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Resource Evaluation Section

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Alaska Open File Report 25

Geologic and Mineral Evaluation of the Chitina and Bremmer River Drainage Basins

BY

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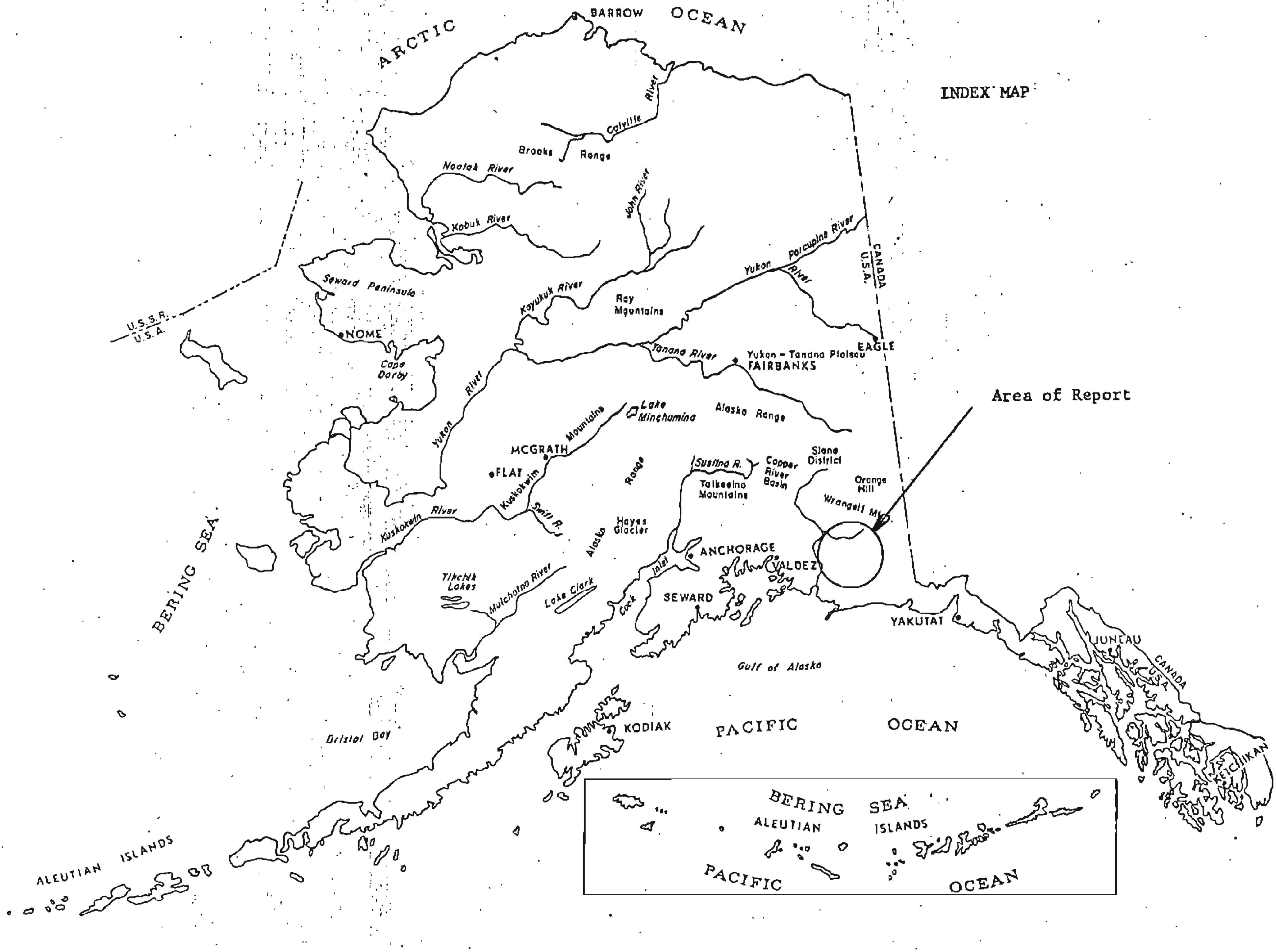
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INTRODUCTION

This report has been written to assist the Wild and Scenic River task force of the U. S. Bureau of Recreation in considering the suitability of certain priority Alaskan rivers for inclusion in the national system.

Geologic file research followed by field check and geochemical sampling will result in recommendations concerning the possible economic mineral areas of the river drainage. The final results and recommendations will be submitted as appendixes to the report before August 1973.

