal and few thin partings. The Shaw and Martin beds comprise two benches of coal separated by partings, and the product from full-bed mining will require thorough preparation.

The estimated recoverable reserves east of Eska Creek might be increased by diamond drilling in the north limb of the syncline north of the area investigated. Down faulting east of the Alaska Engineering Commission mine indicates that this area might be underlain by coal beds. The dip of the Emery bed in this mine is reported to be 15° south on the east side of the northeast fault, indicating that the beds in the north limb of the syncline may have the same dip. Drill holes 3-15-EA and 7-10-EA on the north side of the area penetrated the Eska group of coal beds.

Preparation studies of coals from the Evan Jones and Eska 2 mines show that coal containing 18 percent ash can be recovered from the coal beds in this field. However, the high inherent ash in all coal from beds in the Matanuska field, except some beds in the Moose Creek area, necessitates mechanical cleaning to secure a satisfactory product.

The investigation indicates that the area of recoverable reserves east of Eska Creek is separated by faults into small areas. Mining these small areas, which are in several beds, is not favorable for low-cost mining. The structural conditions in and surrounding the coal beds and the extent of the measured reserves in the area east of Eska Creek do not warrant development of a modern mechanized mine at present.

ACKNOWLEDGMENTS

Before July 1945, field investigations were under the direction of Robert S. Sanford 7/ and James H. Hulbert 8/ of the Mining Branch. From July 1945 to January 1950, field investigations of coal in Alaska were under the direction of Albert L. Toenges, Louis A. Turnbull, and Theodore R. Jolley, Bituminous Coal-Mining Section, Pittsburgh, Pa. Coal analyses were under the direction of H. M. Cooper and R. F. Abernethy. Preparation of thin sections and samples of coal for analyses were supervised by B. C. Parks, assisted by H. J. O'Donnell and H. L. Smith. Illustrations were prepared by the Graphic Section under the supervision of Louis F. Perry, supervising engineer. Geological field work was conducted by Farrell F. Barnes and Thomas G. Payne, geologists of the Alaska Branch of the Federal Geological Survey.

7/ Sanford, Robert S., former acting chief, Alaska Division, Mining Branch, Bureau of Mines, Juneau, Alaska.

8/ Hulbert, James H., former mining engineer, Alaska Division, Mining Branch Bureau of Mines, Juneau, Alaska.

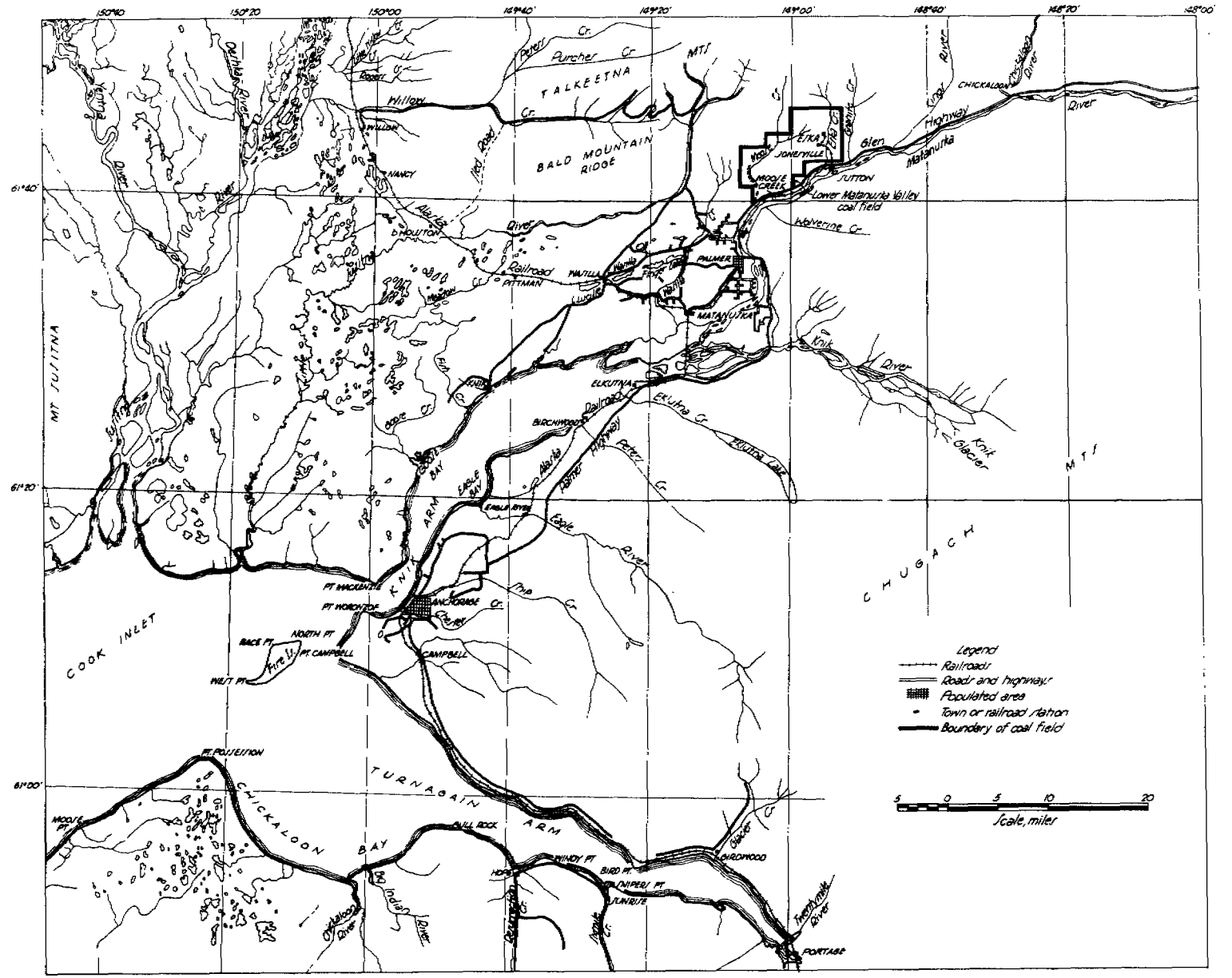

Figure 1. - Anchorage area, showing lower Matanuska coal field.

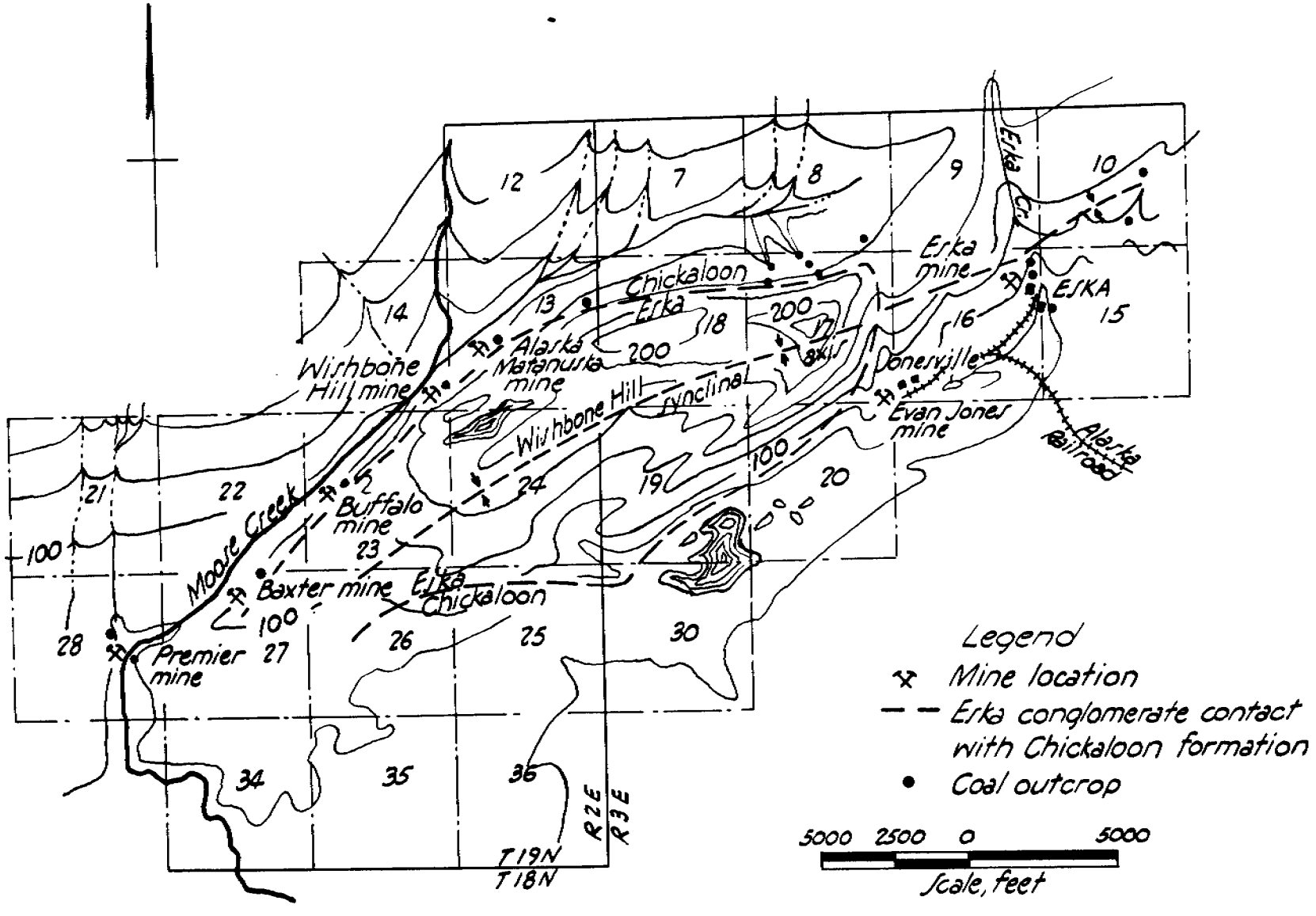

Figure 2. - Mines in lower Matanuska Valley coal field.

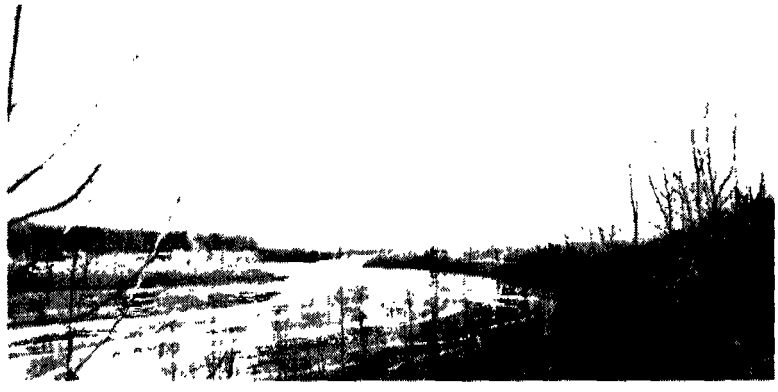

Figure 3. - Matanuska River, with many braided channels.

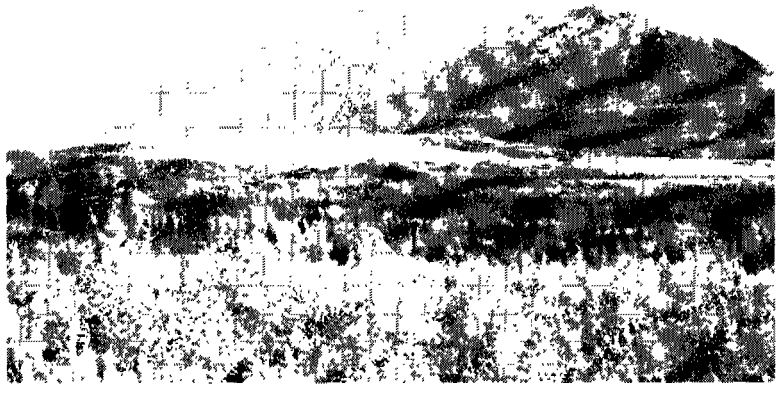

Figure 4. - Matanuska glacier at head of Matanuska Valley.

Figure 5. - Wishbone Hill, with vertical escarpments.

The cooperation of B. D. Stewart, Territorial Commissioner of Mines; L. G. Anderson, Bureau of Mines; Harry J. Hill, general manager, and Tom McFarlane, superintendent, Evan Jones mine; Col. O. F. Ohlson and Col. J. P. Johnson, general managers, Alaska Railroad; and Harvey Hiber and H. Tomlinson, superintendents of the Eska 2 mine, is gratefully acknowledged. Camp facilities furnished by the Evan Jones mine and the Alaska Railroad are appreciated.

DESCRIPTION OF AREA

The Matanuska Valley coal field is in south central Alaska, 60 miles northeast of Anchorage and 16 miles northeast of Palmer, Alaska. (See figs. 1 and 2.) The Eska 2 mine area is west of Eska, Alaska, the terminus of the Matanuska branch line of the Alaska Railroad. An access road extending from Sutton to Jonesville was constructed by the Evan Jones Coal Co. in 1945. In 1946 an access road was constructed from Jonesville to Eska, and 1947 this road was extended to the Eska Creek area east of Eska. The Alaska Road Commission constructed an all-weather road from Sutton on the Glen Highway to Eska and Jonesville in 1949.

The Matanuska coal field is in the foothills of the Talkeetna Range on the north side of Matanuska Valley. The Matanuska River, with many braided channels (fig. 3), is south of the areas investigated. Knob Creek is a tributary of Eska Creek, which is a tributary of the Matanuska River. Both creeks are wide, with low banks on the south side of the area, but become canyons with steep to vertical banks toward their source. Glaciation has altered many topographic features and outcrops are covered by the glacial deposits. The Matanuska glacier (fig. 4) has receded and is now 60 miles upstream from Palmer.

Topography

The topography of the Matanuska Valley coal field is glaciated and comprises knobs, kettles, eskers, and marginal moraines. Drainage of the area is poor, and there are swamps enclosed by low ridges. Eska Creek is in the center of the area investigated, and Knob Creek bounds the area on the east. There is a general southeast slope rising from 600 feet in the southeast to 900 feet in the southwest, to 1,500 feet in the northeast, and 2,300 feet in the northwest. Wishbone Hill is west of Eska Creek and forms a ridge separating the Eska Creek area from Moose Creek on the northwest. (See fig. 5.) Knob Hill, northeast of this area, is another prominent feature.

Climate

The climate is mild; summer high temperatures range from 70 to 80° and an average mean winter low is -20° F. Winter temperatures have dropped to -40°. The average annual rainfall is 25 to 30 inches. However, torrential rains occur, and these cause flash floods. The average accumulated snowfall is 3 feet, with a maximum accumulation of 10 feet. The most suitable period for field work is May 15 to October 15.

Mining Rights

The coal and mining rights are owned by the Government and are leased in accordance to the Coal Leasing Act.9/ The areas investigated are in coal-leasing unit 7 and an adjacent prospector's leasing unit in T. 19 N., R. 3 E. Leasing unit 7 comprises the following: E1/2 SE1/4 and NW1/4 SE1/4 sec. 8, S1/2 sec. 9, SW1/4 sec. 10, NW1/4 sec. 15, and N1/2, SW1/4, and N1/2 SE1/4 sec. 16. The prospector's unit comprises the following E1/2 sec. 10, W1/2 sec. 11, NW 1/4 sec. 14, and NE1/4 sec. 15. The Alaska Railroad mines are in leasing unit 7. This railroad is operated by the United States Department of the Interior and pays no royalty on coal mined. The usual royalty collected by the Government on coal-mining leases is 10 cents per ton, and on prospecting permits, 25 cents per ton. However, coal-royalty rates are determined on leasing units by competitive bidding, and leases are awarded to the highest bidder. Coal-mining leases are for an indefinite term, renewable at intervals of about 2 years, and usually are automatically renewed if coal mining is continued in a workmanlike and diligent manner. Coal-prospecting permits grant exclusive rights to prospect on the described land for definite terms of about 2 or 4 years and may be renewed if prospecting is conscientious and diligent. Permits and leases are granted only to citizens of the United States.

GEOLOGY

General Description

The geology of the Matanuska coal field was studied first by Martin and Katz,10/ who described the Tertiary rocks as comprising two normarine sedimentary formations, namely in ascending order: (1) The Chickaloon formation and (2) the Eska conglomerate. Cretaceous rocks, which are beneath the Chickaloon formation, may be present east of Knob Creek but were not within the areas investigated. Quaternary glacial and alluvial deposits cover the entire field except on the steepest slopes and highest ridges. The geology has been described also by Tuck,11/ Barnes,12/ and Payne13/ of the Federal Geological Survey, and a brief summary of the results of their studies is incorporated in this report.

Chickaloon Formation

The Chickaloon formation is about 5,000 feet thick and comprises claystone, siltstone, sandstone, and groups of coal beds. Most of the coal beds are in the upper 1,500 feet of the formation, except for two thin coal zones that are thought to be in the lower 500 feet of this formation. The Chickaloon formation

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9/ Dept. of Interior, Regulations Governing Coal-Land Leases in the Territory of Alaska: May 1916, 86 pp.

10/ Martin, C. G., and Katz, F. J., Geology and Coal Fields of the Lower Matanuska Valley, Alaska: Geol. Survey Bull. 500, 1912, 98 pp.

11/ Tuck, Ralph, Work cited, footnote 6.

12/ Barnes, F. F., and Byers, F. M., Jr., Work cited, footnote 5.

13/ Payne, T. G., and Hopkins, D. M., Geology and Coal Resources of the Western Part of the Lower Matanuska Valley Coal Field, Alaska: Geol. Survey Mim. Rept. 105117, 1944, 22 pp.

is exposed on the eastern and northern sides of Wishbone Hill and along Eska Creek. The coal in the upper part of the formation occurs in groups of three or more beds generally close together. However, these groups generally are separated by thick intervals of claystone (shale). Ironstone, which comprises layers and nodular concretions ranging from 1 inch to 3 feet in thickness and diameter, is common throughout the formation and generally is most abundant in the zone beneath the lower coal beds. Below the coal-bearing part of the formation are numerous, thin-bedded, dark claystones, silty claystones, and fine sandstones which contain thin streaks of coal and carbonaceous shale. The upper part of the formation contains three distinctive sandstone layers, known locally as the Emery, Eska, and Little Eska sandstones. The Emery and Eska sandstones weather to a buff color and are above the coal beds of the same name. The Little Eska sandstones are above the lower or Little Eska coal beds and contain crystalline minerals derived from the erosion of granite. These sandstone members usually are recognized in the core samples.

The thrust of the mountain uplift north and south of the area of Chickaloon formation has caused faulting and folding and formed the Wishbone Hill syncline. The folding is greatest in the weakest and least competent beds, and the attitude of the weaker beds may be different than of the stronger beds. This difference in attitude also is apt to occur between the Chickaloon formation and the overlying Eska conglomerate because there is a great difference in the strength of the beds in these two formations.

The groups of coal beds were named by Tuck,[14] Barnes,[15] and Payne[16] and the groups in descending order follow:

Jonesville
- Bed 4
- Bed 3
- Bed 2
- Bed 1

Premier
- Bed 5 - bed 0
- Bed 6 - bed 00
- Bed 7
- Bed 7A
- Bed 7B

Maitland
- Chapin bed
- Maitland bed
- David bed
- Emery bed or Bed 8

Bed 9

Eska
- Eska bed
- Shaw bed (Bed 10)
- Martin bed

Little Eska

Each coal bed penetrated in the drilling is described in the discussion of diamond drilling.

14/ Tuck, Ralph, Work cited, footnote 6.
15/ Barnes, F. F., and Byers, F. M., Jr., Work cited, footnote 5.
16/ Payne, T. G., and Hopkins, D. M., Work cited, footnote 13.

Eska Conglomerate

The Eska conglomerate, which is about 1,700 feet thick, is composed predominantly of pebbles, cobblestones, and boulders cemented by a sandy matrix and includes numerous sandstone beds ranging from a few inches to 40 feet thick. The lower 1,100 feet comprise mostly volcanic and metamorphic rocks. The upper 600 feet is mostly granite and diorite rocks.

Quaternary Alluvial Deposits

The recent alluvial deposits range from a few inches to 50 feet or more thick. Most of the surface, except the steepest slopes, are covered with soil, silt, gravel, and boulders. Slide rock, comprised mostly of fragments of conglomerate, including blocks as large as 50 feet in diameter, have slid from Wishbone Hill and covered slopes adjacent to escarpments west of Eska. The mantle of alluvium obscures most of the outcrops and must be penetrated to determine the rocks beneath. (See fig. 6.) Occasionally fragments and masses of coal are found in the alluvium.

INVESTIGATION OF COAL DEPOSITS IN THE VICINITY OF ALASKA RAILROAD ESKA 2 MINE

Preliminary Examination

A reconnaissance of the area was made in the spring of 1945 by Bureau of Mines engineers and Federal Geological Survey geologists. The geology of the area was mapped and reported by Barnes[17] in 1944, and it is stated in this report that the largest coal reserve of the Eska 2 mine is in the north limb of the syncline between the Eska fault zone and the Jonesville fault. (See fig. 8.) The strata in the north limb of this block indicate that all of the coal beds from the Jonesville group to the Eska group are present. The strike entries in the Eska mine are in the Eska group of beds, which comprise the Eska, Shaw, and Martin. These lower beds were developed, but the upper beds have not been mined in the Eska mine. Development in the Eska bed in the north limb of the syncline was stopped because of the increase in the inherent ash in the coal. The Shaw bed contains two benches of coal separated by a thick parting of coaly claystone and bony coal. However, the entire section of the bed was extracted, and a yield of approximately 50 percent clean coal was obtained. As development in the Martin bed advanced to the west, the inherent ash in the coal increased and mining was stopped. Refuse and extraneous rock in the coal loaded in the mine had increased to the proportion of 60 percent of the run-of-mine coal in 1945. This amount of refuse was a burden on the preparation plant and resulted in an excessive cost of clean coal. To determine the extent, thickness, and physical and chemical characteristics of the coal beds overlying the Eska group, diamond drilling was undertaken in 1945 in an area of the Eska 2 mine, where potential reserves were indicated by the geological reconnaissance. The beds overlying the Eska group include all beds mined at the Evan Jones mine in the Premier and Jonesville groups. These upper beds also were mined in the Alaska Engineering Commission mine east of Eska.

17/ Barnes, F. F., and Byers, F. M., Jr., Work cited, footnote 5.

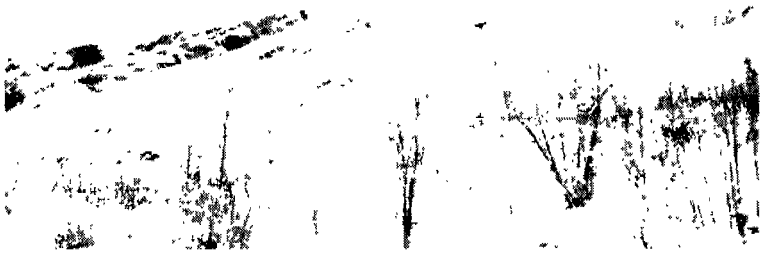

Figure 6. - Alluvial-covered foreground, looking west from Eska, Alaska.

Figure 7. - Portal of Alaska Railroad Eska 2 mine entry.

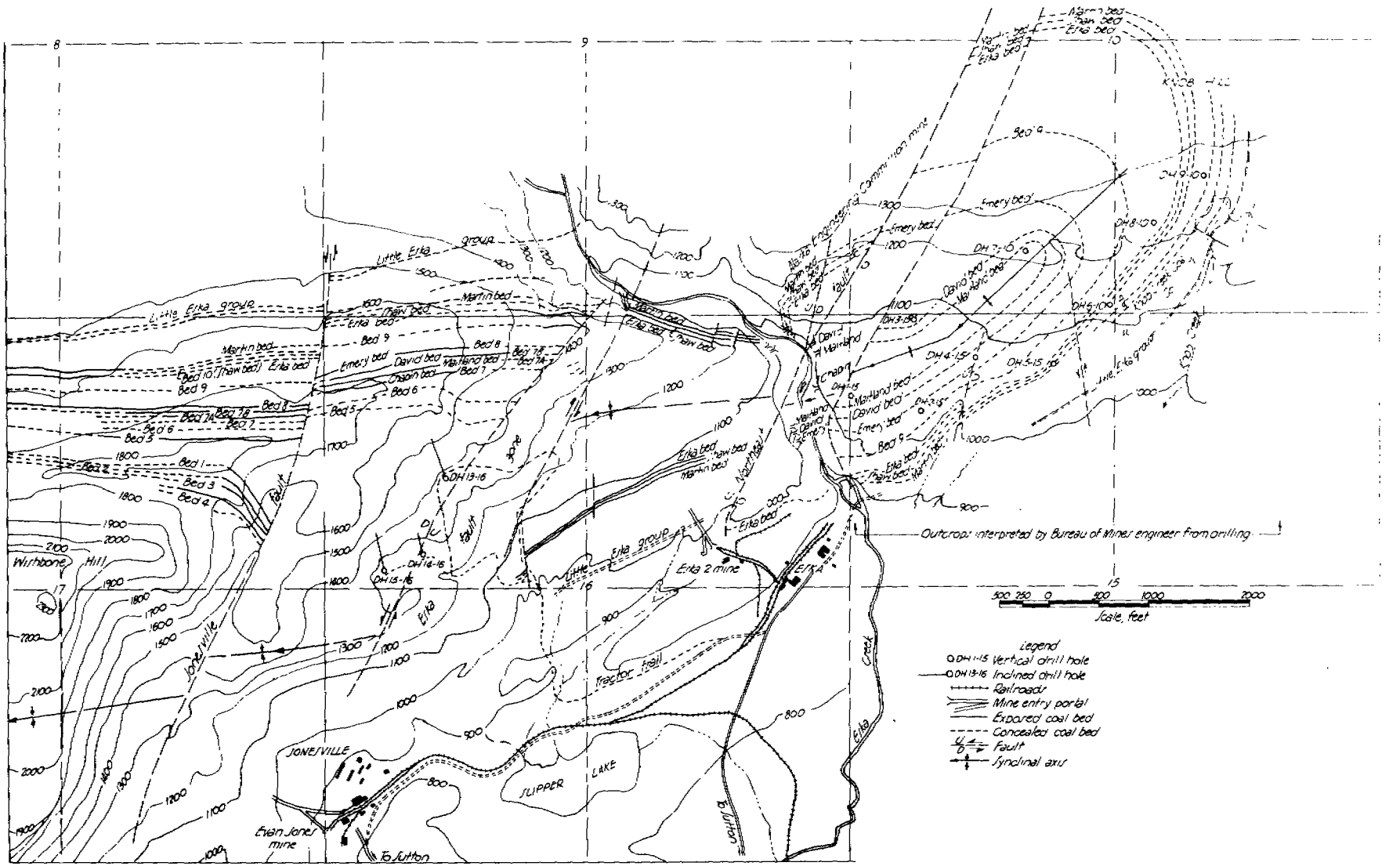

Figure 8. - Geologic map of area of Alaska Railroad Eska mine. (Geology and base map by Geological Survey).

Trail Building

Trails were constructed west from Eska to drill sites 13-16, 14-16, and 15-16 (fig. 8) with a bulldozer. The trails were 6 feet wide and were graded and leveled where the surface was rough and uneven. About 1-1/2 miles of trail were built at a cost of $1,000.00 per mile across steep terrain comprising soil and gravel.

The drilling equipment was transported to the drill holes on sleds drawn by a crawler-type tractor.

Diamond Drilling

Diamond drilling was done under contract between the Bureau of Mines and Lynch Bros. - diamond-drill contractors of Seattle, Wash. As a guide for estimating the cost of drilling under similar conditions, unit contract prices are given:

	Description		Unit price
1.	Driving though overburden and installing standpipe of sufficient size to permit continued core boring with BX-size bit		
	From 0 to 30 feet	per foot	$7.50
	From 30 feet to bedrock	do.	8.40
2.	Diamond drill core boring with BX bit	do.	7.90
3.	Diamond drill core boring with AX bit	do.	7.40
4.	Additional diamond-drill core boring as ordered by Government beyond guaranteed minimum of 4,000 feet up to a maximum of 10,000 feet, including minimum:		
	With BX bit	do.	7.65
	With AX bit	do.	7.15
5.	Reaming AX-size holes to BX-size holes for installing AX-size casing	do.	2.50
6.	Casing BX-size holes	do.	1.50
7.	Cementing, waiting for cement to set and drilling through cement	do.	2.50
8.	Extra time for surveying and other nonproductive work as ordered by Government	per hour	7.00

The thickness, physical characteristics, and extent of the Upper Chickaloon coal beds and underlying and overlying strata were determined by diamond drilling, which yielded 1-5/8- and 1-1/8-inch coal cores. Chemical and petrographic analyses were made of these cores and the dip (and strike) of the beds were computed from the drilling data.

Hole locations are shown in figure 8, and each hole is designated by a serial and section number separated by a dash. The serial number designates the order of drilling and the section number in which the hole was drilled; for example, 13-16 indicates the 13th hole drilled and is located in section 16.

Detailed logs of drill holes and chemical analyses of coal cores are given in the appendix. Locations of the holes are summarized as follows:

Hole 13-16	1,400 feet W. and 1,040 feet N. of center of sec. 16, T. 19 N., R. 3 E.
Hole 14-16	1,650 feet W. and 295 feet N. of center of sec. 16, T. 19 N., R. 3 E.
Hole 15-16	2,000 feet W. and 130 feet N. of center of sec. 16, T. 19 N., R. 3 E.

Holes 1 to 12 were drilled by the Mining Branch of the Bureau of Mines in the Moose Creek area. The results for holes 1 to 8 were published by the Bureau of Mines,18/ and the results for holes 1 to 11 were published by the Geological Survey.19/ Hole 12 was abandoned at 149 feet and no core was recovered.

Drilling of holes 13 to 15 was begun June 17, 1945, and completed October 22, 1945.

Progress of drilling is as follows:

Holes drilled	3
Footage	2,081
Overburden (standpipe) feet	85
1-5/8-inch core drilling do.	987
1-1/8-inch core drilling do.	1,009
Drilling shifts	164
Average feet per drilling shift	12.7
Total shifts, including moves, repairs, and other delays (1 drill, two 8-hour shifts per day 6 days per week)	214
Feet per shift (total shifts)	9.7
Average cost per foot	$8.44

Strata Penetrated in Drilling

Beds of the Eska conglomerate and Chickaloon formations in the area are folded into a southwest-plunging syncline. This syncline, which has been named Wishbone Hill, is segregated into displaced segments by several major transverse faults and many minor faults that strike in a northeast direction. The area investigated by drill holes 13-16, 14-16, and 15-16 is between the Eska fault zone and the Jonesville fault. (See fig. 8.) The average dip of strata penetrated by the drill holes is 30° SE. (See fig. 9.) The inclination of the drill holes was about 60° from the horizontal and the strike of drill hole 13-16 was N. 20° W., and the strike of drill holes 14-16 and 15-16 was N. 10° W. The relations of the stratigraphic units are essentially typical throughout the area, and the coal series of the Chickaloon formation have been correlated laterally and vertically. Bed names are shown in the logs of drill holes. All beds were penetrated essentially normal to the bedding and bed thickness shown in logs is true thickness.

18/ Apell, G. A., Work cited, footnote 4.
19/ Payne, T. G., and Hopkins, D. M., Work cited, footnote 13.

