

UNITED STATES DEPARTMENT OF THE INTERIOR

Harold L. Ickes, Secretary

BUREAU OF MINES

R. R. Sayers, Director

War Minerals Report 438

COAL DEPOSITS

POINT BARROW AND WAINWRIGHT AREAS

NORTHERN ALASKA



WASHINGTON: 1945

This report is intended for limited distribution among officials of the United States Government
The information contained therein should not be made available to unauthorized persons.

3 3755 001 16984 6

C
SPC
COLL
TN
174
A4
W3
no. 438

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.

WAR MINERALS REPORT
UNITED STATES DEPARTMENT OF THE INTERIOR - BUREAU OF MINES

W.M.R. 438 - Coal

September 1945

COAL DEPOSITS
POINT BARROW AND WAINWRIGHT AREAS
NORTHERN ALASKA

SUMMARY

A fuel shortage at Barrow, Alaska, during the winter of 1942-43 caused great hardship among the Eskimo population of that settlement. To avert, if possible, such occurrences in the future, the Bureau of Mines examined coal deposits in the vicinity of Barrow during the summer of 1943. In the summer of 1944, exploration of selected coal deposits on the Meade River and in the Peard Bay area was begun, the work on the Meade River being in close cooperation with the Office of Indian Affairs coal-mining program that was being conducted to stave off another fuel shortage at Barrow.

The Bureau's exploration at Meade River and in the Peard Bay area indicated the existence of approximately 112,000 short tons of subbituminous coal, 68,000 tons of which may be considered measured coal and 44,000 tons indicated coal. Preliminary examination indicated that a very large tonnage of subbituminous coal could be developed along the east bank of the Kuk River 20 miles south of Wainwright, Alaska.

The Bureau of Mines proposes underground room-and-pillar mining of the coal deposits in the vicinity of the Office of Indian Affairs open-pit mine on the Meade River.

Coal deposits known to occur near other villages along the Arctic coast of Alaska should be investigated and plans made to utilize them.

INTRODUCTION

At one time, the Alaskan Eskimos lived in many small settlements scattered along the Arctic coast. These settlements extended as far south as Bristol Bay and several miles inland on the large rivers. When the white man established trading posts, schools, hospitals, and missions, these people gradually congregated in a few large villages around them, and the natural fuel supply nearby became exhausted.

According to the 1940 census, the population of Barrow, Alaska, was 363 persons, but since that time it has increased considerably, and later estimates place the present population between 400 and 500 persons. With

the exception of 25 white persons, the entire population is comprised of Eskimos.

The Government maintains a school, hospital, store, radio station, and weather station at Barrow. There are also a church and mission and a privately owned trading post.

For many years the Barrow Eskimos depended upon petroleum residue from Cape Simpson and driftwood for fuel. This fuel not only provides warmth during the long, cold winters, but it is also an indirect source of water, which is obtained from melting ice. In recent years, the supplies of petroleum residue and driftwood have not been adequate to meet demands for fuel, and during the winter of 1942-43 and again in 1943-44 Barrow experienced an acute shortage.

This situation was brought to the attention of Governor Ernest E. Gruening, who was instrumental in getting a Bureau of Mines engineer¹ to investigate reported coal occurrences in the vicinity. Coal deposits along the Meade River and at Peard Bay were examined during the spring and fall of 1943. The Office of Indian Affairs shipped in mining equipment in September 1943, and began stripping an open-pit mine on the Meade River in June 1944. In conjunction with this work, a Bureau engineer² conducted a churn drilling program to determine the tonnage of coal in the vicinity of the mine. The Bureau also examined coal deposits in the Peard Bay area and at Kuk River.

LOCATION AND ACCESSIBILITY

The Meade River coal mine, operated by the United States Office of Indian Affairs, is located 60 airline miles S. 15° W. of Barrow at approximate latitude 70°28' N. and longitude 157°25' W. (See fig. 1).

The Arctic Ocean in the vicinity of Point Barrow is usually free of ice between the first of July and the latter part of September. As only one supply ship calls at Barrow during the year, equipment and supplies ordered from the United States must be on the dock in Seattle before the middle of June to be sure of reaching Barrow the same year. As there are no harbors along the Arctic coast, supply ships must anchor two to five miles off shore, and all supplies must be lightered ashore in small barges or native skin boats. Lighterage is usually about \$7.50 a ton; freight from Seattle is \$40 to \$60 a ton, depending on the class of merchandise.

The ice on the Meade River usually breaks the latter part of June and freezes hard enough for dog-sled transportation by late September. From December first to June first, the terrain is usually frozen sufficiently to permit heavy freighting with crawler-type tractor and heavy freighting sleds. January, February, March, and April should prove to be the most practical time for freighting. Tractor freighting between Barrow and Meade River is estimated at about \$12 a ton.

¹ Norman E. Ebbley, Jr.

² Harold C. Pierce.

