DMA Form 1

DEFENSE MINERALS ADMINISTRATION
Control Slip

CONTROLLED DOCUMENT

DMA Docket No. 3248

DO NOT DETACH THIS SLIP

Action on this document is recorded and controlled in Reports and Records Branch. Any movement of this document between divisions or offices of DMA or movement outside DMA must be reported to the Reports and Records Branch. Actions taken that affect status of the case must also be reported.

This document has been recorded as

Exploration Assistance

Any action taken to change the type of request for assistance must be promptly reported to the Reports and Records Branch. Use DMA Form 2 for submitting these reports.

1 cy USBM, USGS

Routing Slip

To:	700	Date	3/19/54
To:	Oper Com	Date	4-14-54
To:	700	Date	4-15-54
To:	Oper Com	Date	6-11-54
To:		Date	
To:		Date	
To:		Date	
To:		Date	
To:		Date	
To:		Date	
To:		Date	
To:		Date	
To:		Date	
To:		Date	
To:		Date	

DO NOT DETACH

CONTROLLED DOCUMENT

M
(Revised

UNITED STATES DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION

Form Approved.
Budget Bureau No. 42-R1035.2.

APPLICATION FOR AID IN AN EXPLORATION PROJECT, PURSUANT TO DMEA ORDER 1, UNDER THE DEFENSE PRODUCTION ACT OF 1950, AS AMENDED

RECEIVED

Not to be filled in by applicant

Docket No. 3284
Metal or Mineral
Date Received
Estimated Cost
Participation (Government %)

INSTRUCTIONS

1. *Name of applicant.*—(*a*) State here your full legal name, in the form in which you will wish to contract, and your mailing address: Kennedy & Hellerich - A partnership
Nome, Alaska
M. R. Kennedy, Nome, Alaska
Geo. Hellerich, 4313 North Fruit Ave., Fresno 4, Calif.

(*b*) If other than an individual, add to your name above whether a corporation, partnership, etc., and the name of the State in which incorporated or otherwise organized.

(*c*) If a corporation, add to above statement, titles, names and addresses of officers.

(*d*) If a partnership, add to the above statement the names and addresses of all partners.

2. *General.*—Read DMEA Order 1, "Government Aid in Defense Exploration Projects," before completing this application. Submit this application and all accompanying papers in quadruplicate (four copies), with your name and address on each sheet of the application and on all accompanying papers. Where sufficient space is not provided on the form for all required information, state it on an accompanying paper, with a reference in each case to the instruction to which it refers by number. Comply with all applicable instructions; or, if not applicable, so state. File the application with Defense Minerals Exploration Administration, Department of the Interior, Washington 25, D. C., or with the nearest field executive officer thereof.

3. *Applicant's property rights.*—(*a*) State the legal description of the land upon which you wish to explore, including all land which you possess or control that may be benefited by the exploration, and excluding any land or interest in land which is not to be included in the exploration project contract Nineteen mining claims located on the southwest slope of Brooks Mt. in the Cape Nome Precinct, 2nd Division, Territory of Alaska

(*b*) State any mine name by which the property is known. Brooks Mt. Prospect

(*c*) State your interest in the land, whether owner, lessee, purchaser under contract, or otherwise owner

(*d*) If you are not the owner, submit with this application a copy of the lease, contract, or other document under which you control the property. Not applicable

(*e*) If you own the land, describe any liens or encumbrances on it none

(*f*) If the land consists of unpatented claims, add to the description above, the book and page numbers for each recorded location notice. See supplemental sheet attached. Item 3 (f)

4. *Physical description.*—(*a*) Describe in detail any mining or exploration operations which have been or now are being conducted upon the land, including existing mine workings and production facilities. State your interest, if any, in such operations. Also describe accessibility of mine workings for examination purposes.

(*b*) State past and current production, and ore reserves, if any, giving quantities and grades.

(*c*) Describe the geologic features of the property, including mineralization, type of deposit (vein, bedded, etc.), and your reasons for wishing to explore. Illustrate with maps or sketches. Send with your application (but not necessarily as a part of it) any geologic or engineering report, assay maps, or other technologic information you may have, indicating on each whether you require its return to you.

(*d*) State the facts with respect to the accessibility of the project: Access roads, distances to shipping, supply and residence points.

(*e*) State the availability of manpower, materials, supplies, equipment, water, and power.

See supplemental sheets attached Item 4 (a) to (e) inclusive.

5. *The exploration project.*—(*a*) State the mineral or minerals for which you [illegible]h to explore [illegible]

(*b*) Describe fully the proposed work, including a map or sketch of the property showing a plan (and cross sections if needed) of any present mine workings, and the location of the proposed exploration work as related to such features as conta[illegible] veins, ore-bearing beds, etc.

(*c*) The work will start within ..... days and be completed within ..... months from the date of an exploration project contract. See supplemental sheets

(*d*) State the operating experience and background of the applicant with relation to the ability to carry out such exploration project, and also that of the person or persons who will supervise the operations.

6. *Estimate of costs.*—Furnish a detailed estimate of the costs of the proposed work (you will have to use a separate sheet), under the following headings. Add the totals under all headings to give the estimated total cost of the project:

(*a*) *Independent contracts.*—(Note.—If the applicant does not intend to let any of the work to contractors, write "none" after this item. To the extent that the work is to be contracted, do not repeat the cost of the contract-work in subsequent items.) State the cost of any proposed independent contracts for the performance of all or any part of the work, expressed in terms of units of work (such as per foot of drilling, per foot of drifting, per hour of bulldozer operations, per cubic yard of material moved, etc.).

(*b*) *Labor, supervision, consultants.*—Include an itemized schedule of numbers, classes and rates of wages, salaries or fees for necessary labor, supervision and engineering and geological consultants.

(*c*) *Operating materials and supplies.*—Furnish an itemized list, including items of equipment costing less than $50 each, and power, water and fuel.

(*d*) *Operating equipment.*—Furnish an itemized list of any operating equipment to be rented, purchased, or which is owned and will be furnished by the Operator, with the estimated rental, purchase price, or suggested use-allowance based on present value, as the case may be.

(*e*) *Rehabilitation and repairs.*—Furnish a detailed list showing the cost of any necessary initial rehabilitation or repairs of existing buildings, installations, fixtures, and movable operating equipment, now owned by the Operator and which will be devoted to the exploration project.

(*f*) *New buildings, improvements, installations.*—Furnish a detailed list showing the cost of any necessary buildings, fixed improvements, or installations to be purchased, installed or constructed for the benefit of the exploration project.

(*g*) *Miscellaneous.*—Furnish a detailed list showing the cost of repairs to and maintenance of operating equipment (not including initial rehabilitation or repairs of the Operator's equipment), analytical work, accounting, workmen's compensation and employers' liability insurance, and payroll taxes.

(*h*) *Contingencies.*—Give an estimate of any necessary allowances for contingencies not included in the costs stated above.

NOTE.—No items of general overhead, corporate management, interest, taxes (other than payroll and sales taxes), or any other indirect costs, or work performed or costs incurred before the date of the contract, should be included in [illegible] estimate of costs.

7. (*a*) Are you prepared to furnish your share of the cost of the proposed project in accordance with the regulations on Government participation (Sec. 7, DMEA No. 1)? yes

(*b*) How do you propose to furnish your share of the costs?

[x] Money [ ] Use of equipment owned by you [ ] Other

Explain in detail on acompanying paper.

CERTIFICATION

The undersigned, whether as an individual, corporate officer, partner, or otherwise, both in his own behalf and acting for the applicant, certifies that the information set forth in this form and accompanying papers is correct and complete, to the best of his knowledge and belief.

Dated Jan. 31st, 1954

Kennedy & Hellerich
(Applicant)

By M. R. Kennedy
Geo Hellerich

Title 18, U. S. Code (Crimes), Section 1001, makes it a criminal offense to make a willfully false statement or representation to any department or agency of the United States as to any matter within its jurisdiction.

U. S. GOVERNMENT PRINTING OFFICE 16—66551-1

Supplemental Information - Form MF - 103 Sheet No. 1

Applicant: Kennedy & Hellerich
Nome, Alaska

ITEM 3

(a) The applicants own nineteen mining claims, which were acquired by location. The claims are located on the southwest flank of Brooks Mountain, approximately three miles distant from the Lost River Mine of the United States Tin Corporation. The claim locations notices have been recorded in the office of the Recorder of the Cape Nome Mining Precinct at Nome, Alaska.

(b) Brooks Mt. Prospect

(c) Owner

(d) Not applicable

(e) None

(f) List of Lode Claims Belonging to Kennedy and Hellerich, Brooks Mountain, Second Judicial Division, Alaska. Official Records Cape Nome Mining Precinct

NAME OR NUMBER	INST.NO	DATE	VOL.	PAGE	LOCATOR
Iron Cap Claim	87718	8/18/.50	-228-	85	George Hellerich
" " No.1	87782	10/20/.50	-228-	87	M.R.Kennedy
" " No.2	87783	10/20/.50	-228-	87	" "
" " No.3	87784	10/20/.50	-228-	88	" "
" " No.4	87785	10/20/.50	-228-	88	" "
" " No.5	87786	10/20/.50	-228-	88	" "
" " No.6	87787	10/20/.50	-228-	86	" "
" " No.7	87788	10/20/.50	-228-	86	" "
" " No.8	87789	10/20/.50	-228-	86	" "
" " NO.9	87790	10/20/.50	-228-	89	" "
" " No.10	87791	10/20/.50	-228-	89	" "
Pageite	88108	8/27/.51	-228-	145	George Hellerich
Midnight Sun	88109	6/19/.51	-228-	146	" "
Sunny Day	88110	6/20/.51	-228-	146	" "
Windy Day	88111	6/21/.51	-228-	147	" "
Foggy Day	88112	6/22/.51	-228-	147	" "
Tourmaline No.2	88129	7/11/.51	-228-	157	M. R. Kennedy
Tourmaline No. 1	88130	7/11/.51	-228-	158	" "
Square Zero	88131	7/6/.51	-228-	159	" "

Applicant: Kennedy & Hellerich
Nome, Alaska

(f) (cont.)
Amended Locations of Lode Claims - Kennedy and Hellerich
Official Records Cape Nome Mining Precinct.

NAME OR NUMBER	INST.NO.	DATE	VOL.	PAGE	LOCATOR
Iron Cap No.1	88107	8/15/.51	88	144	M. R. Kennedy
" " No.2	88106	8/15/.51	88	144	" "
" " No.3	88105	8/15/.51	88	143	" "
" " No.4	88104	8/15/.51	88	142	" "
" " No.5	88103	8/15/.51	88	141	" "
" " No.6	88102	8/15/.51	88	141	" "
" " No.7	88101	8/15/.51	88	140	" "
" " No.8	88100	8/15/.51	88	139	" "
" " No.9	88099	8/15/.51	88	139	" "
" " No.10	88098	8/15/.51	88	138	" "

ITEM 4

(a) The presence of uranium mineralization in greater than trace amounts was first determined in August, 1950. This discovery was made on the Iron Cap, Foggy Day, Iron Cap No. 8 claims and resulted in the location of the claims included in this application. During the winter of 1950 and spring of 1951 a lease agreement was negotiated with the United States Smelting, Refining and Mining Co., whereby the Company undertook the exploration work.

The Smelting Company sent two men to the property in June, 1951. These men established camp and made a survey of the claims. A geologist was added to the party in early July. The balance of July was spent in mapping geology and excavating shallow trenches by hand. This work resulted in the location of uranium mineralization on the Tourmaline No. 2 claim and near the northwest corner of the Square Zero claim.

Additional camp facilities were provided about August 1 and two miners were added to the crew. A tractor and a sixty cubic foot compressor was also made available at about this time. A road was built to the original discovery point on the Iron Cap, Foggy Day, Iron Cap No.8, and an open cut was started. The smelting Co. suspended operations about September 1.

The Company's operations at the Foggy Day prospect resulted in exposure of a highly oxidized meuneritic bearing granitic lens approximately 14 feet high and four feet wide. This lens appears to be on the contact between a coarse grained granite and a marmorized limestone. The entire mass is permanently frozen below a four to five feet mantle of talus that covers the mountain side. At a depth of about 20 feet below the surface

Applicant: Kennedy & Hellerich
Nome, Alaska

(a) (cont). the granitic lens disappeared and was replaced by an eight inch mineralized zone containing hematite stringers.

The samples taken from the granitic lens would indicate an average value between 0.10 and 0.20 percent equivalent uranium. High grade float and localized concentrations in place yielded results as high as 2.0 percent. No primary uranium mineralization has been disclosed by the prospecting to date.

The second significant occurrence of uranium occurs on the Tourmaline No. 2 claim. Numerous tourmaline veins from a fraction of an inch to four inches in width containing uranium mineralization are disclosed in several shallow trenches. The radioactive mineralization appears to occupy joint planes and tension cracks of the open veins. This occurrence is located entirely within the coarse grained granite, the closest limestone being over five hundred feet distant. The heavy talus mantle discouraged smelting Company activity in this area. All of the exploration openings are no longer accessible for examination. Government representatives were present at all times when work was going on. Their findings and conclusions are recorded in Geological Survey Circular 214.

(b) No production has resulted from operations undertaken to date. The exploration that has been accomplished to date is not conclusive, therefore no estimate can be made of ore reserves. The work proposed in this application is designed to explore the ore potential.

(c) Metamorphic, sedimentary and igneous rocks are present in the area covered by this application. The most recent rocks appear to be a coarse grained granite which occupies an area of about two square miles on the southerly flank of Brooks Mountain. This granite mass has intruded a formation of black slate and a massive blue gray limestone.

The sedimentary rocks and granite have been altered along the contact. This alteration is most pronounced along the westerly contact. There is some reason to believe that the dip of the westerly contact is flatter than the contact on the easterly side of the granite mass. This condition may account for the greater amount of alteration. Practically all of the mineralization appears along the westerly contact. It is therefore probably that this is the principal path along which the mineralizing solutions moved.

The principal radioactive mineral is zeunerite, a hydrous copper uranium arsenate, a mineral of secondary origin. The zeunerite has been found in significant concentrations at two locations and in trace amounts at several other localities. The chief associations are with quartz-tourmaline veins in coarse grained granite, and in granite adjacent to a granite-limestone contact associated with fluorite, hematite and tourmaline. In both instances the zeunerite occupies fracture faces, tension cracks or vugs. The limestone appears to be entirely free of radioactivity.

Applicant: Kennedy & Hellerich
Nome, Alaska

(c) (cont.) A detailed discription of the geologic features is contained in geological survey circular 214. A copy of this circular is being included with this report as Exhibit A.

(d) The Brooks Mt. area is accessible by planes with a load limit of 2000 lbs. by landing on an airstrip maintained to service the U. S. Tin Corporation's mine on Cassiterite Creek. A tractor trail about three miles in length is used to bring supplies from this airstrip to the Brooks Mt. prospect. Automotive vehicles with four wheel drive can also negotiate this trail. Heavy equipment can be delivered by ocean going vessels to ships anchorage at the mouth of Lost River. Lighters are used to transfer supplies from ship to shore. There is a well maintained truck road (11 miles) to the landing field described above. A landing field capable of accommodating a plane the size of ADC 3 is being maintained at the mouth of Lost River. Ocean transportation is only possible during the open season, usually from June 15 to October 15.

(e) Man-power for the specialized operations contemplated will have to be brought from Fairbanks and Seattle. Machine helpers and semi-skilled workers can be obtained at Nome. There is an adequate supply of common labor available in the Eskimo villages in the immediate vicinity. The Eskimo worker is a very intelligent person and becomes very proficient in manual and mechanical operation after a short training period. The shortness of the Brooks Mt. job will not permit the training of local labor. Living quarters for the small crew required will be provided at the property in a building already there.

Power for the equipment needed will be furnished by internal combustion engine. Gasoline, fuel, food and miscellaneous supplies can be obtained at either Nome or Teller. Specialized mechanical equipment will have to be shipped from Seattle. Sufficient water for core drilling and domestic purposes is available on the property.

ITEM 5.

(a) The exploration program will be for uranium ores. At present only the secondary mineral zeumerite is known to be present.

(b) The location of the proposed work is shown on the property map, a print of which can be found in the envelope bound with this application. This map also shows the principal geologic features.

The exploration work will be on the Windy Day, Foggy Day, Iron Cap, Iron Cap No. 8 and Iron Cap No. 3 claims, and will consist of a series of four core drill holes at the six locations indicated on the property map. Approximately 500 feet of hole will be made at each location as follows:

1 - Hole 50 ft. deep 5 degrees below the horizontal
1 - Hole 100 ft. deep 25 degrees below the horizontal
1 - Hole 150 ft. deep 45 degrees below the horizontal
1 - Hole 200 ft. deep 65 degrees below the horizontal

Applicant: Kennedy & Hellerich
Nome, Alaska

(b) (cont.) In all cases it is planned to set the core drill up on the downhill side and within 25 to 30 feet of the limestone-granite contact. All of the holes will be drilled in an easterly direction. The core drilling will be done with an eight horse power Joy Manufacturing Company Number 7 gasoline power diamond core drill. Standard A X fittings, removing a one and one-eighth inch core will be used to make hole.

(c) It is estimated that 100 days will be required to complete the total core drilling program of 3,000 feet. The exact starting date of the project cannot be set at this time, as this date is entirely dependent upon the arrival of the drilling equipment at Lost River. The first boat of the open season usually arrives in this port of Bering Sea about July 1. It is estimated that drilling will be under way within a week after the arrival of the equipment on the beach at Lost River. Due to the short season and limited housing, the job will be conducted on a one shift basis, nine hours per day, seven days a week.

(d) The applicant is a partnership, with mining policy under the direction of Geo. Hellerich, a graduate mining engineer with thirty years experience in responsible operating jobs mostly in Alaska. The direction of the contemplated exploration will be under the immediate direction of Hellerich or Mr. Ted Mathews, a consulting graduate mining and mechanical engineer of Fairbanks, Alaska. Mr. Mathews has had wide experience as the responsible head of mining and engineering projects in Alaska.

Supplemental Information - Form MF - 103 Sheet No. 6

Applicant: Kennedy & Mellerich
Nome, Alaska

ITEM No. 6.

(a) Independent Contracts	None
(b) Labor & Supervision	
1 - Driller @ $3.50/hour	$3,725.00
1 - Drill Helper @ $2.75/hour	2,927.00
1 - Working Supervisor & Engineer $1,000.00/month	3,333.00
Total	$9,985.00
(c) Operating Material & Supplies	
Gasoline, Fuel Oil & Misc. Petroleum Products	$ 700.00
Tools (shovels, picks, bars, wheelbarrow & small hand tools)	296.00
Pipe or used fire hose	270.00
Miscellaneous hardware	149.00
Messhouse & bunkhouse equipment	226.00
Miscellaneous supplies (lumber, cement, etc.)	365.00
Total	$2,006.00
(d) Purchases & Rentals	
1 - No. 7 Joy Diamond Core Drill with skids	$2,753.00
Rods, Bits, Tools, Triped, etc.	3,670.00
Auxiliary Water Pump	246.00
Truck Rental	290.00
Tractor Rental	700.00
Total	$9,659.00

Supplemental Information - Form MP - 103 Sheet No. 7

Applicant : Kennedy & Hellerich
Nome, Alaska

ITEM NO 6. (Continued)

(e) Rehabilitation & Repairs

Repairs to Messhouse & Bunkhouse (Labor & Material)	84.00

(f) New Building & Improvements None

(g) Miscellaneous

Repairs to equipment including Diamond Bits	$1,508.40
Assaying	300.00
Accounting	200.00
Workmens Compensation	520.00
Payroll Taxes	470.00
Messhouse loss	900.00
Transportation Personnel	726.45
Transportation emergency supplies & food	180.00
Total	$4,804.85

(h) Contingencies $1,300.00

Note: All cost estimates for equipment & supplies are F.O.B. Last River.

TOTALS

(a) Independent Contracts	None
(b) Labor & Supervision	$9,985.00
(c) Operating Material & Supplies	2,006.00
(d) Purchases & Rentals	9,659.00
(e) Rehabilitation & Repairs	84.00
(f) New buildings & Improvements	None
(g) Miscellaneous	4,804.85
(h) Contingencies	1,300.00
Totals	$27,838.85

The first expenditures will be made on or about June 1, 1954; approximately $10,000.00 will be required at this time.
[illegible] will be required at intervals

MF-193
(Revised April 1952)

UNITED STATES DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION

Form Approved.
Budget Bureau No. 42-R1035.2.

DEPARTMENT OF THE INTERIOR
Defense Minerals Administration
RECEIVED
MAR 19 1954

APPLICATION FOR AID IN AN EXPLORATION PROJECT, PURSUANT TO DMEA ORDER 1, UNDER THE DEFENSE PRODUCTION ACT OF 1950, AS AMENDED

Not to be filled in by applicant

Docket No. 3284
Metal or Mineral Uranium
Date Received
Estimated Cost $27,839
Participation (Government %)

INSTRUCTIONS

1. *Name of applicant.*—(*a*) State here your full legal name, in the form in which you will wish to contract, and your mailing address: Kennedy & Hellerich - A partnership
Nome, Alaska
M. R. Kennedy, Nome, Alaska
Geo. Hellerich, 4313 North Fruit Ave., Fresno 4, Calif.

(*b*) If other than an individual, add to your name above whether a corporation, partnership, etc., and the name of the State in which incorporated or otherwise organized.

(*c*) If a corporation, add to above statement, titles, names and addresses of officers.

(*d*) If a partnership, add to the above statement the names and addresses of all partners.

2. *General.*—Read DMEA Order 1, "Government Aid in Defense Exploration Projects," before completing this application. Submit this application and all accompanying papers in quadruplicate (four copies), with your name and address on each sheet of the application and on all accompanying papers. Where sufficient space is not provided on the form for all required information, state it on an accompanying paper, with a reference in each case to the instruction to which it refers by number. Comply with all applicable instructions; or, if not applicable, so state. File the application with Defense Minerals Exploration Administration, Department of the Interior, Washington 25, D. C., or with the nearest field executive officer thereof.

3. *Applicant's property rights.*—(*a*) State the legal description of the land upon which you wish to explore, including all land which you possess or control that may be benefited by the exploration, and excluding any land or interest in land which is not to be included in the exploration project contract Nineteen mining claims located on the southwest slope of Brooks Mt. in the Cape Nome Precinct, 2nd Division Territory of Alaska

(*b*) State any mine name by which the property is known. Brooks Mt. Prospect

(*c*) State your interest in the land, whether owner, lessee, purchaser under contract, or otherwise owner

(*d*) If you are not the owner, submit with this application a copy of the lease, contract, or other document under which you control the property. not applicable

(*e*) If you own the land, describe any liens or encumbrances on it none

(*f*) If the land consists of unpatented claims, add to the description above, the book and page numbers for each recorded location notice. See supplemental sheet attached Item 3 (f)

4. *Physical description.*—(*a*) Describe in detail any mining or exploration operations which have been or now are being conducted upon the land, including existing mine workings and production facilities. State your interest, if any, in such operations. Also describe accessibility of mine workings for examination purposes.

(*b*) State past and current production, and ore reserves, if any, giving quantities and grades.

(*c*) Describe the geologic features of the property, including mineralization, type of deposit (vein, bedded, etc.), and your reasons for wishing to explore. Illustrate with maps or sketches. Send with your application (but not necessarily as a part of it) any geologic or engineering report, assay maps, or other technologic information you may have, indicating on each whether you require its return to you.

(*d*) State the facts with respect to the accessibility of the project: Access roads, distances to shipping, supply and residence points.

(*e*) State the availability of manpower, materials, supplies, equipment, water, and power.

See supplemental sheets attached Item 4 (a) to (e) inclusive.

5. *The exploration project.*—(a) State the mineral or minerals for which you wish to explore uranium

(b) Describe fully the proposed work, including a map or sketch of the property showing a plan (and cross sections if needed) of any present mine workings, and the location of the proposed exploration work as related to such features as contact veins, ore-bearing beds, etc.

(c) The work will start within ..... days and be completed within ..... months from the date of an exploration project contract. See supplemental sheets

(d) State the operating experience and background of the applicant with relation to the ability to carry out such exploration project, and also that of the person or persons who will supervise the operations.

6. *Estimate of costs.*—Furnish a detailed estimate of the costs of the proposed work (you will have to use a separate sheet), under the following headings. Add the totals under all headings to give the estimated total cost of the project:

(a) *Independent contracts.*—(Note.—If the applicant does not intend to let any of the work to contractors, write "none" after this item. To the extent that the work is to be contracted, do not repeat the cost of the contract-work in subsequent items.) State the cost of any proposed independent contracts for the performance of all or any part of the work, expressed in terms of units of work (such as per foot of drilling, per foot of drifting, per hour of bulldozer operations, per cubic yard of material moved, etc.).

(b) *Labor, supervision, consultants.*—Include an itemized schedule of numbers, classes and rates of wages, salaries or fees for necessary labor, supervision and engineering and geological consultants.

(c) *Operating materials and supplies.*—Furnish an itemized list, including items of equipment costing less than $50 each, and power, water and fuel.

(d) *Operating equipment.*—Furnish an itemized list of any operating equipment to be rented, purchased, or which is owned and will be furnished by the Operator, with the estimated rental, purchase price, or suggested use-allowance based on present value, as the case may be.

(e) *Rehabilitation and repairs.*—Furnish a detailed list showing the cost of any necessary initial rehabilitation or repairs of existing buildings, installations, fixtures, and movable operating equipment, now owned by the Operator and which will be devoted to the exploration project.

(f) *New buildings, improvements, installations.*—Furnish a detailed list showing the cost of any necessary buildings, fixed improvements, or installations to be purchased, installed or constructed for the benefit of the exploration project.

(g) *Miscellaneous.*—Furnish a detailed list showing the cost of repairs to and maintenance of operating equipment (not including initial rehabilitation or repairs of the Operator's equipment), analytical work, accounting, workmen's compensation and employers' liability insurance, and payroll taxes.

(h) *Contingencies.*—Give an estimate of any necessary allowances for contingencies not included in the costs stated above.

NOTE.—No items of general overhead, corporate management, interest, taxes (other than payroll and sales taxes), or any other indirect costs, or work performed or costs incurred before the date of the contract, should be included in the estimate of costs.

7. (a) Are you prepared to furnish your share of the cost of the proposed project in accordance with the regulations on Government participation (Sec. 7, DMEA No. 1)? yes

(b) How do you propose to furnish your share of the costs?

[x] Money [ ] Use of equipment owned by you [ ] Other

Explain in detail on acompanying paper.

CERTIFICATION

The undersigned, whether as an individual, corporate officer, partner, or otherwise, both in his own behalf and acting for the applicant, certifies that the information set forth in this form and accompanying papers is correct and complete, to the best of his knowledge and belief.

Dated Jan 31st, 1954

Kennedy & Hellerich
(Applicant)

By M. R. Kennedy
Geo Hellerich

Title 18, U. S. Code (Crimes), Section 1001, makes it a criminal offense to make a willfully false statement or representation to any department or agency of the United States as to any matter within its jurisdiction.

U. S. GOVERNMENT PRINTING OFFICE 16—66551-1

Supplemental Information - Form MF - 103 Sheet No. 1

Applicant: Kennedy & Hellerich
Nome, Alaska

ITEM 3

(a) The applicants own nineteen mining claims, which were acquired by location. The claims are located on the southwest flank of Brooks Mountain, approximately three miles distant from the Lost River Mine of the United States Tin Corporation. The claim locations notices have been recorded in the office of the Recorder of the Cape Nome Mining Precinct at Nome, Alaska.

(b) Brooks Mt. Prospect

(c) Owner

(d) Not applicable

(e) None

(f) List of Lode Claims Belonging to Kennedy and Hellerich, Brooks Mountain, Second Judicial Division, Alaska. Official Records Cape Nome Mining Precinct

NAME OR NUMBER	INST.NO	DATE	VOL.	PAGE	LOCATOR
Iron Cap Claim	87718	8/18/.50	-228-	85	George Hellerich
" " No.1	87782	10/20/.50	-228-	87	M.R.Kennedy
" " No.2	87783	10/20/.50	-228-	87	" "
" " No.3	87784	10/20/.50	-228-	88	" "
" " No.4	87785	10/20/.50	-228-	88	" "
" " No.5	87786	10/20/.50	-228-	88	" "
" " No.6	87787	10/20/.50	-228-	86	" "
" " No.7	87788	10/20/.50	-228-	86	" "
" " No.8	87789	10/20/.50	-228-	86	" "
" " NO.9	87790	10/20/.50	-228-	89	" "
" " No.10	87791	10/20/.50	-228-	89	" "
Pageite	88108	8/27/.51	-228-	145	George Hellerich
Midnight Sun	88109	6/19/.51	-228-	146	" "
Sunny Day	88110	6/20/.51	-228-	146	" "
Windy Day	88111	6/21/.51	-228-	147	" "
Foggy Day	88112	6/22/.51	-228-	147	" "
Tourmaline No.2	88129	7/11/.51	-228-	157	M. R. Kennedy
Tourmaline No. 1	88130	7/11/.51	-228-	158	" "
Square Zero	88131	7/6/.51	-228-	159	" "

Applicant: Kennedy & Hellerich
Nome, Alaska

(f) (cont.)
Amended Locations of Lode Claims - Kennedy and Hellerich
Official Records Cape Nome Mining Precinct.

NAME OR NUMBER	INST.NO.	DATE	VOL.	PAGE	LOCATOR.
Iron Cap No. 1	88107	8/15/.51	88	144	M. R. Kennedy
" " No. 2	88106	8/15/.51	88	144	" "
" " No. 3	88105	8/15/.51	88	143	" "
" " No. 4	88104	8/15/.51	88	142	" "
" " No. 5	88105	8/15/.51	88	141	" "
" " No. 6	88102	8/15/.51	88	141	" "
" " No. 7	88101	8/15/.51	88	140	" "
" " No. 8	88100	8/15/.51	88	139	" "
" " No. 9	88099	8/15/.51	88	139	" "
" " No.10	88098	8/15/.51	88	138	" "

ITEM 4

(a) The presence of uranium mineralization in greater than trace amounts was first determined in August, 1950. This discovery was made on the Iron Cap, Foggy Day, Iron Cap No. 8 claims and resulted in the location of the claims included in this application. During the winter of 1950 and spring of 1951 a lease agreement was negotiated with the United States Smelting, Refining and Mining Co., whereby the Company undertook the exploration work.

The Smelting Company sent two men to the property in June, 1951. These men established camp and made a survey of the claims. A geologist was added to the party in early July. The balance of July was spent in mapping geology and excavating shallow trenches by hand. This work resulted in the location of uranium mineralization on the Tourmaline No. 2 claim and near the northeast corner of the Square Zero claim.

Additional camp facilities were provided about August 1 and two miners were added to the crew. A tractor and a sixty cubic foot compressor was also made available at about this time. A road was built to the original discovery point on the Iron Cap, Foggy Day, Iron Cap No.8 and an open cut was started. The Smelting Co. suspended operations about September 1.

The Company's operations at the foggy Day prospect resulted in exposure of a highly oxidized zeunerite bearing granitic lens approximately 14 feet high and four feet wide. This lens appears to be on the contact between a coarse grained granite and a marmorized limestone. The entire mass is permanently frozen below a four to five foot mantle of talus that covers the mountain side. At a depth of about 20 feet below the surface

Applicant: Kennedy & Mellerich
Nome, Alaska

(a) (cont). the granitic lens disappeared and was replaced by an eight inch mineralized zone containing hematite stringers.

The samples taken from the granitic lens would indicate an average value between o.10 and 0.20 percent equivalent uranium. High grade float and localized concentrations in place yielded results as high as 2.0 percent. No primary uranium mineralization has been disclosed by the prospecting to date.

The second significant occurrence of uranium occurs on the Tourmaline No. 2 claim. Numerous tourmaline veins from a fraction of an inch to four inches in width containing uranium mineralization are disclosed in several shallow trenches. The radioactive mineralization appears to occupy joint planes and tension cracks of the open veins. This occurrence is located entirely within the coarse grained granite, the closest limestone being over five hundred feet distant. The heavy talus mantle discouraged smelting Company activity in this area. All of the exploration openings are no longer accessible for examination. Government representatives were present at all times when work was going on. Their findings and conclusions are recorded in Geological Survey Circular 214.

(b) No production has resulted from operations undertaken to date. The exploration that has been accomplished to date is not conclusive, therefore no estimate can be made of ore reserves. The work proposed in this application is designed to explore the ore potential.

(c) Metamorphic, sedimentary and igneous rocks are present in the area covered by this application. The most recent rocks appear to be a coarse grained granite which occupies an area of about two square miles on the southerly flank of Brooks Mountain. This granite mass has intruded a formation of black slate and a massive blue gray limestone.

The sedimentary rocks and granite have been altered along the contact. This alteration is most pronounced along the westerly contact. There is some reason to believe that the dip of the westerly contact is flatter than the contact on the easterly side of the granite mass. This condition may account for the greater amount of alteration. Practically all of the mineralization appears along the westerly contact. It is therefore probably that this is the principal path along which the mineralizing solutions moved.

