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FINAL WAR MINERALS REPORT

UNITED STATES DEPARTMENT OF THE INTERIOR -- BUREAU OF MINES

W.M.R.

Coal

April 1945

COAL DEPOSITS OF THE
POINT BARROW AND WAINWRIGHT AREAS,
NORTHERN ALASKA

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SUMMARY

A fuel shortage at Barrow, Alaska during the winter of 1942-43 caused much hardship among the Eskimo population of that settlement. Coal occurrences in the vicinity of Barrow, which could be utilized to alleviate future fuel shortages were examined by the Bureau of Mines during the summer of 1943. In the summer of 1944 an exploration program was undertaken on selected coal deposits on the Meade River and in the Peard Bay area. The exploration work carried on at the Meade River was in close cooperation with the Office of Indian Affairs coal mining program which was being conducted to stave off another fuel shortage at Barrow.

* This war minerals report has been prepared for the engineers and consultants of the Bureau of Mines for their technical review and criticism, and to keep them informed of the progress of the Bureau of Mines war minerals program. It is not to be made available to others, as the data are subject to correction and revision. The final report, when issued, will be distributed on a limited basis to officials of the Federal war agencies, the owners or operators of the properties described therein, and to certain others with specific concern in the production of minerals vital to the prosecution of the war.

The Bureau of Mines exploration at Meade River and in the Peard Bay area indicate the existence of approximately 112,000 short tons of subbituminous coal, of which 68,000 tons may be considered measured coal and 44,000 tons indicated coal. A preliminary examination indicates 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 methods for 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 for the utilization of these deposits in the nearby communities.

INTRODUCTION

At one time the Alaskan Eskimo 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 men established trading posts, schools, hospitals, and missions these people gradually congregated in a few large villages around these installations. The natural fuel supply near many of the large villages along the Arctic Coast became exhausted by the abnormally large population caused by this influx of people from the small outlying settlements.

The population of Barrow, Alaska according to the 1940 census is 363 persons, but since that time there has been a considerable increase 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. In addition to the government installations there is 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 their fuel supply. This fuel not only provided warmth for the Eskimo during the long cold winters, but also as an indirect source of water supply, because water is obtained from melting ice. In recent years the sources of petroleum residue and driftwood have not been adequate to meet the demands for fuel. During the winter of 1942-43 and again in 1943-44 Barrow experienced an acute shortage of fuel.

The fuel problem at Barrow was brought to the attention of Governor Ernest E. Greuning, who was instrumental in getting a Bureau of Mines engineer ^{1/} 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 started stripping an open pit mine on the Meade River in June, 1944. In conjunction with this work an engineer ^{2/} of the Bureau of Mines conducted a churn drilling program to determine the tonnage of coal in the vicinity of the mine. In addition to this work, the Bureau of Mines made examinations of coal deposits in Peard Bay area and at

^{1/} Norman E. Ebbley, Jr. - Mining Engineer
^{2/} Harold C. Pierce - Mining Engineer

Nuk River.

LOCATION AND ACCESSIBILITY

The Meade River Coal Mine, operated by the U. S. Office of Indian Affairs, is located about 60 airline miles S. 16° W. of Barrow at approximate latitude 70° 30' north and longitude 157° 08' west.

(See Figure 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, equipment and supplies ordered from the 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 the supply ship must anchor two to five miles off shore, and all supplies are lightered ashore in small barges or native skin boats. Cost of lighterage at Barrow is usually about \$7.50 a ton; freight from Seattle is \$40.00 to \$60.00 per ton, depending upon the class of merchandise.

The ice usually breaks on the Meade River the latter part of June and freezes sufficiently hard for dog sled transportation late in September. From December 1st to June 1st the terrain is usually frozen sufficiently to permit heavy freighting with crawler-type tractor, and heavy freighting sleds. The months of January, February, March and April should prove to be the most practical time for freighting. It is estimated that tractor freighting between Barrow and Meade River will cost about \$12.00 per ton.

