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STRATEGIC AND CRITICAL MINERAL OCCURRENCES IN SOUTHEASTERN ALASKA

By

J. C. ROEHM

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STRATEGIC AND CRITICAL MINERAL OCCURRENCES IN SOUTHEASTERN ALASKA

INTRODUCTION

The purpose of this report is to furnish information regarding the known occurrences of both strategic and critical minerals in Southeastern Alaska. Some may be found to be of immediate use to industry, while others offer a potential supply for the future. It is hoped that information will contribute to the establishment of a larger and more diversified mining industry for Alaska.

The seemingly difficult transportation problem is becoming less year by year with the increased population, the newly constructed roads, and the present military construction. Ships and planes which now serve the centers of population and industries in Alaska could in many instances be loaded with ores and materials that would serve the Pacific Coast industries. Southeastern Alaska, the most accessible portion of Alaska, is favored by salt-water transportation, with the innumerable straits, fiords, and deep waterways and well protected harbors. The writer has endeavored to point out the accessibility of the occurrences mentioned in this report.

Mineral occurrences of the following metals and materials are herein discussed: Antimony, asbestos, chromium, coal, copper, iron, lead and zinc, manganese, molybdenum, nickel and tungsten. Many other occurrences of minerals containing these metals are known to exist in

Southeastern Alaska; however, they appear from their present showings to be minor in extent. Again many unknown occurrences may exist in vast unexplored sections. Economical deposits of strategic and critical minerals, other than those mentioned in this report, are not known to exist.

The writer has discussed freely each metal and material listed in this report from the standpoint of its abundance, general geological conditions and types of deposits, and many other points with regard to economic possibilities. Under occurrences each prospect or mine is discussed both with regard to its special merits, and its particular known problems. Known references to each are given which will albw further study. Prices and specifications of the Metals Reserve Company are quoted in the case of antimony and chromium, both of which could be mined on a small scale under present economic conditions.

Iron and copper are the two most abundant metals in economic amounts thus far known in Southeastern Alaska. Iron ores seem to offer the most favorable opportunity for an immediate mining industry. These comparatively high grade magnetite bodies, most of which are within easy access to salt-water transportation, may fulfil a demand for this type of ore created by the newly established iron and steel reduction industry on the Pacific Coast. The success and growth of this basic industry on the Pacific Coast will, with the demand created for associated metals and materials, extend its influence to the base metal industry of Alaska.

It was with this thought and hope in mind that this report was compiled and written. By presenting information on the known mineral occurrences it is hoped not only to contribute to the war effort, but that it may also lead to the discovery and development of at present unknown resources.

ACKNOWLEDGMENTS

Special acknowledgment is due Mr. B. D. Stewart, Commissioner of Mines, for the privilege of acquiring detailed knowledge of many of the mineral occurrences described in this report. Most of the information was taken from detail reports by the writer while carrying out field investigations for the Department of Mines. Considerable information relative to reserves and metal content of various deposits was taken from publications of the U. S. Geological Survey. Reference is made to all information obtained outside the Department of Mines and to detailed reports on file with the Department.

Acknowledgment is also extended to Mr. R. S. Sanford, Jr., District Engineer for the U. S. Bureau of Mines, for specific data relative to certain deposits, to his staff of field engineers, and to the staff of the Department of Mines for help in preparation and constructive criticism.

Results of assays mentioned, on samples obtained by the writer, were determined at the Territorial assay offices at Ketchikan, Anchorage and College.

ANTIMONY DEPOSITS

The occurrences of antimony minerals in Southeastern Alaska are of minor importance economically due to the meager amounts of ore showing in these outcroppings. They are widely scattered and consist mainly of outcrops upon which very little development has been accomplished. This metal has commanded very little attention from prospectors in Southeastern Alaska. While some noteworthy occurrences may exist, to date none have been called to the attention of this department.

Among the known occurrences, stibnite and tetrahedrite, with their related oxidation products, have been the only antimony minerals recognized. The stibnite occurrences range from nearly massive bunches to disseminations in small quartz veins and sulphide bodies. The deposits containing tetrahedrite consist of small silver-lead-copper veins located in the Hyder district, and in which this mineral occurs as disseminations composing only a small portion of the metallic content.

The geology of Southeastern Alaska is not generally favorable for deposits of stibnite. This conclusion is based upon the high temperature conditions of the formations as observed by the writer in most of the base metal deposits. Southeastern Alaska represents a steep, rugged mountainous strip of land situated along the western side of the great coast batholith, and protected by numerous small and large islands making up a belt 50 to 70 miles in width bordering the mainland strip on the west. This island belt, which contains various sedimentary belts, invaded by small intrusives, is to a great extent genetically related to the coast batholith itself. The cores of the larger islands represent smaller satellitic intrusives of the coast batholith. Both the main con-

tact belt to the east and the island belt on the west have been denuded to where a considerable portion of the igneous intrusives themselves are exposed. As a result the surrounding formations have been, through extensive metamorphism, subject to high temperatures and pressures. As a result the majority of the metalliferous deposits are of high temperature origin.

Stibnite, which is the only primary economic ore of antimony, is deposited under conditions of low temperature and usually in small veins, bunches, disseminations with other base metal sulphides, and rarely in replacement deposits. All of these types are usually of shallow depth and deposited under low temperature conditions. Their occurrence may, however, be in any rock type. Deposits of stibnite may probably have formed during the invasion of the coast batholith and its satellitic intrusives of Mesozoic age in Southeastern Alaska.* Such is the condition found to exist by Mertie** in the Fairbanks, Kantishna and adjacent districts of the interior of Alaska, closely associated to granites, diorites, quartz diorites, and monzonitic rocks. Since the intrusive masses of Southeastern Alaska are of these types and age, primarily, this assumption is logical. However, since very few antimony deposits have been found, it is logical to assume that most of them have been eroded during the interval since Mesozoic time.

*Buddington, A. F., U. S. Geol. Bull. 800, pp.

**Mertie, J. B. Jr., The Yukon-Tanana Region, U. S. Geol. Survey Bull. 872, 1937, pp. 241-242.

Deposits of stibnite and cinnabar, where the two minerals are associated, as in the Kuskokwim and lower Yukon districts, and associated with Tertiary period of intrusion,* are not known to exist in Southeastern Alaska. While some of the few known occurrences may be related to the Tertiary period, none have been definitely proven, and generally, Tertiary intrusives are believed to be relatively few in all of Southeastern Alaska. The few known occurrences of antimony are inclosed in Jurassic or Cretaceous sediments and volcanics** and near or closely related to intrusives of the coast batholith age. They represent deposits of hydrothermal origin as a later stage or reoccurrence of solutions through fractures, later than the first occurrence of mineralization which formed the greater portion of the gold veins of Cretaceous age in Southeastern Alaska. These deposits formed at periods of lower temperature and after a great portion of the overlying sediments and volcanics had been removed. Four of the known occurrences are located near gold-producing areas, more or less situated on the outer zones. Only traces of gold, however, were determined in them. Only one of the known occurrences contains ore of a shipping grade and in this instance shipping quantities have not to date been proven.

Antimony ore and concentrates are purchased by the Metals Reserve Company by agreement through the Territorial Assay Office at Ketchikan, Alaska. This purchase depot is the only one in Southeastern

*Mertie, J. B. Jr. and Harrington, G. L., Mineral Resources of the Ruby-Kuskokwim Region, U. S. Geol. Survey Bull. 642, 1915, pp. 262-263.

**Buddington, A. F., U. S. Geol. Survey Bull. 800, Plate No. 1.

Alaska, and ore and concentrates are purchased on a basic price per unit of 20 pounds, graduated according to percent of antimony contained. Lots of ore or concentrates may be not less than ten tons and must be delivered at the purchase depot. The following prices are in effect for the year 1943:

Antimony Assay	Price Paid for Dry Short Ton Unit of Antimony Metal
20%	$1.15
25%	1.40
30%	1.65
40%	1.75
50%	1.85
55%	1.925
60%	2.00
70%	2.15

~~Antimony~~ Occurrences

Ketchikan ~~District.~~ Precinct

KK 120-16

The most promising showing of antimony in Southeastern Alaska is on the Hot Air group of claims, owned by Val Klemm of Ketchikan. Stibnite occurs in two showings 200 feet apart, located inland three-fourths of a mile from a point 1 mile east of Point Caamano on the southernmost tip of Cleveland Peninsula, 20 miles north of Ketchikan. The south showing (note sketch), exposed in a long rock cut and in two short shafts, appears to be the top of a small lens, the dimensions of which have not to date been determined. The ore, consisting of nearly massive stibnite, has a width between 3 and 4 feet and is exposed on the south side of the west shaft to a depth of 12 feet and for an additional 6 feet in depth in the east shaft. The ore in the east shaft is exposed

in the bottom with widths of 42 inches on the north side and 52 inches on the south side. The length other than the width of the bottom of the shaft has not been determined. The north showing, 200 feet northwest, consists of stibnite disseminated and in thin fractures in limestone and schistose phyllites. Inspection showed the amounts of stibnite in this north showing to be not commercial. Three channel samples taken from the south showing gave the following results:

		Width	Antimony %
Sample No. 648 - bottom east shaft, north wall		42"	25.67
" " 649 - " " " south wall		4'4"	42.82
" " 650 " west shaft, " "		43"	48.86

The following extract describes the geology* surrounding this prospect:

> "The antimony showings of this group are situated along a contact of thinly bedded bluish limestone overlying graphitic slate or phyllite. This contact strikes N. 28° W. and the dip varies, due to folding and distortion, at a low angle to the east. These sediments are classified as of either Jurassic or Cretaceous**in age and make up the greater portion of Cleveland Peninsula. Associated with the sediments are intercalated beds of tuffs and greenstone volcanics. Both the phyllites and limestone strata have been fractured and the phyllites have been subject to considerable stress. They are schistose, and more or less graphitic in composition. The mineral stibnite is found contained in the fractures mainly in the blue thinly bedded limestone and in the schist in close proximity to the bedding contact. A dike of greenstone schist shows in the large cut which contains the shafts (note sketch). The strike and dip of the dike could not be determined due to the sloughed condition of the cut. It appears to strike north with the sediments, and to have a steep dip to the southwest, cutting the sediments. This dike is mineralized with pyrite and low assays of gold were reported. The relation that the dike has to the shoot of stibnite ore that occurs in the shaft is not known. * * * * *"

*Roehm, J. C., Preliminary Report of Val Klemm's Antimony Prospect, unpublished report of the Territorial Department of Mines.