The principal radioactive mineral is zeunerite, a hydrous copper uranium arsenate, a mineral of secondary origin. The zeunerite has been found in significant concentrations at two locations and in trace amounts at several other localities. The chief associations are with quartz-tourmaline veins in coarse grained granite, and in granite adjacent to a granite-limestone contact associated with fluorite, hematite and tourmaline. In both instances the zeunerite occupies fracture faces, tension cracks or vugs. The limestone appears to be entirely free of radioactivity.

Applicant: Kennedy & Hellerich
Nome, Alaska

(c) (cont.) A detailed discription of the geologic features is contained in geological survey circular 214. A copy of this circular is being included with this report as Exhibit A.

(d) The Brooks Mt. area is accessible by planes with a load limit of 2000 lbs. by landing on an airstrip maintained to service the U. S. Tin Corporation's mine on Cassiterite Creek. A tractor trail about three miles in length is used to bring supplies from this airstrip to the Brooks Mt. prospect. Automotive vehicles with four wheel drive can also negotiate this trail. Heavy equipment can be delivered by ocean going vessels to ships anchorage at the mouth of Lost River. Lighters are used to transfer supplies from ship to shore. There is a well maintained truck road (11 miles) to the landing field described above. A landing field capable of accommodating a plane the size of ADC 3 is being maintained at the mouth of Lost River. Ocean transportation is only possible during the open season, usually from June 15 to October 15.

(e) Man-power for the specialized operations contemplated will have to be brought from Fairbanks and Seattle. Machine helpers and semi-skilled workers can be obtained at Nome. There is an adequate supply of common labor available in the Eskimo villages in the immediate vicinity. The Eskimo worker is a very intelligent person and becomes very proficient in manual and mechanical operation after a short training period. The shortness of the Brooks Mt. job will not permit the training of local labor. Living quarters for the small crew required will be provided at the property in a building already there.

Power for the equipment needed will be furnished by internal combustion engine. Gasoline, fuel, food and miscellaneous supplies can be obtained at either Nome or Teller. Specialized mechanical equipment will have to be shipped from Seattle. Sufficient water for core drilling and domestic purposes is available on the property.

ITEM 5.

(a) The exploration program will be for uranium ores. At present only the secondary mineral zeunerite is known to be present.

(b) The location of the proposed work is shown on the property map, a print of which can be found in the envelope bound with this application. This map also shows the principal geologic features.

The exploration work will be on the Windy Day, Foggy Day, Iron Cap, Iron Cap No. 8 and Iron Cap No. 3 claims, and will consist of a series of four core drill holes at the six locations indicated on the property map. Approximately 500 feet of hole will be made at each location as follows:

1 - Hole 50 ft. deep 5 degrees below the horizontal
1 - Hole 100 ft. deep 25 degrees below the horizontal
1 - Hole 150 ft. deep 45 degrees below the horizontal
1 - Hole 200 ft. deep 65 degrees below the horizontal

Applicant: Kennedy & Hellerich
Nome, Alaska

(b) (cont.) In all cases it is planned to set the core drill up on the downhill side and within 25 to 30 feet of the limestone-granite contact. All of the holes will be drilled in an easterly direction. The core drilling will be done with an eight horse power Joy Manufacturing Company Number 7 gasoline power diamond core drill. Standard A X fittings, removing a one and one-eighth inch core will be used to make hole.

(c) It is estimated that 100 days will be required to complete the total core drilling program of 3,000 feet. The exact starting date of the project cannot be set at this time, as this date is entirely dependent upon the arrival of the drilling equipment at Lost River. The first boat of the open season usually arrives in this port of Bering Sea about July 1. It is estimated that drilling will be under way within a week after the arrival of the equipment on the beach at Lost River. Due to the short season and limited housing, the job will be conducted on a one shift basis, nine hours per day, seven days a week.

(d) The applicant is a partnership, with mining policy under the direction of Geo. Hellerich, a graduate mining engineer with thirty years experience in responsible operating jobs mostly in Alaska. The direction of the contemplated exploration will be under the immediate direction of Hellerich or Mr. Ted Mathews, a consulting graduate mining and mechanical engineer of Fairbanks, Alaska. Mr. Mathews has had wide experience as the responsible head of mining and engineering projects in Alaska.

Applicant: Kennedy & Hellerich
Nome, Alaska

ITEM No. 6.

(a) Independent Contracts	None
(b) Labor & Supervision	
1 - Driller @ $3.50/hour	$3,725.00
1 - Drill Helper @ $2.75/hour	2,927.00
1 - Working Supervisor & Engineer @1,000.00/month	3,333.00
Total	$9,985.00
(c) Operating Material & Supplies	
Gasoline, Fuel Oil & Misc. Petroleum Products	$ 700.00
Tools (shovels, picks, bars, wheelbarrow & small hand tools)	296.00
Pipe or used fire hose	270.00
Miscellaneous hardware	149.00
Messhouse & bunkhouse equipment	226.00
Miscellaneous supplies (lumber, cement, etc.)	365.00
Total	$2,006.00
(d) Purchases & Rentals	
1 - No. 7 Joy Diamond Core Drill with skids	$2,753.00
Rods, Bits, Tools, Tripod, etc.	5,670.00
Auxiliary Water Pump	246.00
Truck Rental	290.00
Tractor Rental	700.00
Total	$9,659.00

Applicant : Kennedy & Hellerich
Nome, Alaska

ITEM NO 6. (Continued)

(e) Rehabilitation & Repairs

Repairs to Messhouse & Bunkhouse (Labor & Material)	84.00

(f) New Building & Improvements None

(g) Miscellaneous

Repairs to equipment including Diamond Bits	$1,508.40
Assaying	300.00
Accounting	200.00
Workmens Compensation	520.00
Payroll Taxes	470.00
Messhouse loss	900.00
Transportation Personnel	726.45
Transportation emergency supplies & food	180.00
Total	$4,804.85

(h) Contingencies $1,300.00

Note: All cost estimates for equipment & supplies are F.O.B. Lost River.

TOTALS

(a) Independent Contracts	None
(b) Labor & Supervision	$9,985.00
(c) Operating Material & Supplies	2,006.00
(d) Purchases & Rentals	9,659.00
(e) Rehabilitation & Repairs	84.00
(f) New buildings & Improvements	None
(g) Miscellaneous	4,804.85
(h) Contingencies	1,300.00
Totals	$27,838.85

The first expenditures will be made on or about June 1, 1954; approximately $10,000.00 will be required at this time.

Surname
Docket copy

700

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
WASHINGTON 25, D. C.

Ching
J. Kearney
Laradyke
Hedges
Selfridge
Johnson

Mr. M. R. Kennedy
Kennedy and Hellerich
Nome, Alaska
and
Mr. George Hellerich
4313 North Fruit Avenue
Fresno 4, California

JUN 14 1954

Re: Docket No. DMEA-3284 (Uranium)
Brooks Mountain Prospect
Seward Peninsula, Alaska

Gentlemen:

Your application for aid for an exploration project and other information available to us in Washington concerning your above-named property have been reviewed.

Projects approved by the Defense Minerals Exploration Administration must, in its judgment, show definite promise of yielding materials of acceptable grade in quantities that will significantly improve the mineral supply position for the National Defense Program.

Careful study of all our information, although noting a small amount of uranium mineralization on your property, indicates to us that the probability of disclosing minable ore reserves by your proposed program is not sufficiently promising to justify Government participation. We regret to advise you, under these circumstances, that your application for exploration assistance is denied.

We wish to thank you for your interest in the Defense Minerals Exploration Program and for bringing your property to our attention.

Sincerely yours,

C. O. Mittendorf (for)

Administrator

Copy to: Mr. George Hellerich

MChing/gla
6-9-54

cc to: Admr. Reading File
Operating Committee
Docket
Messrs. H.D.Keiser, Rm. 3641
DMEA Field Team, Region I (2)
A.P.Butler, Jr. Rm. 3212, GSA
J.O.Hosted, Rm. 3210
Code 700
M.Ching

R.L.G.

KET COPY

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
WASHINGTON 25, D. C.

June 8, 1954

Summary Report on Proposed Project

Purpose: Denial of application

Docket No. DMEA-3284
Date of application - January 31, 1954
Applicant - Kennedy & Hellerich, a partnership
Nome, Alaska
Commodity - Uranium
Property - 19 mining claims, Brooks Mountain, Alaska.
Amount of application - $27,838.85
Work proposed:
Test for primary uranium minerals below the zone of oxidation by diamond drilling the limestone-granite contact by means of 3,000 feet of holes from 6 locations. Drill a series of 4 holes from each location, inclined from 5 degrees to 65 degrees from the horizontal, and ranging from 50 feet to 200 feet in depth.

Field Team Report - No Field Team report submitted as such. Independent reports on the project were submitted by S. H. Lorain, Executive Officer, and C. L. Sainsbury, USGS member, Alaska Field Team, Region I, DMEA. Both reports undated.

Field Team and Commodity Members' comments -

S. H. Lorain, Executive Officer, Field Team: Believes the work proposed by Applicant unsuitable and questions ability of Applicant to carry out a suitable program; therefore agreeable to rejection of the subject application. Nevertheless, favors a preliminary-type exploration program consisting of 1500 feet of diamond drilling, some bulldozer trenching, and intensive Geiger counter prospecting based on adequate surveys.

C. L. Sainsbury, USGS Member, Field Team: Cannot recommend expenditure of approximately $30,000 for exploration at Brooks Mountain if the justification for such expenditure is based upon the indicated economic potential of the deposits. Would favor some exploration if the cost can be divorced from the immediate economic picture and considered as an investment, justified entirely by the factual geologic data that may be acquired.

H. D. Keiser, USBM Member, Uranium Commodity Committee: Recommends that the subject application be denied, but favors consideration of an alternative proposal involving shaft sinking in place of diamond drilling.

Arthur P. Butler, Jr., USGS Member, Uranium Commodity Committee: Recommends that the application be denied because of the low grade of the material exposed, the remoteness of the area, and the lack of any data to indicate that the hypothesis of primary uranium minerals at depth is any more than a possibility. Nevertheless, believes that a shaft sunk along a possible ore shoot at the Foggy Day prospect would be worth the cost and could be recommended for approval.

Michael Ching, Rare and Miscellaneous Metals Division Engineer: In view of the diverse viewpoints indicated above, it is appropriate to review the pertinent basic criteria that should be considered in arriving at a decision concerning the subject application:

(1) The geologic probability of making a significant discovery. A considerable amount of surface prospecting and exploration has already been done in this area by the Geological Survey and the U. S. Smelting, Refining and Mining Co. without significant results. Further exploration is warranted only if the chances are good for exposing a primary uranium oxide source for the uranium found in the secondary deposits near the surface. The hypothesis of primary uranium minerals at depth is a possibility that is not strongly supported by the available data. Furthermore, it is possible to account for the source of the secondary zeunerite by assuming that at one time a primary uranium mineral was present in the porous granite and that the zeunerite is a remaining decomposition product.

(2) The accessibility of the project: Because of the remoteness of the area, manpower, materials, equipment, and power, even though available, must necessarily be high cost. Adverse climatic conditions will add greatly to operating difficulties and costs. Discovery of an ore body which is not outstanding in size or grade would involve an insurmountable transportation or milling problem as well as other economic problems.

(3) The operating experience and background of the Applicant: While one of the partners has had considerable experience in mining operations, particularly placer mining, S. H. Lorain questions his ability to carry out a suitable program unless supervised closely at every step. The subject application has been further weakened by a vacillating attitude on the part of the partners regarding whether or not to go through with it. While no specific communications have been

received in this office, Mr. Lorain has reported correspondence indicating, first, that the partnership had been dissolved; second, that the partnership had been revived; and, third, that one partner wishes to proceed with the application subject to corroboration from the other partner. The fact that one partner is addressed at Nome, Alaska, and the other at Fresno, California, contributes to the difficulty.

It is concluded from the foregoing factors that the application, or any modification thereof, does not have sufficient promise to justify a DMEA exploration project.

Conclusions and Recommendations:

Exploration work on the subject property, either by drilling or by shaft sinking, would undoubtedly contribute some valuable geologic information, but the indicated economic potential of the property does not justify a DMEA project. It is recommended that the application be denied.

F.L. Knouse
For: Ernest Wm. Ellis, Chief
Rare & Misc. Metals Division

Copies to:
Admr. Reading File
Operating Committee
Docket (original)
Code 700
Mr. Ching

STANDARD FORM NO. 64

6/10/54 gfa

Office Memorandum • UNITED STATES GOVERNMENT

TO : E. Wm. Ellis, DMEA Member, Uranium Commodity Committee

DATE: June 7, 1954

Defense Minerals Administration
RECEIVED
JUN 10 1954

FROM : W. S. Twenhofel, Acting USGS Member, Uranium Commodity Committee

SUBJECT: Field Team report, DMEA Docket No. 3284 (Uranium); Kennedy and Hellerich, partners, Nome, Alaska; Nineteen lode claims at Brooks Mountain, York District, Cape Nome Precinct, 2nd Division, Territory of Alaska

Mr. Arthur P. Butler, Jr., USGS Member, Uranium Commodity Committee, reviewed the application of this docket on March 31, 1954, and recommended denial. Mr. Butler based his recommendation on the low grade of the material exposed, the remoteness of the area, and the lack of any data to support the hypothesis that higher-grade primary uranium minerals would be found at depth.

As of this date, I have reviewed an undated report entitled "Preliminary Geologic Appraisal" of the applicant's claims, by C. L. Sainsbury, the Geological Survey's member of the Field Team. I have also reviewed an undated report entitled "Report of examination, Brooks Mountain prospect" by S. H. Lorain, the Executive Officer and the Bureau of Mines' member of the Field Team.

The two reports mentioned above contribute very little new geologic data in addition to that contained in Geological Survey Circular 214, which is the only comprehensive report on the area.

Mr. Sainsbury's comments on the application appear to indicate he feels the proposed project has no economic justification. He bases his conclusion on the low grade surface showings and the extreme remoteness of the project area.

Mr. Lorain's report on the area indicates he feels some modest program of surface mapping, radioametric surveying, trenching, and drilling is desirable as a means of appraising the project area.

Recommendation

I definitely am of the opinion that the application should be denied. I base this conclusion on the poor surface showings, the lack of any known controlling geologic structure, the remoteness of the area from any uranium mill or uranium buying station, and the lack of any data to support the hypothesis of much higher grade primary uranium minerals being present at depth.

W. S. Twenhofel

Copies to: E. Wm. Ellis (2)

5/27/54 gla

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES
WASHINGTON 25, D. C.

Release [illegible]
[illegible]
MAY 28 1954

May 27, 1954

Memorandum

To: Ernest William Ellis, DMEA Member
Uranium Commodity Committee, Room 4640

From: H. D. Keiser, Bureau of Mines Member
Uranium Commodity Committee

Subject: May 3 and May 13, 1954, memorandums by S. H. Lorain and respective accompanying reports by S. H. Lorain and C. L. Sainsbury, DMEA Docket No. 3284, Kennedy and Hellerich, Nome, Alaska.

I have read the subject memorandums with their accompanying reports, and have discussed these documents and the basic application with Joseph O. Hosted, representative of the Atomic Energy Commission.

It is recommended that the application included in the subject docket be denied, and that the Field Team be informed that consideration would be given to an alternative proposal involving the sinking of a shaft, as discussed in the subject documents.

The subject documents have been forwarded to the Chief, Minerals Division, Bureau of Mines, in accord with the routing slip attached thereto.

H. D. Keiser

5/18/54 gla

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
~~WASHINGTON 25, D.C.~~
P. O. Box 560
Juneau, Alaska
May 13, 1954

Defense Minerals Administration
RECEIVED
MAY 17 1954

MEMORANDUM

To: Operating Committee, Defense Minerals Exploration Administration, Washington D. C.

From: Executive Officer, Alaska Field Team, Region I

Subject: Application for exploration contract
Docket No. DMEA-3284
Kennedy and Hellerich

Enclosed herewith is an original and four copies of a report by Sainsbury on the subject application. Although he does not definitely so state, I would interpret Sainsbury's recommendations as being opposed to a DMEA-type exploration job.

It is my personal opinion that the prospect definitely deserves a next-step exploration job - for the reasons set forth in the report recently mailed to you. However the specific proposal set forth in the application is, in my opinion, practically worthless; furthermore I doubt very much if the applicants would be competent to carry out a suitable program unless supervised closely at every step; therefore I will be quite willing to go along with Sainsbury's (essential) rejection of a DMEA project by the subject applicants.

If your office wishes to propose an alternative project, we will be very willing to approach the applicants with regard to a modification of their proposal.

S. H. Lorain, Executive Officer
Alaska Field Team, Region I

Enclosure

cc: Sainsbury

MF-500

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS ADMINISTRATION

REFERENCE SLIP

DATE 3/18

REFERRED TO:
1. Mr. Chief
2.
3. Docket file
4.

FOR:

..... Action	..... Recommendation
..... Approval	..... Record of .....
..... Comment	..... Referring to .....
..... Conference	..... Reply for signature of .....
..... Consideration	..... Rewriting
..... Filing	..... Signature
..... Instructions	..... Suggestions
..... Investigation	..... Your information
..... Initials	
..... Mailing	
..... Previous correspondence	

REMARKS: 3 copies Larsen's report rec'd. with his memo 3/31 & 2 copies of Sainsbury's report sent to Chief, Com.

Check (X) before the items needing attention.

ROBERT E. ADAMS
Initials of sender.

GPO 16—63815-1

Preliminary Geologic Appraisal

DMEA Docket No. 3824, Uranium
Brooks Mountain, Seward Peninsula, Alaska
Hellerich and Kennedy, Partners

RECEIVED

6/11/54

Introduction

The following appraisal of the subject application represents the writer's conclusions and recommendations based upon a study of the published literature pertaining to the uranium deposits (West and White, 1952), and upon oral discussions with members of the Alaska Trace Elements Unit of the Geological Survey. The original application received considerable discussion among the writer, the Trace Elements group, personnel of DMEA, and Mr. Hosted of the Atomic Energy Commission, during the time the writer was in Washington last month.

The comments of Helmuth Wedow, Chief, Alaskan Trace Elements Unit, U. S. Geological Survey, relative the subject exploration are attached.

It is the writer's understanding that all recommended applications for exploration of radioactive commodities must be concurred in by the Atomic Energy Commission, and the following appraisal is based largely upon the oral conclusions and recommendations arrived at in Washington conferences - the writer sees no useful end in presenting a proposal that is not likely to be concurred in by the Atomic Energy Commission, or the Alaskan Trace Elements Unit, which functions as the examining group for Alaskan radioactive deposits.

Geology

White and West of the Geological Survey, with three field assistants, spent two months at Brooks Mountain during the period in which the United States Smelting, Refining and Mining Company conducted their exploration of the known lode deposits containing uranium, and the geologic maps, and assay data collected by the Company were made available to White and West, and to the Alaskan Trace Elements unit.

The writer concludes, therefore, that the geologic data presented in Circular 214 are as complete as present knowledge permit, and will not go into discussions of the geology. The following conclusions relative to the known deposits of uranium at Brooks Mountain seem justified:

(1) secondary uranium minerals occur at widely separate places along the wester margin of a granite stock of more-than-average radioactivity. The spatial distribution of the uraniferous deposits cannot be related logically with known structures, including the actual

limestone-granite contacts or faults or fissures that are large enough to extrapolate with a reasonable degree of success to depths where primary uranium minerals can be expected.

(2) most of the known deposits are small, and radiometric traverses made by the Trace Elements Unit during the course of their investigation did not indicate any large areas of significant anomalous radioactivity, although it is recognized that a detailed isorad map based on sufficiently close control points might outline general areas of higher-than-background value to guide future exploration.

(3) although the ore mined by the United States Smelting, Refining and Mining Company during the exploration of the Foggy Day prospect contained sufficient uranium oxide to be eligible for purchase by the Atomic Energy Commission, no ore reserves of even a few tens of tons can be inferred from surface exposures; and it seems reasonably certain that additional shallow surface exploration will do little to increase present ore reserves.

On the basis of these factors, the writer cannot recommend the expenditure of approximately $30,000.00 for additional exploration at Brooks Mountain <u>if the justification for such expenditure be based upon the indicated economic potential of the deposits.</u> We have recommended denial of other applications where the surface exposures do not indicate that chances of finding minable ore are sufficiently encouraging to warrant subsurface exploration. The fact that this application is for exploration of uranium deposits does not change the economics of the situation.

Furthermore, one cannot reasonably postulate that the press of defense production for waretime use would someday force production from these deposits - their geographic location is such that installations would be hopelessly vulnerable to destruction, and transportation of ores and operating supplies would be impossible.

Other Considerations

The above-mentioned facts and considerations were discussed in Washington with DMEA personnel, with Survey and Bureau of Mines personnel engaged in DMEA work, and with Mr. Hosted of the Atomic Energy Commission. The conclusions stated above relative the indicated economic aspects of the Brooks Mountain deposits represent the general agreements reached in these discussions. Mr. Hosted and Mr. Wedow (a copy of a letter setting forth Mr. Wedow's conclusions is attached) also believed that an expenditure of $30,000.00 for diamond-drilling would be excessive in relation to the information that could be gained.

The writer's pertinent thoughts relative to the need for some exploration at Brooks Mountain are summarized below:

(1) The Seward Peninsula apparently is one of the better, if not the best, uraniferous provinces presently known in Alaska. Several areas of significantly anomalous radioactivity are known, several bedrock occurrences of secondary uranium minerals have been superficially trenched, and granite stocks in the area often exhibit more-than-background radiation.

A logical next step toward the sensible and orderly evaluation of the uranium potentialities of the Seward Peninsula would involve subsurface exploration of a chosen deposit to determine the mineralogic changes at depth, and to determine the possible tonnages of ore that might be expected from certain surface indications.

(2) The question of the existence of primary uranium minerals at Brooks Mountain is perhaps more academic than economic. The geologic setting of the deposits offers strong, though not necessarily conclusive, evidence that primary uranium minerals will be found at depth. An expenditure of $30,000.00 merely to determine the actual existence of primary uranium minerals is not economically justifiable unless such primary minerals are expected in substantial quantities. As pointed out previously, the evidence to date indicates the tonnage of ore to be expected reasonably at Brooks Mountain is small.

Mr. Wedow pointed out orally the somewhat analogous situation that obtains in the Front Range of Colorado where numerous very small but rich pitchblende veinlets occur. To date, however, the Atomic Energy Commission has not been able to develop sufficient reserves of ore to warrant the installation of a purchasing station. The remote location and small inferred reserves of the ore at Brooks Mountain is placed in a more unfavorable light by the fact that all uranium sales must be made to the Government.

(3) It will be difficult to judge the relative cost merits of exploration to be done by shafting as opposed to exploration by diamond-drilling. If exploration by drilling is contemplated, the initial cost of securing equipment and transporting supplies, men and equipment to Brooks Mountain would constitute a major item in exploration costs. Little could be gained in lowering the contemplated costs by paring the amount of drilling proposed. Information can be gained by diamond-drilling to prove or disprove the existence of primary uranium at depth, <u>provided an ore zone is encountered</u>, but the drilling program would give very incomplete information as to the structural controls of an ore zone encountered at depth.

Exploration by shafts offers the distinct advantage of creating openings in which the actual structure and distribution of ore can be studied in detail. However, in order to explore by shafts each of the ore occurrences at Brooks Mountain to a depth where primary uranium can be expected, an unrealistically large expenditure must be made. Shallow shafts sunk by using a gasoline-powered hammer and hand winch might be made at low cost, but they cannot be extended to depths more than a few tens of feet.

No easy solution to the dilemma is apparent to the writer. The following courses of action are recommended for consideration:

Recommendations

1 - The Atomic Energy Commission should decide whether or not the uranium exploration program in Alaska is at a stage where subsurface exploration of the Brooks Mountain deposits is warranted to obtain needed geolgic data such as; (a) the depth of the oxidized zone in the Seward Peninsula (b) the effects of permafrost on the transport and deposition of uranium (c) the nature and tenor of the primary uranium.minerals that occur at depth (d) the establishment of initial criteria to indicate the size and tenor of ore bodies at depth, if such occur.

2 - If it is decided that explorations based on reasons in 1-a,b,c,d (above) are desirable, the unfavorable economic picture should be minimized, and an exploration program decided upon that will be broad enough in scope and completeness to accomplish these objectives. The relative merits of diamond-drilling versus shafts or drifts should be thoroughly explored - perhaps a combination of each type of exploration should be considered.

3 - The costs of such explorations should be divorced from the immediate economic picture, and should be considered as an investment that is justified entirely from the factual geologic data to be acquired.

The writer is inclined to favor some exploration of the deposits at Brooks Mountain. He would, however, press for a comprehensive program of sufficient size to establish the various criteria listed above.

In reviewing my ideas, I am struck by the fact that the program suggested falls more naturally under the exploration functions of the Atomic Energy Commission as carried out by the Physical Exploration Unit of the U. S. Geological Survey than under the type exploration financed by DMEA. This application, is, however, a DMEA application and should be processed under the relative merits of the program presented.

C. L. Sainsbury

C. L. Sainsbury, Field Team,
Region I, U. S. Geological
Survey Member

cc: Lorain - 5
Trace Elements
Gates

UNITED STATES
DEPARTMENT OF THE INTERIOR
Geological Survey
Washington 25, D. C.

DEPARTMENT OF THE INTERIOR
Defense Minerals Administration
RECEIVED
MAY 17 1954

gcs
6/11/54

AIR MAIL

MEMORANDUM

To: C. L. Sainsbury, DMEA Field Team,
U. S. Geological Survey, Juneau, Alaska

From: Helmuth Wedow, Chief, Trace Elements Unit
Alaskan Geology Branch, Washington, D. C.

Subject: Kennedy and Hellerich DMEA loan application (Docket No. 3824) for exploration at the Brooks Mountain uranium prospect

The writer has reviewed the subject DMEA loan application and cannot recommend approval of the diamond drilling program presented for the exploration of the uranium prospect at Brooks Mountain, Seward Peninsula, Alaska. After a redigest of all published and unpublished data available in the files of the Alaskan Trace Elements Unit, it is believed that diamond drilling, particularly with AX bits, would not return sufficient pertinent data for the cost of the operation. Core recovery, especially in possible ore zones at or near the granite-limestone contact very likely would be low because of the highly altered, friable, "soft ground" character of the ore zone. The data gained from drilling with low core recovery would not be sufficiently precise for determining the necessary details of the geologic setting of the contact and possible ore zones and shoots. Uranium analyses and mineralogic studies of core samples from holes with low recovery would be misleading in determining whether the grade increases or whether changes in mineral assemblage occur with depth. Also, drill holes, particularly as planned, could very easily undershoot or overshoot lenticular or elongate pipe-like ore bodies with even very high angles of plunge; and, although present surface data are meager, they do suggest that the ore shoot or zone at the Foggy Day prospect (Drill-hole site "B" on docket map) probably plunges northward at a high angle.

On the other hand, if the Brooks Mountain deposit is analogous to similar surficial secondary uranium occurrences in the Marysvale district of Utah, it is likely that primary uranium oxide ores of higher grade than the surficial secondary ores occur at moderate depth. As the chief initial objective is to determine whether primary uranium minerals are introduced into the mineral assemblage of the ore shoot at depths of

approximately 40 to 100 feet and because the general lack of data on the structural setting of the possible ore shoots, it is believed that a more modest exploration program consisting of following the possible ore shoot at the Foggy Day prospect down the contact with an inclined shaft, timbered where necessary, would be a more feasible operation and could be recommended for approval by the writer. Such an opening on the deposit would make available to the geologist and engineer more data on the structural control of the ore shoot that would be necessary to guide further exploration, if such appears warrented, than would the diamond drilling program outlined in the application. A complete sampling for assays and mineralogic studies of the ore body and adjacent wall rock would be assured, in contrast to the obvious limitations of samples and data obtained from drilling. In addition, if significant quantities of minable grade ore are discovered during the sinking of the shaft, production could proceed.

The above conclusions have been discussed with Joseph O. Hosted of the Division of Raw Materials, U. S. Atomic Energy Commission, and have his concurrence.

Helmuth Wedow

Preliminary Geologic Appraisal

DMEA Docket No. 3E24, Uranium
Brooks Mountain, Seward Peninsula, Alaska
Hollerich and Kennedy, Partners

Defense Minerals Exploration Administration
MAY 17 1954

Reviewed by
DMEA OPERATING COMMITTEE
5-21-54
(date)

Introduction

The following appraisal of the subject application represents the writer's conclusions and recommendations based upon a study of the published literature pertaining to the uranium deposits (West and White, 1952), and upon oral discussions with members of the Alaska Trace Elements Unit of the Geological Survey. The original application received considerable discussion among the writer, the Trace Elements group, personnel of DMEA, and Mr. Hosted of the Atomic Energy Commission, during the time the writer was in Washington last month.

The comments of Helmuth Wedow, Chief, Alaskan Trace Elements Unit, U. S. Geological Survey, relative the subject exploration are attached.

It is the writer's understanding that all recommended applications for exploration of radioactive commodities must be concurred in by the Atomic Energy Commission, and the following appraisal is based largely upon the oral conclusions and recommendations arrived at in Washington conferences - the writer sees no useful end in presenting a proposal that is not likely to be concurred in by the Atomic Energy Commission, or the Alaskan Trace Elements Unit, which functions as the examining group for Alaskan radioactive deposits.

Geology

White and West of the Geological Survey, with three field assistants, spent two months at Brooks Mountain during the period in which the United States Smelting, Refining and Mining Company conducted their exploration of the known lode deposits containing uranium, and the geologic maps, and assay data collected by the Company were made available to White and West, and to the Alaskan Trace Elements unit.

The writer concludes, therefore, that the geologic data presented in Circular 214 are as complete as present knowledge permit, and will not go into discussions of the geology. The following conclusions relative to the known deposits of uranium at Brooks Mountain seem justified:

(1) secondary uranium minerals occur at widely separate places along the wester margin of a granite stock of more-than-average radioactivity. The spatial distribution of the uraniferous deposits cannot be related logically with known structures, including the actual

limestone-granite contacts or faults or fissures that are large enough to extrapolate with a reasonable degree of success to depths where primary uranium minerals can be expected.

(2) Most of the known deposits are small, and radiometric traverses made by the Trace Elements Unit during the course of their investigation did not indicate any large areas of significant anomalous radioactivity, although it is recognized that a detailed isorad map based on sufficiently close control points might outline general areas of higher-than-background value to guide future exploration.

(3) although the ore mined by the United States Smelting, Refining and Mining Company during the exploration of the Foggy Day prospect contained sufficient uranium oxide to be eligible for purchase by the Atomic Energy Commission, no ore reserves of even a few tons of tons can be inferred from surface exposures; and it seems reasonably certain that additional shallow surface exploration will do little to increase present ore reserves.

On the basis of these factors, the writer cannot recommend the expenditure of approximately $30,000.00 for additional exploration at Brooks Mountain <u>if the justification for such expenditure be based upon the indicated economic potential of the deposits.</u> We have recommended denial of other applications where the surface exposures do not indicate that chances of finding minable ore are sufficiently encouraging to warrant subsurface exploration. The fact that this application is for exploration of uranium deposits does not change the economics of the situation.

Furthermore, one cannot reasonably postulate that the press of defense production for war-time use would someday force production from these deposits - their geographic location is such that installations would be hopelessly vulnerable to destruction, and transportation of ores and operating supplies would be impossible.

Other Considerations

The above-mentioned facts and considerations were discussed in Washington with DMEA personnel, with Survey and Bureau of Mines personnel engaged in DMEA work, and with Mr. Hosted of the Atomic Energy Commission. The conclusions stated above relative the indicated economic aspects of the Brooks Mountain deposits represent the general agreements reached in these discussions. Mr. Hosted and Mr. Wedow (a copy of a letter setting forth Mr. Wedow's conclusions is attached) also believed that an expenditure of $30,000.00 for diamond-drilling would be excessive in relation to the information that could be gained.

The writer's pertinent thoughts relative to the need for some exploration at Brooks Mountain are summarized below:

(1) The Seward Peninsula apparently is one of the better, if not the best, uraniferous provinces presently known in Alaska. Several areas of significantly anomalous radioactivity are known, several bedrock occurrences of secondary uranium minerals have been superficially trenched, and granite stocks in the area often exhibit more-than-background radiation.

A logical next step toward the sensible and orderly evaluation of the uranium potentialities of the Seward Peninsula would involve subsurface exploration of a chosen deposit to determine the mineralogic changes at depth, and to determine the possible tonnages of ore that might be expected from certain surface indications.

(2) The question of the existence of primary uranium minerals at Brooks Mountain is perhaps more academic than economic. The geologic setting of the deposits offers strong, though not necessarily conclusive, evidence that primary uranium minerals will be found at depth. An expenditure of $30,000.00 merely to determine the actual existence of primary uranium minerals is not economically justifiable unless such primary minerals are expected in substantial quantities. As pointed out previously, the evidence to date indicates the tonnage of ore to be expected reasonably at Brooks Mountain is small.