There are no roads or trails in this area, and during the summer months the mine is completely isolated so far as overland

transportation is concerned. During periods of high water in the summer time the mine can be reached by skin boat or small motor boat from Barrow by way of Dease Inlet and the Meade River. However, shallow water and shifting sand bars along the river make water transportation impractical during most of the summer.

An airstrip 1700' x 125' has been constructed at the mine, and now air service is available the entire year, using wheels in summer and skis in winter. During the summer, float planes can land on the Meade River, at the mine or on one of the numerous lakes nearby.

Wain Alaska Airline express rates from Fairbanks to the Meade River is \$0.60 a pound. Trips from Barrow to the mine are on a charter basis, and usually cost about \$100.00 for the round trip. These planes carry approximately 1,000 pound pay loads.

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, which maintains daily schedules with the Barrow station.

Peard Bay lies about 75 miles S. 55° W. of Barrow, latitude $70^{\circ} 43'$ N. longitude $159^{\circ} 00'$ W. (See Figure 1.) Coal deposits in the area can be reached by small boats from Barrow, but Peard Bay and the coastal waters are quite shallow, and boats drawing more than four or five feet of water would not be practical. The only other means of summer transportation is by float planes which can land on the sheltered waters of the bay. In winter either dog teams or tractors can be utilized for transportation as well as airplanes equipped with skis.

This area is entirely uninhabited; the nearest village, Wain-

wright, is due west 25 airline miles. Population of Wainwright varies between 300 and 400 natives, the only white residents are the Government teacher and his wife and a nurse. There is a government school, radio station, and store and a privately owned trading post at Wainwright.

Although a mine located 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 break down or other emergency, it would not be necessary to depend altogether upon airplane transportation which is very unreliable at the present time. A mine located at Peard Bay could also supply Wainwright with fuel.

PHYSICAL FEATURES

The Meade River and Peard Bay coal deposits are located in the relatively flat coastal plain which extends inland 20 to 100 miles from Cape Beaufort to the mouth of the Colville River. This coastal plain region is characterized by low relatively flat features, slow meandering streams, and innumerable lakes and ponds. The maximum relief of this region does not exceed two hundred 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 a depth of twenty to forty 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 the sameness of the

landscape. 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 marsh land. The higher ground is covered by a thick mantle of spongy moss and decayed vegetation.

The numerous lakes, ponds and swamps make any type of overland travel extremely circuitous and difficult during the summer months, and the soft spongy tundra makes foot travel an especially slow and tiresome undertaking.

Vegetation consists of a few stunted willows and other unidentified bushes growing along the larger streams. Few willows are found over two feet high, while the large majority are smaller, usually 18 inches or less. The vegetation more remote from the streams consists predominately of moss, lichens, grass and sedges with a few salmon berries and cranberries.

There is no suitable mine or building timber which necessitates shipping all such material from the United States.

CLIMATE

The climate here is typical of all northwestern Alaska; that is, long cold winters accompanied by severe storms, and short cool summers. The mean temperature at Barrow for June, July, August and September is 37° F. Temperatures below 32° are apt to occur during any month of the year. The annual mean temperature for a period of 40 years is 10.1° F. Table 1 tabulates the monthly and annual mean temperature for this period.

