

MR SEIDENHART

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Cook Inlet Coal Field

MI-104-01

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(This Copy)

By H.L. Fredley

Carbon
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To Mr. Stewart

TERRITORY OF ALASKA
DEPARTMENT OF MINES

PE 104-1

RECONNAISSANCE OF THE HOMER COAL FIELD, PARTICULARLY WEST OF
THE HOMER SPIT, (COOK INLET, ALASKA).

On July 13th and 14th, 1945, a surface examination was made of the area in and about the location of the Chas. B. Abbott and Dan Mena lease application, Anchorage Serial 010322.

At this time the weeds and grasses were already over six feet in height throughout which were numerous windfalls of brush and timber felled by old forest and grass fires. Extreme difficulty was found to face every attempt in coordinating outcrops and the distances between them and reference points.

Although the upland topography of the first bench above the beach is reasonably flat, it is backed by high bluffs and steep slopes which are deeply cut by occasional gullies. Fronting on the beach, the flat bench drops off steeply by bluffs of varying heights. In only a few places for a distance of two miles west of Homer is the beach bluff scalable by ordinary means. At the period of high tide, the waters of Cook Inlet wash the foot of the bluffs. Reference to old maps show a distinct and recognizable difference from the present shoreline, indicating an appreciable erosion of the sea bluff wall since 1917 when the maps were made.

As no maps or direct information as to the exact locations or the extent of past mining operations is available, no definite statement can be made as to the relation of caving ground above old workings, and ground subsidence in general due to the speed of erosion by wave action. It may be readily seen however, that wherever indications of mining are found, the sea wall has receded more rapidly than elsewhere.

Generalized descriptions of the topographical, structural, and other geological details of this locality may be found in US Geological Survey Bulletin 259, 277, 379, 587, 642, 714a, 739a, 755a, and 792a. Extracts of these descriptions are included in this report for ready reference.

Although much information is given in these bulletins, it has been found to be of use in a general way only. For those who are interested in definite areas for the purpose of mining, such information is limited in scope and has been of little help.

Observation of the coal measures in the sea bluff west of Homer showed a favorable comparison with the logs and stratigraphic measurements as given in the bulletins. It is noted that in Bulletin 277, the strike of the seams in the vicinity of Bluff Point (different maps and local information place Bluff Point at two different places a mile apart) and implied for the whole area, is given as N 60-70 degrees W, and a NE dip.

These strikes and dips were noted in the vicinity of Bluff Point, but to the east, at and near the site of the Old Mine, the strike was found to be E-W, and dip N. The seams near the eastern boundary of the applied for lease area were found to have strikes of N 50-60 degrees E, with dips to the NW. Although no detailed checks were made in other areas, it was found that the seams outcropping at Millers Landing on Kachemak Bay had a NE-SW strike, and dipped NW.

Observation of the north shore of Kachemak Bay from the end of the Homer Spit gave the impression that the seams were approximately parallel to the shore which has a general bearing of N 50-60 degrees E. The seams dip ~~in~~ inland or NW. In air flight over the area, the stream drainage seemed to follow a NE-SW course. It is doubted that any definite bearing can be stated as being that of the whole structure. Minor undulations in short distances cause many variations in strikes and dips as well as thicknesses.

William Maitland, who with Edward T. McNally operated a coal mine at the site of the so-called Old Mine, states that the seams at that location at Bidarki Creek (supposed to be Coal Creek on old maps) have a strike of E-W and a dip to the N. The older companys development and mining was to the east of the creek, that of Maitland and McNally to the west. From time to time, their development would break into worked out areas of earlier day mining of which there is no presently known record or local knowledge.

Mr. Maitland further stated that his development experience indicated that intense swelling of the footwall was a temporary trouble, but that after the initial swelling had ceased, normal timber sets were satisfactory for all ordinary roof support.

During his residence in the Homer area, he noted that erosion of the shore west of the Homer Spit appeared to be at the rate of about $1\frac{1}{2}$ feet per year. At this rate, the shore has receded about 60 feet since the year 1900. This would account for the scanty evidence of early day exploration and development tunnels which have been reported as being in the face of the bluffs overlooking the beach.

No reference to any disturbance or folding of the coal measures west of Homer Spit is found in the bulletins.

At any place on the bluff for a distance of about five miles west of Homer (the present town of Homer), a reef may be seen jutting out from the shore for about $\frac{1}{2}$ mile at low tide. This is about $5\frac{3}{4}$ miles west of the Old Mine location. Inspection of this reef proved it to be composed of sandstones in which there are at least ^{two} coal seams. The strike of this reef was found to be about N 45 degrees E, and the dip nearly vertical. At the point in the sea bluff, which is the landward ~~extension~~ extension of the reef, the coal seams and struct-

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ure were noted as abruptly changed in dip from nearly horizontal to vertical when viewed from the south, and from east to west. To the west of the point of vertical dip, a small stream, flowing southwesterly, enters Cook Inlet. For some distance west of this section, the ground adjacent to the beach appears to be an agglomeration of sand, gravel, boulders, and talus. This section has been considered as a landslide from the high bluffs to the north. (This is the approximate location of Bluff Point). It may be that this section to the west and north of the fold is the result of the comparative ease with which the elements have been able to erode and work the probably faulted and much disturbed structure at this point.

Nearly all evidence of the earlier mining operations have been destroyed by time, progress, or vandals. Grass and forest fires (there are indications of active underground coal fires), and the settlement of the country by homesteaders have added to the difficulties of locating section corners, wooden post monuments, and witness trees. Changes in the shoreline and or improvements in the technique of mapping make it almost impossible to use the distances and references found on old maps and sketches.

Only a few old residents can be found who have any memory of the older mining operations, and they are usually so vague or general in their statements ^{to be of} assistance in acquiring specific information.

As it is expected that any commencing operations of the lease applicants would be in that part of section 24 (T 6 S, R 14 W) south of the road intersection, more time was spent in that section than elsewhere. A section of the Cooper (?) bed outcropping in the bluff about, on the line of the east boundary of the lease area in A-010322 was found to check the log as given in Bulletin 277 except that the partings showed less clay. In freshly exposed surfaces, the partings were not so evident.

The suggested location of a slope for the planned development and mining of the coal seam is in the east half of section 24 which is not included in the lease application. The applicants are reported to have made an agreement with Frank Nemas, a homesteader who received a patent on the ground including all coal and mineral rights on May 9, 1940, whereby the applicants have the right of entry for mining purposes for a consideration. KX 104-44

This location seems to be ideal in that it is a fine camp location, it is adjacent to the road and near water, and a perfect set-up for waste disposal is at hand. The surface thereabouts is not suitable for the cultivation of crops.

