

Juneau

UNITED STATES DEPARTMENT OF THE INTERIOR
Harold L. Ickes, Secretary

BUREAU OF MINES
R. R. Sayers, Director

NOTED
JAN 17 1945
H. I. SMITH

War Minerals Report 219

DIAMOND STRIP MINE
HEALY DISTRICT, ALASKA

RESTRICTED This document contains information affecting the national defense of the United States within the meaning of the Espionage Act, 50 U.S.C., 31 and 32, as amended. Its transmission to or the revelation of its contents in any manner to an unauthorized person is prohibited by law.

Coal



Please return to ↓

L. Johnson
COMMISSIONER OF MINES
JUNEAU, ALASKA

WASHINGTON: 1944

RESTRICTED

WAR MINERALS REPORT

UNITED STATES DEPARTMENT OF THE INTERIOR - BUREAU OF MINES

W.M.R. 219 -- Coal

August 1944

DIAMOND STRIP MINE

Healy District, Alaska

SUMMARY

At the request of the Coal Procurement Section of the Alaskan Department of the United States Army, the Bureau of Mines investigated the Diamond coal property near Healy, Alaska, from September 6 to October 10, 1943.

This investigation included sampling and estimating the available reserves at the present strip-mining operation and testing the adjacent coal area for its adaptability to a similar operation.

It is estimated that, following the removal of the overburden, 43,300 tons of subbituminous coal can be recovered by open-cut mining from an original body of about 63,600 tons of coal and interbedded waste material.

The C. F. Lytle Co. and Green Construction Co. (operating jointly) have contracted to strip and mine this coal for the Army.

Churn drilling and surface trenching of the adjacent area to the west indicated the coal bed there to be locally disturbed to such an extent that a continuous block of coal, amenable to strip mining, could not be proved.

The War Minerals Reports of the Bureau of Mines are issued by the United States Department of the Interior to give official expression to the conclusions reached on various investigations relating to domestic minerals. These reports are based upon the field work of the Bureau of Mines and upon data made available to the Department from other sources. The primary purpose of these reports is to provide essential information to the war agencies of the United States Government and to assist owners and operators of mining properties in the production of minerals vital to the prosecution of the war.

At this location, no attempt was made to prospect coal for underground mining. Other deposits in the vicinity offer better opportunities for an underground operation.

INTRODUCTION

During the winter of 1942-43, a severe coal shortage was experienced in the interior of Alaska as the result of an increased demand for coal caused by war activities and operational difficulties at the larger Alaska coal mines. To prevent a recurrence of this situation, funds were allocated by the Army to increase production. Exploratory work and, in some instances, the development of promising prospects was undertaken. The Bureau of Mines cooperated with the Coal Procurement Section by furnishing the required engineering personnel to supervise the exploration.

An engineer of the Bureau of Mines¹ and a geologist of the Geological Survey² made a preliminary examination of the proposed strip-mine area on June 28, 1943. A second and more detailed examination was made from July 8 to July 19³.

In the period from September 6 to October 10, the Bureau of Mines⁴ completed the sampling, estimated the available strip-mine reserves, and supervised a short exploratory drilling program.

Aside from the engineer's salary and subsistence, all of the project costs were borne by the Army. The project included (1) detailed sampling of the area being stripped, followed by contour mapping and tonnage estimation, and (2) exploratory drilling of an outcrop 1,500 feet west of the strip mine to test its adaptability to a similar operation.

Many courtesies and considerable assistance that materially aided the progress of the project were extended by the C. F. Lytle Co., Green

¹ Robert S. Sanford, district engineer.

² George O. Gates, associate geologist.

³ Robert L. Thorne, associate mining engineer; F. M. Byers, associate geologist.

⁴ Aner W. Erickson, engineer in charge field exploration.

Construction Co., Army Coal Procurement Section, and Maurice Sharp, coal analyst for the Alaska Railroad.

LOCATION AND ACCESSIBILITY

The Diamond strip mine is 4 miles west of Healy, a station on the Alaska Railroad 110 miles south of Fairbanks. It is situated in the Nenana coal field in the south half of sec. 35, T. 12 S., R. 8 W., Fairbanks meridian.

A good 2-lane gravel road approximately 5 miles in length was built by the contractor from the strip mine to the railroad. Most of this road traverses untimbered bench land, over which road building has been relatively inexpensive. The last mile of the road approaching the mine was constructed over muskeg, which necessitated filling.

The coal is being hauled in 1-1/2-ton trucks to a loading ramp constructed at a 1,600-foot railroad spur. This ramp is designed so that trucks dump directly into the railroad gondolas. The coal is shipped directly to Fairbanks for Army use.