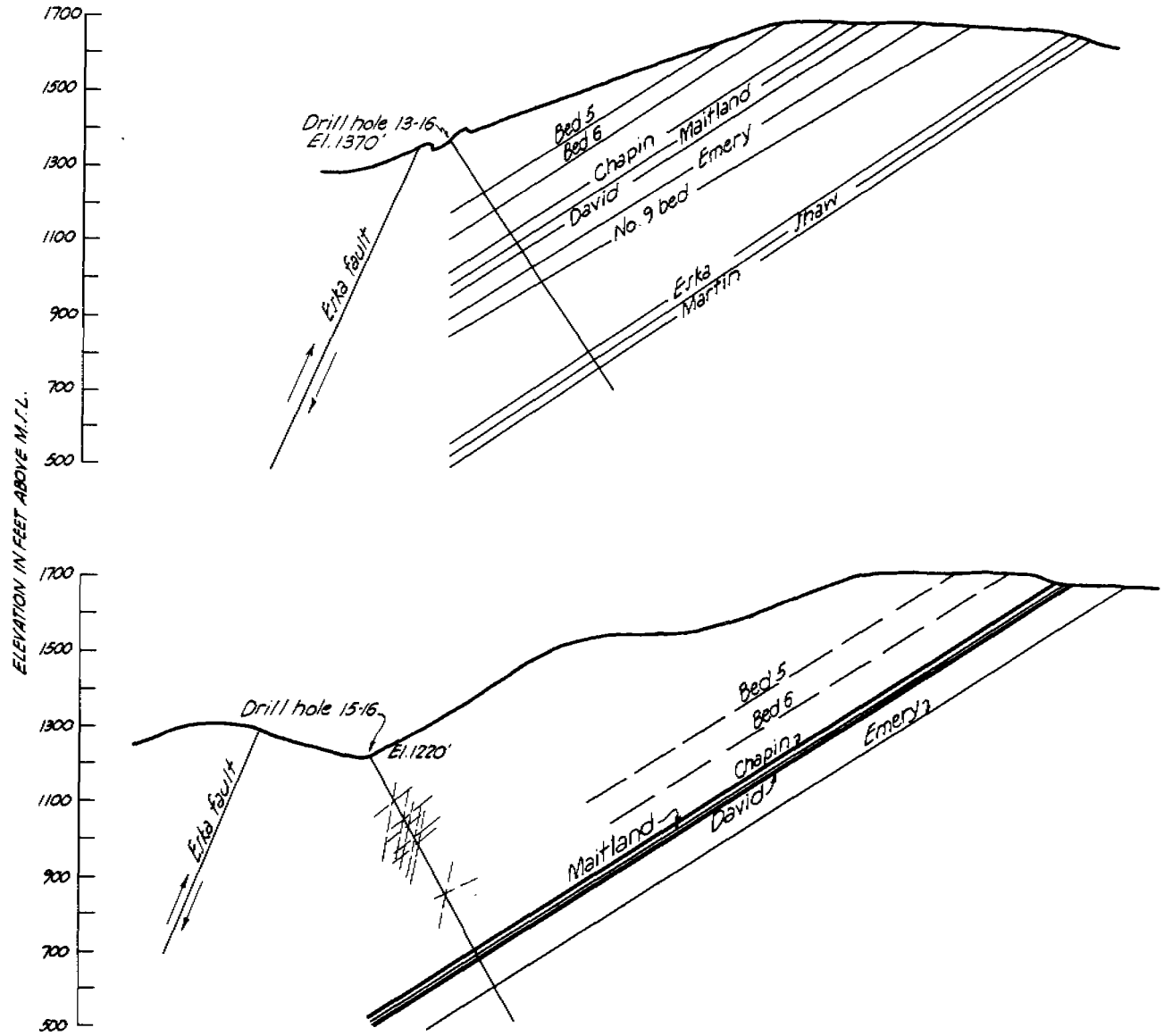

Figure 9. - Cross sections through drill holes 13-16 and 15-16 (looking west).

The strata associated with the Chickaloon groups of coal beds are coaly claystone, silty claystone, claystone, silstone, and sandstone. The Chickaloon formation is characterized by 4 groups of coal beds or at least 18 intervals during which coal was formed. The lower coal beds were penetrated in holes 13-16 and 15-16.

The coal beds penetrated in the drilling in descending order are:

Jonesville group
- No. 5
- No. 6

Maitland group
- Chapin
- Maitland
- David
- Emery (No. 8)

No. 9

Eska group
- Eska
- Shaw
- Martin

Hole 13-16

The field classification of the core recovered from the various coal beds indicated that No. 5, Lower Chapin, Emery (No. 8), Shaw, and Martin beds are of minable thickness. A cross section of drill hole 13-16 is shown in figure 9.

Hole 14-16

No minable coal beds were penetrated in hole 14-16. The first strata penetrated were the Eska conglomerate formation and transition beds between the Eska conglomerate and the Chickaloon formation. Predominant claystone in the bottom of the hole indicates that the upper part of the Chickaloon formation was penetrated. The absence of consistent coal beds and penetration of gouge and shear zones from 176 to 216 feet, from 242 to 245 feet, and from 388 feet 6 inches to 392 feet indicate faulting and lack of conformity to normal sequence. These shear zones locate the edge of the Eska fault zone (fig. 8), which was penetrated and passed through for a short distance. The hole did not penetrate deep enough to yield cores of coal beds to clarify correlation.

Hole 15-16

Hole 15-16 started in the Eska conglomerate and penetrated the intra-formation transition beds into the Chickaloon formation. The bedding was abnormal in the upper part of the hole, with gouge zones from 179 to 180 feet, 244 to 248 feet, and shearing and crushing at 211 feet 6 inches from 236 feet 6 inches to 243 feet, and at 422 feet. Assuming normal structure below 550 feet and an average normal dip of 30°, the coal beds between 580 feet 9 inches and 623 feet 1 inch have been correlated as the Maitland group; and the coal bed

from 696 feet 9 inches to 708 feet has been correlated as the Emery or No. 8 bed. The beds probably minable are the Chapin of the Maitland group from 586 feet 9 inches to 592 feet 9 inches and the Emery or No. 8 bed from 696 feet 9 inches to 708 feet.

The abnormal condition in the upper portion of the hole may be due to erosional undersapping of the softer Chickaloon beds beneath the Eska conglomerate and subsequent sliding of the Eska conglomerate in large masses. These large, massive blocks of Eska conglomerate at the surface of the ground near drill hole 15-16 are partly detached from other large masses, but all of the blocks are on the same dip and strike.

Description of Alaska Railroad Eska 2 Mine

Eska 2 mine was opened with a rock entry (fig. 7), which was driven in a northwest direction across the syncline. This entry penetrates the Martin, Shaw, Eska, and Emery beds, which dip about 30° north and strike east-west in the south limb, and then passes through the wide Eska fault zone into the north limb, where the Eska, Shaw, and Martin beds dip about 34° south and strike east-west. A plan of the mine is shown in figure 10.

In the north limb, strike entries (gangways) are driven in the Eska and Shaw beds and these entries are intake airways. The return airway (counter) is driven in the coal 50 feet up the rise from the strike entry and parallel to it.

Three panel rooms on 50-foot centers are turned off the strike entry at about 600-foot intervals and are driven up the rise from the strike entry to the outcrop. The center room of the panel is the permanent manway and is equipped with a hoist to transport timber and supplies to the working places. The inby and outby rooms of the three panel rooms are equipped with permanent chutes. At 200 feet up the rise from the strike entry, wing or transverse rooms equipped with chutes are turned both to the right and left off the respective outside rooms at an angle of 45°. (See fig. 11.) Rooms on 50-foot centers are turned at 45° up the rise from the transverse rooms and driven to the outcrop. Ten rooms comprise a panel, and pillars are extracted on retreat from the panel.

The barrier pillars between the counter and the transverse rooms range from 150 to 450 feet in width and are not extracted. The first panel was developed from two panel rooms; however, later development was from three panel rooms. (See fig. 11.)

The south limb of the mine was developed from two inside slopes, one in the Eska bed called the Eska slope and one in the Martin bed called the Martin slope. The coal beds in the south limb occur along the axis of the synclinal trough and strike entries in the Eska, Shaw, and Martin beds were driven to the right and left from the slope. The entries driven to the west terminated at the Eska fault zone. The strike of the coal beds changes as the development advances and in plan is shaped in the form of a horseshoe or trough. Rock entries connect the three beds at the bottom of the Martin slope. The stratigraphical interval between the coal beds is about 30 feet. Chute-and-pillar and subjacent mining were practiced. The beds were developed in the

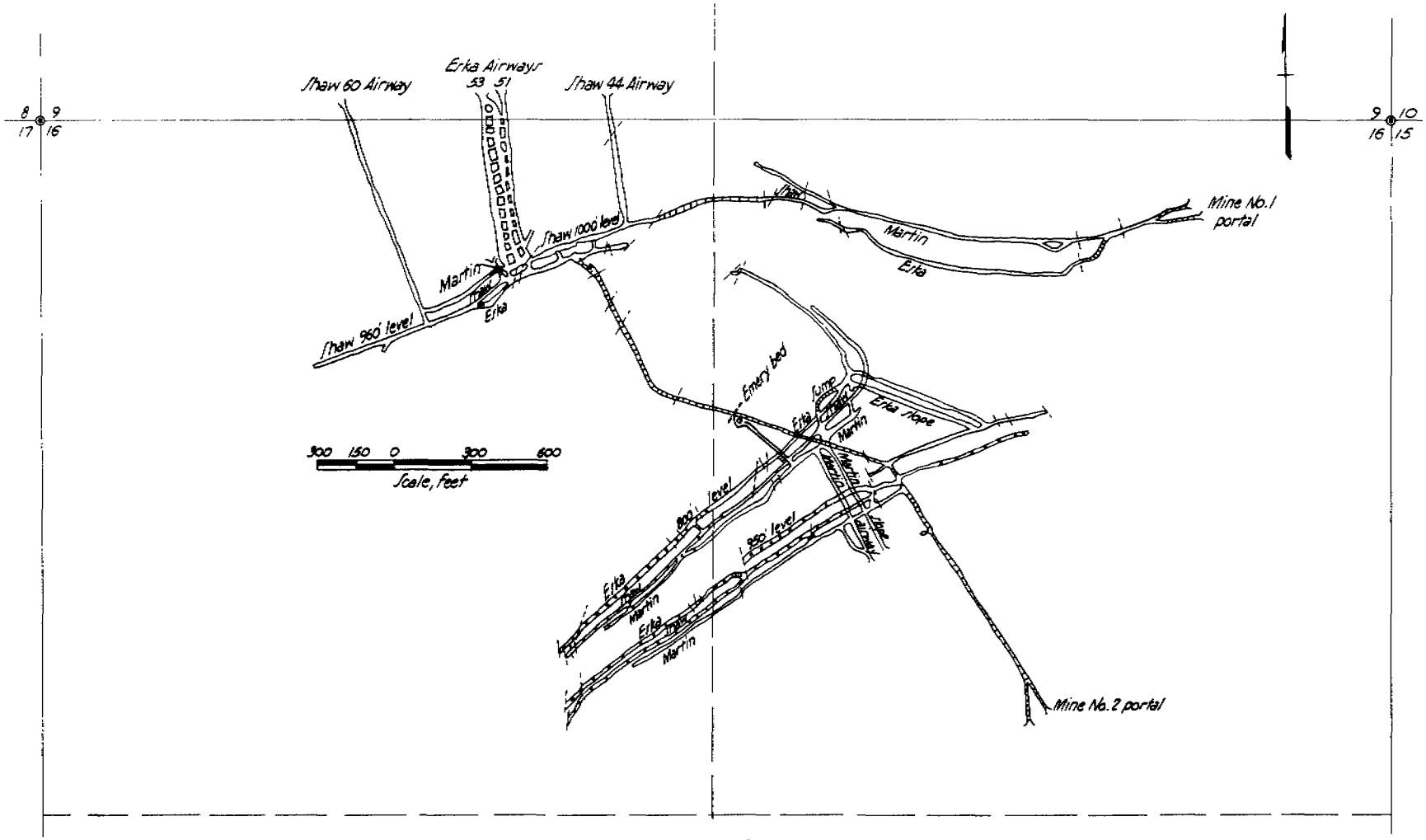

Figure 10. - Plan of Eska mine.

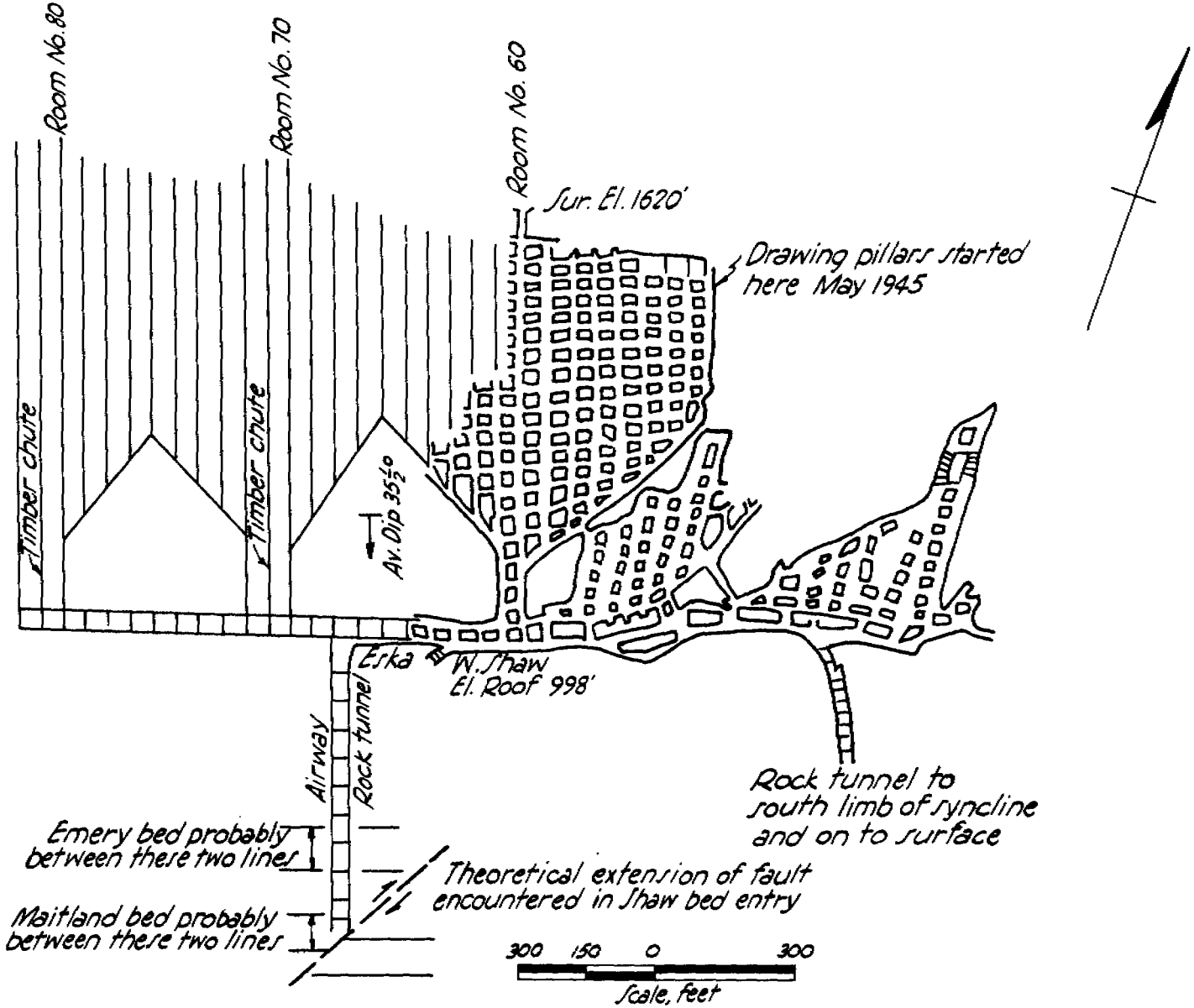

Figure 11. - Development plan in north limb of Eska mine.

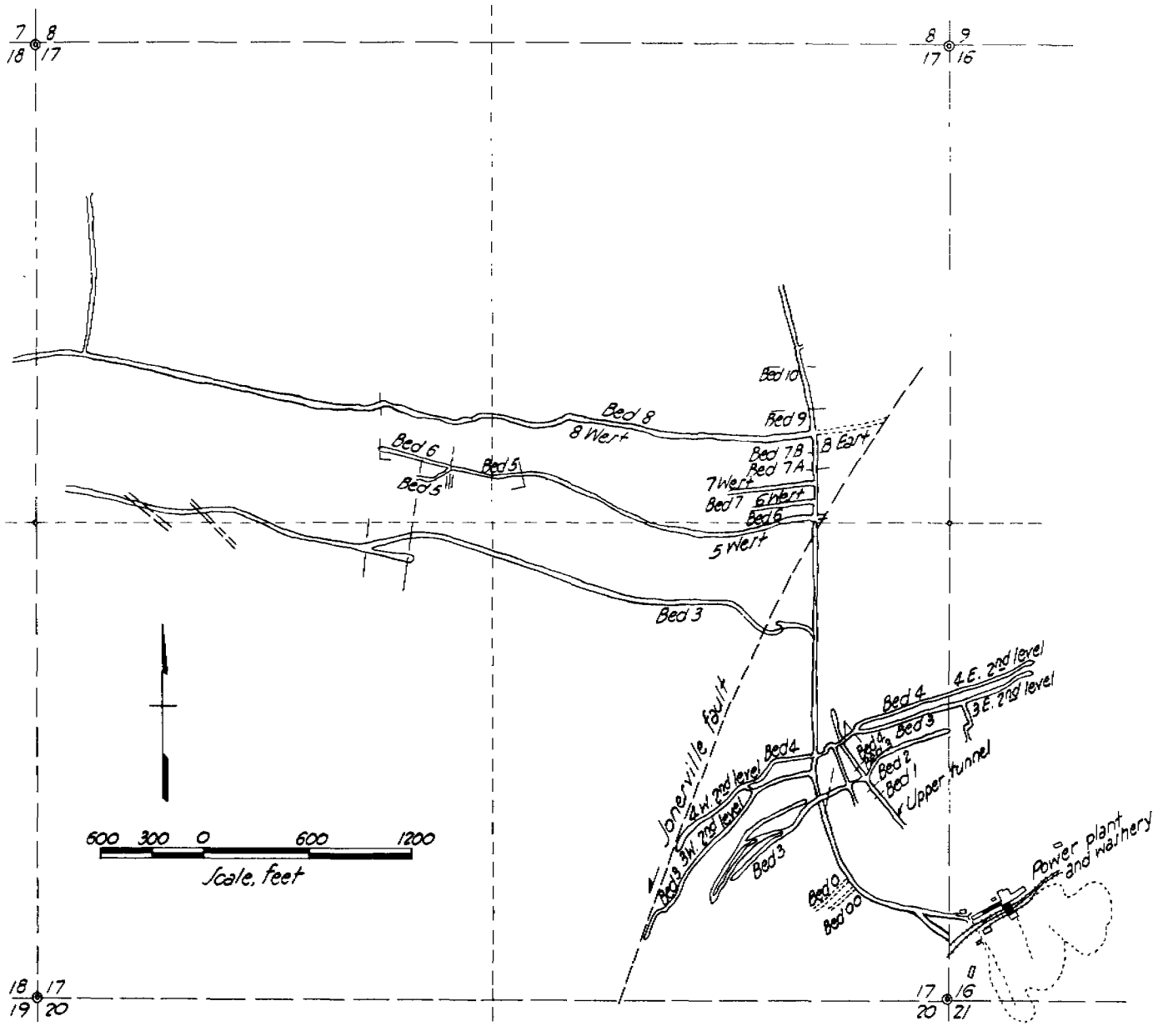

Figure 12. - Plan of Evan Jones Coal Co. mine, Jonesville, Alaska.

order of the top or Eska bed first, the middle or Shaw bed second, and the bottom or Martin bed third. Chutes (rooms) were driven up the rise of the bed 12 feet wide on 40-foot centers. Each room was equipped with a galvanized-iron chute. Pillars were extracted on retreat from each bed.

The north and south limb workings in the mine were separate units, but all coal mined was transported to the surface plant through the same rock entry. The ventilation system of each limb was separate.

There was no development in the beds above the Eska bed. Plans for the development are shown in figure 11; however, the mine was abandoned on June 30, 1946.

Description of Evan Jones Mine

The Evan Jones mine, the only producing mine in the Matanuska field, is on the Matanuska branch of the Alaska Railroad at Jonesville, Alaska. The output of this coal mine, the largest in Alaska, came from beds 1 to 8, with the greatest production from beds 3 and 8. Beds 5 and 6 contain high inherent ash material and are overlain by weak strata which form a poor roof.

The mine opening is a single drift driven in rock at water level. (See fig. 12.) This drift passes through 300 feet of glacial drift and approximately 400 feet of rock and then penetrates the south limb of the coal-bearing formations of the syncline, which extend for about 800 feet. Six coal beds were penetrated in this limb of the syncline - the 00, 0, 1, 2, 3, and 4. The main drift then extends approximately 800 feet north in rock to the coal beds in the north limb of the syncline. An entry was turned west off the main drift and driven about 400 feet in the rock to the No. 3 coal bed west of the Jonesville fault. The other coal beds penetrated by the main drift as it was driven north across the north limb of the syncline and the approximate interval between the beds as measured in the main drift are as follows:

No. 5 - 500 feet inby No. 3
No. 6 - 100 feet inby No. 5
No. 7 - 100 feet inby No. 6
No. 8 - 300 feet inby No. 7
No. 9 - 160 feet inby No. 8
No. 10 - 240 feet inby No. 9

The main drift was stopped 350 feet inby No. 10 bed. The strata between coal beds comprise shaly claystone, sandstone, and siltstone. The dip of the beds in the south limb of the syncline ranges from 11° to 30° N. All minable coal has been extracted in the beds in the south limb of the syncline east of the Jonesville fault. This fault crosses the main adit about 1,400 feet north of the mine workings in the south limb.

The sequence of the beds in the north limb of the syncline, in descending order, is 4, 3, 2, 1, 5, 6, 7, 8, 9, and 10. The dip of these beds ranges from 25° to 35° S. The coal in bed 8 was developed for about 4,700 feet west along the strike of the bed, and about 50 percent of the coal above water level was

extracted. Mining in this bed was discontinued in 1942. Beds 5 and 6 were developed for approximately 2,700 feet west along the strike, and part of the coal was extracted. Mining in No. 6 bed was discontinued in 1945 and in No. 5 in 1946; however, No. 5 bed was reopened in 1950.

At present, approximately 85 percent of the present production of the mine is from operations in the No. 3 bed and 15 percent is from the No. 5 bed in the north limb of the syncline. The thickness of the No. 3 bed ranges from 8 to 12 feet. A section of this bed measured in the No. 8 chute main gangway at 18 crosscut follows:

Material	Thickness Ft.	Thickness in.
Roof - claystone	2	0
Roof coal		5
Hard claystone		1
COAL	1	5
Hard claystone		1/2
COAL		4
Fine sandstone parting		1/2
COAL	1	1
Siltstone, thin coal stringers		2
COAL		5
Siltstone, occasional coal stringers		8
COAL	2	5
Hard claystone lens		1/2
COAL		5
Claystone lens		1/2
COAL		7
Bottom coaly claystone (upper contact breaks well)	1	0
Bed thickness	8	2
Coal thickness	7	1

A section of No. 3 bed measured at approximately 73 crosscut in the strike entry of the Evan Jones mine follows:

Material	Thickness Ft.	Thickness in.
Shaly claystone roof		
COAL	2	8
Silty ironstone		1
COAL	5	5
Ironstone		1
COAL	1	0
Claystone floor (1-inch ironstone)		
Bed thickness	9	3
Coal thickness	9	1

A section of No. 3 bed measured at approximately No. 9 chute in the strike entry follows:

Figure 13. - Portion of the Evan Jones surface plant.

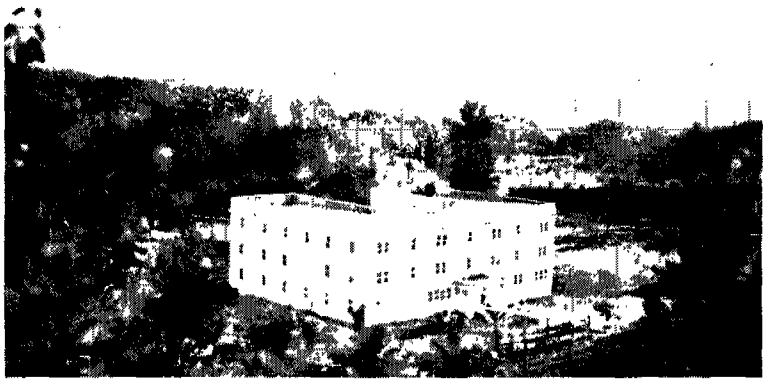

Figure 14. - Dormitory at Eska, Alaska.

Figure 15. - Tipple and preparation plant, Eska, Alaska.

Material	Thickness Ft.	in.
Silty claystone roof		
COAL	1	5
Siltstone		4
COAL	1	8
Siltstone		2
COAL	1	5
Soft claystone, gougy		3
COAL	2	8
Brown clay, soft at bottom		3
COAL		5
Coaly claystone		1
Coal, shaly	1	3
Siltsone bottom		
Bed thickness	9	11
Coal thickness	7	7

The dip of this bed averages 35° in the present workings. The chute-and-pillar system of mining is used. The haulage entry (gangway) is driven on the strike of the bed partly in the footwall so that the bottom of the bed is at car height. The entry is driven 8 to 10 feet wide and about 8 feet high. Three-piece timber sets are used to support the roof where necessary. The airway (counter) is 60 feet up the rise from the gangway. Rooms are turned on 50-foot centers and driven 10 feet wide and about 5 feet high up the rise on advance for a distance of about 1,100 feet. A block comprises 10 rooms. Crosscuts between rooms are on 50-foot centers. After the room has been driven to its limit, the upper 3 to 7 feet of the bed and pillars are extracted on retreat. Pillars are extracted by taking off successive angle slabs. The coal flows by gravity to a chute on the haulageway.

Blast holes are drilled with pneumatic drills, and the holes are charged with permissible explosives, tamped with sand stemming, and detonated electrically.

Rooms are advanced by one man, but two men are used in a place in retreat mining.

Six-ton storage-battery locomotives and steel, drop-bottom cars with a capacity of 3 tons each are used in transporting the coal from the working places to the tipple.

Ventilation is provided by a propeller fan with a capacity of 40,000 cubic feet per minute. The fan is operated blowing, and the intake of the ventilation system is on the gangway. The air passes from the gangway to rooms, travels through the counter, and is exhausted through a room driven to the surface. There is a steam-driven, 60- by 36-inch, centrifugal fan for emergency use.

The production of the mine, about 650 tons a day, is prepared in a preparation plant. The plus 3-inch coal is hand picked, and the minus 3-inch is washed in a jig or a heavy-medium cone. (See fig. 13.) The coal is used by the Army, the railroad, and residents of Anchorage.

Power is generated at the mine by a 300-kilowatt, 440-volt, 3-phase, 60-cycle alternating-current, steam-turbine generator. There are two 70-kilowatt, 440-volt, 3-phase, 60-cycle Diesel-driven generators for emergency use.

Interpretation of Drilling Results and Estimate of Coal Reserves

The information and data pertaining to the chemical characteristics of the coal beds are shown in the appendix. The terms used in reporting reserves are defined as follows:

1. Rank of Coal. - The rank of the coal in this area is high-volatile bituminous, according to the Standard Specifications of the American Society for Testing Materials.20/

2. Overburden. - The overburden is 1,000 feet or less above water level.

3. Classes of Reserves. - The reserves of coal in this area are reported as measured reserves. There will be no estimate of indicated or inferred reserves. Measured coal is defined as follows:

Measured Coal. - Measured coal is that for which tonnage is computed from dimensions revealed in outcrops, trenches, mine workings, and drill holes. The points of observation and measurement are so closely spaced and the thickness and extent of the coal so well-defined that the computed tonnage is judged to be accurate within 20 percent or less of the true tonnage. The limits of accuracy of the estimate should be stated. Although the spacing of the points of observation necessary to demonstrate continuity of coal will vary in different regions according to the habit of the coal beds, the points of observation are, in general, of the order of 1/2 mile apart. The outer limit of a block of measured coal, therefore, shall be of the order of 1/4 mile from the last point of positive information (that is, roughly one-half the distance between points of observation).

Where no data are available other than measurements along the outcrop, but where the continuity of the outcrop is measured in miles and suggests the presence of coal at great distances in from the outcrop, a smooth line drawn roughly 1/2 mile in from the outcrop is used to mark the limit under cover of a block of coal that can also be classed as measured.

4. Bed-Thickness Range. - Reserves in each coal bed are tabulated in bed-thickness ranges, as follows:

14 to 28 inches.
28 to 42 inches.
42 inches and more.

These measurements represent total bed thickness, including all coal and partings in the bed. If the top or bottom bench of a coal bed is separated from the remainder of the bed by a parting of equal or greater thickness than the bench and usually is not mined, such bench and parting are omitted in determining bed thickness.

20/ American Society for Testing Materials, Standard Specifications for Classification of Coal by Rank: 1939, pt. III, pp. 1-6.

5. Thickness of Coal. - In computing the volume of reserves in each thickness category for each bed, the total thickness of clean coal and bony coal in the bed section is used. If the top or bottom bench of coal described under definition of "bed-thickness range" is seldom mined, the thickness of the bench is not used to compute the volume of reserves. A weighted average thickness in each thickness category for each drill hole area of each bed is computed.

6. Weight of Coal. - Estimated coal in place is based on 1,800 short tons per acre-foot.

7. Recoverable Reserves - The minimum bed thickness of recoverable reserves is 28 inches, because this is about the minimum thickness that can be mined mechanically (hand-loaded on conveyors).

DESCRIPTION OF COAL BEDS

No. 5 Bed

A section of the bed penetrated in hole 13-16 follows:

Depth Ft.	Depth in.		Material	Thickness Ft.	Thickness in.	Remarks
167	3		COAL	3	1	El., 1,232 feet;
			Bony coal	2	5	lab. No., C-48684.
			COAL	1	6	
		X	Bony coal	1	5	

Member marked (X) excluded from sample.

A section of this bed measured in the Evan Jones mine near No. 17 chute follows:

Material	Thickness Ft.	Thickness in.
Claystone roof		
Coal, thin streaks of bone	2	0
Coal and bone	1	0
COAL		11
Siltstone		1
COAL		7
Siltstone		2
Coal, streaks of bone		7
Claystone		1
Coal and bony coal	2	6
Siltstone		3
Coal and bone		10
Claystone		1
Coal and bone		11
Silty claystone bottom		

The estimated measured reserves in the No. 5 coal bed in the area investigated in the vicinity of Eska 2 mine is 74,000 tons.

No. 6 Bed

A section of the bed penetrated in hole 13-16 follows:

Depth Ft.	Depth in.	Material	Thickness Ft.	Thickness in.	Remarks
216	0	Bony coal.....	2	1	El., 1,191 feet;
		COAL.....	1	9	Lab. No., C-48735

A section of No. 6 bed measured in the Evan Jones mine near No. 33 chute follows:

Material	Thickness Ft.	Thickness in.
Claystone roof.		
Bone and coaly claystone....		4
COAL.....	2	9
Siltstone.....	1	0
COAL.....		1
Buff siltstone.....		2
COAL.....	1	4
Claystone.....		2
COAL.....		10
Siltstone.....		6
COAL.....		6
Claystone.....		3
COAL.....		9
Claystone bottom.		

No estimate was made of measured reserves in this bed because of unfavorable physical characteristics of the bed.

Chapin Bed

A section of the bed in hole 13-16 follows:

Depth Ft.	Depth in.		Material	Thickness Ft.	Thickness in.	Remarks
302	0		COAL.....	1	4	El., 1,119 feet
		X	Bone.....		3	Lower Chapin;
						lab. No.
						C-48767.

Member marked (X) excluded from sample.

A section of the Chapin bed in Hole 15-16 follows:

Depth Ft.	Depth in.		Material	Thickness Ft.	Thickness in.	Remarks
586	9		COAL.....	1	2	El., 717.0 feet;
		X	Ironstone.....		1	lab. No.,
			COAL.....	4	9	C-51677.

Member marked (X) excluded from sample.

The estimated measured reserves in the Chapin bed in the area investigated in the vicinity of the Eska 2 mine is 357,000 tons.

Emery or No. 8 Bed

A section of the bed penetrated in hole 13-16 follows:

Depth Ft.	Depth in.	Material	Thickness Ft.	Thickness in.	Remarks
405	3	COAL.....	3	9	El., 1,034 feet; lab. No., C-48774.

A section of the bed penetrated in hole 15-16 follows:

Depth Ft.	Depth in.		Material	Thickness Ft.	Thickness in.	Remarks
696	8		Bony coal, bone, and coal....	2	8	El., 616.7 feet; lab. No. C-52396.
		X	Silty claystone.....		2	
			Bone, bony coal, and coal....	2	11	

Member marked (X) excluded from sample.

A section of this bed measured in the Evan Jones mine at the intersection of the No. 8 bed entry and the rock tunnel follows:

Material	Thickness Ft.	Thickness in.
Coaly claystone roof.		
Silstone and coal interbedded.		9
Bony coal.....		6
Siltstone.....		5
Bony coal.....		8
Siltstone.....		7
COAL.....	1	0
Siltstone.....		1
COAL.....	2	8
Siltstone with streaks of bone		5
COAL.....		4
Claystone bottom.		

The estimated measured reserves of the Emory or No. 8 bed in the area investigated in the vicinity of Eska 2 mine is 432,000 tons.

Eska Bed

A section of the bed in hole 13-16 follows:

Depth Ft.	Depth in.	Material	Thickness Ft.	Thickness in.	Remarks
680	1	Coal, including ironstone streak.....	2	5	
		Coal and bone.....	2	0	

The estimated measured reserves in this bed in the area investigated in the vicinity of Eska 2 mine is 142,000 tons.