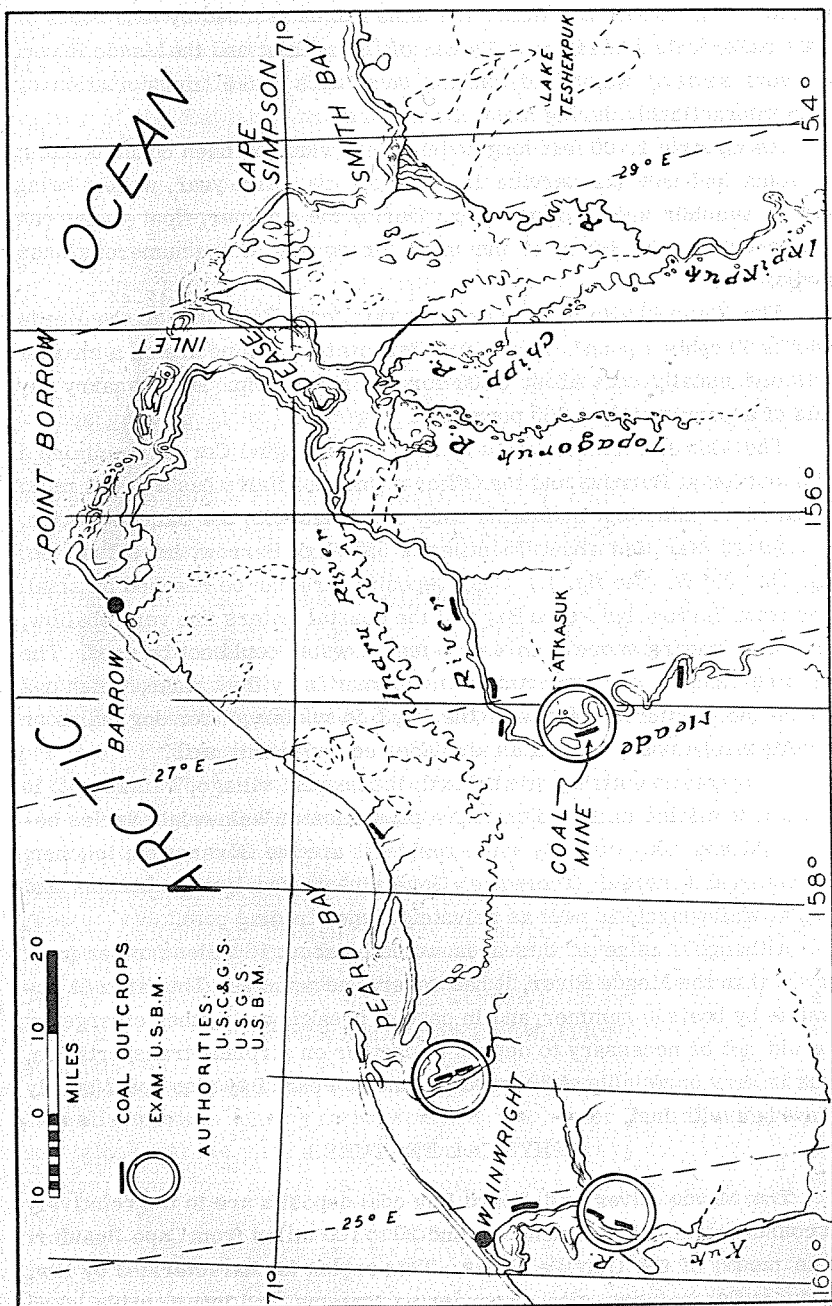


FIG. 1 KNOWN COAL OCCURRENCES POINT BARROW AREA

There are no roads or trails in this area, and in summer the mine is completely isolated with respect to overland transportation. During periods of high water in summer the mine can be reached by skin boats or small motorboats from Barrow by way of Dease Inlet and the Meade River. However, shallow water and shifting sand bars make transportation by water impracticable during most of the summer.

An airstrip 1,700 feet long and 125 feet wide has been constructed at the mine, and now air service is available the entire year, wheels being used in summer and skis in winter. During the summer, float planes can land on the Meade River, at the mine, or on any of the numerous lakes nearby.

The Wein Alaska Airline express rate from Fairbanks to the Meade River is 60 cents a pound. Trips from Barrow to the mine are on a charter basis and usually cost about \$100 for the round trip. Planes carry payloads of approximately 1,000 pounds.

The Alaska Communication System (Army Signal Corps) maintains a radio station at Barrow, and the Office of Indian Affairs has a small radio station at the mine that maintains daily schedules with the Barrow station.

Peard Bay lies about 75 miles S. 55° W. of Barrow, lat. 70° 43' N., long. 159° 00' W. (See fig. 1.) Coal deposits here can be reached by small boats from Barrow, but Peard Bay and the coastal waters are very shallow, and boats drawing more than 4 or 5 feet of water could not be used. The only other means of transportation in summer is by float plane, which can land on the sheltered waters of the bay. In winter, either dog teams or tractors can be used, as well as airplanes equipped with skis.

This area is entirely uninhabited; the nearest village, Wainwright, is due west 25 airline miles. The native population of Wainwright varies between 300 and 400; the only white residents are the Government teacher, his wife, and a nurse. There are a Government school, radio station, and store at Wainwright, as well as privately owned trading post.

Although a mine in this area would be about 15 miles farther from Barrow than the Meade River, it has several advantages. This area is accessible by boats in summer, and in case of breakdown or other emergency it would not be necessary to depend altogether on airplane transportation, which is very unreliable at present. A mine at Peard Bay also could supply Wainwright with fuel.