Mr. Wedow pointed out aptly the somewhat analogous situation that obtains in the Front Range of Colorado where numerous very small but rich pitchblende veinlets occur. To date, however, the Atomic Energy Commission has not been able to develop sufficient reserves of ore to warrant the installation of a purchasing station. The remote location and small inferred reserves of the ore at Brooks Mountain is placed in a more unfavorable light by the fact that all uranium sales must be made to the Government.

(3) It will be difficult to judge the relative cost merits of exploration to be done by shafting as opposed to exploration by diamond-drilling. If exploration by drilling is contemplated, the initial cost of securing equipment and transporting supplies, men and equipment to Brooks Mountain would constitute a major item in exploration costs. Little could be gained in lowering the contemplated costs by paring the amount of drilling proposed. Information can be gained by diamond-drilling to prove or disprove the existence of primary uranium at depth, provided an ore zone is encountered, but the drilling program would give very incomplete information as to the structural controls of an ore zone encountered at depth.

Exploration by shafts offers the distinct advantage of creating openings in which the actual structure and distribution of ore can be studied in detail. However, in order to explore by shafts each of the ore occurrences at Brooks Mountain to a depth where primary uranium can be expected, an unrealistically large expenditure must be made. Shallow shafts sunk by using a gasoline-powered hammer and hand winch might be made at low cost, but they cannot be extended to depths more than a few tens of feet.

No easy solution to the dilemma is apparent to the writer. The following courses of action are recommended for consideration:

Recommendations

1 - The Atomic Energy Commission should decide whether or not the uranium exploration program in Alaska is at a stage where subsurface exploration of the Brooks Mountain deposits is warranted to obtain needed geolgic data such as; (a) the depth of the oxidized zone in the Seward Peninsula (b) the effects of permafrost on the transport and deposition of uranium (c) the nature and tenor of the primary uranium minerals that occur at depth (d) the establishment of initial criteria to indicate the size and tenor of ore bodies at depth, if such occur.

2 - If it is decided that explorations based on reasons in 1-a,b,c,d (above) are desirable, the unfavorable economic picture should be minimized, and an exploration program decided upon that will be broad enough in scope and completeness to accomplish these objectives. The relative merits of diamond-drilling versus shafts or drifts should be thoroughly explored - perhaps a combination of each type of exploration should be considered.

3 - The costs of such explorations should be diverced from the immediate economic picture, and should be considered as an investment that is justified entirely from the factual geologic data to be acquired.

The writer is inclined to favor some exploration of the deposits at Brooks Mountain. He would, however, press for a comprehensive program of sufficient size to establish the various criteria listed above.

In reviewing my lens, I am struck by the fact that the program suggested falls more naturally under the exploration functions of the Atomic Energy Commission as carried out by the Physical Exploration Unit of the U. S. Geological Survey than under the type exploration financed by RMEA. This application, is, however, a RMEA application and should be processed under the relative merits of the program presented.

CLS

C. L. Gainsbury, Field Team,
Region I, U. S. Geological
Survey Member

cc: Lorain - 5
Trace Elements
Gates

UNITED STATES
DEPARTMENT OF THE INTERIOR
Geological Survey
Washington 25, D. C.

AIR MAIL

MEMORANDUM

To: C. L. Sainsbury, DMEA Field Team,
U. S. Geological Survey, Juneau, Alaska

From: Helmuth Wedow, Chief, Trace Elements Unit
Alaskan Geology Branch, Washington, D. C.

Subject: Kennedy and Hellerich DMEA loan application (Docket No. 3824) for exploration at the Brooks Mountain uranium prospect

The writer has reviewed the subject DMEA loan application and cannot recommend approval of the diamond drilling program presented for the exploration of the uranium prospect at Brooks Mountain, Seward Peninsula, Alaska. After a redigest of all published and unpublished data available in the files of the Alaskan Trace Elements Unit, it is believed that diamond drilling, particularly with AX bits, would not return sufficient pertinent data for the cost of the operation. Core recovery, especially in possible ore zones at or near the granite-limestone contact very likely would be low because of the highly altered, friable, "soft ground" character of the ore zone. The data gained from drilling with low core recovery would not be sufficiently precise for determining the necessary details of the geologic setting of the contact and possible ore zones and shoots. Uranium analyses and mineralogic studies of core samples from holes with low recovery would be misleading in determining whether the grade increases or whether changes in mineral assemblage occur with depth. Also, drill holes, particularly as planned, could very easily undershoot or overshoot lenticular or elongate pipe-like ore bodies with even very high angles of plunge; and, although present surface data are meager, they do suggest that the ore shoot or zone at the Foggy Day prospect (Drill-hole site "B" on docket map) probably plunges northward at a high angle.

On the other hand, if the Brooks Mountain deposit is analogous to similar surficial secondary uranium occurrences in the Marysvale district of Utah, it is likely that primary uranium oxide ores of higher grade than the surficial secondary ores occur at moderate depth. As the chief initial objective is to determine whether primary uranium minerals are introduced into the mineral assemblage of the ore shoot at depths of

Reviewed by
DMEA OPERATING COMMITTEE
5-21-54
(date)

approximately 40 to 100 feet and because the general lack of data on the structural setting of the possible ore shoots, it is believed that a more modest exploration program consisting of following the possible ore shoot at the Foggy Day prospect down the contact with an inclined shaft, timbered where necessary, would be a more feasible operation and could be recommended for approval by the writer. Such an opening on the deposit would make available to the geologist and engineer more data on the structural control of the ore shoot that would be necessary to guide further exploration, if such appears warrented, than would the diamond drilling program outlined in the application. A complete sampling for assays and mineralogic studies of the ore body and adjacent wall rock would be assured, in contrast to the obvious limitations of samples and data obtained from drilling. In addition, if significant quantities of minable grade ore are discovered during the sinking of the shaft, production could proceed.

The above conclusions have been discussed with Joseph O. Hosted of the Division of Raw Materials, U. S. Atomic Energy Commission, and have his concurrence.

Helmuth Wedow

XXXXXXXXXXXXXXXXXX
P. O. Box 560
Juneau, Alaska
May 5, 1954

MEMORANDUM

To: Operating Committee, Defense Minerals Exploration Administration

From: S. H. Lorain, Executive Officer

Subject: Reactivation of application Docket No. DMEA-3284, Kennedy and Hellerich

We have just received the following telegram from M. R. Kennedy of Nome, Alaska; "this wire authorizes you to proceed with processing loan application subject to similar authority from Hellerich. My written confirmation mailed today. Regards."

I am mailing you today four copies of a personal report that I have prepared. This report presents the available background data and my own personal conclusions and recommendations. Mr. Sainsbury now is working on his report which should be completed in the near future. When Sainsbury's report is completed it will be mailed to you with a covering letter which may, if necessary, present our compromised proposals for a suitable program.

Whether it will be possible to obtain the applicants agreement to the kind of program that we believe to be adequate, remains to be seen.

S. H. Lorain, Executive Officer
Alaska Field Team, Region I

Reviewed by
DMEA OPERATING COMMITTEE
5-21-54
(date)

5/11/54 gla

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION

~~WASHINGTON 25, D.C.~~
P. O. Box 560
Juneau, Alaska
May 5, 1954

MEMORANDUM

To: Operating Committee, Defense Minerals Exploration Administration

From: S. H. Lorain, Executive Officer

Subject: Reactivation of application Docket No. DMEA-3284, Kennedy and Hellerich

We have just received the following telegram from M. R. Kennedy of Nome, Alaska; "this wire authorizes you to proceed with processing loan application subject to similar authority from Hellerich. My written confirmation mailed today. Regards."

I am mailing you today four copies of a personal report that I have prepared. This report presents the available background data and my own personal conclusions and recommendations. Mr. Sainsbury now is working on his report which should be completed in the near future. When Sainsbury's report is completed it will be mailed to you with a covering letter which may, if necessary, present our compromise proposals for a suitable program.

Whether it will be possible to obtain the applicants agreement to the kind of program that we believe to be adequate, remains to be seen.

S. H. Lorain, Executive Officer
Alaska Field Team, Region I

Enclosures

XXXXXXXXXXXXXXXXXX
P. O. Box 560
Juneau, Alaska
May 3, 1954

MEMORANDUM

To: Operating Committee
Defense Minerals Exploration Administration

From: S. H. Lorain

Subject: Brooks Mountain Prospect, Seward Peninsula, Alaska

Enclosed herewith are four copies of a report on the subject prospect that I prepared for our Bureau of Mines file and for reference purposes with regard to possible future consideration of Docket No. DMEA-3284 (Uranium), Kennedy and Hellerich.

This is strictly my own report; the conclusions and recommendations do not necessarily reflect the combined Field Team views but I believe that it will serve to present the factual data on which a Field Team report may be based.

I told you previously that the Kennedy-Hellerich partnership had been dissolved and that, consequently, their application was dormant. A few days ago I received a telegram from Hellerich in which he stated that the partnership has been revived; he indicated that they might wish to reactivate their application. I wired that no action was being taken until we had a firm statement of their intentions. Up to now I have had no reply.

S. H. Lorain, Executive Officer
Alaska Field Team, Region I

Enclosures

Reviewed by
DMEA OPERATING COMMITTEE
5-21-54
(date)

REPORT OF EXAMINATION

BROOKS MOUNTAIN PROSPECT
(Uranium, zinc, lead, tin)

Port Clarence District, Seward Peninsula Region, Alaska

by

S. H. Lorain
Regional Director, Region I
Bureau of Mines

Executive Officer, Region I
Defense Minerals Exploration Administration

Summary

Uranium-bearing minerals have been found, at intervals, throughout a distance of about 5,000 feet along a contact between limestone and a granite intrusive on the southwest slope of Brooks Mountain on Seward Peninsula, Alaska. One lens of zeunerite-bearing granite about 15 feet long by 3 feet wide, by 10 feet deep was excavated; the eU content was reported to be 0.1 percent to 0.2 percent. An area of indeterminate size, in limestone about 1,000 feet south of the zeunerite-bearing lens, has yielded float believed to contain primary uranium in association with a secondary lead mineral which has been identified as mimetite.

A non-radioactive vein deposit 3½ feet wide but of undetermined length, in limestone about halfway between the zeunerite deposit and the mimetite deposit, assays about 22 percent combined lead-zinc with about 9 ounces of silver and some copper. Tin bearing minerals (notably pagoite and hulsite) from the immediate vicinity also have been identified.

Reviewed by
DMEA OPERATING COMMITTEE
5-21-54
(date)

The mineralization is on an otherwise barren granite-limestone contact near the projected intersection of a strong pre-mineral fault (as mapped by the Geological Survey) which is parallel to, and appears to be related to the principal mineral-bearing fractures at the nearby Lost River tin mine and at numerous zinc-lead-copper-tin prospects along a zone ofmineralization about 8 miles long. Bedrock in the near vicinity of the fault on Brooks Mountain is not exposed.

The mineralized area on Brooks Mountain deserves preliminary-type exploration and additional careful prospecting. A program to test, by drilling, the downward continuation of the scunerite prospect, to test the downward continuation and possible parallel mineralization of the zinc-lead prospect, and to discover the bedrock source of the uraninite-uranium mineralization coincidentally with systematic geiger-counter prospecting of the granite-limestone contact zone and of the area underlain by the above-mentioned fault is recommended.

The recommended first-step program would require about 1,500 feet of diamond drilling, some tractor-dozer trenching if practicable, and intensive geiger-counter prospecting based on adequate surveys. A crew of five men under the supervision of an experienced engineer would be required.

Basic equipment would consist of a skid-mounted, gasoline-powered diamond drill with a capacity of 500 feet of AX hole; a tractor-dozer equivalent to a D-4 Caterpillar or larger; a good jeep or "four-by-four"; geiger-counter and surveying equipment.

Because of weather conditions, the job should be started and completed during the months of July and August.

Introduction

The writer examined this property on July 24, 1953; he was accompanied by Donald Kochesperger[1], by J. R. Houston[2], and by John J. Mulligan[3]. On September 17, 1951 the property had been examined by R. L. Thorne[4] and John J. Mulligan who had prepared a memorandum report. During July and August 1951 a radioactive survey of the area was made by the Geological Survey; the results of this survey have been published in pamphlet form[5].

Most of the data contained in this report were extracted from reports by the Geological Survey and by Thorne and Mulligan; the conclusions and recommendations are the writer's.

Location and Accessibility

The Brooks Mountain uranium prospect is on the upper south slope of Brooks Mountain, a prominent peak on the north flank of the York Mountains 28 miles S 80 E from the westernmost extremity (Cape Prince of Wales) of the Seward Peninsula; it is about 8½ miles due north from the Bering Sea at the mouth of Lost River or approximately 60 miles south of the Arctic Circle at latitude 65 degrees 31 minutes north, longitude 167 degrees 8 minutes west (Fig. 1).

Access from Bering Sea is by graveled road 5½ miles up Lost River to the mouth of Cassiterite Creek, thence, by an unimproved "jeep" trail, 2 miles up Lost River and 1½ miles up Crystal Creek to the prospect (Fig. 2); the last

---

1/ Kochesperger, Donald, general superintendent, Lost River mine, U.S. Tin Corp.

2/ Houston, J. R., geologist, U. S. Geological Survey

3/ Mulligan, John J., mining engineer, U. S. Bureau of Mines

4/ Thorne, Robert L., mining engineer, U. S. Bureau of mines

5/ The Occurrence of Zeunerite at Brooks Mountain, Seward Peninsula, Alaska. Geological Survey Circular 214 by Walter S. West and Max O. White.

Fig. 2-A Lost River Valley looking upstream

two or three miles are on heavy grades. Because the topography is moderately rounded and is free from heavy vegetation, road construction is not difficult. Foot travel during the summer months is, relatively, easy.

Light freight and passengers may be delivered at a landing field on the beach at the mouth of Lost River or at a landing field on Lost River at the mouth of Cassiterite Creek (Fig. 2). In good weather an experienced pilot can land a light plane on a ridge about one mile from the prospect. These landing fields are, approximately, 75 air miles from Nome. Except during heavy winds or low visibility, daily flights are made from Nome with passengers and supplies for the Lost River tin mine on Cassiterite Creek.

Heavy freight must be lightered from ships to the beach at the mouth of Lost River but, normally, freight may be landed only during the months of July to September, inclusive.

History and Production

The exact date of the first mineral discovery on Brooks Mountain is not recorded in available records. Collier[6] reports that a prospector had found tin-bearing minerals on Brooks Mountain in 1901. Knopf[7] reports that, by 1907, a lead-zinc prospect had been discovered at the west end of Brooks Mountain and that a galena prospect had been discovered on the north slope of the mountain. The lead-zinc prospect, now known as the "Read (or Reed) Prospect", is within a few hundred feet of the principal uranium prospects.

In September 1948 strong indications of radioactive minerals were found by Dr. M. R. Kennedy, a Nome dentist. A specimen sent to the Atomic Energy

---

6/ Collier, Arthur J., Tin Deposits of the York Region, Alaska. Geological Survey Bulletin No. 229, p. 26; 1904.

7/ Knopf, Adolph, Geology of the Seward Peninsula Tin Deposits, Alaska. Geological Survey Bulletin 358, pp. 41-44; 1908.

Commission was reported to contain "radioactivity equivalent to 0.35% U_3O_8. The radioactivity originates in a primary uranium-bearing mineral and its alteration products".

Dr. Kennedy was accompanied, or was joined shortly thereafter, by George Hellerich, a mining engineer and an experienced Alaskan placer operator. During 1950 and 1951 Kennedy and Hellerich staked 19 lode claims along the southwest flank of Brooks Mountain to cover spots in which radioactive mineralization had been found.

The Kennedy-Hellerich claims were leased to the United States Smelting, Refining and Mining Co. in the spring of 1951. During the summer of 1951 the lessees built a small bunk house, mapped the property, built a road adjacent to the principal radioactive prospects, cleared a "jeep" trail to the Lost River mine road on Lost River, and dug a small pit on the "Foggy Day" claim (Fig. 3). The pit, which was about 12 feet deep by 40 feet long, exposed a lens or short zone of highly fractured zeunerite bearing granitic rock. Operations were suspended about September 1, 1951; the lease was relinquished shortly thereafter.

No mineral production from Brooks Mountain has been made.

Physical Features and Climate

Brooks Mountain (altitude 2,918 feet) is the highest peak in the York mountains; it is the second highest mountain on Seward Peninsula. From the principal uranium prospects (altitude approximately 2,000 feet) to the summit the mountain sides are rocky and precipitous; except in slide areas the surface is bare. At lower altitudes the mountain sides are moderately steep but the ridges and valleys are rounded; most of the surface is covered with finely divided products of residual weathering. Moss, lichens and grass grow on the more sheltered slopes but larger vegetation does not exist in the area.

The climate is sub-arctic; personal experience indicates that cold winds, frequently accompanied by rain, or snow, are almost constant. Records of the weather on Brooks Mountain have not been made. Weather records at Wales Village, which is on the sea coast 28 miles west of Brooks Mountain, indicate monthly average temperatures that range from a few degrees below zero in mid-winter to 25 degrees to 50 degrees above zero during the spring, summer, and early fall months; the highest average monthly temperature is about 47 degrees during August. The annual precipitation at Wales is about 9.3 inches, of which more than one third falls during July and August.

Labor Supply and Living Conditions

No labor supply exists in the near vicinity of the prospect; consequently all labor must be imported from the various Eskimo villages in the area, from Nome and other Alaskan towns, or from the United States. The nearby Lost River tin mine has demonstrated that Eskimo can be trained quickly for most mine work and that they are satisfactory workers if guided and led by a nucleous of skilled white men. About 200 to 300 Eskimo workers are available from villages in western Seward peninsula but few of them will work steadily throughout the year. Current wages at the Lost River mine range from about $1.50 per hour for untrained Eskimo on outside work to about $2.00 an hour for trained Eskimo on underground work. Skilled white men receive about $2.25 to $2.35 per hour. All work is on a seven day basis with the usual overtime pay. Board is charged at $2.50 per day.

Highly efficient labor that will be needed for pioneer exploratory work on Brooks Mountain should be paid $2.00 to $2.50 an hour for laborers to $3.50 or $4.00 an hour for drillers.

A two room bunk house-boarding house, suitable for a summer crew of not to exceed six men was built near the prospect (see Fig. 2) by the United States Smelting, Refining and Mining Co.; it has been maintained in usable condition but is unfurnished; some minor repairs are needed. This building is about 14 feet wide by 20 feet long. An old 10 by 12 feet cabin is about 3/8 mile from the prospect but it is suitable for emergency use only.

Property and Ownership

The property consists of 19 unpatented lode claims (see Fig. 3) held by Dr. M. R. Kennedy, Nome, Alaska and George Hellerich, 4313 Fruit Ave., Fresno 4, California.

Description of the Deposit

General Geology:

The general geology of the area has been described by Collier[8], by Knopf[9], and by Steidtmann and Cathcart[10]. Additional geologic data pertinent to the deposit has been presented by White and West[11]. The following brief description of the general geology is based upon the above mentioned reports.

The core of Brooks Mountain consists of very coarse grained granite intrusives which are exposed throughout an area about 6,000 feet wide, from east to west, by about 9,000 feet long, from north to south (Fig. 3);

8/ Collier, Arthur J., Refer to footnote 6.

9/ Knopf, Adolph, Refer to footnote 7.

10/ Steidtmann, Edward and Cathcart, S. H., Geology of the York Tin Deposits, Alaska; Geological Survey Bulletin 733, pp. 81-87, 1922.

11/ White, Max G. and West, Walter S., Refer to footnote 5, also to Geological Survey Bulletin 319, Reconnaissance for Uranium in the Lost River Area, Seward Peninsula, Alaska, 1951.

the granite is believed to be of Mesozoic age. There seems to be no question but that this granite is related, closely, to the granitic intrusions in other tin-bearing areas of western Seward peninsula but there is no recorded evidence of strong mineral-bearing fractures or of strong hydrothermal alteration within the granite mass.

Sedimentary rocks along the northwestern and northern margins of the intrusive consist of the uptilted ends of beds of Cambrian, or Pre-Cambrian black slate. These beds are overlain, conformably, by relatively thin remnants of Port Clarence limestone of Silurian and Ordovician age. Either slate or limestone may contact the granite at surface along the northwestern and northern margins of the intrusive; at greater depths the contacting sedimentaries probably are slates.

Sedimentary rocks along the southwestern, southern, and eastern margins of the granite intrusive consist entirely of Port Clarence limestone. The lowest section of this formation consists of about 100 feet of alternating thin slate and limestone laminae; the middle section consists of about 900 feet of impure, thin-bedded limestone with shaly partings; the top section consists of about 1,000 feet of thick-bedded, pure limestone. Some dolomite has been reported near the head of Lost River.

Immediately preceding intrusion of the granite and of related dikes, the York Mountains area was faulted along two predominating trends; one trend is about N 20 W, the other trend is about N 70 E. A fault belonging to the N 20 W system appears (Figs. 1 and 2) to coincide, approximately, with the present valley of Lost River and to terminate against a N 70 E fault about 1½ miles S 70 W from the uranium prospects. A very considerable number of strongly mineralized prospects

(including the Lost River tin mine) appear to be associated with this fault throughout its mapped length (Fig. 2). However, the predominating trend of known mineralization in the Lost River mine is about N 70 W. The N 70 E fault appears to terminate, northeasterly, against the granite contact or in the granite just north of the uranium prospects (Fig. 3); on the geologic map of the area it appears to form the contact between limestone on the south and slate on the north. The projected trace of this fault within the area of the Brooks Mountain prospect is covered, deeply, by slide rock and detritus.

Immediately following intrusion of the granites and of the related dikes, tin bearing fluorine and boron solutions formed veins and replacements in or adjacent to the granites. Lead, zinc, copper, antimony, silver metallization is associated with the tin, fluorine, boron deposits but the time relations between them have not been determined. The known uranium bearing minerals are in the same general area but are not always associated closely with the other metals.

The Deposits:

Radioactive mineralization has been found at a number of spots along the western contact of the granitic intrusive and at a few scattered spots within the intrusive; most of the radioactive minerals were found within a sector of the contact that is about 5,000 feet long. The most intensive concentration of radioactive minerals was found near the middle of the Foggy Day claim. The sample locations, as mapped by the Geological Survey, are shown on Figure 3; the sample analyses, also by the Geological Survey, are listed in Table I.

Work done by the United States Smelting, Refining and Mining Co. on the Foggy Day prospect excavated a "lens" of uranium bearing granite just

Table I

Sample No.	Location	Type of Sample	Description	Raw Sample Percent eU	Raw Sample Percent U	Concentrate Percent eU
3854	Foggy Day prospect	Float	Pegmatitic lens material	2.144	2.25	—
4012	do	Grab	do	0.068	0.04	—
4013	do	do	do	.02	.02	—
4016	do	do	do	.27	.2	—
4102	75 ft. N. of Foggy Day	do	Granite wash material	.006	—	.015a
4105	80 ft. W of sample 4101	do	do	.007	—	.013b
4108	Tourmaline No. 2 claim	do	Hematitic coating on tourmaline vein	1.0	—	—
4109	S. of Tourmaline No. 2 claim	do	Weathered tourmaline vein	.02	—	—
4111	E. of Foggy Day prospect	do	Granite	.004	—	—
4113	W. central part of Iron cap No. 9 claim	do	do	.007	—	.10a
4115	Central part of Iron Cap No. 5 claim	do	do	.004	—	.17a
4116	E. of sample 4115	do	do	.005	—	.20a
4117	Near SE corner of Midnight Sun claim and NE corner of Square Zero claim	do	Weathered granite	.006	—	—
4118	do	do	Granite dike	.009	—	—
4119	S. slope above Crystal Creek-Andersen Creek saddle.	do	Granite	.005	—	—

Sample No.	Location	Type of Sample	Description	Raw Sample Percent eU	Raw Sample Percent U	Concentrate Percent eU
4130	Foggy Day prospect	0.9-ft. channel	Across small lens 5 ft. S of pegmatitic lens, 6 ft. below surface	.2	—	—
4135	Tourmaline No. 2 claim	9.5-ft. channel	Across tourmaline veins and granite	.007	—	—
4139	do	Grab	Tourmaline vein material	0.052	—	—
4163	do	do	Granite between tourmaline veins	.005	—	—
4165	do	12-ft. channel	Across tourmaline veins and granite	.007	—	—
4166	do	Grab	Tourmaline vein material	.054	—	—
4185	S. of Tourmaline No. 2 claim	do	Weathered tourmaline vein	.013	—	—
4185	N. slope above Crystal Creek-Anderson Creek saddle.	do	Granite dike	.007	—	—
4197	Foggy Day prospect	do	Limonite at north border of pegmatitic lens	.23	—	—
4198	do	do	Pegmatitic lens material	.014	—	—
4200	do	20-ft. N-S channel	From south limestone contact to 6 ft. north of pegmatitic lens, 3 ft. below surface	0.01	—	—
4235	S. of Tourmaline No. 2 claim	Grab	Weathered granite	—	—	0.038a
4240	N. central part of Sunny Day claim	do	Oxidized granite	—	—	.19a
4266	Pit S. of Reed Prospect	do	Weathered granite	.005	—	—

Sample No.	Location	Type of Sample	Description	Raw Sample Percent eU	Raw Sample Percent U	Concentrate Percent eU
4275	Paigaite claim	Grab	Aplite dike	—	—	.005a
4278	Foggy Day prospect	18-ft. N-S channel	From south limestone contact to 6 ft. N. of pegmatitic lens, 6 ft. below surface	.02	—	—
4282	do	8-ft.channel	Across pegmatitic lens, 4½ ft. below surface	.08	0.075	—
4283	do	4-ft.channel	Across pegmatitic lens, 9 ft. below surface	.06	—	—
4284	do	3.8-ft.channel	Across pegmatitic lens, 12 ft. below surface	.10	—	—
4285	do	3.6-ft.channel	Across pegmatitic lens, 15 ft. below surface	.12	—	—
4288	N. part of granite mass	Grab	Granite	—	—	.016a
4305	Foggy Day prospect	do	Black 1 in. seam in pegmatitic lens	.31	—	—
4309	do	2-ft.channel	Across pegmatitic lens, 18 ft. below surface	.028	—	—
4320	Near isolated limestone outcrop on Iron Cap No. 5 claim	Grab	Weathered granite	.012	—	—
4434	Foggy Day prospect	2-ft.channel	Central part of pegmatitic lens, 7½ ft. below surface	.25	.22	—
4435	do	3.8-ft.channel	Across pegmatitic lens, 11 ft. below surface	.12	.09	—
4436	do	3.8-ft.channel	Across pegmatitic lens, 14 ft. below surface	.16	—	—

inside the granite contact. The "lens" had been removed before the Bureau of Mines examination; it was described as being about 15 feet long, 3 feet wide, and about 10 feet deep. No records of channel sampling have been obtainable but a specimen obtained by a Bureau of Mines engineer was reported by Hess[12] to contain uranium (in meuserite) on the order of 0.45 percent; the owners state that the average uranium content of the lens was about 0.1% to 0.2% ~~eU~~. The gangue was reported by Hess to consist of altered granite.

At the time of the writer's visit the only visible evidence of the ore lens was a short zone, about 10 feet long by a few feet wide, of highly fractured, meuserite-stained, granite. The trend of predominant fracturing was, approximately, N 70 W. The fracture terminations in the granite were clearly visible but fracturing in the limestone, if it exists, was obscured by detritus. According to reports, the long axis of the ore lens was approximately parallel to the fracturing observed by the writer; consequently the writer assumes that the "lens" was formed by local deposition of meuserite in the fractured granite.

Near the middle of the northern half of the Windy Day claim is the old dump from a shaft (now caved) on the Read (Reed?) prospect. The dump consists of nearly massive sphalerite ("Blackjack") and galena. A grab sample from the dump assayed 14.3 percent zinc, 8.8 percent lead, 0.32 percent copper, and 8.8 ounces silver per ton; it was not radioactive. Knapp[13] states that the ore, where exposed in a trench, was (1907) 3½ feet wide in a vein between limestone walls; the strike was

---

12/ Hess, Harold D., Petrographer, Region II, U. S. Bureau of Mines.

13/ Knapp, Adolph, Refer to footnote 7.

N 15 W, the dip was 65 degrees easterly. In a road cut about 300 feet northwesterly from this shaft the writer observed a barren quartz vein about 1 foot wide, with about 2 feet of silicified limestone, in a nearly vertical fracture about 3 feet wide; the strike was N 20 W. The apparent relation of this exposure to the Reed prospect is shown in the insert on Figure 3.

Several trenches (not mapped) near the center of the southern boundary of the Foggy Day claim disclosed numerous specimens of pegmite ($3CaO.5Fe_2O_3.12SnO_2.6B_2O_3.4H_2O$) but bedrock exposures were not sufficient to determine the manner of occurrence. Several assays of these specimens indicated that the tin content is, approximately, 2.5 percent.

Dr. Kennedy states that his first discovery (see "History") of radioactive mineral consisted of several dozen pieces of float that he dug out of the frozen topsoil within a small area near the middle of the western sideline of the Windy Day claim; further exploration of this area, designated by Dr. Kennedy as his "Damsite" prospect, was neglected after the discovery of samarskite on the Foggy Day claim. An x-ray spectroscopic analysis of one of the specimens by Hess[14] indicated that the thorium content was of the order of 0.34 percent and that the uranium content was of the order of 0.19 percent. Hess was not able to detect any evidence of secondary uranium minerals in the specimen but was of the opinion that the thorium-uranium content was associated with mimetite $(PbCl)Pb_4(AsO_4)$ and limonite which constituted a substantial part of the

---

14/ Hess, Harold D., Refer to footnote 12.

sample. An early report by the Atomic Energy Commission on a specimen said, by Dr. Kennedy, to have been obtained in this same location, stated definitely that the uranium content was primary.

The Ore

The results of petrographic examination and of spectroscopic analysis of representative mineral specimens from the Brooks Mountain deposits are described by Hess[15] as follows:

Specimen From Damsite Prospect

A thorough examination of this particular sample failed to reveal the presence of a discrete primary uranium or thorium mineral. However, it was found that the radioactivity is directly associated with the nimatite and limonite that are contained in this sample.

Concentrates of the above two minerals were produced by magnetic and heavy-liquid separations; however, it was not possible to further separate them. X-ray analyses and microscopic examinations of the concentrates did not indicate the presence of any discrete uranium or thorium minerals. In contrast to the previous sample that was submitted from Brooks Mountain, no secondary uranium mineral was detected.

An x-ray spectrographic analysis indicates that this sample contains in the order of 0.34 percent thorium and 0.19 percent uranium.

Specimen from U. S. Smelting & Refining
Uranium Deposit, Brooks Mountain Area
(Foggy Day Prospect)

This rock specimen has been classified as an altered granite. It contains predominantly orthoclase, associated albite, clear and

15/ Hess, Harold D., Refer to footnote 12

smoky quartz, some hydrous oxides of iron, sericite, kaolinite, a green micaceous secondary uranium mineral, purple and purplish-black fluorite, a small amount of chlorite, disseminated accessory zircon, and traces of epidote and pyrolusite.

X-ray and optical examinations of the green micaceous radioactive material confirm the presence of autunite.

In addition, the optical examination revealed the presence of a small amount of an associated mineral that has the optical properties of uranospinite; however, it was not possible to confirm this by x-ray analysis.

The uranium content of this granite sample is in the order of 0.45 percent.

Specimen from Dump at Read Prospect

This material essentially contains sphalerite, fluorite, pyrrhotite, galena, some arsenopyrite, less phlogopite, and small amounts of limonite, serendibite, chondrodite, paigeite, feldspar, and quartz. Also present are very small amounts of magnetite, cerussite, and pyrite.

The sphalerite, galena and fluorite are essentially liberated in the minus 65 plus 100-mesh fraction; however, very small amounts of sphalerite and fluorite remain locked through 200-mesh.

Specimen from Contact Zone ("Cameron Prospect" North of Foggy Day Prospect

This sample is evidently of pneumatolytic origin. It contains predominantly danburite, a calcium boresilicate, with associated fluorite, biotite, limonite, chlorite, and relatively small amounts of azurite and malachite. Much of the danburite appears

green and blue due to the intimate association of malachite and azurite. There is only a trace of an unidentified tin bearing mineral associated with this material; the occurrence suggests either cassiterite or hulsite.

The specimen also contains several isolated areas of a yellowish-green incoherent material that consists of essentially bindheimite, a hydrous antimonate of lead, with an admixed bismuth mineral that has the properties of arsenobismite, a hydrous arsenate of bismuth. Some cermite, a hydrous copper silicate, a small amount of a silver haloid, and only a trace of a nondescript thorium bearing mineral are associated in this very intimate mixture.

Conclusions

1. Although nearly all of the more important discoveries have been made on or near the granite-limestone contact, no evidence of the existence of contact-metamorphic mineral deposits has been disclosed. The principal reason for localization of discoveries at the contact probably is the existence of good bedrock exposures or of relatively thin overburden where the topography becomes precipitous because of the cropping out of relatively resistant granite. The existence of relatively numerous open channels caused by small adjustments along or near the contact may or may not be a controlling factor.