Shaw Bed

The Shaw bed was mined in both the north and south limbs of Eska 2 mine. A section of the bed penetrated in hole 13-16 follows:

Depth Ft.	Depth in.	Material	Thickness Ft.	Thickness in.	Remarks
701	1	COAL	1	0	
		Bone		10	
		Claystone with streaks of bone	2	0	
		Bony coal and bone	2	0	) Lower bench; el.,
		Bone	1	0	) 786 feet.

The estimated measured reserves in the Shaw bed in the area investigated in the vicinity of Eska 2 mine is 183,000 tons.

Martin Bed

The Martin bed was mined in the south limb of the Eska 2 mine and a section of the bed penetrated in hole 13-16 follows:

Depth Ft.	Depth in.	Material	Thickness Ft.	Thickness in.	Remarks
724	0	Bone	1	6	) El., 770 feet;
		Coal with a few thin bony claystone partings mostly at base	3	6	) lab. No., C-48769.

The estimated measured reserves in this bed in the area investigated in the vicinity of Eska 2 mine are 210,600 tons.

The estimated measured coal reserves in the vicinity of the Alaska Railroad Eska 2 mine are recapitulated in table 1.

TABLE 1. - Estimated measured coal reserves in vicinity of Eska 2 mine, January 1, 1946

Bed	Thickness 28" to 42" Acres	Thickness 28" to 42" Tons	Thickness 42" and more Acres	Thickness 42" and more Tons	Total Measured, tons	Total Recoverable, 1/ tons
No. 5	-	-	9	74,000	74,000	37,000
Chapin	-	-	53	357,000	357,000	178,500
Emery	-	-	64	432,000	432,000	216,000
Eska	34	142,000	-	-	142,000	71,000
Shaw	34	183,000	-	-	183,000	91,500
Martin	-	-	34	210,600	210,600	105,300
Total					1,398,600	699,300

1/ Estimated recovery, 50 percent.

INVESTIGATION OF COAL DEPOSITS IN AREA EAST OF ESKA CREEK

Preliminary Examination

A reconnaissance of the area was made in 1946 by engineers of the Bituminous Coal-Mining Section, Bureau of Mines, and Federal Geological Survey geologists. Barnes[21] reports that as much as 4 million tons of coal might occur east of Eska Creek if structural conditions persist as indicated on the east bank of Eska Creek and in the east mine of the Alaska Engineering Commission. The existence of favorable structure for mechanized mining was indicated in shallow holes churn-drilled by the Alaska Engineering Commission and reported by Tuck.[22] The dormitory at Eska was available for housing miners and the tipple; preparation and surface plants also were available should the investigation prove minable reserves. (See figs. 14 and 15.) Adequate water for diamond drilling was available in Eska and Knob Creeks. The area was found to be accessible and road and hole locations were made.

Road Building

Roads were built east from Eska to drill sites with a bulldozer. The roadbed of the main road was constructed 10 feet wide and was built along a glacial moraine. The road was suitable for truck and automobile travel, except in extremely wet weather. About 2 miles of road was constructed across gently sloping terrain at a cost of $1,500 per mile.

Diamond Drilling

Diamond drilling was done under contract between the Bureau of Mines and Lynch Bros., diamond-drill contractors, Seattle, Wash. As a guide for estimating the cost of drilling under similar conditions in 1947, unit contract prices are given:

Schedule of unit prices

Item No.	Articles or service	Unit	Unit price: Vertical holes	Unit price: Inclined holes
1	Drilling and setting standpipe through overburden to accommodate continued drilling as ordered by resident Government engineer:			
	A. 0 to 50 feet	Foot	$ 7.65	$ 8.15
	B. Beyond depth of 50 feet	do.	8.65	9.15
2	Prices to be paid for drilling from bottom of standpipe to bottom of hole: Drilling with diamond bit to secure core of 2-1/8 inches minimum diameter	do.	8.10	8.10

21/ Barnes, F. F., and Byers, F. M., Jr., Work cited, footnote 5.
22/ Tuck, Ralph, Work cited, footnote 6.

Schedule of unit prices (Cont.)

Item No.	Articles or service	Unit	Unit price: Vertical holes	Unit price: Inclined holes
3	Additional diamond-drill core boring as may be ordered by resident Government engineer in excess of minimum guarantee for items 1 to 2, inclusive, shall be performed at a reduction in prices of $0.25 per foot.	Foot		
4	Reaming hole and installing casing.....	do.	$ 2.60	$ 2.60
5	For cementing, waiting for cement to set, and drilling out cement.....	do.	2.60	2.60
6	Surveying.....	Hour	8.00	8.00
7	Plugging holes with cement from bottom of hole to 50 feet above minable coal beds..	Per hole	55.00	55.00

The thickness, physical characteristics, and extent of the coal beds in the upper part of the Chickaloon coal formation were determined by diamond drilling, which yielded 2-1/8-inch coal cores. Chemical and petrographic analyses were made of these cores, and the dip and strike of the beds were computed from the logs of the holes.

Each hole is designated by a serial and section number separated by a dash and followed by the letters EA. The serial number designates the order of drilling, the section number is the number of the section in which the hole was drilled, and the letters EA represent Eska, Alaska; for example, 1-15-EA indicates that the first hole is located in section 15 at Eska, Alaska. A typical drill set-up is shown in figure 16. Roads between drill holes were built with a bulldozer. (See fig. 17.) Detailed logs of drill holes are given in the appendix. All drill holes were vertical. The locations of drill holes (fig. 18) in T. 19 N., R. 3 E. of the Seward meridian are summarized as follows:

Hole	Location
1-15 EA	780 feet S. and 10 feet E. of NW. corner sec. 15.
2-15 EA	915 feet S. and 715 feet E. of NW. corner sec. 15.
3-15 EA	70 feet S. and 640 feet E. of NW. corner sec. 15.
4-15 EA	405 feet S. and 1,250 feet E. of NW. corner sec. 15.
5-15 EA	480 feet S. and 2,000 feet E. of NW. corner sec. 15.
6-10 EA	60 feet N. and 35 feet W. of S. quarter corner sec. 10.
7-10 EA	590 feet N. and 1,760 feet E. of SW. corner sec. 10.
8-10 EA	880 feet N. and 380 feet E. of S. 1/4 corner sec. 10.
9-10 EA	1,315 feet N. and 870 feet E. of S. 1/4 corner sec. 10.

Diamond drilling began on May 19, 1947 and continued until October 15, 1947; was recessed until May 7, 1948 and completed August 21, 1948.

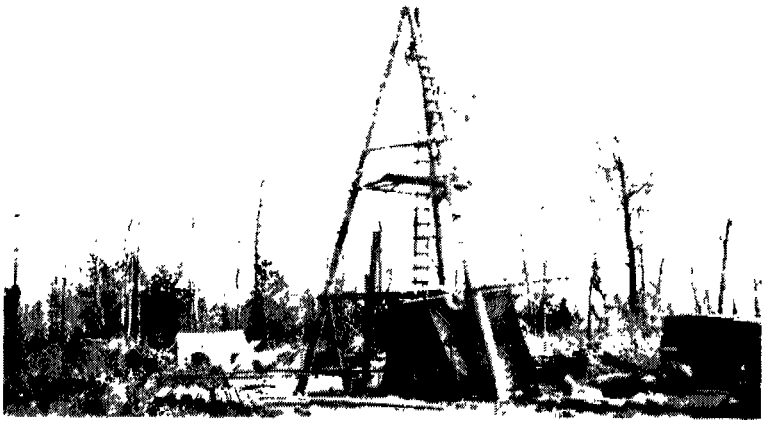

Figure 16. - Diamond drill set-up at hole 2-15 EA.

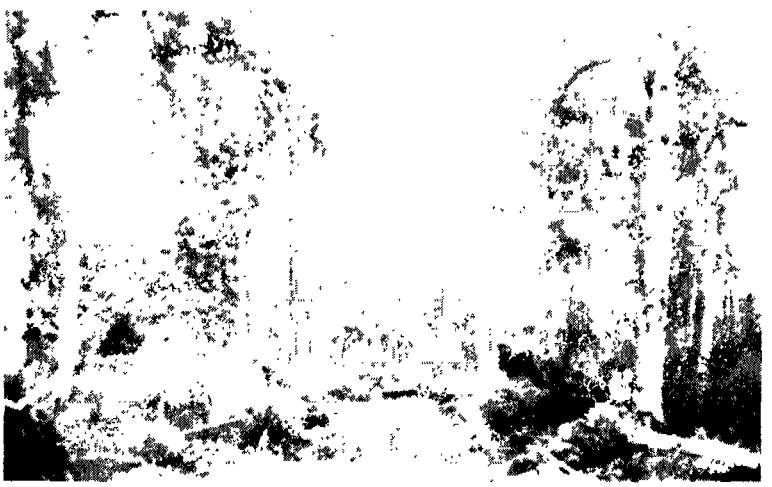

Figure 17. - Bulldozed road east of Eska Creek.

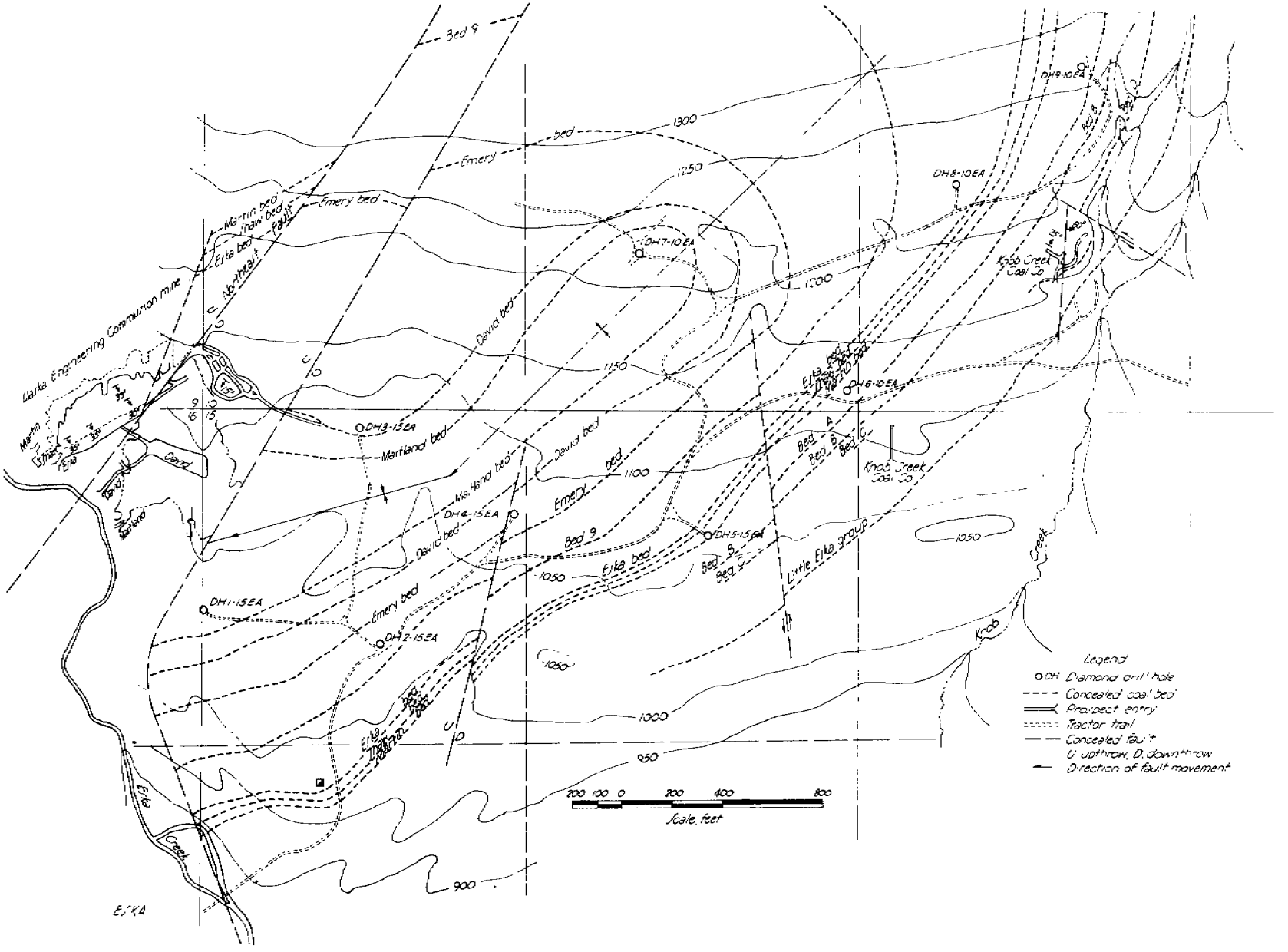

Figure 18. - Area investigated east of Eska Creek, Alaska. (Base map by Geological Survey).

Progress of drilling follows:

Holes drilled	9
Footage	5,158
Overburden (standpipe)	206
2-1/8-inch core drilling	4,952
Drilling shifts	296
Feet per drilling shift	17.4
Total shifts, including moves, repairs, and other delays (1 drill two 8-hour shifts per day 6 days per week)	473
Feet per shift (total shifts)	10.9
Average cost per foot	$8.58

Strata Penetrated in Drilling

All of the drilling was in the upper part of the Chickaloon formation, which comprises conglomerates, sandstones, siltstones, claystones, and coal beds. The geology of the area investigated is shown in figure 8. Coal beds outcrop along the east and west banks of Eska Creek, and there also are outcrops of unidentified coal beds in Knob Creek. Between Eska Creek and Knob Creek the coal beds are covered with alluvium and glacial drift and the outcrops are concealed. The glacial drift and alluvium, which occurs between Eska and Knob Creek, ranges from 0 to 50 feet in thickness and averages 20 feet. Fragments of coal are found in the glacial drift.

The coal beds penetrated by drilling, in descending order, are:

Maitland group:
  Chapin
  Maitland
  David
  Emery
Bed 9
Eska group:
  Eska
  Shaw
  Martin
A, B, C, and D
Little Eska group

Description of Alaska Engineering Commission East Mine

This mine was developed by the Alaska Engineering Commission for the Alaska Railroad by driving strike entries in the Maitland, David, Emery, Eska, Shaw, and Martin beds. (See fig. 18.) The strike entries were started at the outcrops in the canyon of Eska Creek and driven both east and west. The east entries followed the beds on the strike to the northeast fault, and, after passing through this fault, followed the strike of a bed above or higher in the series of beds. This is demonstrated by the entry in the Eska bed, which was driven east to the northeast fault, then into the Emery bed, which is 340 feet stratigraphically above the Eska bed. The entry in the David bed follows

the David bed east, passes through another fault east of the northeast fault, and continues east as a strike entry in the Maitland bed. In both of these entries the beds inby the fault are downthrown. (See fig. 18.) The beds developed east of Eska Creek were in the north limb of a syncline and the beds dip about 15° southwest on the east side of the northeast fault and about 32° southwest on the west side of the northeast fault. (See fig. 18.) The coal was mined up the rise from the strike entries above water level. The Emery, David, and Maitland beds were the only beds extensively mined east of the northeast fault. These beds have not been developed below water level, nor have these beds (except the Maitland) been developed east of a second northeast fault. The mining system followed was chute-and-pillar and some pillars were extracted.

Description of Knob Creek Coal Co. Entries

Two short entries were driven by the Knob Creek Coal Co. in an area about 1/2 mile east of Eska Creek. These entries are shown on figures 7 and 18. The first entry, which is 120 feet east and 200 feet south of the north quarter corner, sec. 15, T. 19 N., R. 3 E., at an elevation of 1,092 feet, was driven N. 10° W. as a single entry through glacial drift, claystone, and siltstone for 130 feet in 1947. The strike of the claystone in the entry was N. 80° W. and dip 9° north. No coal beds were penetrated in the entry. The portal of the second single entry is 900 feet east and 400 feet north of the south quarter corner, sec. 10, T. 19 N., R. 3 E., elevation 1,140 feet. This entry was started in the fall of 1948 in a coal bed above the Little Eska group. A fault was encountered about 100 feet inby the portal in 1950, and development was discontinued. The entry was being driven toward hole 8-10-EA in which the Eska group of coal beds were penetrated.

INTERPRETATION OF DRILLING RESULTS AND ESTIMATED MEASURED RESERVES OF COAL IN AREA EAST OF ESKA CREEK

Detailed logs and analyses of the coals are given in the appendix. Sections and structural contours of the Eska, Shaw, and Martin coal beds are shown in figures 19 to 21, inclusive.

All of the coal beds have a tendency to be lenticular and the thickness of coal, bony coal, and bone varies in each drill hole. All of the coal must be beneficiated by removal of extraneous high-ash portions to obtain satisfactory fuel.

A description of each coal bed, in descending order, follows:

Maitland Bed

The outcrop of the Maitland bed is shown in figure 18.

A section of the bed penetrated in hole 1-15-EA follows:

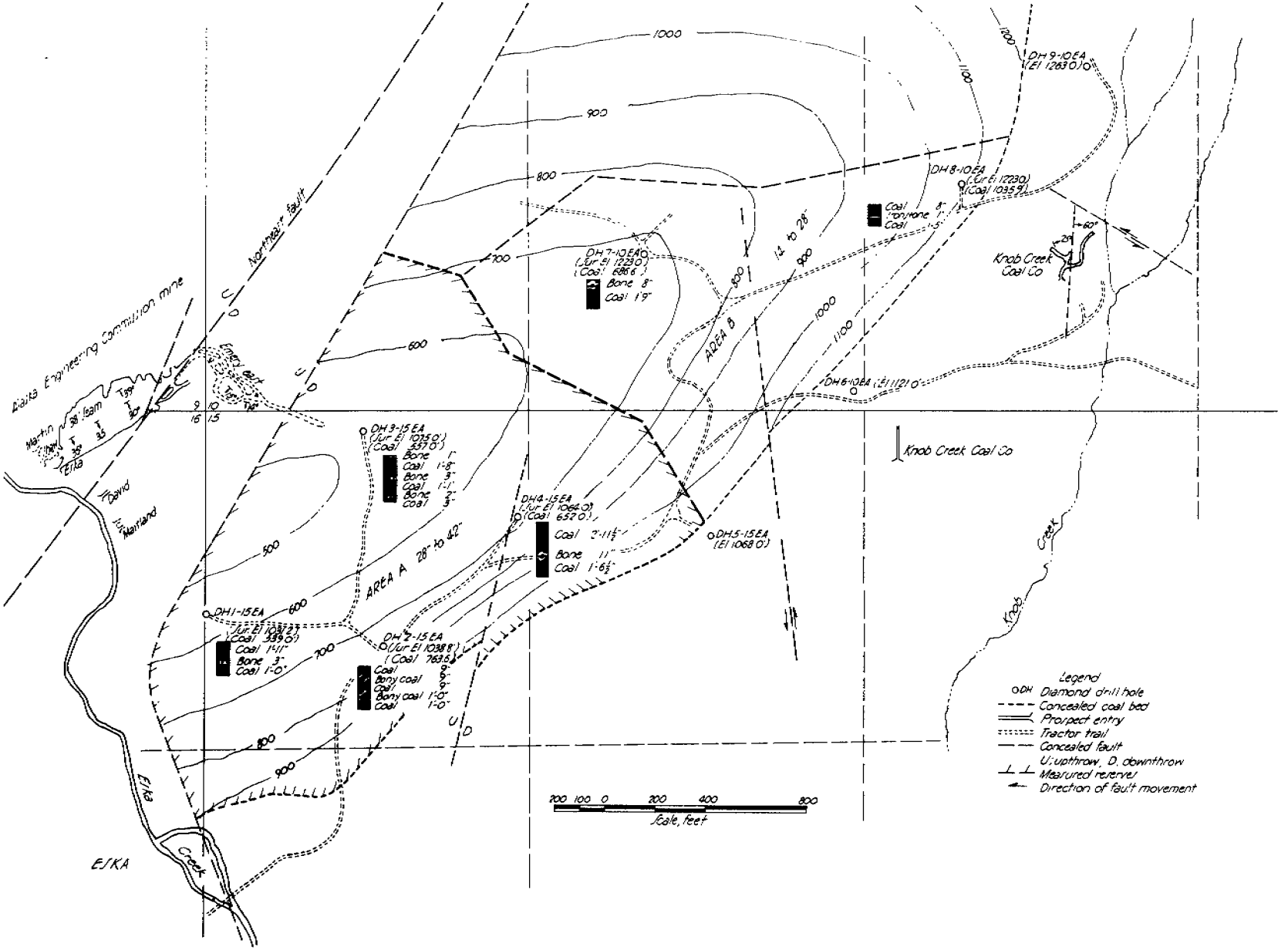

Figure 19. - Eska bed in area east of Eska Creek.

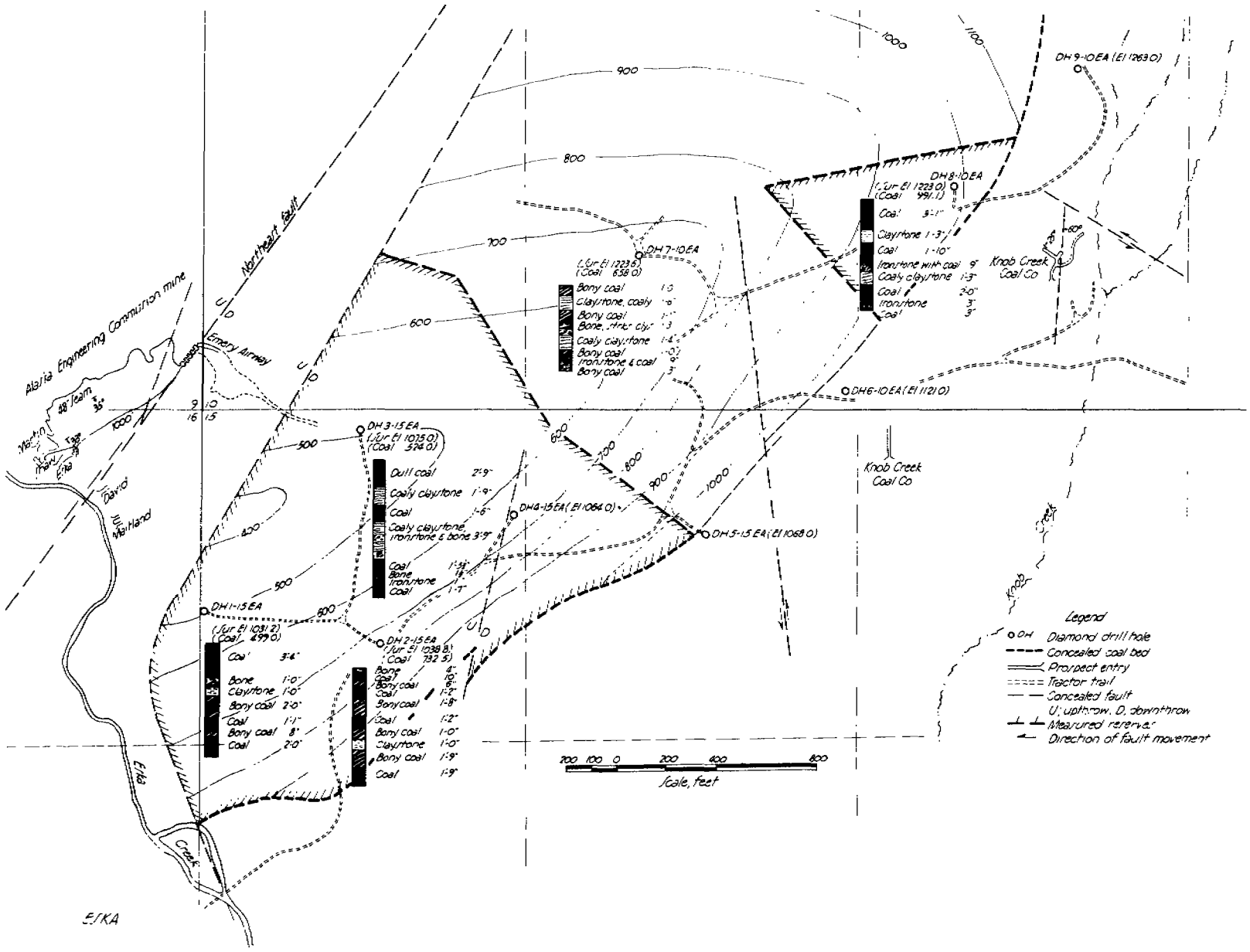

Figure 20. - Shaw bed in area east of Eska Creek.

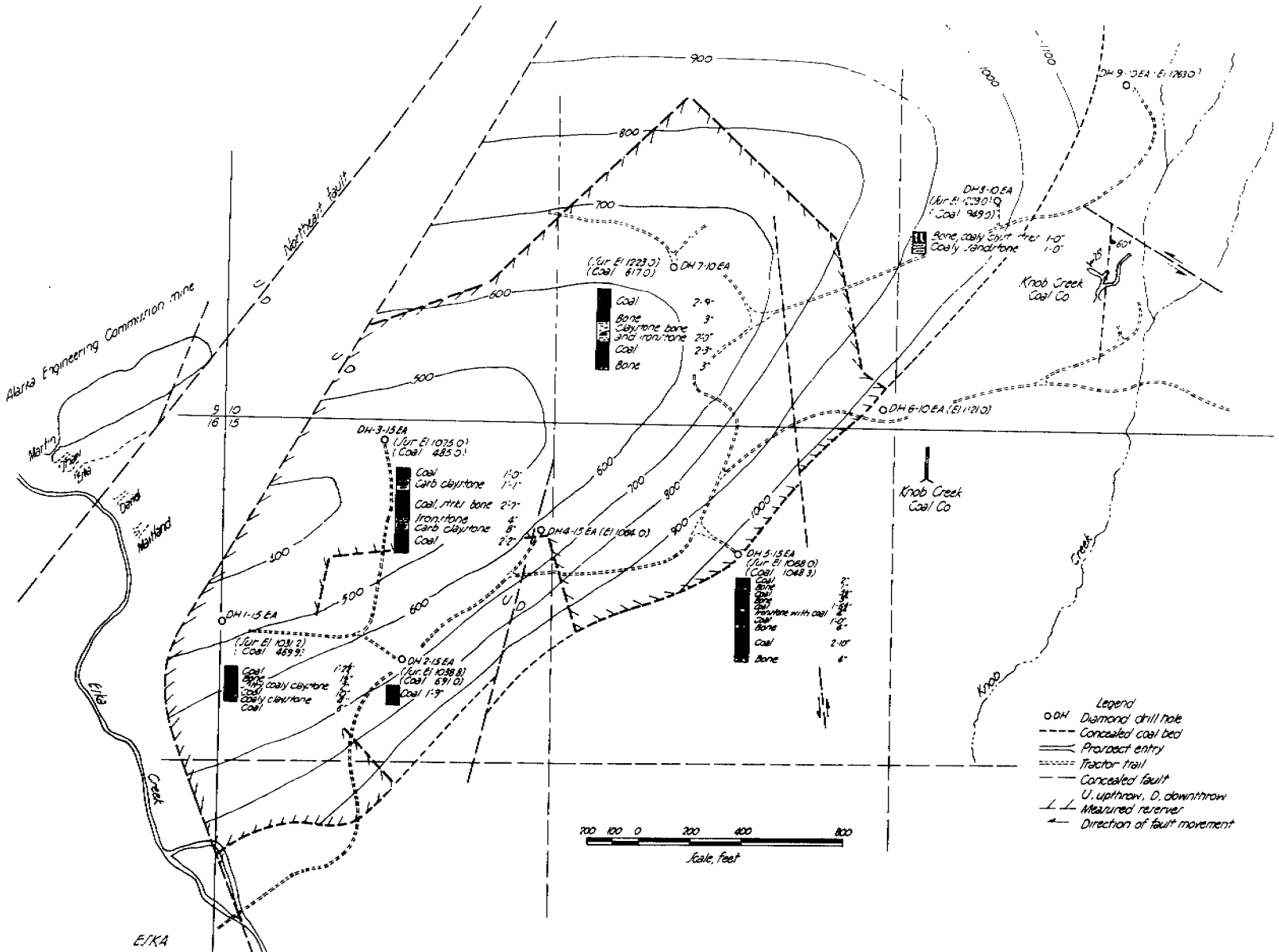

Figure 21. - Martin bed in area east of Eska Creek.

Depth Ft.	Depth in.	Material	Thickness Ft.	Thickness in.	Remarks
61	9	COAL.....	2	6	El., 969.2 feet; lab. No., C-77879.

A section of the bed penetrated in hole 7-10-EA follows:

Depth Ft.	Depth in.	Material	Thickness Ft.	Thickness in.	Remarks
60	6	Coal with thin streaks of bone.....	3	0	El., 1,162.5 feet; lab. No., C-98414.

The area of this bed is small, and no estimate of reserves was made.

David Bed

The outcrop of the David bed is shown in figure 18.

A section of the bed penetrated in hole 1-15-EA follows:

Depth Ft.	Depth in.	Material	Thickness Ft.	Thickness in.	Remarks
106	6	COAL.....		6	El., 924.5 feet.
		Bony coal.....	2	0	

A section of the bed penetrated in hole 7-10-EA follows:

Depth Ft.	Depth in.	Material	Thickness Ft.	Thickness in.	Remarks
102	0	Coal with thin streaks of bone	3	0	El., 1,121.0 feet; lab. No., C-98417.

The area of this bed is small, and no estimate of reserves was made.

Emery Bed

The outcrop of the Emery coal bed is shown in figure 18.

A section of the bed penetrated in hole 1-15-EA follows:

Depth Ft.	Depth in.	Material	Thickness Ft.	Thickness in.	Remarks
153	6	COAL.....	3	6	El., 877.5 feet; lab. No., C-77880.

A section of the bed penetrated in hole 3-15-EA follows:

Depth Ft.	Depth in.	Material	Thickness Ft.	Thickness in.	Remarks
91	0	Bony coal with streaks of coal	2	3	El., 984 feet.

A section of the bed penetrated in hole 4-15-EA follows:

Depth Ft.	Depth in.		Material	Thickness Ft.	Thickness in.	Remarks
22	3		COAL.....		2	El., 1,041.8 feet;
		X	Bone.....		1/2	lab. No., C-83519.
			COAL.....		9	
		X	Bone.....		1	
			COAL.....	1	6-1/2	
		X	Bony coal.....	1	2	

Member marked (X) excluded from sample.

A section of the bed penetrated in hole 7-10-EA follows:

Depth Ft.	Depth in.	Material	Thickness Ft.	Thickness in.	Remarks
213	0	Bony coal.....	1	0	El., 1,010.0 feet.

The area of this bed is small, and no estimate of reserves was made.

Eska Bed

The outcrop of Eska bed and sections of the bed penetrated in holes 1-15-EA, 2-15-EA, 3-15-EA, 4-15-EA, 7-10-EA, and 8-10-EA are shown in figure 19. The estimated measured reserves in the area investigated east of Eska Creek are 477,000 tons, and the weighted average thickness of the coal in this bed is 35 inches; thickness of the bed is 41 inches.

The Eska coal bed comprises one bench of coal in which there usually is included one thin streak of bone or ironstone; however, the entire bed was mined in the Eska 2 mine. This bed has the least partings and extraneous material of any bed in the area. The extraneous material can be removed by washing in a preparation plant. Analyses of the coal in the bed are given in the appendix.

Shaw Bed

The outcrop of the Shaw bed and sections of the bed penetrated in holes 1-15-EA, 2-15-EA, 3-15-EA, 7-10-EA, and 8-10-EA are shown in figure 20. The estimated measured reserves in the area east of Eska Creek are 955,200 tons, and the weighted average thickness of the coal in this bed is 87 inches; thickness of the bed is 138 inches.

The Shaw coal bed comprises two and three benches of coal separated by claystone; however, where mined in the Eska 2 mine, this bed occurred in two benches, and full-seam mining was practiced in developing the north limb to the west. The extraneous material was removed by hand-picking the large sizes and washing the smaller sizes. Analyses of the coal in the bed are given in the appendix.

Martin Bed

The Martin bed outcrop and sections of the bed penetrated in holes 1-15-EA, 2-15-EA, 3-15-EA, 5-15-EA, 7-10-EA, and 8-10-EA are shown in figure 21. The estimated measured reserves in the area investigated east of Eska Creek are 678,300 tons, and the weighted average thickness of coal in the bed is 50 inches; thickness of the bed is 65 inches.

The Martin coal bed is multiple-bedded and generally occurs in two benches separated by a parting that ranges from 4 to 24 inches in thickness. The benches of coal are lenticular, and mining is difficult. Analyses of the coal in the bed are given in the appendix.