The suggested plan of development is that a slope be put down on the seam at a point several hundred feet north of the beach and near the road, with a lower gangway driven out

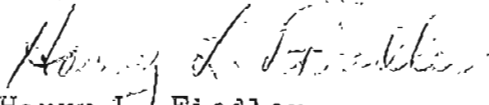
to the beach for easy waste disposal and drainage. A pillar of not less than three hundred feet to be left for the proper support of the sea bluff and bench land surface.

Although the extent of the market, or the volume of coal which it could consume cannot be readily determined, it is estimated that the settlers in the vicinity of Homer alone would use about 5,000 tons per year.

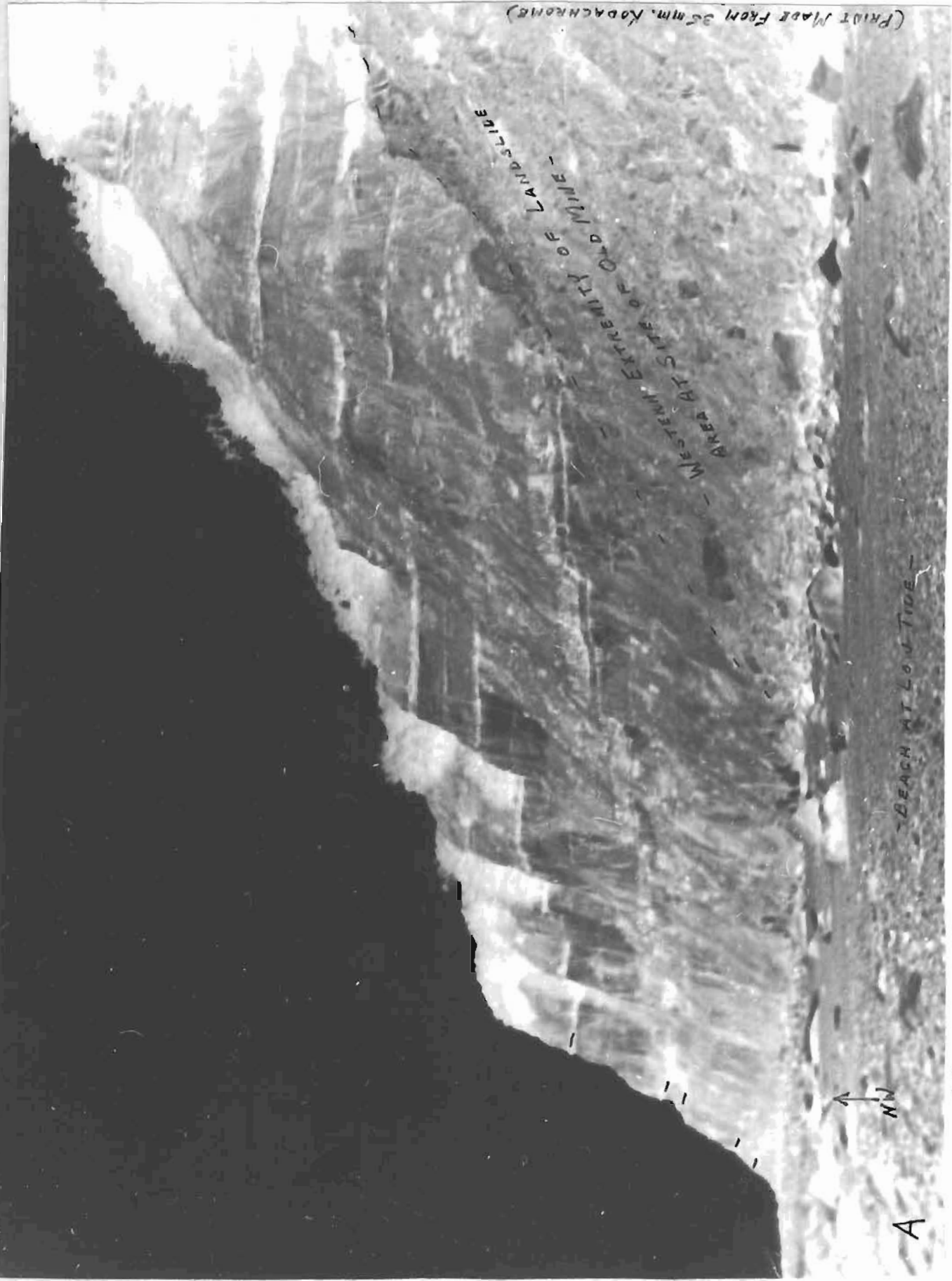
When Maitland and McNally ceased operations about 1923, their production was less than 3,000 tons per year. Their highest production had been about 15,000 tons per year.

From the above report, it is evident that the slender amount of information available would not go far in aiding any new or prospective operators in the Homer area. It is recommended that the services of the Department be used in every manner that may produce helpful results to prospective miners in this field.

Respectfully submitted,


Harry L. Fiedler,
Associate Mining Engineer

Anchorage, Alaska
December 10, 1946



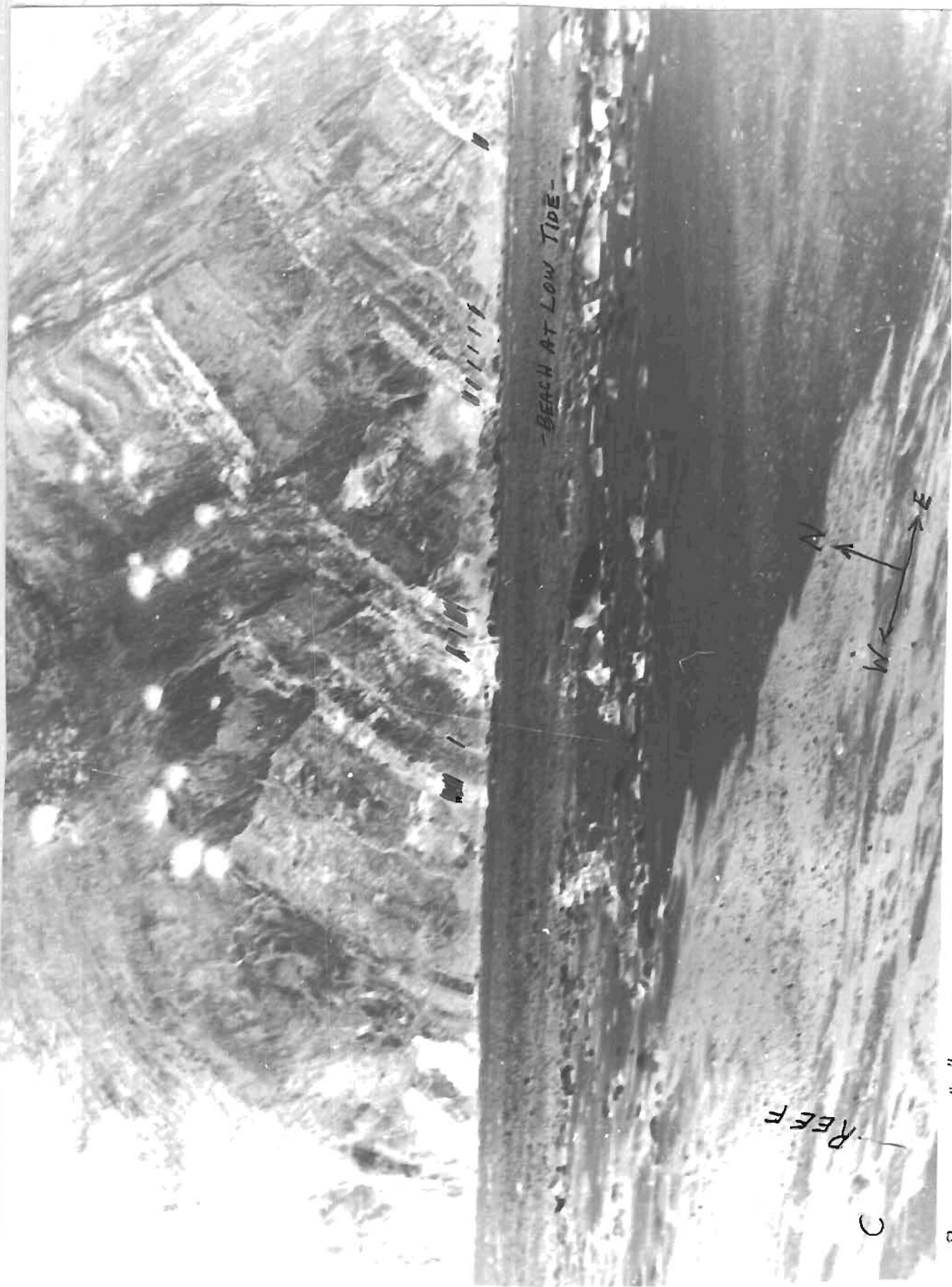
PHOTOGRAPH "A", AS SHOWN BY LOCATION ON MAP - WHITE BANDS ARE COAL SEAMS (MARKED - -)