PHYSICAL FEATURES AND CLIMATE

The Nenana coal field lies in a foothill belt bordered to the south by the high, rugged masses of the Alaska Range and to the north by the broad flats of the Tanana Valley. The coal-field area is characterized by nearly parallel ridges separated by lowlands, many of which are terraced.

The Diamond strip mine lies on the lowest flanks of the rolling foothills. Immediately to the north are broad, terraced benchlands covered in part by gravel and in part by muskeg.

Vegetation consists almost entirely of swampgrass, occasional clumps of bushes, and moss. Aside from a few scattered groups of small black spruce, there is no timber in the vicinity of the mine.

The climate is similar to that of the Tanana Valley in general, with short, hot summers and long, cold winters. The United States Weather Bureau maintains a station at Nenana, 50 miles north of Healy. The following statistics gathered at Nenana are considered applicable to Healy and are averages over a 5-year period:

Annual precipitation (including melted snow), inches. . .	11.96
Annual snowfall do . . .	44.1
Annual mean temperature, °F.	26.0

There was an average of 76 days a year during which more than 0.01 inch of moisture fell, 49 of them from June to October, inclusive.

Almost 50 percent of the snow falls during October and March. The intervening months are generally cold and clear, with occasional cloudiness and sudden light snowstorms.

The 5-year average showed 232 days in which the temperature was 32° or below and 114 days of 0° or below. The lowest temperature during the period was 57° below zero, and the highest was 94° above zero.

LABOR AND LIVING CONDITIONS

Healy is a small railroad settlement with a population of about 50 people and cannot be depended upon to furnish a supply of labor. In this area, it has been customary to hire men at either Fairbanks or Anchorage.

The following tabulation shows the wages paid as standardized for the Territory by the War Labor Board:

	<u>Per hour</u>
Air-hammer operator, open cut	\$1.315
Core driller	1.500
General laborer	1.015
Power-shovel operator	2.000
Dozer (5 cubic yards and under) driver	1.400
Wagon drill operator	1.615

Time-and-a-half must be paid for work in excess of 8 hours a day and in excess of 40 hours a week. Double wages must be paid for the seventh consecutive working day.

At present it is difficult to find labor, and the efficiency of that obtained is usually low, particularly in the unskilled brackets. The contractor at the property has brought almost an entire crew from Iowa.

Housing facilities had to be established by the contractor. All building materials were shipped to the mine, as there is no suitable lumber in the vicinity. Food, gasoline, Diesel oil, and other supplies usually are shipped from Fairbanks by rail. Occasionally, perishable supplies and repair parts are flown from Fairbanks or Anchorage and landed on a small airfield at the camp.

HISTORY AND OWNERSHIP

The Diamond strip mine is covered by Coal Prospecting Permit No. 04923. This permit, issued May 16, 1942, contains 600 acres and is held by James W. Norris and Constantine Pastrikakis (Gus Paris). During August 1943, these men filed an application at Fairbanks for an additional 1,960 acres lying adjacent to, and west of the present permit. Information concerning final governmental action on this application is not available.

On July 17, 1943, the C. F. Lytle Co. and Green Construction Co. (operating jointly) subleased this property from Paris and Norris and subsequently contracted with the Coal Procurement Section of the Alaskan Department of the Army to strip and mine the coal. Their operation, designed to mine and ship 600 tons a day, was started on October 14. During the first 14 days, less than half of the quota was met owing to a shortage of railroad cars, which has since been overcome.

COAL DEPOSITS

According to Martin⁵, the coal measures of the Nenana coal field are of Tertiary age, overlie Paleozoic schists and igneous rocks, and are covered by Quaternary gravels 1,500 to 2,000 feet thick.

⁵ G. C. Martin, *The Nenana Coal Field Alaska: Geol. Survey Bull.* 664, p.6.

The coal-bearing strata are at least 1,200 to 1,500 feet thick and are composed of poorly consolidated sands, clays, and gravels interbedded with varying grades of coal, generally lignitic. In places, owing to folding and warping, subbituminous coals are found. Most of the individual coal areas, however, are gently warped basins or synclines, with occasional local faulting and tight folding.

The Diamond property occupies the south flank of a large and gentle syncline, the major axis of which appears to run easterly and westerly. Immediately to the south of the deposit are steep, rugged hills composed of schist and intrusive rocks. Stratigraphically, the beds appear to be only a few hundred feet above the schist.

The coal being stripped strikes approximately S. 66° W. and dips about 37° northwesterly. This area is designated as area 1 on figure 1. Toward the west end of this area and adjacent to the small valley cutting across the outcrop, the coal is considerably disturbed. To the southwest across a valley, in the area designated as 2 on figure 1, where an attempt was made to pick up the continuation of the bed, there is much evidence of structural deformation.

Churn drilling in this area failed to provide a basis for correlation between these coal beds and those in the strip-mine area. Subsequent trenching, however, established a reasonable degree of assurance of their continuity across the small valley.