PHYSICAL FEATURES

The Meade River and Peard Bay coal deposits are in the relatively flat coastal plain, which extends inland 20 to 100 miles from Cape Beaufort to the mouth of the Colville River. This region is characterized by low, relatively flat features, slow, meandering streams, and innumerable lakes and ponds. Maximum relief does not exceed 200 feet and in most places is not over 50 feet.

The area immediately adjacent to the Meade River mine is a low and nearly flat plain in which the Meade River and its tributaries have entrenched themselves to depths of 20 to 40 feet. A fairly recent elevation of this area has left benches along the river about 15 feet higher than the low-water level. The most noticeable characteristic of the area is the monotony of the flat land, as there are no prominent landmarks or timber to relieve it. All depressions on this flat plain catch the surface water, which is held by the frozen underlying strata, causing a large portion of the surface to be covered with lakes, ponds, and marshes. A thick mantle of spongy moss and decayed vegetation covers the higher ground. The numerous lakes, ponds, and swamps make any type of overland travel extremely circuitous and difficult in summer, and the soft, spongy tundra makes foot travel especially slow and tiresome.

Vegetation consists of a few stunted willows and other unidentified bushes growing along the larger streams. Few willows are over 2 feet high, the large majority being 18 inches or less. Vegetation more remote from the streams is chiefly moss, lichens, grass, and sedges, with a few salmonberries and cranberries. Lack of timber suitable for mines or building necessitates shipping all such material from the United States.

CLIMATE

The climate here is typical of all northwestern Alaska; that is, winters are long and cold, with severe storms, and summers are short and cool. The mean temperature at Barrow for June, July, August, and September is 37° F. Temperatures below 32° are likely to occur during any month of the year. The mean temperature for a period of 40 years is 10.1° F.

At Barrow, the average annual precipitation recorded over a 40-year period was 5.34 inches. This includes the average snowfall for a 19-year period, which was 55.4 inches. October is reported as having the greatest rainfall. Ample water for camp or mine use is available during the summer months from the rivers and their tributaries. During the winter, the only water available is that obtained by melting ice or snow.

LABOR AND LIVING CONDITIONS

At present the mine has no housing facilities. During the summer of 1944 all work was done by native Eskimos, who either lived in tents or built sod igloos. At the mine a white foreman, employed by the Office of Indian Affairs, lived in a small wanigan mounted on a bob sled, which had been towed out from Barrow.

Six native workers and their families live at the mine. Additional Eskimo labor can be obtained from Barrow, and although these natives are not skilled workmen they could be trained to handle skilled and semi-skilled jobs. The present wage scale in Barrow for unskilled native labor is 50 cents an hour with overtime for all over 40 hours a week. At present, skilled labor must be imported from Fairbanks or Seattle. The wage scale

at Fairbanks in 1944 was \$1.50 to \$2 an hour for skilled labor and \$1 to \$1.25 for unskilled.

Time-and-a-half is paid for all over 40 hours a week and double time for Sunday. There are no housing facilities or labor of any kind at Peard Bay. Native labor can be procured from Wainwright and Barrow, but skilled labor must be imported from Interior Alaska or Seattle.

HISTORY AND PRODUCTION

The presence of coal deposits in the northern Arctic region has been known for many years. The Eskimos used coal from the Meade River deposits at their hunting and fishing camps. At various times coal was transported by the natives from the Peard Bay area to Barrow. Coal was obtained from deposits near Wainwright for use by the Eskimos and the Government school. In the past, little if any attempt has been made to develop and mine the coal systematically.

In the spring of 1943, an engineer of the Bureau of Mines examined the deposits at Peard Bay and along the Meade River. During the summer of the same year the Office of Indian Affairs purchased equipment for an open-pit mine at the Meade River. This equipment was shipped to Barrow and transported by tractor train to the coal deposits near the bank of the river.

During the winter of 1943-44, approximately 100 tons of coal was dug by hand from exposed portions of the beds. This coal was hauled by tractors and sleds to Barrow, where it was sold to the natives. In the spring of 1944 the Office of Indian Affairs hired a mine foreman to supervise operation of the open-pit mine. Hydraulic equipment was set up, and overburden was stripped during the summer. This operation exposed an area of coal 70 feet wide and 140 feet long along the river banks. However, in September flood waters covered the coal before any could be mined, so that it became necessary to open an underground operation near the open pit to satisfy the urgent fuel needs at Barrow. This underground mine is now in operation and is producing a small tonnage daily.

GEOLOGY³

The Arctic coastal plain is thickly mantled by marine sands and silt, which effectively mask the underlying formations. In a few isolated places warping has brought older rocks near enough to the surface to be exposed by erosion. In such places coal beds have been exposed by stream action.

Fragments of sea shells in the sands indicate they were shallow-water marine deposits, probably of Pleistocene age. A slight general uplift of this area has raised the marine sands above sea level, and wind and water have modeled them into gently rolling flat lands.