B

PHOTOGRAPH "B", AS SHOWN BY LOCATION ON MAP.

- WHITE BANDS ARE COAL SEAMS.



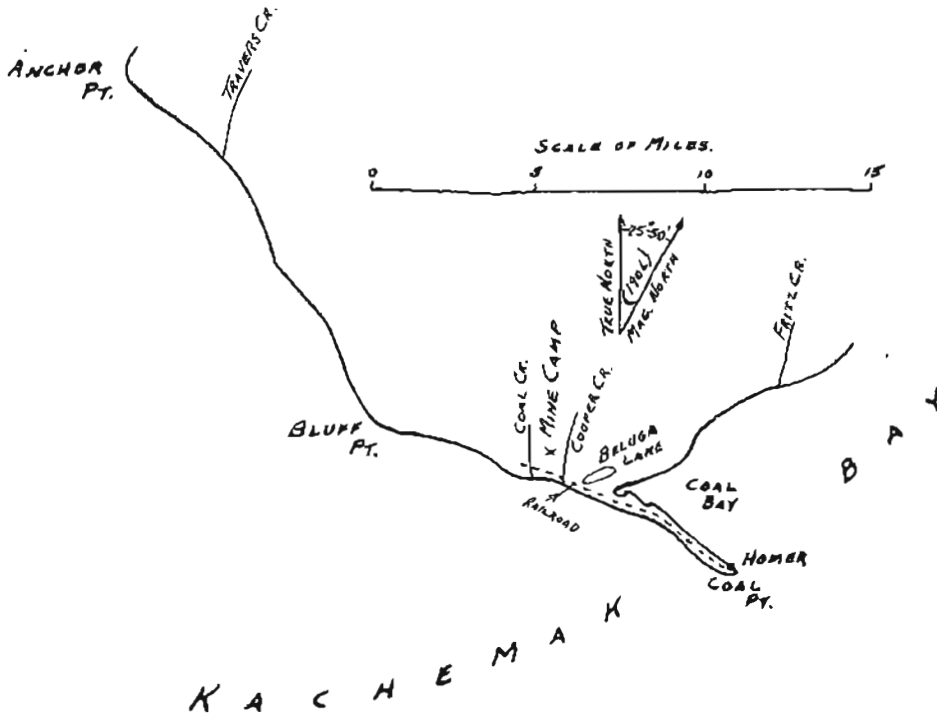
- BEACH AT LOW TIDE -

REEF
C

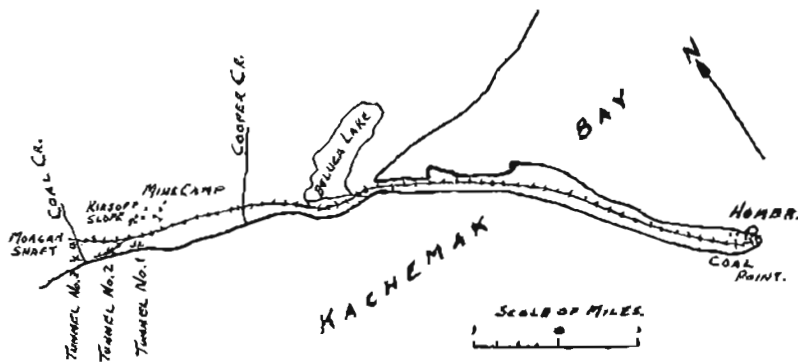


PHOTOGRAPH "C", AS SHOWN BY LOCATION ON MAP. - WHITE BANDS ARE COAL SEAMS.

FROM - U.S.G.S. BULLETIN 277,
PLATE XIII



FROM - U.S.G.S. BULLETIN 277,
FIGURE 5.



SKETCH MAP OF COOK INLET COAL FIELDS COMPANY'S OPERATION.

USGS Bulletin 259, (1904), pages 155, 156, 157,

The north shore (of Kachemak Bay) is comparatively smooth, while the eastern and southern shore is made irregular by coves, headlands and islands. A great plateau having a general elevation of 1000 feet lies north of the bay, and the north shore is a bluff which varies in height from 50 to 400 feet. The bluff is cut by canyons at a number of places between Homer Spit and the head of the bay. On the south side of the bay is a mass of rugged mountains, with six glaciers. Large vessels can go up to Bear Cove, although the head of the bay and the north shore are very shallow. The tidal range is from 16 to 28 feet at Homer.

The geology as well as the topography of the two sides of Kachemak Bay presents strong contrasts. Crystalline or schistose rocks compose the mountains on the south side. On the north side of the bay is an extensive Tertiary lignite-bearing series known as the Kenai formation. From Anchor Point to the head of the bay, a distance of 40 miles, coal seams are almost continuously exposed, interbedded in soft sandstone, shale, clay, and fine conglomerate. These rocks strike nearly east (magnetic), and dip northward at angles as high in places, as 20 degrees. A thickness of between 2000 and 3000 feet of strata is exposed in the sea bluff from Anchor Point to the head of the bay. It is impossible to determine the exact thickness because there are stretches over which the beds can not be traced, and faults of unknown throw disturb the strata. Anchor Point is near the base of the series, but the head of the bay probably does not reach to the top, for coal has been found 15 miles further inland.