It is possible that surface slumping and sliding may have been responsible for the distortion noted during the exploration. Martin states: "Extensive slumping was noted on many hillsides. In some places, acres of the surface beds have slid bodily for long distances. Most of the slides observed have been caused by the removal of moss by forest fires. This removal allows the ground to thaw and permits the surface waters to soften the clays that form a large part of the coal-bearing strata."

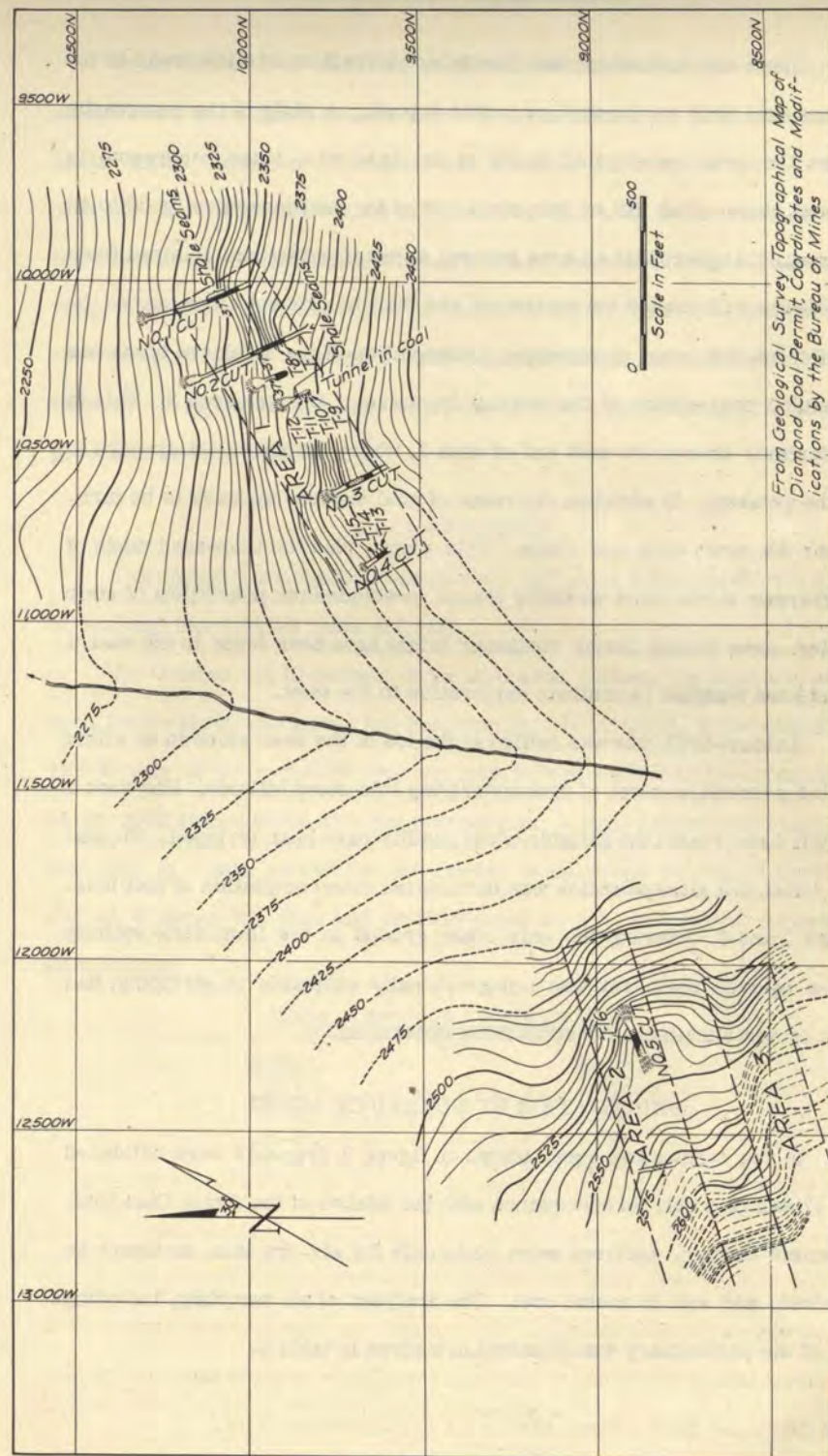


FIG. 1-TOPOGRAPHY AT DIAMOND COAL OPERATION SHOWING TRENCHING - JULY, 1943

There are indications that Martin's observations of slide areas in the Nenana coal field can be applied to this deposit. A study of the topography shows the area investigated to lie at the base of a steep northwesterly dipping slope. The dip of this slope and of the coal measures is 30 to 40 degrees. It appears that an area several acres in extent has slumped from a shale footwall toward the northwest, and that the present slope marks the position of this zone of slippage. Deformation of the displaced block has prevented correlation of the bedding from area 1 through area 2. This is particularly true at the east end of area 2, where displacement appears to be the greatest. In addition, the trace of coal exposed appears to be turning to the south of a low ridge. This ridge, plus the increased depth of overburden in the most westerly trench, precludes the possibility of strip mining, even though better continuity might have been found in the coal if it had been feasible to continue exploration to the west.