Table I

MONTHLY AND ANNUAL MEAN TEMPERATURE
Arctic Coast Region - Barrow

Y e a r	J a n	F e b	M a r	A p r	M a y	J u n e	J u l y	A u g u s t	S e p t e m b e r	O c t o b e r	N o v e m b e r	D e c e m b e r	A n n u a l
1881											0	-18.0	
1882	-15.5	-23.2	-4.6	-4.4	-22.0	34.5	43.2	37.9	31.5	8.8	-7.1	-17.1	8.8
1883	-16.9	-6.3	-13.3	-2.8	23.0	32.3	36.2	37.0					
1901									33.2	14.2	-4.7	-12.1	
1902	-23.2	-6.5	-21.3	-1.4	21.4	39.6	39.7	38.0	31.9	25.2	2.4	-23.3	10.2
1903	-21.9	-15.6	-6.4	-3.0	18.1	36.1	38.2	38.5	30.1	5.7	-7.5	-5.6	8.9
1904	-26.2	-11.8	-2.6	1.6									
1910									34.0	16.6	10.4	-13.8	
1911	-23.0	-14.0	-22.7		23.8	37.2	45.6	42.5	35.6	27.2	7.6	-15.8	
1915													-20.6
1916	-8.7	-15.2	-19.4	0.6	24.4			35.8	30.4	18.9	-2.8	-20.9	
1917	-26.0	-4.8											
1920										13.9	-1.3	13.0	
1921	-17.9	-19.4	-14.4	-2.4	19.0	32.2	42.3	40.0	30.4	15.8	6.0	-9.0	10.2
Mean	-19.9	-13.0	-13.1	-1.7	21.7	35.3	40.9	38.5	32.1	16.3	0.3	-15.4	10.1

At Barrow the average 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.^{3/} 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 no housing facilities are available at the mine. During the summer of 1944 all the labor was performed by native Eskimos who either lived in tents or built themselves sod igloos. At the mine a white foreman, employed by the Office of Indian Affairs, lived in a

^{3/} U. S. Weather Bureau

small wanigan mounted on a bob sled which had been towed out from Barrow.

There are six native workers and their families living 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 \$0.50 an hour with overtime for all over 40 hours per week. At present skilled labor must be imported from Fairbanks or Seattle. The wage scale in Fairbanks at the present time (1944) is as follows:

Skilled labor.....\$ 1.50 to \$ 2.00 per hour
Unskilled labor....\$ 1.00 to \$ 1.25 per hour

Providing no working days were missed during the week, 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 for fuel to supply their hunting and fishing camps. At various times coal was transported by the natives from the Peard Bay area to Barrow. In the vicinity of Wainwright coal was obtained from nearby deposits for use by the Eskimos and the government school. During the past years there has been little if any attempt made to develop and mine these coal deposits in a systematic manner.

In the spring of 1943 an engineer of the Bureau of Mines examined

coal 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 were dug by hand from exposed portions of the beds. This coal was hauled with tractors and sleds to Barrow where it was sold to the native population. In the spring of 1944 the Office of Indian Affairs hired a mine foreman to supervise the operation of the open pit mine. Hydraulic equipment was set up, and overburden was stripped during the summer months. This operation exposed an area of coal 70 feet wide and 140 feet in length along the banks of the river. However, in September flood waters covered the coal before any could be mined. Under these conditions it became necessary to open an underground operation near the open pit, in order to supply the urgent fuel needs at Barrow. This underground mine is now in operation and is producing a small tonnage daily.

GEOLOGY ^W

The Arctic coastal plain area is covered by a thick mantle of marine sands and silt, which effectively mask the underlying formations. In a few isolated locations local warping has brought older rocks near enough to the surface to expose them by erosion. It is in these localities that coal beds have been exposed by stream action.

Fragments of broken sea shells in the sands indicate they were shallow water marine deposits, probably of Pleistocene age. A slight

^W Philip S. Smith, and J. B. Mertie, Jr., Geology and Mineral Resources of Northwestern Alaska, Department of the Interior, Geological Survey - Bull. 815, 1930

general uplift of this area has brought the marine sands above sea level, and wind and water action has modeled them into gently rolling flat lands.

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

Large dikes and sills of ice are found cutting through the overburden in the Meade River area, but no evidence was found to indicate that these ice seams cut through the coal beds. However, at one locality near Peard Bay ice seams were observed to cut through the coal beds as well as the overburden.

OCCURRENCE OF THE DEPOSIT

The Cretaceous series at the Meade River outcrop along the west bank of the present stream. Four coal beds, one above the other appear in this outcrop. (See Figure 2.) The top bed (No. 1 bed) is $3\frac{1}{4}$ inches thick. The second bed, (No. 2) is 5 to 6 feet, and the two lower beds (No's. 3 and 4) are approximately 12 inches thick.