The westernmost coal seams in this bay outcrop between tide levels half a mile south of Anchor Point, while the first exposures above high-tide level are 3 miles southeast of the point near the mouth of Travers Creek or Troublesome Gulch. A seam at this locality is said to be about 5 feet thick, of which the middle portion is very hard and shiny. Some chunks of it will melt and coke like bituminous coal when put on the fire.

In the cliff at Bluff Point, 471 feet of strata contain 18 feet of coal in seams ranging in thickness from 3 inches to 4 1/2 feet. The character of the series is shown by a typical section measured near the mine camp at the west end of the Cook Inlet Coal Fields Company Railroad.

SECTION OF KENAI FORMATION AT MINE CAMP⁽¹⁾, KACHEMAK BAY.

Sandstone	30	0	Clay shale	3	7
Clay shale	25	0	Coal	0	5
Coal	7	5	Clay shale	12	0
Clay shale	30	0	Coal	0	5
Coal(samp. 3)	2	9	Clay shale	26	0
Shale	16	0	Sandstone	40	0
Sandstone	20	0	Clay shale and		
Coal	2	5	coal streaks	18	0
Clay shale	9	1	Coal	1	11
Coal	1	5	Clay shale	34	0
Clay shale	15	3	Sandstone	2	0
Sandstone	11	10	Coal	0	10
Clay shale	16	0	Sandstone to beach		
Coal(Cooper Seam, samp.No. 4)	6	6		50	0
			total	382'	10"

USGS Bulletin 259, pages 155, 156, 157 continued. (1904)

In this section there are 9 coal seams, having a total thickness of 24 feet. The smallest seam in the section is 5 inches and the largest 7 feet 5 inches. The rocks dip slightly to the east along the shore and at an angle of 15 or 20 degrees into the bluff. It is at this point that the greatest amount of development work has been done.

The Cook Inlet Coal Fields Company chose this as the best portion of the field for developing a large mine, and began extensive operations in 1899. They constructed a railroad 7 1/2 miles long which extends from their dock at the outer end of Homer Spit back to the mainland, and ends at Coal Creek. A house and store, with over a dozen tool, engine, and storage houses were built at the dock and this group of buildings is known as Homer. Eight or ten buildings constituting the mine camp were erected at the other end of the railroad, and underground work was begun in the fall of 1899 by driving a three-compartment shaft 125 feet. In 1900 tunnel No. 1 was driven in the face of the bluff on a seam of coal 6 1/2 feet thick, but it proved to be very wet and was abandoned. Tunnel No. 2 was driven 350 feet and had to be pumped to keep it dry. Coal was brought to the mouth of the tunnel in mine cars, dumped into a skip, and hoisted up over the bluff by a square framed derrick which spilled into a railroad car standing on the spur. At the west end of the railroad a vertical three-compartment shaft was sunk over 25 feet and a tunnel was started on coal in the sea bluff to connect with the shaft. This third or Ray tunnel was driven 125 feet. All work on this property was discontinued in March, 1902, but the company holds possession by retaining a representative on the ground.

Detailed sections of two seams exposed in the sea bluff near tunnel No. 2, the position of which in the section of the formation given above can be recognized by their total thickness, follow.

The first and thickest seam, which is over 50 feet below the top of the bluff at the hoist, measures thus:

<u>COAL SEAM AT MINE CAMP, KACHEMAK BAY.</u>		
Bony coal and clay	2	0
Clay shale	1	8
Coal	2	6
Clay parting	0	2
Coal	1	1
total	7'	5"

Following is the section of the bed on which the tunnels were driven:

<u>COAL SEAM AT MINE CAMP, KACHEMAK BAY.</u>		
Coal	3	0
Clay parting	0	0.5
Coal	1	11
Clay parting	0	1.5
Coal	1	5
total	6'	6"

Other seams of coal that lie below those named in the long section above are found below high tide off the point beyond Coal Creek.

USGS Bulletin 259, pages 155, 156, 157 continued. (1904)

The coal in the section at the mine camp is hard, compact, glossy lignite. It is clean, does not smut the hands, and tends to break into cubical fragments when dried.

USGS Bulletin 259, pages 159, 160. (1904)

The Kachemak Bay coals carry a large quantity of moisture and it seems probable that 15 to 20 per cent is the amount that would be held by the market-ed coal.

The fuel ratio of the coal from the bay is low and its bulkiness is also an objection. It can be mined in large quantity without much difficulty and is an excellent house coal, but the demand for it is small in this region. This coal will make steam readily and might be used locally if it were offered for sale at the proper price. If put on the market, Kachemak Bay coal would have to compete with higher grade lignites from Puget Sound and bituminous coal from Vancouver Island. It could do this successfully in a few Alaska markets if mined on such a large scale as to be sold at a low price, commensurate with its quality.

ANALYSES OF COALS FROM MINE CAMP, KACHEMAK BAY.

#3	20.87mstr	40.71vol	33.29fx	cb	5.13 ash
4	19.26	43.95	28.74		8.05
7	19.22	41.22	31.96		7.60

Sample 3 in the above table was taken from the outcrop of the two foot 9 inch seam near the west end of the Cook Inlet Coal Fields Company Railroad, Kachemak Bay; sample 4 came from 50 feet inside tunnel No. 3 at the mine camp; sample 7 represents 30 inches of a 4 1/2 foot bed occurring below tide about 500 feet off shore near Coal Creek.

USGS Bulletin 277, pages 55, 56. (1906)

Since 1899 the Cook Inlet Coal Fields Company has held possession of the most desirable part of the coal field on the north shore of Kachemak Bay. This is the portion which lies to the west and within 3 miles of the base of the long spit known as Coal Point.

Under the management of this company a large dock was built on the east side of Coal Point, where there is a protected anchorage. A 42 inch gage railroad was constructed from the dock along the spit to the mainland, where it rises to the top of the bluff about 200 feet above the beach and ends at Coal Creek. Two shafts were started and three tunnels were driven on a 6 1/2 foot coal seam which outcrops in the sea bluff between Cooper and Coal Creeks. Underground work was begun in the fall of 1899 by driving the first of these shafts, which is known as the Kirsopp slope, because it was excavated under the direction of John Kirsopp, an English mining engineer. This shaft had three compartments and was carried 125 feet, when it was discovered that the slope of the shaft was so nearly parallel with the dip of the coal that it would have to be driven nearly 1800 feet to reach the coal. In 1900 tunnel No. 1 was driven in the face of the bluff on a seam of coal 6 1/2 feet thick. It proved to be very wet and was abandoned. Tunnel No. 2, on the same seam, was driven 350 feet and had to be pumped to keep it dry. Coal was brought to the mouth of the tunnel in mine cars, dumped into a skip, and hoisted over the bluff by a square-framed derrick which spilled into a railroad car standing on the spur track. At the west end of the railroad, a vertical 3-compartment shaft, known as the Morgan shaft and contemporaneous with tunnel No. 1, was sunk over 25 feet, and a tunnel was started on coal in the sea bluff near Coal Creek to connect with the shaft. This third, or Bay, tunnel was driven 125 feet when work at that end of the field was discontinued and efforts were concentrated on getting coal out from tunnel No. 2. During the winter of 1901-2 the mail steamer "Discovery" was supplied continuously with fuel and other vessels occasionally. All work on the property ceased in March 1902, but the company holds possession by retaining a representative on the ground. No money or effort is being expended, however, in keeping the railroad or mine tunnels in repair. Eight buildings at the mine camp and 20 at Coal Point at Homer, which was the company's headquarters, are in good condition. Figure- 5-(P.1) shows the location of the development work done by this company.