2. The strongest evidence of mineralization is along that part of the contact covered by the Foggy Day and Windy Day claims; some mineralization has been found in the granite a short distance north and northeast of these claims. In view of the fact that other parts of the contact and of the granite are relatively barren and that the N 70 E fault, as mapped by Steidtmann

and Cathcart (Fig. 1 and Fig. 3), appears to terminate in the granite a short distance north or northeast of the above-mentioned claims, we may infer that the mineralization is controlled by this fault or by fractures associated with it. The east-west trend of the fracturing at the Foggy Day xenotime prospect suggests that these fractures may have been caused by the fault movement.

3. Hess' failure to detect the presence of secondary uranium minerals in strongly radioactive lead-bearing minerals from the "Dannsite" prospect favors a strong inference that primary uranium ores may exist in the area. This inference is supported further by the A.E.C. report of primary uranium in the first specimen submitted by Dr. Kennedy who states that this specimen also was found on the Dannsite prospect.

4. The evidences of moderately strong metallic mineralization associated with reasonably good evidence of the existence of strong pre-mineral faulting and fracturing justify preliminary-type exploration for uranium, zinc, lead and, possibly, tin. This exploration should be concentrated in the areas underlain by limestone immediately west of that part of the granite-limestone contact which now is included between the end lines of the Foggy Day and Rainy Day claims. Intensive prospecting also should be done along the trace of the N 70 E fault whether in granite or in limestone.

Recommendations

The recommended procedure for preliminary exploration is as follows:

1. Map on scale of at least 100 ft. = 1 inch, the Foggy Day-Windy Day contact area showing topography, geology, prospect workings and sample locations. Systematically prospect the area west of the contact by geiger counter on a surveyed grid.

2. Trench by tractor-dozer, if practicable, the area of the Damsite prospect to find and delineate the bedrock source of the radioactive mineralization. If, because of permafrost or excessively deep overburden, trenching is proved to be impracticable, the area should be crosscut east-west and north-south by diamond drilling at about 45 degree inclinations.

3. By diamond drilling approximately at right angles to the long axis of the fracture zone, attempt to trace downward the meunarite-bearing fractures of the meunarite prospect on the Foggy Day claim. The initial work should be by very short holes which would intersect the downward projection at about 25 feet vertical intervals.

4. Crosscut to Road prospect and into granite by diamond drilling from road (see x-section Fig. 3A). First hole should be nearly flat; additional holes inclined downward as may be proved advisable. Successful results from first step may justify the drilling of parallel sections to north and south.

5. Try to locate exact position of the N 70 E (Steidtmann-Cathcart) fault. Prospect its course from granite to intersection with Lost River fault, using tractor-dozer for trenching where practicable. Take radioactivity readings at systematic intervals.

About 1,500 feet of diamond drilling (mostly AX core), the use of a tractor-dozer, and systematic geiger-counter prospecting during the months of July and August should be enough to determine whether additional work is justified. Actual field investigations should not be started until about July first; they should be terminated very early in September.

The project should require an engineer-supervisor, two diamond drillers, a tractor operator, a general utility man, and a cook-swamper.

Operations must be on a 7-day week basis. Provision should be made for unlimited overtime to permit nearly round-the-clock operation during good weather. A great deal of lost time on account of bad weather is to be expected. A jeep or (preferably) a "Four-by-Four" for transportation of men and supplies between the prospect and Last River airfield is necessary to efficient operation.

The project will require very close and very skilled technical supervision.

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION

~~WASHINGTON 25, D.C.~~
P. O. Box 560
Juneau, Alaska
May 3, 1954

MAY 6 - 1954

MEMORANDUM

To: Operating Committee
Defense Minerals Exploration Administration

From: S. H. Lorain

Subject: Brooks Mountain Prospect, Seward Peninsula, Alaska

Enclosed herewith are four copies of a report on the subject prospect that I prepared for our Bureau of Mines file and for reference purposes with regard to possible future consideration of Docket No. DMEA-3284 (Uranium), Kennedy and Hellerich.

This is strictly my own report; the conclusions and recommendations do not necessarily reflect the combined Field Team views but I believe that it will serve to present the factual data on which a Field Team report may be based.

I told you previously that the Kennedy-Hellerich partnership had been dissolved and that, consequently, their application was dormant. A few days ago I received a telegram from Hellerich in which he stated that the partnership has been revived; he indicated that they might wish to reactivate their application. I wired that no action was being taken until we had a firm statement of their intentions. Up to now I have had no reply.

S. H. Lorain, Executive Officer
Alaska Field Team, Region I

Enclosures

REPORT OF EXAMINATION

BROOKS MOUNTAIN PROSPECT
(Uranium, zinc, lead, tin)

Port Clarence District, Seward Peninsula Region, Alaska

by

S. H. Lorain
Regional Director, Region I
Bureau of Mines

Executive Officer, Region I
Defense Minerals Exploration Administration

Summary

Uranium-bearing minerals have been found, at intervals, throughout a distance of about 5,000 feet along a contact between limestone and a granite intrusive on the southwest slope of Brooks Mountain on Seward Peninsula, Alaska. One lens of zeunerite-bearing granite about 15 feet long by 3 feet wide, by 10 feet deep was excavated; the eU content was reported to be 0.1 percent to 0.2 percent. An area of indeterminate size, in limestone about 1,000 feet south of the zeunerite-bearing lens, has yielded float believed to contain primary uranium in association with a secondary lead mineral which has been identified as mimetite.

A non-radioactive vein deposit 3½ feet wide but of undetermined length, in limestone about halfway between the zeunerite deposit and the mimetite deposit, assays about 22 percent combined lead-zinc with about 9 ounces of silver and some copper. Tin bearing minerals (notably pageite and hulsite) from the immediate vicinity also have been identified.

The mineralization is on an otherwise barren granite-limestone contact near the projected intersection of a strong pre-mineral fault (as mapped by the Geological Survey) which is parallel to, and appears to be related to the principal mineral-bearing fractures at the nearby Lost River tin mine and at numerous zinc-lead-copper-tin prospects along a zone ofmineralization about 8 miles long. Bedrock in the near vicinity of the fault on Brooks Mountain is not exposed.

The mineralized area on Brooks Mountain deserves preliminary-type exploration and additional careful prospecting. A program to test, by drilling, the downward continuation of the zeunerite prospect, to test the downward continuation and possible parallel mineralization of the zinc-lead prospect, and to discover the bedrock source of the mimetite-uranium mineralization coincidentally with systematic geiger-counter prospecting of the granite-limestone contact zone and of the area underlain by the above-mentioned fault is recommended.

The recommended first-step program would require about 1,500 feet of diamond drilling, some tractor-dozer trenching if practicable, and intensive geiger-counter prospecting based on adequate surveys. A crew of five men under the supervision of an experienced engineer would be required.

Basic equipment would consist of a skid-mounted, gasoline-powered diamond drill with a capacity of 500 feet of AX hole; a tractor-dozer equivalent to a D-4 Caterpillar or larger; a good jeep or "four-by-four"; geiger-counter and surveying equipment.

Because of weather conditions, the job should be started and completed during the months of July and August.

Introduction

The writer examined this property on July 24, 1953; he was accompanied by Donald Kechesperger[1], by J. R. Houston[2], and by John J. Mulligan[3]. On September 17, 1951 the property had been examined by R. L. Thorne[4] and John J. Mulligan who had prepared a memorandum report. During July and August 1951 a radioactive survey of the area was made by the Geological Survey; the results of this survey have been published in pamphlet form[5].

Most of the data contained in this report were extracted from reports by the Geological Survey and by Thorne and Mulligan; the conclusions and recommendations are the writer's.

Location and Accessibility

The Brooks Mountain uranium prospect is on the upper south slope of Brooks Mountain, a prominent peak on the north flank of the York Mountains 28 miles S 80 E from the westernmost extremity (Cape Prince of Wales) of the Seward Peninsula; it is about 8½ miles due north from the Bering Sea at the mouth of Lost River or approximately 60 miles south of the Arctic Circle at latitude 65 degrees 31 minutes north, longitude 167 degrees 8 minutes west (Fig. 1).

Access from Bering Sea is by graveled road 5½ miles up Lost River to the mouth of Cassiterite Creek, thence, by an unimproved "jeep" trail, 2 miles up Lost River and 1½ miles up Crystal Creek to the prospect (Fig. 2); the last

---

1/ Kechesperger, Donald, general superintendent, Lost River mine, U.S. Tin Corp.

2/ Houston, J. R., geologist, U. S. Geological Survey

3/ Mulligan, John J., mining engineer, U. S. Bureau of Mines

4/ Thorne, Robert L., mining engineer, U. S. Bureau of mines

5/ The Occurrence of Zeunerite at Brooks Mountain, Seward Peninsula, Alaska. Geological Survey Circular 214 by Walter S. West and Max G. White.

Fig. 2-A Lost River Valley looking upstream

two or three miles are on heavy grades. Because the topography is moderately rounded and is free from heavy vegetation, road construction is not difficult. Foot travel during the summer months is, relatively, easy.

Light freight and passengers may be delivered at a landing field on the beach at the mouth of Lost River or at a landing field on Lost River at the mouth of Cassiterite Creek (Fig. 2). In good weather an experienced pilot can land a light plane on a ridge about one mile from the prospect. These landing fields are, approximately, 75 air miles from Nome. Except during heavy winds or low visibility, daily flights are made from Nome with passengers and supplies for the Lost River tin mine on Cassiterite Creek.

Heavy freight must be lightered from ships to the beach at the mouth of Lost River but, normally, freight may be landed only during the months of July to September, inclusive.

History and Production

The exact date of the first mineral discovery on Brooks Mountain is not recorded in available records. Collier[6] reports that a prospector had found tin-bearing minerals on Brooks Mountain in 1901. Knopf[7] reports that, by 1907, a lead-zinc prospect had been discovered at the west end of Brooks Mountain and that a galena prospect had been discovered on the north slope of the mountain. The lead-zinc prospect, now known as the "Read (or Reed) Prospect", is within a few hundred feet of the principal uranium prospects.

In September 1948 strong indications of radioactive minerals were found by Dr. M. R. Kennedy, a Nome dentist. A specimen sent to the Atomic Energy

---

6/ Collier, Arthur J., Tin Deposits of the York Region, Alaska. Geological Survey Bulletin No. 229, p. 26; 1904.

7/ Knopf, Adolph, Geology of the Seward Peninsula Tin Deposits, Alaska. Geological Survey Bulletin 358, pp. 41-44; 1908.

Commission was reported to contain "radioactivity equivalent to 0.35% U_3O_8. The radioactivity originates in a primary uranium-bearing mineral and its alteration products".

Dr. Kennedy was accompanied, or was joined shortly thereafter, by George Hellerich, a mining engineer and an experienced Alaskan placer operator. During 1950 and 1951 Kennedy and Hellerich staked 19 lode claims along the southwest flank of Brooks Mountain to cover spots in which radioactive mineralization had been found.

The Kennedy-Hellerich claims were leased to the United States Smelting, Refining and Mining Co. in the spring of 1951. During the summer of 1951 the lessees built a small bunk house, mapped the property, built a road adjacent to the principal radioactive prospects, cleared a "jeep" trail to the Lost River mine road on Lost River, and dug a small pit on the "Foggy Day" claim (Fig. 3). The pit, which was about 12 feet deep by 40 feet long, exposed a lens or short zone of highly fractured zeunerite bearing granitic rock. Operations were suspended about September 1, 1951; the lease was relinquished shortly thereafter.

No mineral production from Brooks Mountain has been made.

Physical Features and Climate

Brooks Mountain (altitude 2,918 feet) is the highest peak in the York mountains; it is the second highest mountain on Seward Peninsula. From the principal uranium prospects (altitude approximately 2,000 feet) to the summit the mountain sides are rocky and precipitous; except in slide areas the surface is bare. At lower altitudes the mountain sides are moderately steep but the ridges and valleys are rounded; most of the surface is covered with finely divided products of residual weathering. Moss, lichens and grass grow on the more sheltered slopes but larger vegetation does not exist in the area.

The climate is sub-arctic; personal experience indicates that cold winds, frequently accompanied by rain, or snow, are almost constant. Records of the weather on Brooks Mountain have not been made. Weather records at Wales Village, which is on the sea coast 28 miles west of Brooks Mountain, indicate monthly average temperatures that range from a few degrees below zero in mid-winter to 25 degrees to 50 degrees above zero during the spring, summer, and early fall months; the highest average monthly temperature is about 47 degrees during August. The annual precipitation at Wales is about 9.3 inches, of which more than one third falls during July and August.

Labor Supply and Living Conditions

No labor supply exists in the near vicinity of the prospect; consequently all labor must be imported from the various Eskimo villages in the area, from Nome and other Alaskan towns, or from the United States. The nearby Lost River tin mine has demonstrated that Eskimo can be trained quickly for most mine work and that they are satisfactory workers if guided and led by a nucleous of skilled white men. About 200 to 300 Eskimo workers are available from villages in western Seward peninsula but few of them will work steadily throughout the year. Current wages at the Lost River mine range from about $1.50 per hour for untrained Eskimo on outside work to about $2.00 an hour for trained Eskimo on underground work. Skilled white men receive about $2.25 to $2.35 per hour. All work is on a seven day basis with the usual overtime pay. Board is charged at $2.50 per day.

Highly efficient labor that will be needed for pioneer exploratory work on Brooks Mountain should be paid $2.00 to $2.50 an hour for laborers to $3.50 or $4.00 an hour for drillers.

A two room bunk house-boarding house, suitable for a summer crew of not to exceed six men was built near the prospect (see Fig. 2) by the United States Smelting, Refining and Mining Co.; it has been maintained in usable condition but is unfurnished; some minor repairs are needed. This building is about 14 feet wide by 20 feet long. An old 10 by 12 foot cabin is about 3/8 mile from the prospect but it is suitable for emergency use only.

Property and Ownership

The property consists of 19 unpatented lode claims (see Fig. 3) held by Dr. M. R. Kennedy, Nome, Alaska and George Hellerich, 4313 Fruit Ave., Fresno 4, California.

Description of the Deposit

General Geology:

The general geology of the area has been described by Collier[8], by Knopf[9], and by Steidtmann and Cathcart[10]. Additional geologic data pertinent to the deposit has been presented by White and West[11]. The following brief description of the general geology is based upon the above mentioned reports.

The core of Brooks Mountain consists of very coarse grained granite intrusives which are exposed throughout an area about 6,000 feet wide, from east to west, by about 9,000 feet long, from north to south (Fig. 3);

8/ Collier, Arthur J., Refer to footnote 6.

9/ Knopf, Adolph, Refer to footnote 7.

10/ Steidtmann, Edward and Cathcart, S. H., Geology of the York Tin Deposits, Alaska; Geological Survey Bulletin 733, pp. 81-87, 1922.

11/ White, Max G. and West, Walter E., Refer to footnote 5, also to Geological Survey Bulletin 319, Reconnaissance for Uranium in the Lost River Area, Seward Peninsula, Alaska, 1951.

the granite is believed to be of Mesozoic age. There seems to be no question but that this granite is related, closely, to the granitic intrusions in other tin-bearing areas of western Seward peninsula but there is no recorded evidence of strong mineral-bearing fractures or of strong hydrothermal alteration within the granite mass.

Sedimentary rocks along the northwestern and northern margins of the intrusive consist of the uptilted ends of beds of Cambrian, or Pre-Cambrian black slate. These beds are overlain, conformably, by relatively thin remnants of Port Clarence limestone of Silurian and Ordovician age. Either slate or limestone may contact the granite at surface along the northwestern and northern margins of the intrusive; at greater depths the contacting sedimentaries probably are slates.

Sedimentary rocks along the southwestern, southern, and eastern margins of the granite intrusive consist entirely of Port Clarence limestone. The lowest section of this formation consists of about 100 feet of alternating thin slate and limestone laminae; the middle section consists of about 900 feet of impure, thin-bedded limestone with shaly partings; the top section consists of about 1,000 feet of thick-bedded, pure limestone. Some dolomite has been reported near the head of Lost River.

Immediately preceding intrusion of the granite and of related dikes, the York Mountains area was faulted along two predominating trends; one trend is about N 20 W, the other trend is about N 70 E. A fault belonging to the N 20 W system appears (Figs. 1 and 2) to coincide, approximately, with the present valley of Lost River and to terminate against a N 70 E fault about 1½ miles S 70 W from the uranium prospects. A very considerable number of strongly mineralized prospects

(including the Lost River tin mine) appear to be associated with this fault throughout its mapped length (Fig. 2). However, the predominating trend of known mineralization in the Lost River mine is about N 70 W. The above-mentioned N 70 E fault appears to terminate, northeasterly, against the granite contact or in the granite just north of the uranium prospects (Fig. 3); on the geologic map of the area it appears to form the contact between limestone on the south and slate on the north. The projected trace of this fault within the area of the Brooks Mountain prospect is covered, deeply, by slide rock and detritus.

Immediately following intrusion of the granites and of the related dikes, tin bearing fluorine and boron solutions formed veins and replacements in or adjacent to the granites. Lead, zinc, copper, antimony, silver metallization is associated with the tin, fluorine, boron deposits but the time relations between them have not been determined. The known uranium bearing minerals are in the same general area but are not always associated closely with the other metals.

The Deposits:

Radioactive mineralization has been found at a number of spots along the western contact of the granitic intrusive and at a few scattered spots within the intrusive; most of the radioactive minerals were found within a sector of the contact that is about 5,000 feet long. The most intensive concentration of radioactive minerals was found near the middle of the Foggy Day claim. The sample locations, as mapped by the Geological Survey, are shown on Figure 3; the sample analyses, also by the Geological Survey, are listed in Table I.

Work done by the United States Smelting, Refining and Mining Co. on the Foggy Day prospect excavated a "lens" of uranium bearing granite just

Table I

Sample No.	Location	Type of Sample	Description	Raw Sample Percent eU	Raw Sample Percent U	Concentrate Percent eU
3854	Foggy Day prospect	Float	Pegmatitic lens material	2.144	2.25	—
4012	do	Grab	do	0.068	0.04	—
4013	do	do	do	.02	.02	—
4016	do	do	do	.27	.2	—
4101	75 ft. N. of Foggy Day	do	Granite wash material	.006	—	.015a
4105	80 ft. W of sample 4101	do	do	.007	—	.0[illegible]
4108	Tourmaline No. 2 claim	do	Hematitic coating on tourmaline vein	1.0	—	—
4109	S. of Tourmaline No. 2 claim	do	Weathered tourmaline vein	.02	—	—
4111	E. of Foggy Day prospect	do	Granite	.004	—	—
4113	W. central part of Iron cap No. 9 claim	do	do	.007	—	.10a
4115	Central part of Iron Cap No. 5 claim	do	do	.004	—	.17a
4116	E. of sample 4115	do	do	.005	—	.2[illegible]
4117	Near SE corner of Midnight Sun claim and NE corner of Square Zero claim	do	Weathered granite	.006	—	—
4118	do	do	Granite dike	.009	—	—
4119	S. slope above Crystal Creek-Anderson Creek saddle.	do	Granite	.005	—	—

Sample No.	Location	Type of Sample	Description	Raw Sample Percent eU	Raw Sample Percent U	Concentrate Percent eU
4130	Foggy Day prospect	0.9-ft. channel	Across small lens 5 ft. S of pegmatitic lens, 6 ft. below surface	.2	—	—
4135	Tourmaline No. 2 claim	9.5-ft. channel	Across tourmaline veins and granite	.007	—	—
4139	do	Grab	Tourmaline vein material	0.052	—	—
4163	do	do	Granite between tourmaline veins	.005	—	—
4165	do	12-ft. channel	Across tourmaline veins and granite	.007	—	—
4166	do	Grab	Tourmaline vein material	.054	—	—
4185	S. of Tourmaline No. 2 claim	do	Weathered tourmaline vein	.013	—	—
4185	N. slope above Crystal Creek-Anderson Creek saddle.	do	Granite dike	.007	—	—
4197	Foggy Day prospect	do	Limonite at north border of pegmatitic lens	.23	—	—
4198	do	do	Pegmatitic lens material	.014	—	—
4200	do	20-ft. N-S channel	From south limestone contact to 6 ft. north of pegmatitic lens, 3 ft. below surface	0.01	—	—
4235	S. of Tourmaline No. 2 claim	Grab	Weathered granite	—	—	0.038a
4240	N. central part of Sunny Day claim	do	Oxidized granite	—	—	.19a
4266	Pit S. of Read Prospect	do	Weathered granite	.005	—	—

Sample No.	Location	Type of Sample	Description	Raw Sample Percent eU	Raw Sample Percent U	Concentrate Percent eU
4275	Paigeite claim	Grab	Aplite dike	—	—	.005a
4278	Foggy Day prospect	18-ft. N-S channel	From south limestone contact to 6 ft. N. of pegmatitic lens, 6 ft. below surface	.02	—	—
4282	do	8-ft.channel	Across pegmatitic lens, 4½ ft. below surface	.08	0.075	—
4283	do	4-ft.channel	Across pegmatitic lens, 9 ft. below surface	.06	—	—
4284	do	3.8-ft,channel	Across pegmatitic lens, 12 ft. below surface	.10	—	—
4285	do	3.6-ft.channel	Across pegmatitic lens, 15 ft. below surface	.12	—	—
4288	N. part of granite mass	Grab	Granite	—	—	.016a
4305	Foggy Day prospect	do	Black 1 in. seam in pegmatitic lens	.31	—	—
4309	do	2-ft.channel	Across pegmatitic lens, 18 ft. below surface	.028	—	—
4320	Near isolated limestone outcrop on Iron Cap No. 5 claim	Grab	Weathered granite	.012	—	—
4434	Foggy Day prospect	2-ft.channel	Central part of pegmatitic lens, 7½ ft. below surface	.25	.22	—
4435	do	3.8-ft.channel	Across pegmatitic lens, 11 ft. below surface	.12	.09	—
4436	do	3.8-ft.channel	Across pegmatitic lens, 14 ft. below surface	.16	—	—

inside the granite contact. The "lens" had been removed before the Bureau of Mines examination; it was described as being about 15 feet long, 3 feet wide, and about 10 feet deep. No records of channel sampling have been obtainable but a specimen obtained by a Bureau of Mines engineer was reported by Hess[12] to contain uranium (in zeunerite) on the order of 0.45 percent; the owners state that the average uranium content of the lens was about 0.1% to 0.2% ~~aM~~. The gangue was reported by Hess to consist of altered granite.

At the time of the writer's visit the only visible evidence of the ore lens was a short zone, about 10 feet long by a few feet wide, of highly fractured, zeunerite-stained, granite. The trend of predominant fracturing was, approximately, N 70 W. The fracture terminations in the granite were clearly visible but fracturing in the limestone, if it exists, was obscured by detritus. According to reports, the long axis of the ore lens was approximately parallel to the fracturing observed by the writer; consequently the writer assumes that the "lens" was formed by local deposition of zeunerite in the fractured granite.

Near the middle of the northern half of the Windy Day claim is the old dump from a shaft (now caved) on the Read (Reed?) prospect. The dump consists of nearly massive sphalerite ("Blackjack") and galena. A grab sample from the dump assayed 14.3 percent zinc, 8.8 percent lead, 0.32 percent copper, and 8.8 ounces silver per ton; it was not radioactive. Knopf[13] states that the ore, where exposed in a trench, was (1907) 3½ feet wide in a vein between limestone walls; the strike was

---

12/ Hess, Harold D., Petrograher, Region II, U. S. Bureau of Mines.

13/ Knopf, Adolph, Refer to footnote 7.

N 15 W, the dip was 65 degrees easterly. In a road cut about 300 feet northwesterly from this shaft the writer observed a barren quartz vein about 1 foot wide, with about 2 feet of silicified limestone, in a nearly vertical fracture about 3 feet wide; the strike was N 20 W. The apparent relation of this exposure to the Reed prospect is shown in the insert on Figure 3.

Several trenches (not mapped) near the center of the southern boundary of the Foggy Day claim disclosed numerous specimens of pageite ($3OFeO.5Fe_2O_3.1SnO_2.6B_2O_3.4H_2O$) but bedrock exposures were not sufficient to determine the manner of occurrence. Several assays of these specimens indicated that the tin content is, approximately, 2.5 percent.

Dr. Kennedy states that his first discovery (see "History") of radioactive mineral consisted of several dozen pieces of float that he dug out of the frozen topsoil within a small area near the middle of the western sideline of the Windy Day claim; further exploration of this area, designated by Dr. Kennedy as his "Damnsite" prospect, was neglected after the discovery of seunerite on the Foggy Day claim. An x-ray spectroscopic analysis of one of the specimens by Hess[14] indicated that the thorium content was of the order of 0.34 percent and that the uranium content was of the order of 0.19 percent. Hess was not able to detect any evidence of secondary uranium minerals in the specimen but was of the opinion that the thorium-uranium content was associated with mimetite $(PbCl)Pb_4(AsO_4)$ and limonite which constituted a substantial part of the

---

14/ Hess, Harold D., Refer to footnote 12.

sample. An early report by the Atomic Energy Commission on a specimen said, by Dr. Kennedy, to have been obtained in this same location, stated definitely that the uranium content was primary.

The Ore

The results of petrographic examination and of spectroscopic analysis of representative mineral specimens from the Brooks Mountain deposits are described by Hess[15] as follows:

Specimen From Damsite Prospect

A thorough examination of this particular sample failed to reveal the presence of a discrete primary uranium or thorium mineral. However, it was found that the radioactivity is directly associated with the mimetite and limonite that are contained in this sample.

Concentrates of the above two minerals were produced by magnetic and heavy-liquid separations; however, it was not possible to further separate them. X-ray analyses and microscopic examinations of the concentrates did not indicate the presence of any discrete uranium or thorium minerals. In contrast to the previous sample that was submitted from Brooks Mountain, no secondary uranium mineral was detected.

An x-ray spectrographic analysis indicates that this sample contains in the order of 0.34 percent thorium and 0.19 percent uranium.

Specimen from U. S. Smelting & Refining
Uranium Deposit, Brooks Mountain Area
(Foggy Bay Prospect)

This rock specimen has been classified as an altered granite. It contains predominantly orthoclase, associated albite, clear and

15/ Hess, Harold D., Refer to footnote 12

smoky quartz, some hydrous oxides of iron, sericite, kaolinite, a green micaceous secondary uranium mineral, purple and purplish-black fluorite, a small amount of chlorite, disseminated accessory zircon, and traces of epidote and pyrolusite.

X-ray and optical examinations of the green micaceous radioactive material confirm the presence of autunite.

In addition, the optical examination revealed the presence of a small amount of an associated mineral that has the optical properties of uranospinite; however, it was not possible to confirm this by x-ray analysis.

The uranium content of this granite sample is in the order of 0.45 percent.

Specimen from Dump at Read Prospect

This material essentially contains sphalerite, fluorite, pyrrhotite, galena, some arsenopyrite, less phlogopite, and small amounts of limonite, serendibite, chondrodite, paigeite, feldspar, and quartz. Also present are very small amounts of magnetite, cerussite, and pyrite.

The sphalerite, galena and fluorite are essentially liberated in the minus 65 plus 100-mesh fraction; however, very small amounts of sphalerite and fluorite remain looked through 200-mesh.

Specimen from Contact Zone ("Cameron Prospect" North of Foggy Bay Prospect

This sample is evidently of pneumatolytic origin. It contains predominantly danburite, a calcium boresilicate, with associated fluorite, biotite, limonite, chlorite, and relatively small amounts of azurite and malachite. Much of the danburite appears

green and blue due to the intimate association of malachite and azurite. There is only a trace of an unidentified tin bearing mineral associated with this material; the occurrence suggests either cassiterite or hulsite.

The specimen also contains several isolated areas of a yellowish-green incoherent material that consists of essentially bindheimite, a hydrous antimonate of lead, with an admixed bismuth mineral that has the properties of arsenobismite, a hydrous arsenate of bismuth. Some cermite, a hydrous copper silicate, a small amount of a silver haloid, and only a trace of a nondescript thorium bearing mineral are associated in this very intimate mixture.

Conclusions

1. Although nearly all of the more important discoveries have been made on or near the granite-limestone contact, no evidence of the existence of contact-metamorphic mineral deposits has been disclosed. The principal reason for localization of discoveries at the contact probably is the existence of good bedrock exposures or of relatively thin overburden where the topography becomes precipitous because of the cropping out of relatively resistant granite. The existence of relatively numerous open channels caused by small adjustments along or near the contact may or may not be a controlling factor.

2. The strongest evidence of mineralization is along that part of the contact covered by the Foggy Day and Windy Day claims; some mineralization has been found in the granite a short distance north and northeast of these claims. In view of the fact that other parts of the contact and of the granite are relatively barren and that the N 70 E fault, as mapped by Steidtman

and Cathcart (Fig. 1 and Fig. 3), appears to terminate in the granite a short distance north or northeast of the above-mentioned claims, we may infer that the mineralization is controlled by this fault or by fractures associated with it. The east-west trend of the fracturing at the Foggy Day zeunerite prospect suggests that these fractures may have been caused by the fault movement.

3. Hess' failure to detect the presence of secondary uranium minerals in strongly radioactive lead-bearing minerals from the "Damnsite" prospect favors a strong inference that primary uranium ores may exist in the area. This inference is supported further by the A.E.C. report of primary uranium in the first specimen submitted by Dr. Kennedy who states that this specimen also was found on the Damnsite prospect.

4. The evidences of moderately strong metallic mineralization associated with reasonably good evidence of the existence of strong pre-mineral faulting and fracturing justify preliminary-type exploration for uranium, zinc, lead and, possibly, tin. This exploration should be concentrated in the areas underlain by limestone immediately west of that part of the granite-limestone contact which now is included between the end lines of the Foggy Day and Rainy Day claims. Intensive prospecting also should be done along the trace of the N 70 E fault whether in granite or in limestone.

Recommendations

The recommended procedure for preliminary exploration is as follows:

1. Map on scale of at least 100 ft. = 1 inch, the Foggy Day-Windy Day contact area showing topography, geology, prospect workings and sample locations. Systematically prospect the area west of the contact by geiger counter on a surveyed grid.

2. Trench by tractor-dozer, if practicable, the area of the Damsite prospect to find and delineate the bedrock source of the radioactive mineralization. If, because of permafrost or excessively deep overburden, trenching is proved to be impracticable, the area should be crosscut east-west and north-south by diamond drilling at about 45 degree inclinations.

3. By diamond drilling approximately at right angles to the long axis of the fracture zone, attempt to trace downward the scunerite-bearing fractures of the scunerite prospect on the Foggy Day claim. The initial work should be by very short holes which would intersect the downward projection at about 25 foot vertical intervals.

4. Crosscut to Read prospect and into granite by diamond drilling from road (see x-section Fig. 3A). First hole should be nearly flat; additional holes inclined downward as may be proved advisable. Successful results from first step may justify the drilling of parallel sections to north and south.

5. Try to locate exact position of the N 70 E (Steidtman-Cathcart) fault. Prospect its course from granite to intersection with Lost River fault, using tractor-dozer for trenching where practicable. Take radioactivity readings at systematic intervals.

About 1,500 feet of diamond drilling (mostly AX core), the use of a tractor-dozer, and systematic geiger-counter prospecting during the months of July and August should be enough to determine whether additional work is justified. Actual field investigations should not be started until about July first; they should be terminated very early in September.

The project should require an engineer-supervisor, two diamond drillers, a tractor operator, a general utility man, and a cook-swamper.

Operations must be on a 7-day week basis. Provision should be made for unlimited overtime to permit nearly round-the-clock operation during good weather. A great deal of lost time on account of bad weather is to be expected. A jeep or (preferably) a "Four-by-Four" for transportation of men and supplies between the prospect and Lost River airfield is necessary to efficient operation.

The project will require very close and very skilled technical supervision.

STANDARD FORM NO. 64

4/27/54 gla

Office Memorandum • UNITED STATES GOVERNMENT

TO : E. Wm. Ellis, DMEA Member, Uranium Commodity Committee

DATE: April 23, 1954

FROM : Arthur P. Butler, Jr., USGS Member, Uranium Commodity Committee

SUBJECT: DMEA Docket 3284 (Uranium), Kennedy and Hellerich - a partnership, applicant, Nome, Alaska

Reference is made to my memorandum of March 31, 1954, above subject.

Since I prepared my memorandum of March 31, I have received a memorandum dated March 31, 1954, above subject, from Helmuth Wedow, Chief, Trace Elements Unit, Alaskan Geology Branch, USGS, to C. L. Sainsbury, DMEA Field Team. A copy of this memorandum is attached.

Mr. Wedow, who has first hand and personal knowledge of the deposit, recommends denial of the application. I also have recommended denial of the application.

Mr. Wedow has suggested in his memorandum of March 31, that a shaft be sunk along a "possible ore shoot at the Foggy Day prospect down the contact". He believes such work would be worth the cost and could be recommended for approval.

In view of Mr. Wedow's first hand knowledge, I concur with his comments and recommendation.

Copies to: E. Wm. Ellis (2).

Arthur P. Butler, Jr.

E. Wm. Ellis, DMEA Member, Uranium Commodity Committee

April 23, 1954

Arthur P. Butler, Jr., USGS Member, Uranium Commodity Committee

DMEA Docket 3284 (Uranium), Kennedy and Hellerich - a partnership, applicant, Nome, Alaska

Reference is made to my memorandum of March 31, 1954, above subject.