**Buddington, A. F. & Chapin, Theo., Geology and Mineral Resources of Southeastern Alaska, U. S. Geol. Survey Bull. 800, Plate No. 1.

Further undermineralization in the same report:*

"The only mineral of ecomonic importance noted was stibnite, and the small shoot located in the shafts contains commercial values. The mineral occurs as small radiating needle-like crystals up to large platy masses, curved and deformed by movement, associated and intergrown with quartz and calcite. Small amounts of realgar were noted, disseminated through portions of the ore. Pyrite and pieces of limestone and schist are also included in the ore. * * * * *"

Juneau ~~District~~ Precinct:

A small quartz vein containing stibnite is located on the Victory group of claims on the north shore of Reid Inlet in Glacier Bay. The claim group is owned by the Le Roy Mining Company and the discovery was made by J. P. Ibach. K+111-2

The discovery consists of a fissure vein, which begins on the shore of Reid Inlet, and strikes N. 43° W. and dips 80-85° NE. The vein ranges from 12 inches to 3 feet and small quartz lenses containing stibnite occur at intervals along the vein. The formations transgressed (?) fractures by this fissure consist of a contact zone with a granitic mass to the east which changes into metamorphosed limestone, slates and green calcareous slates to the west. These altered sediments within the contact zone occur as large and small broken fragments and masses, ingulfed in the whole, through which the ore bearing fissure cuts. Due to the various fragmental masses, the fissure is irregular in strike, but generally follows the strike of the sediments N. 43-45° W.

Op. cit., p. 5.

The main showings thus far exposed, since no development has been accomplished, consist of two small quartz lenses containing both massive seams and disseminated stibnite. The precipitation of this mineral is the result of ascending hot solutions which were forced upward at loci points of splits and joint intersections on the hanging wall of the vein.

No. 1 lens is located on the Victory claim 400 feet from the beach, as measured along the slope, at an elevation of 180 feet. Here the fissure splits and joins again within a distance of 50 feet. The hanging wall portion contains the most stibnite in small bands and disseminations with 15 inches at the widest portion. The formation here is a calcareous green slate. The seams of nearly massive stibnite range up to one inch in width, several of which make up the width of the vein with interspaced disseminations and gouge material.

Sample 990 was taken across 12 inches near the central portion of the lens. Assay results of this sample amounted to nil in gold and 11.77 percent antimony.

No. 2 lens is located above No. 1 lens at an elevation of 380 feet, and a measured slope distance of 850 feet from the beach. The length of this outcrop is 30 feet and its maximum width is 12 inches. The formation containing this lens consists of a contact rock composed of feldspar, quartz and lime minerals. Banding of the ore is again evident as in No. 1 lens, however, the lens as a whole appears to contain lesser amounts of stibnite.

Sample 991 was taken across 12 inches of the central portion of the lens. Results by assay gave results of nil in gold and silver and 10.32 percent antimony.

A small showing of stibnite ore is located on the Antimony mineral claim, 4 miles northwest of Douglas, Alaska on Douglas Island, in the creek bed of Eagle Creek at an elevation of 400 feet and 4,000 feet from the beach. The discovery was reported to have been made by Ralph Thompson in 1932, and the claim is owned by John Sve of Juneau.

The showing consists of a compound vein of quartz and the antimony sulphide stibnite, ranging in width from 6 to 16 inches. The exposure is in the bed of Eagle Creek and for a few feet on the south bank and for a total distance of 70 feet in length. The vein starts on the east at a contact of metamorphic sedimentary schist and greenstone lava. The vein lies wholly within the lava and represents a filled fracture by hot ascending solutions. The strike is N. 85° W. and the dip is slightly off vertical to the north. The contact between the sedimentary schist and the greenstone lava is represented by a wide shear zone consisting of schistose sediments that range from gray phyllites to limy schists and intercalated lava dikes. This contact strikes N. 30° W. and the dip is 66° E. The schists near the contact are highly altered and mineralized, containing iron pyrite. The greenstone lava is a compact dense green rock, fine grained texture with phenocrysts of a short green mineral thought to be augite.

The compound vein consists of a regular 6 to 7 inch impure quartz vein on the hanging wall, with 2 to 6 inches of nearly massive stibnite, and widths of disseminated stibnite on the footwall. The hanging wall quartz is hard and drusy and deposited around angular brecciated rock pieces. This portion of the vein contains only a small amount of disseminated stibnite. The footwall portion is made up of nearly massive stibnite with a banded structure and long bladed crystals, in part, and in other parts of disseminations in the quartz. In the small cut opposite the creek bed on the south side the massive stibnite ore appears to be widening in depth.

Sample 1093 represents a channel sample across 16 inches in the bed of the creek. The following assay results were obtained: Au. nil, Ag. nil, and Sb. 20.72 percent.

Sample 1094 represents a 6-inch channel sample of nearly massive stibnite from the cut on the south side of the creek. This sample gave assay results of nil in gold and silver and 51.83 percent antimony.

Stibnite occurs associated in two of the veins of the Clark gold prospect located on Gold Branch of Carlson Creek 6½ miles east of Juneau. This occurrence is described as follows in U. S. Geol. Survey bulletin 783:* KX 112-72

> "Stibnite occurs in needle forms in bands and disseminated in the quartz on the John W. and William N. claims at an altitude of about 2,100 feet. * * * * *
>
> "On the William N. claim an area has been stripped which shows a maximum width of vein of 20 feet. This vein strikes about north. Some of the quartz here is accompanied by stibnite.

*Smith, P. S. et. al., Mineral Resources of Alaska, Report of Progress of Investigations, 1924, U. S. Geol. Survey Bull. 783, p. 51.

A specimen of the vein matter with stibnite is reported to have assayed $2.80 in gold and $4.25 in silver to the ton (the silver being computed at $1 an ounce)."

Assay results showing the amounts of antimony contained are lacking. However, commercial amounts and values are apparently lacking. This stibnite association with gold values in quartz veins is the only known occurrence in Southeastern Alaska. These gold veins are wholly within the intrusive mass of the coast batholith of Jurassic or Lower Cretaceous age.

Stibnite was reported to occur in minute radiating needles inclosed in calcite in the Queen mine* south of Juneau. KX112-69

The occurrences of stibnite within the Juneau Gold Belt, while not of economic importance, are believed, with their close association to the gold deposit, to be related to the Jurassic or Lower Cretaceous intrusions which formed the gold deposits.

Petersburg ~~District~~ Precinct:

Stibnite occurs with other more numerous metallic sulphides in a limestone replacement deposit in Akihula Bay, Coronation Island. KX119-150 This deposit is exposed at high tide level at a point at the foot of a high limestone bluff one-quarter mile from the entrance on the east side. The showing consists of both massive bunches and disseminated sulphides in a light buff colored limestone exposed only a few square feet in area and a few tons of float scattered along the beach. The ore occurs at the intersection of two zones of fracturing. One set strikes N. 20° E. and dips 60-65° SE., and the other set strikes N. 20° W. and dips 50° SW.

These zones of fracturing occur near the intersection of a basic and an acidic dike. Massive bunches of sulphides occur at the intersections of the fractures. Replacement by the sulphides of the limestone is evident along the fractures. Some masses of sulphides occur as flat-lying lenses of small proportion which appear to follow down on the apexes of the fracture intersections toward a basic dike 100 feet south. Sulphide float pieces can be followed from the showing in places at high tide level into the heavy slide material nearly to this basic dike.

The metallic minerals contained in the sulphides are, in order of abundance, pyrite, pyrrhotite, stibnite, sphalerite, a little chalcopyrite and small amounts of gold and silver, determined by assay. The gangue minerals are calcite, blue and white quartz, limonite, manganese oxides and possibly carbonates, an unidentified black mineral, and lime silicates.

Sample 1082 consisted of a 10-pound sample made up of pieces taken from the outcrop and numerous small pieces taken from the larger float pieces. This sample gave returns of 0.14 oz. Au., 0.20 oz. Ag. per ton, 3.55% Sb., 1.89% Zn., and a trace of copper. Approximately 200 tons of this ore could be readily mined from the showing above tide water and the loose float on the beach.