A churn-drill hole was drilled at the toe of the scar slope in an effort to find a minable seam of coal underlying this steep hillside. Had such a deposit been found, the hillside could readily have been stripped. No coal was found, and all exploration was terminated upon completion of that hole. Areas 2 and 3, covering the only other ground in the immediate vicinity of the haulage road that was topographically adaptable to stripping, had been proven unsuitable for strip-mine operations.

EXPLORATION BY BUREAU OF MINES

In the strip-mine area, shown on figure 2, trenches were bulldozed and 17 samples cut. In accordance with the wishes of the Army Coal Procurement Section, analyses were made only for air-dry loss, moisture as received, and ash in moist coal. The analyses of all sampling, including that of the preliminary examinations, are given in table 1.

In an attempt to trace the coal bed westward from the strip-mine area, 5 holes were churn-drilled and 3 trenches excavated on the west side of the valley. Location of the holes and trenches is shown on figure 3, and sections through the drill holes are shown on figure 4. Trench E-6, which is 10 feet deep, did not expose the full width of the coal bed because topography prevented extension of the cut to the south. Trench E-7 crosscut the coal completely and exposed a coal width of 15 feet, as compared with a width of 40 feet in trench E-5. Churn-drill hole 5 proved this 40-foot exposure to be only 3 feet thick.

COAL RESERVES

Preliminary estimates made before stripping indicated 63,600 tons of coal and interbedded shale and clay.

By October 10, 70 percent of the coal area between the west and east strip limits shown on figure 2 had been completely stripped. Approximately 12,100 tons of poor-quality coal and interbedded waste had been removed by the contractors along with the overburden. A final survey was made on that date to obtain measurements needed to calculate the coal reserves. Figure 2 shows the plan and profiles used as a basis for the following calculations:

Areas of sections (by planimeter)