Since I prepared my memorandum of March 31, I have received a memorandum dated March 31, 1954, above subject, from Helmuth Wedow, Chief, Trace Elements Unit, Alaskan Geology Branch, USGS, to C. L. Sainsbury, DMEA Field Team. A copy of this memorandum is attached.

Mr. Wedow, who has first hand and personal knowledge of the deposit, recommends denial of the application. I also have recommended denial of the application.

Mr. Wedow has suggested in his memorandum of March 31, that a shaft be sunk along a "possible ore shoot at the Foggy Day prospect down the contact". He believes such work would be worth the cost and could be recommended for approval.

In view of Mr. Wedow's first hand knowledge, I concur with his comments and recommendation.

Copies to: E. Wm. Ellis (2)

E. Wm. Ellis, DMEA Member, Uranium Commodity Committee

April 23, 1954

Arthur P. Butler, Jr., USGS Member, Uranium Commodity Committee

DMEA Docket 3284 (Uranium), Kennedy and Hallerich - a partnership, applicant, Nome, Alaska

Reference is made to my memorandum of March 31, 1954, above subject.

Since I prepared my memorandum of March 31, I have received a memorandum dated March 31, 1954, above subject, from Helmuth Wedow, Chief, Trace Elements Unit, Alaskan Geology Branch, USGS, to C. L. Sainsbury, DMEA Field Team. A copy of this memorandum is attached.

Mr. Wedow, who has first hand and personal knowledge of the deposit, recommends denial of the application. I also have recommended denial of the application.

Mr. Wedow has suggested in his memorandum of March 31, that a shaft be sunk along a "possible ore shoot at the Foggy Day prospect down the contact". He believes such work would be worth the cost and could be recommended for approval.

In view of Mr. Wedow's first hand knowledge, I concur with his comments and recommendation.

Copies to: E. Wm. Ellis (2)

GEOLOGICAL SURVEY
TEPCO
RECEIVED
APR 12 1954
Denver

AIR MAIL

March 31, 1954

MEMORANDUM

To: C. L. Sainsbury, DMEA Field Team,
U. S. Geological Survey, Juneau, Alaska

Through: George O. Gates, Chief, Alaskan Geology Branch
Menlo Park, California

From: Helmuth G. Snow, Chief, Trace Elements Unit
Alaskan Geology Branch, Washington, D. C.

Subject: Kennedy and Hallerich DMEA loan application (Docket No. ~~3624~~ 3284)
for exploration at the Brooks Mountain uranium prospect

The writer has reviewed the subject DMEA loan application and cannot recommend approval of the diamond drilling program presented for the exploration of the uranium prospect at Brooks Mountain, Seward Peninsula, Alaska. After a redigest of all published and unpublished data available in the files of the Alaskan Trace Elements Unit, it is believed that diamond drilling, particularly with AX bits, would not return sufficient pertinent data for the cost of the operation. Core recovery, especially in possible ore zones at or near the granite-limestone contact very likely would be low because of the highly altered, friable, "soft ground" character of the ore zone. The data gained from drilling with low core recovery would not be sufficiently precise for determining the necessary details of the geologic setting of the contact and possible ore zones and shoots. Uranium analyses and mineralogic studies of core samples from holes with low recovery would be misleading in determining whether the grade increases or whether changes in mineral assemblage occur with depth. Also, drill holes, particularly as planned, could very easily undershoot or overshoot lenticular or elongate pipe-like ore bodies with even very high angles of plunge; and, although present surface data are meager, they do suggest that the ore shoot or zone at the Foggy Day prospect (Drill-hole site "B" on docket map) probably plunges northward at a high angle.

On the other hand, if the Brooks Mountain deposit is analogous to similar surficial secondary uranium occurrences in the Marysvale district of Utah, it is likely that primary uranium oxide ores of higher grade than the surficial secondary ores occur

at moderate depth. As the chief initial objective is to determine whether primary uranium minerals are introduced into the mineral assemblage of the ore shoot at depths of approximately 40 to 100 feet and because the general lack of data on the structural setting of the possible ore shoots, it is believed that a more modest exploration program consisting of following the possible ore shoot at the Foggy Day prospect down the contact with an inclined shaft, timbered where necessary, would be a more feasible operation and could be recommended for approval by the writer. Such an opening on the deposit would make available to the geologist and engineer more data on the structural control of the ore shoot that would be necessary to guide further exploration, if such appears warranted, than would the diamond drilling program outlined in the application. A complete sampling for assays and mineralogic studies of the ore body and adjacent wall rock would be assured, in contrast to the obvious limitations of samples and data obtained from drilling. In addition, if significant quantities of minable grade ore are discovered during the sinking of the shaft, production could proceed.

The above conclusions have been discussed with Joseph O. Hosted of the Division of Raw Materials, U. S. Atomic Energy Commission, and have his concurrence.

Helmuth Wedow

cc: Gates
Lemmon
Hosted
Butler, Denver

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
~~WASHINGTON 25, D.C.~~
P. O. Box 560
Juneau, Alaska

April 16, 1954

Geo. C. Selfridge, Chairman
Operating Committee
Defense Minerals Exploration Admin.
Washington, D. C.

Ref: Docket No. DMEA-3284
Kennedy and Hellerich

Dear Mr. Selfridge:

Your telegram of April 14 asking about a Field Team Report on the referenced docket was received only today.

Although we have not received specific notice to that effect, we have received letters from Mr. Hellerich and Dr. Kennedy which indicate that the partnership has been disolved. We must assume, therefore, that the application currently is inactive and that there is considerable doubt as to whether it will be renewed and revised by whomever may be successors to the partnership of Kennedy and Hellerich. For that reason the Field Team has not taken steps to prepare and submit a joint Field Team Report nor do we plan to take such steps unless your office instructs us to do so.

I have prepared a personal report, which is now being typed, primarily for submission to the Bureau of Mines for record. I will send copies of this report for your records but it is not intended to constitute a Field Team Report or a specific appraisal of the application that has been submitted. Nevertheless it may provide considerable reference data and thereby save considerable work and time if a Field Team Report is required at some time in the future.

If you want a Field Team Report at this time, please send us specific instructions to that effect.

Yours very truly,

S. H. Lorain,
Executive Officer
Field Team Region I

cc: USGS- Sainsbury

4/20/54 gla

UNITED STATES
DEPARTMENT OF THE INTERIOR
Defense Minerals Exploration Administration

P. O. Box 560
Juneau, Alaska

April 16, 1954

Geo. C. Selfridge, Chairman
Operating Committee
Defense Minerals Exploration Admin.
Washington, D. C.

Ref: Docket No. DMEA-3284
Kennedy and Hellerich

Dear Mr. Selfridge:

Your telegram of April 14 asking about a Field Team Report on the referenced docket was received only today.

Although we have not received specific notice to that effect, we have received letters from Mr. Hellerich and Dr. Kennedy which indicate that the partnership has been disolved. We must assume, therefore, that the application currently is inactive and that there is cnnsiderable doubt as to whether it will be renewed and revised by whomever may be successors to the partnership of Kennedy and Hellerich. For that reason the Field Team has not taken steps to prepare and submit a joint Field Team Report nor do we plan to take such steps unless your office instructs us to do so.

I have prepared a personal report, which is now being typed, primarily for submission to the Bureau of Mines for record. I will send copies of this report for your records but it is not intended to constitute a Field Team Report or a specific appraisal of the application that has been submitted. Nevertheless it may provide considerable reference data and thereby save considerable work and time if a Field Team Report is required at some time in the future.

If you want a Field Team Report at this time, please send us specific instructions to that effect.

Yours very truly,

S. H. Lorain,
Executive Officer
Field Team Region I

cc: USGS- Sainsbury

SHL:pl

Surname
Docket copy

700

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
WASHINGTON 25, D. C.

Ching
Ellis
Farabee
Hedges
Selfridge
Williams
Wittenberg

T E L E T Y P E

MChing/gla

[redacted]

DMEA - Department of the Interior

APR 14 1954

S. H. LORAIN, EXECUTIVE OFFICER
DMEA FIELD TEAM, REGION I
BUREAU OF MINES
P.O. BOX 560
JUNEAU, ALASKA

RE DOCKET 3284 KENNELY AND HELLERICH FURTHER ACTION WAITING FIELD TEAM

REPORT REFERRED TO IN YOUR LETTER MARCH 16.

George C. Selfridge

George C. Selfridge (246)
CHAIRMAN, OPERATING COMMITTEE

MChing/gla
4-14-54
cc to: Adm. Reading File
Operating Committee
Docket
Messrs. HDKeiser, Rm. 3641
APButler, Jr. Rm. 3212, GSA
JOHosted, Rm. 3210
Code 700
MChing
Confirmation to Region I

STANDARD FORM NO. 64

4/6/54 gla

Office Memorandum • UNITED STATES GOVERNMENT

TO : E. Wm. Ellis, DMEA Member, Uranium Commodity Committee

DATE: March 31, 1954

Defense Minerals Administration
RECEIVED
APR - 6 1954

FROM : Arthur P. Butler, Jr., USGS Member, Uranium Commodity Committee

SUBJECT: Review of application, DMEA Docket 3284 (Uranium), Kennedy and Hellerich - a partnership, applicant, Nome, Alaska. Nineteen lode claims at Books Mountain, York District, Cape Nome Precinct, 2nd Division Territory of Alaska.

The application identified in the subject above has been reviewed. There was no Field Team report accompanying the application and I presume none has been prepared. However, I have consulted a memorandum of January 1954 from the Trace Elements Unit of the Alaskan Geology Branch, USGS, relative to the merits of a drilling program on the property covered by the subject application.

Proposal

To core drill 24 holes, ranging in length from 50 to 200 feet, for a total length of about 3,000 feet. The holes to explore the western edge of a zeunerite-bearing granite stock.

Comments

The Geological Survey has issued a fairly complete report, USGS Circular 214, covering the area included in the application. This report is based on field work done by the Geological Survey for the Atomic Energy Commission, and includes data obtained from the most recent exploration work done by the United States Smelting, Refining, and Mining Company.

In Circular 214 it is reported that the overall average of the surfaces exposures of the material to be tested is about 0.07 percent equivalent uranium. Most of the uranium present is in the mineral zeunerite which occurs in vugs and fractures in oxidized and decomposed granite.

Obviously the analyses of surface samples indicate the grade to be too low to be of possible commercial interest. However, the possibility is suggested in Circular 214 that the uranium in the zeunerite was derived from primary uranium minerals which may be present in the granite below the zone of surface oxidation. It is this possibility that the applicant intends to test by means of drilling. Considerably higher grade material than the average (0.07eU) of surface samples, also is sought at depth.

The highest-grade surface exposures found to date are in granite along the western edge of a granite stock. The few surface exposures do not indicate any geologic control governing the presence of zeunerite in the granite body. It may be presumed the uranium mineralization is confirmed to the granite along its outer edge, but such a presumption is based on very little evidence.

A discovery, in order to be significant in the remote location of this prospect, would have to be large enough to support a mill, because the cost of shipping raw ore would be prohibitive. The present geologic information does not suggest a reasonable possibility for a large size deposit of good grade.

Recommendation

Because of the low grade of the material exposed, the remoteness of the area, and the lack of any data to indicate that the hypothesis of primary uranium minerals at depth is any more than a possibility, I recommend that the application be denied.

Arthur P. Butler, Jr.

Copies to: E. Wm. Ellis (2)

Defense Minerals Administration
RECEIVED
2 - 8 1954

E. Wm. Ellis, DMEA Member, Uranium Commodity Committee

March 31, 1954

Arthur P. Butler, Jr., USGS Member, Uranium Commodity Committee

Review of application, DMEA Docket 3284 (Uranium), Kennedy and Hallerich - a partnership, applicant, Nome, Alaska. Nineteen lode claims at Rocky Mountain, York District, Cape Nome Precinct, 2nd Division Territory of Alaska.

The application identified in the subject above has been reviewed. There was no Field Team report accompanying the application and I presume none has been prepared. However, I have consulted a memorandum of January 1954 from the Trace Elements Unit of the Alaskan Geology Branch, USGS, relative to the merits of a drilling program on the property covered by the subject application.

Proposal

To core drill 24 holes, ranging in length from 50 to 200 feet, for a total length of about 3,000 feet. The holes to explore the western edge of a meunerite-bearing granite stock.

Comments

The Geological Survey has issued a fairly complete report, USGS Circular 214, covering the area included in the application. This report is based on field work done by the Geological Survey for the Atomic Energy Commission, and includes data obtained from the most recent exploration work done by the United States Smelting, Refining, and Mining Company.

In Circular 214 it is reported that the overall average of the surfaces exposures of the material to be tested is about 0.07 percent equivalent uranium. Most of the uranium present is in the mineral meunerite which occurs in veins and fractures in oxidized and decomposed granite.

Obviously the analyses of surface samples indicate the grade to be too low to be of possible commercial interest. However, the possibility is suggested in Circular 214 that the uranium in the meunerite was derived from primary uranium minerals which may be present in the granite below the zone of surface oxidation. It is this possibility that the applicant intends to test by means of drilling. Considerably higher grade material than the average (0.07%) of surface samples, also is sought at depth.

The highest-grade surface exposures found to date are in granite along the western edge of a granite stock. The few surface exposures do not indicate any geologic control governing the presence of soumerite in the granite body. It may be presumed the uranium mineralization is confirmed to the granite along its outer edge, but such a presumption is based on very little evidence.

A discovery, in order to be significant in the remote location of this prospect, would have to be large enough to support a mill, because the cost of shipping raw ore would be prohibitive. The present geologic information does not suggest a reasonable possibility for a large size deposit of good grade.

Recommendation

Because of the low grade of the material exposed, the remoteness of the area, and the lack of any data to indicate that the hypothesis of primary uranium minerals at depth is any more than a possibility, I recommend that the application be denied.

Copies to: E. Wm. Ellis (2)

E. Wm. Ellis, DMEA Member, Uranium Commodity Committee

March 31, 1954

Arthur P. Butler, Jr., USGS Member, Uranium Commodity Committee

Review of application, DMEA Docket 3284 (Uranium), Kennedy and Hellerich - a partnership, applicant, Nome, Alaska. Nineteen lode claims at Books Mountain, York District, Cape Nome Precinct, 2nd Division Territory of Alaska.

The application identified in the subject above has been reviewed. There was no Field Team report accompanying the application and I presume none has been prepared. However, I have consulted a memorandum of January 1954 from the Trace Elements Unit of the Alaskan Geology Branch, USGS, relative to the merits of a drilling program on the property covered by the subject application.

Proposal

To core drill 24 holes, ranging in length from 50 to 200 feet, for a total length of about 3,000 feet. The holes to explore the western edge of a zeunerite-bearing granite stock.

Comments

The Geological Survey has issued a fairly complete report, USGS Circular 214, covering the area included in the application. This report is based on field work done by the Geological Survey for the Atomic Energy Commission, and includes data obtained from the most recent exploration work done by the United States Smelting, Refining, and Mining Company.

In Circular 214 it is reported that the overall average of the surfaces exposures of the material to be tested is about 0.07 percent equivalent uranium. Most of the uranium present is in the mineral zeunerite which occurs in vugs and fractures in oxidized and decomposed granite.

Obviously the analyses of surface samples indicate the grade to be too low to be of possible commercial interest. However, the possibility is suggested in Circular 214 that the uranium in the zeunerite was derived from primary uranium minerals which may be present in the granite below the zone of surface oxidation. It is this possibility that the applicant intends to test by means of drilling. Considerably higher grade material than the average (0.07eU) of surface samples, also is sought at depth.

The highest-grade surface exposures found to date are in granite along the western edge of a granite stock. The few surface exposures do not indicate any geologic control governing the presence of seunerite in the granite body. It may be presumed the uranium mineralization is confined to the granite along its outer edge, but such a presumption is based on very little evidence.

A discovery, in order to be significant in the remote location of this prospect, would have to be large enough to support a mill, because the cost of shipping raw ore would be prohibitive. The present geologic information does not suggest a reasonable possibility for a large size deposit of good grade.

Recommendation

Because of the low grade of the material exposed, the remoteness of the area, and the lack of any data to indicate that the hypothesis of primary uranium minerals at depth is any more than a possibility, I recommend that the application be denied.

Copies to: E. Wm. Ellis (2)

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES
WASHINGTON 25, D. C.

March 29, 1954

Defense Minerals Administration
RECEIVED
MAR 29 1954

Memorandum

To: Ernest William Ellis, DMEA Member
Uranium Commodity Committee, Room 4640

From: H. D. Keiser, Bureau of Mines Member
Uranium Commodity Committee

Subject: DMEA Docket 3284, Kennedy & Hellerich, Nome, Alaska

I have reviewed the application included in the subject docket and discussed it with Joseph O. Hosted, representative of the Atomic Energy Commission.

It is recommended that the application be referred to the Field Team for investigation and report.

H. D. Keiser

H. D. Keiser

Attachment

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES
WASHINGTON 25, D. C.

March 29, 1954

Memorandum

To: Ernest William Ellis, DMEA Member
Uranium Commodity Committee, Room 4640

From: H. D. Keiser, Bureau of Mines Member
Uranium Commodity Committee

Subject: DMEA Docket 3284, Kennedy & Hellerich, Nome, Alaska

Department of the Interior
Defense Minerals Administration
RECEIVED
MAR 29 1954

I have reviewed the application included in the subject docket and discussed it with Joseph O. Hosted, representative of the Atomic Energy Commission.

It is recommended that the application be referred to the Field Team for investigation and report.

H. D. Keiser

Attachment

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES
WASHINGTON 25, D. C.

March 29, 1954

Department of the Interior
Defense Minerals Administration
RECEIVED
MAR 29 1954

Memorandum

To: Ernest William Ellis, DMEA Member
Uranium Commodity Committee, Room 4640

From: H. D. Keiser, Bureau of Mines Member
Uranium Commodity Committee

Subject: DMEA Docket 3284, Kennedy & Kellerich, Nome, Alaska

I have reviewed the application included in the subject docket and discussed it with Joseph O. Hosted, representative of the Atomic Energy Commission.

It is recommended that the application be referred to the Field Team for investigation and report.

H. D. Keiser

Attachment

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
WASHINGTON 25, D. C.

March 19, 1954
Subject: DMEA-3284
Re: Exploration Assistance
Brooks Mt. Prospect

Mr. M. R. Kennedy
Kennedy & Hellerich
Nome, Alaska

Dear Sir:

The receipt of your application dated Jan. 31, 1954 for exploration assistance under the Defense Production Act of 1950, as amended, is hereby acknowledged.

Your application has been assigned Docket Number DMEA-3284 and referred to the Rare and Miscellaneous Metals Division.

Kindly refer to DMEA-3284 in any future correspondence relating to your application.

Sincerely yours,

Robert E. Adams
Chief, Operation's Control
and Statistics Division

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
WASHINGTON 25, D. C.

March 19, 1954

Memorandum

To: Executive Officer, DMEA Field Team, Region I

From: Chief, Operation's Control and Statistics Division

Subject: Assignment of Docket Number

There is listed below the assigned docket number to an application recently received from Region I.

DMEA-3284 Kennedy & Hellerich

Robert E. Adams,
Chief, Operation's Control
and Statistics Division

UNITED STATES
DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION
~~WASHINGTON 25, D.C.~~

P. O. Box 560
Juneau, Alaska

DEPARTMENT OF THE INTERIOR
Defense Minerals Administration
RECEIVED
MAR 19 1954

March 16, 1954

Memorandum:

To: George C. Selfridge, Chairman, Operating Committee
Defense Minerals Exploration Administration, Washington, D. C.

From: Executive Officer, Field Team, Region I

Subject: Application for exploration contract (uranium)
Kennedy and Hellerich, Nome, Alaska

Some time ago we received four copies of the subject application but, inasmuch as no letter of transmittal accompanied them and inasmuch as only four copies had been sent from San Francisco, we assumed that these were "extras" sent to us by the applicants and that the formal application had been made to Washington. As time went by and no word was received from your office we began to suspect a mixup and arranged for Mr. Sainsbury to investigate when he went outside early this month. Your telegram of March 10 confirms our suspicions, therefore I am enclosing three copies of the application. One copy is being retained here so that we can continue with preparation of our report. Work on the report was started shortly after the application was received.

Because of Sainsbury's trip outside and because it was necessary for me to make a trip to the "westward", we have not been able to complete our report. Allowing for pressure of other work, I should be able to get out a report within the next ten days or two weeks. In the meantime, your Washington staff can be working on the application. I am not asking the applicant to send additional copies because I think that some revision will be necessary; consequently it might be advisable to wait until we have a program decided upon.

Our local staff is entirely favorable to the project in principle but we are "unhappy" with the proposed drilling plan; it is practically foredoomed to failure and would prove nothing. Mr. Hellerich is a mining engineer who has a fine reputation in placer mining but evidently does not understand lode exploration or mining; consequently the situation is a bit delicate.

8

3/16/54

Our opinions, and the reasons therefore, will be explained more fully in the forthcoming report.

S. H. Lorain, Executive Officer
Field Team, Region I

cc: Sainsbury - USGS

Encls: 1 (in trip)

UNITED STATES
DEPARTMENT OF THE INTERIOR

Defense Minerals Exploration Administration

Defense Minerals Administration
RECEIVED
MAR 19 1954

P. O. Box 560
Juneau, Alaska

March 16, 1954

Memorandum:

To: George C. Selfridge, Chairman, Operating Committee
Defense Minerals Exploration Administration, Washington, D. C.

From: Executive Officer, Field Team, Region I

Subject: Application for exploration contract (uranium)
Kennedy and Hellerich, Nome, Alaska

Some time ago we received four copies of the subject application but, inasmuch as no letter of transmittal accompanied them and inasmuch as only four copies had been sent from San Francisco, we assumed that these were "extras" sent to us by the applicants and that the formal application had been made to Washington. As time went by and no word was received from your office we began to suspect a mixup and arranged for Mr. Sainsbury to investigate when he went outside early this month. Your telegram of March 10 confirms our suspicions, therefore I am enclosing three copies of the application. One copy is being retained here so that we can continue with preparation of our report. Work on the report was started shortly after the application was received.

Because of Sainsbury's trip outside and because it was necessary for me to make a trip to the "westward", we have not been able to complete our report. Allowing for pressure of other work, I should be able to get out a report within the next ten days or two weeks. In the meantime, your Washington staff can be working on the application. I am not asking the applicant to send additional copies because I think that some revision will be necessary; consequently it might be advisable to wait until we have a program decided upon.

Our local staff is entirely favorable to the project in principle but we are "unhappy" with the proposed drilling plan; it is practically foredoomed to failure and would prove nothing. Mr. Hellerich is a mining engineer who has a fine reputation in placer mining but evidently does not understand lode exploration or mining; consequently the situation is a bit delicate.

DEPARTMENT OF THE ARMY
Defense Minerals Administration
MAR 19 1954

Memo to Operating Comm., D MEA
Kennedy & Hellerich, (uranium)

3/16/54

Our opinions, and the reasons therefore, will be explained more fully in the forthcoming report.

S. H. Lorain, Executive Officer
Field Team, Region I

cc: Sainsbury - USGS

Encls: 1 (in trip)

MF-103
(Revised April 1952)

UNITED STATES DEPARTMENT OF THE INTERIOR
DEFENSE MINERALS EXPLORATION ADMINISTRATION

Form Approved.
Budget Bureau No. 42-R1035.2.

DEPARTMENT OF THE INTERIOR
Defense Minerals Administration
RECEIVED
MAR 19 1954

APPLICATION FOR AID IN AN EXPLORATION PROJECT, PURSUANT TO DMEA ORDER 1, UNDER THE DEFENSE PRODUCTION ACT OF 1950, AS AMENDED

Not to be filled in by applicant

Docket No. 3284
Metal or Mineral Uranium
Date Received
Estimated Cost $27,839
Participation (Government %)

INSTRUCTIONS

1. *Name of applicant.*—(*a*) State here your full legal name, in the form in which you will wish to contract, and your mailing address: Kennedy & Hellerich - A partnership
Nome, Alaska
M. R. Kennedy, Nome, Alaska
Geo. Hellerich, 4313 North Fruit Ave., Fresno 4, Calif.

(*b*) If other than an individual, add to your name above whether a corporation, partnership, etc., and the name of the State in which incorporated or otherwise organized.

(*c*) If a corporation, add to above statement, titles, names and addresses of officers.

(*d*) If a partnership, add to the above statement the names and addresses of all partners.

2. *General.*—Read DMEA Order 1, "Government Aid in Defense Exploration Projects," before completing this application. Submit this application and all accompanying papers in quadruplicate (four copies), with your name and address on each sheet of the application and on all accompanying papers. Where sufficient space is not provided on the form for all required information, state it on an accompanying paper, with a reference in each case to the instruction to which it refers by number. Comply with all applicable instructions; or, if not applicable, so state. File the application with Defense Minerals Exploration Administration, Department of the Interior, Washington 25, D. C., or with the nearest field executive officer thereof.

3. *Applicant's property rights.*—(*a*) State the legal description of the land upon which you wish to explore, including all land which you possess or control that may be benefited by the exploration, and excluding any land or interest in land which is not to be included in the exploration project contract Nineteen mining claims located on the southwest slope of Brooks Mt. in the Cape Nome Precinct, 2nd Division Territory of Alaska

(*b*) State any mine name by which the property is known. Brooks Mt. Prospect

(*c*) State your interest in the land, whether owner, lessee, purchaser under contract, or otherwise owner

(*d*) If you are not the owner, submit with this application a copy of the lease, contract, or other document under which you control the property. not applicable

(*e*) If you own the land, describe any liens or encumbrances on it none

(*f*) If the land consists of unpatented claims, add to the description above, the book and page numbers for each recorded location notice. See supplemental sheet attached Item 3 (f)

4. *Physical description.*—(*a*) Describe in detail any mining or exploration operations which have been or now are being conducted upon the land, including existing mine workings and production facilities. State your interest, if any, in such operations. Also describe accessibility of mine workings for examination purposes.

(*b*) State past and current production, and ore reserves, if any, giving quantities and grades.

(*c*) Describe the geologic features of the property, including mineralization, type of deposit (vein, bedded, etc.), and your reasons for wishing to explore. Illustrate with maps or sketches. Send with your application (but not necessarily as a part of it) any geologic or engineering report, assay maps, or other technologic information you may have, indicating on each whether you require its return to you.

(*d*) State the facts with respect to the accessibility of the project: Access roads, distances to shipping, supply and residence points.

(*e*) State the availability of manpower, materials, supplies, equipment, water, and power.
See supplemental sheets attached Item 4 (a) to (e) inclusive.

16—66551-1

5. *The exploration project.*—(*a*) State the mineral or minerals for which you wish to explore uranium

(*b*) Describe fully the proposed work, including a map or sketch of the property showing a plan (and cross sections if needed) of any present mine workings, and the location of the proposed exploration work as related to such features as contact veins, ore-bearing beds, etc.

(*c*) The work will start within ..... days and be completed within ..... months from the date of an exploration project contract. See supplemental sheets

(*d*) State the operating experience and background of the applicant with relation to the ability to carry out such exploration project, and also that of the person or persons who will supervise the operations.

6. *Estimate of costs.*—Furnish a detailed estimate of the costs of the proposed work (you will have to use a separate sheet), under the following headings. Add the totals under all headings to give the estimated total cost of the project:

(*a*) *Independent contracts.*—(Note.—If the applicant does not intend to let any of the work to contractors, write "none" after this item. To the extent that the work is to be contracted, do not repeat the cost of the contract-work in subsequent items.) State the cost of any proposed independent contracts for the performance of all or any part of the work, expressed in terms of units of work (such as per foot of drilling, per foot of drifting, per hour of bulldozer operations, per cubic yard of material moved, etc.).

(*b*) *Labor, supervision, consultants.*—Include an itemized schedule of numbers, classes and rates of wages, salaries or fees for necessary labor, supervision and engineering and geological consultants.

(*c*) *Operating materials and supplies.*—Furnish an itemized list, including items of equipment costing less than $50 each, and power, water and fuel.

(*d*) *Operating equipment.*—Furnish an itemized list of any operating equipment to be rented, purchased, or which is owned and will be furnished by the Operator, with the estimated rental, purchase price, or suggested use-allowance based on present value, as the case may be.

(*e*) *Rehabilitation and repairs.*—Furnish a detailed list showing the cost of any necessary initial rehabilitation or repairs of existing buildings, installations, fixtures, and movable operating equipment, now owned by the Operator and which will be devoted to the exploration project.

(*f*) *New buildings, improvements, installations.*—Furnish a detailed list showing the cost of any necessary buildings, fixed improvements, or installations to be purchased, installed or constructed for the benefit of the exploration project.

(*g*) *Miscellaneous.*—Furnish a detailed list showing the cost of repairs to and maintenance of operating equipment (not including initial rehabilitation or repairs of the Operator's equipment), analytical work, accounting, workmen's compensation and employers' liability insurance, and payroll taxes.

(*h*) *Contingencies.*—Give an estimate of any necessary allowances for contingencies not included in the costs stated above.

NOTE.—No items of general overhead, corporate management, interest, taxes (other than payroll and sales taxes), or any other indirect costs, or work performed or costs incurred before the date of the contract, should be included in the estimate of costs.

7. (*a*) Are you prepared to furnish your share of the cost of the proposed project in accordance with the regulations on Government participation (Sec. 7, DMEA No. 1)? yes

(*b*) How do you propose to furnish your share of the costs?

[x] Money [ ] Use of equipment owned by you [ ] Other

Explain in detail on acompanying paper.

CERTIFICATION

The undersigned, whether as an individual, corporate officer, partner, or otherwise, both in his own behalf and acting for the applicant, certifies that the information set forth in this form and accompanying papers is correct and complete, to the best of his knowledge and belief.

Dated Jan 31st, 1954

Kennedy & Hellerich
(Applicant)

By M. R. Kennedy
Geo Hellerich

Title 18, U. S. Code (Crimes), Section 1001, makes it a criminal offense to make a willfully false statement or representation to any department or agency of the United States as to any matter within its jurisdiction.

U. S. GOVERNMENT PRINTING OFFICE 16—66551-1

Supplemental Information - Form MF - 103 Sheet No. 1

Applicant: Kennedy & Hellerich
Nome, Alaska

ITEM 3

(a) The applicants own nineteen mining claims, which were acquired by location. The claims are located on the southwest flank of Brooks Mountain, approximately three miles distant from the Lost River Mine of the United States Tin Corporation. The claim locations notices have been recorded in the office of the Recorder of the Cape Nome Mining Precinct at Nome, Alaska.

(b) Brooks Mt. Prospect

(c) Owner

(d) Not applicable

(e) None

(f) List of Lode Claims Belonging to Kennedy and Hellerich, Brooks Mountain, Second Judicial Division, Alaska. Official Records Cape Nome Mining Precinct

NAME OR NUMBER	INST.NO	DATE	VOL.	PAGE	LOCATOR
Iron Cap Claim	87718	8/18/.50	-228-	85	George Hellerich
" " No.1	87782	10/20/.50	-228-	87	M.R.Kennedy
" " No.2	87783	10/20/.50	-228-	87	" "
" " No.3	87784	10/20/.50	-228-	88	" "
" " No.4	87785	10/20/.50	-228-	88	" "
" " No.5	87786	10/20/.50	-228-	88	" "
" " No.6	87787	10/20/.50	-228-	86	" "
" " No.7	87788	10/20/.50	-228-	86	" "
" " No.8	87789	10/20/.50	-228-	86	" "
" " NO.9	87790	10/20/.50	-228-	89	" "
" " No.10	87791	10/20/.50	-228-	89	" "
Pageite	88108	8/27/.51	-228-	145	George Hellerich
Midnight Sun	88109	6/19/.51	-228-	146	" "
Sunny Day	88110	6/20/.51	-228-	146	" "
Windy Day	88111	6/21/.51	-228-	147	" "
Foggy Day	88112	6/22/.51	-228-	147	" "
Tourmaline No.2	88129	7/11/.51	-228-	157	M. R. Kennedy
Tourmaline No. 1	88130	7/11/.51	-228-	158	" "
Square Zero	88131	7/6/.51	-228-	159	" "

Applicant: Kennedy & Hellerich
Nome, Alaska

(f) (cont)
Amended Locations of Lode Claims - Kennedy and Hellerich
Official Records Cape Nome Mining Precinct.

NAME OR NUMBER	INST.NO.	DATE	VOL.	PAGE	LOCATOR.
Iron Cap No. 1	88107	8/15/.51	88	144	M. R. Kennedy
" " No. 2	88106	8/15/.51	88	144	" "
" " No. 3	88105	8/15/.51	88	143	" "
" " No. 4	88104	8/15/.51	88	142	" "
" " No. 5	88105	8/15/.51	88	141	" "
" " No. 6	88102	8/15/.51	88	141	" "
" " No. 7	88101	8/15/.51	88	140	" "
" " No. 8	88100	8/15/.51	88	139	" "
" " No. 9	88099	8/15/.51	88	139	" "
" " No.10	88098	8/15/.51	88	138	" "

ITEM 4

(a) The presence of uranium mineralization in greater than trace amounts was first determined in August, 1950. This discovery was made on the Iron Cap, Foggy Day, Iron Cap No. 8 claims and resulted in the location of the claims included in this application. During the winter of 1950 and spring of 1951 a lease agreement was negotiated with the United States Smelting, Refining and Mining Co., whereby the Company undertook the exploration work.