The mineral potential of this area is considered excellent. Most of the Chitina Valley Drainage should be considered prospective for economic minerals. The area within red lines on the enclosed maps should be left accessible for mineral exploration.

A field check will be made in June for additional geologic data and geochemical sampling. The results of this work will be submitted as an appendix to this report before August 1973.

Regional Geology

The Chitina River drainage trends northwest-southeast and lies on the rugged south flank of the Wrangell Mountains. The area of the drainage basin contains a sequence of layered consolidated rocks ranging in thickness from 25,000 feet to 30,000 feet which are cut by small scattered plutons and widespread surficial deposits. These rocks range in age from Mississippian to Quaternary.

Geology of the Chitina River Drainage

MISSISSIPPIAN ROCKS

The oldest rocks include schist, gneiss, slate and recrystallized limestone. These rocks include the Strelna Creek in the Chitina Valley. The Strelna formation is a complex of bedded lavas and tuffs, interstratified with sedimentary beds and cut by basic intrusive rocks. Tuffaceous beds and lava sheets constitute the major part of the formation. The basalts are dense black flows and the tuffs for the most part are very fine-grained. Black argillites, thin-bedded cherts, and silicified limestone make up the sedimentary rocks of the Strelna formation. Intrusive gabbro and pyroxene diorite cut the sediments in many localities. This complex of igneous and sedimentary rocks has been subjected to long-continued, recurring pressure and heat, which have brought about chemical and mineralogical changes and produced an intricate system of folds and faults.

PERMIAN ROCKS

Permian rocks are composed of a thick sequence of submarine lavas and their derivative volcaniclastic rocks, which are overlain by Permian marine sedimentary rocks practically devoid of volcanic material. Gabbro intrusions cut the Permian rocks. The Nikolai Greenstone (Permo-Triassic) is widespread and well exposed within the Chitina River drainage. The greenstone disconformably underlies the Chitistone limestone of Triassic age, and unconformably overlies the Permian rocks. Angular discordances at the base of the greenstone are generally less than 10 degrees. The Nikolai Greenstone regionally consists of a sequence of subaerial basaltic lava flows and a basal conglomerate. The contacts between the conglomerate and the overlying lava are sharp, but locally they may be gradational. Basal conglomerates of the Nikolai are poorly sorted dark greenish-gray rocks that consist of abundant subrounded pebbles in a fine grained-matrix. Many of the conglomerates have been sheared and altered. Matrixes of the conglomerates are grawackelike assemblages dominated by secondary minerals such as, chlorite, pumpellyite, albite, quartz, opaque dust, and calcite. The Nikolai lavas are altered basalts that are fine-grained, slightly porphyritic with intergranular and, uncommonly, subophitic textures. Amygdules from 1-5 mm long are uniformly distributed throughout most of the flows and contain chlorite and calcite. Except for relicts of Permian fossils in limestone clasts of the conglomerate, the Nikolai Greenstone is unfossiliferous.

TRIASSIC ROCKS

The Nikolai Greenstone is disconformably overlain by late Triassic carbonate rocks, the Chitistone and Nizina Limestone, and chert of the McCarthy Formation of Late Triassic and Early Jurassic age. The Chitistone Limestone disconformably overlies Nikolai Greenstone and gradationally underlies Nizina Limestone. The formation consists of lime mudstone and lesser amounts of wackestone, crystalline limestone, and dolomite. The dominant carbonate mudstones range from relatively pure calcite-rich rocks to dolomitic rocks, which are confined to the lower parts of the formation. The wackestones are mineralogically and texturally similar to the mudstones, but they contain more than 10 per cent clastic constituents. The crystalline carbonates consist of crystalline phases of limestone, dolomitic limestone, and dolomite. Most contain small quantities of quartz, pyrite, and hematite. The formation's cherts, are dark gray to black chalcedony with minor amounts of calcite, fractured subconchiodally. The Chitistone limestone was probably deposited in shallow seas partly under intertidal and supratidal conditions on a carbonate shelf that overlaid a platform of epirogenetically submerged Nikolai Greenstone.

The Nizina Limestone conformably overlies the Chitistone Limestone along broadly gradational contacts and conformably underlies the lower member of the McCarthy Formation. The Nizina Limestone consists of limestone with subordinate local chert lenses and nodules. The Nizina Limestone probably formed on the basinward slope of a drowned carbonate shelf platform of Chitistone Limestone.