<u>Section</u>	<u>Sq. ft.</u>
E-1	794
E-2	1,600
E-3	1,021
E-4	2,030

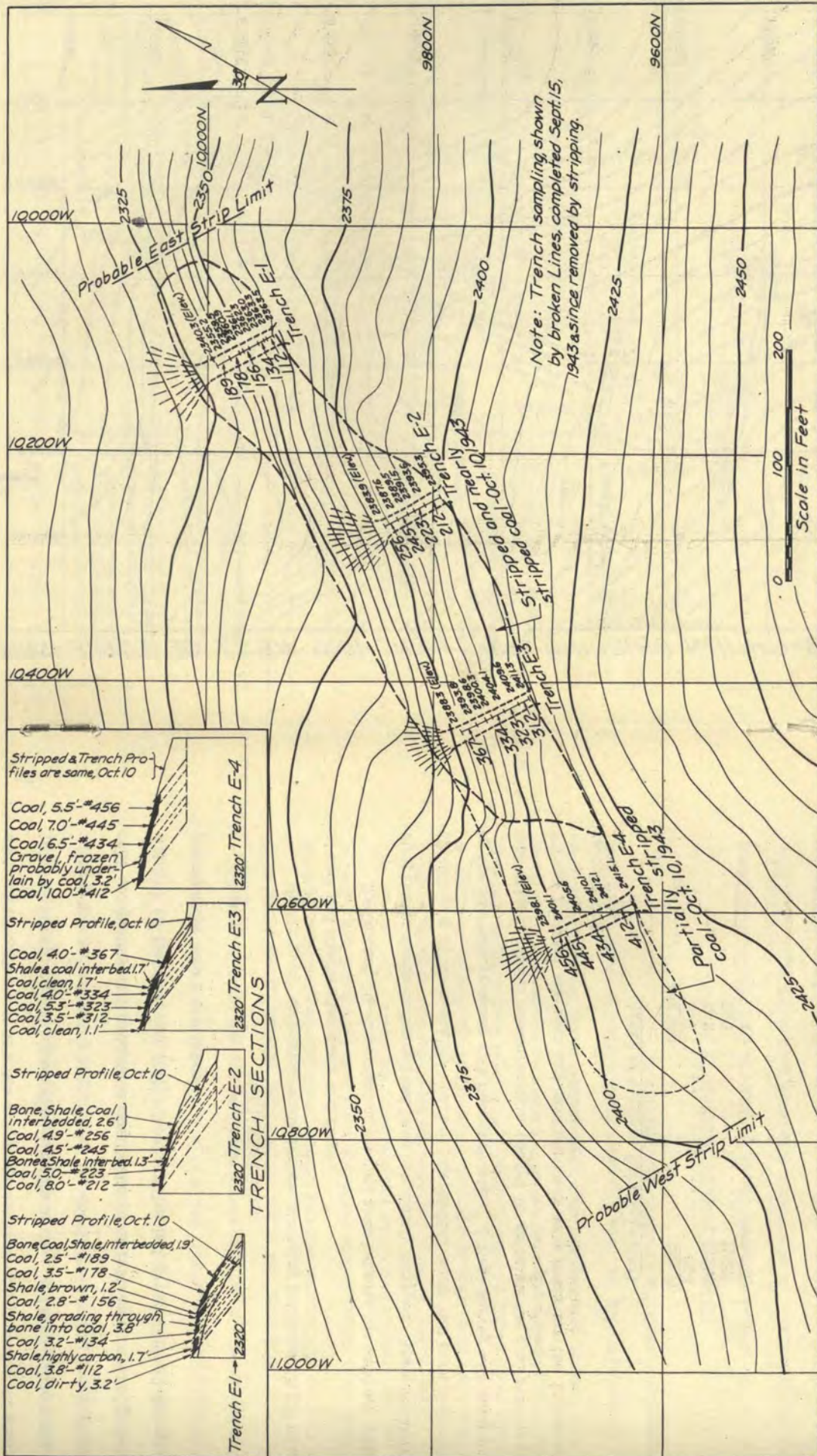


FIG. 2-CONTOUR MAP SHOWING STRIPPING AND FINAL SAMPLING AT DIAMOND COAL LEASE

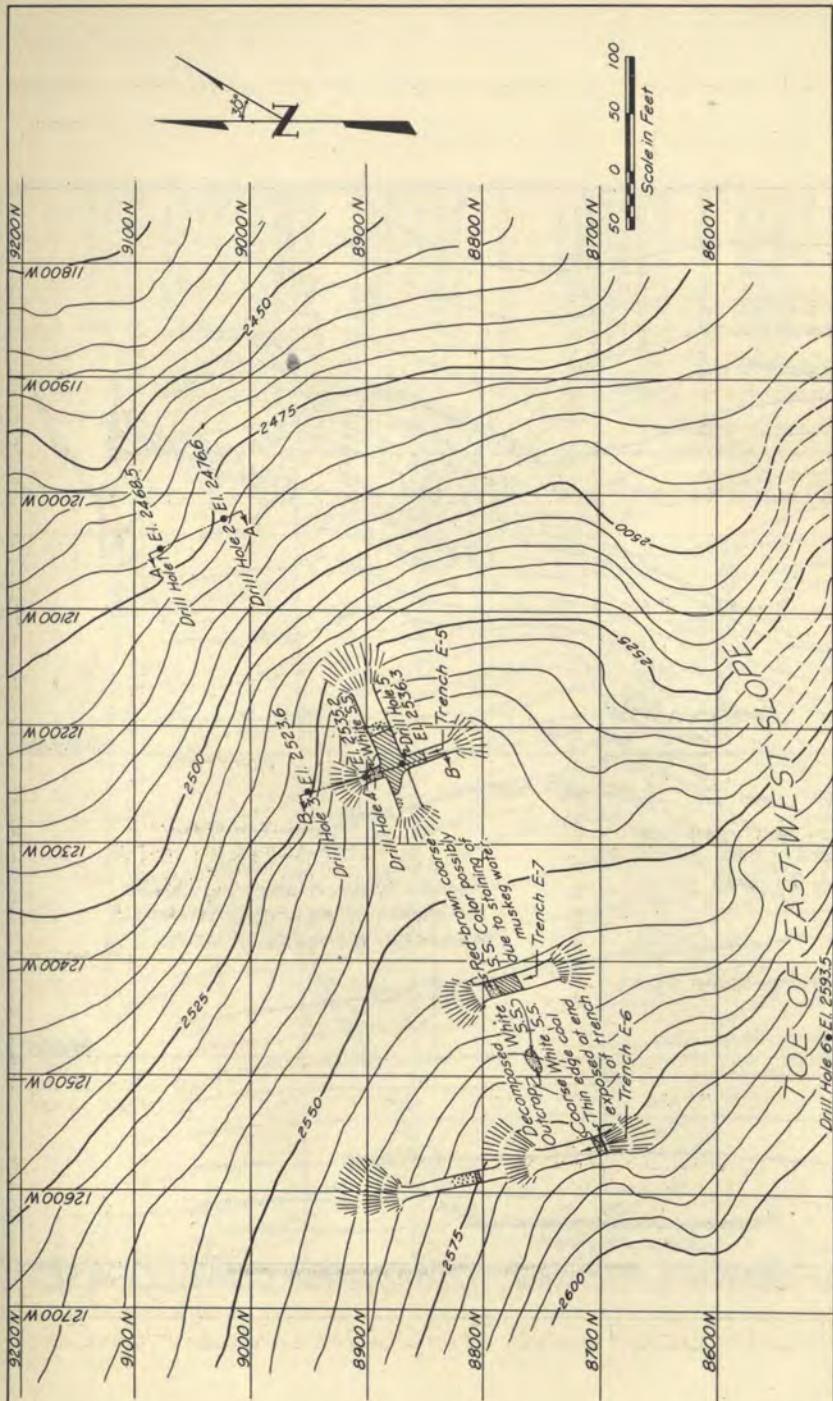