The Smelting Company sent two men to the property in June, 1951. These men established camp and made a survey of the claims. A geologist was added to the party in early July. The balance of July was spent in mapping geology and excavating shallow trenches by hand. This work resulted in the location of uranium mineralization on the Tourmaline No. 2 claim and near the northeast corner of the Square Zero claim.

Additional camp facilities were provided about August 1 and two miners were added to the crew. A tractor and a sixty cubic foot compressor was also made available at about this time. A road was built to the original discovery point on the Iron Cap, Foggy Day, Iron Cap No.8 and an open cut was started. The Smelting Co. suspended operations about September 1.

The Company's operations at the foggy Day prospect resulted in exposure of a highly oxidized zeunerite bearing granitic lens approximately 14 feet high and four feet wide. (This lens appears to be on the contact between a coarse grained granite and a marmorized limestone.) The entire mass is permanently frozen below a four to five foot mantle of talus that covers the mountain side. At a depth of about 20 feet below the surface

(This lens was perpindicular to the contact and had no observable connection with the marmorized limestone. Contact was probably a fracture in the Granite. Location close to L.S. probably was accidental.) L Mulligan

Supplemental Information - Form MF - 103 Sheet No. 3

Applicant: Kennedy & Hellerich
Nome, Alaska

This is Probable Scouring-not Contact zone

(a) (cont). the granitic lens disappeared and was replaced by an eight inch mineralized zone containing hematite stringers.

The samples taken from the granitic lens would indicate an average value between o.10 and 0.20 percent equivalent uranium. High grade float and localized concentrations in place yielded results as high as 2.0 percent. No primary uranium mineralization has been disclosed by the prospecting to date.

No mention made of original discovery which is near the intersection of Iron Cap #1 and Iron Cap #2

The second significant occurrence of uranium occurs on the Tourmaline No. 2 claim. Numerous tourmaline veins from a fraction of an inch to four inches in width containing uranium mineralization are disclosed in several shallow trenches. The radioactive mineralization appears to occupy joint planes and tension cracks of the open veins. This occurrence is located entirely within the coarse grained granite, the closest limestone being over five hundred feet distant. The heavy talus mantle discouraged smelting Company activity in this area. All of the exploration openings are no longer accessible for examination. Government representatives were present at all times when work was going on. Their findings and conclusions are recorded in Geological Survey Circular 214.

(b) No production has resulted from operations undertaken to date. The exploration that has been accomplished to date is not conclusive, therefore no estimate can be made of ore reserves. The work proposed in this application is designed to explore the ore potential.

(c) Metamorphic, sedimentary and igneous rocks are present in the area covered by this application. The most recent rocks appear to be a coarse grained granite which occupies an area of about two square miles on the southerly flank of Brooks Mountain. This granite mass has intruded a formation of black slate and a massive blue gray limestone.

The sedimentary rocks and granite have been altered along the contact. This alteration is most pronounced along the westerly contact. There is some reason to believe that the dip of the westerly contact is flatter than the contact on the easterly side of the granite mass. This condition may account for the greater amount of alteration. Practically all of the mineralization appears along the westerly contact. It is therefore probably that this is the principal path along which the mineralizing solutions moved.

Maybe but mineralization may have non relation to contact

The principal radioactive mineral is zeunerite, a hydrous copper uranium arsenate, a mineral of secondary origin. The zeunerite has been found in significant concentrations at two locations and in trace amounts at several other localities. The chief associations are with quartz-tourmaline veins in coarse grained granite, and in granite adjacent to a granite-limestone contact associated with fluorite, hematite and tourmaline. In both instances the zeunerite occupies fracture faces, tension cracks or vugs. The limestone appears to be entirely free of radioactivity.

Applicant: Kennedy & Hellerich
Nome, Alaska

(c) (cont.) A detailed discription of the geologic features is contained in geological survey circular 214. A copy of this circular is being included with this report as Exhibit A.

(d) The Brooks Mt. area is accessible by planes with a load limit of 2000 lbs. by landing on an airstrip maintained to service the U. S. Tin Corporation's mine on Cassiterite Creek. A tractor trail about three miles in length is used to bring supplies from this airstrip to the Brooks Mt. prospect. Automotive vehicles with four wheel drive can also negotiate this trail. Heavy equipment can be delivered by ocean going vessels to ships anchorage at the mouth of Lost River. Lighters are used to transfer supplies from ship to shore. There is a well maintained truck road (11 miles) to the landing field described above. A landing field capable of accommodating a plane the size of DC 3 is being maintained at the mouth of Lost River. Ocean transportation is only possible during the open season, usually from June 15 to October 15.

(e) Man-power for the specialized operations contemplated will have to be brought from Fairbanks and Seattle. Machine helpers and semi-skilled workers can be obtained at Nome. There is an adequate supply of common labor available in the Eskimo villages in the immediate vicinity. The Eskimo worker is a very intelligent person and becomes very proficient in manual and mechanical operation after a short training period. The shortness of the Brooks Mt. job will not permit the training of local labor. Living quarters for the small crew required will be provided at the property in a building already there.

Power for the equipment needed will be furnished by internal combustion engine. Gasoline, fuel, food and miscellaneous supplies can be obtained at either Nome or Teller. Specialized mechanical equipment will have to be shipped from Seattle. Sufficient water for core drilling and domestic purposes is available on the property.

ITEM 5.

(a) The exploration program will be for uranium ores. At present only the secondary mineral zeunerite is known to be present.

(b) The location of the proposed work is shown on the property map, a print of which can be found in the envelope bound with this application. This map also shows the principal geologic features.

The exploration work will be on the Windy Day, Foggy Day, Iron Cap, Iron Cap No. 8 and Iron Cap No. 3 claims, and will consist of a series of four core drill holes at the six locations indicated on the property map. Approximately 500 feet of hole will be made at each location as follows:

1 - Hole 50 ft. deep 5 degrees below the horizontal
1 - Hole 100 ft. deep 25 degrees below the horizontal
1 - Hole 150 ft. deep 45 degrees below the horizontal
1 - Hole 200 ft. deep 65 degrees below the horizontal

Applicant: Kennedy & Hellerich
Nome, Alaska

(b) (cont.) In all cases it is planned to set the core drill up on the downhill side and within 25 to 30 feet of the limestone-granite contact. All of the holes will be drilled in an easterly direction. The core drilling will be done with an eight horse power Joy Manufacturing Company Number 7 gasoline power diamond core drill. Standard A X fittings, removing a one and one-eighth inch core will be used to make hole.

(c) It is estimated that 100 days will be required to complete the total core drilling program of 3,000 feet. The exact starting date of the project cannot be set at this time, as this date is entirely dependent upon the arrival of the drilling equipment at Lost River. The first boat of the open season usually arrives in this port of Bering Sea about July 1. It is estimated that drilling will be under way within a week after the arrival of the equipment on the beach at Lost River. Due to the short season and limited housing, the job will be conducted on a one shift basis, nine hours per day, seven days a week.

(d) The applicant is a partnership, with mining policy under the direction of Geo. Hellerich, a graduate mining engineer, with thirty years experience in responsible operating jobs mostly in Alaska. The direction of the contemplated exploration will be under the immediate direction of Hellerich or Mr. Ted Mathews, a consulting graduate mining and mechanical engineer of Fairbanks, Alaska. Mr. Mathews has had wide experience as the responsible head of mining and engineering projects in Alaska.

Supplemental Information - Form MF - 103 Sheet No. 6

Applicant: Kennedy & Hellerich
Nome, Alaska

ITEM No. 6.

(a) Independent Contracts	None
(b) Labor & Supervision	
1 - Driller @ $3.50/hour	$3,725.00
1 - Drill Helper @ $2.75/hour	2,927.00
1 - Working Supervisor & Engineer @1,000.00/month	3,333.00
Total	$9,985.00
(c) Operating Material & Supplies	
Gasoline, Fuel Oil & Misc. Petroleum Products	$ 700.00
Tools (shovels, picks, bars, wheelbarrow & small hand tools)	296.00
Pipe or used fire hose	270.00
Miscellaneous hardware	149.00
Messhouse & bunkhouse equipment	226.00
Miscellaneous supplies (lumber, cement, etc.)	365.00
Total	$2,006.00
(d) Purchases & Rentals	
1 - No. 7 Joy Diamond Core Drill with skids	$2,753.00
Rods, Bits, Tools, Tripod, etc.	5,670.00
Auxiliary Water Pump	246.00
Truck Rental	290.00
Tractor Rental	700.00
Total	$9,659.00

Applicant : Kennedy & Hellerich
Nome, Alaska

ITEM NO 6. (Continued)

(e) Rehabilitation & Repairs

Repairs to Messhouse & Bunkhouse (Labor & Material)	84.00

(f) New Building & Improvements None

(g) Miscellaneous

Repairs to equipment including Diamond Bits	$1,508.40
Assaying	300.00
Accounting	200.00
Workmens Compensation	520.00
Payroll Taxes	470.00
Messhouse loss	900.00
Transportation Personnel	726.45
Transportation emergency supplies & food	180.00
Total	$4,804.85

(h) Contingencies $1,300.00

Note: All cost estimates for equipment & supplies are F.O.B. Lost River.

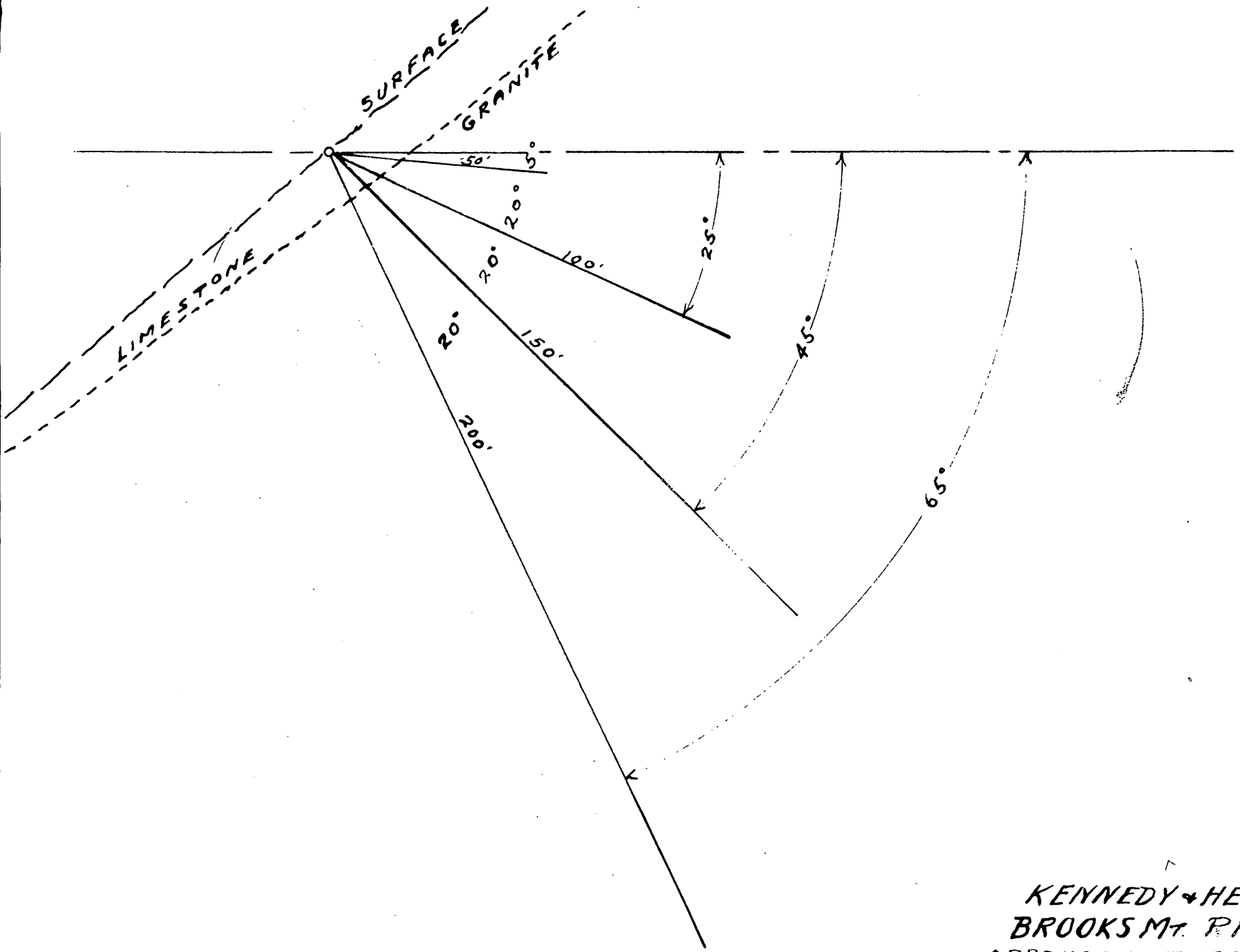
TOTALS

(a) Independent Contracts	None
(b) Labor & Supervision	$9,985.00
(c) Operating Material & Supplies	2,006.00
(d) Purchases & Rentals	9,659.00
(e) Rehabilitation & Repairs	84.00
(f) New buildings & Improvements	None
(g) Miscellaneous	4,804.85
(h) Contingencies	1,300.00
Totals	$27,838.85

The first expenditures will be made on or about June 1, 1954; approximately $10,000 will be required at this time

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES
1201 N. DIVISION STREET
SPOKANE 2, WASHINGTON

Contract Administration and Audit Division
Defense Minerals Exploration Administration
Department of the Interior
Washington 25, D. C.



KENNEDY & HELLERICH
BROOKS MT. PROSPECT
ARRANGEMENT OF DRILL HOLES

GWH

RC. 214

GEOLOGICAL SURVEY CIRCULAR 214

THE OCCURRENCE OF ZEUNERITE AT BROOKS MOUNTAIN SEWARD PENINSULA ALASKA

By Walter S. West and Max G. White

UNITED STATES DEPARTMENT OF THE INTERIOR
Oscar L. Chapman, Secretary

GEOLOGICAL SURVEY
W. E. Wrather, Director

GEOLOGICAL SURVEY CIRCULAR 214

THE OCCURRENCE OF ZEUNERITE AT BROOKS MOUNTAIN SEWARD PENINSULA, ALASKA

By Walter S. West and Max G. White

This report concerns work done on behalf of the U. S. Atomic Energy Commission and is published with the permission of the Commission.

Washington, D. C., 1952

Free on application to the Geological Survey, Washington 25, D. C.

THE OCCURRENCE OF ZEUNERITE AT BROOKS MOUNTAIN SEWARD PENINSULA, ALASKA

CONTENTS

	Page
Abstract	1
Introduction	1
Geology	2
Description of rock types	2
Slate	2
Limestone	2
Granite	2
Dikes	3
Structure	3
Hydrothermal alteration of sedimentary rocks and granite	3
Mineral Deposits and radioactivity studies	3
Foggy Day prospect	3
Tourmaline No. 2 claim	6
Minor occurrences of zeunerite	6
Radioactivity of the granite	7
Conclusions	7
Recommendation for prospecting	7
References cited	7

ILLUSTRATIONS

	Page
Plate 1. Geologic map of the Brooks Mountain area, Teller quadrangle, Seward Peninsula, Alaska	Inside back cover
Figure 1. Index map of the Seward Peninsula, Alaska, showing the location of the Brooks Mountain area	2

TABLE

	Page
Table 1. Analyses of selected samples from the Brooks Mountain area, Seward Peninsula	4

ABSTRACT

Zeunerite occurs near the surface of a granite stock on the southwest flank of Brooks Mountain, Alaska. The largest deposit is at the Foggy Day prospect. Zeunerite is disseminated in hematite which partially or totally fills openings and vugs in a highly oxidized lens-shaped body of pegmatitic granite and, to a minor extent, in openings and cracks in the weathered granite enclosing the lens. Although a few specimens from the pegmatitic lens contain as high as 2.1 percent equivalent uranium, the average content of the lens rock is between 0.1 and 0.2 percent equivalent uranium and that of both the lens material and the surrounding zeunerite-bearing granite is about 0.07 percent equivalent uranium. A smaller concentration of zeunerite occurs as surface coatings on a few of the quartz-tourmaline veins that occupy joint fractures in granite on Tourmaline No. 2 claim. The vein material here contains about 0.05 percent equivalaent uranium. Zeunerite, in trace amounts, was identified in a sample from a site near Tourmaline No. 2 claim and in two samples from other sites near the Foggy Day prospect. The zeunerite at these three localities is probably related in source to the Tourmaline No. 2 claim and Foggy Day prospect deposits.

Although no primary uranium minerals were found, it is possible that a primary mineral zone may occur below the zone of oxidation at the Foggy Day prospect.

INTRODUCTION

Brooks Mountain (altitude 2,898 ft) is located in the central part of the Teller Quadrangle (issued by the Geological Survey, scale 1:250,000) about 25 miles east of Cape Prince of Wales and 85 miles northwest of Nome (fig. 1). It is the highest peak in the York Mountains, which form the divide between the streams flowing north into the Arctic Ocean and those flowing south into the Bering Sea. Brooks Mountain itself constitutes the drainage source for several of the headwater tributaries of the Mint River; York Creek, a tributary to the Pinauk River; Anderson Creek, a tributary to the Don River; and Crystal Creek, a headwater tributary to Lost River.

The Brooks Mountain area is accessible by small planes, which may land on a crude airstrip on the southwest slope of the mountain above Crystal Creek or on two other airstrips farther down Lost River. Heavy equipment and supplies can be transported by tug and barge to the Bering Sea beach near the mouth of Lost River and brought up to the 1,400-ft saddle between Crystal Creek and Mint River over a tractor trail. This trail will also accommodate jeeps and trucks.

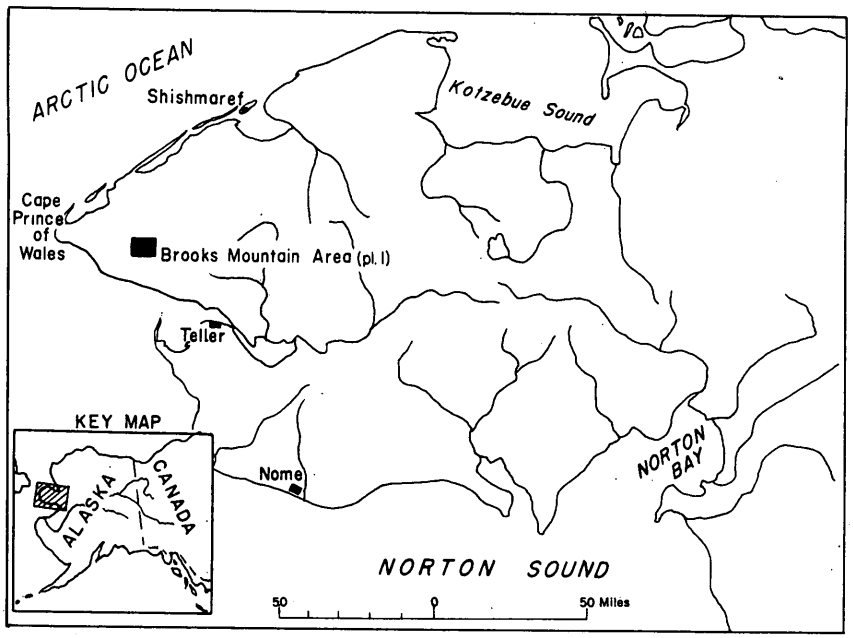


Figure 1. --Index map of the Seward Peninsula, Alaska, showing the location of the Brooks Mountain area.

The Brooks Mountain area has been visited and described a number of times by members of the Geological Survey (Collier, 1902, pp. 14, 29, 30, 51; 1904-a, pp. 10, 15, 26; 1905, p. 125; Knopf, 1908, pp. 13, 17-25, 34, 41-44, 61; and Steidtmann and Cathcart, 1922). No field investigations for radioactive materials had been made in this area by the Geological Survey prior to 1951. Radiometric scanning of rock samples in the Survey collections and radiometric and mineralogic studies of samples sent to the Survey by Mr. George Hellerich of Fairbanks during the summer of 1950 indicated that Brooks Mountain was one of the places in Alaska most likely to contain high-grade uranium ores (Wedow, White, and Moxham, 1951, pp. 2, 26-28, 32). For this reason a radioactivity investigation of the Brooks Mountain area was made during the latter part of July and August 1951. This included several bedrock claims that were being prospected for uranium by the United States Smelting, Refining, and Mining Company on the southwest slope of the mountain. Some of these claims were owned by the company and the remainder were leased by it from Mr. George Hellerich of Fairbanks and associates from elsewhere in Alaska. The investigation was made by Walter S. West and Max G. White, geologists; and Fred Freitag, Arthur E. Nessett, and Eugene A. Hainze, field assistants. This work was done on behalf of the Division of Raw Materials of the U. S. Atomic Energy Commission.

GEOLOGY

Brooks Mountain is composed of igneous, sedimentary, and metamorphic rocks, consisting of a granite mass and felsic and mafic dikes of Mesozoic(?) age, which intrude a formation of black slate of Cambrian or pre-Cambrian age and the Port Clarence limestone of Ordovician, Silurian, and Devonian age (pl. 1).

Description of rock types

Slate. --The black carbonaceous slate at Brooks Mountain has an exceedingly fine-grained texture and a platy structure. Quartz and mica are common constituents. In contact with the granite and for several hundred feet away from the contact the slate has been altered to a dense, compact brown mass that shows faint banding. It has lost its original platy character and the mineral grains are slightly coarser.

Limestone. --The limestone on Brooks Mountain varies from thin-bedded rock with brown to black shaly partings to pure, gray granular rock in beds averaging about 3 ft in thickness. In places, however, the limestone has been highly metamorphosed, as at the Foggy Day prospect, where it has been changed to a coarse-grained white marble traversed by seams of silicates and veins and veinlets of other minerals. A green mica zone at the limestone and granite contact in the Foggy Day claim is probably the result of alteration of the limestone.

Granite. --A small stock of granite is exposed over an area of about 1-3/4 sq mi on the south flank of Brooks Mountain (pl. 1).

There are at least two facies of the granite; one is a coarse-grained porphyritic granite with phenocrysts of orthoclase as much as 3 in. in length but averaging about 1-1/2 in. ; the other is a medium-grained granite. Although the evidence is not conclusive, it appears that the coarse-grained granite forms the main body of the mass, and the medium-grained rock may be a chilled border phase of the granite. Mineral constituents common to both facies of granite include orthoclase, plagioclase, biotite, smoky quartz, glassy quartz, and black tourmaline, with accessory monazite, zircon, xenotime, anatase, magnetite, and ilmenite.

A possible correlation may be made between the granite of Brooks Mountain and other granite masses in the York district, particularly those on Cassiterite and Tin Creeks in the Lost River area, and at Cape and Ear Mountains. This correlation is based not only on similarity of composition but also on the occurrence of tin minerals in or near all the granite masses. In addition the granite masses all intrude the Port Clarence limestone, and the contact metamorphism of the limestone adjacent to the granite at all the masses is similar.

Dikes. --Several granite and aplite dikes, one dacite porphyry dike, and one pegmatite dike are known to crop out on Brooks Mountain (pl. 1). The granite and aplite are found in the slate, limestone, and granite; the dacite porphyry dike cuts both limestone and slate; and the pegmatite dike is in limestone. All of the dikes are believed to be genetically related to the granite.

Structure

The Paleozoic sedimentary rocks, which strike northeast along the northwest side of the granite at Brooks Mountain, appear to lie in an over-turned anticline with the axis of the fold dipping northwest. The nature of the contact between the sedimentary rocks and the granite is poorly defined; it was observed only in a few isolated outcrops and is inferred mostly from float and talus. The contact is probably a normal intrusive contact, although the sedimentary rocks may have been thrust faulted against the granite by compressive stresses from the northwest. However, if such faulting has taken place, it was probably localized at the contact, as there is no evidence of faulting in the sedimentary rocks to the southwest of the area under consideration here.

One major and two minor joint fracture systems are present in the granite. The major joint fractures trend northwest and at many points are occupied by narrow quartz-tourmaline veins. The valley at the head of the Mint River fork that drains the area is a cirque. Erosion of the strongly jointed granite at the head of the cirque has formed high, sharp pinnacles, some of which are 200 ft high.

Hydrothermal alteration of sedimentary rocks and granite

The sedimentary rocks and granite at Brooks Mountain have been hydrothermally altered, particularly along the limestone and granite contact on the southwest flank of the mountain (pl. 1).

A narrow zone of tactite(?), composed essentially of green mica, fluorite, and calcite, was observed in the workings of the Foggy Day prospect (pl. 1) which lie mainly in granite at the limestone and granite contact on the southwest flank of the mountain. The metamorphosed limestone on the southwest flank of the mountain, from the Paigeite claim on the south to the Iron Cap No. 10 claim on the north (pl. 1), contains a large variety of minerals including idocrase, diopside, grossularite, augite, hedenbergite, scapolite, chrondrodite, phlogopite, siderophyllite, tourmaline, fluorite, sheelite, arsenopyrite, ludwigite, pyrite, pyrrhotite, magnetite, hematite, limonite, galena, cerussite, sphalerite, chalcopyrite, chalcocite, bornite, azurite, malachite, hulsite, and paigeite. These minerals, with the exception of those that are of secondary origin, appear to have been formed from solutions introducing fluorine, chlorine, boron, silica, aluminum, magnesium, tungsten, arsenic, sulphur, iron, lead, zinc, copper, and tin, which penetrated the limestone through fissures, joints, and bedding planes. Little or no alteration took place along the eastern edge of the limestone and granite contact.

Minerals introduced in the granite are hematite, limonite, siderite, pyrrhotite, arsenopyrite, fluorite, scheelite, chalcopyrite, azurite, malachite, tetrahedrite, cassiterite, bismuth, and zeunerite, and the quartz and tourmaline that occupy joint fractures in the granite. Some of these minerals from which the uranium in the zeunerite has been derived may have been deposited in the granite.

As most of the minerals formed by hydrothermal alteration occur near the limestone and granite contact, it is probable the contact was the principal path along which the mineralizing solutions moved. The solutions apparently were more effective in causing deposition and replacement in the limestone than in the granite.

The alteration of the rocks at Brooks Mountain appears to have been produced in part by solutions from the granite magma, at the time that it came in contact with the limestone; and in part, at a later time, by hot solutions which may have been released either from the granite during the process of cooling or from some deep-seated source after the granite had solidified, as was the case in the Lost River area (White and West, 1952).

MINERAL DEPOSITS AND RADIOACTIVITY STUDIES

Uranium in the form of zeunerite, a hydrous copper-uranium arsenate, was found concentrated at two localities and in trace amounts at three other places on Brooks Mountain. Other radioactive minerals are also present in the granite. Equivalent uranium and uranium analyses of pertinent Brooks Mountain samples are given in table 1. Sample locations are shown on plate 1.

As preliminary uranium analyses of samples from the zeunerite occurrences at Brooks Mountain closely paralleled the equivalent uranium analyses on the same samples it was believed that in the present investigation analyses for equivalent uranium would be sufficient to indicate the amount of radioactive material present. Most analyses were made in the Washington laboratory of the Trace Elements Section, U. S. Geological Survey; some equivalent uranium analyses were made in the Fairbanks laboratory of its Alaskan Trace Elements unit.

Foggy Day Prospect

The largest concentration of zeunerite on Brooks Mountain was found at the Foggy Day prospect, which is situated on the Foggy Day, Iron Cap, and Iron Cap No. 8 claims (pl. 1). This prospect is in granite adjacent to a contact with an altered marmorized limestone and consists of an open-cut about 20 ft deep, which was excavated by the United States Smelting, Refining, and Mining Company during the summer of 1951. The zeunerite at this prospect occurs in a lens-shaped body

Table 1.--Analyses of selected samples from Brooks Mountain, Seward Peninsula, Alaska

[U is uranium; eU, effective uranium. An a concentrate was derived from crushed, raw sample by screening, sliming, and methylene-iodide separation; b, by panning and methylene-iodide separation.]

Sample no.	Location	Type of sample	Description	Raw sample		Concentrate
				Percent eU	Percent U	Percent eU
4200	Foggy Day prospect----------	20-ft N-S channel-	From south limestone contact to 6 ft north of pegmatitic lens, 3 ft below surface.	0.01	---	---
4282	------do----------	8-ft channel------	Across pegmatitic lens, 4-1/2 ft below surface.	.08	0.075	---
4278	------do----------	18-ft N-S channel-	From south limestone contact to 6 ft N. of pegmatitic lens, 6 ft below surface.	.02	---	---
4434	------do----------	2-ft channel------	Central part of pegmatitic lens, 7-1/2 ft below surface.	.25	.22	---
4283	------do----------	4-ft channel------	Across pegmatitic lens, 9 ft below surface.	.06	---	---
4435	------do----------	3.8-ft channel----	Across pegmatitic lens, 11 ft below surface.	.12	.09	---
4284	------do----------	3.8-ft channel----	Across pegmatitic lens, 12 ft below surface.	.10	---	---
4436	------do----------	3.8-ft channel----	Across pegmatitic lens, 14 ft below surface.	.16	---	---
4285	------do----------	3.6-ft channel----	Across pegmatitic lens, 15 ft below surface.	.12	---	---
4309	------do----------	2-ft channel------	Across pegmatitic lens, 18 ft below surface.	.028	---	---
3854	------do----------	Float----------	Pegmatitic lens material------	2.144	2.25	---
4012	------do----------	Grab----------	------do----------	0.068	0.04	---
4013	------do----------	------do----------	------do----------	.02	.02	---
4016	------do----------	------do----------	------do----------	.27	.2	---
4197	------do----------	------do----------	Limonite at north border of pegmatitic lens.	.23	---	---
4198	------do----------	------do----------	Pegmatitic lens material------	.014	---	---
4305	------do----------	------do----------	Black 1 in. seam in pegmatitic lens.	.31	---	---
4130	------do----------	0.9-ft channel----	Across small lens 5 ft S. of pegmatitic lens, 6 ft below surface.	.2	---	---
4108	Tourmaline No. 2 claim-------	Grab----------	Hematitic coating on tourmaline vein.	1.0	---	---
4139	------do----------	------do----------	Tourmaline vein material------	0.052	---	---
4163	------do----------	------do----------	Granite between tourmaline veins.	.005	---	---
4165	------do----------	12-ft channel-----	Across tourmaline veins and granite.	.007	---	---
4166	------do----------	Grab----------	Tourmaline vein material------	.054	---	---
4135	------do----------	9.5-ft channel----	Across tourmaline veins and granite.	.007	---	---

4185	S. of Tourmaline No. 2 claim-	Grab----------	Weathered tourmaline vein-----	.013	---	---
4109	------do----------	------do----------	-----do----------	.02	---	---
4235	------do----------	------do----------	Weathered granite----------	---	---	0.038a
4117	Near SE. corner of Midnight Sun claim and NE. corner of Square Zero claim.	------do----------	------do----------	.006	---	---
4118	------do----------	------do----------	Granite dike----------	.009	---	---
4320	Near isolated limestone outcrop on Iron Cap No. 5 claim.	------do----------	Weathered granite----------	.012	---	---
4266	Pit S. of Read prospect------	------do----------	------do----------	.005	---	---
4275	Paigeite claim----------	------do----------	Aplite dike----------	---	---	.005a
4288	N. part of granite mass------	------do----------	Granite----------	---	---	.016a
4101	75 ft N. of Foggy Day--------	------do----------	Granite wash material---------	.006	---	.015a
4105	80 ft W. of sample 4101------	------do----------	------do----------	.007	---	.013b
4111	E. of Foggy Day prospect-----	------do----------	Granite----------	.004	---	---
4113	W. central part of Iron Cap No. 9 claim.	------do----------	------do--- ----------	.007	---	.10a
4115	Central part of Iron Cap No. 5 claim.	------do----------	------do----------	.004	---	.17a
4116	E. of sample 4115----------	------do----------	------do----------	.005	---	.20a
4240	N. central part of Sunny Day claim.	------do----------	Oxidized granite----------	---	---	.19a
4119	S. slope above Crystal Creek-Anderson Creek saddle.	------do----------	Granite---------- ----------	.005	---	---
4185	N. slope above Crystal Creek-Anderson Creek saddle.	------do----------	Granite dike----------	.007	---	---

of granite rock, about 15 ft in diameter and 4 or 5 ft thick. Both the zeunerite-bearing granitic lens and the adjacent granite are highly oxidized and weathered, though permanently frozen. The material in the lens appears to be a pegmatitic phase of the coarse-grained granite. An interpretation of the relation of lens rock to the surrounding granite is difficult because of the degree of decomposition of the rock. The pegmatite rock is porous and vuggy. The zeunerite occurs in tabular crystals up to 1/4 in. in diameter embedded in bright red hematite, which usually fills the openings and vugs in the lens of pegmatitic rocks. The remaining space is generally occupied by clear ice, which in some cases has large crystals of zeunerite suspended in it. Zeunerite is found in minor to trace amounts in the openings and cracks in the granite rock that encloses the lens and in a very small granitic lens about 5 ft south of the larger lens. Considerable amounts of purple fluorite, black tourmaline, and smoky quartz occur in the pegmatitic phase. The minerals present in heavy mineral fractions (those greater than 3.3 sp gr) of two typical high- and low-grade samples from the lens are as follows:

Concentrations of zeunerite in granite from Foggy Day prospect, Brooks Mountain, Alaska

Sample 4432

Minerals	Estimated percent
Zeunerite	70
Zircon	9
Hematite	9
Tourmaline	4
Limonite	3
Arsenopyrite	2
Fluorite	1
Scheelite	1
Chalcopyrite	1
Magnetite	trace

Sample 4198

Minerals	Estimated percent
Hematite	70
Limonite	20
Zircon	3
Zeunerite	2
Pyrrhotite	2
Fluorite	2
Scheelite	1
Arsenopyrite	trace
Magnetite	trace
Tourmaline	trace

Careful studies of the minerals in the lens disclosed that the only radioactive mineral other than zeunerite is hematite, although some of the other minerals contain minor amounts of uranium as revealed by flux tests. No primary uranium minerals were found in either the lens material or the surrounding granite. Radiometric data indicates that the pegmatitic lens material probably averages between 0.1 and 0.2 percent equivalent uranium. A few high-grade float specimens and localized concentrations in the lens have been found to contain as high as 2.1 percent equivalent uranium. The overall average of the lens rock and the surrounding zeunerite-bearing granite is about 0.07 percent equivalent uranium.