The production of this region is estimated as follows:

Port Graham	2700 tons
Kachemak Bay:	1090
Taken by Schwerin	200
Mined by Curtis	650
Taken by tug "Kodat"	15
On cars at Homer	80
Heap at Cook Inlet C F C mine	20
Sold at Homer	125
total	<u>3790</u> tons

USGS Bulletin 277, page 57, 58, 59. (1906)

The Kenai formation as exposed in Kachemak Bay is composed of soft, light-gray sandstones and clay shales, with numerous interspersed coal seams. **** the formation, aggregating 1763 feet of strata, ****. ***(it) show(s) that coal seams ranging in thickness from a few inches to 7 feet are distributed throughout the portion of the formation represented. It appears also that

USGS Bulletin 277, pages 57, 58, 59 continued. (1906)

350 feet at the top of the Valle Creek section, which is the highest geologically contain no sandstone, but are composed entirely of shale and coal. It can not be said with certainty that the lower portion of the formation is characterized by an abundance of sandstone and the upper part by a lack of it, although there is a suggestion that this may be the case. The sandstones are medium-grained, soft, light gray, sometimes iron stained, and occur in beds from a few inches to 30 feet thick. Cross-bedding was noted at one horizon. Some portions of the heavier beds of sandstone are hard and weather out in nodular blocks. In these blocks the best preserved fossil plants are sometimes found. In one locality lenses of grit occur in a sandstone mass. The pebbles in the grit are smaller than one-half inch in diameter and are mostly quartz. Dall reports conglomerates in the Kenai series on Kachemak Bay, but the author (Stone) found none in the portion he visited. Sandstone at places grades into sandy shale.

The shales of the Kenai formation on Kachemak Bay are all light-colored clay or mud rocks, grading on one side into arenaceous shale and on the other into clay. The shales are soft and crumbly on the outcrop, and when wet become plastic. Beds of clay that have been baked by the burning of coal seams are red and hard. Small blocks of gray, hard limestone were found at one locality and suggest that calcareous sediments in small amount may be contained in the formation. Limestone was not seen in place.

The abundant coal seams in the Kenai rocks of this field are all lignite. They vary in thickness from mere streaks to beds several feet thick. Eldridge counted 38 seams along the beach at Tyonok, varying in thickness from a foot to 15 feet, and Mirsopp figures 73 seams on the north shore of Kachemak Bay. Much of the Kachemak Bay lignite, especially that in the lower beds, is hard and glossy, clean to handle, and tends to break cubically. The higher beds, however, are dull and lighter and show more woody fiber.

***Estimated roughly, there probably are about 1500 feet of strata between Bluff Point and the base of Coal Point. ***

The Kenai formation in Kachemak Bay and vicinity is very gently folded and has suffered but little faulting. North of the bay four broad folds, which probably trend generally east and west, are described by the coal-bearing beds under the Kenai Plateau. Along the shore of the bay the strike is generally about N 65 degrees W. and the dip is northeast at low angles. The few faults which were noted seemed to be small.

It is reported that several seams of coal outcrop between high and low tide one-half mile south of Anchor Point. One seam is said (by Fred Reist, prospector) to be 8 1/2 feet thick and harder than coal found elsewhere in this bay. These coal beds off Anchor Point are probably in the lowest Kenai exposed Kachemak Bay. Coal also occurs a few feet above high tide at the mouth of Travers Creek, 3 miles east of Anchor Point. The seam is 5 feet thick, and the middle portion, about 2 feet thick, is a hard, shiny coal which is considered by those who have used it (Fred Reist and Fred Barker, prospectors) to be of higher grade than that found further east. Some of it is said to melt and cake like Pittsburg coal when ignited. This coal is bright, blocky, ignites quickly, and does not soil the hands.

USGS Bulletin 277, pages 60, 61, 62. (1906)

At Bluff Point, 12 miles northwest of Homer, a cliff has been formed by a landslip extending parallel to the coast for a mile. In this cliff the Kenai formation is beautifully exposed. The top of the bluff, which is one-eighth mile back from the beach and 600 feet high, is a broad meadow, bordered with spruce. A section of the formation measured at this point by T. W. Stanton and the writer (Stone) is as follows:

PARTIAL SECTION OF KENAI FORMATION AT BLUFF POINT.					
Sandstone with thin coal streaks	40'	0"	Coal (section below)	3'	11"
Massive crossbedded sandstone	20	0	Clay shale	15	0
Massive sandstone	15	0	Bony shale	0	6
Arenaceous shale	15	0	Clay shale	10	0
Coal	2	6	Sandstone	5	0
Bluish clay shale	15	0	Coal	0	7
Coal	0	5	Clay shale	20	0
Carbonaceous clay shale	1	3	Coal	0	9
Coal	1	3	Clay shale	1	3
Clay shale	30	0	Sandstone	10	0
Sandstone	10	0	Clay shale	1	0
Coal	2	6	Coal	0	3
Clay shale	10	0	Clay shale	2	0
Coal	1	0	Coal	0	3
Clay shale	35	0	Clay shale	3	6
Sandstone	20	0	Bony coal	0	1
Clay shale	5	0	Clay shale	60	0
Coal (section below)	4	6	Sandstone lenses	0	10
Clay shale with sandstone lense	40	0	Clay shale	65	0
Coal	0	6	Beach		
Clay shale	0	10			
Carbonaceous shale	0	10	total	<u>470'</u>	<u>11"</u>

In this bluff the strata strike about N 65 degrees W., or parallel with the coast line, and dip northeast. The sandstones are medium course grained, soft, quartzose, and often somewhat iron stained. Shale which is so soft that it crumbles readily forms the greater part of the bluff. Eighteen feet of coal in 13 seams ranging in thickness from 3 inches to 4 1/2 feet are interbedded with the shale and sandstone, all of black, glossy lignite. Detailed measurements of the two largest seams in the section given above are as follows:

SECTION OF COAL SEAM AT BLUFF POINT.