FIG. 3-CHURN DRILLING AND TRENCHING WEST OF STRIP-MINE

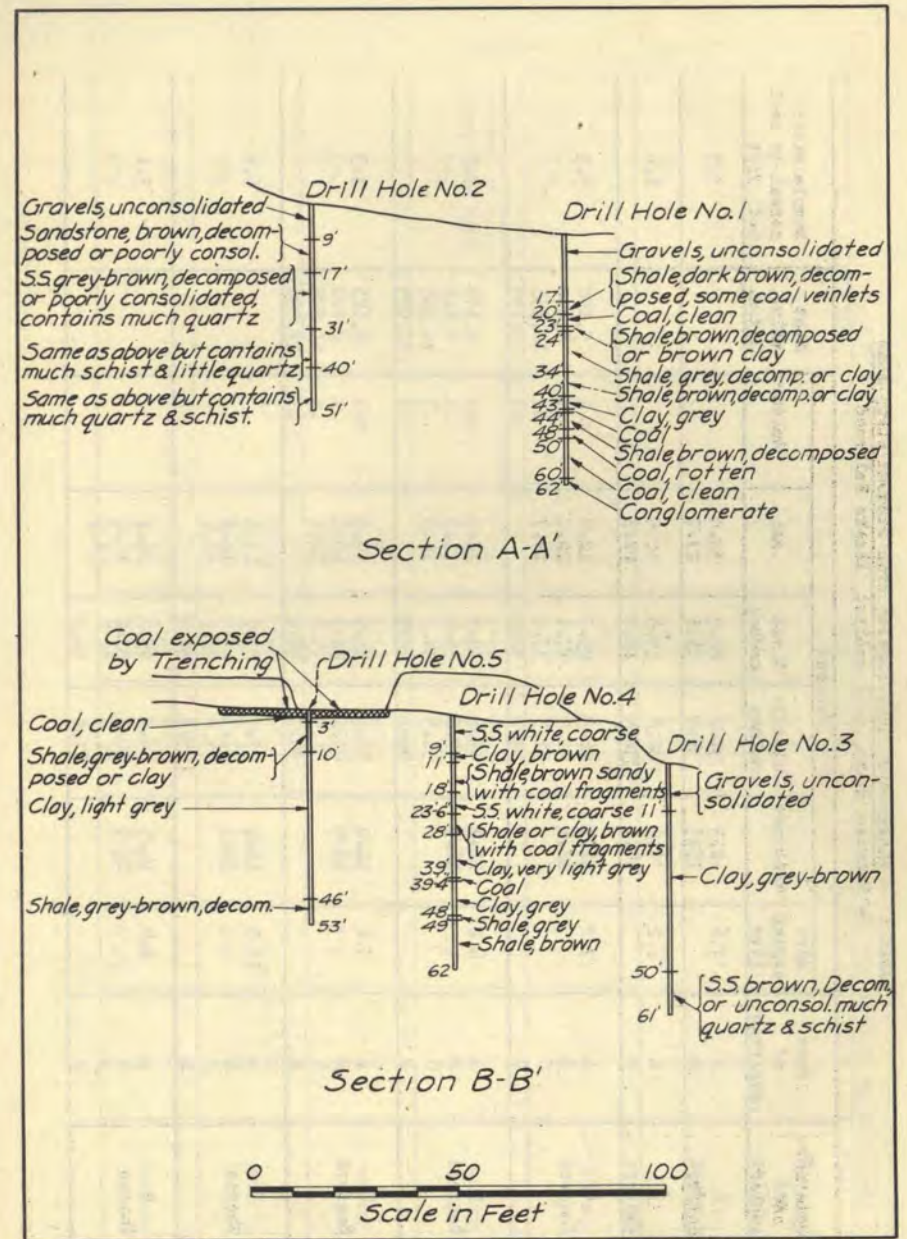


FIG. 4-SECTIONS THROUGH DRILL HOLES

TABLE 1. - Analysis of coal samples from Diamond strip mine
By Maurice Sharp, coal analyst, Alaska Railroad