TRIASSIC - JURASSIC ROCKS

The lower member of the McCarthy Formation is characterized by incompetent thin bedded, strongly deformed strata that conformably overlies the Nizina Limestone. The lower member is composed of impure limestone with minor amounts of impure chert and shale. Upper member rocks consist of impure limestone and lesser quantities of chert and spiculite. Gradations between the members calcareous and siliceous rocks are common. The upper member is probably entirely Early Jurassic in age, although its basal strata may be Late Triassic.

CRETACEOUS ROCKS

A major regional orogeny, near the close of the Jurassic or in pre-Albian Cretaceous, produced the dominant structural features of the region. Cretaceous sedimentary rocks constitute a complex stratigraphic sequence that is divided into the Kennicott, Moonshine Creek, Shulze, Chititu, and MacColl Ridge Formations. The Cretaceous rocks are separated from underlying older rocks by a pronounced angular unconformity and from overlying younger rocks by a slight angular discordance. The Kennicott Formation consists of a basal conglomerate, grading upward into a sequence of sandstone, siltstone, and shale and containing scattered calcareous concretions and erratically distributed wood and plant debris. The Schulze Formation overlies the Kennicott Formation with disconformity or possibly with slight angular discordance. The formation consists of thin-bedded light-colored erosion-resistent siliceous rocks. These are composed of fine and very fine-grained sandstone, siltstone, and platy porcelanite. The Moonshine Creek Formation unconformably overlies the Nikolai Greenstone; disconformably overlies the Kennicott Formation, and is unconformably overlain by Tertiary nonmarine sedimentary rocks that are intercalated with the older flows of the Wrangell lava. The Moonshine Creek Formation consists dominantly of siltstone and sandstone that is of diverse grain sizes. Stratigraphically it is divided into six informal members. The formation was probably deposited in a restricted,,rapidly sinking basin.

In the upper Chitina Valley the Chititu Formation is exposed principally in cliffs along the rivers. At the most places the Chititu Formation overlies the Kennicott Formation with apparent conformity, as well as the Schulze Formation. It is conformably overlain by the MacColl Ridge Formation. The formation consists mainly of pelitic rocks, mudstone and shale. It contains minor amounts of procelanite, impure chert, and fine-grained sandstone, and thin beds and lenses of impure limestone. Locally it is cut by the Tertiary plutons, chiefly felsic dikes and sills. Chititu rock have been altered to hornfels in irregular metamorphic aureoles near some of the larger plutons.

The MacColl Ridge Formation is not extensively distributed, and it is largely confined to high mountainous terrain where its erosion-resistant strata form bold outcrops. The formation consists of coarse and medium-grained sandstone that in places grades into granule conglomerate, fine-grained sandstone, or siltstone. The formation is cut by Tertiary granodiorite plutons, and also by a few dikes and sills of Tertiary felsic intrusive rocks. The formation's limited distribution, together with coarseness of the clasts and the abundance of lithic fragments, indicates rapid deposition probably adjacent to a locally uplifted area.

TERTIARY ROCKS

The Tertiary rocks include the Frederika Formation and Wrangell lava and small plutons of felsic hypabyssal rocks or intermediate to mafic intrusives, chiefly granodiorite, and a few dikes and sills. The Frederika Formation is conglomerate, sandstone, siltstone, shale, and low-rank coal. Wrangell lava consists of andesite and basaltic andesite, and subordinate pyroclastic rocks.

QUATERNARY ROCKS

Quaternary surficial deposits in the region are alluvium, talus, rock glaciers, several kinds of moraines, landslides, fluvioglacial deposits, and thin veneers of soil,. slope wash, or Colluvium.

INTRUSIVE ROCKS

Instrusive rocks include gabbro of Permian or Triassic age and intermediate to mafic, felsic hypabyssal and andesitic rocks of Cenozoic age.

Economic Geology

Much of the area of the south flank of the Wrangell Mountains is geologically favorable for the deposition of metallic sulfides. The best known massive copper sulfide lodes occur in the lower part of the Chitistone Limestone at the Kennicott mines. These mines produced over one billion pounds of copper over the time period 1900 to 1938, which at present market values would be worth in excess of 500 million dollars. The contact between the Chitistone Limestone and the Nikolai Greenstone extends many miles to the east and west of the Kennicott area and the possibilities of developing rich copper deposits along this trend remains high.