Samples of a good grade of antimony ore were recently received from Harry Colp of Petersburg. These ranged from a few needles of stibnite in a quartz gangue to nearly pure stibnite. Evidence of strong hydrothermal action was indicated by the type of the ore. According to Mr. Colp,* this consists of a chimney deposit and is located in Wrangell Narrows in the Petersburg district. This occurrence has not been examined by the Department nor are representative assays available.

*Written communication of January 4, 1943 from Mr. H. Colp.

Hyder District:

Tetrahedrite, a copper-antimony sulphide, is found in many of the prospects in the Hyder district associated with other sulphides. No occurrence of stibnite in the district is known by this Department. Since the amount of antimony in the mineral tetrahedrite consists of only a small percentage, and the mineral itself is not abundant in the ores, or in large tonnages at any one deposit, none of the deposits is herein described. Small amounts of secondary antimony minerals have been noted in the oxidation products of some of these deposits, but the amounts are not of commercial importance. The properties in the Hyder district which contain ore in which tetrahedrite occurs are herewith listed:

Olympia and Olympia Extension claims
Monarch Claim
Alaska Premier
Daly Alaska
Gold Cliff Premier
Cantu
Ninety Six
Homestake
Silver King
Keno

These properties are of importance on account of their metalliferous content other than antimony, and detailed reports can be found U. S. Geol. Survey bulletin 807.*

*Buddington, A. F., Geology of Hyder and Vicinity, Southeastern Alaska, U. S. Geol. Survey Bull. 807, pp. 63-112.

ASBESTOS DEPOSITS

Commercial deposits of asbestos are not known to occur in Southeastern Alaska. The only type of asbestos that could be economically mined under present conditions in Alaska is the strong fiber variety chrysotile. This mineral occurs in the Kobuk region and is of excellent grade,* however, its existence in Southeastern Alaska is not known.

Three occurrences of asbestos minerals are known in Southeastern Alaska. Two of these are tremolite and the other the rare type known as mountain leather.

Tremolite is a magnesia-lime silicate** contact mineral containing 57.7 percent silica, 28.85 percent magnesia, and 13.35 percent lime. When found in fibrous form it is termed asbestos; however, it does not possess the valuable qualities of chrysotile and anthophyllite. It occurs in veins and shear zones as slip fiber in rocks of high magnesium content such as crystalline limestone, dolomite, and schists. "Industrial Mineral and Rocks," published by the American Institute of Mining and Metallurgy in 1937, gives the following occurrences and uses as an asbestos:

> "Tremolite occurs in masses of white to dark gray columnar or bladelike crystals, which generally are brittle, and are used principally for wall insulation or certain cemented products. This mineral has been found, however, occurring as fibers of sufficient length and flexibility to be of a spinning grade. As it has particularly good acid-resisting quality, it is especially suited to the manufacture of filter pads, used in filtering fruit juices and acids."

*Reed, Irving M., Unpublished Report, 1931, Territorial Department of Mines.

**Dana, A Textbook of Mineralogy, p. 297.

Tremolite, which is in itself a contact metamorphic mineral formed by alteration from other more primary minerals, alters to talc, sometimes of the fibrous type. It has in a few instances been mined, ground, and used as a source of talc. Conditions resulting from the present war have caused an increased demand for talc.

Occurrences

Juneau ~~District~~ Precinct:

A deposit of amphibole schist of the tremolite variety occurs on Mansfield Peninsula on the north end of Admiralty Island. The location is 2½ miles inland from tidewater from a point at the mouth of Bear Creek on the east side of the peninsula. The latter point is 15 miles via airline due west of Juneau.

A small amount of development was accomplished by the Alaska Asbestos Company, Inc. prior to 1930, which consisted of an opencut across the belt of tremolite schist, and a road from the beach to the property. K4112-37

The occurrence is described by B. D. Stewart* as follows:

> "The deposit in which the fibrous tremolite is found occurs in the form of a belt of talcose schist of prevailing dark greenish hue that is exposed by a bedrock trench over a width of 64 feet. * * * * * Much of the trench was excavated in loose material that originally covered the bedrock along the hillside, but near its northerly end it reaches a depth of about 2 feet beneath the bedrock surface of the valley floor. * * * * * The bedrock material near this northerly wall of the belt which, as previously stated, is a movement plane, is contorted and brecciated and surfaces of individual fragments are slickensided. Between the fragments and foliae of the schist are small masses and veinlets of fibrous tremolite which occasionally assume the form of cross-fiber structure. The bulk of the fibrous material, however, is of the slip-fiber variety. * * * * *

*Stewart, B. D., Occurrence of Temolite Asbestos on Admiralty Island, Unpublished Report of the Territorial Department of Mines.

"The schist bedrock in which the fibrous material occurs is talcose throughout the width of the entire belt. Except for occasional small crystals of pyrite, it is so soft and free from grit that it may be chewed without discomfort to the teeth. The fibrous material is likewise exceedingly soft. When rubbed between the palms of the hand it is converted into talc powder which disappears entirely into the pores of the skin."

An analysis of a sample made up of the amphibole schist from this deposit, BDS. No. 738, gave returns of 22.41 percent MgO.

This deposit may, under the rapidly changing economic conditions, particularly as applied to Alaska, become of economic value. The use of this rock as a low grade asbestos may render it of value for insulation, both in private buildings and surface and underground construction by the Army and Navy in Alaska. Asbestos is one of the best fireproofing and heat-insulating materials known. Some of the following uses, as quoted from U. S. Bureau of Mines bulletin 403, "Asbestos", by Oliver Bowles, might be applied in Alaskan construction:

"Large quantities of the shorter grades of asbestos are used in the manufacture of building materials. Roofing shingles made of portland cement and asbestos are used extensively. Compressed sheets of asbestos combined with cement are used for corrugated sheeting, wall board, mill board, lumber, and floor tile. Corrugated asbestos sheets have special merit in constructing chemical plants or other buildings exposed to a corrosive atmosphere. * * * * Asbestos-cement products are used increasingly in Europe as roofing, ceilings, partitions, paneling, linings of interior and exterior walls, water pipes and gutters. It is claimed that the pipes and gutters are waterproof, require no painting, and compare favorably in strength with cast iron."

It is becoming apparent that permanent construction in Alaska should be fortified with the qualities of insulation and protection from corrosion, as well as non-inflammability. These qualities are of extreme

importance in military and naval construction of supply depots, underground storage, etc. Thus the time approaches when a ready supply of these materials should be available near the area of utilization. There are in Southeastern Alaska abundant limestone and deposits of gypsum for the making of cement, together with low grade asbestos, which would be favorable for future construction. A detailed survey of these resources, together with the establishment of a small industry, would be beneficial to the Territory.

Again the talc contained in the Admiralty Island deposit may be a source of supply for the newly developing synthetic rubber industry. Available sources may be nearer manufacturing centers, but certainly not nearer salt water transportation. The magnesium content of the asbestos zone and the country rock surrounding this deposit might make a possible magnesium development, providing metallurgical extraction processes are developed.

A deposit of mountain leather, a cross-fiber variety of asbestos, and known for its intense heat resisting qualities, is known to exist on Lemesurier Island in Icy Straits. J. P. Ibach of Juneau, Alaska is reported to be the discoverer and holds the property at the present time. This deposit has not been examined by Territorial representatives and no description of it is available. Several samples have been submitted to the Department, and those submitted to the Johns-Manville Company were reported to be of excellent grade.*

KXIII-24

*Written communication of November 28, 1934 received by the Territorial Department of Mines from Henry Mulryan, Geologist for Johns-Manville Co.

This mineral is light, floats on water, and due to the interlacing of fibers, it is extremely tough. It occurs rarely throughout the world and is only economically mined in a few places.

The occurrences of this mineral on Lemesurier Island were reported to be on the southeast side of the island in dark colored intrusive rock. Numerous occurrences of small veins along minor slippage zones on a low barren mountain were reported as extending over an extensive area. The veins were reported as small, ranging only a few inches in width.

There have been no attempts to develop the property to date. It was examined by a representative of the Johns-Manville Company in 1934. It was reported that approximately 75 tons of this mineral was in sight at that time. A later communication from the Johns-Manville Company indicates that the company has located a source of this material nearer their plants and that they did not have an asbestos plant on the west coast.*

Ketchikan District:

Marbleized beds of dolomitic limestone occur intercalated in the gneissic schists that occupy the entrance to Walkers Cove located on the east side of Behm Canal. Slide No. 429**from samples submitted by A. Wolf***shows a marbleized dolomitic limestone with approximately one-third of the contained carbonate minerals altered to tremolite. Small seams were reported as observed in the area containing short fiber asbestos. The extent or quality of this apparent variety of tremolite is not known.

*Written communication of September 6, 1941 from the Johns-Manville Co. to the Commissioner of Mines.
**On file in the office of the Department of Mines.
***Al. Wolf, verbal communication regarding this deposit.

CHROMITE [illegible]

Chromite, the only ore mineral of chromium, occurs in five localities in Southeastern Alaska. Only three of these localities are worthy of mention, since the other two contain only traces of the mineral. The geological conditions surrounding each occurrence are very similar in that the chromite occurs in basic to ultrabasic rocks. Only one area offers any chance for an immediate production and there to a very limited extent. Alaska has reserves of high grade chromite ore on Kenai Peninsula* which is not included in Southeastern Alaska.