Coal and shale	0'	10"
Coal	0	11
Shale parting	0	3
Coal	0	9
Shale parting	0	1
Coal	0	3
Shale parting	0	2
Coal	1	3
total	<u>4'</u>	<u>6"</u>

A thinner seam 42 feet below the one just given and about 180 feet above the beach has about the same amount of coal with less waste.

USGS Bulletin 277, pages 60, 61, 62 (continued) (1906)

SECTION OF COAL SEAM AT BLUFF POINT.

Coal	2'	6"
Shale parting	0	2
Coal	1	3
total -	<u>3'</u>	<u>11"</u>

MINE CAMP.- That portion of the north shore which lies just west of Coal Point may be called the mine-camp district. It lies at the west end of the Cook Inlet Coal Fields Company's railroad, 7 miles from Homer. The coal-bearing series is exposed in a cliff which is 250 feet high at a point three-fourths mile west of the mine camp but which decreases in elevation toward the east and disappears before reaching the base of Coal Point. A view of this cliff shows a number of coal seams.

A section whose base is as high stratigraphically as the top of the one at Bluff Point was measured near the mine camp. The lower part was obtained at the point near Coal Creek and the upper part one-half mile farther west. The combined section is as follows:

PARTIAL SECTION OF KEMAL TERRACE AT THE MINE CAMP, KACHEMAK BAY.

(See section as shown in excerpt for USGS Bulletin 259, pages 155, 156, 157.) (PAGE 9)

Between the two places where the section was measured there is some variation in the character and sequence of the strata. At the point the section seems to be composed more largely of sandstone, and the coal 42 feet above the Copper Seam appears to be absent. The sandstones are only partly consolidated and are less resistant to weathering than the coal, while the shales, which are soft and crumbly, sometimes contain hard lenses and a few clay ironstones.

Exposed in this cliff are three coal seams, whose position in the preceding section can be recognized by their total thickness. The first and thickest seam, which is more than 50 feet below the top of the bluff where the section was measured at the end of the railroad spur, is composed of the following beds:

COAL SEAM AT THE MINE CAMP, KACHEMAK BAY.

Bony shale and clay	2'	0"
Clay shale	1	8
Coal	2	6
Clay parting	0	2
Coal	1	1
total -	<u>7'</u>	<u>5"</u>

The next section is the third seam from the top of the bluff:

USGS Bulletin 277, pages 60, 61, 62 (continued) (1906)

COAL SEAM AT THE MINE CAMP, KACHEMAK BAY.

Coal	1'	7"
Clay parting	0	4
Coal	0	6
total -	2'	5"

Following is the section of the Cooper seam, on which three tunnels were driven by Cook Inlet Coal fields Company:

COOPER SEAM AT THE MINE CAMP, KACHEMAK BAY.

Coal	3'	0"
Clay parting	0	0 $\frac{1}{2}$
Coal	1	11
Clay parting	0	1 $\frac{1}{2}$
Coal	1	5
total -	6'	6"

Other seams of coal lying lower than those given in the section on page 61 are found below high tide at the point near Coal Creek. The first one outcrops about 350 feet from the base of the point and appears to be about 6 feet thick. It has an upper bench at least 15 inches and a lower one 30 inches thick. The strike of this seam across the beach is N 58 degrees W. and the dip north. The interval between this coal and the base of the formation given above (page 61) seems to be occupied by sandstone. Outcropping parallel to it and 130 feet farther offshore is another seam, which is 4 feet 5 inches thick and strikes N 80 degrees W. Still farther offshore and exposed only at very low tide is a 1-foot seam.

The coal in these seams is hard, compact, glossy lignite. It is clean, does not smut the hands, and tends to break in cubical fragments. When exposed to the weather its content of moisture causes it to slack down to fine chips. Carloads of coal that have been standing at Homer for three years****(show) only a small amount of disintegration,***** but the blocks are so deeply weathered that they easily break into pieces. The composition of these coals will be discussed later.

The rocks dip slightly to the east along shore and at an angle of 15 degrees or 20 degrees into the bluff. There are nine coal seams in the mine camp bluff, having a total thickness of 24 feet, as shown in the section on page 61. The smallest seam in the section is 4 inches and the largest 7 feet 5 inches thick.

This portion of the Kachemak Bay coal field, lying west of Coal Point, was the scene of considerable development work by the Cook Inlet Coal Fields Company, as described on page 55.

USGS Bulletin 379, page 116. (1909)

*****. The Homer field includes the land bordering Kachemak Bay and northward to Cape Kasilof. There are at least 1,000 square miles in this field. *****

(This) coal field is in a lowland area. A sea cliff forms the shore line, and the upland surface has a rolling topography, with low

USGS Bulletin 379, page 116 (continued) (1909)

hills and shallow depressions characteristic of areas mantled by glacial drift. *****. From Cape Kasilof southward to Anchor Point and thence eastward for several miles beyond the Homer Split the shores of Cook Inlet and Kachemak Bay are bordered by a cliff that ranges in height from 50 to 400 feet, in which the coal beds occur.

USGS Bulletin 379, pages 121, 122. (1909)

About $1\frac{1}{2}$ ^{miles} southeast of Anchor Point seams of lignite appear in the beach at extreme low tide. These seams vary from 12 to 20 inches in thickness, strike about N. 50 degrees E., and dip from 10 degrees to 15 degrees SE. The lignite is bright and clean and breaks with a cubical fracture, but lignite in such thin seams is not of much economic value. Southeastward to Troublesome Gulch several more thin seams of high-grade lignite outcrop. The strike remains the same as that farther west, but the dip is toward the north, or into the bluff. This change in the direction of the dip indicates a gentle fold in the strata. Between Troublesome Gulch and the mouth of Diamond Creek a low anticlinal fold appears along the beach. About $1\frac{1}{2}$ miles east of Troublesome Gulch a lignite seam with the following section outcrops:

SECTION OF LIGNITE NEAR TROUBLESOME GULCH.

Coarse sand	-	-
Lignite	2	
Carbonaceous shale		3
Lignite	1	9
Clay	-	-

*****. Three-fourths of a mile west of Diamond Creek a seam of lignite $3\frac{1}{2}$ feet thick was sampled*****. The section here is as follows:

SECTION OF LIGNITE NEAR DIAMOND CREEK.