Sample No. and sampler	Form of analysis*	Percent					Sulfur	Heat value, B.t.u.	Sample width normal to coal bed, feet
		Air-drying loss	Moisture	Volatile matter	Fixed carbon	Ash			
2 Sanford	A	7.6	8.3	38.8	22.9	30.0		5.9	
	B		15.3	35.9	21.1	27.7			
3 Sanford	A	6.2	9.0	40.9	19.6	30.5		1.4	
	B		14.6	38.4	18.4	28.6			
4 Sanford	A	7.2	11.7	46.2	29.2	12.9	0.1	9,140	5.3
	B		18.1	42.9	27.1	12.0	.1	8,480	
	C			52.3	33.0	14.7	.1	10,355	
	D			61.2	38.8		.1	12,135	
5 Sanford	A	6.2	11.4	45.6	30.3	12.7	0.1	9,185	3.8
	B		16.9	42.8	28.4	11.9	.1	8,615	
	C			51.5	34.2	14.3	.1	10,365	
	D			60.1	39.9		.1	12,095	
6 Sanford	A	5.6	12.0	45.6	31.5	10.9	0.1	9,325	3.3
	B		16.9	43.1	29.7	10.3	.1	8,800	
	C			51.9	35.7	12.4	.1	10,585	
	D			59.2	40.8		.1	12,090	
7 Thorne	A	15.0	18.1	43.9	23.0	15.0		6.6	
	B		30.3	37.3	19.6	12.8			
	C			53.5	28.1	18.4			
	D			65.5	34.5				
8 Thorne	A	9.4	14.5	44.2	25.2	16.1		3.1	
	B		22.5	40.1	22.8	14.6			
	C			51.7	29.4	18.9			
	D			63.8	36.2				

9 Thorne	A	10.4	13.2	45.3	31.7	9.8		4.8
	B		22.2	40.6	28.4	8.8		
	C			52.2	36.5	11.3		
	D			58.8	41.2			
10 Thorne	A	8.0	13.3	44.8	28.0	13.9		4.8
	B		20.2	41.2	25.8	12.8		
	C			51.6	32.3	16.1		
	D			61.5	38.5			
11 Thorne	A	9.2	11.6	44.1	24.3	20.0		4.8
	B		19.7	40.0	22.1	18.2		
	C			49.8	27.5	22.7		
	D			64.4	35.6			
12 Thorne	A	8.0	8.7	35.5	19.2	36.6		4.8 (Much unavoidable dirt in sample)
	B		16.0	32.7	17.7	33.6		
	C			38.9	21.1	40.0		
	D			64.9	35.1			
13 Thorne	A	13.8	20.3	42.3	26.8	10.6		6.6
	B		31.3	36.5	23.1	9.1		
	C			53.1	33.6	13.3		
	D			61.2	38.8			
14 Thorne	A	23.6	14.0	47.3	30.3	8.4		6.6
	B		34.3	36.1	23.1	6.5		
	C			54.9	35.2	9.9		
	D			61.0	39.0			
15 Thorne	A	15.4	20.6	45.4	20.8	13.2		6.6
	B		32.8	38.4	17.6	11.2		
	C			57.1	26.2	16.7		
	D			68.6	31.4			

* See footnote on page 16.

TABLE 1. - Analysis of coal samples from Diamond strip mine (Continued)
By Maurice Sharp, coal analyst, Alaska Railroad

Sample No. and sampler	Form of analysis*	Percent					Heat value, B.t.u.	Sample width normal to coal bed, feet
		Air-drying loss	Moisture	Volatile matter	Fixed carbon	Ash		
16	A	13.0	14.1	46.1	33.5	6.3		(1)
Thorne	B		25.3	40.1	29.1	5.5		
	C			53.7	39.0	7.3		
	D			58.0	42.0			
Erickson	B	17.4	27.1			7.8		3.8
112	B	15.8	25.7			12.0		3.2
134	B	17.4	31.5			12.8		2.8
156	B	17.4	32.6			11.7		3.5
178	B	20.0	37.8			9.8		2.5
189	B	13.0	28.1			12.6		8.0
212	B	9.4	25.5			9.4		5.0
223	B	15.4	27.9			12.0		4.5
245	B	18.0	26.2			13.1		4.9
256	B	7.2	22.9			10.4		3.5
312	B	11.2	24.1			10.2		5.3
323	B	18.0	26.4			12.1		4.0
334	B	7.0	24.1			20.4		10.0
367	B	8.0	23.9			6.9		6.5
412	B	10.4	22.1			14.1		7.0
434	B	10.0	24.0			12.9		5.5
445	B					14.1		
456	B							

- * A = Analysis on air-dried coal.
- * B = Analysis on coal as received.
- * C = Analysis on moisture-free coal.
- * D = Analysis on ash-free coal.