The purchase depots in Alaska are not authorized to purchase chromium ore, however, the Metals Reserve Company maintains purchase depots for the ore in Oregon and northern California. Mining of chromium ore in Alaska will necessitate the delivery to one of these depots at the producer's expense. Three grades are accepted, with the following specifications:

	High Grade %	Low Grade, A-%	Low Grade, B-%
Cr_2O_3, minimum	45	40	40
Silica, maximum	11	13	--
Phosphorus, maximum	0.20	0.50	--
Sulphur, maximum	0.50	1.00	--
Chrome-iron ratio, minimum	2.5:1	2.0:1	--

*Guild, Philip W., Chromite Deposits of Kenai Peninsula, Alaska, U. S. Geol. Survey Bull. 931-G, 1942.

Prices per long ton of 2240 pounds dry weight are:

High grade - $40.50, plus 90 cents per ton for each unit above 45% and plus $1.50 per ton for each tenth increase in chrome-iron ratio to a maximum of 3.0:1.

Low grade-A - $28.00, with similar bonuses for excess over base specifications.

Low grade-B - $24.00, plus 60 cents per ton for each unit of chromic oxide in excess of 40%.

Under the existing prices the mining of chromite would be within the limits of economic mining in Southeastern Alaska. The following occurrences, while they offer no large reserves, are within areas where, with further prospecting and development, commercial orebodies may be discovered ~~with development and further prospecting~~. There has been very little incentive for prospecting for chromite or its development prior to the present emergency. As a result, there are no chromite developments in Southeastern Alaska. The writer recommends the following areas for further prospecting and development:

Occurrences

Petersburg ~~District~~ Precinct:

KA 116-8

Red Bluff Bay Deposits: Chromite was found and recognized in the ultramafic rocks of Red Bluff Bay by Ray Race of Juneau in the year 1933. Samples were submitted to the Territorial Department of Mines and a preliminary examination was made by B. D. Stewart, Supervising Engineer for that department, immediately following the discovery. This was followed by examinations of three engineers for commercial firms, and last by the strategic minerals investigation of 1942.*

*Guild, P. W. & Balsley, James R., Jr., Chromite Deposits of Red Bluff Bay and Vicinity, Baranof Island, Alaska, U. S. Geol. Survey Bull. 936-G.

The Red Bluff Bay area is located on the east coast of Baranof Island, due west and across Chatham Strait from the northwest tip of Kuiu Island. The ultramafic intrusive bodies in which chromite occurs, according to the U. S. Geological Survey,* consist of the small area, 1½ square miles, located at the entrance on the east side of Red Bluff Bay, and seven other occurrences 10 miles inland in a west-northwest direction. These inland occurrences have not been visited by any representative of this department. Chromite was discovered in these inland intrusives by Joe Hill in 1936. During that year chromite samples of good grade were submitted to the department by Hill. Guild** in his investigations, found no deposits of economic importance in these interior occurrences. He indicates that the only chromite deposits of economic value are those confined to the ultramafic intrusive mass on the east side of the entrance to Red Bluff Bay.

The ultramafic intrusives consist of dunite and pyroxenite which have been altered to serpentine and contain zones of talc. These intrusives have invaded a sequence of phyllites and greenstone schists of Triassic (?) age. Chromite occurs as small lenses or tabular masses, disseminations and thin layers in the dunite and paralleling the layers of pyroxenite.

Eight deposits are known to occur on the Red Bluff Bay intrusive mass, five of which contain small tonnages of a grade which can be shipped without concentration. An estimated tonnage of shipping grade

*Op. cit., p. 2.

**Op. cit., p. 2.

ore amounts to 570 tons of 40 percent or more chromic oxide content, and a possible tonnage, estimated from surface outcrops, of 29,000 tons of concentrating ore averaging 12 percent of chromic oxide.* The ratio of chromium to iron is low and does not meet the specifications of the Metals Reserve Company for the two higher grades of ore, and would command the low base price of $24.00 per ton plus 60 cents per ton for each unit in excess of 40 percent of chromic oxide. To mine, concentrate, and ship this low grade ore would be a marginal undertaking under present prices and the limited known possible reserves.

Ketchikan ~~District~~ Precinct:

Chromite occurs in two areas in the Ketchikan district, both having been discovered by the writer, and each offers possibilities, with systematic prospecting and development. Both are within easy access to salt water transportation and both offer a possible future source of chromium, with concentration applied to low grade disseminated deposits. Neither is of value as an immediate source of this metal.

1249-117 Mt. Burnett Chromite ~~Deposits~~ occurrences: The mineral chromite occurs within the scope of two small intrusive areas on Cleveland Peninsula, locally known as the Mt. Burnett area, and situated inland between Vixen Inlet and Union Bay (note location sketch). Mt. Burnett, and the associated ridge to the north, is an ultrabasic intrusive mass which has invaded the metamorphic schists and sediments that occupy a wide belt on the west side of the coast batholith, and whose definite age is not

*Op. cit., U. S. Geol. Survey Bull. 936-G, p. 186.

known. Generally, the intrusive mass, as shown by outcrop, is a segregation of the various basic rocks that occur in bands that encircle the elongated mass. These range from peridotite to hornblendite and gabbro, alternating from one to the other as successive flows, and grading into pyroxenite and dunite as a central core. Many dark basic dikes cut through the schists and radiate out from the basic intrusive mass.

Chromite was traced by numerous small pieces of float, and irregular outcroppings for a distance of 2 miles along the high ridge over the top of Mt. Burnett. This consisted of a zone of dissemination across a width of 200 feet. In the zone the chromite is widely scattered and has some associated magnetite in places; however, some of the bunches are very pure chromite. On the ridge northwest of Mt. Burnett, chromite was found in irregular masses and disseminations for a distance of 2 miles. Here considerable more magnetite is associated. On this northwest exposure the dunite and pyroxenite are intermixed and the area of outcrop is smaller than the dunite mass of Mt. Burnett. The occurrences range from 1500 to 2400 feet in elevation.

Sample 441 consisted of mixed pieces of chromite taken from various outcroppings on Mt. Burnett and gave an assay result of 17.72 percent chromium.

In some outcrops, particularly those of the north exposure, considerable magnetite and ilmenite was noted associated with the chromite.

Following the initial discovery by the writer, two small lenses and zones of chromite occurrences were discovered by Axel Carlson and Dr. Peterson of Ketchikan. The following description of these occurrences

is included in an unpublished summary report:*

> "The No. 1 or lower showing was encountered at an elevation of 2150 feet on the barren northeast slope of Mt. Burnett. Here a curved lens of ilmenite-chromite ore was found contained in the apex of a nearly closed fold. The strike of the longest limb of the fold containing the ore was N. 53° W. This limb has a dip to the northeast. The plunge of the fold was southeast at a steep angle. Solid ore was exposed on the northwest limb for 30 feet and this ranged from one inch on the northwest side to eighteen inches in width at the apex of the fold. Small bunches and seams containing disseminated chromite were found extending over a distance of 200 feet. The ore appears to follow the apex of the fold in its steep dip to the southeast.
>
> "Sample 848 was taken across the lens at its widest portion of 18 inches. This gave results of 21.7 percent Cr_2O_3 and 22.7 percent Fe.
>
> "Showing No. 2 is located 300 feet southwest of No. 1 at an elevation of 2250 feet. It consists of a flat-lying lens of ilmenite-chromite ore 12 feet in length and averaging 20 inches in width. Alongside were several small seams up to one inch in width that persisted for several hundred feet in length with a strike of N. 45° W. and a dip of 42° SW. The flat lens had a low dip to the southwest, but appears to be related to no definite structure and its depth is very indefinite. The persistent seams and a few irregular bunches were traced over a distance of 300 feet.
>
> "Sample 849 was taken across the flat lens over 20 inches in width. This sample gave results of 21.8 percent Cr_2O_3 and 24.9 percent Fe."

The Mt. Burnett area has not been thoroughly prospected for chromite and the chance of discovering other bodies is considered very good. The amount of known chromium ore in this area, under present specifications, is not to be considered as a reserve.

Yellow Hill Chromite Occurrences: The mineral chromite was discovered by the writer to be contained in the ultrabasic intrusive which forms Yellow Hill on the central western portion of Annette Island, one and a half miles south of Metlakatla. The area of outcropping dunite

*Roehm, J. C., Unpublished Summary Report of Mining Investigations in the Ketchikan District, Sept. 10 - Oct. 9, 1941, pp. 1-2.

consists of 500 acres comprising Yellow Hill, which rises to an elevation of 525 feet, and there is another 200 or 300 acres extending south from Yellow Hill at a lower elevation, and which extends to Tamgas Harbor. This extension strikes in the general direction of the ultrabasic mass which crosses Duke Island to the south, and may be genetically connected with it. The mass of dunite comprising Yellow Hill is nearly one and a fourth miles in length and three-fourths of a mile in width. Small lakes occupy basins along the east and northeast sections in the dunite. The contact at the foot of the hill is covered with vegetation and talus, with the exception of the northwest portion. Here a blended contact is in evidence with a gradual increase of pyroxene and a decrease of olivine until the outer portion becomes a coarse crystalline pyroxenite. The width of the pyroxenite band was not determined; however, both gabbroic and dioritic rocks were encountered less than one half mile to the northwest. Directly north and northeast of Yellow Hill greenstone volcanics outcrop. These are classified by Buddington* as of Jurassic or Cretaceous age. The contact between the dunite and the volcanics is covered. However, the writer is of the opinion that the volcanics overlie the ultrabasic mass and are of a later age. This opinion is based on lack of metamorphic evidence in the volcanics. On the east side a low valley partially filled with glacial moraine separates the dunite mass from the Annette granite, the latter forming the central and greater portion of the island. However, along the east border of the dunite outcroppings

*Buddington & Chapin, Geology and Mineral Resources of Southeastern Alaska, U. S. Geol. Survey Bull. 800, Plate 1.

pyroxene crystals were noted to be increasing, indicating the presence of the pyroxenite band. The relationship of the Annette granite ~~with~~ to the ultrabasic intrusive was not observed. At the rock quarry at the foot of the hill on the southwest extension, a complex of basic formations was observed. These consisted of fine grained dark formations ranging through dunite, hornblendite, pyroxenite and serpentine. Chromite was not observed in the formations of this complex.