Carbonaceous shale	1'	3"
Lignite		3
Carbonaceous shale		5
Lignite	1	
Shale		2
Lignite	2	7
Clay	-	-

The next important outcrops are at Bluff Point, near the old coal mines of the Cook Inlet Coal Fields Company. This part of the field and the area extending eastward to the head of the bay have been examined by Stone (Bull. 277), to whose report the reader is referred for details. In this part of the field 2,000 to 3,000 feet of coal-bearing rocks are exposed; these include an aggregate of over 60 feet of workable coal beds, the thickest bed of which is about 7 feet. *****

Though some mining has been done at Kachemak Bay for many years, the entire production (1908) probably does not exceed a few thousand tons. During the summer of 1906 the coal lands northwest of Homer were surveyed for patents in 160-acre claims. This work included all the land bordering the shore from the mine camp, near tunnel No. 1 westward to a locality

USGS Bulletin 379, pages 121, 122 (continued) (1909)

within 2 or 3 miles of Anchor Point, and inland throughout this coastal belt for about 3 miles. In 1907 patent surveys were continued in this field and one shaft was sunk on the McDougal property, a recently staked claim, to a depth of 141 feet 6 inches. The following record from the surface downward is reported at this shaft:

RECORD OF SHAFT ON THE MCDUGAL PROPERTY, KACHEMAK BAY.

Drift, probably glacial material and recent alluvium	85'
Sandstone	45
Soapstone	5
Coal	6 6"

No very definite report of progress in this field has been received for the season of 1908, but there does not seem to have been much activity.

COAL SAMPLE ANALYSES.

- No. 4429. North shore of Kachemak Bay, 1 mile west of Homer Spit; 6-foot bed.
- No. 4426. North shore of Kachemak Bay, three-fourths of a mile west of Diamond Creek, several miles southeast of Anchor Point.
- No. 4432. North shore of Kachemak Bay, 1½ miles east of Troublesome Gulch, several miles southeast of Anchor Point.

SAMPLES AS RECEIVED.

No.	Air-dry. Loss	Moist-ure	Volat-ile	Fix. carbon	ash	sulfur	BTU
4429	9.40	18.59	36.13	34.92	10.36	0.34	8,548
4426	19.40	28.06	33.51	32.81	5.62	0.19	7,812
4432	7.50	19.95	35.88	29.18	14.99	0.41	8,053

USGS Bulletin 587, page 68 to 74 inclusive. (1915)

The Kenai formation is probably about 1,800 or 2,000 feet thick. Two measured sections *** contain about 1,800 and 1,700 feet of beds, and neither the top nor the bottom is exposed. These sections undoubtedly overlap and are possibly complete duplicates, but the beds in one can not with certainty be correlated with those in the other.

The rocks of the Kenai formation consist of partly indurated sands and clays, probably of about equal volume, the individual beds being generally not more than 20 or 30 feet thick, though a few measure more than 100 feet, interbedded with a few inconspicuous conglomerates and with many beds of lignite. The rocks are in general sufficiently indurated to stand up readily in almost vertical cliffs several hundred feet high, yet they may be easily cut with the point of a pick or knife. A few beds are more thoroughly indurated but they ~~are~~ apparently owe their greater consolidation to the growth of concretions or to other local cementation.

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The argillaceous beds are mostly gray or blue, though rarely white, soft, plastic when wet, and have imperfectly developed shaly fracture.

Most of the sandy beds are composed of fairly well sorted and clean-washed white quartz sand, and contain not very abundant ferromagnesian grains. Some beds are feldspathic.

The coal beds are numerous, but most of them are of only moderate thickness. The measured stratigraphic sections show that 3 to 5 per cent of the total thickness of rock consists of coal beds 3 to 7 feet thick.

Neither the base nor the top of the formation has been observed. It apparently contains no beds of marine origin.

Section Between Anchor Point And Homer Spit.

The exposures of Tertiary rocks in the cliffs between Anchor Point and Homer Spit are not continuous, being interrupted by landslides and deposits of Quaternary gravels. The general dip is southeastward, so that the outcrops nearest Anchor Point reveal the lowest Tertiary beds in this part of the section. It is impossible to describe the entire section with certainty, for there is no evidence as to the amount of dip or the presence of faults in the stretches in which the Tertiary beds are concealed. The exposures observed will be described and their probable stratigraphic relations will be considered. From the data thus presented an approximately complete section of the rocks can be compiled.

The only deposits exposed in the first 2-3/4 miles southeast of Anchor Point are Quaternary gravels and a few small scattered outcrops (?) of lignite at the base of the cliff or far out on the beach at very low tide. A 2-foot bed of lignite is exposed at the mouth of a creek 2-3/4 miles south of Anchor Point, at an elevation of about 10 feet. The dip at this point, or at least the component showing in the cliff face, is about 2 degrees SE., which carries the coal below tide within a short distance. What was regarded as the same coal was seen far out on the beach a quarter mile farther southeast. In the next quarter of a mile several gentle folds cause a repetition of either this bed or of one near its horizon. An anticline 4 miles south of Anchor Point has maximum dip of 6 degrees on each flank for short distances, beyond which the dips flatten out to very low angles. Half a mile farther south the following section was measured:

SECTION OF SHORE CLIFFS ABOUT 4 1/2 MILES SE OF ANCHOR POINT.

Coarse sand at top	
Coal (1)	24"
Carbonaceous shale	3
Coal (1)	21
Clay	

(1) included in sample No. 4432.

The bed that overlies the coal consists of white sand with a stratum of 2-inch pebbles at its base. It rests unconformably upon the coal and is probably Quaternary. This sand forms the lower part of the cliff for the next half mile, to the mouth of the next creek, where there are exposures of clay,

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dark sands, and coal beds that dip gently southward. A short distance farther south the following section was measured:

SECTION OF SHORE CLIFFS ABOUT 5 MILES SE OF ANCHOR POINT.

Glacial deposits	20'	0"
Sandy shale	20'	0"
Coal		11
Shale		2
Coal		9
Clay		1½
Coal		5
Shale		2
Coal		9
Shale	1	11
Coal	1	11
Clay	2	3
Shaly sandstone	10	0
Clay	1	0
Coal with clay partings	2	6
Shale		4
Sandstone	10	0
total -	53'	2½"

The dip is southward at a low angle, the beds exposed in the above section passing below the beach in about half a mile. The exposures are then obscured by landslides for about a quarter of a mile, the next outcrop showing the following section:

SECTION ABOUT 5-¾ MILES SOUTHEAST OF ANCHOR POINT.

Sandy shale		
Coal	3'	0"
Clay	2	5
Coal	2	0
Carbonaceous shale		4
Clay	2	4
total -	10'	1"

The following section, exposed farther southeast, is regarded as immediately overlying the preceding:

SECTION ABOUT 6 MILES SOUTHEAST OF ANCHOR POINT.

Glacial deposits		
Sand & clay with large sandstone nodules	20'	0"
Coal	1	3
Sandy clay		6
Thin alternating beds of coal & clay	3	0
Sandy clay	6	0
Coal & clay in alternat. beds up to 4" thick	3	0
total -	33'	9"

The following section represents beds which probably immediately over-

lie those of the section just described:

SECTION ABOUT 6 $\frac{1}{2}$ MILES SOUTHEAST OF ANCHOR POINT.