These coal beds are separated by 1 to 6 feet of clay and were originally 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 erosional 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 very similar geologic processes as those occurring 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 3.1 per cent to 10.9 percent. (See Appendix I for analysis.) 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 $1/4$ inch to $3/4$ inch in size.

EXPLORATIONS BY THE BUREAU OF MINES

The Bureau of Mines drilled 15 churn drill holes at Meade River. The drill used was a light airplane drill with $1/4$ -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 Figure 3.)

No coal of minable thickness was found to the northwest of line 15.8. In this area the coal has been eroded. Between lines 15.8 and

16.4 the coal beds were found covered by 25 to 30 feet of overburden. The Beds appear to continue 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. Table 2 is a summary of churn drilling results.

Three trenches were dug along the bank of the Meade River north of the open pit. Trench No. 1 revealed the No. 2 coal bed directly below the Pleistocene sands, bed No. 1 and the overlying clays are missing. (See Figure 4.) Prospecting at trench No. 2 revealed beds No's. 3 and 4, while trench No. 3 showed only one small seam of coal, presumably this is bed No. 4. (See Figure 5.)

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 x 8 feet for use as the present underground working shaft.

Three separate coal exposures were examined in the Peard Bay area. These exposures are referred to as beds number 1, 2 and 3 (See Figure 6.) A total of 1600 linear feet of coal beds are exposed in the cut banks along the shore of Peard Bay and Kugroak River. These beds, varying from 5 to 6 feet in thickness, were prospected by four shaft holes located 60 to 100 feet from the outcrop. (See Figure 7.) Two of the holes were located on ice cracks which apparently cut through a coal bed. However, probing with a steam point from the surface in the areas between these ice seams, indicated the existence of coal bed number 1. This condition where the ice cuts through the coal is probably due to some unusual circumstance affecting only a small

Table 2

SUMMARY OF CHURN DRILL HOLES

Hole No.	Line No.	Elev. of Collar	Depth of Hole	Depth of Sand	Formation
1	16.7				
2	16.6				
3	16.4				
4	16.3				
5	16.0	69.7	37.5	20	Clay from 20' to 27' - Coal from 27' to 37'
6	15.8	73.3	46.0	27	Coal from 27' to 35' - Clay below 35' thin bed coal at 39'
7	15.8	75.2	36.0	24	Coal 24' to 34' - Clay 34' to 36'
8	15.6	73.7	25	24	Some coal at 25' - Lost pump at 25' abandoned hole.
9	15.6	72.5	42.5	25	Dirty coal 26' to 29' - Clay from 29' to 42.5
10	15.7	73.2	37	30	Coal and Sand from 30' to 34' - Clay from 34' to 37'
11	16.0	75.7	40	25	A little clay at 26' - Coal 26' to 30' - Clay 30' to 32' - Coal 32' - 38'
12	16.15				Stuck tools at 25' - Lost the hole
13	16.4	68.3	41	22	Clay 22' - 39' - Coal 29' to 39'
14	15.9	66.0	25	14	Coal 14' to 23' - Clay 23' to 25'
15	15.3	75.1	35	25	Coal 25' to 29' - Clay 29' to 35'
16	15.0	74.5	34	29	Sand and Coal 29' to 32' - Clay 32' to 34'
17	14.8	66.1	23	18	17' to 18' Sand and Coal - 18' to 23' Clay
18	15.5	66.2	22	18	Clay 18' to 22'
19	16.5	71.0	25	21	21' to 25' Sand pump broke at 25'

Drilled by The Office of Indian Affairs,
June, 1944

area, as the other two holes did encounter coal. Nowhere in the Mende River area was the ice found cutting through the coal beds.

A preliminary examination was made of the Kuk River deposits. These deposits at latitude $70^{\circ} 21'$ No., longitude $159^{\circ} 41'$ W. are located approximately 20 miles south of Wainwright. Two coal beds outcrop in a cut bank for a distance of one mile along the east shore of the Kuk River. The top bed is $5' 6''$ thick and the bottom one is $6'$ thick. One sample was cut across the full width of each bed. The coal from these beds is classed as subbituminous with a heat value of 11,000 B.T.U. and 5 percent ash content. (See Appendix II.)