Copper lodes are widely distributed in the Nikolai Greenstone. These deposits in the greenstone form veins, altered zones, and mineralized amygdules and interflow lenses. The veins, are generally narrow and discontinuous, typically contain chalcopyrite, bornite, or chalcocite as their chief copper minerals and quartz as their dominant gangue. Mineralized amygdules in the greenstone contain native copper and generally smaller quantities of other copper minerals. Placer copper has been found wherever streams cutting rocks of the Nikolai Greenstone have been worked for gold and is present in pieces that range in size from small shot to masses of several hundred pounds.

Gold has been produced in the Chitina Valley from both lode deposits and placers. Gold bearing veins are known in rocks of the Strelna Formation and in rocks of the Chugach Mountains that have been correlated with the Strelna. Placer gold has been mined productively at Dan and Chititu Creeks and their tributaries. Placer gold also occurs on Young Creek, Canyon Creek, and the Kiagna River. Most of the placer gold has been concentrated in deep bench gravels near the bedrock. These gravels are being reworked by present day streams and reconcentration of the gold is occurring.

Silver occurs in this region associated with the ores of Kennicott, where it is present to the amount of 14 to 16 ounces to the ton; in the pyrite-chalcopyrite veins on Berg Creek; in the Tetrehedrite veins on the Kotsina River; and as native silver associated with native copper and gold in placers.

SUMMARY

Copper occurs in the basaltic lavas of the Strelna Formation which underlies the Nikolai Greenstone and is common throughout it. A few copper deposits in greenstone occur as well-defined fissure veins, but most of the deposition of copper has been in pre-existing openings or by replacement of the wall rock along irregular systems of fractures. Gold and silver are found in formations ranging from the tuff, limestone, shale and basalt flows of the Strelna formation to the Cretaceous shales and is being re-concentrated by stream action in present day gravels.

The potential for this area is considered excellent. This conclusion is supported by the fact that the region lies within a porphyry copper belt, shows many areas of mineralization in favorable host rocks, and has a large number of mining claims filed within the region. The major economic barrier to mineral exploitation has been lack of access and an economical means of transportation and facilities.

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ABSTRACT

Gold is the chief metallic mineral in the Bremner River drainage basin. It is found chiefly in outcrop areas of slate and graywackes that represent an eastward extension of the Valdez group. It is apparently derived from quartz veins cutting the slates and graywackes and is accompanied by the metallic sulfides, pyrite and galena. All the gold produced from the Bremner River drainage comes from gold-bearing gravels derived by erosion of the country rock.

Golconda Creek is the most important gold-producing stream of the area. Its auriferous deposits are a reconcentration product from the bench gravels into which the creek has incised its channel. Gold bearing gravels are present on the Bremner River, Little Bremner River, and some other tributaries of the Bremner. With the price of gold on the increase this area should be throughly explored and mapped. The potential for a commercial deposit is certainly high and should warrant further consideration.

RECOMMENDATIONS

1. Based on past placer production and the future potential of commercial gold placer deposits, the headwater areas of the Bremner and Little Bremner Rivers should probably be considered for exclusion from the Wild and Scenic Rivers act.
2. These two potential areas are indicated on the map. The other areas are not included in the above and could be considered for inclusion within the system if final field data indicates the lack of mineral potential.
3. Data available on the Bremner River drainage is incomplete and a final decision should be held in reservation until a complete evaluation has been made.

INTRODUCTION

This report has been written to assist the Wild and Scenic River task force of the U. S. Bureau of Outdoor Recreation in considering the suitability of certain priority Alaskan rivers for inclusion in the national system.

Geologic file research followed by field check and geochemical sampling will result in recommendations concerning the possible economic mineral areas of the river drainage. The final results and recommendations will be submitted as appendixes to this report before August 1973.

REGIONAL SETTING

The Bremner River lies south of the Chitina River in the Chugach Mountains. Its drainage basin occupies an area of approximately 1,000 square miles. The rocks within the drainage basin are predominately Cretaceous (Valdez group) in age. Quaternary deposits consist of boulders, gravel, sand, silt, and clay. Granite intrusions occur near the headwaters of the Bremner but they have not been mapped or age dated.

GEOLOGY

The graywacke of the Valdez group (Cret.) is a sandstone-like rock of gray or bluish color, containing more feldspar than quartz with a higher percentage of dark-colored minerals than a typical sandstone. In many locations small fragments of slate and shale are found mixed with the graywacke. The graywacke generally differs from the slate in having a coarser texture and less well-developed cleavage. The slate is fine grained and is greenish or bluish gray to nearly black in color, and shows a well-developed cleavage. The slates and graywackes are folded and considerably metamorphosed. Dips on the Little Bremner River range from 30° to 40° S., decreasing toward the north. The slates and graywackes are cut by a large number of quartz veins, some contain metallic sulfides and a small amount of gold. They occur as gash veins and fillings in openings along joint planes and at the crest of the fold axis.