Bed A

The outcrop of bed A is shown in figure 18, and sections of the bed penetrated in holes 6-10-EA, 8-10-EA, and 9-10-EA are given in the logs. This bed ranges from 13 to 24 inches thick.

Bed B

The outcrop of bed B is shown in figure 18.

A section of this bed penetrated in hole 5-15-EA follows:

Depth Ft.	Depth in.	Material	Thickness Ft.	Thickness in.	Remarks
130	7	COAL	2	2	El., 937.4 feet;
	X	Bone		2	lab. No., C-83567.
		COAL	1	1	
	X	Bone		2	
		COAL		11	
	X	Carbonaceous siltstone		1	
	X	COAL		9-1/2	

Member marked (X) excluded from sample.

A section of this bed penetrated in hole 6-10-EA follows:

Depth Ft.	Depth in.	Material	Thickness Ft.	Thickness in.	Remarks
98	3	COAL	3	0	El., 1,012.2 feet; lab. No., C-97349.

A section of this bed penetrated in hole 9-10-EA follows:

Depth Ft.	Depth in.	Material	Thickness Ft.	Thickness in.	Remarks
121	6	COAL	2	6	El., 1,142.5 feet;
	X	Ironstone		1	lab. No., D-8011.
		COAL	2	2-1/2	
	X	Bone		5-1/2	
		COAL		6	
	X	Claystone		1	
		COAL		5-1/2	
	X	Bone		1	
		COAL		1/2	
	X	Bone		1/2	
		COAL		1-1/2	
	X	Shale and bone		4-1/2	
		COAL		4-1/2	

Member marked (X) excluded from sample.

A small area of reserves is indicated, and an attempt to develop this area was made by the Knob Crook Coal Co.

Bed C

Bed C was penetrated in holes 5-15-EA and 6-10-EA, and the thickness of the bed ranged from 8 to 20 inches.

Bed D

The outcrop of bed D is shown in figure 18. A section of this bed penetrated in hole 6-10-EA follows:

Depth Ft.	Depth in.	Material	Thickness Ft.	Thickness in.	Remarks
327	10	COAL		11	El., 793.2 feet;
	X	Ironstone and coal		1	lab. No., C-97351
		COAL		8	
	X	Ironstone and coal		2	
		COAL	1	1	

Member marked (X) excluded from sample.

A section of this bed penetrated in hole 8-10-EA follows:

Depth Ft.	Depth in.	Material	Thickness Ft.	Thickness in.	Remarks
583	10	COAL	2	1	El., 639.2 feet; lab. No., D-555.

A section of this bed penetrated in hole 9-10-EA follows:

Depth Ft.	Depth in.	Material	Thickness Ft.	Thickness in.	Remarks
306	6	Coal with thin streaks of bone	2	1	El., 956.5 feet.

This bed ranges from 25 to 35 inches thick.

Little Eska Group

The Little Eska group of coal beds was penetrated in holes 5-15-EA, 6-10-EA, 8-10-EA, and 9-10-EA. This group of coal beds is multiple-bedded and comprises interbedded coal, bony coal, bone, and coaly claystone. The Little Eska group comprises the lowest known coal beds in the upper part of the Chickaloon formation. The outcrop of this group of beds is shown in figure 18, and no recoverable reserves were developed in these beds.

The measured reserves of coal in the area east of Eska Creek are recapitulated in table 2.

TABLE 2. - Coal reserves in area east of Eska Creek, January 1, 1949

Bed	Thickness: 14" to 28" Acres	14" to 28" Tons	28" to 42" Acres	28" to 42" Tons	42" and more Acres	42" and more Tons	Total Measured: 14" and more Tons	Total Recoverable 1/: 28" and more Tons
Eska..	35.5	115,500	56.1	361,500	-	-	477,000	180,750
Shaw..	-	-	-	-	73.2	955,200	955,200	477,600
Martin	14.6	46,000	15.3	68,800	70.0	563,500	678,300	316,150
Total.....							2,110,500	974,500

1/ Based on an estimated recovery of 50 percent.

COAL PREPARATION OF MATANUSKA COALS

Washability characteristics and washing coals from the Matanuska Valley field of Alaska are discussed by Geer and Yancey,23/ and their summary and conclusions are given below:

> This report describes the washability characteristics and washing of coals from the Eska and Evan Jones mines, the principal producers in the Matanuska field of Alaska. Screen-sizing tests and specific-gravity analyses were made on both coals to evaluate their washability characteristics, and detailed washery-performance tests were made with the Eska coal.
>
> The Eska coal contains 40 percent of impurity heavier than 1.70 specific gravity, and the Evan Jones coal about half that amount. Both coals contain, in addition, unusually large amounts of intermediate-density bony material. The shale and bone associated with

23/ Geer, M. R., and Yancey, H. F., Washability Characteristics and Washing of Coals from the Matanuska Field of Alaska: Bureau of Mines Rept. of Investigations 3840, 1946, 17 pp.

both coals is more resistant to breakage than the clean coal and consequently tend to concentrate in the coarser sizes, with a corresponding concentration of the clean coal in the finer sizes. Considering all sizes together, a product of 18 to 19 percent ash is obtained by a separation at 1.70 specific gravity. Separation at a specific gravity of less than about 1.70 entails a large loss in yield for the increased reduction in ash content obtained, owing to the large proportion of bony material in the coal.

The Eska coal is washed in a modern Baum-type jig. The jig is able to make an efficient separation between coal and refuse in preparing a washed product of 20 percent ash, but separations at lower specific gravities to obtain cleaner washed coal can be made only at impaired efficiency. The washing results indicate that in treating coals of this type the efficiency of the separation effected between coal and impurity is influenced by the amount of refuse material removed, as well as by the proportion of "near-gravity" material present in the coal.

The Evan Jones coal is washed in a manually controlled, Forrester-type jig. With this type of jig the quality of the products obtained is determined largely by the skill of the operator, and uniformity of operation is difficult to maintain. Samples of the washed coal collected on successive days varied from 14 to 19 percent ash. A similar variation in quality is evident in the record of shipments from this mine.

An important factor that must be considered in connection with the utilization of coals from this district is that their specific-gravity composition imposes a lower limit for the ash content to which they can be washed with a reasonable yield of washed coal. This factor is inherent in the character of the coal and, therefore, applies even when the coal is treated in modern, well-operated, washing equipment. Washed coal having a minimum ash content of 14 percent can be produced, but only with a sharp sacrifice in yield. If coal of less than 18 percent ash is required, its enhanced value must justify the increased cost of preparing such a product.

APPENDIX

The logs of drill holes in the appendix show the names of the coal beds penetrated and the laboratory numbers of the chemical analyses of the coal cores under the column headed "Remarks." Dips given in this column are the apparent dips of the strata measured on bedding planes in the cores at the depths shown.

Analyses of coal cores are given in tables 3 and 4 in the appendix. The column headed "Drill hole" shows, in the order listed, the drill hole from which the core was recovered, the depth below the surface from which the core was obtained, and the name of the coal bed. The columns "Core received," "Core rejected," and "Core analyzed" show the part of the diamond-drill core that was analyzed. Most of the coal beds in the Matanuska field contain partings of clay-stone or shale, and all partings 3/8 inch or more thick were removed before the sample was sent to the chemical laboratory for analysis.

Log, hole 13-16

Location: 1,400 feet W. and 1,040 feet N. of center sec. 16, T. 19 N., R. 3 E., Seward Meridian, Eska, Alaska.
Elevation: Collar of hole - 1,370 feet.
Bearing of hole: N. 20° W.
Dip of hole: 56°
Dip angle of strata generally normal to the hole or approximately 34° to the southeast.

Depth From- Ft.	Depth From- in.	Depth To- Ft.	Depth To- in.	Material	Thickness Ft.	Thickness in.	Remarks
0	0	6	6	Soil	6	6	
6	6	7	0	Claystone		6	
7	0	12	0	Iron-stained gray claystone	5	0	
12	0	16	0	Gray siltsone	4	0	
16	0	24	0	Gray claystone	8	0	
24	0	24	11	Bone and carbonaceous shale		11	
24	11	25	10	Dark-gray shale		11	
25	10	28	0	Carbonaceous shale	2	2	
28	0	30	7	Coaly claystone	2	9	
30	7	35	11	Interbedded carbonaceous shale and bone	5	2	
35	11	36	10	Bony coal		11)	El., 1,337 ft.
36	10	37	6	Silty claystone		8	
37	6	40	1	Iron-stained siltstone, occasional streak of carbonaceous shale	2	7	
40	1	60	0	Gray, silty claystone	19	11	Sheared, 46 to 50 ft.
60	0	60	1	Clay gouge		1	
60	1	80	10	Gray claystone, carbonaceous at 80 ft.	20	9	
80	10	81	0	Bone		2	
81	0	83	11	Coaly claystone, silty at base	2	11	
83	11	165	6	Interbedded siltstone and claystone, carbonaceous at 103, 112, 136, 145, and 154 ft.	82	7	
165	6	167	3	Carbonaceous shale with streaks of bony coal		9	
167	3	170	4	COAL	3	1)	No. 5 bed; el., 1,232 ft.; C-48684.
170	4	172	9	Bony coal	2	5)	
172	9	174	3	COAL	1	6)	
174	3	175	8	Bony coal	1	5	
175	8	176	9	Bone and bony coal	1	1	
176	9	177	0	Claystone with thin streaks of coal		3	
177	0	178	8	COAL	1	8	C-48685.

Log, hole 13-16 (Con't.)

Depth From- Ft.	Depth From- in.	Depth To- Ft.	Depth To- in.	Material	Thickness Ft.	Thickness in.	Remarks
178	8	179	2	Claystone		6	
179	2	179	7	Bony coal		5	
179	7	180	9	Claystone	1	2	
180	9	181	9	Bony coal	1	0	) C-48733.
181	9	182	2	Carbonaceous claystone		5	
182	2	183	4	Bone and bony coal	1	2	
183	4	185	2	Coaly claystone	1	10	
185	2	186	2	Bone and bony coal	1	0	
186	2	188	9	Coal, partly bony	2	7	) C-48734.
188	9	189	1	Claystone		4	
189	1	190	1	Dense, heavy siltstone with calcite cementing	1	0	
190	1	198	0	Gray siltstone, occasional plant fragments	7	11	
198	0	204	3	Interbedded siltstone and claystone	6	3	
204	3	207	4	Dark-gray, silty claystone	3	1	
207	4	209	3	Interbedded fine siltstone and silty claystone	1	11	
209	3	215	6	Claystone, silty at base	6	3	Slickensides.
215	6	215	11	Coaly claystone		5	
215	11	216	0	Bone		1	
216	0	218	1	Bony coal	2	1	
218	1	219	10	COAL	1	9	) No. 6 bed; el., 1,191 ft., C-48735.
219	10	220	3	Bone		5	
220	3	220	4	Coaly claystone		1	
220	4	220	7	Silty ironstone		3	
220	7	221	7	Claystone, with few carbonaceous particles	1	0	
221	7	222	8	COAL	1	1	) C-48736.
222	8	223	1	Silty claystone and bone		5	
223	1	224	6	COAL	1	5	) El., 1,185 ft., C-48737.
224	6	224	8	Bone		2	) Bottom of No. 6 bed.
224	8	225	8	Claystone, carbonaceous streaks top and bottom	1	0	
225	8	228	3	Silty claystone	2	7	
228	3	228	9	Dark-gray claystone		6	Slickensided.
228	9	231	7	Silty claystone	2	10	
231	7	232	2	Claystone, with occasional leaf impressions		7	
232	2	235	6	Siltstone	3	4	
235	6	237	0	Gray, fine sandstone	1	6	
237	0	239	11	Interbedded siltstone and claystone	2	11	
239	11	240	0	Gray clay		1	

Log, hole 13-16 (Cont.)

Depth From- Ft.	Depth From- in.	Depth To- Ft.	Depth To- in.	Material	Thickness Ft.	Thickness in.	Remarks
240	0	246	5	Silty claystone and claystone, occasional plant fragments	6	5	
246	5	252	1	Interbedded silty claystone and fine siltstone	5	8	
252	1	276	0	Silty claystone	23	11	
276	0	280	7	Gray claystone	4	7	
280	7	282	0	Bony coal	1	5)	Upper Chapin;
282	0	282	6	Coal and claystone, highly distorted		) 6)	el., 1,137 ft.; C-48766.
282	6	283	2	Bony coal		8)	
283	2	283	8	Bone		6)	
283	8	284	4	Bony coal		8)	
284	4	289	6	Claystone, with coal laminae	5	2	
289	6	294	6	Medium-gray bentonitic claystone	5	0	
294	6	302	0	Claystone grading into coaly claystone at base	7	6	
302	0	303	4	COAL	1	4)	Lower Chapin;
						)	el., 1,119 ft.;
						)	C-48767.
303	4	303	7	Bone		3)	
303	7	306	0	Coal, with numerous bony streaks	2	) 5)	
306	0	306	4	Bone		4)	
306	4	325	2	Shattered silty claystone	18	10	
325	2	325	6	Bone and coal		4)	Upper Maitland; el., 1,100 ft.
325	6	325	8	Dark claystone, with streaks of coal		2	
325	8	327	6	Coal, bony at base	1	10)	C-48738.
327	6	328	0	Bone		6	
328	0	330	10	Claystone, with streaks of bone	2	10	
330	10	331	4	Bony coal		6	
331	4	331	8	Calcareous silty claystone		4	
331	8	332	11	COAL	1	3	Lower Maitland; el., 1,095 ft.; C-48739.
332	11	333	6	Bony coal		7	
333	6	334	0	Claystone		6	
334	0	334	3	Coaly claystone		3	
334	3	351	2	Claystone with siltstone bands, silty at base	16	11	
351	2	351	4	Ironstone		2	
351	4	353	8	Silty claystone, grading into claystone	2	4	
353	8	354	4	Coaly claystone		8	
354	4	356	1	Coal and bony coal	1	9)	David bed;
						)	el., 1,076 ft.;
356	1	357	8	Dirty coal	1	7)	C-48768.
357	8	358	3	COAL		7)	
358	3	358	6	Bone		3	Highly sheared.

Log, hole 13-16 (Cont.)

Depth From- Ft.	Depth From- in.	Depth To- Ft.	Depth To- in.	Material	Thickness Ft.	Thickness in.	Remarks
358	6	359	4	Coaly claystone		10	
359	4	368	4	Gray siltstone	9	0	
368	4	376	2	Silty claystone	7	10	
376	2	382	0	Fine sandstone	5	10	
382	0	398	0	Gray siltstone, carbonaceous bands at base	16	0	
398	0	400	1	Claystone	2	1	
400	1	400	4	Coaly claystone		3	
400	4	401	3	Highly contorted, calcareous claystone		11	
401	3	402	7	Coaly claystone	1	4	
402	7	403	5	Bone		10	
403	5	403	10	Coaly claystone		5	
403	10	404	9	Bony coal		11	
404	9	405	2	Siltstone, with lenses of coal		5	
405	2	405	3	Ironstone		1	
405	3	409	0	COAL	3	9	) Emery bed; el., 1,034 ft.; C-48740.
409	0	409	9	Coaly claystone		9	
409	9	484	0	Silty claystone and claystone	74	3	
484	0	484	11	Fine sandstone		11	
484	11	506	9	Siltstone	21	10	
506	9	515	10	Fine sandstone	9	1	
515	10	527	7	Claystone, with silty streaks	11	9	
527	7	530	0	Interbedded claystone and siltsone	2	5	
530	0	541	3	Claystone, silty at base	11	3	
541	3	541	9	Carbonaceous claystone		6	
541	9	542	0	Bone		3	
542	0	542	3	COAL		3	
542	3	544	1	Carbonaceous claystone, with coal lenses	1	10	
544	1	545	1	Coal, with a few bony streaks	1	0	
545	1	545	5	Carbonaceous claystone		4	
545	5	545	6	COAL		1	
545	6	547	6	Bone and carbonaceous claystone	2	0	
547	6	548	7	COAL	1	1	) No. 9 bed.
548	7	548	10	Bone		3	
548	10	551	10	Siltstone	3	0	
551	10	552	4	Carbonaceous claystone		6	
552	4	553	4	Coal and bony coal	1	0	
553	4	557	0	Siltstone, with coal lenses	3	8	Bottom of B-size core.
557	0	576	0	Siltstone	19	0	Top of A-size core.
576	0	648	6	Claystone and silty claystone	72	6	
648	6	657	8	Silty claystone, grading into siltstone	9	2	
657	8	659	1	Carbonaceous claystone	1	5	

Log, hole 13-16-(Cont.)

Depth From- Ft.	Depth From- in.	Depth To- Ft.	Depth To- in.	Material	Thickness Ft.	Thickness in.	Remarks
659	1	662	7	Gray medium to fine sandstone	3	6	
662	7	662	9	Siltstone		2	
662	9	664	3	Silty claystone	1	6	
664	3	665	3	Carbonaceous claystone	1	0	
665	3	668	3	Silty claystone	3	0	
668	3	675	9	Interbedded siltstone and claystone	7	6	
675	9	676	1	COAL		4	
676	1	678	7	Siltstone	2	6	
678	7	680	1	Dark claystone	1	6	
680	1	682	6	Coal, including ironstone streak	2	5)	Eska bed.
682	6	684	6	Coal and bone	2	0	
684	6	689	5	Silty claystone	4	11	
689	5	691	11	Coaly claystone	2	6	
691	11	694	1	Claystone with carbonaceous streaks	2	2	
694	1	695	11	Bone and bony coal	1	10)	El., 794 ft.
695	11	696	4	Carbonaceous claystone		5	
696	4	697	6	Bone and bony coal	1	2	
697	6	700	1	Coaly claystone	2	7	
700	1	701	1	Claystone with carbonaceous streaks	1	0	
701	1	702	1	COAL	1	0	
702	1	702	11	Bone		10	
702	11	704	11	Claystone, with streaks of bone	2	0	
704	11	706	11	Bony coal and bone	2	0)	Shaw bed; el., 786 ft.
706	11	707	11	Bone	1	0	
707	11	712	6	Claystone	4	7	
712	6	713	0	Fine sandstone		6	
713	0	724	0	Claystone, with silty and carbonaceous streaks	11	0	
724	0	725	6	Bone	1	6)	Martin bed; el., 770 ft. C-4-8769.
725	6	729	0	Coal, with a few thin, bony claystone partings, mostly at the base	3	6)	
729	0	732	6	Bony coal and bone	3	6	
732	6	740	0	Silty claystone	7	6	
740	0	750	0	Siltstone	10	0	
750	0	763	3	Silty claystone, with calcareous and iron carbonate streaks	13	3	
763	3	772	0	Fine sandstone	8	9	
772	0	776	0	Silty claystone and claystone	4	0	
776	0	780	0	Claystone, with carbonaceous streaks	4	0	
780	0	783	0	Silty claystone	3	0	

Log, hole 14-16

Location: 1,650 feet W. and 295 feet N. of center sec. 16, T. 19 N., R. 3 E., Seward Meridian, Eska, Alaska.
Elevation: Collar of hole - 1,230 feet.
Bearing of hole: N. 10° W.
Dip of hole: 60°

Depth From- Ft.	Depth From- in.	Depth To- Ft.	Depth To- in.	Material	Thickness Ft.	Thickness in.	Remarks
0	0	15	0	Soil	15	0	
15	0	16	0	Pebble conglomerate boulder	1	0	
16	0	18	9	Buff silty claystone	2	9	
18	9	22	3	Gray and buff medium sandstone	3	6	
22	3	23	0	Coarse, micaceous siltstone		9	
23	0	24	9	Dark-gray claystone, streaks of siltstone	1	9	
24	9	41	6	Greenish-buff coarse siltstone, micaceous, with fine sandstone and siltstone streaks	16	9	
41	6	48	0	Interbedded claystone and siltstone	6	6	
48	0	55	0	Fine siltstone, with thin streaks of claystone	7	1	
55	0	61	0	Interbedded siltstone and claystone	6	0	
61	0	67	0	Claystone	6	0	
67	0	69	2	Silty claystone	2	2	
69	2	83	3	Dark medium to fine siltstone	14	1	
83	3	92	0	Fine siltstone, grading into silty claystone	8	9	
92	0	94	0	Claystone	2	0	
94	0	101	6	Siltstone	7	6	
101	6	134	0	Dark-to light-gray, coarse, granular sandstone, with white specks	32	6	
134	0	140	0	Fine to medium to coarse sandstone	6	0	
140	0	146	0	Interbedded claystone, silty claystone, and siltstone	6	0	
146	0	152	6	Medium sandstone, streaks of siltstone at base	6	6	
152	6	168	0	Interbedded siltstone and claystone	15	5	
168	0	170	0	Slightly carbonaceous claystone	2	0	
170	0	174	0	Gray, friable medium to coarse sandstone	4	0	
174	0	176	0	Dark-gray, silty claystone	2	0	
176	0	181	6	Claystone, some coal and bone at base	5	6	Crushed.
181	6	183	5	Gray clay gouge	1	11	
183	5	184	5	Hard, silty claystone	1	0	Crushed.

Log, hole 14-16 (Cont.)

Depth From- Ft.	Depth From- in.	Depth To- Ft.	Depth To- in.	Material	Thickness Ft.	Thickness in.	Remarks
184	5	186	6	Broken, dark claystone	2	1	
186	6	190	6	Claystone, some coal and gouge	4	0	Crushed.
190	6	192	0	Siltstone	1	6	
192	0	201	0	Silty claystone	9	0	
201	0	208	0	Claystone	7	0	Shearing.
208	0	209	8	Saccharoidal sandstone	1	8	
209	8	216	0	Claystone	6	4	Crushed.
216	0	218	6	Saccharoidal sandstone	2	6	
218	6	221	6	Claystone	3	0	
221	6	221	9	Claystone, with iron carbonate cement		3	
221	9	238	6	Claystone	16	9	
238	6	239	2	Claystone, with iron carbonate cement		8	
239	2	242	6	Claystone	3	4	
242	6	244	9	Claystone, siltstone, and coal	2	3	Crushed.
244	9	247	0	Claystone	2	3	
247	0	247	3	COAL		3	
247	3	250	0	Dark, coaly claystone	2	9	Bottom of B-size core.
250	0	257	0	Claystone, with iron carbonate zones near base	7	0	Top of A-size core.
257	0	276	0	Claystone, coaly zones near top and middle	19	0	
276	0	278	0	Hard, silty claystone, with iron carbonate cement	2	0	
278	0	281	2	Medium sandstone	3	2	
281	2	282	1	Claystone, with thin clay bands		11	
282	1	282	4	Silty claystone, iron carbonate cement		3	
282	4	283	0	Silty claystone		8	
283	0	285	3	Claystone	2	3	
285	3	285	7	Gray clay		4	
285	7	315	0	Claystone, locally silty, some limy	29	5	
315	0	317	6	Silty claystone, grading into medium siltstone	2	6	
317	6	319	6	Silty claystone	2	0	
319	6	334	7	Siltstone	15	1	
334	7	337	0	Silty claystone, grading into claystone	2	5	
337	0	359	11	Claystone	22	11	
359	11	364	0	Medium sandstone	4	1	
364	0	372	0	Claystone, grading into silty claystone	8	0	
372	0	372	2	Grit		2	
372	2	373	0	Claystone		10	
373	0	374	10	Grit	1	10	

Log, hole 14-16 (Cont.)

Depth From- Ft.	Depth From- in.	Depth To- Ft.	Depth To- in.	Material	Thickness Ft.	Thickness in.	Remarks
374	10	388	0	Medium to coarse sandstone	13	2	
388	0	388	6	Claystone		6	
388	6	391	10	Coal, bone, coaly claystone	3	4	Shattered and contorted.
391	10	415	0	Claystone, slightly coaly at 398 ft. 6 in.	23	2	
415	0	417	7	Silty claystone	2	7	
417	7	424	0	Coaly claystone	6	5	
424	0	424	2	COAL		2	
424	2	426	2	Coaly claystone	2	0	
426	2	426	5	COAL		3	
426	5	431	5	Claystone	5	0	
431	5	432	4	Limy claystone, calcite-filled fractures		11	
432	4	445	3	Claystone	12	11	
445	3	449	1	Silty claystone	3	10	
449	1	459	1	Medium siltstone	10	0	
459	1	462	5	Fine sandstone	3	4	
462	5	471	0	Silty claystone and siltstone	8	7	
471	0	472	10	Claystone	1	10	
472	10	473	5	Medium siltstone		7	
473	5	473	9	Claystone		4	
473	9	477	4	Medium siltstone	3	7	
477	4	488	10	Silty claystone, grading into claystone	11	6	
488	10	490	9	Claystone, with abundant leaf fragments	1	11	
490	9	493	0	Silty claystone	2	3	

Log, hole 15-16

Location: 2,000 feet W. and 130 feet N. of center sec. 16, T. 19 N., R. 3 E., Seward Meridian, Eska, Alaska.
Elevation: Collar of hole - 1,220 feet.
Bearing of hole: N. 10° W.
Dip of hole: 60°

Depth From- Ft.	Depth From- in.	Depth To- Ft.	Depth To- in.	Material	Thickness Ft.	Thickness in.	Remarks
0	0	62	0	Overburden, sand, gravel, silt, with numerous boulders of conglomerate, coarse sandstone, and siltstone	62	0	
62	0	63	2	Medium to fine siltstone, with a few coaly lenses	1	2	
63	2	64	2	Claystone, with a few thin coal lenses	1	0	
64	2	68	3	Fine to medium sandstone grading down into siltstone	4	1	

Log, hole 15-16 (Cont.)

Depth From- Ft.	Depth From- in.	Depth To- Ft.	Depth To- in.	Material	Thickness Ft.	Thickness in.	Remarks
68	3	69	0	Claystone and silty claystone, with a few coaly lenses		9	
69	0	69	3	Gray, quartz-diorite, porphyry-dike rock		3	
69	3	70	0	Dark-gray claystone		9	
70	0	84	6	Fine to medium siltstone, with several 6" beds of medium siltstone in lower part	14	6	
84	6	92	0	Silty claystone, grading down into claystone	7	6	
92	0	95	6	Silty claystone, with occasional leaf impressions	3	6	
95	6	99	7	Fine to medium siltstone	4	1	
99	7	100	0	Silty claystone		5	
100	0	107	0	Claystone, with rare carbonized plant fragments, coal and bone near top, sheared at 103 ft.	7	0	
107	0	107	5	Medium siltstone		5	
107	5	107	9	Claystone		4	
107	9	107	11	Medium siltstone		2	
107	11	110	2	Claystone, grading down into silty claystone and siltstone	2	3	
110	2	119	5	Fine to medium siltstone, weathered, minor faulting, bedding generally normal, locally contorted	9	3	
119	5	127	7	Claystone, silty near middle	8	2	
127	7	132	5	Fine to medium siltstone, weathered fractures	4	10	
132	5	134	0	Silty claystone	1	7	Crushed or sheared.
134	0	137	9	Thin-bedded, silty claystone, grading into siltstone	3	9	
137	9	141	5	Medium to coarse sandstone, dark matrix, with numerous white specks, weathered cracks	3	8	
141	5	142	7	Medium to coarse sandstone, weathered dark brown	1	2	
142	7	179	0	Medium to coarse sandstone, with a few pebbles, dark-gray matrix, light-colored blotches	36	5	
179	0	180	3	Weathered, brown, sticky, ground-up sandstone gouge zone	1	3	
180	3	188	0	Fine to medium sandstone, thin carbonaceous streaks	7	9	Dip, 20°-25°.
188	0	190	6	Fine siltstone, grading into silty claystone	2	6	Weathered and crushed.

Log, hole 15-16 (Cont.)

Depth From- Ft.	Depth From- in.	Depth To- Ft.	Depth To- in.	Material	Thickness Ft.	Thickness in.	Remarks
190	6	195	0	Fine to medium sandstone, carbonaceous fragments, leaf impressions, grading down into siltstone	4	6	
195	0	196	9	Silty claystone, leaf impressions	1	9	
196	9	202	0	Oxidized, dark-gray, porous sandstone, white specks	5	3	
202	0	209	0	Silty claystone and siltstone, leaf impressions	7	0	
209	0	209	7	Claystone with carbonaceous streaks		7	Sheared.
209	7	211	6	Siltstone, grading into medium to coarse sandstone, friable at base	1	11	
211	6	229	6	Claystone, thin coal lenses at 216 ft. 7 in. to 217 ft. 7 in.	18	0	Sheared at top.
229	6	236	6	Silty claystone	7	0	
236	6	243	0	Highly crushed carbonaceous claystone	6	6	
243	0	244	0	Siltstone	1	0	
244	0	245	0	Clay and sand gouge	1	0	
245	0	247	0	White, coarse, sugary sandstone	2	0	
247	0	247	7	Gray claystone		7	
247	7	248	2	White, coarse sandstone		7	
248	2	248	9	Sandstone and claystone gouge		7	Sheared.
248	9	268	9	Claystone, few local carbonaceous streaks and coal lenses	20	0	Crushed and sheared.
268	9	268	11	COAL		2	Bottom of BX at 265 ft.
268	11	270	0	Claystone	1	1	
270	0	274	3	Clay gouge	4	3	Crushed.
274	3	274	7	Silty claystone		4	
274	7	290	6	Claystone, several crushed zones, trace of coal at 279 ft. and 290 ft.	15	11	
290	6	291	1	Claystone gouge		7	Crushed.
291	1	293	11	Claystone with a few coal lenses	2	10	
293	11	294	2	Bone		3	
294	2	303	0	Claystone, coaly near top, gougy from 300 to 301 ft., silty and carbonaceous streaks at base	8	10	
303	0	304	11	Soft, friable sandstone	1	11	
304	11	319	3	Interbedded siltstone, silty claystone, and claystone	14	4	
319	3	319	5	Bone		2	

Log, hole 15-16 (Cont.)

Depth From- Ft.	Depth From- in.	Depth To- Ft.	Depth To- in.	Material	Thickness Ft.	Thickness in.	Remarks
319	5	334	0	Claystone, silty in middle	14	7	
334	0	361	5	Interbedded siltstone, silty claystone, and claystone	27	5	
361	5	363	5	Fine sandstone	2	0	
363	5	364	11	Siltstone, grading into arkose	1	6	
364	11	381	11	Coarse, massive sandstone, with few thin claystone streaks	17	0	Dip, 10°
381	11	397	0	Arkose, silty in middle, silty claystone with few coal fragments at base	15	1	
397	0	399	6	Bone and some thin-bedded coal	2	6	
399	6	405	0	Claystone	5	6	
405	0	411	6	Coaly claystone	6	6	
411	6	418	7	Claystone, silty at base	7	1	
418	7	421	11	Interbedded silty claystone and claystone	3	4	
421	11	423	9	Claystone and gouge	1	10	Crushed.
423	9	432	8	Claystone, with few coaly and bony lenses	8	11	
432	8	433	2	Fine, silty ironstone		6	
433	2	468	5	Coaly claystone, silty at top	35	3	
468	5	468	9	Siltstone		4	
468	9	471	9	Silty claystone, grading into claystone	3	0	
471	9	477	11	Fine-bedded siltstone, grading into fine sandstone, carbonaceous banding	6	2	
477	11	501	0	Fine to medium to coarse sandstone, with a few silty bands, shattered from 485 to 490 ft. and 495 to 500 ft.	23	1	
501	0	518	3	Siltstone, grading into fine sandstone, siltstone, and silty claystone	17	3	
518	3	520	1	Silty claystone grading into siltstone	1	10	
520	1	523	7	Sandstone, grading into siltstone, cross-bedding, 2-thin, arkose beds at base	3	6	
523	7	538	2	Silty claystone, with thin coaly streaks	14	7	Contorted bedding.
538	2	538	7	Contorted bone, with some coal		5	
538	7	549	7	Claystone, grading into silty claystone and into claystone	11	0	
549	7	551	8	Carbonaceous claystone, with abundant coal fragments at top	2	1	Crushed.

Log, hole 15-16 (Cont.)