The massive dunite, as it appears on its weathered surface, is a light buff to grayish brown in color, which from a distance appears to have a pinkish yellow hue. The unaltered dunite is fine grained, has a dark greenish gray color, with occasional lustrous black spinels, mainly chromite and magnetite. Pyroxene crystals in scattered segregations with associated serpentine seams and veinlets and small irregular bunches and disseminations of chromite are contained more or less generally through the entire dunite mass. The chromite is to a large extent associated near and with the small serpentine veinlets and the scattered small bunches of pyroxene. There were no areas of serpentine or pyroxenite of any extent noted within the dunite mass. However, numerous pieces of pyroxenite float are evident in the thin glacial moraine which is irregularly scattered about the hill and along the lake shores. This scattered moraine supports a small amount of vegetation and some portions of the dunite mass are sparsely covered. Such is the condition on the southeastern and southern portions.

Major structural features were not encountered within the dunite mass. Minor structures such as east-west trending seams and irregular fractures are evident, and along these indication of a slight movement is evident. These seams and fractures contain thin films of serpentine. The usual small weathering cracks and open fractures, which cause the dunite to break into nearly square blocks, are in evidence.

Commercial chromite deposits were not observed during the three-day examination of the area. Further investigation, with close prospecting and possible development, may reveal commercial deposits. The most concentrated area of disseminated chromite was found in the southeastern portion of Yellow Hill, where the elevations lower to a hundred feet above sea level and increasing vegetation obscures exposures from view.

To the writer's knowledge this is the only written account of the details of this chromite occurrence to date. This detailed information is given as an aid to those wishing to continue the search for chromite deposits. Annette Island is wholly a military reserve and permission is necessary from military authorities on the island before admittance may be gained.

COAL [illegible]

Extensive coal bearing formations are lacking in Southeastern Alaska. Those which are known to contain coal are relatively small scattered areas, consisting of small shallow basin remnants of Tertiary age. Sedimentary formations of the Carboniferous period are few and small, and no coal measures have been discovered in them. The same conditions exist with regard to Cretaceous sedimentary formations, however, they are more extensive in area, but also lack coal measures. The coal measures associated with the Tertiary sediments are deposits of thin beds, and contain irregular structure. The coal measurers contained are thin, and in places they are badly crushed and generally of poor quality. They are, according to Buddington,* found only in the Eocene series of the Tertiary period. There are in these measures exceptional occurrences which have a possibility, with development, of supplying some of the needs of Southeastern Alaska. However, there is considerable doubt as to amounts being available to supply industries that are large consumers. A geological feature, which in part accounts for the exceptional occurrences, and one to be considered in future prospecting for coal, is the close association of the lower Eocene or coal-bearing sediments and the later Tertiary extrusives. These extrusives have invaded the coal measures in places, which accounts for the crushed condition of the coal beds, as well as having produced a higher grade coal in certain localities by heat and metamorphic action. The extent to which these areas are affected depends upon local geological conditions.

*Buddington, A. F. and Chapin, Theodore, Geology and Mineral Deposits of Southeastern Alaska, U. S. Geol. Survey Bull. 800, Plate 1.

Since at present all coal consumed in Southeastern Alaska is imported and due to the present war conditions an acute shortage has developed, a local producing coal mine would be a profitable enterprise. The market would be limited to consumers in Southeastern Alaska, and a good grade of coal could easily compete with the imported product. With the gradual increase of population and greater military development, an expanding market is to be expected in the future.

Tertiary sediments, which are known to be coal-bearing, are located on Admiralty, Kupreanof, Kuiu, Zarembo and Prince of Wales islands. Of these areas the only one with any past production has been the area surrounding Kootznahoo Inlet on the southern end of Admiralty Island. 12X114-108 This area also contains the largest known area of Tertiary sediments in Southeastern Alaska. Contained in this area are several known occurrences of coal, one of which, locally known as the Harkrader Mine, has the best known grade of coal and has in the past been a small producer. Of the other occurrences, many are known to be of poor grade and contain thinner beds unsuitable for mining. As an immediate source of coal the No. 2 bed at the Harkrader Mine offers the best known possibility. This, followed by further prospecting and development in the surrounding Kootznahoo area, and close inspection of the other known occurrences, plus detail geological mapping, may reveal a source of coal sufficient to supply a part of the needs of Southeastern Alaska.

The acquisition of coal land in Alaska is under the Federal Coal Leasing Act administered by the Secretary of the Interior. He is authorized to issue coal-prospecting permits to applicants qualified to hold coal

leases where prospecting or exploratory work is necessary to determine the existence or workability of coal deposits in an unclaimed, undeveloped area in Alaska. These permits are issued for terms not exceeding four years and holdings are limited to 40-acre tracts up to 2560 acres. At the end of the four-year period the permittee is entitled to a lease not exceeding 50 years, if commercial deposits of coal are found. The only coal land not subject to prospecting consists of the holdings known as the Harkrader coal claims, which consist of 132.67 acres of patented land. The patent rights to these claims were issued prior to the Federal Coal Leasing Act.

Occurrences

Juneau ~~District:~~

Kootznahoo Inlet, Admiralty Island Coal Field: The area surrounding Kootznahoo Inlet on the western shore of the southern portion of Admiralty Island consists of coal-bearing sediments of lower Tertiary or Eocene age.* The extremities of this area are approximately 8 miles square. It contains the best known grade of coal and the most likely known prospects in Southeastern Alaska. The ~~following~~ attached sketch shows the location of this area on Admiralty Island.

The discovery of coal in this area was reported by Dall** to have been made by a native in 1868, who submitted samples to the fort at Sitka. This led to the survey of the inlet and to other discoveries of coal. A supply of good coal was sought in Southeastern Alaska by the skippers of various steamers and coast guard cutters, after the purchase of Alaska from Russia. The present known discoveries and most of the old

*Op. cit., p. 1, Bull. 800, Plate 1.
**Dall, W. H., Coal and Lignite of Alaska, Seventeenth Ann. Rept., U. S. Geol. Survey, Pt. I, p. 777.

developments in Southeastern Alaska are the results of efforts by these early-day skippers and their crews in search of coal for steamship use. Since 1900 there has been very little development of coal prospects in Southeastern Alaska, due primarily to the increased use of oil and more extensive transportation facilities.

The most noteworthy coal prospect in the area is the Harkrader Mine, both from its intermittent development and production, and because it contains the best known grade of coal. This prospect is located in a small cove on the south side of Kanalku Bay in Kootznahoo Inlet. It was prospected and opened up by James McCloskey about the year 1895. These early activities are described by Dall,* who mentions a production of 100 tons of coal. A short description by Wright**in 1905 states that the coal exposures are mostly concealed, and that the incline shaft was 180 feet in depth, with a vein width of 12 feet, of which 7 feet was coal and 5 feet of interbedded shale. In 1913 a patent was issued to Geo. Harkrader covering 132.67 acres, Survey No. 688. After patent was issued the property remained idle until 1928, when the mine was leased by the Admiralty Island Coal Company. A coal prospecting permit was also granted Howard H. Lerch, secretary for the company, for additional ground adjoining the Harkrader property. This company operated during a portion of the year 1928 and ceased operations in July, 1929.

The following, as described by B. D. Stewart,*** represents the total amount of development to date:

*Op. cit., Seventeenth Ann. Rept., pp. 782-783
**Wright, C. W., The Juneau Gold Belt, U. S. Geol. Survey Bull. 287, p. 154.
***Stewart, B. D., Report on Cooperative Mining Investigations, 1931, pp. 26-27.

"The haulage slope at this property has been driven on the coal seams at an angle from the horizontal of about 20 degrees for a distance of 605 feet. Mine cross-cuts from the slope ranging in length from 20 feet to 120 feet, and aggregating about 400 feet, have been driven at intervals of from 50 feet to 100 feet, and a gangway on the seam has been extended westerly from the bottom of the slope a distance of approximately 150 feet."

Note sketch No. showing a longitudinal section of the mine, drawn by B. D. Stewart ~~from the survey plat and information furnished by officials of the company.~~

There are two coal veins on this property worthy of consideration and both outcrop at high tide line on the small peninsula in the southern section of Kanalku Bay. These beds are less than 50 feet apart, measured at right angles to each other. The upper bed, as followed by the incline shaft, is the only one developed. The beds strike N. 40° E. and dip southeast 20-25°. The formation overlying the upper bed is a coarse sandstone, apparently slightly harder than the shales inclosing the coal beds, as noted by outcrop. The upper bed is described by Smith* as occurring in two benches with the upper one maintaining a thickness of 2 feet and the lower one about 3 feet. These are separated, according to B. D. Stewart,** by 12 inches of soft clay, which is advantageous for mining of both benches in that little drilling is required and a small amount of powder is necessary in mining. Further, as noted in sketch No. , the lower portion of the bed gradually becomes flat-lying and upturned. This condition is due to a fault which apparently cuts off the coal bed to the west.