Along the Meade River, the Pleistocene deposits unconformably overlies a Cretaceous series containing coal beds. Previous to the deposition

³ Smith, Philip S., and Mertie, J. B., Jr., *Geology and Mineral Resources of Northwestern Alaska*: Geol. Survey Bull. 815, 1950, 351 pp.

of the Pleistocene sands, the Cretaceous beds, composed principally of clay and coal with some interbedded shales, were warped so that they dip easterly approximately 1° . During deposition of the Pleistocene sand, the Cretaceous beds were eroded to base level, and the coal above this level was worked over by wave action and concentrated in the sands as secondary deposits. A similar condition prevails near Wainwright, where the Arctic Ocean is bringing up coal and concentrating it on the beach in sufficient quantity to constitute an important source of fuel for the Wainwright village.

Large dikes and sills of ice cut through the overburden in the Meade River area, but there was no indication that these ice seams cut through the coal beds. However, at one place near Peard Bay ice seams were observed to cut through coal beds as well as overburden.

OCCURRENCE OF THE DEPOSIT

The Cretaceous series outcrops along the west bank of the Meade River. Four coal beds, one above the other, appear in this outcrop. The top bed (No. 1) is 34 inches thick; the second (No. 2) is 5 to 6 feet, and the two lower beds (Nos. 3 and 4) are approximately 12 inches thick. These beds are separated by 1 to 6 feet of clay and originally were overlain by clay of unknown thickness. During Pleistocene time most of this clay and the higher portions of the coal beds were eroded away. The present coal appears as truncated beds dipping below the old erosion surface.

Sufficient work has not been done at Peard Bay to determine the attitude of the coal beds, but present work indicates they are nearly flat and have been subjected to geologic processes similar to those that have taken place along the Meade River.

CHARACTER OF COAL DEPOSITS

Coal from Meade River, Peard Bay, and the Kuk River areas is classed as subbituminous. The heat value ranges from 9,700 to 11,110 B.t.u., and the ash content is 3.1 to 10.9 percent. This coal is finely divided by a network of very small ice cracks throughout the beds. Large lumps of seemingly solid coal when thawed will disintegrate into smaller pieces usually $1/4$ to $3/4$ inch in size.

EXPLORATION BY BUREAU OF MINES

The Bureau of Mines churn-drilled 15 holes at Meade River. The drill used was a light airplane drill with 4-inch tools owned by the Office of Indian Affairs.

Drill lines were laid out perpendicular to the course of the river, and numbered so that each full unit represents 1,000 feet. Thus, line 15.0 is 1,000 feet from line 16.0 and 200 feet from line 15.2 (see fig. 2).

No coal of minable thickness was found northwest of line 15.8. In this area the coal has been eroded. Between lines 15.8 and 16.4 the coal beds were covered by 25 to 30 feet of overburden. The beds appear to con-

tinue to the southeast of line 16.4, but the dip in this direction makes them too deep to be reached with the light drilling equipment.

Three trenches were dug along the bank of the Meade River north of the open pit. Trench 1 revealed No. 2 coal bed directly below the Pleistocene sands; bed 1 and the overlying clays are missing (see fig. 3). Prospecting at trench 2 revealed beds 3 and 4, whereas trench 3 showed only one small seam of coal, presumably bed 4.

In addition to the churn-drill holes and trenches, one prospect shaft was sunk through the coal as a check on the drilling. This shaft was later enlarged to 5 by 8 feet for use as a present underground working shaft.

Three separate coal exposures were examined in the Peard Bay area and are referred to as beds 1, 2, and 3 (see fig. 4). A total of 1,600 linear feet of coal beds is exposed in the cut banks along the shore of Peard Bay and Kukroak River. These beds, 5 to 6 feet in thickness, were prospected by four shaft holes located 60 to 100 feet from the outcrop (see fig. 5). Two of the holes were on ice cracks that apparently cut through a coal bed. However, probing from the surface with a steam point in the areas between these ice seams indicated the existence of coal bed 1. This condition, where the ice cuts through the coal, is probably due to some unusual circumstance affecting only a small area, as the other two holes did encounter coal. Nowhere in the Meade River area was the ice found cutting through the coal beds.

A preliminary examination was made of the Kuk River deposits at lat. 70° 21' N., long. 159° 41' W., approximately 20 miles south of Wainwright. Two coal beds outcrop in a cut bank for a distance of 1 mile along the east shore of the Kuk River. The top bed is 5 feet 6 inches thick and the bottom one is 6 feet thick. One sample was cut across the full width of each bed. The coal from these beds is classed as subbituminous and has a heat value of 11,000 B.t.u. and 5 percent ash content.

Table 1 is a stratigraphic section through the coal series at the place where the samples were cut.

TABLE 1

Overburden, clay and sand . . .	10 to 12 feet.
Bone.	1 foot, 6 inches.
Coal.	5 feet, 6 inches (sample C-27949).
Clay.	4 feet, 0 inches.
Coal.	6 feet, 0 inches (sample C-27947).
Clay.	6 inches.
Water level in the Kuk River	

Considerable difficulty was experienced in getting supplies and equipment to the job. The only airline serving the area had chartered some of its planes to the Navy for work in connection with the Barrow petroleum exploration; consequently, transportation was a problem throughout the project, and much time was lost from lack of necessary tools and supplies.