Granite (diorite) has been reported by prospectors who have been on the upper parts of the two forks of the Bremner River (Moffit 1914). This diorite appears as stream float on many of the river bars, and is characterized by very little alteration

ECONOMIC GEOLOGY

The belt of interbedded slates and graywackes that extends westward from the head of the Bremner River to the Kenai Peninsula is auriferous in many places if not throughout its entire length.

This belt is intruded by light-colored diorite dikes and is cut by numerous veins of quartz. Many of the quartz veins are small and pinch out within a few feet along strike, but some may be traced for considerable distances and are evidently connected with extensive fracture systems. Many veins contain gold in amounts ranging from trace to commercial amounts. The veins commonly contain a small proportion of metallic sulfides, among which pyrite, galena and molybdenite are found. Gold can be panned from practically all the streams that cut areas of slate and graywacke.

The most promising areas for placer gold are the bench gravels. These gravels received a gold concentration during the initial erosion and deposition and are now being enriched where the streams have intrenched themselves in the benches, and are removing large amounts of gravel and concentrating the gold.

GOLD PLACERS

Golconda Creek - Golconda is a tributary to the North Fork of the Bremner River, joining it 5 miles below the headwaters. Golconda Creek lies completely within a slate area, with the slate being cut by numerous light-colored, fine-grained dikes of dioritic porphry. The slate exposed along the creek is hard and siliceous and locally is almost schistose. The stream gravels are shallow, with a maximum thickness of around 8 feet. Commercial mining was carried on within this area for a period of 8 years (1901 - 1909, Moffit, 1914).

BREMNER RIVER

Mining near Threemile Canyon was conducted in the bench gravels. A ridge of slate and graywacke had formerly dammed the river, producing a lake, forming lacustrine deposits of sand and fine gravel. The river cut through these deposits forming gravel benches in which fine gold is present. This gold may be panned from almost any of the river bars in this area. Little exploration has been done to furnish any proper estimate of the gold content of these gravels. The gravel deposits are extensive, and large amounts are so fine that they can be handled easily. There are a number of placer claims on a tributary near the end of Threemile Canyon but little information is available (Moffit 1914).

Little Bremner

Exploration on the Little Bremner has been confined to the lower end of the flat between the upper canyon and the glacier from which it flows. This flat is composed of glacial outwash material, and the presence of coarse gold in the gravel has been known for many years. Conditions are favorable for placer mining in this area if gold content should prove commercial in volume.

Yellow Band Lode

Lies high on the mountain east of Golconda Creek and 1 1/4 miles south of the pass leading to Monahan Creek. Claims are the property of John Letendra, Joe Meloy, and Carl Killian, under lease to A. C. Baldwin of Seattle.

The country rock in this vicinity is a succession of alternating beds of slate and graywacke intruded by numerous light-colored porphyritic dikes. Beds are strongly folded and cut by many faults and shear zones. Slate is the dominant rock type. The dikes that intrude the slate appear to belong to at least two distinct groups. One that appears to be the older trends eastward or a little north of east. Dikes in this group are offset in some places where they are crossed by dikes of the second group, which commonly strike somewhat west of north and indicate the trend of the principal faults and shear zones, although there is some deviation from this strike along smaller dikes. Mineralization took place along the sheared zone of crushed rock and quartz which is now stained with iron oxide.

There is a drift over 50 feet long on the Killian vein and a crosscutting tunnel 60 feet long and several open cuts on the Meloy vein, which is 240 feet east of the Killian vein and 110 feet higher at the tunnel. The tunnel on the Meloy vein penetrates a dike nearly 10 feet wide which either branches or is cut by narrower dikes striking more to the west in the vicinity of the tunnel. The main dike appears to have resulted from two intrusions, for the east and west sides differ in appearance. Possibly the difference is due to faulting and shearing, which is pronounced. The average weighted value of the ore along a stretch of about 200 feet and for a width of 30 inches is said to be in excess of $20 a ton.

Two landing fields are available: 1. Golconda - Monahan Creek, 2. Gravel bench west of Golconda Creek and south of the mining area.