Lignite & shale in thin alternating beds	4'	0"
Sandstone with concretionary masses	10	0
Shale	3	0
Coal	2	3
Clay		4
Coal	1	4
Carbonaceous shale		3
Shale	5	0
Shale with lignite bands	3	0
Carbonaceous shale		1
Coal		5
total -	29'	8"

Quaternary deposits and landslides conceal the rocks for some distance southeast of this point. The next exposures show the following section:

SECTION ABOUT 7-1/8 MILES SOUTHEAST OF ANCHOR POINT.

Quaternary deposits.		
Coal and shale		3'
Sandstone and shale	10	
Coal and shale in thin alternating beds	8	
Sandstone and shale	15	
Sandy shale with coal beds	2	
Sandstone and shale	20	
Coal with shale partings	4	
Sandy clay	4	
Coal		2
total -		68'

The following section,***which was measured a little farther southeast, immediately follows in stratigraphic sequence:

SECTION ABOUT 8 $\frac{1}{2}$ MILES SOUTHEAST OF ANCHOR POINT.

Quaternary deposits.		
Coal and shale in thin alternating beds	6'	0"
Coal	1	3
Sandstone and shale with thin beds coal	25	0
Coal with shale partings	2	0
Shale and sandstone	13	9
Carbonaceous shale	1	3
Coal		3
Carbonaceous shale		5
Coal		1
Carbonaceous shale		2
Coal (1)	2	7
Shale	8	0
Shale with thin coal beds	25	0
total -	85'	9"

(1) included in sample No. 4426.

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The next 100 feet of strata contains eight or ten thin coal beds separated by shales.

The following section, measured at Bluff Point ***, overlies these beds, a very small, if any, interval lying between and the rocks being practically horizontal:

SECTION OF PART OF KENAI FORMATION AT BLUFF POINT.

Sandstone with thin coal streaks	40'	0"
Massive cross-bedded sandstone	20	0
Massive sandstone	15	0
Arenaceous shale	15	0
Coal	2	6
Bluish clay shale	15	0
Coal		5
Carbonaceous clay shale	1	3
Coal	1	8
Clay shale	30	0
Sandstone	10	0
Coal	2	6
Clay shale	10	0
Coal	1	0
Clay shale	35	0
Sandstone	20	0
Clay shale	5	0
Coal, Cooper bed (section below):		
Coal and shale		10
Coal		11
Shale parting		3
Coal		9
Shale parting		1
Coal		3
Shale parting		2
Coal	1	3
Clay shale with sandstone lens	40	0
Coal		6
Clay shale		10
Carbonaceous shale		10
Coal	2	6
Shale parting		2
Coal	1	3
Clay shale	15	0
Fony coal		6
Clay shale	10	0
Sandstone	5	0
Coal		7
Clay shale	20	0
Coal		9
Clay shale	1	3
Sandstone	10	0
Clay shale	1	0
Coal		3
Clay shale	2	0
Coal		3

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Clay shale	3'	6"
Bony coal		1
Clay shale	60	0
Sandstone lenses		10
Clay shale	65	0
Beach.		
total -	470'	11"

The following section, exposed at Mine Camp, is practically a duplicate of the Bluff Point section. Minor differences in detail may be noted.

SECTION OF PART OF KENAI FORMATION AT MINE CAMP.

Sandstone	30'	0"
Clay shale	25	0
Bony coal and shale clay	2	0
Clay shale	1	8
Coal	2	6
Clay parting		2
Coal	1	1
Clay shale	30	0
Coal (1)	2	9
Shale	16	0
Sandstone	20	0
Coal	1	7
Clay parting		4
Coal		6
Clay shale	9	1
Coal	1	5
Clay shale	15	3
Sandstone	11	10
Clay shale	16	0
Coal(COOPER seam):		
Coal (2)	3	0
Clay parting		$\frac{1}{2}$ "
Coal (2)	1	11
Clay parting		$\frac{1}{2}$ "
Coal (2)	1	5
Clay shale	3	7
Coal		5
Clay shale	12	0
Coal		5
Clay shale	26	0
Sandstone	40	0
Clay shale & coal streaks	18	0
Coal	1	11
Clay shale	34	0
Sandstone	2	0
Coal		10
Sandstone to beach	50	0
total -	382'	10"

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The sections recorded above aggregate about 855 feet of strata ($4\frac{1}{2}$ per cent coal), no allowance being made for concealed beds. As the places where the beds are concealed are near outcrops in which the rocks are practically horizontal, the missing strata are probably not very thick. It is quite as probable that the apparent thickness is reduced by reversed dips in these intervals as it is that there is any appreciable increase.

Other beds of coal lying lower than those given in the (Bluff Point) section ***are found below high tide at the point near Coal Creek. One outcrop about 350 feet from the base of the point and appears to be about 6 feet thick. Its upper bench is at least 15 inches and a lower one is 30 inches thick. The strike of this bed across the beach is N 58 degrees W. and the dip is north. The interval between this coal and the base of the (Mine Camp) section given above seems to be occupied by sandstone. Outcropping parallel with it and 130 feet farther offshore is another bed, which is 4 feet 5 inches thick and strikes N 80 degrees W. Still farther offshore and exposed only at very low tide is a 1-foot bed.

The section from Anchor Point to Homer Spit certainly lies beneath at least the larger part of the Kachemak Bay section, which is described below. No exact correlation of the beds of the two sections is possible, but the upper part of the Cook Inlet section is probably in general the equivalent of the lower part of the Kachemak Bay section. The Bradley coal, east of Homer Spit, is possibly the equivalent of the Cooper coal of the Mine Camp section, or at least it can not be far from the stratigraphic place of the Cooper coal.

USGS Bulletin 642, page 30. (1915)

There were no important developments in the coal ***** fields of Alaska during 1915. Under the new leasing law a number of permits were granted to mine coal in 10-acre tracts or less, and as a result some lignitic coal was mined at a number of localities to supply a local market. The largest of these operations was the Bluff Point mine, on the north side of Kachemak Bay, an eastern indentation of Cook Inlet. This property was operated for most of the year, and its product was marketed at Seward, Anchorage, and other places near by. Smaller operations were carried on (elsewhere)*****. It is estimated that the total production (of all operations) was about 1,400 tons, valued at \$3,300.

USGS Bulletin 714-A, page 78. (1919)

The Bluff Point lignite coal mine, at Kachemak Bay, was operated during the summer of 1919, and supplied a local market on Cook Inlet. Some of this lignite was also sold at Anchorage for domestic use.

USGS Bulletin 739-A, page 17. (1921)

The McNally & Maitland lignite mine, at Bluff Point, Cook Inlet, was operated as usual during the summer

USGS Bulletin 755-A, page 20. (1922)

*****. As in the past, the Bluff mine, on Cook Inlet was operated.

USGS Bulletin 792-A, page 34. (1925)

*****. A little coal is also mined at Bluff Point, on Kenai Peninsula, for use of the local canneries in Cook Inlet. The coal from these localities, however, is only a fraction of 1 per cent of the production of the Matanuska and Healy fields. (Estimated to be less than 800 tons).