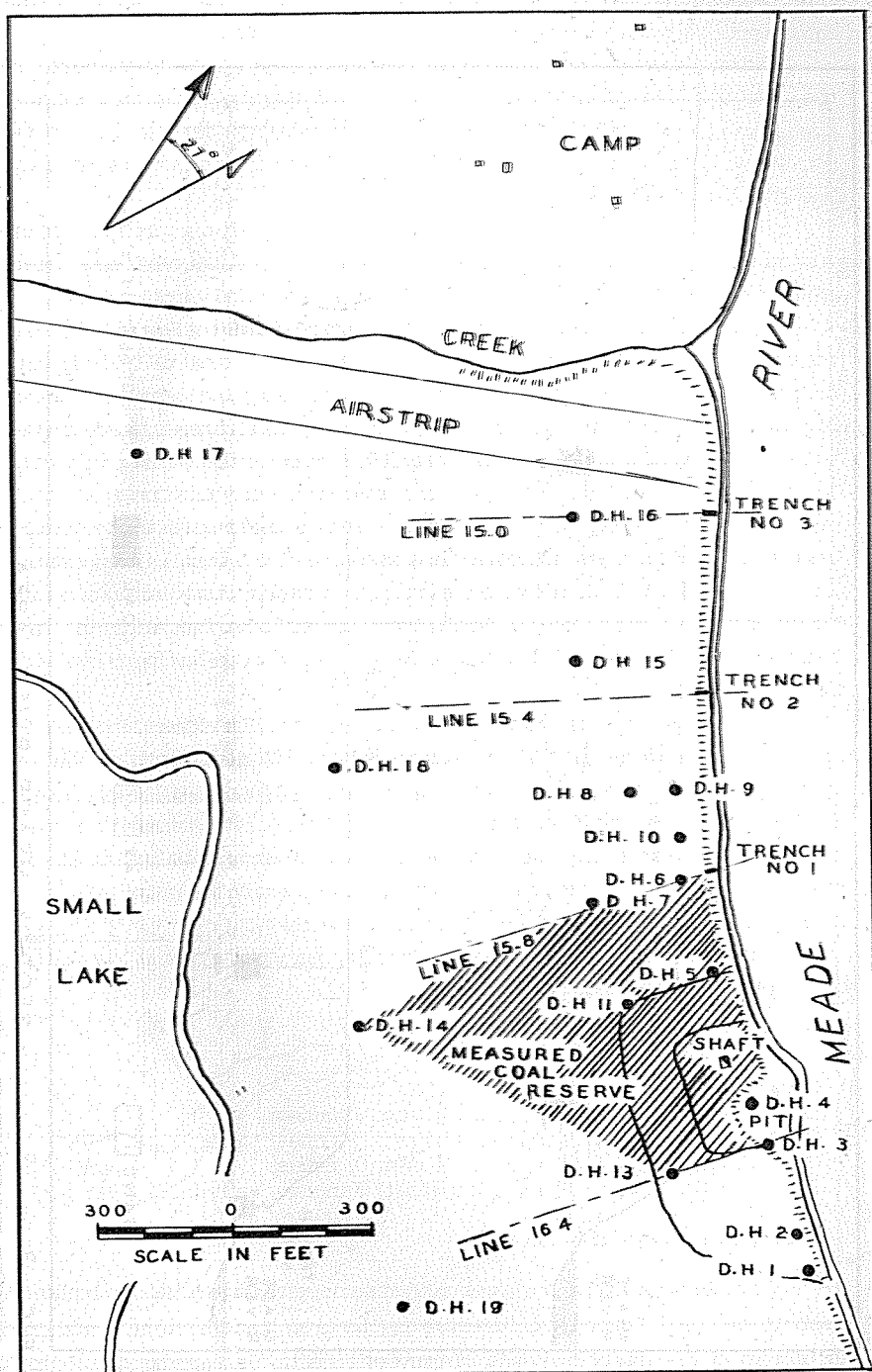


FIG. 2. AREA ADJACENT TO MEADE RIVER

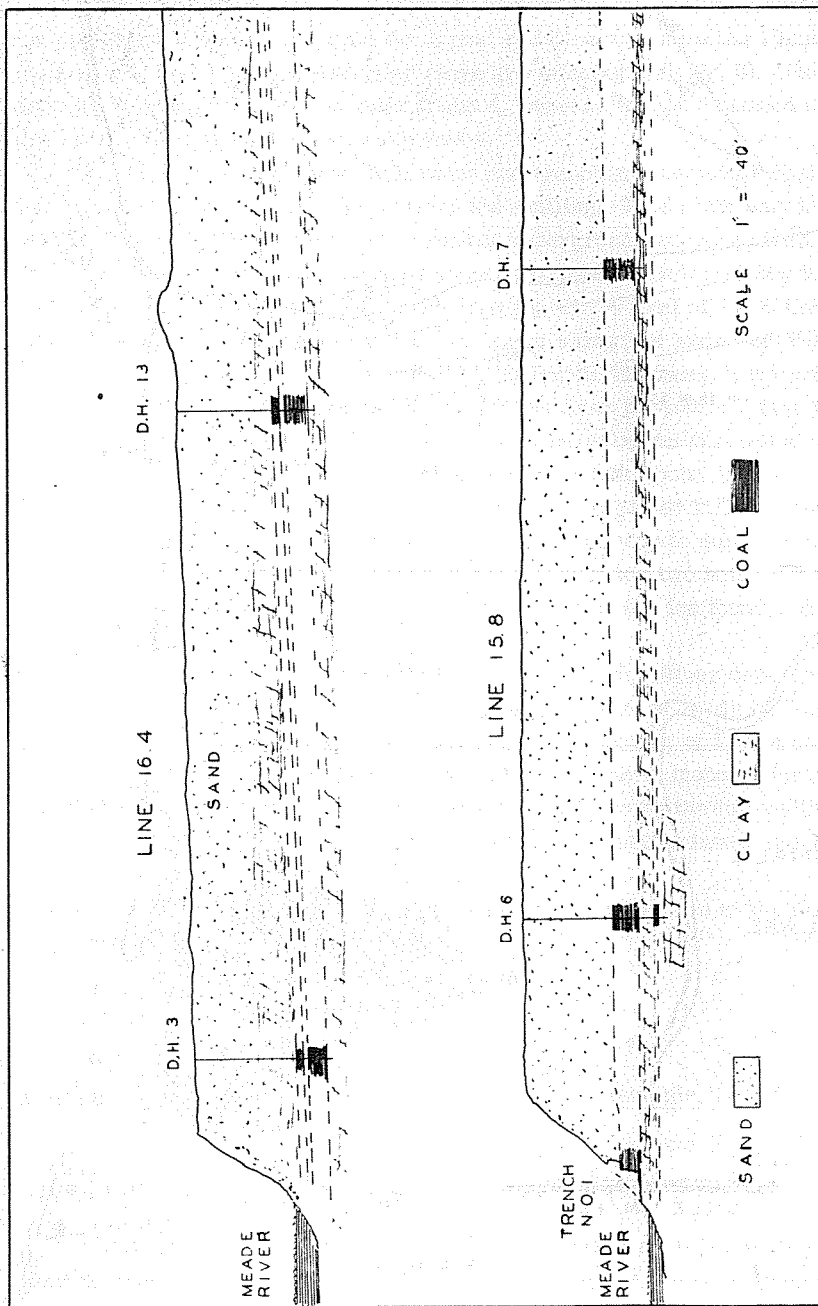


FIG. 3 SECTION MEADE RIVER AREA

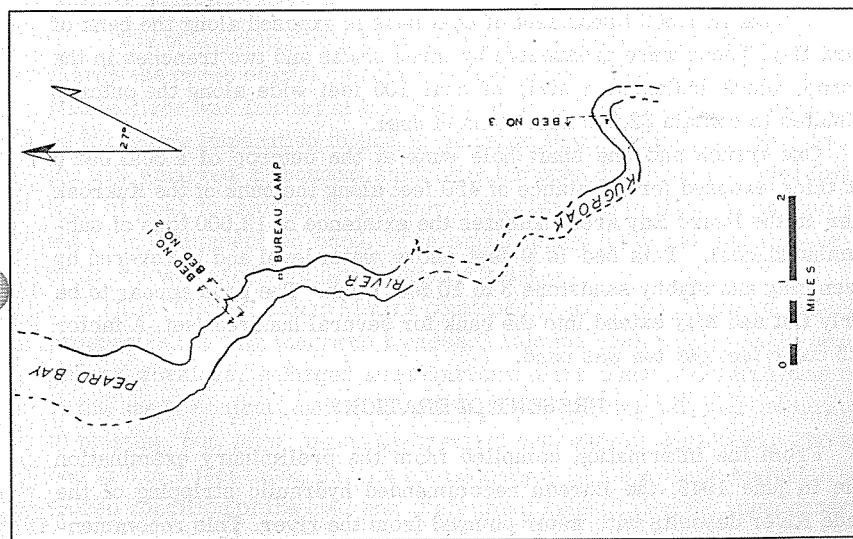


FIG. 4 PEARD BAY AREA