Depth From- Ft.	Depth From- in.	Depth To- Ft.	Depth To- in.	Material	Thickness Ft.	Thickness in.	Remarks
551	8	552	7	Bony coal		11	
552	7	553	3	Bone		8	
553	3	559	2	Coaly claystone	5	11	
559	2	560	1	Siltstone, grading into fine sandstone		11	
560	1	560	8	Hard, calcareous claystone		7	
560	8	562	8	Coaly claystone, with some bone	2	0	
562	8	562	11	Siltstone		3	
562	11	563	1	Sandstone		2	
563	1	564	7	Interbedded siltstone and fine sandstone	1	6	
564	7	569	2	Silty claystone, grading into claystone	4	7	
569	2	572	7	Interbedded silty claystone, siltstone, and fine sandstone	3	5	
572	7	586	9	Gray, fractured claystone, silty streaks, coaly near base	14	2	
586	9	587	11	COAL	1	2)	Maitland group,
587	11	588	0	Ironstone		1	Chapin bed;
588	0	592	9	COAL	4	9)	el., 717 ft.; C-51677.
592	9	594	9	Carbonaceous claystone, with a few coal lenses	2	0	
594	9	595	6	Silty ironstone		9	
595	6	599	7	Claystone	4	1	
599	7	600	2	Coal and bone		7	El., 703.5 ft., C-52255.
600	2	600	4	Coaly silty ironstone		2	
600	4	603	10	COAL	3	6	C-52255.
603	10	604	0	Coaly ironstone		2	
604	0	614	0	Coal, with 2-in. coal ironstone marker near top and middle	10	0	Maitland group; C-52255.
614	0	617	0	Bone and coaly claystone	3	0	
617	0	620	0	Silty, coaly claystone	3	0	
620	0	620	8	Claystone		8	
620	8	621	2	Bony coal		6	
621	2	621	5	Claystone		3	
621	5	622	1	Bone		8	
622	1	623	1	Bony coal	1	0	
623	1	623	9	Claystone, with few coal lenses		8	
623	9	639	2	Coaly claystone	15	5	
639	2	640	11	Coal and bone	1	9	David bed; C-52993.
640	11	643	11	Coaly claystone	3	0	
643	11	648	11	Claystone	5	0	
648	11	652	0	Silty claystone	3	1	

Log, hole 15-16 (Cont.)

Depth From- Ft.	Depth From- in.	Depth To- Ft.	Depth To- in.	Material	Thickness Ft.	Thickness in.	Remarks
652	0	656	0	Claystone, with leaf fragments	4	0	
656	0	680	6	Siltstone, with thin streaks of silty claystone	24	6	Normal bedding.
680	6	682	0	Interbedded siltstone and silty claystone	1	6	
682	0	691	8	Claystone, with leaf fragments and coaly streaks near bottom	9	8	
691	8	692	0	Bony coal		4	
692	0	693	6	Claystone	1	6	
693	6	694	2	Bone		8	
694	2	696	7	Coaly claystone	2	5	
696	7	696	9	Ironstone		2	
696	9	699	5	Bony coal, bone, and coal	2	8	Emery or No. 8 bed; el., 616.7 ft., C-52396.
699	5	699	7	Silty claystone		2	
699	7	702	6	Bone, bony coal, and coal	2	11	
702	6	703	3	Coaly claystone		9	
703	3	703	8	Coal and bone		5	
703	8	704	6	Claystone, coaly at top and bottom		10	
704	6	706	6	Coal and bony coal	2	0	
706	6	706	7	Silty claystone		1	
706	7	708	0	Coal and bony coal	1	5	
708	0	708	3	Siltstone		3	
708	3	711	0	Sandstone, with thin coal streaks	2	9	
711	0	713	6	Silty claystone	2	6	
713	6	722	0	Fine sandstone, grading into siltstone	8	6	
722	0	723	2	Silty claystone	1	2	
723	2	726	5	Claystone, silty at base	3	3	Normal bedding.
726	5	729	8	Siltstone, with calcite veinlet	3	3	
729	8	736	2	Interbedded silty claystone, siltstone, and fine sandstone, few leaf impressions	6	6	
736	2	737	0	Fine sandstone		10	
737	0	740	6	Claystone, with numerous leaf impressions	3	6	
740	6	749	6	Siltstone, with limy cement	9	0	
749	6	751	8	Mottled fine sandstone, with streaks of siltstone and carbonized plant fragments	2	2	
751	8	766	3	Claystone, silty top and bottom, limy at 752 ft. 7 in.	14	7	
766	3	768	0	Light gray to buff limestone	1	9	

Log, hole 15-16 (Cont.)

Depth From- Ft.	Depth From- in.	Depth To- Ft.	Depth To- in.	Material	Thickness Ft.	Thickness in.	Remarks
768	0	772	0	Silty and dense claystone, probably limy	4	0	
772	0	773	0	Silty claystone, lime cement	1	0	
773	0	778	0	Claystone, streaks of siltstone, numerous plant fragments	5	0	
778	0	779	0	Limy claystone with calcite veinlets	1	0	
779	0	781	5	Dense claystone, with siltstone streaks	2	5	
781	5	790	0	Fine sandstone, with silty bands and thin bands of claystone and leaf fragments, cross-bedding	8	7	
790	0	798	0	Claystone, with thin limy and silty claystone bands	8	0	
798	0	798	6	Dark-brown, shaly claystone		6	Crushed.
798	6	805	0	Dark-brown, shaly claystone, with a few pieces of coal	6	6	

Bedding angles

Depth, feet	Degrees	Dip, degrees
70	90	30
95	90	30
105	80	20
119	90	30
125	80-85	20-25
185	80-85	20-25
243	50	10
370	70	10
415	75	15
477	90	30
500	80	20
675	90	30
725	90	30

Log, hole 1-15 EA

Location: 780 feet S. and 10 feet E. of NW. corner sec. 15, T. 19 N., R. 3 E., Seward Meridian, Eska, Alaska.
Elevation: Collar of hole - 1,031 feet.

Depth From- Ft.	Depth From- in.	Depth To- Ft.	Depth To- in.	Material	Thickness Ft.	Thickness in.	Remarks
0	0	36	0	Overburden, soil, sand, clay, scattered boulders and gravel	36	0	
36	0	40	6	Siltstone and fine sandstone	4	6	
40	6	45	6	Silty claystone	5	0	Dip, 10°
45	6	46	0	Fine sandstone		6	
46	0	48	6	Silty claystone with streaks of sandstone	2	6	
48	6	49	3	Sandstone		9	
49	3	52	0	Silty claystone	2	9	Dip, 10°
52	0	57	6	Claystone	5	6	
57	6	61	0	Interbedded claystone and siltstone	3	6	
61	0	61	9	Claystone		9	
61	9	64	3	COAL	2	6	Maitland bed; el., 969.2 ft.; C-77879.
64	3	64	9	Bone		6	
64	9	65	3	Coaly claystone		6	
65	3	70	9	Claystone, with streaks of clay and coal	5	6	
70	9	71	5	Bone		8	
71	5	72	5	Claystone	1	0	
72	5	74	5	COAL	2	0	
74	5	74	7	Claystone and bone		2	
74	7	77	0	Claystone and coaly claystone	2	5	
77	0	93	0	Claystone, with plant fossils, thin, silty streaks	16	0	
93	0	100	0	Interbedded and cross-bedded siltstone and claystone	7	0	
100	0	106	2	Claystone	6	2	
106	2	106	6	Clay, with streaks of coaly claystone		4	
106	6	107	0	COAL		6)	David bed;
107	0	109	0	Bony coal	2	0)	el., 924.5 ft.
109	0	109	6	Coaly claystone		6	
109	6	109	10	Sandstone		4	
109	10	110	6	Silty claystone, with coaly blebs		8	
110	6	111	0	Coaly claystone		6	
111	0	115	0	Claystone	4	0	

Log, hole 1-15 EA (Cont.)

Depth From- Ft.	Depth From- in.	Depth To- Ft.	Depth To- in.	Material	Thickness Ft.	Thickness in.	Remarks
115	0	128	0	Cross-bedded siltstone with thin streaks of claystone	13	0	
128	0	131	6	Silty claystone	3	6	
131	6	133	0	Siltstone	1	6	
133	0	134	0	Silty claystone	1	0	
134	0	134	6	Siltstone		6	Dip, 5°
134	6	136	6	Coaly claystone	2	0	
136	6	139	6	Siltstone	3	0	
139	6	151	6	Claystone	12	0	
151	6	152	0	Clay		6	
152	0	153	6	Bone and coaly claystone	1	6	
153	6	157	0	COAL	3	6	Emery bed; el., 877.5 ft. C-77880.
157	0	157	5	Clay		5	
157	5	158	0	Siltstone		7	
158	0	160	0	Claystone	2	0	
160	0	172	0	Massive, fine sandstone	12	0	
172	0	233	0	Massive sandstone	61	0	
233	0	234	0	Claystone	1	0	
234	0	234	6	Claystone, with streaks of coaly claystone		6	
234	6	234	10	Claystone		4	
234	10	236	6	Coaly claystone, 1/4-inch streaks of coal	1	8	Dip, 5° - 10°.
236	6	238	7	Carbonaceous claystone, thin streaks of coal	2	1	
238	7	240	7	Gray claystone, with a few distorted coal streaks	2	0	
240	7	241	0	Claystone, with streaks of coaly claystone		5	
241	0	242	2	Gray claystone	1	2	
242	2	243	2	Siltstone	1	0	
243	2	243	4	Coal with calcite streaks		2	
243	4	245	3	Thin-bedded, fine sandstone and siltstone	1	11	
245	3	246	1	Gray claystone		10	
246	1	254	7	Whitish, bentonitic claystone	8	6	
254	7	256	2	Gray claystone	1	7	
256	2	256	4	Coaly claystone		2	
256	4	256	10	Bone		6	
256	10	257	5	Coaly claystone		7	
257	5	261	11	Gray claystone	4	6	
261	11	263	0	Carbonaceous claystone, with few coaly streaks	1	1	
263	0	265	5	Coal and coaly claystone	2	5	
265	5	267	2	Gray claystone	1	9	

Log, hole 1-15 EA (Cont.)

Depth From- Ft.	Depth From- in.	Depth To- Ft.	Depth To- in.	Material	Thickness Ft.	Thickness in.	Remarks
267	2	269	0	Fine gray siltstone	1	10	
269	0	269	5	Gray claystone		5	
269	5	272	4	Gray siltstone	2	11	
272	4	274	3	Silty claystone	1	11	
274	3	276	3	Fine siltstone, with contorted, coaly stringers	2	0	
276	3	294	0	Gray claystone	17	9	
294	0	294	6	Siltstone		6	
294	6	296	0	Gray claystone	1	6	
296	0	297	10	Claystone, with streaks of coaly claystone	1	10	
297	10	298	0	Siltstone		2	
298	0	298	10	Bone		10	
298	10	299	0	Siltstone		2	
299	0	300	4	Coal, 1-1/2-inch streak of bone	1	4	Bed 9a; C-77881.
300	4	302	2	Claystone, streaks of coaly claystone	1	10	
302	2	304	2	Coaly claystone, streaks of claystone	2	0	
304	2	305	6	COAL	1	4	Bed 9b; C-77882.
305	6	308	3	Claystone, thin streaks and blebs of coal	2	9	
308	3	308	8	Coaly claystone		5	
308	8	309	6	Silty claystone		10	
309	6	310	4	Cross-bedded, coaly claystone		10	
310	4	313	9	Claystone	3	5	
313	9	314	0	Coaly claystone		3	
314	0	314	8	Claystone		8	
314	8	323	10	Claystone, streaks and blebs of coal	9	2	Dip, 5° - 20°.
323	10	324	0	COAL		2	
324	0	324	1	Cross-bedded claystone		1	
324	1	324	3	Bone		2	
324	3	324	10	Claystone, streaks of coaly claystone		7	
324	10	326	6	Siltstone	1	8	
326	6	327	3	Silty claystone		9	
327	3	331	6	Siltstone	4	3	
331	6	333	0	Dark claystone, with coal fragments	1	6	
333	0	340	0	Claystone	7	0	
340	0	341	0	Siltstone	1	0	
341	0	350	0	Interbedded siltstone and silty claystone	9	0	

Log, hole 1-15 EA (Cont.)

Depth From- Ft.	Depth From- in.	Depth To- Ft.	Depth To- in.	Material	Thickness Ft.	Thickness in.	Remarks
350	0	356	6	Siltstone	6	6	
356	6	378	2	Massive, fine sandstone	21	8	
378	2	378	4	COAL		2	
378	4	379	2	Fine sandstone, with blebs of coal		10	
379	2	402	0	Massive, speckled, coarse sandstone	22	10	
402	0	403	3	Siltstone	1	3	
403	3	412	3	Fine sandstone	9	0	
412	3	440	0	Medium sandstone	27	9	
440	0	447	0	Dark claystone	7	0	
447	0	447	6	Coal and coaly claystone		6	
447	6	448	0	Claystone		6	
448	0	491	8	Interbedded and crossbedded fine sandstone, siltstone, and silty claystone	43	8	Dip, 10°-20°; good roof.
491	8	492	0	Siltstone, with leaf impressions		4	
492	0	492	4	Bone		4)	Eska bed;
492	4	494	3	COAL	1	11)	dip, 0°-10°;
494	3	494	6	Bone		3)	el., 539.0
494	6	495	6	Coal, with 1-inch streak of bone	1	) 0)	ft.; C-78003.
495	6	496	8	Bone, with thin, coal streaks	1	2	
496	8	497	3	COAL		7	
497	3	497	5	Claystone		2	
497	5	498	4	COAL		11	
498	4	498	8	Bone		4	
498	8	501	4	Bone, coaly claystone, and coal	2	8	
501	4	502	0	Carbonaceous claystone		8	
502	0	502	8	Bone		8	
502	8	502	10	Siltstone		2	
502	10	503	4	Claystone		6	
503	4	504	0	Siltstone and silty claystone		8	
504	0	510	0	Fine sandstone, with thin, carbonaceous streaks	6	0	
510	0	513	0	Silty claystone	3	0	
513	0	526	0	Fine sandstone, with thin, carbonaceous streaks	13	0	Dip, 30°.
526	0	529	0	Siltstone	3	0	Dip, 20°.
529	0	531	2	Claystone	2	2	
531	2	531	7	Coaly claystone and coal		5	
531	7	532	2	Carbonaceous claystone, streaks of bone		7	
532	2	532	6	COAL		4)	Shaw bed;
532	6	532	7-1/2	Bone		1-1/2	el., 498.9 ft.;
532	7-1/2	533	1-1/2	COAL		6)	C-78029.
533	1-1/2	533	3	Bony coal and sandstone		1-1/2	
533	3	533	4-1/2	COAL		1-1/2)	

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Log, hole 1-15 EA (Cont.)

Depth From- Ft.	Depth From- in.	Depth To- Ft.	Depth To- in.	Material	Thickness Ft.	Thickness in.	Remarks
533	4-1/2	533	6-1/2	Bone		2	
533	6-1/2	534	4	COAL		9-1/2	
534	4	534	5	Bone		1	
534	5	535	9	COAL	1	4	)
535	9	536	9	Bone, with thin streaks of coal	1	0	
536	9	537	9	Carbonaceous claystone, with thin streaks of coal	1	0	
537	9	539	5-1/2	Bony coal	1	8-1/2	
539	5-1/2	539	8	COAL		2-1/2	
539	8	539	9	Bone		1	
539	9	540	10	COAL	1	1	) C-78030.
540	10	541	6	Bony coal		8	)
541	6	543	6	COAL	2	0	)
543	6	543	10	Bone		4	
543	10	544	2	Carbonaceous claystone		4	
544	2	544	6	Bone		4	
544	6	548	0	Siltstone	3	6	
548	0	551	0	Silty claystone	3	0	
551	0	558	0	Claystone, with streaks of silty claystone	7	0	
558	0	558	11	Carbonaceous claystone, with thin coal streaks		11	
558	11	559	0	Siltstone		1	Poor roof.
559	0	560	2	Coaly claystone, with streaks of coal and bone	1	2	
560	2	560	4	Siltstone		2	
560	4	561	2	Coaly claystone, with streaks of coal and bone		10	
561	2	562	4-1/2	COAL	1	2-1/2	) Martin bed;
562	4-1/2	562	6	Bone		1-1/2	el.,469.9
562	6	562	8	Silty, coaly claystone		2	ft.;
562	8	563	6	COAL		10	) C-78095.
563	6	563	10	Coaly claystone		4	
563	10	564	4	COAL		6	)
564	4	565	4	Coaly claystone, with streaks of coal	1	0	
565	4	565	8	Bone		4	
565	8	566	1	COAL		5	) C-78096.
566	1	566	4	Coaly claystone		3	
566	4	568	1	COAL	1	9	)
568	1	568	4	Bony coal, with streaks of siltstone		3	
568	4	568	7	Coaly claystone		3	
568	7	569	0	Bony coal		5	

Log, hole 1-15 EA (Cont.)

Depth From- Ft.	Depth From- in.	Depth To- Ft.	Depth To- in.	Material	Thickness Ft.	Thickness in.	Remarks
569	0	570	6	Coaly claystone	1	6	
570	6	571	0	COAL		6	
571	0	571	6	Bone		6	
571	6	571	9	Carbonaceous claystone		3	
571	9	572	0	Carbonaceous siltstone		3	
572	0	572	3	COAL		3	
572	3	575	9	Claystone, with streaks of coaly claystone	3	6	
575	9	576	0	COAL		3	
576	0	580	0	Claystone, with thin streaks and blebs of coal	4	0	Dip, 20°.
580	0	582	0	Siltstone, with mottled ironstone	2	0	
582	0	587	0	Silty claystone	5	0	
587	0	589	0	Fine sandstone	2	0	
589	0	593	0	Silty claystone	4	0	

Log, hole 2-15 EA

Location: 915 feet S. and 715 feet E. of NW. corner sec. 15, T. 19 N., R. 3 E., Seward Meridian, Eska, Alaska.
Elevation: Collar of hole - 1,038.8 feet.

Depth From- Ft.	Depth From- in.	Depth To- Ft.	Depth To- in.	Material	Thickness Ft.	Thickness in.	Remarks
0	0	49	0	Overburden, soil, sand, granite boulders, and decomposed siltstone	49	0	
49	0	66	0	Medium speckled sandstone	17	0	
66	0	70	0	Dark claystone, with thin coal streaks and carbonized fragments	4	0	
70	0	71	6	Gray claystone	1	6	
71	6	76	6	Fine sandstone, with thin streaks of silty claystone	5	0	
76	6	76	9	Hard, calcareous siltstone		3	
76	9	78	0	Silty claystone	1	3	
78	0	85	0	White, bentonitic claystone	7	0	
85	0	87	0	Siltstone, with very thin carbonaceous streaks	2	0	
87	0	89	0	Dark claystone, with streaks of coaly claystone	2	0	
89	0	89	6	Clay		6	
89	6	89	8	COAL		2	
89	8	90	0	Brown, silty claystone with 1/4-inch streak of clay		4	
90	0	91	0	Coaly claystone	1	0	
91	0	102	0	Interbedded and crossbedded fine sandstone and siltstone	11	0	
102	0	104	0	Claystone, with streaks of coaly claystone and coal	2	0	Bed 9.

Log, hole 2-15 EA (Cont.)

Depth From- Ft.	Depth From- in.	Depth To- Ft.	Depth To- in.	Material	Thickness Ft.	Thickness in.	Remarks
104	0	109	0	Silty claystone	5	0	
109	0	114	0	Siltstone, with cross-bedding at base	5	0	
114	0	118	6	Claystone, with a few carbonized streaks	4	6	
118	6	122	0	Siltstone	3	6	
122	0	128	0	Dark claystone, with gray, slickensided claystone and gouge at 125 ft.	6	0	
128	0	129	0	Siltstone	1	0	
129	0	131	0	Gray claystone	2	0	Slickensided.
131	0	157	0	Dark-gray, silty claystone with thin, black, coaly streaks	26	0	Dips: 132 ft.-45° 139 ft.-50° 145 ft.-55° 150 ft.-25°
157	0	160	0	Silty claystone	3	0	
160	0	181	0	Siltstone	21	0	
181	0	200	0	Massive, fine, silty sandstone	19	0	
200	0	201	0	Coarse, speckled sandstone contorted at base	1	0	
201	0	204	0	Fine to medium sandstone	3	0	
204	0	228	6	Massive, coarse, speckled sandstone, with slickensides at 205 ft.	24	6	
228	6	229	4	Fine sandstone		10	
229	4	230	2	Coarse, contorted sandstone, with fine sandstone lenses and carbonized fragments		10	
230	2	235	0	Fine sandstone	4	10	
235	0	238	0	Claystone	3	0	Slickensided.
238	0	239	2	Silty claystone	1	2	
239	2	239	6	Ironstone		4	
239	6	246	0	Silty claystone	6	6	Dip, 20°.
246	0	256	0	Siltstone and fine sandstone	10	0	
256	0	271	6	Interbedded and crossbedded, fine sandstone and siltstone	15	6	
271	6	272	0	Dark claystone		6	
272	0	275	0	Silty claystone	3	0	
275	0	275	3	Dark claystone		3	Good roof.
275	3	276	0	COAL		9	Eska bed; el., 763.6 ft.; C-78692.
276	0	276	9	Bone		9	C-86312.
276	9	277	6	COAL		9	C-78692.

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Log, hole 2-15 EA (Cont.)

Depth From- Ft.	Depth From- in.	Depth To- Ft.	Depth To- in.	Material	Thickness Ft.	Thickness in.	Remarks
277	6	278	6	Bony coal	1	0	C-86313.
278	6	279	6	COAL	1	0	C-78692.
279	6	281	6	Coaly claystone, with streaks of coal and clay	2	0	
281	6	285	9	Carbonaceous claystone, with streaks of coaly claystone	4	3	
285	9	287	0	Bony coal	1	3	
287	0	295	0	Dark claystone, with irregular bedding	8	0	Dip, 20°.
295	0	297	0	Interbedded, silty claystone and siltstone	2	0	
297	0	300	0	Interbedded siltstone and fine sandstone	3	0	
300	0	301	0	Silty claystone	1	0	
301	0	305	10	Dark gray claystone	4	10	Dip, 20°.
305	10	306	4	Dark claystone, with thin streaks of coal and coaly claystone		6	
306	4	306	8	Bone		4	Shaw bed,
306	8	307	6	COAL		10)	el,732.5 ft.
307	6	308	0	Bony coal		6)	C-78693.
308	0	308	1	Bone		1	
308	1	309	2	COAL	1	1)	
309	2	310	10	Bony coal	1	8)	
310	10	311	0	Bone		2	
311	0	311	4	COAL		4)	
311	4	311	6	Bone		2	
311	6	312	0	COAL		6	
312	0	313	0	Bony coal	1	0	
313	0	314	0	Coaly claystone, with streaks of bone	1	0	
314	0	315	0	COAL	1	0)	C-78694.
315	0	315	3	Bone		3	
315	3	317	6	COAL	2	3)	C-78695.
317	6	317	7	Ironstone nodule		1	
317	7	317	8	Bony coal		1	
317	8	317	10	Ironstone		2	
317	10	318	2	Bony coal		4	
318	2	318	6	Siltstone, with bony streaks		4	
318	6	319	4	COAL		10)	
319	4	319	8	Coaly claystone		4	
319	8	320	3	Bony coal, with streaks of coaly claystone		7	
320	3	321	0	Coaly claystone		9	
321	0	332	0	Siltstone	11	0	
332	0	334	0	Gray claystone	2	0	
334	0	335	0	Hard, silicified siltstone	1	0	
335	0	344	6	Silty claystone	9	6	Dip, 30°-40°.

Log, hole 2-15 EA (Cont.)

Depth From- Ft.	Depth From- in.	Depth To- Ft.	Depth To- in.	Material	Thickness Ft.	Thickness in.	Remarks
344	6	345	6	Coaly, silty claystone, with streaks of bone	1	0	
345	6	346	4	Tan, calcareous siltstone, with streaks of bone		10	
346	4	347	10	Coaly claystone, with streaks of bone	1	6	
347	10	349	7	Coal, with a few dull streaks	1	9	Martin bed; el., 691 ft.; dip, 20°, C-78696.
349	7	350	4	Silty, coaly claystone, with streaks of bone		9	
350	4	350	8	Bone		4	
350	8	351	8	Gray claystone	1	0	Slicknesided.
351	8	352	2	Bone		6	
352	2	352	8	Silty, coaly claystone		6	
352	8	353	3	Claystone, with streaks of bone		7	
353	3	354	0	Bone		9	
354	0	355	1	Silty claystone, with streaks of bone	1	1	
355	1	357	3	Bone, with streaks of coal	2	2	
357	3	365	0	Gray claystone, with scattered coal streaks	7	9	
365	0	365	6	Ironstone		6	
365	6	371	0	Silty claystone	5	6	
371	0	372	0	Fine sandstone	1	0	
372	0	376	0	Silty claystone	4	0	
376	0	376	8	Coaly claystone		8	
376	8	377	0	Silty claystone		4	
377	0	377	8	COAL		8	
377	8	378	2	Coaly claystone		6	
378	2	380	6	Claystone, with streaks of coaly claystone	2	4	
380	6	381	0	Ironstone		6	
381	0	387	0	Dark, silty claystone, with blebs of carbonized plant fragments	6	0	
387	0	392	0	Siltstone, with thin streaks of silty claystone	5	0	
392	0	397	0	Claystone, with streaks and blebs of coal	5	0	
397	0	407	0	Siltstone, with 1-ft. calcareous streak at 405 ft.	10	0	

No water or gas in the hole.

Log, hole 3-15 EA

Location: 70 feet S. and 640 feet E. of NW. corner, sec. 15, T. 19 N., R. 3 E., Seward Meridian, Eska, Alaska.
Elevation: Collar of hole - 1,075 feet.

Depth From- Ft.	Depth From- in.	Depth To- Ft.	Depth To- in.	Material	Thickness Ft.	Thickness in.	Remarks
0	0	38	0	Overburden, soil, glacial drift, boulders, sand, clay, and gravel	38	0	
38	0	40	0	Fine sandstone	2	0	
40	0	41	0	Silty claystone	1	0	
41	0	52	0	Interbedded siltstone and fine sandstone	11	0	
52	0	55	0	Claystone, with streaks of coaly claystone	3	0	Dip, 30°.
55	0	57	0	Interbedded siltstone and fine sandstone	2	0	
57	0	68	0	Silty claystone	11	0	
68	0	69	0	Fine sandstone	1	0	
69	0	84	0	Speckled medium sandstone, with carbonized plant fragments and blebs of coal	15	0	
84	0	85	0	Dark claystone, with leaf impressions	1	0	
85	0	91	0	Dark claystone, with streaks of coaly claystone	6	0	Dip, 35°.
91	0	93	3	Bony coal, with streaks of coal	2	3	Emory; el., 984 ft.
93	3	96	3	Contorted, hard, silty ironstone, with streaks and blebs of coal	3	0	
96	3	97	1	Bony coal		10	
97	1	97	9	Silty claystone		8	
97	9	97	11	Bone		2	
97	11	102	0	Silty claystone	4	1	
102	0	116	0	Fine sandstone	14	0	
116	0	132	0	Interbedded siltstone and fine sandstone, with irregular banding and ironstone near top	16	0	
132	0	151	0	Massive medium to coarse speckled sandstone	19	0	Granite.
151	0	165	0	Interbedded gray siltstone and silty claystone, with occasional carbonized plant fragments	14	0	
165	0	168	6	Contorted, dark claystone, with streaks of coaly claystone	3	6	Dip, 30°.
168	6	170	0	Siltstone, with thin, irregular, carbonized bands	1	6	

Log, hole 3-15 EA (Cont.)

Depth From- Ft.	Depth From- in.	Depth To- Ft.	Depth To- in.	Material	Thickness Ft.	Thickness in.	Remarks
170	0	176	6	Interbedded siltstone and silty claystone	6	6	Bentonitic.
176	6	182	10	White, bentonitic claystone	6	4	
182	10	183	0	Limestone, with calcite veinlets and sulfides of iron		2	
183	0	184	0	Siltstone	1	0	
184	0	185	6	Silty claystone	1	6	
185	6	187	0	Dark claystone, with streaks of coaly claystone	1	6	Slickensided.
187	0	188	0	Yellow, bentonitic clay and gouge	1	0	
188	0	189	6	Dark claystone, with streaks of coaly claystone	1	6	
189	6	193	6	Silty claystone, with interbedded sandstone	4	0	
193	6	194	0	Calcareous siltstone		6	
194	0	197	6	Claystone, with streaks of coaly claystone	3	6	Dip, 20°-25°.
197	6	199	0	Silty claystone	1	6	
199	0	202	0	Siltstone	3	0	
202	0	211	0	Fine sandstone, with calcite veinlets at base	9	0	
211	0	213	0	Dark claystone, with carbonized plant fragments	2	0	
213	0	239	0	Silty claystone and siltstone	26	0	
239	0	244	0	Dark claystone	5	0	
244	0	250	6	Silty claystone, with coaly claystone, ironstone, and clay streaks	6	6	
250	6	251	0	Coaly claystone, with streaks of coal		6	
251	0	252	0	Dark claystone	1	0	
252	0	252	2	Bony coal		2	Bed 9; el., 823 ft.
252	2	252	4	COAL		2	
252	4	252	7	Ironstone lenses and coal streaks		3	
252	7	253	6	COAL		11	
253	6	254	0	Ironstone		6	
254	0	256	0	Coaly claystone, with streaks of bone	2	0	
256	0	256	2	Bone and claystone		2	
256	2	258	6	COAL	2	4	C-80437.
258	6	259	0	Claystone		6	
259	0	259	6	Fine sandstone		6	
259	6	260	0	Coaly claystone		6	
260	0	262	0	Silty, bentonitic claystone	2	0	
262	0	349	0	Massive fine sandstone, with occasional ironstone and bentonitic bands	87	0	

Log, hole 3-15 EA (Cont.)

Depth From- Ft.	Depth From- in.	Depth To- Ft.	Depth To- in.	Material	Thickness Ft.	Thickness in.	Remarks
349	0	350	6	Contorted medium and coarse sandstone	1	6	
350	6	357	0	Contorted medium and fine sandstone	6	6	
357	0	427	0	Massive, speckled, coarse sandstone, occasional carbonized streaks and blebs	70	0	Dip, 30° at 386 ft. and 420 ft.
427	0	436	0	Cross-bedded fine to medium sandstone	9	0	
436	0	437	0	Silty claystone	1	0	Dip, 20°.
437	0	438	0	Ironstone	1	0	
438	0	442	7	Claystone	4	7	
442	7	443	0	Coal, with calcite and pyrite veinlets		5	
443	0	444	0	Tan, contorted ironstone, with calcite veinlets and carbonized bands	1	0	
444	0	446	0	Coaly, shaly claystone, with calcite specks	2	0	
446	0	452	0	Massive medium sandstone, with contorted banding	6	0	
452	0	481	0	Cross-bedded and interbedded fine sandstone, siltstone, and silty claystone	29	0	
481	0	486	0	Dark, shaly claystone, with ironstone nodule	5	0	Dip, 15°.
486	6	486	6	Ironstone		6	
486	6	490	0	Dark, shaly claystone, with ironstone nodules	3	6	Dip, 15°.
490	0	493	0	Interbedded gray sandstone and dark claystone	3	0	Dip, 20°.
493	0	516	0	Fine to medium sandstone, with wavy, carbonized plant fragments and occasional ironstone bands	23	0	Dip, 17°.
516	0	518	1	Dark claystone, with thin streaks of coaly claystone	2	1	Dip, 20°.
518	1	518	2	Bone		1	Eska bed; el.,
518	2	519	10	COAL	1	8)	557 ft.
519	10	520	1	Bone		3	
520	1	521	2	Coal with 1/2-in. bone streak	1	1)	C-80438.
521	2	521	4	Bone		2	
521	4	521	7	COAL		3	
521	7	522	2	Bone, with claystone streaks		7	
522	2	523	4	Bony coal, with thin streaks of coaly claystone	1	2	

Log, hole 3-15 EA (Cont.)

Depth From- Ft.	Depth From- in.	Depth To- Ft.	Depth To- in.	Material	Thickness Ft.	Thickness in.	Remarks
523	4	523	9	Coaly claystone		5	
523	9	524	3	COAL		6	
524	3	525	5	Bony coal, with thin streaks of coal	1	2	
525	5	534	3	Coaly claystone and siltstone, with 1/2-in. streaks of coal and bone	8	10	
534	3	534	9	Coal and bone		6	
534	9	538	0	Dark claystone, with occasional streaks of coaly claystone	3	3	
538	0	538	6	Ironstone, with calcite veinlets		6	
538	6	542	0	Dark claystone, with sandy streaks and tan, circular, and wavy, calcareous markings	3	6	
542	0	551	0	Interbedded fine sandstone and dark siltstone	9	0	
551	0	558	9	Dark claystone, with thin streaks of ironstone and coal	7	9	Watercourse at 557 ft. 6 in.
558	9	559	0	Ironstone		3	
559	0	561	9	Dull coal, with thin streaks of bone	2	9	Shaw bed; el., 524 ft.; C-85530.
561	9	563	6	Coaly claystone, with streaks of bone	1	9	Dip, 15°.
563	6	563	7	Bone		1	
563	7	563	10	COAL		3)	C-80491.
563	10	564	0	Bone		2	
564	0	565	0	COAL	1	0)	
565	0	567	6	Carbonaceous claystone, with thin streaks of coal	2	6	
567	6	567	9	Coaly claystone		3	
567	9	568	0	Ironstone and bone		3	
568	0	568	6	Bone		6	
568	6	568	8	Ironstone		2	
568	8	568	9	Bone		1	
568	9	570	2-1/2	COAL	1	5-1/2)	C-80492.
570	2-1/2	570	4	Bone		1-1/2	
570	4	570	5	Ironstone		1	
570	5	572	0	COAL	1	7)	
572	0	572	6	Ironstone, with streaks of bone and pyrite		6	
572	6	573	3	Bone, with calcite streaks		9	
573	3	573	6	Coaly claystone		3	
573	6	588	6	Dark-gray, silty claystone	15	0	

Log, hole 3-15 EA (Cont.)