*Smith, P. S., Mineral Resources of Alaska, 1929, U. S. Geol. Survey Bull. 824, p. 72.
**Oral communication.

The No. 2 bed, which outcrops 80 feet north of No. 1 along the beach, has not been developed. A minable width is assumed from the outcrop and a similar grade of coal is expected due to its nearness to No. 1 bed. The cross-cut into the footwall was recommended by B. D. Stewart during the activities of the Admiralty Island Coal Company. The crosscut was started, but not completed to No. 2 bed. The completion of this crosscut would probably disclose a minable amount of coal.

The coal of the upper bed has been identified as bituminous.* An analysis of the upper seam on the beach outcrop from samples collected by Dall** gave the following results:

	Percent
Moisture	2.44
Volatile matter	44.75
Fixed carbon	47.93
Ash	4.88
Sulphur	0.67

Total coal production amounts to nearly 600 tons, of which 100 tons was produced prior to 1900*** and nearly 500 tons in the years 1928 and 1929.****

The present status with regard to this property is not fully known. Following the closing of the mine by the Admiralty Island Coal Company, the property was awarded to unpaid miners by a Court decision in 1930. Since then an overseer has been maintained at Angoon at the entrance to Kootznahoo Inlet. The equipment is reported to be obsolete and the shaft to be filled with water.

*Sample submitted by B. D. Stewart to H. I. Smith, U. S. Bureau of Mines correspondence.
**Op. cit., Seventeenth Ann. Rept., p. 783.
***Op. cit., " " "
****Production reports in the files of the Territorial Department of Mines.

Other coal occurrences in Kootznahoo Inlet on which small amounts of early development work was done, and from which small amounts of coal was mined, are mentioned by Dall.* These however, are of poorer grade than the Harkrader, and they are classified as lignite. The widths vary from a few inches to slightly over a foot. None are considered to be of economic importance at the present time. A coal seam about a foot thick is reported to occur at Favorite Bay on the southeastern arm of the inlet. A few tons of coal was mined from this vein, which outcrops under water and was reached by a short shaft. The prospect became known as the Sepphagen Mine. Another called the Meade and Mitchell seam, and located on the point 10 feet above high tide at the intersection of Lighter Creek and Davis Creek in the eastern part of the inlet, averages one foot in thickness. This was developed by two short tunnels. The Natives were reported to have mined a few tons from this outcrop in the early days. Located at the head of Lighter Creek considerable money was spent in opening up the Brightman and DeGroff seam. A tunnel 100 feet in length was driven in nearly horizontal sediments. This seam is reported to consist of shaly lignite and maintained a thickness of 14 inches. Other smaller occurrences were noted in the inlet by Dall, however, they are not worthy of further mention.

Another occurrence of coal on Admiralty Island is described by Dall and a later description by Wright was made. This occurrence is at Murder Cove east of Point Gardner on the southern extremity of the island. Its location is 2 miles inland from the head of the cove at an elevation

*Op. cit., Seventeenth Ann. Rept.

of 500 feet. Development consisting of two tunnels over 100 feet in length was ~~driven~~ done in 1885. In 1900 development was renewed, but commercial quantities of coal are not known to have been developed. The following description by Wright* gives the latest known information:

> "The coal is bituminous, with a low percentage of ash and no visible amount of sulphur. The beds have been slightly folded and crushed and in mining the coal breaks into small fragments. The coal lies in three benches, separated by narrow seams of tuff and impure coal. The total width of the seam averages 5 feet and that of the partings about 1 foot. * * * * *
>
> "The trend of the bed follows the curvature of the drift shown in the diagram of the workings, but it has not been traced beyond these limits. (Fig. 41) The inclined shaft followed it at an angle of 25° for a distance of 100 feet, at which point the coal bed was found to be displaced. The shaft was continued at a somewhat steeper angle for 80 feet and at this depth the surrounding rocks were crosscut and the coal bed was relocated. * * * * *
>
> "The crushed nature of the coal and the irregularity of the structure are unfavorable, as well as the situation of the deposit."

This coal measure is reported to be contained in a lava breccia with the benches separated by thin beds of tuff. The age of these formations is not definitely known. However, this deposit is located** on the north edge of a small area of lower Cretaceous sediments, which form the islands and shore lines east of Point Gardner. It is within the realm of possibility that the coal measures are associated with the lower Cretaceous sediments, and further prospecting may develop additional occurrences of coal of ~~an~~ economic ~~nature~~ importance. This vein contains a minable width and a minable grade of coal. The following plan of the underground workings is taken from bulletin 287. It is very doubtful as to the accessibility of the workings at the present time.

*Op. cit., Bull. 287, pp. 152-153.
**Op. cit., Bull. 800, Plate No. 1.

Other known areas where Tertiary formations are found and where coal beds have been reported are as follows:

Ernest Kirberger* of Kake reports a $2\frac{1}{2}$-foot vein of coal at Port Camden opposite Keku Strait on Kuiu Island. This coal is said to be lignite.

Narrow seams of an impure coal are reported by Wright** as occurring in the Tertiary formation at Port Camden, Kuiu Island, and at Hamilton Bay, Kupreanof Island. Further reports of coal seams in Tertiary sediments are confined to Whale Bay on the west coast of Baranof Island and the southwestern portion of Zarembo Island. These locations are shown on the accompanying location sketch. Further information is lacking, however, careful prospecting in the localities may reveal other deposits.

In conclusion, the following facts pertain to coal deposits in Southeastern Alaska:

1. No extensive formations containing coal measurers are to be found in the geological complex of Southeastern Alaska.

2. The known measures are thin beds that are confined to small areas.

3. The grades of coal are lignite, with the exception of local small areas affected by later intrusions and extrusions, where a bituminous grade has been formed.

4. These localizations are no doubt small in extent and irregular in form due to disruptive agencies accompanying the invasion of the intrusive and extrusive rocks.

*Oral communication.
**Wright, F. E. and C. W., The Ketchikan and Wrangell Mining Districts, 1908, U. S. Geol. Survey Bull. 347, pp. 59-61.

Geographically, the nearest known extensive coal deposits to Southeastern Alaska are those located inland from Controller Bay along the Bering River. In this area, which lies approximately 375 miles by water northwesterly of Juneau, are extensive coal deposits ranging in grade from bituminous to ~~semi~~-anthracite. These deposits are very accessible to salt water transportation and, with exceptionally high grades, give promise of a supply for the future, not only for Southeastern Alaska, but for other areas in Alaska bordering the Pacific Ocean. Detail information regarding these deposits is contained in U. S. Geological Survey bulletin 335, "Geology and Mineral Resources of the Controller Bay Region, Alaska" by G. C. Martin, 1908.

COPPER [illegible]

Copper mining was an established industry in Southeastern Alaska for a period of 15 years from 1905 to 1920. The total production of copper during this period amounted to 33,266,940 pounds with a total valuation of approximately $6,355,767,[1] exclusive of the value of the gold and silver contained in the ore. Prior to 1905 only occasional small shipments of ore were made and the known production to this date amounted to 1,600,000 pounds of copper. The most productive years were those during the World War, 1915-1918, during which copper commanded a price greatly exceeding the present market. The price of copper mined during the fifteen-year period, according to the above production figures, averaged nearly 20 cents per pound. During this period considerable prospecting for copper deposits was carried out. Known ore reserves in the larger deposits were nearly depleted. Two smelters were erected during this period; however, many problems were encountered, including insufficient ore reserves for continuous operation, which forced them to close. The years following 1920 up to the present time mark a period of very little copper production, with only one or two mines operating and irregular shipments of copper ore. The situation at present is the operation of one mine which, with gold, silver and palladium values contained with the copper, operates intermittently and with a small crew.

Prospecting and development of copper properties have declined along with production. As a result there have been no new discoveries of

*Figures taken from production records published by the U. S. Geological Survey in its mineral resources bulletins, 1905-1920.

copper of importance since this early mining period. Nearly all the copper mines and prospects of note in the Ketchikan district are situated on Prince of Wales Island. Most of these deposits are contact metamorphic in origin, and contain considerable quantities of magnetite of good grade. Of these deposits only those containing economic amounts of copper were mined. As a result the larger masses of magnetite with low copper content remain intact. Estimates of magnetite reserves in the Kasaan Peninsula and Copper Mountain areas on Prince of Wales Island by individual engineers, the U. S. Geological Survey and the Bureau of Mines, range from 15 to 20 million tons. The copper content of this iron ore, based on assays of individual orebodies, ranges from a fraction of one percent to one percent. Future copper mining in Southeastern Alaska will resort to the mining of copper-magnetite bodies with a low copper content on a large consolidated scale, with the iron content the most valuable factor, or to the mining of small higher grade deposits of copper on a comparatively small scale.

The copper-magnetite bodies of Prince of Wales Island are made up mostly of magnetite with the copper mainly in the form of chalcopyrite, a sulphide of sulphur, iron and copper; also a small amount of pyrite and various gangue minerals. These sulphides furnish a sulphur content, which in an iron ore is detrimental at least where the finished steel product contains an excess of .05 percent. Further, a copper content of over .25 percent in the finished metal causes surface cracks and checks. From the few analyses obtained by this department on some of the magnetite deposits, a milling process to the extent of removing the copper and iron sulphides would seem to be necessary.