Estimated tonnage
(using a factor of 25 cubic feet of coal to a ton)

Block enclosed by and under:

East strip limit and trench E-1

$$110 \times \frac{(794+400 \text{ (est.)})}{25} = 2,626 \text{ (2,600) tons}$$

Trench E-1 and trench E-2

$$190 \times \frac{(794+1,600)}{25} = 9,097 \text{ (9,100) tons}$$

Trench E-2 and trench E-3

$$195 \times \frac{(1,600+1,021)}{25} = 10,218 \text{ (10,200) tons}$$

Trench E-3 and trench E-4

$$200 \times \frac{(1,021+2,030)}{25} = 12,200 \text{ tons}$$

Trench E-4 and west strip limit

$$215 \times \frac{(2,030+2,030 \text{ (est.)})}{25} = 17,458 \text{ (17,400) tons}$$

Measured Reserves

Block enclosed by and under:	Coal and waste, tons	Waste		Clean coal, tons
		Percent	Tons	
Trenches E-1 and E-2 ..	9,100	8	(728) 700	8,400
Trenches E-2 and E-3 ..	10,200	6	(612) 600	9,600
Trenches E-3 and E-4 ..	12,200	3	(366) 400	11,800
	31,500		1,700	29,800

Indicated Reserves

Block enclosed by and under:	Coal and waste, tons	Waste		Clean coal, tons
		Estimate, percent	Tons	
East strip limit and trench E-1	2,600	11	(286) 300	2,300
Trench E-4 and west strip limit	17,400	-	-	17,400
	20,000			19,700

<u>Total Reserves</u>		
	Coal and waste, tons	Clean coal, tons
Measured . . .	31,500	29,800
Indicated . . .	20,000	19,700
	51,500	49,500

During the remainder of the stripping operations, additional weathered coal near the surface will be lost. This has been calculated as follows:

Block enclosed by and under:	Clean coal, tons	Stripping complete October 10, percent	Estimated coal lost during the remaining stripping		Estimated clean coal to be mined and shipped, tons
			Percent	Tons	
East strip limit and trench E-1 .	2,300	100	0	0	2,300
Trenches E-1 and E-2	8,400	100	0	0	8,400
Trenches E-2 and E-3	9,600	100	0	0	9,600
Trenches E-3 and E-4	11,800	45	15	1,800 (1,755)	10,000
Trench E-4 and west strip limit .	17,400	0	25	4,400 (4,350)	13,000
	49,500			6,200	43,300

It should be noted that the figures given for waste and clean coal are necessarily approximations, inasmuch as the amounts of dirty coal, bone, and shale found in the four 10-foot trenches was used as a basis for estimating partings and lenses in the bulk of the deposit. Geologic evidence did not indicate continuous partings of waste material, but rather local lensing, which probably is proportional throughout the body to that found in the trenches. Lenses of impurities appear to be most prominent at the east end of the deposit.

As previously mentioned, approximately 12,100 tons of coal and interbedded waste material had been removed by the contractors by deep stripping. About 8,100 tons of this was from the east end of the mine where a poor-quality coal was found. The material was stripped because the contractors were attempting to find a marketable grade of coal at depth. Under normal conditions of production and demand for coal, the east end of this deposit would not have been considered for mining.

OPERATIONS

Three caterpillar Diesel bulldozers were used in stripping the overburden from the coal. Stripped material was moved down-slope as far as topography would economically permit. The hanging-wall side of the coal bed was soft and broken, and it proved necessary to carry stripping well into the seam to obtain clean coal for loading.

Upon completion of stripping, it was tentatively planned to establish ramps and benches from which a 3/4-cubic-yard power shovel could load directly into trucks. The deposit was to be worked downward, and benches 10 to 15 feet in height were to be maintained. Drilling for the limited blasting necessary was to be done with jackhammers operating from a portable compressor.

All work by the C. F. Lytle Co. and Green Construction Co. at the Diamond property, including exploration, camp construction, road building, stripping, mining, and hauling the coal to the railroad will be paid for under contract by the Army's Coal Procurement Section. This contract, drawn up before complete exploration of the deposit, allows for renegotiation, and was drawn to permit operations to be started immediately.

Final costs of the operation are not available at this time.

CONCLUSIONS

The investigation of the Diamond strip-mine area, requested by the Coal Procurement Section and completed by the Bureau of Mines, has indicated that:

1. Approximately 43,300 tons of clean coal can be expected from the present stripping operation. With power-shovel loading as planned, 25 to 50 percent of the 2,000 tons of interbedded waste material will, of necessity, be included with the clean coal.

2. There is no likelihood of extending the strip-mining operation into areas served by present haulage facilities. Although coal for underground mining is probably present immediately adjacent on the west side of the area drilled, there are other areas in the general vicinity where underground mining might be undertaken with greater success.

No further exploration by the Bureau of Mines is proposed at this time.

oOo

46634