Table 3 is a stratigraphic section through the coal series at the location where the samples were cut.

Table 3

STRATIGRAPHIC SECTION

Overburden, clay and sand	10 - 12 feet
Bone	1' - 6"
Coal	5' - 6" (sample No. G-27949)
Clay	4' - 0"
Coal	6' - 0" (sample No. G-27947)
Clay	6"
Water level in the Kuk River	

Considerable difficulty was experienced in getting supplies and equipment on to the job. The only airline serving the area had some of their planes chartered 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.

SAMPLING

Clean samples were not obtained from the churn drilling pro-

gram; 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 No. 2 at Meade River, also from bed No. 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. These samples were quartered and shipped to the Bureau of Mines laboratory. The true moisture content of these samples is also not known.

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 number 1 and drill holes number 7, 14, 13, and 3. (See Figure 3.) This estimate is the amount of coal contained in the lower bed which is 5 feet thick and which is now being mined by underground methods. The lack of evidence of severe faulting and folding makes it reasonable to assume 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 beds were prospected by three shafts and two trenches in the outcrop, indicating a strip of coal 100 feet wide along

the outcrop. This strip is 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 Kugroak River in the Peard Bay area indicates the existence of 12,000 tons of subbituminous coal. This bed is located 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.

EQUIPMENT

The mining operation of the Office of Indian Affairs at Meade River has been handicapped by difficulties caused by the war. Tractors were needed to transport coal from the mine to Barrow, but only second hand equipment could be obtained. Three used tractors of different models, were purchased necessitating carrying 3 sets of replacement parts.

It was impossible to purchase sleighs in 1943, for hauling coal so go-devils were built at Nome, and shipped to Barrow. These however, did not prove to be very satisfactory.

In 1944 heavy freighting sleighs were ordered from the States and unloaded at Nome in the fall. During the winter two of these sleighs were transported by airplane to Barrow. As yet the mine still does not have sufficient suitable equipment for transporting the coal to Barrow.

An inventory of mining equipment purchased by the Office of

Indian Affairs is as follows:

- 1 - RD-6 Tractor (badly worn)
- 1 - D-7 Tractor (fair condition)
- 4 - Sleds built in Nome
- 1 - Wanigan 5' x 12' mounted on bob sled
- 1 - Wanigan 8' x 14' mounted on bob sled
- 1 - Arc welder (new)
- 1 - Acetylene Generator with torch and fitting's
- 1 - Pumping unit - 4,400 Diesel Caterpillar
with 8" x 10" Delaval pump.
- 300' - Hydraulic pipe
- 1 - Hydraulic Giant with nozzle
- 1 - 4" airplane churn drill with tools
- 3 - Lengths of 4" drill casing

In addition one RD-7 tractor and four No. 6 sleighs are at Nome, Alaska. This equipment was to have been unloaded at Barrow last summer, but the boat did not stay long enough to discharge all its cargo.

PRESSENT OPERATIONS

From the information compiled from the preliminary examination made in June 1943 the Bureau of Mines 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 during 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 overburden was 25 feet to 30 feet deep, and it was found that pumping water to strip in Northern Alaska, is too costly at

with equipment that was 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 using the same make-shift hoisting equipment. As 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 manual-operated coal augers were used. The coal bed is 5 feet to 6 feet thick so it is not necessary to mine waste material. The frozen condition of the coal and overburden eliminated the necessity for timbering.

Approximately 80 tons of coal were mined during a 5 months period, November 1944 to March 1945 inclusive. At the present time a small quantity of coal is still being mined by these methods.

The small tonnage of coal mined during this period was not caused by difficulties encountered in mining. The same 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 encountered with frequent break downs of inadequate equipment, consequently, very little time was spent mining. However, several hundred tons of coal could have been mined if the freighting equipment had been able to handle it.

The coal mined at the Meade River is being sold to the Eskimos at cost 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. At present coal is being sold for \$25.00 per ton.