Depth From- Ft.	Depth From- in.	Depth To- Ft.	Depth To- in.	Material	Thickness Ft.	Thickness in.	Remarks
588	6	589	0	Ironstone		6	
589	0	590	0	Carbonaceous claystone	1	0	
590	0	591	0	Bony coal	1	0	Martin bed; el., 485 ft.
591	0	592	1	Carbonaceous claystone, with thin streaks of bone	1	1	Dip, 15°.
592	1	594	8	Coal, with a few thin streaks of bone	2	7	C-85531.
594	8	595	0	Ironstone		4	
595	0	595	8	Carbonaceous claystone		8	
595	8	597	10	COAL	2	2	C-80493.
597	10	599	0	Carbonaceous claystone	1	2	Dip, 15°.
599	0	599	4	Ironstone		4	
599	4	600	8	Coal, with streaks of bone	1	4	
600	8	600	11	Carbonaceous claystone		3	
600	11	601	7	Coal, with streaks of bone		8	
601	7	601	9	Carbonaceous sandstone		2	
601	9	602	1	Bony coal, with streaks of carbonaceous claystone		4	
602	1	602	7	Carbonaceous claystone		6	
602	7	604	0	Gray claystone	1	5	

Log, hole 4-15 EA

Location: 405 feet S. and 1,250 feet E. of NW. corner, sec. 15, T. 19 N., R. 3 E., Seward Meridian, Eska, Alaska.
Elevation: Collar of hole - 1,064 feet.

Depth From- Ft.	Depth From- in.	Depth To- Ft.	Depth To- in.	Material	Thickness Ft.	Thickness in.	Remarks
0	0	10	0	Overburden, soil, sand, and gravel	10	0	
10	0	18	0	Medium speckled sandstone	8	0	
18	0	20	0	Siltstone	2	0	Dip, 15°-20°.
20	0	22	3	Silty, shaly claystone	2	3	
22	3	22	5	COAL		2)	Emery bed; el.,
22	5	22	5-1/2	Bone		1/2	1,041.8 ft.;
22	5-1/2	23	2-1/2	COAL		9)	C-83519.
23	2-1/2	23	3-1/2	Bone		1	
23	3-1/2	24	10	COAL	1	6-1/2)	
24	10	26	0	Bony coal	1	2	
26	0	26	6	Coaly claystone		6	
26	6	28	6	Siltstone	2	0	
28	6	29	2	Bony coal		8	
29	2	29	8	Coaly claystone		6	

Log, hole 4-15 EA (Cont.)

Depth From- Ft.	Depth From- in.	Depth To- Ft.	Depth To- in.	Material	Thickness Ft.	Thickness in.	Remarks
29	8	32	0	Coal, with one thin streak of bone	2	4	C-83520.
32	0	32	2	Ironstone		2	
32	2	34	6	Carbonaceous claystone	2	4	Dip, 20°.
34	6	37	0	Gray claystone	2	6	
37	0	37	3	Coaly claystone		3	
37	3	38	0	Bony coal		9	
38	0	38	6	Claystone		6	
38	6	41	0	Coaly claystone	2	6	Dip, 30°.
41	0	42	0	Gray claystone	1	0	
42	0	44	0	Bony coal, with streaks of coal	2	0	
44	0	45	8	Carbonaceous claystone and siltstone	1	8	
45	8	46	5	Coaly claystone		9	
46	5	47	5	Bone, with streaks of coaly claystone	1	0	
47	5	48	5	Carbonaceous siltstone and claystone	1	0	
48	5	49	5	Coaly claystone, with streaks of bone	1	0	
49	5	50	5	Bone	1	0	Dip, 25°.
50	5	57	0	Interbedded siltstone and sandstone	6	7	Dip, 30°.
57	0	64	0	Silty claystone	7	0	Dip, 30°.
64	0	96	5	Interbedded sandstone, siltstone, and silty, bentonitic claystone	32	5	Dip, 35°.
96	5	98	0	Bony coal	1	7	
98	0	98	4	Ironstone, with pyrite veinlets		4	
98	4	99	9	Bony coal	1	5	
99	9	102	0	Siltstone, with streaks of clay	2	3	
102	0	103	0	Ironstone, with calcite veinlets	1	0	
103	0	116	0	Interbedded fine sandstone and dark, silty claystone, with blebs of coal	13	0	
116	0	117	0	Ironstone	1	0	
117	0	119	0	Medium sandstone, with wavy, thin, dark bands	2	0	Dip, 0°-15°.
119	0	119	4	Bony coal		4	
119	4	124	0	Dark, silty claystone	4	8	
124	0	132	0	Fine sandstone, with carbonized plant fragments	8	0	
132	0	140	0	Claystone, with occasional 2-in. ironstone bands	8	0	
140	0	142	0	Sandstone	2	0	
142	0	144	0	Claystone	2	0	

Log, hole 4-15 EA (Cont.)

Depth From- Ft.	Depth From- in.	Depth To- Ft.	Depth To- in.	Material	Thickness Ft.	Thickness in.	Remarks
144	0	147	0	Fine sandstone	3	0	
147	0	147	10	Ironstone and bone		10	
147	10	152	6	Dark claystone	4	8	
152	6	154	0	Siltstone	1	6	
154	0	174	0	Claystone and silty claystone	20	0	
174	0	174	6	Ironstone		6	
174	6	176	0	Dark claystone	1	6	
176	0	178	0	Coaly claystone	2	0	
178	0	178	2	Ironstone		2	
178	2	178	4	Coaly claystone		2	
178	4	179	0	Bony coal		8	
179	0	179	2	Ironstone and coal		2	
179	2	182	0	Bony coal and coal	2	10	
182	0	182	10	Ironstone and coal		10	
182	10	184	6	Coal and bone	1	8	
184	6	184	10	Ironstone		4	
184	10	188	0	Sandstone	3	2	
188	0	188	3	Coaly claystone		3	
188	3	188	6	Brownish claystone		3	Sheared.
188	6	189	0	Gray claystone with few coaly streaks		6	
189	0	189	3	Gray ironstone		3	
189	3	194	0	Gray claystone, with few coaly streaks	4	9	
194	0	195	0	Silty claystone	1	0	
195	0	199	0	Siltstone	4	0	
199	0	200	0	Fine sandstone	1	0	
200	0	200	6	Clayey siltstone		6	
200	6	203	0	Gray siltstone	2	6	
203	0	209	0	Silty claystone, few coal lenses and streaks	6	0	Dip, 20°-45°.
209	0	210	0	Ironstone, with calcite veinlets	1	0	
210	0	210	9	Silty claystone		9	
210	9	211	0	Ironstone		3	
211	0	212	6	Silty claystone	1	6	Dip, 30°.
212	6	213	0	Ironstone		6	
213	0	216	0	Siltstone	3	0	
216	0	219	0	Silty claystone	3	0	Dip, 30°-40°.
219	0	228	0	Siltstone	9	0	
228	0	268	0	Fine to medium sandstone, with few thin, bentonitic streaks	40	0	
268	0	339	0	Coarse, light-gray sandstone, speckled with biotite	71	0	Dip, 30°-40°.
339	0	349	0	Dark claystone, with carbonized plant fragments	10	0	

Log, hole 4-15 EA (Cont.)

Depth From- Ft.	Depth From- in.	Depth To- Ft.	Depth To- in.	Material	Thickness Ft.	Thickness in.	Remarks
349	0	357	0	Siltstone, with thin streaks of claystone and carbonized plant fragments	8	0	Dip, 40°.
357	0	361	0	Fine sandstone, with streaks of dark, carbonized plant fragments	4	0	
361	0	384	0	Interbedded sandstone and dark siltstone, with carbonized plant fragments	23	0	
384	0	412	0	Medium sandstone, with thin, carbonaceous streaks and dark, silty streaks	28	0	Dip, 20°-30°.
412	0	412	6	Carbonaceous siltstone		6	Eska bed.
412	6	413	0	COAL		6	Dip 25°.
413	0	413	6	Carbonaceous siltstone		6	El., 650.5 ft.
413	6	416	5-1/2	COAL	2	11-1/2)	
416	5-1/2	417	4-1/2	Bone, with coal streaks		11	
417	4-1/2	418	11	COAL	1	6-1/2)	C-83564.
418	11	419	2	Bone		3	
419	2	419	10	Carbonaceous claystone		8	
419	10	420	10	COAL	1	0	
420	10	422	4	Bony coal	1	6	
422	4	423	6	Carbonaceous claystone	1	2	
423	6	424	0	Siltstone, with streaks of coal		6	
424	0	425	0	Carbonaceous claystone	1	0	
425	0	426	0	Bone and carbonaceous claystone	1	0	
426	0	426	3	Coaly claystone		3	

Log, hole 5-15 EA

Location: 480 feet S. and 2,000 feet E. of NW. corner, sec. 15, T. 19 N., R. 3 E., Seward Meridian, Eska, Alaska.
Elevation: Collar of hole - 1,068 feet.

Depth From- Ft.	Depth From- in.	Depth To- Ft.	Depth To- in.	Material	Thickness Ft.	Thickness in.	Remarks
0	0	14	0	Overburden clay, with a little gravel, lower 4 ft., decomposed claystone, with carbonized plant fragments	14	0	
14	0	15	0	Claystone, with carbonaceous plant fragments	1	0	
15	0	18	3	Coaly, carbonaceous claystone, with thin streaks of coal and bone	3	3	
18	3	18	8	Bone and siltstone		5	

Log, hole 5-15 EA (Cont.)

Depth From- Ft.	Depth From- in.	Depth To- Ft.	Depth To- in.	Material	Thickness Ft.	Thickness in.	Remarks
18	8	19	6	Ironstone, with calcite and coal enfolded		10	
19	6	19	8	Fine sandstone		2	
19	8	19	10	COAL		2)	Martin bed; el.,
19	10	19	11	Bone		1	1,048.3 ft.;
19	11	20	4-1/2	COAL		5-1/2)	C-83565.
20	4-1/2	20	7-1/2	Bone		3	
20	7-1/2	22	2	COAL	1	6-1/2)	
22	2	22	6	Ironstone, folded with coal and calcite		4	
22	6	23	6	Coal, with thin streaks of bone	1	0	
23	6	23	10	Bone		4	
23	10	26	8	Coal, with thin streaks of bone	2	10	C-83566.
26	8	27	0	Bone		4	
27	0	29	0	Carbonaceous claystone	2	0	
29	0	31	0	Fine sandstone	2	0	
31	0	37	0	Siltstone and fine sandstone, with carbonized plant fragments and dark streaks	6	0	Dip, 5°-10°.
37	0	40	0	Dark siltstone	3	0	
40	0	42	0	Fine sandstone	2	0	
42	0	55	0	Fine sandstone and dark siltstone	13	0	
55	0	71	0	Medium to coarse, light-gray, dark-speckled sandstone	16	0	
71	0	73	0	Claystone, with carbonized plant fragments	2	0	Dip, 10°-15°.
73	0	76	0	Fine sandstone, with dark siltstone bands	3	0	
76	0	77	0	Dark claystone	1	0	
77	0	78	6	Fine sandstone	1	6	
78	6	83	0	Dark, silty claystone, with carbonized plant fragments and 1 ironstone band	4	6	
83	0	85	6	Fine sandstone, with dark, silty bands	2	6	
85	6	89	0	Dark claystone, coaly at top	3	6	
89	0	92	0	Fine sandstone	3	0	
92	0	128	0	Interbedded siltstone and fine sandstone, with thin streaks of carbonized plant fragments	36	0	Dip, 5°-10°.
128	0	130	4	Dark, silty claystone, with abundant plant fragments	2	4	Slickensides.

Log, hole 5-15 EA (Cont.)

Depth From- Ft.	Depth From- in.	Depth To- Ft.	Depth To- in.	Material	Thickness Ft.	Thickness in.	Remarks
130	4	130	7	Coaly claystone, with thin, pyrite bands		3	B bed; el.,
132	7	132	9	COAL	2	2)	937.4 ft.;
132	9	132	11	Bone		2	C-83567.
132	11	134	0	COAL	1	1)	
134	0	134	3	Bone		3	
134	3	135	2	COAL		11)	
135	2	135	3	Carbonaceous siltstone		1	
135	3	136	1/2	COAL		9-1/2	C-83567.
136	1/2	136	2	Bone		1-1/2	
136	2	136	6	Siltstone and ironstone		4	
136	6	145	0	Claystone, with thin streaks of coal and coaly claystone	8	6	
145	0	147	0	Sandy claystone	2	0	
147	0	149	0	Claystone	2	0	
149	0	149	3	Ironstone		3	
149	3	151	0	Claystone	1	9	
151	0	164	0	Siltstone, with streaks of fine sandstone, steep and vertical fractures	13	0	
164	0	166	0	Claystone	2	0	Slickensides.
166	0	175	0	Irregular, bedded siltstone and fine sandstone	9	0	
175	0	178	0	Claystone	3	0	
178	0	182	0	Interbedded siltstone and fine sandstone	4	0	
182	0	203	0	Irregular bedded fine sandstone	21	0	
203	0	213	0	Interbedded medium and coarse sandstone	10	0	
213	0	243	6	Coarse, light-gray, dark-speckled sandstone, with blebs of coal	30	6	
243	6	245	0	Dark, carbonaceous claystone, with thin streaks of coal	1	6	Dip, 45°.
245	0	252	10	Fine sandstone, with thin streaks of dark siltstone containing carbonized plant fragments	7	10	Dip, 30°.
252	10	253	6	COAL		8	C bed.
253	6	254	6	Coaly claystone, with streaks of coal	1	0	
254	6	255	0	Silty ironstone		6	
255	0	265	0	Interbedded fine sandstone and dark siltstone	10	0	
265	0	266	6	Coarse, speckled sandstone	1	6	
266	6	279	0	Dark, silty claystone, with abundant plant fragments	12	6	Dip, 25°.

Log, hole 5-15 EA (Cont.)

Depth From- Ft.	Depth From- in.	Depth To- Ft.	Depth To- in.	Material	Thickness Ft.	Thickness in.	Remarks
279	0	288	0	Fine sandstone, interbedded with dark siltstone	9	0	
288	0	289	0	Calcareous claystone	1	0	
289	0	294	0	Dark, silty claystone, with abundant carbonized leaves	5	0	Dip, 35°.
294	0	296	0	Fine sandstone and dark siltstone	2	0	
296	0	305	0	Dark, carbonaceous claystone	9	0	Dip, 25°.
305	0	305	1	Ironstone		1	
305	1	305	3	COAL		2	
305	3	305	5	Ironstone		2	
305	5	305	10	Bone and coaly claystone		5	
305	10	306	6	Dark siltstone		8	
306	6	307	0	Ironstone		6	
307	0	308	0	Fine sandstone	1	0	
308	0	310	4	Dark, carbonaceous claystone	2	4	Dip, 25°.
310	4	311	0	COAL		8	
311	0	312	0	Bone and coaly claystone	1	0	
312	0	312	6	Sandy claystone		6	
312	6	316	0	Fine sandstone	3	6	
316	0	317	1	Claystone, with streaks of coal and bone	1	1	
317	1	317	5-1/2	COAL	1	4-1/2	
317	5-1/2	317	7	Bone		1-1/2	
317	7	320	3	Carbonaceous claystone and bone	2	8	
320	3	320	6	COAL		3	
320	6	320	9	Bone		3	
320	9	321	4	Carbonaceous claystone, with streaks of bone		7	
321	4	321	10	COAL		6	
321	10	322	8	Folded ironstone, with blebs of coal and streaks of calcite		10	
322	8	323	9	COAL	1	1	
323	9	324	7	Bone		10	
324	7	325	0	Claystone, with ironstone streaks		5	
325	0	329	0	Fine sandstone	4	0	
329	0	330	0	Dark claystone	1	0	
330	0	330	5	Ironstone		5	
330	5	333	0	Dark, carbonaceous claystone	2	7	
333	0	333	5	Bone		5	
333	5	333	10	Carbonaceous claystone		5	
333	10	334	2	Bone		4	
334	2	334	4	Carbonaceous claystone		2	)
334	4	335	10	COAL	1	6	) C-83569.

Log, hole 5-15 EA (Cont.)

Depth From- Ft.	Depth From- in.	Depth To- Ft.	Depth To- in.	Material	Thickness Ft.	Thickness in.	Remarks
335	10	338	0	Claystone, with thin streaks of coal and bone	2	2	
338	0	338	3	Siltstone, with claystone streaks		3	
338	3	339	3	COAL	1	0	
339	3	339	6	Carbonaceous siltstone		3	
339	6	346	0	Carbonaceous claystone, with streaks of coal and bone	6	6	
346	0	348	0	Fine sandstone	2	0	
348	0	370	0	Interbedded and crossbedded fine sandstone and dark siltstone, with carbonized plant fragments and blebs of coal at base	22	0	
370	0	374	0	Ironstone, with numerous thin calcite veinlets and a bleb of coal at base	4	0	
374	0	374	6	Siltstone		6	
374	6	379	0	Ironstone	4	6	
379	0	384	0	Dark siltstone	5	0	
384	0	408	0	Interbedded dark, silty claystone and dark siltstone with occasional thin streaks of coal	24	0	
408	0	422	0	Fine sandstone, with thin streaks of dark siltstone and occasional ironstone concretions	14	0	
422	0	425	0	Dark siltstone	3	0	
425	0	434	0	Dark claystone, with occasional blebs of coal	9	0	
434	0	435	0	Ironstone	1	0	
435	0	436	0	Claystone	1	0	
436	0	440	0	Siltstone	4	0	
440	0	441	0	Ironstone, with calcite veinlets	1	0	
441	0	450	0	Fine sandstone	9	0	
450	0	565	0	Massive medium to coarse, light-gray sandstone, with tan and dark speckles	115	0	
565	0	566	6	Dark, carbonaceous claystone	1	6	
566	6	567	6-1/2	COAL	1	1/2)	Little Eska group; el., 501.5 ft. Dip, 30°; C-83696.
567	6-1/2	567	7	Claystone			
567	7	569	0	COAL	1	5)	

Log, hole 5-15 EA (Cont.)

Depth From- Ft.	Depth From- in.	Depth To- Ft.	Depth To- in.	Material	Thickness Ft.	Thickness in.	Remarks
569	0	570	6	Carbonaceous claystone, with streaks of coaly claystone	1	6	Dip, 20°- 40°
570	6	572	6	COAL	2	0	C-83696.
572	6	572	9	Bony coal		3	
572	9	574	0	Coal and bony coal, with streaks of coaly claystone	1	3	
574	0	576	2	Carbonaceous claystone, with thin streaks of coal and bone	2	2	Dip, 30°.
576	2	577	1	Bony coal		11	
577	1	582	6	Carbonaceous claystone, with thin streaks of bone	5	5	Dip, 45°.
582	6	582	9	Ironstone		3	
582	9	586	0	Coaly claystone, with streaks of coal and bone	3	3	Slickensided.
586	0	586	6	Bony coal		6	
586	6	587	6	Carbonaceous claystone	1	0	Dip, 20°-40°.
587	6	588	0	Bony coal		6	
588	0	588	7	Carbonaceous claystone, with streaks of bone		7	Dip, 30°.
588	7	589	3	Bone		8	El., 479.5 ft.
589	3	591	3	COAL	2	0)	C-83697.
591	3	591	6	Carbonaceous claystone		3	
591	6	591	7	Bone		1	
591	7	592	0	COAL		5	
592	0	592	9	Bony coal		9	Dip, 30°.
592	9	600	8	Carbonaceous claystone, with streaks of coaly claystone and ironstone	7	11	El., 467.2 ft.
600	8	602	0	Bone and coal	1	4	C-83698.
602	0	602	1	Carbonaceous claystone		1	
602	1	603	0	Bone and coal		11	
603	0	604	0	Bony coal, with thin streaks of carbonaceous claystone	1	0	
604	0	604	2	Coaly claystone		2	
604	2	605	9	Coal, with a thin ironstone streak and thin bony streaks	1	7	C-83698.
605	9	605	10	Ironstone		1	
605	10	606	5	Carbonaceous claystone, with streaks of coaly claystone		7	
606	5	606	8	Ironstone		3	
606	8	607	5	Bony coal		9	
607	5	607	9	Calcite bands in coaly claystone		4	
607	9	622	0	Hard, calcareous, gray, massive, fine sandstone and siltstone	14	3	

Log, hole 5-15 EA (Cont.)

Depth From- Ft.	Depth From- in.	Depth To- Ft.	Depth To- in.	Material	Thickness Ft.	Thickness in.	Remarks
622	0	656	0	Interbedded and crossbedded hard, calcareous, fine sandstone and dark siltstone, with thin clayey streaks near base	34	0	

Log, hole 6-10 EA

Location: 60 feet N. and 35 feet W. of S. 1/4 corner, sec. 10, T. 19 N., R. 3 E., Seward Meridian, Eska, Alaska.
Elevation: Collar of hole - 1,121 feet.

Depth From- Ft.	Depth From- in.	Depth To- Ft.	Depth To- in.	Material	Thickness Ft.	Thickness in.	Remarks
0	0	21	0	Overburden, decompoased claystone, sandstone, and a few rocks	21	0	
21	0	23	0	Siltstone	2	0	
23	0	35	0	Fine sandstone	12	0	
35	0	57	9	Massive, speckled, medium sandstone	22	9	
57	9	58	3	Ironstone		6	
58	3	60	3	Coal with thin bony streaks	2	0)	A bed; el., 1,063.3 ft.
60	3	62	8	Coaly claystone, with thin streaks of coal	2	5	
62	8	64	4	COAL	1	8)	C-97348.
64	4	64	9	Coaly claystone		5	
64	9	65	2	COAL		5)	
65	2	65	11	Coaly claystone		9	
65	11	66	1	Silty claystone		2	
66	1	68	6	Siltstone	2	5	
68	6	76	0	Fine sandstone, with dark carbonized bands and leaf fragments	7	6	Dip, 30°.
76	0	80	0	Dark siltstone	4	0	Do.
80	0	94	0	Interbedded dark siltstone and fine sandstone	14	0	
94	0	95	0	Claystone	1	0	
95	0	95	6	Limestone and ironstone		6	
95	6	97	0	Clayey claystone	1	6	
97	0	98	3	Dark claystone	1	3	
98	3	101	3	COAL	3	0)	B bed; el. 1,012.2 ft.; C-97349.
101	3	103	3	Dark claystone	2	0	

Log, hole 6-10 EA (Cont.)

Depth From- Ft.	Depth From- in.	Depth To- Ft.	Depth To- in.	Material	Thickness Ft.	Thickness in.	Remarks
103	3	117	0	Dark silty claystone, with plant fragments	13	9	
117	0	122	0	Fine sandstone	5	0	
122	0	128	0	Dark claystone	6	0	Dip, 10°.
128	0	132	0	Fine sandstone	4	0	
132	0	140	0	Claystone, with thin ironstone and silty streaks	8	0	
140	0	143	0	Dark claystone	3	0	
143	0	143	6	COAL		6	
143	6	146	6	Coaly claystone, with thin streaks of coal	3	0	
146	6	146	8	Bony coal		2	Dip, 10°.
146	8	147	6	Interbedded coaly claystone and dark claystone		10	Dip, 10°- 20°.
147	6	151	0	Claystone, with thin streaks of ironstone	3	6	
151	0	177	0	Interbedded and crossbedded fine sandstone and siltstone, with thin, folded, carbonized bands and a few coal fragments	26	0	
177	0	189	0	Siltstone, grading into fine sandstone	12	0	
189	0	224	6	Massive medium to coarse sandstone, with numerous blebs and folded fragments of coal in top.	35	6	
224	6	225	0	Dark claystone, with streaks of coaly claystone		6	
225	0	230	0	Fine, crossbedded sandstone	5	0	
230	0	230	6	Coaly claystone		6	
230	6	230	8	Bone		2	
230	8	232	4	COAL	1	8)	C bed; C-97350.
232	4	233	3	Bone		11	
233	3	235	3	Claystone	2	0	
235	3	270	0	Interbedded medium and fine sandstone and siltstone, with some crossbedding and thin, dark streaks of carbonized plant fragments	34	9)	Dip, 20°-30°.
270	0	274	0	Claystone	4	0	
274	0	294	0	Siltstone, with streaks of fine sandstone and occasional ironstone	20	0	
294	0	304	0	Dark, silty claystone, with thin ironstone bands	10	0	

Log, hole 6-10 EA (Cont.)

Depth From- Ft.	Depth From- in.	Depth To- Ft.	Depth To- in.	Material	Thickness Ft.	Thickness in.	Remarks
304	0	311	0	Dark claystone, with numerous carbonized fragments	7	0	
311	0	312	6	Coaly claystone	1	6	
312	6	312	9	Ironstone		3	
312	9	313	0	Coaly claystone		3	
313	0	319	0	Dark claystone, with numerous carbonized fragments	6	0	
319	0	319	6	Coaly claystone		6	
319	6	324	6	Calcareous siltstone, with calcite veinlets	5	0	
324	6	327	10	Dark claystone, with streaks of coaly claystone	3	4	
327	10	328	9	COAL		11)	D bed.
328	9	328	10	Ironstone and coal		1	
328	10	329	6	COAL		8	C-97351.
329	6	329	9	Ironstone and coal		3	
329	9	330	10	COAL	1	1)	
330	10	331	7	Bony coal		9	
331	7	337	0	Dark claystone, with thin streaks of coaly claystone and coal	5	5	
337	0	350	0	Fine sandstone, with thin beds of siltstone	13	0	
350	0	363	0	Interbedded and cross-bedded fine sandstone and dark siltstone, with occasional ironstone nodules	13	0	Dip, 10°.
363	0	365	3	Dark, silty claystone	2	3	Do.
365	3	365	6	Ironstone		3	
365	6	367	6	Coaly claystone, with streaks of coal	2	0	
367	6	371	6	Dark, silty claystone, with streaks of coaly claystone	4	0	
371	6	377	0	Silty claystone, with ironstone bands	5	6	
377	0	381	0	Fine, calcareous sandstone, with thin, dark siltstone bands	4	0	
381	0	393	0	Dark siltstone, with numerous ironstone bands	12	0	
393	0	410	0	Interbedded and crossbedded fine sandstone and siltstone	17	0	
410	0	422	0	Silty claystone, with dark carbonized bands	12	0	
422	0	425	0	Siltstone	3	0	

Log, hole 6-10 EA (Cont.)

Depth From- Ft.	Depth From- in.	Depth To- Ft.	Depth To- in.	Material	Thickness Ft.	Thickness in.	Remarks
425	0	437	0	Hard, medium-speckled sandstone, with thin, dark, silty bands	12	0	
437	0	447	0	Interbedded dark siltstone and dark, silty claystone	10	0	Dip, 20°.
447	0	450	0	Siltstone	3	0	
450	0	454	0	Fine sandstone	4	0	
454	0	571	0	Massive medium to coarse light-gray sandstone, with tan and dark speckles	117	0	
571	0	578	0	Dark siltstone	7	0	
578	0	581	0	do.	3	0	Dip, 20°.
581	0	583	2	Dark claystone, with streaks of coaly claystone	2	2	
583	2	584	2	COAL	1	0)	Little Eska group; el., 538.8 ft. C-97352
584	2	584	8	Bony coal		6	
584	8	586	2	COAL	1	6)	
586	2	586	10	Coaly claystone		8	
586	10	588	5	Dark claystone, with streaks of coaly claystone	1	7	
588	5	589	10	COAL	1	5)	C-97353.
589	10	592	8	Coaly claystone, with streaks of coal	2	10	
592	8	594	2	Bony coal, with streaks of carbonaceous claystone	1	6	
594	2	597	6	Claystone	3	4	
597	6	598	0	Ironstone		6	
598	0	603	3	Dark, silty claystone, with streaks of coal and ironstone	5	3	
603	3	603	6	Bony coal and coaly claystone		3	
603	6	607	0	Bony coal	3	6)	C-97354.
607	0	607	1	Siltstone		1	
607	1	607	7	Bone and coaly claystone		6	
607	7	610	3	Coaly claystone, with streaks of ironstone and bone	2	8	Dip, 25°.
610	3	611	3	COAL	1	0)	
611	3	612	4	Claystone	1	1	
612	4	612	7	Ironstone and coal		3	
612	7	613	0	COAL		5)	C-97355.
613	0	613	1	Bone		1	
613	1	614	11	COAL	1	10)	
614	11	615	5	Coaly claystone, with calcite veinlet and streak or ironstone and bone		6	

Log, hole 6-10 EA (Cont.)

Depth From- Ft.	Depth From- in.	Depth To- Ft.	Depth To- in.	Material	Thickness Ft.	Thickness in.	Remarks
615	5	625	0	Interbedded gray sandstone and siltstone, with streaks of ironstone; coaly claystone blob at 616 ft. 3 in.	9	7	

Log, hole 7-10 EA

Location: 590 feet N. and 1,760 feet E. of SW. corner, sec. 10, T. 19 N., R. 3 E., Seward Meridian, Eska, Alaska.
Elevation: Collar of hole - 1,223 feet.

Depth From- Ft.	Depth From- in.	Depth To- Ft.	Depth To- in.	Material	Thickness Ft.	Thickness in.	Remarks
0	0	2	0	Overburden	2	0	
2	0	25	0	Coarse and conglomeratic gray sandstone, with green and dark specklos	23	0	
25	0	41	0	Gray siltstone, with thin streaks of silty claystone	16	0	Dip, 20°.
41	0	50	0	Interbedded siltstone and and fine sandstone	9	0	
50	0	60	0	Gray, very fine sandstone	10	0	
60	0	60	3	Ironstone		3	
60	3	60	6	Coaly claystone		3	
60	6	63	6	Coal, with thin streaks of bone	3	0	Maitland; el., 1,162.5 ft., C-98414.
63	6	64	7	Coaly claystone	1	1	Dip, 30°
64	7	65	5	Ironstone		10	
65	5	66	6	Coaly claystone	1	1	
66	6	66	11	COAL		5)	
66	11	67	5-1/2	Bone		6-1/2	
67	5-1/2	69	6	COAL	2	1/2)	C-98415.
69	6	70	6	Coaly claystone, with streaks of ironstone	1	0	
70	6	72	0	COAL	1	6	C-98416.
72	0	73	0	Claystone	1	0	
73	0	74	3	Coaly claystone	1	3	
74	3	74	9	COAL		6	C-98416.
74	9	75	9	Coaly claystone	1	0	
75	9	79	0	Claystone	3	3	
79	0	83	8	Silty claystone	4	8	
83	8	84	2	Ironstone		6	
84	2	85	2	Coal, with streaks of coaly claystone	1	0	

Log, hole 7-10 EA (Cont.)

Depth From- Ft.	Depth From- in.	Depth To- Ft.	Depth To- in.	Material	Thickness Ft.	Thickness in.	Remarks
85	2	93	0	Siltstone, with streaks of coaly claystone and coal	7	10	
93	0	96	0	Siltstone	3	0	
96	0	96	6	Ironstone		6	
96	6	97	6	Bony coal	1	0	Dip, 30°.
97	6	100	6	Dark claystone	3	0	
100	6	102	0	Coaly claystone	1	6	
102	0	105	0	Coal, with thin streaks of bone	3	0	David, el., 1,121.0 ft.; C-98417.
105	0	105	6	Claystone		6	
105	6	106	6	Coaly claystone	1	0	
106	6	107	6	Bony coal	1	0	
107	6	107	9	Coaly claystone		3	
107	9	109	0	Siltstone	1	3	
109	0	115	0	Medium sandstone	6	0	
115	0	136	0	Interbedded gray siltstone and fine sandstone, with occasional ironstone	21	0	
136	0	140	0	Claystone, with streaks of coaly claystone and ironstone	4	0	
140	0	186	0	Interbedded gray siltstone and fine sandstone, with thin streaks of silty claystone	46	0	
186	0	200	0	Medium sandstone, with thin streaks of siltstone	14	0	
200	0	212	0	Gray claystone, with occasional ironstone nodule and carbonized plant fragments	12	0	
212	0	212	3	Coaly ironstone		3	
212	3	213	0	Coaly claystone		9	
213	0	214	0	Bony coal	1	0	Emery; el., 1,010.0 ft.
214	0	216	6	Claystone, with coaly streaks	2	6	
216	6	218	6	Bony coal	2	0	
218	6	219	10	Claystone, with thin, coaly streaks	1	4	
219	10	220	1-1/2	COAL		3-1/2)	
220	1-1/2	220	2	Ironstone		1/2	
220	2	221	6	COAL	1	4)	C-98583.