The following copper occurrences are of such a nature as to offer small-scale copper mining operations on a grade of ore that under present conditions would absorb the cost of shipment to the States and of reduction at smelters. The copper-magnetite bodies are classified and discussed under iron deposits.

~~Copper~~ Occurrences

Ketchikan ~~District~~ Precinct: K4 119-1

The only producing copper mine of recent years within the Ketchikan district has been the Goodro mine of the Alaska Gold and Metals Company located at the head of the salt chuck in the northwestern portion of Kasaan Bay. Prior to this last year this mine has been operating at a capacity of nearly 1,000 tons of ore monthly mined and milled. According to Mr. Lee Howard, manager,[1] the ore as mined, while containing only a low percentage of copper, contains values in gold and palladium ranging from $3 to $5 per ton. These values, plus the copper content, when concentrated on the property, produce a high grade shipping product. Average ore analyses by Campbell, as shown by Mertie,[2] from the Goodro or Salt Chuck mine glory hole deposit, averages 1.427 percent copper, .063 oz. of gold, .217 oz. of silver and .253 oz. of platinum and palladium per ton. From this ore an average concentrate of 40.06 percent copper, 1.213 oz. of gold, 5.293 oz. of silver and 5.147 oz. of platinum and palladium is obtained. The ore is confined to small shoots in areas along a gabbro-pyroxenite contact in which the copper minerals, mainly bornite with

[1]Oral communication.
[2]Mertie, J. B., Jr., Lode Mining in the Juneau and Ketchikan Districts, U. S. Geol. Survey Bull. 714, p. 123.

chalcopyrite and secondary alterations, occur in small masses and disseminations scattered irregularly in both walls of the contact. According to Mr. Howard, the known ore reserve remaining in the vicinity of the glory hole, the site of the underground development, consists of 30,000 square feet, measured by surface exposure. The present workings consist of a glory hole and two adit levels at 200 and 300 feet below and connected by raises and stopes. Thus the proven depth of minable ore is 300 feet below surface exposures. The depth to which the present grade of ore will extend is not known. A diamond drill hole, according to Stewart,[1] proves an additional 50 feet for the central ore lens of the glory hole series. Further estimates by Mr. Howard in all the outcrops on the Goodro property total 200,000 square feet containing ore. Since this amount, other than that surrounding the glory hole, is estimated from surface exposures only, it has to be considered as possible ore.

Further information regarding the workings, geology and production of this mine can be found in U. S. Geological Survey Prof. Paper 87, "Geology and Ore Deposits of Copper Mountain and Kasaan Peninsula, Alaska" by Charles Will Wright, page 99; and U. S. Geological Survey Bull. 347, "The Ketchikan and Wrangell Mining Districts, Alaska" by F. E. and C. W. Wright, pages 125-126. Further, the "Mineral Resources of Alaska" series from the year 1914 to the present date give accounts of operations.

The Rush and Brown Mine, owned also by the Alaska Gold and Metals Company, is located one and a fourth miles southwest of the Goodro Mine at the head of Kasaan Bay. This mine was one of the larger producers

[1] Stewart, B. D., Report on Cooperative Mining Investigations, March 31, 1931, pp. 12-14.

during the years of the World War, and one of the oldest producers, having operated almost continuously from 1904 to 1924. The latest development on this property was by the Solar Development Company during the years 1929 and 1930. A description of this development is given in a report by B. D. Stewart.[1] The mine workings have been filled with water since the mine ceased producing in 1923, except that they were dewatered during the development by the Solar Development Company. Since that time the property has remained idle.

The following account by Mertie[2] in 1919 is taken from a report on this property four years prior to its closing:

> " * * * * * The property includes two ore bodies that have been developed to a productive basis and a number of others that have not been explored. The larger of the two productive ore bodies is a contact-metamorphic deposit of copper-bearing magnetite, and the smaller a fault-zone deposit, with chalcopyrite as the chief sulphide. The former is of too low a grade to be worked at the present price of copper, but the latter carries a higher grade of copper ore and also considerable gold and silver, and in recent years mining has been confined to this deposit. * * * * *
>
> "The contact-metamorphic deposit lies in contact rock between diorite and graywacke, trends about due east, and stands practically vertical, plunging perhaps at a high angle to the north. The ore has been exposed in a glory hole and numerous drifts from it to a depth of 140 feet, for a distance of about 200 feet, and shows a width ranging from 50 feet at the west end to 125 feet at the east end. The deposit, however, is irregular in outline and variable in ore content owing to the inclusions of numerous horses of country rock. Both the ore and the country rock are much faulted, but in general the throw of the faults seems to be small. * * * * *
>
> "The chief sulphides contained in the magnetite are chalcopyrite and pyrite, but they are so scattered that it is difficult to find copper ore of a commercial grade. The whole deposit of cupriferous magnetite, if mined completely, should yield not less than 0.5 per-cent and possibly 1 percent of copper. * * * * *
>
> "About 160 feet north of the contact ore at the surface lies the shear-zone deposit, observations upon which show that the vein is irregular in attitude, ranging in strike from N. 65° E. to east and in dip from 45° to 60° S."

[1]Op. cit., Report on Cooperative Mining Investigations, pp. 11-14.
[2]Op. cit., Bull. 714, pp. 119-120.

Some mining and development was done on the copper-bearing magnetite ore body and according to Stewart[1] some ore was shipped. However, the greater portion of the ore mined and shipped was from the shear zone deposit. This ore body was developed by an incline shaft from which the following levels were driven: 100, 200, 250', 300, 350, 400, 450 and 500 feet. A vertical shaft connected the 200-foot level and the surface. Work on the 1251-foot adit driven by the Solar Development Company was suspended prior to reaching the 300-foot level, which it failed to reach by a distance of 220 feet. Completion of this adit would act as a drainage of the workings to the 300 level and permit more accessible mining on the lower levels. Copper ore is known to exist below the lowest, or 500 level, and is believed to exist in the undeveloped portions of the vein to the east of the lower workings. Production figures of the mine have not been made available to this office, however, they may be obtained from the company at present holding the property.

KK 119-51 The It Mine, located on Kasaan Peninsula, 4 miles northwest of Kasaan, and 4,000 feet from the beach, was a producer of a good grade of copper ore from 1908 until 1917. This property is held by the Granby Consolidated Mining and Smelting Company of Canada. Considerable development work has been done on the property. The ore bodies are described by Wright[2] as follows:

> "Ore bodies - The ore bodies are contact deposits which lie on both sides of a diorite intrusive mass. The contact zone here is widest on the northeast side of the diorite, where the principal ore bodies are found, though developments on the southwest side have

[1]B. D. Stewart, oral communication.
[2]Wright, C. W., Copper Mountain and Kasaan Peninsula, U. S. Geol. Survey Prof. Paper 87, pp. 94-95.

also revealed small masses of ore. The intruded rocks are limestone and graywacke and have been much altered by infiltration of mineral from the contact zone.

"The minable ore bodies consist of chalcopyrite, pyrite (often in large octahedral crystals), garnet, epidote, and some hematite. They are from a few feet to many in dimension. Several such bodies have been found and mined and exploration, both in depth as well as laterally, continues to expose masses of ore."

Besides copper values, this ore was reported to have contained notable amounts of gold. Mining and considerable development were carried on by the Granby Company during the years of 1914 to 1917. Short accounts of these developments are given from year to year in the series of bulletins on mineral resources of Alaska issued by the U. S. Geological Survey for the consecutive years of operation. Production figures from this property or ore reserves are not known by this department. However, impressions gained from prospectors and miners who are familiar with conditions are to the effect that chances for developing further copper ore are very good both in the It mine and the surrounding vicinity.

K+119-7 The Copper Center prospect, which is situated in the immediate vicinity of the It mine and along the same dioritic contact zone is located 3,000 feet from the shore of Kasaan Bay at an elevation of 380 feet. Three claims are held by A. Moquist of Ketchikan. This prospect offers a shipping grade of copper ore in one of the showings, with the amount unknown. A description of these showings, as contained in a report by the writer,[1] is as follows:

"Showings: Numerous old cuts and shafts are confined to a small area in the vicinity of a small knoll. Two cuts were cleaned out on the south side of the knoll and a band 3 feet wide of flat-lying ore, consisting mainly of magnetite, with some chalcopyrite and pyrite, is exposed. At a point 20 feet north

[1]Roehm, J. C., Preliminary Report of Copper Center Prospect, unpublished report in the files of the Territorial Department of Mines.

of these cuts an attempt was made to clean out an old shaft. This shaft was cleaned to a depth of 6 feet. On the walls another 3-foot band of similar ore is exposed, and contained in the band was 18 inches of nearly massive chalcopyrite. The depth to which the chalcopyrite extends in the shaft could not be determined. Its exposed length was 15 feet. * * * * *

"Sample 426 was taken 4 feet down in the shaft across 18 inches of nearly massive chalcopyrite and pyrite. This gave returns of 0.24 oz. gold and 0.30 oz. silver per ton, and 11.07 percent copper."

This prospect offers a possibility of mining copper ore on a small scale, with further development. A short description of the prospect, which has retained its original name, is given by C. W. Wright in U. S. Geological Survey Professional Paper 87, "Copper Mountain and Kasaan Peninsula, Alaska," p. 100.