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APPENDIX I

AOF 24 AND AOF 25

Geochemical results from a field inspection by Wild and Scenic River Task Force of Chitina and Bremner Rivers and geologic evaluation summary.

by

P. L. Dobey

July 30, 1973

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AOF 24
AOF 25

INTRODUCTION TO APPENDIX I

AOF 24 and AOF 25

A field inspection of the Chitina and Bremner Rivers was conducted under the leadership of the U. S. Bureau of Outdoor Recreation, Wild and Scenic River Task Force on July 30, 1973.

The purpose of the trip was to aid in the determination of the suitability of the rivers for classification in the Wild and Scenic system. Scenic, recreational, biological, and mineral observations were made by the respective members of the team. This appendix details the geochemical sampling carried out for mineral evaluation and summarizes the mineral potential of the area on the basis of known data.

Equipment used for the survey was a Bell 205A helicopter leased from Evergreen Helicopters by the BLM. Because of a tight time schedule for the BOR studies, only one day could be used to fly both the Chitina and Bremner Rivers. The plan had been to stop at all stream intersections with the main rivers or at least once a mile to obtain geochemical samples and geologic observations for the Mineral-Energy evaluation by the DGGS. The selection o a Bell 205A was unfortunate. This large craft burns 90 gallons of fuel an hour and the survey was restricted to 12 of the planned 60 stops because of a shortage of fuel. Therefore the appended data represent only a preliminary reconnaissance of the river areas.

GEOLOGIC EVALUATION AND SUMMARY

Mineral - Only 12 locations were sampled during the field inspection but of these stream-sediment samples, two were anomalous. Station 7 on the Gilahina River (Chitina Drainage) was slightly above mean background in copper. Station 12 near the old gold lode mine at Golconda Creek (Bremner Drainage) had anomalous concentrations of copper, lead, and zinc. See attached geochemical results.

Previous geochemical analysis of samples in the McCarthy-Kennicott area by the USGS (OFR #457) revealed many anomalous concentrations of metals.

The numerous lode and placer deposits in the area (see map), the anomalous geochemical values, and the favorable geologic setting, all point to a high potential for economic metallic mineral concentrations.

Radioactive - Panned concentrates of equivalent uranium under .002% were reported in the Kennicott-McCarthy area, and placer concentrates of .004% equivalent uranium were reported in the Bremner River drainage by Moxham and Nelson (1952 reconnaissance for radioactive materials in south-central Alaska, USGS, Circular 184).

There is a possibility of radioactive sedimentary prospects in the Chitina-Bremner River drainages. The abundance of volcanics and granitic rocks provide the source terrain. The Quaternary sands and gravels of the valley floor and Cretaceous sedimentary sands of the drainage basin could form a reservoir for "roll front" type uranium deposits.

Geothermal - There is a hot spring reported on 12 Mile Creek near the head of Kiagina River, a tributary of Upper Chitina River. Little else is known of the geothermal possibilities of the area and it appears limited.

Petroleum - Petroleum potential of the river drainages is extremely low. The lack of a thick sedimentary section, abundance of volcanics, and intense regional deformation of the strata by the Wrangell and Chugach uplifts, indicate that the area is not oil country.

Coal - The Bering River coal field near the Pacific Coast is the closest significant occurrence of coal. The coal potential of the area is low.

APPENDIX BIBLIOGRAPHY

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Analyses of stream-sediment samples from the Chitna and Bremner River Drainages.

(Analyses by quantitative atomic absorption methods. N = not detected).

Station Number	Field Sample Number	Parts per million					Remarks
		Au	Ag	Cu	Pb	Zn	
		Chitina River Drainage					
1	D-1-73	N	N	25	15	40	Lakina River Mouth
2	D-2-73	N	N	45	15	55	Nizina River Mouth
3	D-3-73	N	N	25	15	35	Jakes Bar - Float is 90% Quartz Diorite
4	D-5-73	N	N	50	20	45	
5	D-6-73	N	N	40	15	70	Chokosna River
6	D-7-73	N	N	30	10	35	
7	D-8-73	.5	N	80	15	60	Gilahina River
		Bremner River Drainage					
8	D-9-73	N	N	20	10	50	Float 90% Fine Grained SS
9	D-10-73	N	N	20	25	10	
10	D-11-73	N	N	20	2.5	10	Float Iron Stained Granite Cobbles
11	D-13-73	N	N	15	30	10	Mouth Golcanda Creek
12	D-15-73	N	N	75	40	165	Near Golconda Mine