Log, hole 7-10 EA (Cont.)

Depth From- Ft.	Depth From- in.	Depth To- Ft.	Depth To- in.	Material	Thickness Ft.	Thickness in.	Remarks
221	6	221	8-1/2	Bone		2-1/2	
221	8-1/2	224	6	COAL	2	9-1/2)	
224	6	225	3	Claystone		9	
225	3	226	4	COAL	1	1)	
226	4	226	9	Coaly claystone		5	
226	9	230	0	Claystone, with thin, coaly streaks	3	3	Dip, 20°.
230	0	235	0	Fine sandstone, with streaks of ironstone	5	0	
235	0	246	0	Claystone, with shaly streaks and plant fragments	11	0	
246	0	251	0	Fine sandstone	5	0	
251	0	281	0	Siltstone, with occasional ironstone streak	30	0	
281	0	297	0	Dark claystone, with occasional shaly and ironstone streaks	16	0	Dip, 10°-20°.
297	0	297	8	Claystone, with streaks of coaly claystone		8	Dip, 30°.
297	8	298	2	COAL		6	
298	2	298	5	Ironstone, with pyrite		3	
298	5	298	11	COAL		6	
298	11	299	2	Ironstone, with pyrite		3	
299	2	299	8	COAL		6	
299	8	303	0	Claystone, with thin streaks of coaly claystone	3	4	Dip, 30°.
303	0	303	6	Coaly claystone		6	
303	6	306	6	Coal, with thin, calcite veinlets	3	0	Bed 9; el., 919.5 ft., C-98418.
306	6	307	0	Bone		6	
307	0	307	6	Coaly claystone		6	
307	6	311	6	Siltstone to very fine sandstone	4	0	
311	6	313	6	Coaly claystone, with thin streaks of coal and ironstone	2	0	
313	6	313	8	Gray clay		2	
313	8	314	2	Dark claystone		6	
314	2	320	0	Fine-to medium-gray sandstone	5	10	
320	0	480	0	Medium-light-gray sandstone, with dark-brown, green, and black speckles	160	0	
480	0	484	0	Siltstone	4	0	

Log, hole 7-10 EA (Cont.)

Depth From- Ft.	Depth From- in.	Depth To- Ft.	Depth To- in.	Material	Thickness Ft.	Thickness in.	Remarks
484	0	492	0	Silty claystone, grading into shaly claystone, with coaly streaks at base	8	0	Dip, 10°-20°.
492	0	499	0	Medium sandstone	7	0	
499	0	520	0	Siltstone, with scattered ironstone bands	21	0	
520	0	536	5	Interbedded and cross-bedded, dark-gray siltstone and fine, light-gray sandstone	16	5	
536	5	537	1	Bone		8	Eska; el. 686.6 ft.
537	1	538	10	COAL	1	9	
538	10	539	8	Siltstone		10	
539	8	540	0	Coaly claystone		4	
540	0	540	4	COAL		4	
540	4	540	8	Claystone, with coaly streaks		4	
540	8	541	4	Coaly claystone		8	
541	4	542	4	Bony coal, with ironstone	1	0	
542	4	543	8	Coaly claystone	1	4	
543	8	544	8	Bony coal	1	0	
544	8	546	9	Coaly claystone, with streaks of bone	2	1	
546	9	547	9	Claystone, with coaly streaks	1	0	
547	9	548	3	Ironstone		6	
548	3	549	6	Siltstone, with streaks of ironstone	1	3	
549	6	558	0	Interbedded and crossbedded, light-gray, fine sandstone and dark-gray siltstone	8	6	
558	0	561	0	Siltstone, with streaks of ironstone	3	0	
561	0	564	11	Dark claystone, with coaly ironstone streaks	3	11	
564	11	565	0	Pyrite		1	
565	0	566	0	Bony coal	1	0	Shaw; el., 658.0 ft.
566	0	567	6	Dark claystone, with coaly streaks	1	6	Dip, 10°-20°.
567	6	568	7	Bony coal	1	1	
568	7	569	10	Bone, with streaks of coaly claystone	1	3	
569	10	571	2	Coaly claystone	1	4	

Log, hole 7-10 EA (Cont.)

Depth From- Ft.	Depth From- in.	Depth To- Ft.	Depth To- in.	Material	Thickness Ft.	Thickness in.	Remarks
571	2	572	2	Bony coal	1	0	
572	2	572	11	Ironstone and coal		9	
572	11	573	2	Bony coal		3	
573	2	574	2	Coaly claystone	1	0	
574	2	574	8	Bony coal		6	
574	8	578	6	Siltstone	3	10	
578	6	579	0	Coal and ironstone		6	
579	0	580	0	COAL	1	0	
580	0	581	0	Coaly claystone, with streaks of ironstone	1	0	
581	0	583	0	Claystone	2	0	
583	0	587	0	Siltstone, with thin ironstone and claystone streaks	4	0	
587	0	597	0	Interbedded fine sandstone and siltstone, shaly near top and ironstone near bottom	10	0	
597	0	603	8	Shaly claystone, with thin ironstone streaks	6	8	Dip, 20°.
603	8	606	0	Claystone, with thin ironstone and coaly streaks	2	4	
606	0	608	9	COAL	2	9	) Martin; el., 617.0 ft.
608	9	609	0	Bone		3	
609	0	611	0	Claystone, bone, and ironstone	2	0	
611	0	613	3	COAL	2	3	) C-98584.
613	3	613	6	Bone		3	
613	6	615	4	Claystone, with streaks of coaly claystone and ironstone	1	10	
615	4	616	10	Bony coal	1	6	
616	10	617	6	Bone, with streaks of coaly claystone		8	
617	6	620	6	Coaly claystone, with streaks of bone	3	0	
620	6	622	0	Bone, with streaks of coaly claystone	1	6	
622	0	630	0	Claystone, with streaks of ironstone	8	0	
630	0	662	0	Siltstone, with thin streaks of ironstone and fine sandstone	32	0	

Log, hole 8-10 EA

Location: 880 feet N. and 380 feet E. of S. 1/4 corner, sec. 10, T. 19 N., R. 3 E., Seward Meridian, Eska, Alaska.
Elevation: Collar of hole - 1,223 feet.

Depth From- Ft.	Depth From- in.	Depth To- Ft.	Depth To- in.	Material	Thickness Ft.	Thickness in.	Remarks
0	0	18	0	Overburden, glacial drift, gravel with few boulders	18	0	
18	0	22	0	Fine to medium sandstone	4	0	
22	0	113	0	Massive, light-gray, medium sandstone, with dark speckles and a few thin-bedded clay and fine sandstone streaks	91	0	Dip, 45°.
113	0	115	0	Dark claystone, with some slickensides	2	0	
115	0	121	0	Dark-gray, interbedded, fine sandstone and siltstone	6	0	
121	0	136	6	Interbedded dark siltstone and claystone, with occasional ironstone nodule and thin calcite veinlet at 135 ft.	15	6	Dip, 30°-45°.
136	6	144	0	Interbedded fine sandstone and siltstone	7	6	
144	0	152	9	Dark claystone, with silty streaks and occasional ironstone nodule	8	9	Slickensides.
152	9	153	4	Bony coal		7	
153	4	155	4	Dark claystone	2	0	Dip, 30°.
155	4	166	0	Interbedded fine sandstone, siltstone, and claystone	10	8	Slickensides.
166	0	183	6	Hard interbedded and cross-bedded gray fine sandstone and dark siltstone, with carbonized plant fragments	17	6	
183	6	187	1	Hard siltstone, with some ironstone nodules	3	7	Eska; el., 1,035.9 ft.
187	1	187	9	COAL		8)	
187	9	187	10	Ironstone		1	
187	10	189	3	COAL	1	5)	Dip, 5°; D-479.
189	3	189	8	Bony coal, with white flakes and calcite veinlets		5)	
189	8	190	4	Coal, with thin streaks of bone		8)	
190	4	190	7	Coaly claystone and bone		3	
190	7	190	9	Bony coal		2	
190	9	191	0	Ironstone and coal		3	

Log, hole 8-10 EA (Cont.)

Depth From- Ft.	Depth From- in.	Depth To- Ft.	Depth To- in.	Material	Thickness Ft.	Thickness in.	Remarks
191	0	193	0	Coaly claystone, with streaks of coal	2	0	
193	0	193	8	Bony coal		8	
193	8	194	2	Claystone		6	
194	2	195	6	Siltstone and ironstone	1	4	
195	6	195	10	Bony coal		4	
195	10	197	0	Coaly claystone	1	2	
197	0	197	8	Bony coal		8	Dip, 5°.
197	8	198	1	Ironstone		5	
198	1	201	0	Coaly claystone, with streaks of coal	2	11	
201	0	204	0	Siltstone	3	0	
204	0	222	0	Interbedded and crossbedded gray sandstone and dark siltstone, with ironstone inclusions and thin streaks of carbonized plant fragments	18	0	
222	0	227	3	Claystone	5	3	Dip, 5°-20°.
227	3	227	6	Ironstone		3	
227	6	228	8	Claystone	1	2	
228	8	229	8	Coaly claystone, with streaks of coal	1	0	
229	8	230	8	Ironstone and coal	1	0	
230	8	231	4	Interbedded coaly claystone and ironstone		8	Shaw; el. 991.1 ft.
231	4	231	10	Coaly claystone and bone		6	
231	10	234	11	COAL	3	1)	D-480.
234	11	236	2	Claystone	1	3	Slickensides.
236	2	238	0	COAL	1	10)	
238	0	238	9	Ironstone, with coal inclusions		9	
238	9	239	2	Coaly claystone		5	
239	2	239	6	Claystone		4	
239	6	240	0	Coaly claystone		6	
240	0	242	0	COAL	2	0	Dip, 20°.
242	0	242	3	Ironstone		3	
242	3	242	6	COAL		3	
242	6	243	0	Coaly claystone		6	
243	0	243	3	Ironstone		3	
243	3	244	3	Claystone and coaly claystone	1	0	
244	3	245	3	Claystone	1	0	
245	3	245	9	Coaly claystone		6	Dip, 10°.
245	9	246	6	Claystone		9	
246	6	247	0	Coaly claystone		6	
247	0	270	0	Siltstone, with thin streaks of fine sandstone and occasional ironstone nodule	23	0	Dip, 5°-15°.
270	0	273	6	Claystone, with streaks of coaly claystone and ironstone	3	6	

Log, hole 8-10 EA (Cont.)

Depth From- Ft.	Depth From- in.	Depth To- Ft.	Depth To- in.	Material	Thickness Ft.	Thickness in.	Remarks
273	6	274	0	Coaly claystone		6	Dip, 10°-30°.
274	0	275	0	Bone, with streaks of coaly claystone	1	0	Martin; el., 949.0 ft.; dip, 10°.
275	0	276	0	Coaly claystone	1	0	Dip, 10°-20°.
276	0	277	0	Claystone, with blebs of coal	1	0	
277	0	282	0	Interbedded gray, fine sandstone and dark siltstone, with ironstone nodules	5	0	
282	0	287	0	Claystone, with occasional ironstone nodule	5	0	
287	0	296	0	Fine sandstone and siltstone, with occasional ironstone	9	0	
296	0	308	0	Interbedded siltstone, silty claystone, and claystone	12	0	
308	0	317	7	Claystone, with ironstone nodules and calcite veinlets along fractures	9	7	Slickensides.
317	7	318	3	Bone		8	A bed; el., 905.6 ft.
318	3	319	5	COAL	1	2	D-553.
319	5	320	0	Carbonaceous and coaly claystone		7	
320	0	320	4	Ironstone		4	
320	4	321	2	Carbonaceous and coaly claystone		10	
321	2	322	0	Bone		10	
322	0	324	0	COAL	2	0	D-554.
324	0	324	4	Bone		4	
324	4	325	10	Carbonaceous claystone, with streaks of bone and coal	1	6	
325	10	328	0	Claystone	2	2	
328	0	360	0	Crossbedded, medium to coarse gray sandstone, with tan speckles and thin streaks of fine sandstone and dark siltstone	32	0	
360	0	361	0	Limestone, with calcite veinlets	1	0	
361	0	362	0	Siltstone	1	0	
362	0	363	6	Limestone, with calcite veinlets	1	6	
363	6	363	9	Bentonitic clay, with calcite veinlet		3	
363	9	364	7	Claystone		10	
364	7	365	7	Bony coal, with streakof ironstone	1	0	

Log, hole 8-10 EA (Cont.)

Depth From- Ft.	Depth From- in.	Depth To- Ft.	Depth To- in.	Material	Thickness Ft.	Thickness in.	Remarks
365	7	369	0	Medium to coarse sandstone	3	5	
369	0	388	0	Siltstone	19	0	
388	0	394	0	Fine sandstone	6	0	
394	0	402	0	Siltstone, with occasional ironstone nodule	8	0	
402	0	405	6	Fine sandstone, with 2-in. calcite veinlet	3	6	
405	6	412	0	Dark claystone, with silty streaks	6	6	Dip, 5°-10°.
412	0	413	0	Coaly claystone	1	0	
413	0	413	3	COAL		3	
413	3	419	0	Claystone, with thin coaly streaks	5	9	Dip, 5°-10°.
419	0	425	0	Interbedded fine sandstone and siltstone, with occasional ironstone nodule	6	0	
425	0	439	0	Claystone, with thin, coaly and carbonaceous streaks	14	0	
439	0	454	0	Fine to medium sandstone, with thin streaks of siltstone	15	0	
454	0	463	0	Interbedded silty claystone, siltstone, and fine sandstone, with slickensides in the claystone	9	0	
463	0	475	0	Hard siltstone to very fine sandstone	12	0	
475	0	478	0	Silty claystone and siltstone	3	0	
478	0	496	0	Very fine sandstone, with occasional ironstone nodule	18	0	
496	0	534	0	Fine to medium sandstone, with occasional ironstone	38	0	
534	0	581	0	Medium to coarse gray sandstone, with dark speckles	47	0	
581	0	581	6	Claystone		6	
581	6	581	9	Bone		3	
581	9	583	6	Fine sandstone	1	9	
583	6	583	9	Coaly claystone, with streaks of bone		3	
583	9	583	10	Ironstone		1	
583	10	585	11	COAL	2	1)	D bed; D-555.
585	11	586	1	Bone		2)	
586	1	587	7	Coaly claystone, with streaks of bone	1	6	
587	7	588	1	Ironstone		6	
588	1	588	3	Claystone		2	
588	3	588	5	COAL		2	

Log, hole 8-10 EA (Cont.)

Depth From- Ft.	Depth From- in.	Depth To- Ft.	Depth To- in.	Material	Thickness Ft.	Thickness in.	Remarks
588	5	588	9	Claystone		4	
588	9	590	0	Silty claystone	1	3	
590	0	600	0	Fine sandstone, with thin streaks of silty claystone	10	0	Dip, 10°.
600	0	606	0	Siltstone, with a few carbonized plant fragments	6	0	
606	0	628	0	Siltstone, with thin streaks of silty claystone, ironstone, and sandstone	22	0	
628	0	648	0	Dark claystone, with carbonized plant fragments and thin coaly and ironstone streaks	20	0	
648	0	648	6	Bony coal		6	
648	6	649	5	Coaly claystone, with streaks of bone		11	
649	5	651	0	Hard, calcareous, fine sandstone	1	7	
651	0	651	6	Coaly claystone		6	
651	6	655	0	Dark claystone, with thin, coaly streaks	3	6	
655	0	655	4	Coaly claystone		4	
655	4	655	10	COAL		6	
655	10	657	6	Dark claystone	1	8	
657	6	658	6	Coaly claystone, with streaks of bone	1	0	
658	6	659	0	Dark claystone		6	
659	0	659	7	COAL		7	Little Eska group.
659	7	659	9	Coaly claystone		2	
659	9	660	0	COAL		3)	D-556.
660	0	660	8	Dark claystone with coaly streaks		8	
660	8	662	4	COAL	1	8)	
662	4	662	6	Carbonaceous ironstone		2	
662	6	667	9	Dark claystone	5	3	
667	9	668	0	COAL		3	
668	0	668	2	Ironstone		2	
668	2	668	3	Claystone		1	
668	3	668	7	COAL		4	
668	7	671	4	Dark claystone, with coaly streaks near top	2	9	
671	4	672	4	COAL	1	0	
672	4	672	10	Coaly claystone		6	
672	10	673	6	Coal, with streaks of coaly claystone		8	
673	6	676	0	Dark claystone, with thin streaks of coaly claystone and coal	2	6	

Log, hole 8-10 EA (Cont.)

Depth From- Ft.	Depth From- in.	Depth To- Ft.	Depth To- in.	Material	Thickness Ft.	Thickness in.	Remarks
676	0	676	6	Coaly claystone		6	
676	6	677	0	Ironstone		6	
677	0	677	6	Bony coal		6	
677	6	678	6	Carbonaceous claystone	1	0	
678	6	679	0	Bony coal, with streaks of coaly claystone		6	
679	0	680	0	Claystone	1	0	

Log, hole 9-10 EA

Location: 1,315 feet N. and 870 feet E. of S. 1/4 corner, sec. 10, T. 19 N., R. 3 E., Seward Meridian, Eska, Alaska.
Elevation: Collar of hole - 1,263 feet.

Depth From- Ft.	Depth From- in.	Depth To- Ft.	Depth To- in.	Material	Thickness Ft.	Thickness in.	Remarks
0	0	18	0	Overburden, clay and sand	18	0	
18	0	30	0	Interbedded siltstone and silty claystone	12	0	
30	0	39	0	Claystone, with thin streaks of ironstone	9	0	Dip, 10°-20°.
39	0	39	6	Coaly claystone		6	
39	6	40	7	Bony coal	1	1	A bed.
40	7	49	0	Dark claystone, with streaks of coaly claystone	8	5	Dip, 20°.
49	0	49	6	Ironstone		6	
49	6	50	6	Coaly claystone, with streaks of bone	1	0	
50	6	65	0	Siltstone, with thin streaks of ironstone, sandstone, and claystone	14	6	Dip, 10°.
65	0	74	0	Hard fine sandstone, with ironstone nodule	9	0	
74	0	85	0	Gray medium sandstone, with thin, silty streaks and thin, carbonized streaks	11	0	
85	0	105	0	Massive, medium-gray sandstone, with tan and dark speckles	20	0	Dip, 30°-45°.
105	0	120	0	Interbedded, dark, fine sandstone and siltstone, with thin streaks of carbonized plant fragments	15	0	
120	0	121	6	Claystone, with thin streaks of coaly claystone	1	6	Dip, 45°.
121	6	124	0	COAL	2	6)	B bed; el.,
124	0	124	1	Ironstone		1	1,142.5 ft.
124	1	126	3-1/2	COAL	2	2-1/2)	D-8011.

Log, hole 9-10 EA (Cont.)

Depth From- Ft.	Depth From- in.	Depth To- Ft.	Depth To- in.	Material	Thickness Ft.	Thickness in.	Remarks
126	3-1/2	126	9	Bone		5-1/2	
126	9	127	3	COAL		6)	
127	3	127	4	Claystone		1	
127	4	127	9-1/2	COAL		5-1/2)	
127	9-1/2	127	10-1/2	Bone		1	
127	10-1/2	127	11	COAL		1/2)	
127	11	127	11-1/2	Bone		1/2	
127	11-1/2	128	1	COAL		1-1/2)	
128	1	128	5-1/2	Shale and bone		4-1/2	
128	5-1/2	128	10	COAL		4-1/2)	
128	10	132	0	Claystone	3	2	
132	0	143	0	Siltstone	11	0	
143	0	162	0	Fine to medium gray sandstone	19	0	
162	0	245	0	Massive, coarse, gray sandstone, with brown and dark specks	83	0	Dip, 30°.
245	0	250	0	Interbedded fine and medium gray sandstone	5	0	
250	0	255	0	Dark, silty claystone	5	0	Dip, 20°-30°.
255	0	260	0	Dark claystone, with thin streaks of coaly claystone	5	0	
260	0	264	0	Dark, silty claystone	4	0	
264	0	266	0	Fine sandstone	2	0	
266	0	274	0	Dark claystone, with thin coaly and silty streaks	8	0	Dip, 30°.
274	0	282	0	Fine gray sandstone, with thin, dark, silty streaks	8	0	
282	0	305	6	Dark claystone, with thin, coaly streaks and occasional ironstone nodule	23	6	Dip, 10°-20°.
305	6	306	6	Coaly claystone, with streaks of coal	1	0	
306	6	308	7	Coal, with thin streaks of bone	2	1	D bed.
308	7	308	10	Coaly claystone		3	
308	10	309	2	Bony coal		4	
309	2	312	10	Claystone	3	8	
312	10	313	0	COAL		2	
313	0	325	0	Claystone, with streaks of siltstone and ironstone	12	0	Fractures at 45°.
325	0	345	0	Dark gray siltstone, with streaks of ironstone	20	0	
345	0	356	0	Fine to medium gray sandstone	11	0	

Log, hole 9-10 EA (Cont.)

Depth From- Ft.	Depth From- in.	Depth To- Ft.	Depth To- in.	Material	Thickness Ft.	Thickness in.	Remarks
356	0	366	0	Massive, coarse gray sandstone, with brown speckles	10	0	
366	0	404	0	Interbedded and crossbedded silty claystone, siltstone, and fine sandstone, with ironstone streaks	38	0	
404	0	405	6	Claystone	1	6	
405	6	405	8	Ironstone and sandstone, with calcite		2	
405	8	406	2	Coaly claystone		6	Dip, 45°.
406	2	406	2-1/2	Claystone		1/2	
406	2-1/2	408	1-1/2	COAL	1	11)	Little Eska group; el., 855.2 ft.
408	1-1/2	408	2-1/2	Bone		1	
408	2-1/2	409	9-1/2	COAL	1	7)	D-8012.
409	9-1/2	409	11	Bone		1-1/2	
409	11	410	4-1/2	COAL		5-1/2)	
410	4-1/2	410	6	Bone		1-1/2	
410	6	413	0	Claystone	2	6	Dip, 45°.
413	0	427	0	Interbedded, dark, silty claystone and siltstone, with streaks of ironstone	14	0	
427	0	434	8	Dark claystone, covered with calcite	7	8	Slickensides.
434	8	435	0	Coaly claystone		4	
435	0	436	0	COAL	1	0	
436	0	438	6	Bony coal, with streaks of coaly claystone	2	6	
438	6	439	6	Coaly claystone and bone	1	0	
439	6	440	3-1/2	COAL		9-1/2)	D-8013.
440	3-1/2	440	6	Bony coal		2-1/2	Dip, 45°.
440	6	440	7	Ironstone		1	
440	7	441	5	COAL		10)	
441	5	441	7	Bone		2	
441	7	441	8	COAL		1)	
441	8	441	9	Bone		1	
441	9	442	4	COAL		7)	
442	4	442	6	Bone		2	
442	6	446	0	Dark claystone	3	6	
446	0	447	6	COAL	1	6	
447	6	447	10	Dark claystone		4	
447	10	449	8	Coal, with thin streaks of bone	1	10	D-8014.
449	8	450	0	Dark claystone		4	
450	0	450	9	Bony coal, with thin ironstone streaks		9	

Log, hole 9-10 EA (Cont.)

Depth From- Ft.	Depth From- in.	Depth To- Ft.	Depth To- in.	Material	Thickness Ft.	Thickness in.	Remarks
450	9	451	0	Coaly claystone		3	
451	0	452	0	Sandstone	1	0	
452	0	457	0	Claystone and calcite veinlets	5	0	Slickonsides.
457	0	505	0	Interbedded gray sandstone and dark siltstone	48	0	do.

TABLE 3. - Analyses of coal cores in vicinity of Eska 2 mine, Matanuska Valley field, Eska Alaska

Drill hole	Lab. No.	Condition[1]	Proximate, percent: Moisture	Volatile matter	Fixed carbon	Ash	Ultimate, percent: Sulfur	Hydrogen	Carbon	Nitrogen	Oxygen	Calorific value B.t.u.	Fusibility of ash: Initial deformation temperature, °F.	Softening temperature, °F.	Fluid temperature, °F.	Real specific gravity	Core received, inches	Core rejected, inches	Core analyzed, inches
									NO. 5 BED										
13-16	C-48684	1	3.8	40.4	44.8	11.0	0.3	5.5	67.6	1.6	14.0	12,080	2,440	2,540	2,680	1.373	44	1-3/4	42-1/4
(167 ft. 3 in. to 174 ft. 3 in.)		2	-	42.0	46.6	11.4	.3	5.3	70.3	1.6	11.1	12,560	-	-	-	-	-	-	-
		3	-	47.4	52.6	-	.3	6.0	79.4	1.8	12.5	14,180	-	-	-	-	-	-	-
13-16	C-48685	1	3.7	38.8	45.2	12.3	.2	-	-	-	-	12,050	2,890	2,910+	-	-	16	-	16
(177 ft. to 178 ft. 9 in.)		2	-	40.2	47.0	12.8	.3	-	-	-	-	12,500	-	-	-	-	-	-	-
		3	-	46.1	53.9	-	.3	-	-	-	-	14,340	-	-	-	-	-	-	-
13-16	C-48733	1	4.6	39.5	43.0	12.9	.4	-	-	-	-	11,870	2,910+	-	-	1.377	8-1/2	-	8-1/2
(180 ft. 9 in. to 181 ft. 9 in.)		2	-	41.4	45.1	13.5	.4	-	-	-	-	12,440	-	-	-	-	-	-	-
		3	-	47.8	52.2	-	.5	-	-	-	-	14,380	-	-	-	-	-	-	-
13-16	C-48734	1	3.7	36.4	39.2	20.7	.4	5.1	59.6	1.4	12.8	10,690	2,910+	-	-	1.448	26-1/2	-	26-1/2
(186 ft. 2 in. to 188 ft. 9 in.)		2	-	37.8	40.7	21.5	.4	4.9	61.9	1.4	9.9	11,100	-	-	-	-	-	-	-
		3	-	48.1	51.9	-	.5	6.2	78.8	1.8	12.7	14,130	-	-	-	-	-	-	-
									NO. 6 BED										
13-16	C-48735	1	4.6	39.4	52.3	3.7	.4	-	-	-	-	13,240	2,570	2,620	2,760	1.326	13-1/4	-	13-1/4
(218 ft. 1 in. to 219 ft. 10 in.)		2	-	41.4	54.8	3.8	.5	-	-	-	-	13,880	-	-	-	-	-	-	-
		3	-	43.0	57.0	-	.5	-	-	-	-	14,440	-	-	-	-	-	-	-
13-16	C-48736	1	4.1	41.1	48.9	5.9	.3	-	-	-	-	13,050	2,910+	-	-	-	7-1/2	-	7-1/2
(221 ft. 7 in. to 222 ft. 8 in.)		2	-	42.8	51.1	6.1	.3	-	-	-	-	13,600	-	-	-	-	-	-	-
		3	-	45.6	54.4	-	.4	-	-	-	-	14,480	-	-	-	-	-	-	-
13-16	C-48737	1	4.5	37.9	45.0	12.6	.3	-	-	-	-	11,960	2,910+	-	-	1.373	7	-	7
(223 ft. 1 in. to 224 ft. 6 in.)		2	-	39.6	47.3	13.1	.3	-	-	-	-	12,520	-	-	-	-	-	-	-
		3	-	45.6	54.4	-	.4	-	-	-	-	14,410	-	-	-	-	-	-	-
									CHAPIN BED										
13-16	C-48766	1	3.2	42.9	46.2	7.7	.4	-	-	-	-	13,010	2,760	2,840	2,910+	-	17	7	10
(282 ft. 6 in. to 284 ft. 4 in.)		2	-	44.3	47.8	7.9	.4	-	-	-	-	13,440	-	-	-	-	-	-	-
		3	-	48.1	51.9	-	.4	-	-	-	-	14,600	-	-	-	-	-	-	-
13-16	C-48767	1	3.4	40.8	43.5	12.3	.4	-	-	-	-	12,220	2,790	2,840	2,910	-	27	12	15
(302 ft. to 306 ft. 4 in.)		2	-	42.2	45.0	12.8	.4	-	-	-	-	12,660	-	-	-	-	-	-	-
		3	-	48.4	51.6	-	.5	-	-	-	-	14,510	-	-	-	-	-	-	-
15-16	C-51677	1	2.4	40.7	44.7	12.2	.3	5.5	69.2	1.4	11.4	12,390	2,410	2,460	2,570	1.372	30	-	30
(586 ft. 9 in. to 592 ft. 9 in.)		2	-	41.7	45.8	12.5	.3	5.3	70.9	1.5	9.5	12,690	-	-	-	-	-	-	-
		3	-	47.6	52.4	-	.3	6.1	81.1	1.7	10.8	14,510	-	-	-	-	-	-	-
									MAITLAND BED										
13-16	C-48738	1	3.9	38.4	43.6	14.1	.4	-	-	-	-	11,830	2,910+	-	-	1.379	13	-	13
(325 ft. 8 in. to 327 ft. 6 in.)		2	-	40.0	45.3	14.7	.4	-	-	-	-	12,300	-	-	-	-	-	-	-
		3	-	46.9	53.1	-	.5	-	-	-	-	14,420	-	-	-	-	-	-	-
13-16	C-48739	1	4.3	40.3	47.2	8.2	.8	-	-	-	-	12,720	2,520	2,610	2,700	-	10-1/2	-	10-1/2
(331 ft. 8 in. to 332 ft. 11 in.)		2	-	42.1	49.4	8.5	.8	-	-	-	-	13,290	-	-	-	-	-	-	-
		3	-	46.0	54.0	-	.9	-	-	-	-	14,530	-	-	-	-	-	-	-
15-16	C-52255	1	2.3	41.4	39.8	16.5	.2	5.3	64.3	1.2	12.5	11,560	2,380	2,510	2,650	1.421	58	6	52
(599 ft. 7 in. to 614 ft.)		2	-	42.4	40.7	16.9	.3	5.1	65.8	1.2	10.7	11,830	-	-	-	-	-	-	-
		3	-	51.0	49.0	-	.3	6.2	79.2	1.5	12.8	14,240	-	-	-	-	-	-	-
									DAVID BED										
13-16	C-48768	1	4.0	39.6	47.1	9.3	.3	-	-	-	-	12,570	2,740	2,790	2,910+	-	26-1/2	14	12-1/2
(354 ft. 4 in. to 358 ft. 3 in.)		2	-	41.3	49.0	9.7	.3	-	-	-	-	13,090	-	-	-	-	-	-	-
		3	-	45.7	54.3	-	.4	-	-	-	-	14,500	-	-	-	-	-	-	-
15-16	C-52993	1	2.0	36.3	39.7	22.0	-	-	-	-	-	-	-	-	-	-	9	-	9
(639 ft. 2 in. to 640 ft. 11 in.)		2	-	37.1	40.5	22.4	-	-	-	-	-	-	-	-	-	-	-	-	-
		3	-	47.8	52.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
									EMERY BED										
13-16	C-48740	1	4.5	38.9	45.2	11.4	0.3	5.6	67.6	1.7	13.4	12,200	2,910+	-	-	1.364	31-1/2	1-1/4	30-1/4
(405 ft. 3 in. to 409 ft.)		2	-	40.7	47.3	12.0	.3	5.4	70.8	1.8	9.7	12,760	-	-	-	-	-	-	-
		3	-	46.2	53.8	-	.4	6.1	80.4	2.0	11.1	14,500	-	-	-	-	-	-	-
15-16	C-52396	1	2.1	33.1	32.9	31.9	.3	4.4	52.6	1.3	9.5	9,460	2,800	2,850	2,910	1.558	14	1	13
(696 ft. 9 in. to 698 ft. 5 in.)		2	-	33.8	33.7	32.5	.3	4.2	53.7	1.3	8.0	9,660	-	-	-	-	-	-	-
		3	-	50.0	50.0	-	.5	6.2	79.6	1.9	11.8	14,310	-	-	-	-	-	-	-
									MARTIN BED										
13-16	C-48769	1	4.1	37.2	42.0	16.7	.4	-	-	-	-	11,630	2,890	2,910+	-	-	22	8-1/2	13-1/2
(725 ft. 6 in. to 729 ft.)		2	-	38.7	43.9	17.4	.4	-	-	-	-	12,120	-	-	-	-	-	-	-
		3	-	46.9	53.1	-	.5	-	-	-	-	14,670	-	-	-	-	-	-	-

1/ 1 = Sample as-received; 2 = dried at 105° C.; and 3 = moisture- and ash-free.