No radioactivity was found in the limestone near the Foggy Day prospect nor in the base metal veinlets in the limestone.

By the end of August, exploration at the Foggy Day prospect had almost completely removed the pegmatitic lens. At the bottom of the cut and the base of the lens, hematitic stringers were observed in a zone about 8 in. wide. These stringers may represent feeder channels coming out of the granite. If so, the zeunerite and hematite may have been deposited by solutions which followed these channels from a primary deposit at greater depths in the granite. However, it is also possible to account for the source of the zeunerite by assuming that at one time primary minerals including a uranium mineral filled the vugs in the porous granite and that the zeunerite and hematite are the remaining decomposition products.

Tourmaline No. 2 claim

Another locality where a concentration of uranium was found on Brooks Mountain is on the Tourmaline No. 2 claim approximately 700 ft SE. of the Luther prospect and a little over 500 ft from the nearest point along the limestone and granite contact (pl. 1). On this claim, networks of quartz-tourmaline veins ranging in width from a fraction of an inch to 4 in. occur in joint fractures in the granite. Zeunerite and brown scaly hematite are found as coatings on some of the vein surfaces and wall rocks. The concentration of radioactive material is restricted to the open veins. Tourmaline veins which completely fill the joint fractures contain no zeunerite or hematite. In August 1951 exploration by the United States Smelting, Refining, and Mining Company exposed some of the zeunerite-bearing tourmaline veins in several shallow pits and trenches. The veins were not traced for any great distance because of talus cover. Although a few pieces of high-grade vein rock contain as much as 1.0 percent equivalent uranium, the average content of the vein material is about 0.05 percent equivalent uranium. Also in this vicinity are several radioactive hematite-bearing tourmaline veins that contain no zeunerite, probably because of leaching.

Minor occurrences of zeunerite

Zeunerite, in trace amounts, was identified in samples from three other localities on Brooks Mountain as follows:

(1) In weathered granite a short distance southeast of the Midnight Sun claim and the northeast corner of the Square Zero claim (sample 4117, pl. 1).

(2) In slightly weathered granite at the northern boundary of the small isolated, paigeite-bearing limestone mass on Iron Cap No. 5 claim (sample 4320, pl. 1).

(3) On the ore dump of the Cameron prospect (sample 4260, pl. 1).

Sample 4117 is in the tourmaline vein area and has a comparatively close proximity to the Tourmaline No. 2 claim deposits. Therefore, the minor amount of zeunerite at this site may have been derived from the same source as that on the Tourmaline No. 2 claim. The zeunerite in samples 4320 and 4260 is probably related in source to that of the Foggy Day prospect because of the nearness to this deposit. Several highly oxidized hematitic zones in granite, geologically similar to the Foggy Day occurrence, on Iron Cap No. 3, Sunny Day, and Iron Cap No. 9 claims contain no zeunerite although the hematite is slightly radioactive. There is no evidence of any large scale leaching of zeunerite in these deposits, if zeunerite was ever present. The hematite, although earthy, is generally more compact than at the Foggy Day prospect. The Cameron prospect, which has mineral assemblages similar to the Read and Luther prospects, is the only base metal prospect that is slightly radioactive. Its radioactivity also is probably related in source to the Foggy Day deposit.

Radioactivity of the granite

The granite of Brooks Mountain as a whole is slightly radioactive. The radioactivity is caused by zircon, monazite and xenotime, which are primary accessory minerals in the granite. The principal radioactive element in these minerals is probably thorium. The amount of radioactivity at any given place on the granite mass is directly proportional to the quantity of these accessory minerals present. The average equivalent uranium content of the granite is about 0.005 percent.

CONCLUSIONS

Zeunerite is the major uranium-bearing mineral at the surface in the Brooks Mountain area. Traces of uranium occur as an impurity in some of the fluorite, tourmaline, smoky quartz, hematite, limonite, siderite, malachite, azurite, tetrahedrite, arsenopyrite, biotite, muscovite, sericite, and a secondary bismuth mineral. Zircon, monazite, and xenotime are also radioactive, but the radioactivity of these minerals is probably due mainly to thorium.

The principal points of uranium mineralization are at two localities on Brooks Mountain, although trace amounts of zeunerite have been found at three other places where the geological structure is probably related to that at the two main zeunerite deposits. Numerous other sites, geologically similar to the two main zeunerite-bearing sites, do not contain zeunerite. Consequently, most of the quartz-tourmaline veins on the mountain contain only a very small amount of radioactive material, and no other red oxidized zones in the granite are more than slightly radioactive. The marked restriction of principal zeunerite mineralization to the two localities indicates that uranium may have been derived from one or possibly two local primary sources within the granite. Radiometric examination of the granite mass and laboratory studies of the granite samples have so far failed to disclose the presence of a primary uranium mineral from which the uranium in the zeunerite could have been derived.

The surface evidence cannot be considered to indicate the occurrence of a commercial uranium deposit at the Foggy Day prospect. Nevertheless it would be unwise to eliminate it from consideration as a source of uranium because of the special importance of the climatic factor. The deposit is probably of preglacial origin and, if so, has remained frozen below the permafrost table since the inception of the present cold period. If the zeunerite is of secondary, water-borne origin, its deposition was of necessity cut off by the change in climate and no further enlargement was possible. It may be also that a considerable portion of the original deposit has been removed by glacial action. Thus its present extent is not of equal diagnostic value with that of similar secondary deposits in temperate climates.

RECOMMENDATIONS FOR PROSPECTING

Further discoveries of surficial occurrences of zeunerite similar to the Foggy Day prospect and Tourmaline No. 2 claim would probably not contribute much to the present knowledge of the origin of the uranium minerals at Brooks Mountain, as the known deposits have been rather comprehensively investigated by geologists of both the Geological Survey and the United States Smelting, Refining, and Mining Company. Consequently, further exploration of this uranium deposit should be directed toward testing the hypothesis of a primary uranium oxide source for the uranium in the zeunerite. It is believed that the best method of testing this hypothesis is by diamond drilling close to the surface workings at the Foggy Day prospect in an attempt to intersect the uraniferous zone at shallow depths, with the objective of determining whether any significant changes in mineral content occur at 25, 50, 100, 150, and 200 ft below the surface. The main significant change to be sought is the introduction of uraninite or pitchblende into the mineral assemblage of the deposit. The shallower holes should of course be drilled first as very little is known of the subsurface attitude of the possible deposit.

REFERENCES CITED

Collier, A. J., 1902, A reconnaissance of the northwestern portion of Seward Peninsula, Alaska: U. S. Geol. Survey Prof. Paper 2, 70 pp.

_____, 1904, Tin deposits of the York region, Alaska: U. S. Geol. Survey Bull. 225, pp. 154-167.

_____, 1904a, The tin deposits of the York region, Alaska: U. S. Geol. Survey Bull. 229, 61 pp.

_____, 1905, Recent development of Alaska tin deposits: U. S. Geol. Survey Bull. 259, pp. 120-127.

Knopf, Adolph, 1908, Geology of the Seward Peninsula tin deposits, Alaska: U. S. Geol. Survey Bull. 733, 130 pp.

Wedow, Helmuth, White, M. G., and Moxham, R. M., 1951, Interim report on an appraisal of the uranium possibilities of Alaska: U. S. Geol. Survey Trace Elements Mem. Rept. 235, (in open files of the Geological Survey).

White, M. G. and West, W. S., 1952, Reconnaissance for uranium in the Lost River area, Seward Peninsula, Alaska: U. S. Geol. Survey Trace Elements Inv. Rept. 220 (in open files of the Geological Survey).

INT.-DUP. SEC., WASH., D.C. 30433

CIRC. 214

GEOLOGICAL SURVEY CIRCULAR 214

THE OCCURRENCE OF ZEUNERITE AT BROOKS MOUNTAIN SEWARD PENINSULA ALASKA

By Walter S. West and Max G. White

UNITED STATES DEPARTMENT OF THE INTERIOR
Oscar L. Chapman, Secretary

GEOLOGICAL SURVEY
W. E. Wrather, Director

GEOLOGICAL SURVEY CIRCULAR 214

THE OCCURRENCE OF ZEUNERITE AT BROOKS MOUNTAIN SEWARD PENINSULA, ALASKA

By Walter S. West and Max G. White

This report concerns work done on behalf of the U. S. Atomic Energy Commission and is published with the permission of the Commission.

Washington, D. C., 1952

Free on application to the Geological Survey, Washington 25, D. C.

THE OCCURRENCE OF ZEUNERITE AT BROOKS MOUNTAIN SEWARD PENINSULA, ALASKA

CONTENTS

	Page
Abstract	1
Introduction	1
Geology	2
Description of rock types	2
Slate	2
Limestone	2
Granite	2
Dikes	3
Structure	3
Hydrothermal alteration of sedimentary rocks and granite	3
Mineral Deposits and radioactivity studies	3
Foggy Day prospect	3
Tourmaline No. 2 claim	6
Minor occurrences of zeunerite	6
Radioactivity of the granite	7
Conclusions	7
Recommendation for prospecting	7
References cited	7

ILLUSTRATIONS

	Page
Plate 1. Geologic map of the Brooks Mountain area, Teller quadrangle, Seward Peninsula, Alaska	Inside back cover
Figure 1. Index map of the Seward Peninsula, Alaska, showing the location of the Brooks Mountain area	2

TABLE

	Page
Table 1. Analyses of selected samples from the Brooks Mountain area, Seward Peninsula	4

ABSTRACT

Zeunerite occurs near the surface of a granite stock on the southwest flank of Brooks Mountain, Alaska. The largest deposit is at the Foggy Day prospect. Zeunerite is disseminated in hematite which partially or totally fills openings and vugs in a highly oxidized lens-shaped body of pegmatitic granite and, to a minor extent, in openings and cracks in the weathered granite enclosing the lens. Although a few specimens from the pegmatitic lens contain as high as 2.1 percent equivalent uranium, the average content of the lens rock is between 0.1 and 0.2 percent equivalent uranium and that of both the lens material and the surrounding zeunerite-bearing granite is about 0.07 percent equivalent uranium. A smaller concentration of zeunerite occurs as surface coatings on a few of the quartz-tourmaline veins that occupy joint fractures in granite on Tourmaline No. 2 claim. The vein material here contains about 0.05 percent equivalaent uranium. Zeunerite, in trace amounts, was identified in a sample from a site near Tourmaline No. 2 claim and in two samples from other sites near the Foggy Day prospect. The zeunerite at these three localities is probably related in source to the Tourmaline No. 2 claim and Foggy Day prospect deposits.

Although no primary uranium minerals were found, it is possible that a primary mineral zone may occur below the zone of oxidation at the Foggy Day prospect.

INTRODUCTION

Brooks Mountain (altitude 2,898 ft) is located in the central part of the Teller Quadrangle (issued by the Geological Survey, scale 1:250,000) about 25 miles east of Cape Prince of Wales and 85 miles northwest of Nome (fig. 1). It is the highest peak in the York Mountains, which form the divide between the streams flowing north into the Arctic Ocean and those flowing south into the Bering Sea. Brooks Mountain itself constitutes the drainage source for several of the headwater tributaries of the Mint River; York Creek, a tributary to the Pinauk River; Anderson Creek, a tributary to the Don River; and Crystal Creek, a headwater tributary to Lost River.

The Brooks Mountain area is accessible by small planes, which may land on a crude airstrip on the southwest slope of the mountain above Crystal Creek or on two other airstrips farther down Lost River. Heavy equipment and supplies can be transported by tug and barge to the Bering Sea beach near the mouth of Lost River and brought up to the 1,400-ft saddle between Crystal Creek and Mint River over a tractor trail. This trail will also accommodate jeeps and trucks.

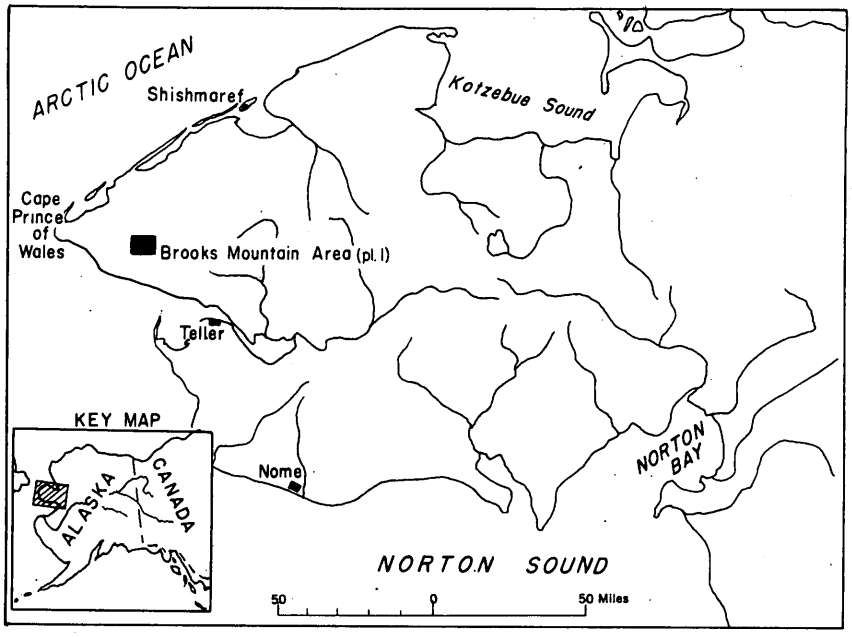


Figure 1. --Index map of the Seward Peninsula, Alaska, showing the location of the Brooks Mountain area.

The Brooks Mountain area has been visited and described a number of times by members of the Geological Survey (Collier, 1902, pp. 14, 29, 30, 51; 1904-a, pp. 10, 15, 26; 1905, p. 125; Knopf, 1908, pp. 13, 17-25, 34, 41-44, 61; and Steidtmann and Cathcart, 1922). No field investigations for radioactive materials had been made in this area by the Geological Survey prior to 1951. Radiometric scanning of rock samples in the Survey collections and radiometric and mineralogic studies of samples sent to the Survey by Mr. George Hellerich of Fairbanks during the summer of 1950 indicated that Brooks Mountain was one of the places in Alaska most likely to contain high-grade uranium ores (Wedow, White, and Moxham, 1951, pp. 2, 26-28, 32). For this reason a radioactivity investigation of the Brooks Mountain area was made during the latter part of July and August 1951. This included several bedrock claims that were being prospected for uranium by the United States Smelting, Refining, and Mining Company on the southwest slope of the mountain. Some of these claims were owned by the company and the remainder were leased by it from Mr. George Hellerich of Fairbanks and associates from elsewhere in Alaska. The investigation was made by Walter S. West and Max G. White, geologists; and Fred Freitag, Arthur E. Nessett, and Eugene A. Hainze, field assistants. This work was done on behalf of the Division of Raw Materials of the U. S. Atomic Energy Commission.

GEOLOGY

Brooks Mountain is composed of igneous, sedimentary, and metamorphic rocks, consisting of a granite mass and felsic and mafic dikes of Mesozoic(?) age, which intrude a formation of black slate of Cambrian or pre-Cambrian age and the Port Clarence limestone of Ordovician, Silurian, and Devonian age (pl. 1).

Description of rock types

Slate. --The black carbonaceous slate at Brooks Mountain has an exceedingly fine-grained texture and a platy structure. Quartz and mica are common constituents. In contact with the granite and for several hundred feet away from the contact the slate has been altered to a dense, compact brown mass that shows faint banding. It has lost its original platy character and the mineral grains are slightly coarser.

Limestone. --The limestone on Brooks Mountain varies from thin-bedded rock with brown to black shaly partings to pure, gray granular rock in beds averaging about 3 ft in thickness. In places, however, the limestone has been highly metamorphosed, as at the Foggy Day prospect, where it has been changed to a coarse-grained white marble traversed by seams of silicates and veins and veinlets of other minerals. A green mica zone at the limestone and granite contact in the Foggy Day claim is probably the result of alteration of the limestone.

Granite. --A small stock of granite is exposed over an area of about 1-3/4 sq mi on the south flank of Brooks Mountain (pl. 1).

There are at least two facies of the granite; one is a coarse-grained porphyritic granite with phenocrysts of orthoclase as much as 3 in. in length but averaging about 1-1/2 in.; the other is a medium-grained granite. Although the evidence is not conclusive, it appears that the coarse-grained granite forms the main body of the mass, and the medium-grained rock may be a chilled border phase of the granite. Mineral constituents common to both facies of granite include orthoclase, plagioclase, biotite, smoky quartz, glassy quartz, and black tourmaline, with accessory monazite, zircon, xenotime, anatase, magnetite, and ilmenite.

A possible correlation may be made between the granite of Brooks Mountain and other granite masses in the York district, particularly those on Cassiterite and Tin Creeks in the Lost River area, and at Cape and Ear Mountains. This correlation is based not only on similarity of composition but also on the occurrence of tin minerals in or near all the granite masses. In addition the granite masses all intrude the Port Clarence limestone, and the contact metamorphism of the limestone adjacent to the granite at all the masses is similar.

Dikes. --Several granite and aplite dikes, one dacite porphyry dike, and one pegmatite dike are known to crop out on Brooks Mountain (pl. 1). The granite and aplite are found in the slate, limestone, and granite; the dacite porphyry dike cuts both limestone and slate; and the pegmatite dike is in limestone. All of the dikes are believed to be genetically related to the granite.

Structure

The Paleozoic sedimentary rocks, which strike northeast along the northwest side of the granite at Brooks Mountain, appear to lie in an over-turned anticline with the axis of the fold dipping northwest. The nature of the contact between the sedimentary rocks and the granite is poorly defined; it was observed only in a few isolated outcrops and is inferred mostly from float and talus. The contact is probably a normal intrusive contact, although the sedimentary rocks may have been thrust faulted against the granite by compressive stresses from the northwest. However, if such faulting has taken place, it was probably localized at the contact, as there is no evidence of faulting in the sedimentary rocks to the southwest of the area under consideration here.

One major and two minor joint fracture systems are present in the granite. The major joint fractures trend northwest and at many points are occupied by narrow quartz-tourmaline veins. The valley at the head of the Mint River fork that drains the area is a cirque. Erosion of the strongly jointed granite at the head of the cirque has formed high, sharp pinnacles, some of which are 200 ft high.

Hydrothermal alteration of sedimentary rocks and granite

The sedimentary rocks and granite at Brooks Mountain have been hydrothermally altered, particularly along the limestone and granite contact on the southwest flank of the mountain (pl. 1).

A narrow zone of tactite(?), composed essentially of green mica, fluorite, and calcite, was observed in the workings of the Foggy Day prospect (pl. 1) which lie mainly in granite at the limestone and granite contact on the southwest flank of the mountain. The metamorphosed limestone on the southwest flank of the mountain, from the Paigeite claim on the south to the Iron Cap No. 10 claim on the north (pl. 1), contains a large variety of minerals including idocrase, diopside, grossularite, augite, hedenbergite, scapolite, chrondrodite, phlogopite, siderophyllite, tourmaline, fluorite, sheelite, arsenopyrite, ludwigite, pyrite, pyrrhotite, magnetite, hematite, limonite, galena, cerussite, sphalerite, chalcopyrite, chalcocite, bornite, azurite, malachite, hulsite, and paigeite. These minerals, with the exception of those that are of secondary origin, appear to have been formed from solutions introducing fluorine, chlorine, boron, silica, aluminum, magnesium, tungsten, arsenic, sulphur, iron, lead, zinc, copper, and tin, which penetrated the limestone through fissures, joints, and bedding planes. Little or no alteration took place along the eastern edge of the limestone and granite contact.

Minerals introduced in the granite are hematite, limonite, siderite, pyrrhotite, arsenopyrite, fluorite, scheelite, chalcopyrite, azurite, malachite, tetrahedrite, cassiterite, bismuth, and zeunerite, and the quartz and tourmaline that occupy joint fractures in the granite. Some of these minerals from which the uranium in the zeunerite has been derived may have been deposited in the granite.

As most of the minerals formed by hydrothermal alteration occur near the limestone and granite contact, it is probable the contact was the principal path along which the mineralizing solutions moved. The solutions apparently were more effective in causing deposition and replacement in the limestone than in the granite.

The alteration of the rocks at Brooks Mountain appears to have been produced in part by solutions from the granite magma, at the time that it came in contact with the limestone; and in part, at a later time, by hot solutions which may have been released either from the granite during the process of cooling or from some deep-seated source after the granite had solidified, as was the case in the Lost River area (White and West, 1952).

MINERAL DEPOSITS AND RADIOACTIVITY STUDIES

Uranium in the form of zeunerite, a hydrous copper-uranium arsenate, was found concentrated at two localities and in trace amounts at three other places on Brooks Mountain. Other radioactive minerals are also present in the granite. Equivalent uranium and uranium analyses of pertinent Brooks Mountain samples are given in table 1. Sample locations are shown on plate 1.

As preliminary uranium analyses of samples from the zeunerite occurrences at Brooks Mountain closely paralleled the equivalent uranium analyses on the same samples it was believed that in the present investigation analyses for equivalent uranium would be sufficient to indicate the amount of radioactive material present. Most analyses were made in the Washington laboratory of the Trace Elements Section, U. S. Geological Survey; some equivalent uranium analyses were made in the Fairbanks laboratory of its Alaskan Trace Elements unit.

Foggy Day Prospect

The largest concentration of zeunerite on Brooks Mountain was found at the Foggy Day prospect, which is situated on the Foggy Day, Iron Cap, and Iron Cap No. 8 claims (pl. 1). This prospect is in granite adjacent to a contact with an altered marmorized limestone and consists of an open-cut about 20 ft deep, which was excavated by the United States Smelting, Refining, and Mining Company during the summer of 1951. The zeunerite at this prospect occurs in a lens-shaped body

Table 1.--Analyses of selected samples from Brooks Mountain, Seward Peninsula, Alaska

[U is uranium; eU, effective uranium. An a concentrate was derived from crushed, raw sample by screening, sliming, and methylene-iodide separation; b, by panning and methylene-iodide separation.]

Sample no.	Location	Type of sample	Description	Raw sample		Concentrate
				Percent eU	Percent U	Percent eU
4200	Foggy Day prospect----------	20-ft N-S channel-	From south limestone contact to 6 ft north of pegmatitic lens, 3 ft below surface.	0.01	---	---
4282	------do----------	8-ft channel------	Across pegmatitic lens, 4-1/2 ft below surface.	.08	0.075	---
4278	------do----------	18-ft N-S channel-	From south limestone contact to 6 ft N. of pegmatitic lens, 6 ft below surface.	.02	---	---
4434	------do----------	2-ft channel------	Central part of pegmatitic lens, 7-1/2 ft below surface.	.25	.22	---
4283	------do----------	4-ft channel------	Across pegmatitic lens, 9 ft below surface.	.06	---	---
4435	------do----------	3.8-ft channel----	Across pegmatitic lens, 11 ft below surface.	.12	.09	---
4284	------do----------	3.8-ft channel----	Across pegmatitic lens, 12 ft below surface.	.10	---	---
4436	------do----------	3.8-ft channel----	Across pegmatitic lens, 14 ft below surface.	.16	---	---
4285	------do----------	3.6-ft channel----	Across pegmatitic lens, 15 ft below surface.	.12	---	---
4309	------do----------	2-ft channel------	Across pegmatitic lens, 18 ft below surface.	.028	---	---
3854	------do----------	Float----------	Pegmatitic lens material------	2.144	2.25	---
4012	------do----------	Grab----------	------do----------	0.068	0.04	---
4013	------do----------	------do----------	------do----------	.02	.02	---
4016	------do----------	------do----------	------do----------	.27	.2	---
4197	------do----------	------do----------	Limonite at north border of pegmatitic lens.	.23	---	---
4198	------do----------	------do----------	Pegmatitic lens material------	.014	---	---
4305	------do----------	------do----------	Black 1 in. seam in pegmatitic lens.	.31	---	---
4130	------do----------	0.9-ft channel----	Across small lens 5 ft S. of pegmatitic lens, 6 ft below surface.	.2	---	---
4108	Tourmaline No. 2 claim-------	Grab----------	Hematitic coating on tourmaline vein.	1.0	---	---
4139	------do----------	------do----------	Tourmaline vein material------	0.052	---	---
4163	------do----------	------do----------	Granite between tourmaline veins.	.005	---	---
4165	------do----------	12-ft channel-----	Across tourmaline veins and granite.	.007	---	---
4166	------do----------	Grab----------	Tourmaline vein material------	.054	---	---
4135	------do----------	9.5-ft channel----	Across tourmaline veins and granite.	.007	---	---

4185	S. of Tourmaline No. 2 claim-	Grab----------	Weathered tourmaline vein-----	.013	---	---
4109	------do----------	------do----------	-----do----------	.02	---	---
4235	------do----------	------do----------	Weathered granite----------	---	---	0.038a
4117	Near SE. corner of Midnight Sun claim and NE. corner of Square Zero claim.	------do----------	------do----------	.006	---	---
4118	------do----------	------do----------	Granite dike----------	.009	---	---
4320	Near isolated limestone outcrop on Iron Cap No. 5 claim.	------do----------	Weathered granite----------	.012	---	---
4266	Pit S. of Read prospect------	------do----------	------do----------	.005	---	---
4275	Paigeite claim----------	------do----------	Aplite dike----------	---	---	.005a
4288	N. part of granite mass------	------do----------	Granite----------	---	---	.016a
4101	75 ft N. of Foggy Day--------	------do----------	Granite wash material---------	.006	---	.015a
4105	80 ft W. of sample 4101------	------do----------	------do----------	.007	---	.013b
4111	E. of Foggy Day prospect-----	------do----------	Granite----------	.004	---	---
4113	W. central part of Iron Cap No. 9 claim.	------do----------	------do--- ----------	.007	---	.10a
4115	Central part of Iron Cap No. 5 claim.	------do----------	------do----------	.004	---	.17a
4116	E. of sample 4115----------	------do----------	------do----------	.005	---	.20a
4240	N. central part of Sunny Day claim.	------do----------	Oxidized granite----------	---	---	.19a
4119	S. slope above Crystal Creek-Anderson Creek saddle.	------do----------	Granite---------- ----------	.005	---	---
4185	N. slope above Crystal Creek-Anderson Creek saddle.	------do----------	Granite dike----------	.007	---	---

of granite rock, about 15 ft in diameter and 4 or 5 ft thick. Both the zeunerite-bearing granitic lens and the adjacent granite are highly oxidized and weathered, though permanently frozen. The material in the lens appears to be a pegmatitic phase of the coarse-grained granite. An interpretation of the relation of lens rock to the surrounding granite is difficult because of the degree of decomposition of the rock. The pegmatite rock is porous and vuggy. The zeunerite occurs in tabular crystals up to 1/4 in. in diameter embedded in bright red hematite, which usually fills the openings and vugs in the lens of pegmatitic rocks. The remaining space is generally occupied by clear ice, which in some cases has large crystals of zeunerite suspended in it. Zeunerite is found in minor to trace amounts in the openings and cracks in the granite rock that encloses the lens and in a very small granitic lens about 5 ft south of the larger lens. Considerable amounts of purple fluorite, black tourmaline, and smoky quartz occur in the pegmatitic phase. The minerals present in heavy mineral fractions (those greater than 3.3 sp gr) of two typical high- and low-grade samples from the lens are as follows:

Concentrations of zeunerite in granite from Foggy Day prospect, Brooks Mountain, Alaska

Sample 4432

Minerals	Estimated percent
Zeunerite	70
Zircon	9
Hematite	9
Tourmaline	4
Limonite	3
Arsenopyrite	2
Fluorite	1
Scheelite	1
Chalcopyrite	1
Magnetite	trace

Sample 4198

Minerals	Estimated percent
Hematite	70
Limonite	20
Zircon	3
Zeunerite	2
Pyrrhotite	2
Fluorite	2
Scheelite	1
Arsenopyrite	trace
Magnetite	trace
Tourmaline	trace

Careful studies of the minerals in the lens disclosed that the only radioactive mineral other than zeunerite is hematite, although some of the other minerals contain minor amounts of uranium as revealed by flux tests. No primary uranium minerals were found in either the lens material or the surrounding granite. Radiometric data indicates that the pegmatitic lens material probably averages between 0.1 and 0.2 percent equivalent uranium. A few high-grade float specimens and localized concentrations in the lens have been found to contain as high as 2.1 percent equivalent uranium. The overall average of the lens rock and the surrounding zeunerite-bearing granite is about 0.07 percent equivalent uranium.

No radioactivity was found in the limestone near the Foggy Day prospect nor in the base metal veinlets in the limestone.

By the end of August, exploration at the Foggy Day prospect had almost completely removed the pegmatitic lens. At the bottom of the cut and the base of the lens, hematitic stringers were observed in a zone about 8 in. wide. These stringers may represent feeder channels coming out of the granite. If so, the zeunerite and hematite may have been deposited by solutions which followed these channels from a primary deposit at greater depths in the granite. However, it is also possible to account for the source of the zeunerite by assuming that at one time primary minerals including a uranium mineral filled the vugs in the porous granite and that the zeunerite and hematite are the remaining decomposition products.

Tourmaline No. 2 claim

Another locality where a concentration of uranium was found on Brooks Mountain is on the Tourmaline No. 2 claim approximately 700 ft SE. of the Luther prospect and a little over 500 ft from the nearest point along the limestone and granite contact (pl. 1). On this claim, networks of quartz-tourmaline veins ranging in width from a fraction of an inch to 4 in. occur in joint fractures in the granite. Zeunerite and brown scaly hematite are found as coatings on some of the vein surfaces and wall rocks. The concentration of radioactive material is restricted to the open veins. Tourmaline veins which completely fill the joint fractures contain no zeunerite or hematite. In August 1951 exploration by the United States Smelting, Refining, and Mining Company exposed some of the zeunerite-bearing tourmaline veins in several shallow pits and trenches. The veins were not traced for any great distance because of talus cover. Although a few pieces of high-grade vein rock contain as much as 1.0 percent equivalent uranium, the average content of the vein material is about 0.05 percent equivalent uranium. Also in this vicinity are several radioactive hematite-bearing tourmaline veins that contain no zeunerite, probably because of leaching.

Minor occurrences of zeunerite

Zeunerite, in trace amounts, was identified in samples from three other localities on Brooks Mountain as follows:

(1) In weathered granite a short distance southeast of the Midnight Sun claim and the northeast corner of the Square Zero claim (sample 4117, pl. 1).

(2) In slightly weathered granite at the northern boundary of the small isolated, paigeite-bearing limestone mass on Iron Cap No. 5 claim (sample 4320, pl. 1).

(3) On the ore dump of the Cameron prospect (sample 4260, pl. 1).

Sample 4117 is in the tourmaline vein area and has a comparatively close proximity to the Tourmaline No. 2 claim deposits. Therefore, the minor amount of zeunerite at this site may have been derived from the same source as that on the Tourmaline No. 2 claim. The zeunerite in samples 4320 and 4260 is probably related in source to that of the Foggy Day prospect because of the nearness to this deposit. Several highly oxidized hematitic zones in granite, geologically similar to the Foggy Day occurrence, on Iron Cap No. 3, Sunny Day, and Iron Cap No. 9 claims contain no zeunerite although the hematite is slightly radioactive. There is no evidence of any large scale leaching of zeunerite in these deposits, if zeunerite was ever present. The hematite, although earthy, is generally more compact than at the Foggy Day prospect. The Cameron prospect, which has mineral assemblages similar to the Read and Luther prospects, is the only base metal prospect that is slightly radioactive. Its radioactivity also is probably related in source to the Foggy Day deposit.