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 rooms excavated at the bottom of these shafts for storage space of ice and meat. These underground 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 entire year. The ground temperatures in the coal beds at the Meade River were found to be about 20° F. Table 4 lists the recorded temperatures taken from drill holes.

Table 4GROUND TEMPERATURES
Degrees Fahrenheit

Depth in Feet	Drill Hole 9	Drill Hole 11	Drill Hole 9	Drill Hole 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 while 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 give a thawing action. This necessitates carrying the stripping operation at least one 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 upon summer thawing, hence there is no need for rushing 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, therefore it would not be necessary to stockpile. Stockpiling requires rehandling of 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 location and equipment for underground mining is lacking.

A new shaft should be opened on the higher ground near drill hole 13. (See Figure 2.) By locating the shaft on higher ground, surface water can easily be sealed out, and there will be less tendency in

winter 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 favorable grades for tramming.

This mine will need to produce from 1,000 to 1,500 tons yearly, and will probably only be operated during the winter months. For a small operation of this type marketing mine run coal, room and pillar methods should prove the most practical system of mining. A single entry system with rooms turned off on each side at thirty foot centers should prove adequate. The maximum size room and the size pillars to be left will have to be determined by experience. Gas should not cause any difficulties in these shallow, frozen deposits.

The following list of additional equipment would be necessary to insure production of 1,500 tons of coal during a six months mining season:

- 1 - gasoline single drum hoist or a hoist to fit the RD-6 tractor, which could be used for hoisting, as it is too small for freighting.
- 1 - ton 16# rail with spikes, fish plates and bolts.
- 500 - board feet rough 4" x 4" for ties.
- 2 - 20 cubic feet Mine cars
- 1 - 1 ton skip
- Material for head frame 30 feet high.

ESTIMATES

It has been estimated ^{5/11} that Barrow will consume 1,400 - 1,500 tons of local coal per year. The following estimates of costs

5/Norman Ebbley, Jr. - PROPOSED COAL MINING POINT BARROW
AREA NORTHERN ALASKA

U. S. Bureau of Mines War Mineral Report 1944

are based upon producing this tonnage, using present freighting equipment and the additional equipment recommended for underground mining.

Freighting 1,500 tons with two cabs and 6 sleighs.

1 - Cab driver and mechanic		
8 months at \$4.00	\$ 3,200	
5 - natives		
6 months at \$150.00	4,500	
200 bbls. fuel at \$22.00	4,400	
Gasoline, oil and grease	350	
Repair parts	<u>1,550</u>	
		\$ 16,000

Mining 1,500 tons.

1 - Miner		
6 months at \$400.00	\$ 2,400	
5 - natives		
6 months at \$150.00	4,500	
Supplies - powder, gasoline, shovels ect.	<u>1,500</u>	
		\$ 8,400

Emergency air transportation of personnel and supplies	\$ 2,400	
Contingencies	<u>1,200</u>	
		\$ 3,600

Total mining and Freighting - - - - - \$ 30,000

Present cost of coal for the Government hospital and school was estimated at \$ 20,955; ^{6/} local coal needed would be 575 tons at \$ 20.00 per ton, this amounts to \$11,500. The indicated saving to the Government is \$9,455 a year which will retire a \$76,000 capital investment plus 4% interest in 10 years.

In addition the other government agencies will save an estimated \$2,800 annually.

^{6/} Work cited - footnote 5.
^{7/} See footnote 5.

CONCLUSION

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

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

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

Prospecting during the past fall and winter was limited to areas that appeared favorable for strip mining, so that the present mine equipment could be utilized. Only one small area has been located that appears suitable for this type of mining so 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 coal produced at Meade River in government installations at Barrow it would be possible for the Government to save about \$ 9,455 a year. The amount of this saving was computed by subtracting the total cost of 1,500 tons of coal produced at the Meade River Mine, and delivered from the total landed cost of coal shipped up from the United States.