TABLE 4. - Analyses of coal cores, East Eska Creek area, Matanuska Valley field, Eska, Alaska

Drill hole	Lab. No.	Condition[1]	Proximate, percent: Moisture	Volatile matter	Fixed carbon	Ash	Sulfur	Ultimate, percent: Hydrogen	Carbon	Nitrogen	Oxygen	Calorific value B.t.u.	Fusibility of ash: Initial deformation temperature, °F.	Softening temperature, °F.	Fluid temperature, °F.	Real specific gravity	Core received, inches	Core rejected, inches	Core analyzed, inches
MAITLAND COAL BED																			
1-15-EA (61 ft. 9 in. to 74 ft. 5 in.)	C-77879	1	3.7	40.2	45.5	10.6	0.4	5.6	70.0	1.7	11.7	12,480	2,680	2,750	2,780	1.37	57	33	24
		2	-	41.7	47.3	11.0	.4	5.4	72.7	1.8	8.7	12,960	-	-	-	-	-	-	-
		3	-	46.9	53.1	-	.5	6.1	81.7	2.0	9.7	14,560	-	-	-	-	-	-	-
7-10-EA (60 ft. 6 in. to 63 ft. 6 in.)	C-98414	1	2.9	36.8	39.7	20.6	.4	5.2	60.1	1.6	12.1	10,930	2,910+	-	-	1.45	17	-	17
		2	3.8	36.4	39.4	20.4	.4	5.2	59.6	1.6	12.8	10,830	-	-	-	-	-	-	-
		3	-	37.9	40.8	21.3	.4	5.0	61.9	1.6	9.8	11,260	-	-	-	-	-	-	-
7-10-EA (66 ft. 6 in. to 69 ft. 6 in.)	C-98415	1	3.1	37.0	42.1	17.8	.4	5.3	63.4	1.7	11.4	11,440	2,910+	-	-	1.42	24	5-1/2	18-1/2
		2	3.9	36.7	41.7	17.7	.4	5.3	62.9	1.7	12.0	11,340	-	-	-	-	-	-	-
		3	-	38.1	43.5	18.4	.5	5.1	65.4	1.7	8.9	11,800	-	-	-	-	-	-	-
7-10-EA (70 ft. 6 in. to 74 ft. 9 in.)	C-98416	1	3.2	39.5	48.5	8.8	.5	5.7	71.8	1.6	11.6	12,790	2,230	2,360	2,590	1.35	31	18	13
		2	3.9	39.2	48.2	8.7	.5	5.7	71.3	1.6	12.2	12,690	-	-	-	-	-	-	-
		3	-	40.8	50.1	9.1	.5	5.5	74.2	1.7	9.0	13,210	-	-	-	-	-	-	-
DAVID COAL BED																			
7-10-EA (102 ft. to 105 ft.)	C-98417	1	3.2	33.5	37.4	25.9	0.8	4.7	55.5	1.5	11.6	10,030	2,540	2,610	2,730	1.51	18	-	18
		2	3.9	33.3	37.1	25.7	.7	4.7	55.1	1.5	12.3	9,960	-	-	-	-	-	-	-
		3	-	34.6	38.6	26.8	.8	4.5	57.4	1.5	9.0	10,360	-	-	-	-	-	-	-
EMERY COAL BED																			
1-15-EA (153 ft. 6 in. to 157 ft.)	C-77880	1	3.7	39.1	44.1	13.1	0.3	5.5	67.7	1.6	11.8	12,170	2,760	2,910+	-	1.379	21	-	21
		2	-	40.6	45.8	13.6	.3	5.3	70.4	1.7	8.7	12,640	-	-	-	-	-	-	-
		3	-	47.0	53.0	-	.4	6.2	81.5	1.9	10.0	14,640	-	-	-	-	-	-	-
4-15-EA (22 ft. 3 in. to 24 ft. 10 in.)	C-83519	1	3.4	39.7	40.9	16.0	.4	5.2	63.8	1.3	13.3	11,390	2,080	2,210	2,520	1.44	20	1-1/2	18-1/2
		2	-	41.1	42.4	16.5	.4	5.0	66.0	1.3	10.8	11,790	-	-	-	-	-	-	-
		3	-	49.3	50.7	-	.5	5.9	79.1	1.6	12.9	14,120	-	-	-	-	-	-	-
4-15-EA (29 ft. 8 in. to 32 ft.)	C-83520	1	3.5	39.4	44.5	12.6	.8	5.5	66.9	1.6	12.6	12,180	2,210	2,430	2,540	1.39	18	-	18
		2	-	40.8	46.1	13.1	.9	5.3	69.3	1.6	9.8	12,620	-	-	-	-	-	-	-
		3	-	47.0	53.0	-	1.0	6.0	79.7	1.9	11.4	14,520	-	-	-	-	-	-	-
7-10-EA (219 ft. 10 in. to 226 ft. 4 in.)	C-98583	1	2.4	37.7	40.3	19.6	.3	4.9	62.4	1.6	11.2	11,030	2,180	2,280	2,420	1.46	43	6-1/2	36-1/2
		2	3.5	37.3	39.8	19.4	.3	5.0	61.7	1.6	12.0	10,910	-	-	-	-	-	-	-
		3	-	38.6	41.3	20.1	.3	4.8	63.9	1.6	9.3	11,310	-	-	-	-	-	-	-
9 COAL BED																			
1-15-EA (299 ft. to 300 ft. 4 in.)	C-77881	1	3.1	38.0	44.3	14.6	0.5	5.4	66.9	1.5	11.1	12,020	2,910+	-	-	1.38	14	-	14
		2	-	39.2	45.7	15.1	.5	5.2	69.1	1.6	8.5	12,410	-	-	-	-	-	-	-
		3	-	46.2	53.8	-	.6	6.1	81.3	1.8	10.2	14,610	-	-	-	-	-	-	-
1-15-EA (304 ft. 2 in. to 305 ft. 6 in.)	C-77882	1	3.5	39.8	46.5	10.2	.5	5.5	70.2	1.5	12.1	12,510	2,280	2,340	2,500	1.36	14	-	14
		2	-	41.2	48.2	10.6	.5	5.3	72.8	1.6	9.2	12,970	-	-	-	-	-	-	-
		3	-	46.1	53.9	-	.6	5.9	81.4	1.8	10.3	14,500	-	-	-	-	-	-	-
3-15-EA (256 ft. to 258 ft. 6 in.)	C-80437	1	4.5	36.5	48.7	10.3	.4	5.5	69.2	1.6	13.0	12,350	2,680	2,760	2,840	1.38	24	2	22
		2	-	38.2	51.0	10.8	.5	5.2	72.5	1.6	9.4	12,940	-	-	-	-	-	-	-
		3	-	42.8	57.2	-	.5	5.8	81.2	1.8	10.7	14,500	-	-	-	-	-	-	-
7-10-EA (303 ft. 6 in. to 306 ft. 6 in.)	C-98418	1	3.3	38.0	50.5	8.2	.4	5.5	72.3	1.8	11.8	12,870	2,910+	-	-	1.34	26	-	26
		2	4.2	37.7	50.0	8.1	.4	5.6	71.7	1.8	12.4	12,760	-	-	-	-	-	-	-
		3	-	39.3	52.3	8.4	.4	5.3	74.8	1.9	9.2	13,310	-	-	-	-	-	-	-

See footnote at end of table.

TABLE 4. - Analyses of coal cores, East Eska Creek area, Matanuska Valley Field, Eska, Alaska (Contd.)

Drill hole	Lab. No.	Condition[1]	Proximate, percent: Moisture	Volatile matter	Fixed carbon	Ultimate, percent: Ash	Sulfur	Hydrogen	Carbon	Nitrogen	Oxygen	Calorific value B.t.u.	Fusibility of ash: Initial deformation temperature, °F.	Softening temperature, °F.	Fluid temperature, °F.	Real specific gravity	Core received, inches	Core rejected, inches	Core analyzed, inches
ESKA COAL BED																			
1-15-EA (492 ft. 4 in. to 495 ft. 6 in.)	C-78003	1	2.9	40.3	48.2	8.6	0.5	5.7	71.3	1.6	12.3	12,970	2,380	2,450	2,650	1.344	30	2	28
		2	-	41.5	49.6	8.9	.5	5.5	73.5	1.7	9.9	13,360	-	-	-	-	-	-	-
		3	-	45.5	54.5	-	.5	6.1	80.7	1.8	10.9	14,660	-	-	-	-	-	-	-
2-15-EA (275 ft. 3 in. to 279 ft. 6 in.)	C-78692	1	3.0	38.9	41.8	16.3	.5	5.4	65.7	1.3	10.8	11,840	2,780	2,840	2,890	1.40	36	19	17
		2	-	40.1	43.1	16.8	.5	5.2	67.7	1.4	8.4	12,200	-	-	-	-	-	-	-
		3	-	48.1	51.9	-	.6	6.3	81.3	1.6	10.2	14,660	-	-	-	-	-	-	-
2-15-EA (276 ft. to 276 ft. 9 in.)	C-86312	1	2.0	34.2	36.2	27.6	.4	4.6	56.0	1.3	10.1	10,110	2,910+	-	-	1.51	8	-	8
		2	-	34.9	36.9	28.2	.4	4.4	57.1	1.4	8.5	10,320	-	-	-	-	-	-	-
		3	-	48.6	51.4	-	.6	6.2	79.5	1.9	11.8	14,360	-	-	-	-	-	-	-
2-15-EA (277 ft. 6 in. to 278 ft. 6 in.)	C-86313	1	2.0	32.5	33.7	31.8	.4	4.3	52.4	1.3	9.8	9,440	2,800	2,870	2,910+	1.55	11	-	11
		2	-	33.2	34.4	32.4	.4	4.2	53.5	1.4	8.1	9,620	-	-	-	-	-	-	-
		3	-	49.1	50.9	-	.5	6.2	79.0	2.0	12.3	14,240	-	-	-	-	-	-	-
3-15-EA (518 ft. 1 in. to 521 ft. 7 in.)	C-80438	1	3.4	39.1	42.8	14.7	.4	5.4	66.6	1.5	11.4	11,980	2,680	2,750	2,870	1.39	42	6	36
		2	-	40.5	44.3	15.2	.4	5.2	68.9	1.6	8.7	12,400	-	-	-	-	-	-	-
		3	-	47.7	52.3	-	.5	6.1	81.2	1.8	10.4	14,620	-	-	-	-	-	-	-
4-15-EA (413 ft. 6 in. to 419 ft. 2 in.)	C-83564	1	2.5	42.1	44.3	11.1	.5	5.7	69.7	1.7	11.3	12,700	2,620	2,680	2,840	1.34	40	14	26
		2	-	43.2	45.4	11.4	.5	5.6	71.5	1.8	9.2	13,030	-	-	-	-	-	-	-
		3	-	48.7	51.3	-	.6	6.3	80.6	2.0	10.5	14,710	-	-	-	-	-	-	-
8-10-EA (187 ft. 1 in. to 190 ft. 4 in.)	D-479	1	2.5	38.2	45.2	14.1	.4	5.4	67.4	1.7	11.0	12,150	2,520	2,620	2,780	1.38	34	6	28
		2	3.2	37.9	44.9	14.0	.4	5.5	66.9	1.7	11.5	12,050	-	-	-	-	-	-	-
		3	-	39.2	46.3	14.5	.4	5.3	69.1	1.7	9.0	12,460	-	-	-	-	-	-	-
UPPER SHAW COAL BED																			
1-15-EA (532 ft. 2 in. to 535 ft. 9 in.)	C-78029	1	2.8	40.8	44.9	11.5	0.5	5.6	69.7	1.7	11.0	12,630	2,800	2,890	2,910+	1.350	37	3	34
		2	-	42.0	46.1	11.9	.5	5.4	71.7	1.7	8.8	13,000	-	-	-	-	-	-	-
		3	-	47.6	52.4	-	.6	6.2	81.4	1.9	9.9	14,750	-	-	-	-	-	-	-
2-15-EA (306 ft. 8 in. to 312 ft.)	C-78693	1	3.2	36.8	40.7	19.3	.5	5.1	62.4	1.5	11.2	11,300	2,910	2,910+	-	1.43	40	20	20
		2	-	38.0	42.1	19.9	.5	4.9	64.4	1.6	8.7	11,670	-	-	-	-	-	-	-
		3	-	47.5	52.5	-	.7	6.2	80.5	1.9	10.7	14,570	-	-	-	-	-	-	-
3-15-EA (559 ft. to 561 ft. 9 in.)	C-85530	1	2.1	32.4	34.0	31.5	.5	4.4	52.7	1.2	9.7	9,510	2,910+	-	-	1.54	28	-	28
		2	-	33.1	34.7	32.2	.5	4.3	53.8	1.3	7.9	9,710	-	-	-	-	-	-	-
		3	-	48.9	51.1	-	.7	6.3	79.4	1.9	11.7	14,330	-	-	-	-	-	-	-
3-15-EA (563 ft. 6 in. to 565 ft.)	C-80491	1	4.7	35.4	40.1	19.8	.5	5.3	61.0	1.4	12.0	11,020	2,910+	-	-	1.44	12	3	9
		2	-	37.1	42.1	20.8	.5	5.0	64.0	1.5	8.2	11,560	-	-	-	-	-	-	-
		3	-	46.8	53.2	-	.7	6.4	80.8	1.8	10.3	14,590	-	-	-	-	-	-	-
LOWER SHAW COAL BED																			
1-15-EA (539 ft. 9 in. to 543 ft. 6 in.)	C-78030	1	2.9	39.8	40.8	16.5	0.5	5.3	65.3	1.5	10.9	11,760	2,620	2,730	2,840	1.406	35	7	28
		2	-	41.0	42.0	17.0	.5	5.1	67.2	1.6	8.6	12,110	-	-	-	-	-	-	-
		3	-	49.4	50.6	-	.6	6.2	81.0	1.9	10.3	14,590	-	-	-	-	-	-	-
2-15-EA (314 ft. to 315 ft. 9 in.)	C-78694	1	3.0	38.9	36.9	21.2	.5	4.9	60.7	1.3	11.4	10,830	2,080	2,150	2,470	1.47	17	3	14
		2	-	40.1	38.1	21.8	.5	4.7	62.6	1.3	9.1	11,170	-	-	-	-	-	-	-
		3	-	51.3	48.7	-	.6	6.0	80.1	1.7	11.6	14,290	-	-	-	-	-	-	-
2-15-EA (315 ft. 9 in. to 319 ft. 4 in.)	C-78695	1	3.0	39.3	43.0	14.7	.5	5.5	66.8	1.7	10.8	12,070	2,830	2,910+	-	1.38	36	11	25
		2	-	40.5	44.4	15.1	.5	5.3	68.9	1.8	8.4	12,450	-	-	-	-	-	-	-
		3	-	47.7	52.3	-	.6	6.2	81.2	2.1	9.9	14,660	-	-	-	-	-	-	-

See footnote at end of table.

TABLE 4 - Analyses of coal cores, East Eska Creek area, Matanuska Valley field, Eska, Alaska (Contd.)

Drill hole	Lab. No.	Condition[1]	Proximate, percent: Moisture	Volatile matter	Fixed carbon	Ash	Ultimate, percent: Sulfur	Hydrogen	Carbon	Nitrogen	Oxygen	Calorific value B.t.u.	Fusibility of ash: Initial deformation temperature, °F.	Softening temperature, °F.	Fluid temperature, °F.	Real specific gravity	Core received, inches	Core rejected inches	Core analyzed, inches
							LOWER SHAW COAL BED - Continued												
3-15-EA (568 ft. 8 in. to 572 ft.)	C-80492	1	3.8	39.9	39.2	17.1	0.6	5.4	63.6	1.5	11.8	11,410	2,090	2,230	2,520	1.42	27	3-1/2	23-1/2
		2	-	41.5	40.7	17.8	.7	5.1	66.1	1.5	8.8	11,860	-	-	-	-	-	-	-
		3	-	50.4	49.6	-	.8	6.3	80.5	1.9	10.5	14,430	-	-	-	-	-	-	-
							SHAW COAL BED (Upper and Lower)												
8-10-EA (231 ft. 10 in. to 242 ft.)	D-480	1	2.5	39.0	46.6	11.9	0.6	5.4	69.6	1.7	10.8	12,440	2,750	2,800	2,890	1.37	82	22	60
		2	3.4	38.6	46.2	11.8	.6	5.5	68.9	1.6	11.6	12,320	-	-	-	-	-	-	-
		3	-	40.0	47.8	12.2	.6	5.3	71.4	1.7	8.8	12,760	-	-	-	-	-	-	-
							MARTIN COAL BED												
1-15-EA (561 ft. 2 in. to 564 ft. 4 in.)	C-78095	1	2.8	40.1	42.0	15.1	0.5	5.2	66.6	1.5	11.1	11,960	2,100	2,230	2,470	1.397	32	6-1/2	25-1/2
		2	-	41.2	43.3	15.5	.5	5.1	68.5	1.5	8.9	12,300	-	-	-	-	-	-	-
		3	-	48.8	51.2	-	.6	6.0	81.1	1.8	10.5	14,550	-	-	-	-	-	-	-
1-15-EA (565 ft. 8 in. to 568 ft. 1 in.)	C-78096	1	2.8	40.2	43.6	13.4	.5	5.5	68.5	1.5	10.6	12,330	2,840	2,890	2,910+	1.369	29	3	26
		2	-	41.3	44.9	13.8	.5	5.3	70.4	1.6	8.4	12,680	-	-	-	-	-	-	-
		3	-	48.0	52.0	-	.5	6.2	81.7	1.8	9.8	14,710	-	-	-	-	-	-	-
2-15-EA (347 ft. 10 in. to 349 ft. 7 in.)	C-78696	1	3.0	37.5	42.4	17.1	.4	5.4	64.9	1.5	10.7	11,760	2,890	2,910+	-	1.40	21	-	21
		2	-	38.7	43.7	17.6	.5	5.2	66.8	1.5	8.4	12,120	-	-	-	-	-	-	-
		3	-	46.9	53.1	-	.6	6.3	81.1	1.9	10.1	14,710	-	-	-	-	-	-	-
3-15-EA (592 ft. 1 in. to 594 ft. 8 in.)	C-85531	1	1.8	35.6	38.6	24.0	.3	5.0	59.8	1.4	9.5	10,800	2,910+	-	-	1.46	30	-	30
		2	-	36.2	39.3	24.5	.4	4.9	60.9	1.4	7.9	10,990	-	-	-	-	-	-	-
		3	-	48.0	52.0	-	.5	6.4	80.6	1.8	10.7	14,550	-	-	-	-	-	-	-
3-15-EA (595 ft. 8 in. to 597 ft. 10 in.)	C-80493	1	4.1	40.8	46.6	8.5	.4	5.9	70.3	1.7	13.2	12,910	2,910+	-	-	1.33	14	-	14
		2	-	42.5	48.6	8.9	.4	5.6	73.3	1.7	10.1	13,460	-	-	-	-	-	-	-
		3	-	46.7	53.3	-	.5	6.2	80.5	1.9	10.9	14,780	-	-	-	-	-	-	-
5-15-EA (19 ft. 8 in. to 22 ft. 2 in.)	C-83565	1	3.2	39.4	43.1	14.3	.3	5.5	66.4	1.7	11.8	12,070	2,910	2,910+	-	1.37	27	3-1/2	23-1/2
		2	-	40.7	44.5	14.8	.4	5.3	68.6	1.8	9.1	12,470	-	-	-	-	-	-	-
		3	-	47.7	52.3	-	.4	6.3	80.4	2.1	10.8	14,620	-	-	-	-	-	-	-
5-15-EA (23 ft. 10 in. to 26 ft. 8 in.)	C-83566	1	3.6	38.1	48.9	9.4	.4	5.6	70.5	1.7	12.4	12,690	2,680	2,820	2,880	1.35	24	-	24
		2	-	39.5	50.7	9.8	.4	5.3	73.2	1.8	9.5	13,170	-	-	-	-	-	-	-
		3	-	43.8	56.2	-	.4	5.9	81.1	2.0	10.6	14,600	-	-	-	-	-	-	-
7-10-EA (606 ft. to 613 ft. 6 in.)	C-98584	1	2.0	36.1	38.1	23.8	.4	5.0	60.3	1.4	9.1	10,850	2,890	2,910+	-	1.46	54	21-1/2	32-1/2
		2	3.0	35.7	37.7	23.6	.4	5.1	59.6	1.3	10.0	10,740	-	-	-	-	-	-	-
		3	-	36.8	38.9	24.3	.4	4.9	61.5	1.4	7.5	11,070	-	-	-	-	-	-	-
							A COAL BED												
6-10-EA (58 ft. 3 in. to 65 ft. 2 in.)	C-97348	1	2.6	38.8	43.7	14.9	0.6	5.5	66.6	1.7	10.7	12,060	2,470	2,590	2,750	1.38	56	18	38
		2	3.2	38.5	43.5	14.8	.6	5.5	66.2	1.7	11.2	11,980	-	-	-	-	-	-	-
		3	-	39.8	45.0	15.2	.6	5.3	68.3	1.8	8.8	12,370	-	-	-	-	-	-	-
8-10-EA (318 ft. 3 in. to 319 ft. 5 in.)	D-553	1	2.6	38.4	45.3	13.7	.7	5.3	67.9	1.7	10.7	12,260	2,210	2,340	2,490	1.38	11	-	11
		2	3.1	38.2	45.1	13.6	.7	5.4	67.5	1.7	11.1	12,190	-	-	-	-	-	-	-
		3	-	39.4	46.6	14.0	.7	5.2	69.7	1.7	8.7	12,580	-	-	-	-	-	-	-
							B COAL BED												
5-15-EA (130 ft. 7 in. to 136 ft. 2 in.)	C-83567	1	2.9	39.1	43.8	14.2	0.4	5.4	66.7	1.8	11.5	12,090	2,520	2,620	2,820	1.39	62	7-1/2	54-1/2
		2	-	40.3	45.1	14.6	.4	5.2	68.7	1.8	9.3	12,450	-	-	-	-	-	-	-
		3	-	47.2	52.8	-	.4	6.1	80.5	2.1	10.9	14,580	-	-	-	-	-	-	-
6-10-EA (98 ft. 3 in. to 101 ft. 3 in.)	C-97349	1	2.7	40.9	50.5	5.9	.8	5.8	74.5	1.9	11.1	13,440	2,220	2,330	2,540	1.31	18	-	18
		2	3.4	40.6	50.1	5.9	.8	5.8	73.9	1.9	11.7	13,340	-	-	-	-	-	-	-
		3	-	42.1	51.8	6.1	.8	5.6	76.6	2.0	8.9	13,810	-	-	-	-	-	-	-

See footnote at end of table.

TABLE 4. - Analyses of coal cores, East Eska Creek area, Matanuska Valley field, Eska, Alaska (Contd.)

Drill hole	Lab. No.	Condition 1/	Proximate, percent			Ultimate, percent						Calorific value B.t.u.	Fusibility of ash			Real specific gravity	Core received, inches	Core rejected, inches	Core analyzed, inches
			Moisture	Volatile matter	Fixed carbon	Ash	Sulfur	Hydrogen	Carbon	Nitrogen	Oxygen		Initial deformation temperature, °F.	Softening temperature, °F.	Fluid temperature, °F.				
B COAL BED - Continued																			
8-10-EA (322 ft. to 324 ft.)	D-554	1	2.5	41.8	45.3	10.4	0.6	5.8	70.8	1.8	10.6	12,840	2,310	2,420	2,590	1.34	14	-	14
		2	3.1	41.5	45.1	10.3	.6	5.8	70.4	1.8	11.1	12,760	-	-	-	-	-	-	-
		3	-	42.8	46.6	10.6	.6	5.6	72.6	1.8	8.8	13,160	-	-	-	-	-	-	-
9-10-EA (121 ft. 6 in. to 128 ft. 10 in.)	D-8011	1	2.6	36.9	47.0	13.5	.4	5.4	67.5	1.7	11.5	12,210	2,870	2,910+	-	1.38	68-1/2	13-1/2	55
		2	3.7	36.5	46.5	13.3	.3	5.4	66.8	1.7	12.5	12,080	-	-	-	-	-	-	-
		3	-	37.9	48.3	13.8	.4	5.2	69.3	1.7	9.6	12,540	-	-	-	-	-	-	-
C COAL BED																			
6-10-EA (230 ft. 8 in. to 232 ft. 4 in.)	C-97350	1	2.7	39.2	54.0	4.1	0.6	5.6	76.8	2.0	10.9	13,680	2,000	2,050	2,260	1.33	8	-	8
		2	3.6	28.8	53.5	4.1	.6	5.7	76.1	2.0	11.5	13,560	-	-	-	-	-	-	-
		3	-	40.3	55.5	4.2	.6	5.4	78.9	2.1	8.8	14,050	-	-	-	-	-	-	-
D COAL BED																			
6-10-EA (327 ft. 10 in. to 330 ft. 10 in.)	C-97351	1	2.6	41.2	49.7	6.5	0.5	5.6	74.9	1.8	10.7	13,340	2,130	2,210	2,360	1.33	36	4	32
		2	3.4	40.9	49.2	6.5	.5	5.7	74.3	1.8	11.2	13,230	-	-	-	-	-	-	-
		3	-	42.3	51.0	6.7	.5	5.5	76.9	1.8	8.6	13,690	-	-	-	-	-	-	-
8-10-EA (583 ft. 10 in. to 586 ft. 1 in.)	D-555	1	2.8	35.5	39.8	21.9	.5	5.0	60.9	1.7	10.0	11,010	2,730	2,840	2,910+	1.45	15	2	13
		2	3.4	35.2	39.6	21.8	.5	5.0	60.6	1.7	10.4	10,940	-	-	-	-	-	-	-
		3	-	36.5	41.0	22.5	.5	4.8	62.7	1.7	7.8	11,330	-	-	-	-	-	-	-
LITTLE ESKA GROUP COAL BEDS																			
5-15-EA (566 ft. 6 in. to 569 ft.)	C-83695	1	2.6	43.4	45.0	9.0	0.5	5.8	71.9	1.4	11.4	13,110	2,240	2,310	2,470	1.33	26	1/2	25-1/2
		2	-	44.5	46.2	9.3	.5	5.6	73.8	1.5	9.3	13,450	-	-	-	-	-	-	-
		3	-	49.0	51.0	-	.6	6.2	81.4	1.6	10.2	14,830	-	-	-	-	-	-	-
5-15-EA (570 ft. 6 in. to 572 ft. 6 in.)	C-83696	1	2.5	41.7	43.6	12.2	.4	5.7	69.0	1.4	11.3	12,590	2,340	2,430	2,880	1.35	12	-	12
		2	-	42.8	44.7	12.5	.4	5.5	70.8	1.4	9.4	12,910	-	-	-	-	-	-	-
		3	-	48.9	51.1	-	.4	6.3	80.8	1.6	10.9	14,750	-	-	-	-	-	-	-
5-15-EA (588 ft. 7 in. to 591 ft. 3 in.)	C-83697	1	2.5	43.0	43.6	10.9	.2	5.8	70.4	1.3	11.4	12,950	2,330	2,400	2,570	1.33	29	8	21
		2	-	44.1	44.7	11.2	.2	5.7	72.2	1.4	9.3	13,280	-	-	-	-	-	-	-
		3	-	49.7	50.3	-	.3	6.4	81.3	1.5	10.5	14,960	-	-	-	-	-	-	-
5-15-EA (600 ft. 8 in. to 603 ft.)	C-85433	1	1.8	36.2	37.4	24.6	.3	4.8	58.9	1.3	10.1	10,630	2,470	2,600	2,710	1.48	28	1	27
		2	-	36.9	38.1	25.0	.3	4.6	60.0	1.4	8.7	10,820	-	-	-	-	-	-	-
		3	-	49.1	50.9	-	.4	6.2	80.0	1.8	11.6	14,430	-	-	-	-	-	-	-
5-15-EA (604 ft. 2 in. to 605 ft. 9 in.)	C-83698	1	2.8	40.8	46.1	10.3	.3	5.5	71.0	1.4	11.5	12,820	2,010	2,100	2,330	1.36	19	-	19
		2	-	42.0	47.4	10.6	.3	5.4	73.0	1.4	9.3	13,180	-	-	-	-	-	-	-
		3	-	47.0	53.0	-	.4	6.0	81.7	1.6	10.3	14,750	-	-	-	-	-	-	-
6-10-EA (583 ft. 2 in. to 586 ft. 2 in.)	C-97352	1	2.0	41.7	44.7	11.6	.7	5.6	70.3	1.8	10.0	12,760	2,110	2,200	2,500	1.35	28	4	24
		2	2.7	41.3	44.5	11.5	.7	5.6	69.7	1.8	10.7	12,670	-	-	-	-	-	-	-
		3	-	42.5	45.7	11.8	.7	5.5	71.7	1.8	8.5	13,020	-	-	-	-	-	-	-
6-10-EA (588 ft. 5 in. to 589 ft. 10 in.)	C-97353	1	2.0	40.2	43.4	14.4	.4	5.6	67.8	1.7	10.1	12,330	2,230	2,340	2,730	1.37	12	-	12
		2	2.7	39.9	43.1	14.3	.4	5.7	67.2	1.7	10.7	12,230	-	-	-	-	-	-	-
		3	-	41.0	44.3	14.7	.4	5.5	69.1	1.7	8.6	12,570	-	-	-	-	-	-	-
6-10-EA (603 ft. 6 in. to 607 ft.)	C-97354	1	1.8	36.9	38.7	22.6	.3	5.1	61.0	1.4	9.6	11,060	2,910+	-	-	1.44	21	-	21
		2	2.2	36.7	38.7	22.4	.3	5.1	60.7	1.4	10.1	11,000	-	-	-	-	-	-	-
		3	-	37.5	39.5	23.0	.3	4.9	62.1	1.5	8.2	11,250	-	-	-	-	-	-	-
6-10-EA (610 ft. 3 in. to 614 ft. 11 in.)	C-97355	1	2.1	33.6	36.2	28.1	.4	4.6	56.6	1.4	8.9	10,200	2,620	2,700	2,890	1.49	49	8	41
		2	2.7	33.4	36.0	27.9	.4	4.6	56.2	1.3	9.6	10,140	-	-	-	-	-	-	-
		3	-	34.3	37.0	28.7	.4	4.5	57.8	1.4	7.2	10,420	-	-	-	-	-	-	-
8-10-EA (659 ft. to 662 ft. 4 in.)	D-556	1	2.1	41.9	38.8	17.2	.2	5.1	64.9	1.6	11.0	11,610	1,970	2,090	2,340	1.43	33	8	25
		2	2.6	41.7	38.6	17.1	.2	5.2	64.6	1.6	11.3	11,550	-	-	-	-	-	-	-
		3	-	42.8	39.6	17.6	.2	5.0	66.3	1.6	9.3	11,850	-	-	-	-	-	-	-
9-10-EA (406 ft. 2 in. to 410 ft. 6 in.)	D-8012	1	1.9	37.8	43.3	17.0	0.4	5.3	65.2	1.6	10.5	11,870	2,810	2,910+	-	1.39	40	4-1/2	35-1/2
		2	2.9	37.5	42.8	16.8	.4	5.4	64.5	1.6	11.3	11,750	-	-	-	-	-	-	-
		3	-	38.6	44.1	17.3	.4	5.2	66.4	1.7	9.0	12,100	-	-	-	-	-	-	-
9-10-EA (439 ft. 6 in. to 442 ft. 6 in.)	D-8013	1	2.0	35.4	46.2	16.4	.5	5.1	65.8	1.6	10.6	11,840	2,810	2,860	2,910+	1.40	32	8	24
		2	3.2	35.0	45.6	16.2	.4	5.2	65.0	1.6	11.6	11,700	-	-	-	-	-	-	-
		3	-	36.1	47.1	16.8	.5	5.0	67.1	1.7	8.9	12,080	-	-	-	-	-	-	-
9-10-EA (447 ft. 10 in. to 449 ft. 8 in.)	D-8014	1	2.1	33.0	39.0	25.9	.5	4.6	57.2	1.5	10.3	10,350	2,780	2,840	2,910+	1.49	11	-	11
		2	2.9	32.7	38.7	25.7	.5	4.6	56.8	1.5	10.9	10,270	-	-	-	-	-	-	-
		3	-	33.7	39.8	26.5	.5	4.4	58.5	1.6	8.5	10,580	-	-	-	-	-	-	-

1/ Sample as received; 2, dried at 105° C.; 3 moisture- and ash-free.

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Int. - Bu. of Mines, Pgh., Pa.