Radioactivity of the granite

The granite of Brooks Mountain as a whole is slightly radioactive. The radioactivity is caused by zircon, monazite and xenotime, which are primary accessory minerals in the granite. The principal radioactive element in these minerals is probably thorium. The amount of radioactivity at any given place on the granite mass is directly proportional to the quantity of these accessory minerals present. The average equivalent uranium content of the granite is about 0.005 percent.

CONCLUSIONS

Zeunerite is the major uranium-bearing mineral at the surface in the Brooks Mountain area. Traces of uranium occur as an impurity in some of the fluorite, tourmaline, smoky quartz, hematite, limonite, siderite, malachite, azurite, tetrahedrite, arsenopyrite, biotite, muscovite, sericite, and a secondary bismuth mineral. Zircon, monazite, and xenotime are also radioactive, but the radioactivity of these minerals is probably due mainly to thorium.

The principal points of uranium mineralization are at two localities on Brooks Mountain, although trace amounts of zeunerite have been found at three other places where the geological structure is probably related to that at the two main zeunerite deposits. Numerous other sites, geologically similar to the two main zeunerite-bearing sites, do not contain zeunerite. Consequently, most of the quartz-tourmaline veins on the mountain contain only a very small amount of radioactive material, and no other red oxidized zones in the granite are more than slightly radioactive. The marked restriction of principal zeunerite mineralization to the two localities indicates that uranium may have been derived from one or possibly two local primary sources within the granite. Radiometric examination of the granite mass and laboratory studies of the granite samples have so far failed to disclose the presence of a primary uranium mineral from which the uranium in the zeunerite could have been derived.

The surface evidence cannot be considered to indicate the occurrence of a commercial uranium deposit at the Foggy Day prospect. Nevertheless it would be unwise to eliminate it from consideration as a source of uranium because of the special importance of the climatic factor. The deposit is probably of preglacial origin and, if so, has remained frozen below the permafrost table since the inception of the present cold period. If the zeunerite is of secondary, water-borne origin, its deposition was of necessity cut off by the change in climate and no further enlargement was possible. It may be also that a considerable portion of the original deposit has been removed by glacial action. Thus its present extent is not of equal diagnostic value with that of similar secondary deposits in temperate climates.

RECOMMENDATIONS FOR PROSPECTING

Further discoveries of surficial occurrences of zeunerite similar to the Foggy Day prospect and Tourmaline No. 2 claim would probably not contribute much to the present knowledge of the origin of the uranium minerals at Brooks Mountain, as the known deposits have been rather comprehensively investigated by geologists of both the Geological Survey and the United States Smelting, Refining, and Mining Company. Consequently, further exploration of this uranium deposit should be directed toward testing the hypothesis of a primary uranium oxide source for the uranium in the zeunerite. It is believed that the best method of testing this hypothesis is by diamond drilling close to the surface workings at the Foggy Day prospect in an attempt to intersect the uraniferous zone at shallow depths, with the objective of determining whether any significant changes in mineral content occur at 25, 50, 100, 150, and 200 ft below the surface. The main significant change to be sought is the introduction of uraninite or pitchblende into the mineral assemblage of the deposit. The shallower holes should of course be drilled first as very little is known of the subsurface attitude of the possible deposit.

REFERENCES CITED

Collier, A. J., 1902, A reconnaissance of the northwestern portion of Seward Peninsula, Alaska: U. S. Geol. Survey Prof. Paper 2, 70 pp.

_____, 1904, Tin deposits of the York region, Alaska: U. S. Geol. Survey Bull. 225, pp. 154-167.

_____, 1904a, The tin deposits of the York region, Alaska: U. S. Geol. Survey Bull. 229, 61 pp.

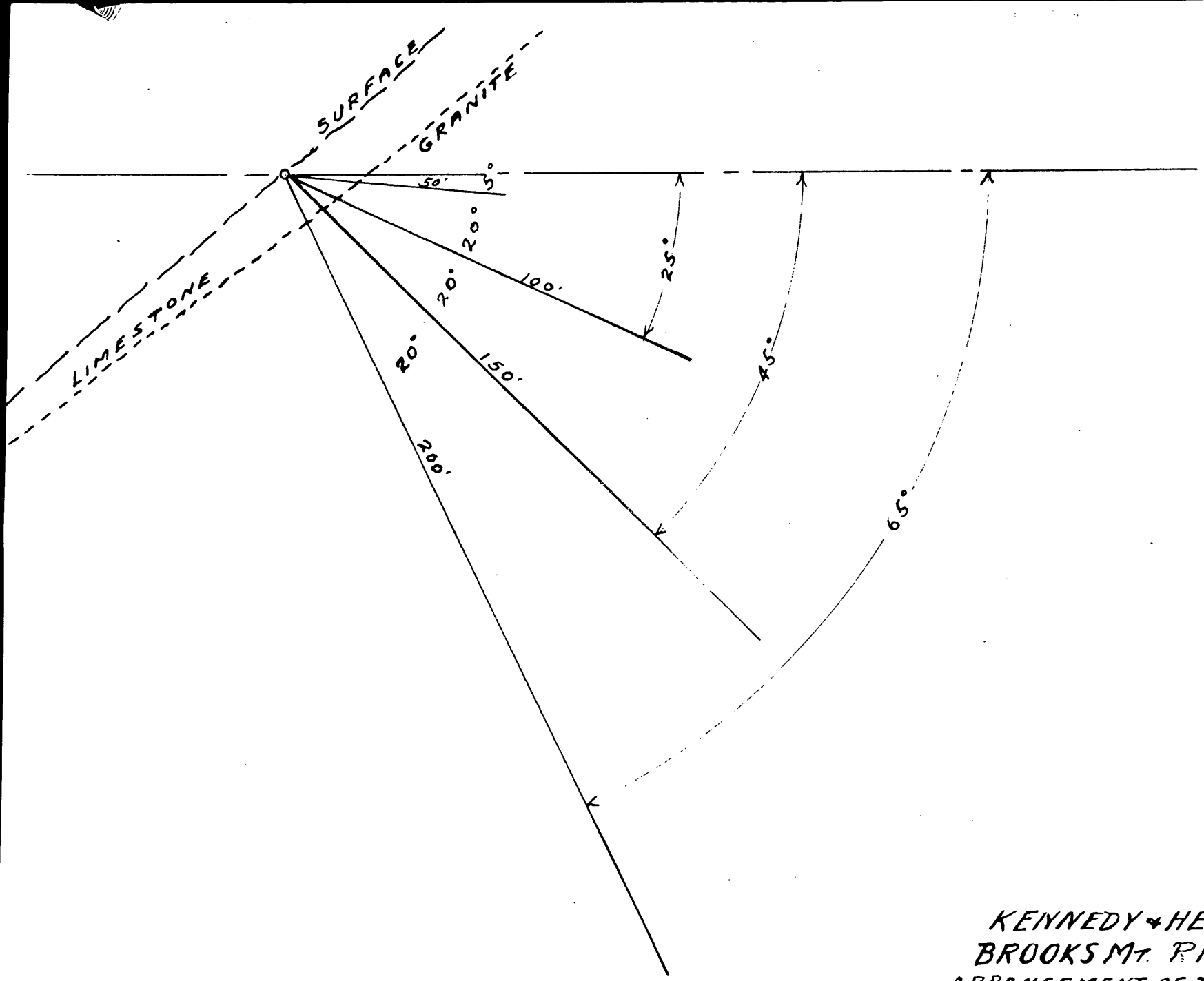
_____, 1905, Recent development of Alaska tin deposits: U. S. Geol. Survey Bull. 259, pp. 120-127.

Knopf, Adolph, 1908, Geology of the Seward Peninsula tin deposits, Alaska: U. S. Geol. Survey Bull. 733, 130 pp.

Wedow, Helmuth, White, M. G., and Moxham, R. M., 1951, Interim report on an appraisal of the uranium possibilities of Alaska: U. S. Geol. Survey Trace Elements Mem. Rept. 235, (in open files of the Geological Survey).

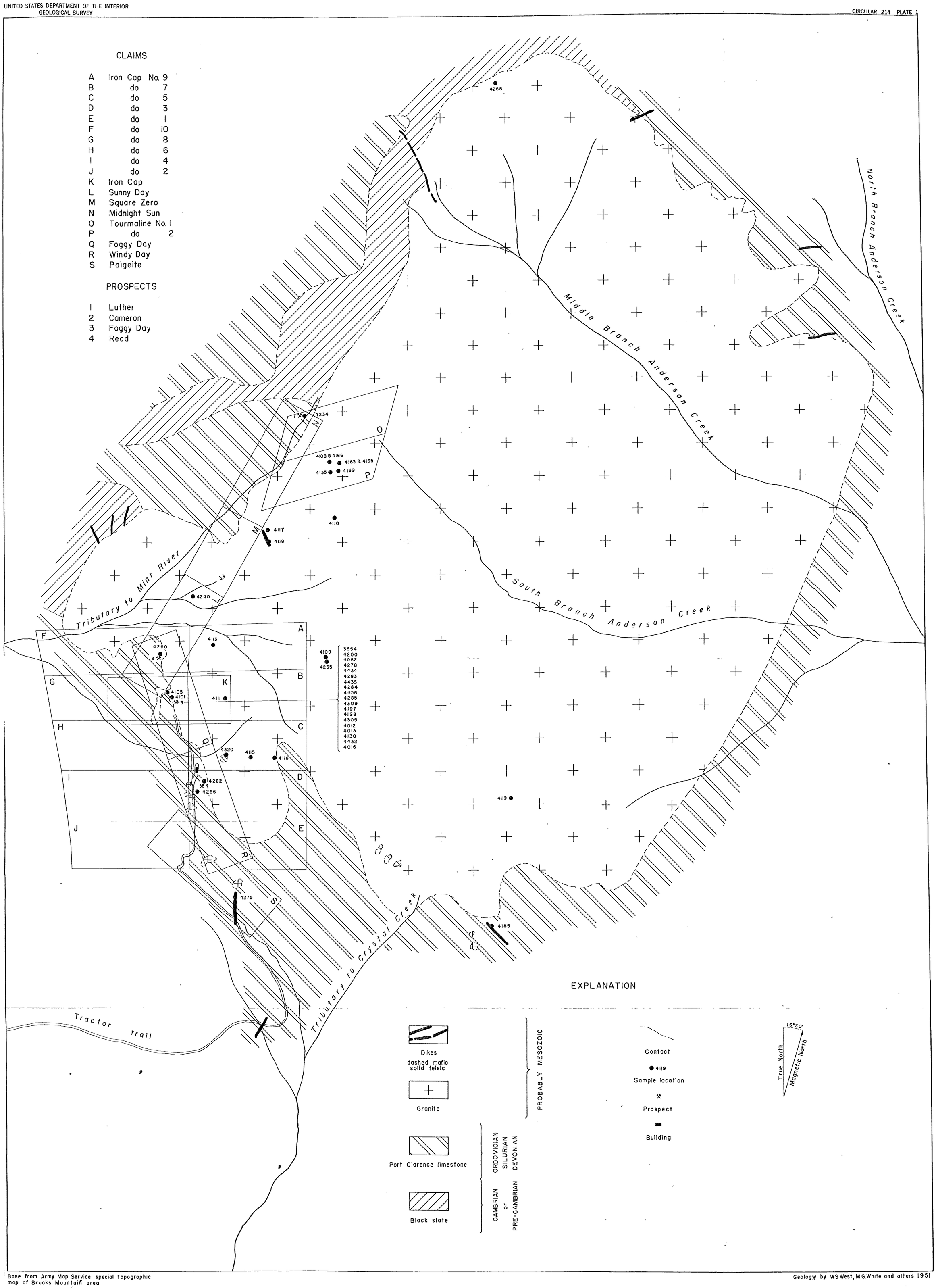
White, M. G. and West, W. S., 1952, Reconnaissance for uranium in the Lost River area, Seward Peninsula, Alaska: U. S. Geol. Survey Trace Elements Inv. Rept. 220 (in open files of the Geological Survey).

INT.-DUP. SEC., WASH., D.C. 30433



KENNEDY & HELLERICH
BROOKS MT. PROSPECT
ARRANGEMENT OF DRILL HOLES

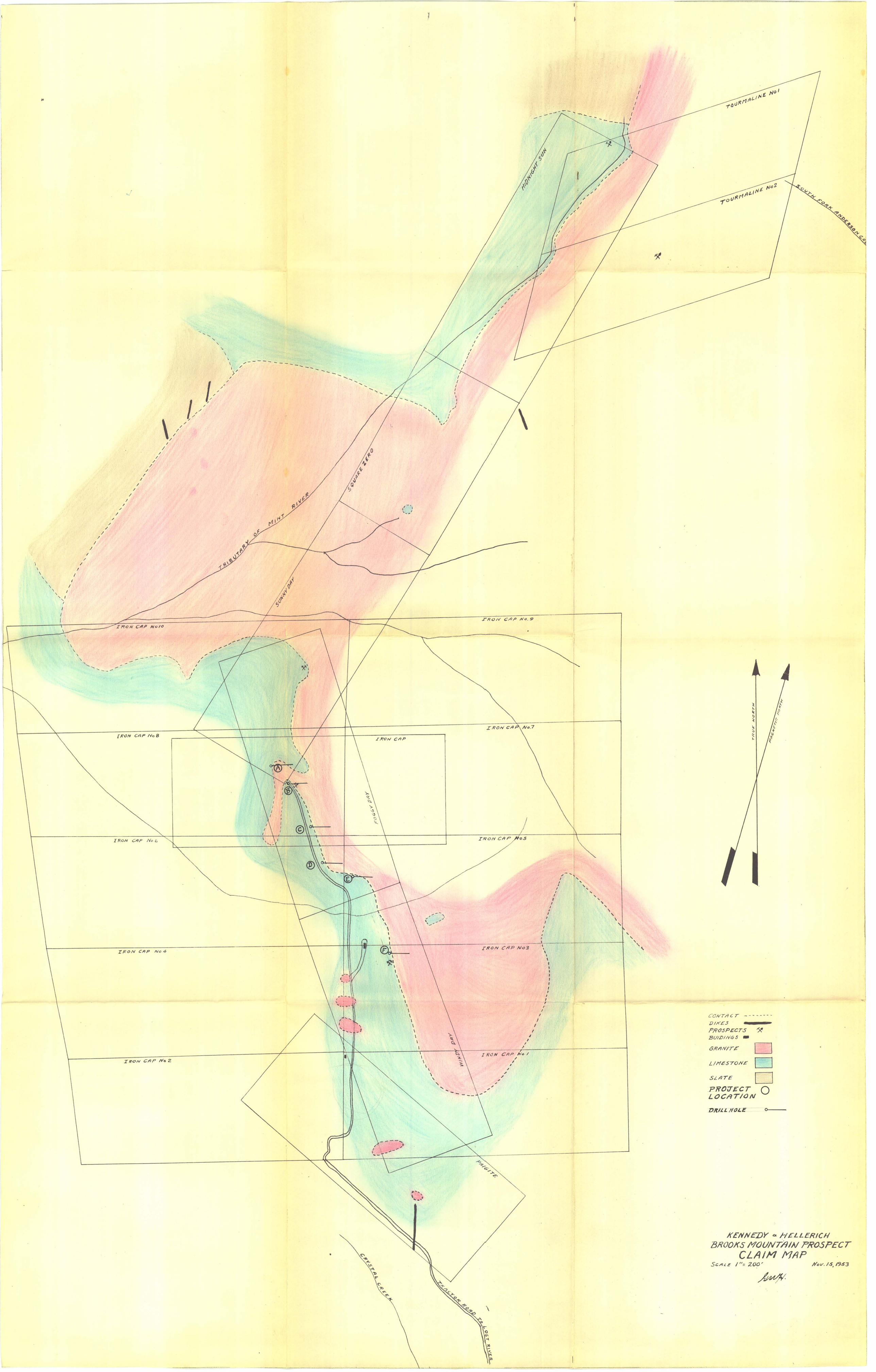
GWH



Base from Army Map Service special topographic map of Brooks Mountain area

Geology by W.S. West, M.G. White and others 1951

GEOLOGIC MAP OF THE BROOKS MOUNTAIN AREA, TELLER QUADRANGLE, SEWARD PENINSULA, ALASKA

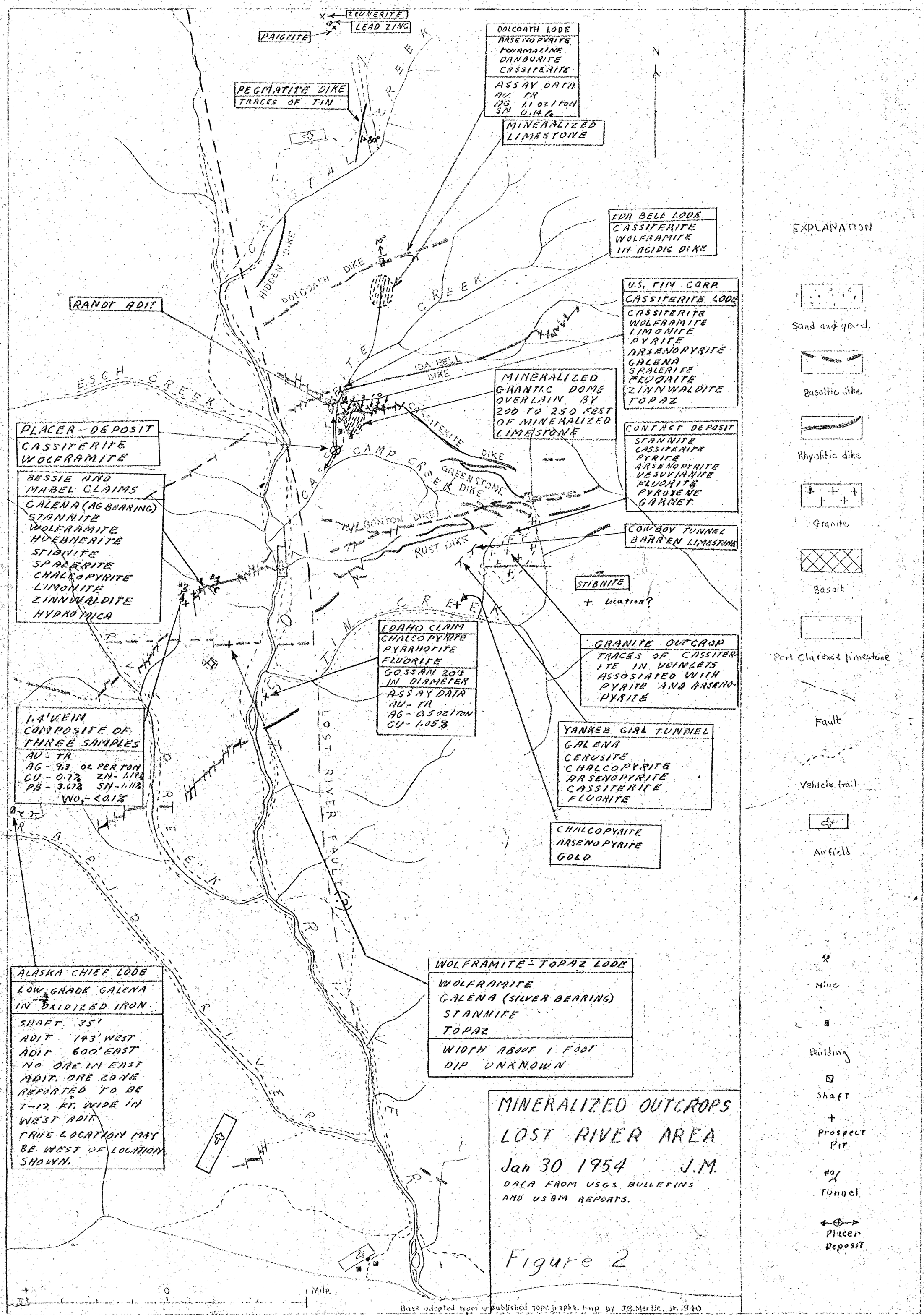


KENNEDY & HELLERICH
BROOKS MOUNTAIN PROSPECT
CLAIM MAP

SCALE 1" = 200' Nov. 15, 1953

EXPLANATION
Swamp muck and alluvium
Amygdaloidal basalt
Quartz porphyry dike
Quartz vein
Granite
(probably Mesozoic)
Limestone, in part metamorphosed
(Including Port Clarence limestone, of Silurian and Ordovician age; and limestone of Cape Mountain, in part at least of upper Mississippian age; metamorphism indicated by darker color)
Basalt and gabbro
(Including some slate in areas represented by lighter color)
Black slate
Fault
Dip and strike of stratified rocks
Strike and vertical dip
Locality where fossils were collected
(M., upper Mississippian; S. Silurian; L. O. Lower Ordovician; U. O. Upper Ordovician)
Lode-tin prospect
Placer-tin prospect
Unclassified prospect
QUATERNARY
POST-PALEOZOIC
ORDOVICIAN, SILURIAN, AND CARBONIFEROUS
PRE-ORDOVICIAN
CAMBRIAN OR PRE-CAMBRIAN
Geology by Arthur J. Collier and Frank L. Hess in 1901-1904
Revised by Edward Steidtmann and S. H. Cathcart in 1918
Wales
Cape Mtn
Cape York
Brooks Mtn.
Uranium Prospect
Lost River Tin Mine
Pt. Spencer
168°00'
40'
20'
167°00'
40'
TOPOGRAPHIC AND GEOLOGIC RECONNAISSANCE MAP OF THE YORK TIN REGION,
Scale 1/250000
Contour interval 200 feet
Datum is mean sea level
1922
Cape Mtn.
Brooks Mtn.
Black Mtn.
SECTION ALONG LINE A-B

FIGURE 1


ZEUNERITE
LEAD ZINC
PAIGEITE
DOLCOATH LODE
ARSENOPYRITE
TOURMALINE
DANBURITE
CASSITERITE
ASSAY DATA
AU TR
AG 1.1 OZ/TON
SN 0.14%
PEGMATITE DIKE
TRACES OF TIN
MINERALIZED LIMESTONE
N
EDA BELL LODE
CASSITERITE
WOLFRAMITE
IN ACIDIC DIKE
HIDDEN DIKE
DOLCOATH DIKE
CRYSTAL CREEK
U.S. TIN CORP.
CASSITERITE LODE
CASSITERITE
WOLFRAMITE
LIMONITE
PYRITE
ARSENOPYRITE
GALENA
SPALERITE
FLUORITE
ZINNWALDITE
TOPAZ
RANDT ADIT
ESCH CREEK
IDA BELL DIKE
MINERALIZED GRANITIC DOME OVERLAIN BY 200 TO 250 FEET OF MINERALIZED LIMESTONE
CASSITERITE DIKE
PLACER DEPOSIT
CASSITERITE
WOLFRAMITE
CAMP CREEK
GREENSTONE DIKE
CONTACT DEPOSIT
STANNITE
CASSITERITE
PYRITE
ARSENOPYRITE
VESUVIANITE
FLUORITE
PYROXENE
GARNET
BESSIE AND MABEL CLAIMS
GALENA (AG BEARING)
STANNITE
WOLFRAMITE
HUEBNERITE
STIBNITE
SPALERITE
CHALCOPYRITE
LIMONITE
ZINNWALDITE
HYDROMICA
HALBONTON DIKE
RUST DIKE
COWBOY TUNNEL
BARREN LIMESTONE
STIBNITE
+ Location?
TIN CREEK
IDAHO CLAIM
CHALCOPYRITE
PYRRHOTITE
FLUORITE
GOSSAN 20'S IN DIAMETER
ASSAY DATA
AU - TR
AG - 0.5 oz/TON
CU - 1.05%
GRANITE OUTCROP
TRACES OF CASSITERITE IN VEINLETS ASSOSIATED WITH PYRITE AND ARSENOPYRITE
1.4' VEIN
COMPOSITE OF THREE SAMPLES
AU - TR
AG - 9.3 oz PER TON
CU - 0.7% ZN - 1.1%
PB - 3.6% SN - 1.1%
WO3 - <0.1%
LOST RIVER FAULT
YANKEE GIRL TUNNEL
GALENA
CERUSITE
CHALCOPYRITE
ARSENOPYRITE
CASSITERITE
FLUORITE
CHALCOPYRITE
ARSENOPYRITE
GOLD
RAPID CREEK
ALASKA CHIEF LODE
LOW GRADE GALENA IN OXIDIZED IRON
SHAFT 35'
ADIT 143' WEST
ADIT 600' EAST
NO ORE IN EAST ADIT. ORE ZONE REPORTED TO BE 7-12 FT. WIDE IN WEST ADIT.
TRUE LOCATION MAY BE WEST OF LOCATION SHOWN.
WOLFRAMITE-TOPAZ LODE
WOLFRAMITE
GALENA (SILVER BEARING)
STANNITE
TOPAZ
WIDTH ABOUT 1 FOOT
DIP UNKNOWN
MINERALIZED OUTCROPS
LOST RIVER AREA
Jan 30 1954 J.M.
DATA FROM USGS BULLETINS AND USBM REPORTS.
Figure 2
1 Mile
Base adapted from unpublished topographic map by J.S. Merlie, Jr. 1940
EXPLANATION
Sand and gravel
Basaltic dike
Rhyolitic dike
Granite
Basalt
Port Clarence limestone
Fault
Vehicle trail
Airfield
Mine
Building
Shaft
Prospect Pit
Tunnel
Placer Deposit

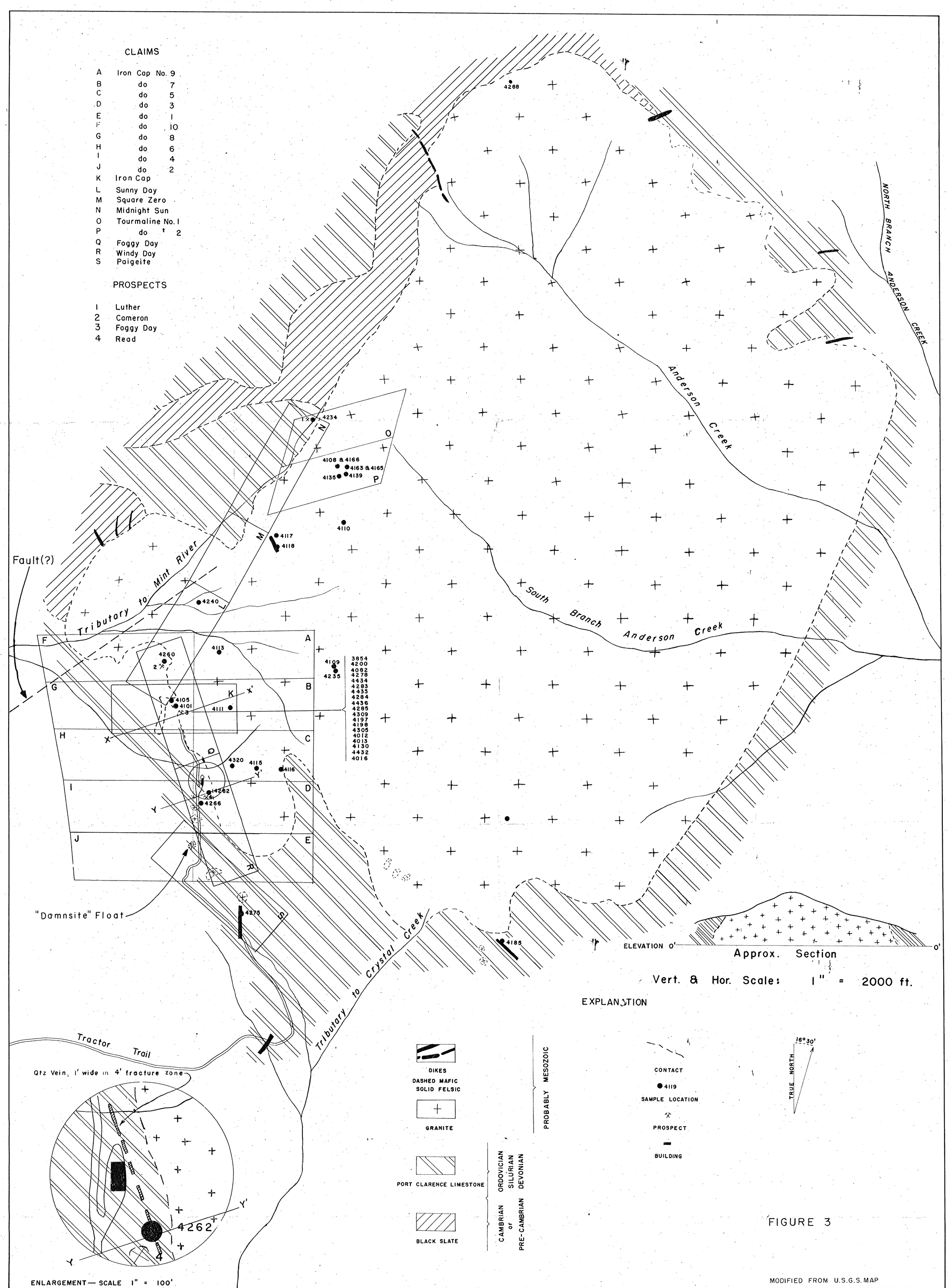
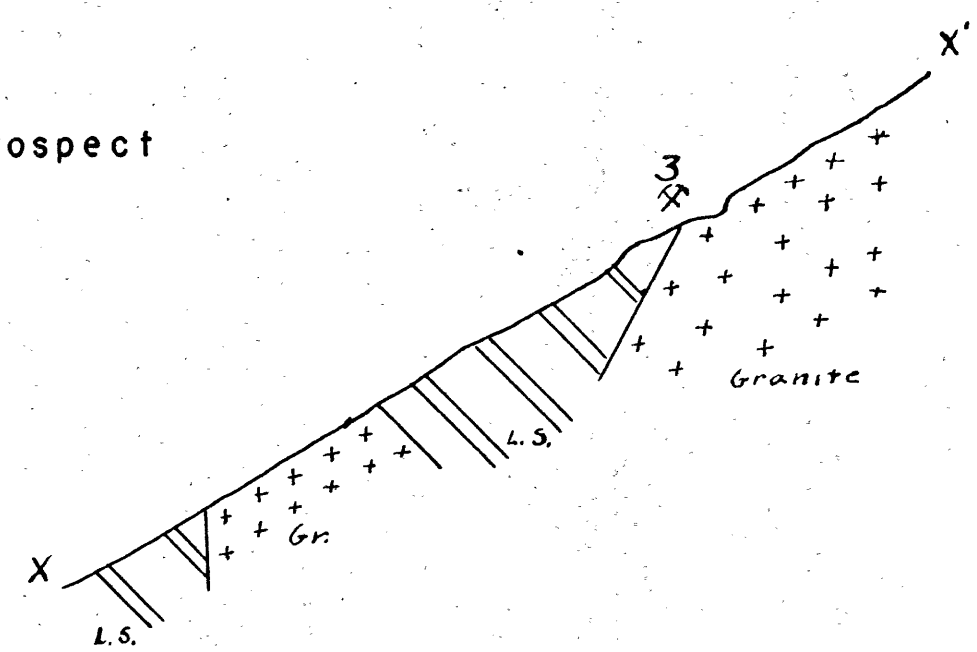


FIGURE 3

GEOLOGIC MAP OF THE BROOKS MOUNTAIN AREA, TELLER QUADRANGLE, SEWARD PENINSULA, ALASKA

Foggy Day Prospect



Read Prospect

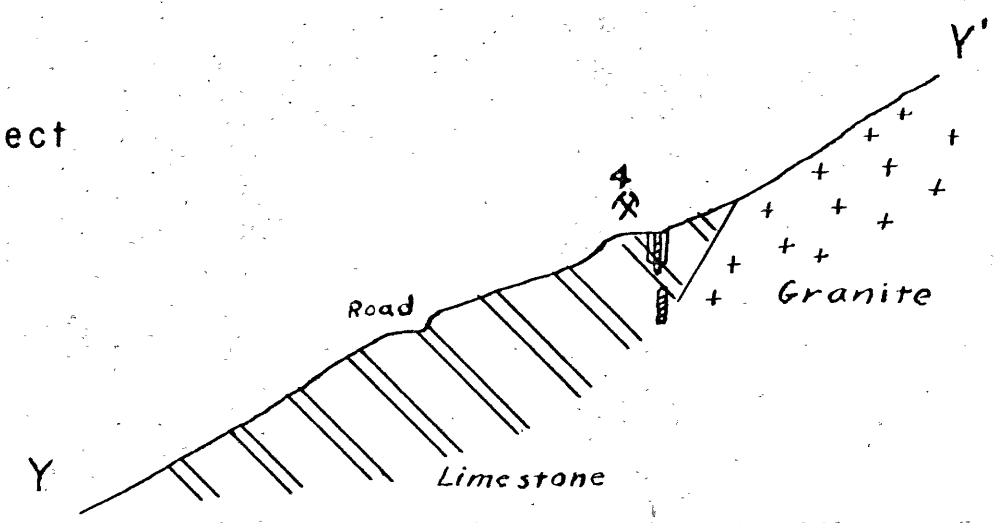


FIGURE 3-A

APPROX. CROSSECTIONS

BROOKS MOUNTAIN URANIUM

SCALE

0' 100' 400'