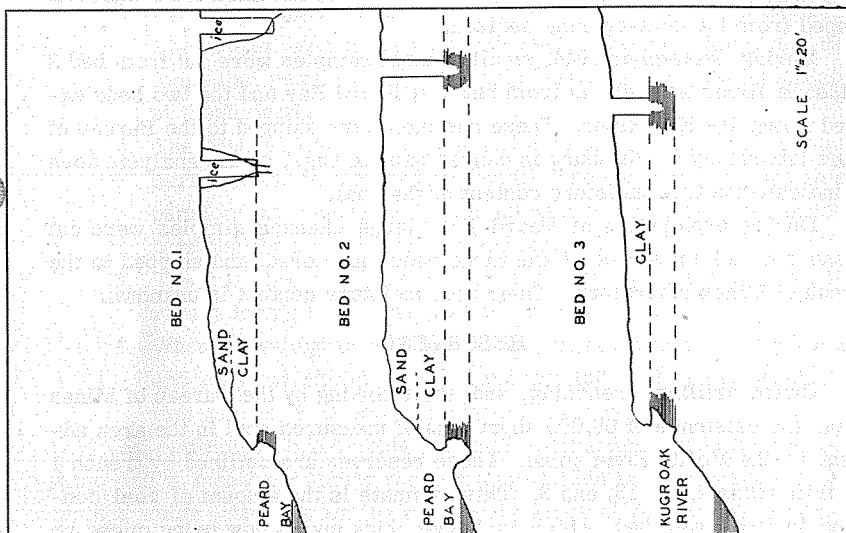


FIG. 5 SECTIONS PEARD BAY AREA

SAMPLING

Clean samples were not obtained from the churn-drilling program; sloughing of loose sands and clay in the holes contaminated the material pumped from the coal-bearing horizon.