Lightering coal at Peard Bay

Coal from Peard Bay
enroute to Barrow

APPENDIX I

Goal Analysis

Eskimos mining coal
Peard Bay Alaska

Drilling for coal
at Meade River Coal Mine

Sod House at Meade River

Camp at Meade River
Coal Mine

Striping at Open Pit Mine Meade River

Striped overburden building up near Open Pit at Meade River

Eskimo camp Meade River
Coal Mine

Sinking shaft with boiler
and drill at Meade River
Coal Mine

APPENDIX II

Stripping costs at Meade River Mine 1944

Estimated Yds. stripped with pump 16,000

Cost:

Labor 315 man days at \$5.00 \$ 1,575.00
 Fuel 35 bbls. at \$22.00 770.00
 Lub. Oil & Gasoline 30.00
 Foreman 3 Mo. at \$450.00 less \$990.00
 charged to tractor stripping 460.00

Total \$ 2,835.00

Estimated Yds. stripped with tractor 9,000
 Hours worked 445

Cost:

Operator 445 Hrs. at \$2.00 \$ 890.00
 Fuel 9 bbls. at \$22.00 198.00
 Gasoline 30 Gals. at \$ 0.50 15.00
 Lub. oil and grease 70.00
 Repairs 1,400.00

Total \$ 2,673.00

Cost per yard stripped with pump 17.7¢
 Cost per yard stripped with tractor 29.7¢

Cost of preparatory work 150 man days at \$5.00 . . . \$ 750.00

Total cost including preparatory work \$ 6,258.00

Average cost per yard for 25,000 25.03¢

Above costs do not include depreciation or any indirect costs.

No repairs are included on the pumping unit as this was a new machine.

However, the tractor repairs are much higher than normally required for this amount of work because this used machine was in poor condition at the beginning of the season.

Preparatory work included assembling and installing pump, assembling churn drill and drilling four holes.

COST REPORT NO. 1

Summary of Costs

	<u>SM Costs</u>
Rehabilitation	\$ 3,569.66
Drilling	2,453.89
Shaft sinking	3,576.45
Trenching	<u>211.05</u>
	\$ 9,839.05
Ledger encumbrances as of January 30, 1945	9,160.02
Items not reflected in Ledger:	
Salaries of classified personnel. . \$ 1,615.90	
G.B.I.'s	1,900.20
Est. per diem-Hobley for December	192.00
TR-50 Alaska Photo Shop	<u>4.20</u>
	12,672.32
Ledger items not chargeable to project:	2,659.77
Salaries W.A.E. personnel not on project	195.50
Refund on items returned for credit	<u>178.00</u>
Accumulated Project Costs.	\$ 9,839.05

COST REPORT NO. 2

Rehabilitation and Preparatory

Labor.	\$ 683.22
Explosives	
Timber	
Other Supplies	917.01
Rental of Equipment	
Supervision.	756.69
Transportation	1,212.74
Camp and Cooking	
Miscellaneous	
TOTALS	\$ 3,569.66

Rehabilitation covers the cost of establishing a camp at Meade River - Winterizing Camp - dismantling Meade River Camp, moving and establishing a camp at Peard Bay - dismantling camp at Peard Bay.

COST REPORT NO. 3

Churn Drilling

Labor.	\$ 522.74
Explosives	
Timber	
Other Supplies	1,129.56
Rental of Equipment	
Supervision.	709.59
Transportation	90.00
Camp and Cooking	
Miscellaneous	
TOTALS	\$ 2,451.89

COST REPORT NO. 4

Shaft Sinking

Labor.	\$ 726.27
Explosives	
Timber	
Other Supplies	1,280.47
Rental of Equipment	
Supervision.	1,205.87
Transportation	363.84
Camp and Cooking	
Miscellaneous	
TOTALS	\$ 3,576.45

COST REPORT NO. 5

Trenching

Labor.	\$ 143.65
Explosives	
Timber	
Other Supplies	63.15
Rental of Equipment	
Supervision.	34.25
Transportation	
Camp and Cooking	
Miscellaneous	
TOTALS.	\$ 241.05