During September 1944, small channel samples were cut from bed 2 at Meade River as well as from bed 1 at Peard Bay and the two beds exposed along the Kuk River. These samples were shipped to the Bureau of Mines laboratory at Pittsburg in canvas sample bags, so the analysis does not indicate the true moisture content of the coal.

During exploration at Peard Bay, large channel samples were cut across the full thickness of the three beds, quartered, and shipped to the Bureau of Mines laboratory. Their true moisture content is unknown.

RESERVES

Churn drilling, trenching, and shaft sinking by the Bureau of Mines reveal the existence of 68,000 short tons of measured coal in the area adjacent to the Meade River mine. These reserves are outlined by trench 1 and drill holes 7, 14, 13, and 3. This estimate is the amount of coal contained in the lower bed, which is 5 feet thick and is now being mined by underground methods. The lack of evidence of severe faulting and folding makes it reasonable to assume that the deeper portions of this bed contain several times the tonnage of the measured coal. An overlying bed 2.8 feet thick is not included in the estimate, as the coal in this bed cannot be utilized without washing.

A total of 1,600 linear feet of coal beds is exposed along the bank of Peard Bay. These were prospected by three shafts and two trenches in the outcrop, which indicated a strip of coal 100 feet wide along the outcrop estimated to contain 32,000 short tons of coal.

One trench and one shaft hole sunk at the outcrop of a coal bed 6 feet thick exposed for a distance of 450 feet along the bank of the Kukroak River in the Peard Bay area indicates the existence of 12,000 tons of sub-bituminous coal. This bed is 9 feet above water level and is covered by frozen clay and slabby sandstone 3 to 10 feet thick. The beds appear to be nearly flat and may extend into the bank for several hundred feet. A factor of 25 cubic feet per ton was used.

PRESENT OPERATIONS

From the information compiled from the preliminary examination made in June 1943, the Bureau recommended hydraulic stripping of the Meade River deposits with water pumped from the river. This recommendation was made without the aid of a detailed examination, because it was imperative to lay out a mining program and purchase equipment and supplies before the ship sailed from Seattle for Barrow the middle of July 1943.

It was necessary to take immediate steps to help alleviate the coal shortage at Barrow. As a result of acting on insufficient data the mine was not in a suitable location for strip mining.

The following unfavorable conditions were found at the open-pit mine:

1. The frozen overburden was 25 feet to 30 feet deep, and it was found that pumping water to strip in Northern Alaska is too costly at these depths.
2. The Meade River is shallow and does not have current enough to carry away the stripped material. The sands do not stay in suspension and consequently pile up near the coal bed, necessitating handling the overburden two and three times.
3. The coal bed was only 1 foot above the low-water level of the river; during floods the coal bed is under water.
4. When traveling in and out of the pit, the tractor brings in sand and clay, which are soon ground into the coal by the treads. For this reason, it is not possible to mine clean coal.

An estimated 25,000 cubic yards of overburden were stripped with a pump and a bulldozer during the summer of 1944 at an average cost of 25 cents a cubic yard. From the total cubic yards of overburden stripped in the pit, 9,800 was removed from 1,960 tons of coal at a total cost of \$2,450 or \$1.25 a ton of coal stripped. The knowledge gained from the first season's operation should make it possible to lower the cost materially in the future.

The summer experience indicates that open-pit mining is feasible on suitable deposits.

The steamship that arrived at Barrow in September 1944 did not discharge the cargo of coal consigned to that place. The open-pit mine at the Meade River was flooded at that time, and it was not possible to mine coal, so it became imperative to find some other source of fuel. Therefore, the Bureau enlarged a prospect shaft near the open-pit mine and extracted 10 tons of coal to determine whether it was feasible to mine the frozen coal with the equipment on hand. The small churn drill was set up over the shaft and was used as a headframe and hoist.

The Office of Indian Affairs continued to mine coal from the enlarged prospect shaft with the same makeshift hoisting equipment. At the underground workings, enlarged wheelbarrows were used in transporting coal to the shaft. At first, hand steel was used for drilling the coal preparatory to blasting, but, later, manually operated coal augers were used. The coal bed is 5 to 6 feet thick, so it is not necessary to mine waste material. The frozen condition of the coal and overburden made timbering unnecessary.

Approximately 80 tons of coal was mined from November 1944 to March 1945, inclusive. At present (April 1945) the tractor and sleigh are making 1-1/2 round trips a week from the coal mine to Barrow.

The small tonnage of coal mined during this period was not due to difficulties encountered in mining. The crew that was engaged in mining also freighted to Barrow. When a capacity load of 15 to 20 tons was mined and loaded on sleighs it was taken to the village. Considerable trouble was experienced with frequent breakdowns of inadequate equipment, consequently, very little time was spent in mining. However, several hundred tons of coal could have been mined, had the freighting equipment been able to handle it.

The coal mined at Meade River is being sold to the Eskimos at \$25 a ton through the native store at Barrow. The native store is a cooperative venture operated by the natives under the management of the Office of Indian Affairs.

PROPOSALS

Mining

Underground mining of the Meade River or Peard Bay deposits should not present any unusual difficulties. The relatively shallow depth of overburden and the permanently frozen condition of these deposits will make very little timbering necessary. Throughout Northern Alaska, shafts have been sunk 15 to 20 feet into the frozen muck, and large storage rooms for ice and meat have been excavated at the bottom of them. These cellars stand for many years with no timbering except near the collar of the shafts. It is necessary to timber near the collar to seal out surface water. The temperature in these cellars is approximately 20° F. throughout the year. The ground temperatures in the coal beds at Meade River were found to be about 20° F. Table 2 lists the recorded temperatures (in degrees Fahrenheit) taken from drill holes.

TABLE 2

Depth, feet	Drill hole, °F.			
	9	11	8	5
5.	38	32	34	30
10.	30	30	30	
15.	26	25		
20.	22	23		
25.	20	20		
30.	18	19		
35.	18	20		

Recorded August 29, 1944. Air Temp. 42° F.

The advantages of underground mining over open-pit mining are:

1. Underground mining is independent of season or weather, whereas open-pit operations are handicapped by short summers and inclement weather. All stripping and mining must be done during July and August, when temperatures are high enough to permit thawing. This necessitates carrying the stripping operation at least 1 year ahead of the mining, and any delay during July or August would seriously curtail production for that year.

2. Underground mining is not dependent on summer thawing, hence there is no need to rush the work during the short season with resulting inefficiency and high costs.
3. Coal could be mined during the winter and loaded directly into the sleighs, so that it would not be necessary to stockpile. Stockpiling requires rehandling the coal. Coal mined by open-pit methods would have to be removed from the pit and stockpiled on high ground, where it would not be drifted over with snow.
4. Small crews could work the year around underground, or larger crews could be employed during the slack seasons, when the Eskimos have no other employment.
5. Clean coal can be mined from underground working.

The present underground operation was undertaken purely as an emergency measure. The shaft is in a poor situation, and equipment for underground mining is lacking.

A new shaft should be opened on the higher ground near drill hole 13. By locating the shaft on higher ground, surface water can easily be sealed out and there will be less tendency for snow to drift around a headframe. However, before the shaft is definitely located, three or four holes should be drilled in the area adjacent to hole 13. This would block out enough coal to supply Barrow for 10 to 15 years and furnish information that would allow the underground development to be laid out with grades favorable for tramming.

This mine will need to produce 1,000 to 1,500 tons yearly, and probably will be operated only in winter. For such a small operation, room-and-pillar mining should prove the most practical. A single-entry system with rooms turned off on each side at 30-foot centers should prove adequate. The maximum room size and size of pillars to be left must be determined by experience. Gas should not cause difficulty.

ESTIMATES

It has been estimated that Barrow will consume 1,400 to 1,500 tons of local coal per year. The following estimates of costs are based upon producing this tonnage, using present freighting equipment and the additional equipment recommended for underground mining.

Freighting 1,500 tons with two "cats" and six sleighs

1 foreman, who is a "cat" driver and mechanic, 6 months at \$400.	\$2,400	
5 natives, 6 months at \$150.	4,500	
200 bbl. fuel at \$22.	4,400	
Gasoline, oil, and grease.	350	
Repair parts.	<u>5,550</u>	\$17,200

Mining 1,500 tons

1 foreman, 6 months at \$400.	\$2,400	
5 natives, 6 months at \$150	4,500	
Supplies, repair parts, powder, gasoline, shovels, etc.	<u>2,300</u>	\$9,200
Emergency air transportation of personnel and supplies.	2,400	
Contingencies.	<u>1,200</u>	<u>3,600</u>
Total mining and freighting.		30,000

Present cost of coal shipped annually to Barrow for the Government hospital and school averages about \$20,900. This can be replaced by 575 tons of local coal at \$20 a ton, or \$11,500. The indicated saving to the Government is \$9,400 a year, which will retire the capital investment plus 4 percent interest in 10 years.

In addition, the other Government agencies, by converting from oil to coal, can save an estimated \$2,400 annually by using 175 tons of local coal. The rest of the coal can be sold through the native store to the Eskimos.

CONCLUSIONS

A simple geologic structure with no evidence of severe faulting, together with widespread coal outcrops, indicates that large areas in northern Alaska are underlain at no great depth by minable coal beds.

Enough coal to supply local needs for many years was developed at Meade River. Indications are that additional work at Peard Bay will develop a larger tonnage than was found at the Meade River mine.

The Peard Bay deposits are more favorably located than the present workings on Meade River, because Peard Bay is accessible in summer by small boats, whereas the present mine is entirely dependent on air transportation in summer. A mining operation here could also dispose of a small amount of coal in Wainwright, which is only 25 miles by airline from Peard Bay.

Prospecting during the fall and winter of 1944 was limited to areas that appeared favorable for strip mining so that the present mine equipment could be utilized. As only one small area that appears suitable for this type of mining has been located, it is probable that if any substantial tonnage of coal is ever mined along the Arctic Coast it will be from underground operations.

By using Meade River coal in Government buildings at Barrow it would be possible for the Government to save about \$11,800 a year. This amount was computed by subtracting the total cost of 1,500 tons of coal produced at the Meade River mine, and delivered, from the total cost of coal shipped up from the United States.