KX 119-53 The Shepard mine is another small property in the vicinity of the It mine, from which small shipments of a good grade of copper ore have been made, and offers a possibility for further shipments. The Shepard group consists of three claims and two mill sites located 6 miles northwest of Kasaan, with the workings 1,800 feet inland from the shore of Kasaan Bay at an elevation of 300 feet. The following account by the writer is contained in an unpublished report:[1]

"The underground workings consist of an adit approximately 250 feet in length that was cared at a point 100 feet in from the portal, and connects with the bottom of the glory hole, and a cross-cut leads to the bottom of the shaft. The workings below the glory hole were accessible through a short raise. The southeast end of the workings expose the garnet band for a distance of 30 feet. The south end has been cut off by a fault that strikes N. 15° W. and dips 70° W. The southern extension of this band has not been found. Sample 429 was taken across 24 inches of this garnet band in the face of the drift, and returns of 0.06 oz. gold, 0.60 oz. silver per ton, and 4.6 percent copper were received.

[1]Roehm, J. C., Preliminary Report of Shepard Group of Claims, June 17, 1938, unpublished report in the files of the Territorial Department of Mines.

"At a point 55 feet west of the shaft a glory hole 20 feet long, 7 feet wide, and 30 feet deep has been sunk on the garnet rock band. The footwall of this band is crystalline limestone and the hanging wall is the 4-foot porphyry dike. Sample 430 was taken across 30 inches of this band on the south face of the glory hole, 20 feet down. This gave results of 0.03 oz. gold, 0.50 oz. silver, and 5.75 percent copper per ton.
* * * * *

"A few more tons of this ore are in sight below the glory hole and in the drift. The amount of molybdenite associated with the copper ore appears sufficient to save provided enough ore is found to operate a concentration plant."

K+119-59 The Rich Hill copper mine, held by R. G. Nibbe of Berkeley, California, and situated on Kasaan Peninsula, 2 miles east of Kasaan, contains an unknown quantity of ore of a shipping grade. Stewart[1] gives an account of the last workings on the property as follows:

"During the year 1930 Mr. Andrews[2] completed the driving of a crosscut tunnel approximately 400 feet in length that intercepts the main ore body about 100 feet in elevation below the surface workings that were operated by the Granby Company. From the end of this tunnel a raise in ore is being driven up to connect with the bottom of the glory hole. This raise had reached a point about 60 feet above the tunnel level in June, 1930. The high-grade ore zone at this point is said to have a width of 14 feet. At 115 feet from the portal the crosscut tunnel also intercepts the footwall of a zone of disseminated chalcopyrite ore, through which it continues for a distance of 75 feet to the hanging wall. Surface exposures indicate that this lower grade zone trends easterly and westerly. Underground it has not been explored beyond the limits of the width of the crosscut tunnel.
* * * * * "

This property is within easy access to the salt water of Kasaan Bay and, according to Mr. Fred McKay,[3] 50 tons of ore, which averages better than 10 percent copper, still remains at the cabin site on the beach below the workings.

[1]Stewart, B. D., Report of Cooperative Mining Investigations, 1931, pp. 15-16.
[2]Former owner--now deceased.
[3]Personal communication.

Following is a list of inactive copper mines in the Ketchikan district, other than those mentioned above, from which ore has been shipped:[1]

Name of Property	Owner	Location	Remarks
Copper Mt. Group KK 119-87	Alaska Copper Co.	Hetta Inlet, Copper Harbor	One of larger copper producers in SE. Alaska--known ore mined out.
Jumbo Group KK 119-86	Sulzer Estate	Hetta Inlet, 2 miles north of Copper Harbor	One of the larger producers. Some of lower workings known to contain copper ore. Also contains some associated molybdenite.
Green ~~Mountain~~ Monster Group KK 119-85	Sulzer Estate	Inland from head of Hetta Inlet and Portage Bay	Contains known ore bodies. Inaccessibility has prevented mining.
Corbin Mine KK 119-89	Alaska Metals Mining Co.	Hetta Inlet near beach, 1½ miles north of Copper Harbor	Producer of low grade massive sulphide ore--future source of pyrite ore.
Copper City Mine KK 119-88	Unknown	Hetta Inlet, 7 miles south of Copper Harbor	Producer for several years. Further development underground and surface showings warranted.
Mamie Mine KK 119-55	Granby Consolidated	Kasaan Peninsula, Prince of Wales I.	Large producer, mined for copper content and fluxing ore. Now potential iron deposit.
Stevenstown Mine KK 119-57	" "	" "	Producer of copper--ore bodies nearly exhausted.
Mt. Andrew Mine KK 119-58	Andrews Estate	" "	Higher grade of copper ore nearly exhausted. Contains large volume iron ore. See following report on iron.
Niblack Mine KK 119-103	Wakefield Estate	Niblack Anchorage, Prince of Wales I.	Past producer--reserves unknown.
Cymru Mine KK 119-40	Unknown	Head of N. Arm Moira Sound, Prince of Wales I.	Past producer--reserves unknown.

[1]Various "Mineral Resources of Alaska" bulletins of the U. S. Geological Survey.

Name of Property	Owner	Location	Remarks
Khayyam Mine KK 119-100	None	Head of McKenzie Inlet, Skowl Arm	Small copper producer. Contains future source of pyrite ore.
Big Harbor Mine KK 119-138	Unknown	Trocadero Bay, W. coast of Prince of Wales I.	Small producer--considerable development.
Lake Bay KK 119-135	Unknown	Lake Bay, NE. coast of Prince of Wales I.	Siliceous copper ore, low grade, with low gold values.

Petersburg ~~District.~~ Precinct

KK 117-36 The only copper prospect worthy of mention in the Petersburg district is that of the Kupreanof Mining Company located 5-3/4 miles inland at an elevation of 1,275 feet near the head of Duncan Canal on Kupreanof Island. The ore bodies and geology are described in U. S. Geological Survey bulletin 739, "Mineral Resources of Alaska, 1921," p. 70, as follows:

> "The ore bodies occur within a series of black slate and phyllite interbedded with chert and associated greenstones. In part the greenstones are altered dikes and sheets of diorite; in part they may be intercalated andesite flows, and in part they are probably contact-metamorphosed limestone beds. * * * * * The ore bodies lie on the crest of an anticline, and the beds and ore zones show gentle dips of 10° to 30°. The hanging wall of the ore body is a sheet of much altered fine-grained diorite composed of uralitic hornblende and plagioclase ($Ab_{90}An_{10}$). The footwall comprises interbedded slate and chert. The country rock of the ore, as indicated by unreplaced lenses remaining in the ore body, is a pyroxene granulite. * * * * * The ore mineral is cupriferous pyrite or chalcopyrite and occurs essentially as veinlets and blebs in masses of pyrrhotite which is replacing the pyroxene granulite. * * * * * The character of this ore body and its associated rocks very strongly suggests that it has been formed through the metasomatic replacement of a limestone bed."

The vein was further reported to be exposed 200 feet in surface exposures and it varied from 3 to 6 feet in width. There has been no development on this property since 1921 and the workings are said to be caved.

Juneau ~~District.~~ Precinct

Copper is contained in the ores of several base-metal prospects and properties in the Juneau district. Some are referred to in U. S. Geological Survey reports as copper prospects, such as the Point Astley property at Holkam Bay, the Enterprise prospect on Tracy Arm, and the Alaska-Endicott property at William Henry Bay on Lynn Canal. Both the Point Astley and Enterprise prospects contain greater amounts of zinc than copper and are discussed later in this report under zinc deposits.

K-112-b The Alaska-Endicott property is the only known copper property in the Juneau district from which ore has been shipped where the values consisted predominantly of copper. A mill was erected during the year 1920 to concentrate this low grade ore. The following year the mill was operated and some concentrate was shipped. This operation apparently did not prove profitable after considerable underground development had been accomplished. The Territory of Alaska recently acquired title to the property.

The lode is described by Mertie[1] as follows:

> "The copper lode that is being developed is a vein composed chiefly of calcite with considerable silica in the form of tiny veinlets of quartz and chalcedony. The copper ore is exclusively chalcopyrite and occurs with the quartz. The vein pinches and swells, but probably averages 10 feet in thickness. The general strike is about N. 75° E. and the dip 80° S., but there are many local irregularities in attitude, due mainly to faulting. The ore carries only small quantities of gold or silver and is classed as a low-grade copper ore. The mine is being developed on the assumption that a 2 percent copper ore can be produced."

[1]Mertie, J. B., Jr., Lode Mining in the Juneau and Ketchikan Districts, U. S. Geol. Survey Bull. 714, p. 111.

Several copper samples of good grade have been received from the Glacier Bay area of the Juneau district. One prospect inland from the central eastern side was reported to have had some development several years ago. Information regarding this prospect and other discoveries within the area is lacking.

Hyder ~~District~~ Prim 4-:

The copper minerals chalcopyrite and tetrahedrite and their alteration products occur in most of the properties within the Hyder district. In only one property is copper the major content, with the other properties containing greater amounts of lead and zinc and associated gold-silver values. Detailed descriptions of these properties are contained in U. S. Geological Survey bulletin 807, "Geology of Hyder and Vicinity, Southeastern Alaska" by A. F. Buddington.

Kt 118-24 The Blasher property, located at the end and north side of the Texas Creek road, contains on the Sunset claim a quartz vein with copper the predominating metal. The vein is in granodiorite, extending from the granodiorite-sedimentary contact a distance of 170 feet as exposed by open-cut. The strike is N. 40° W. and the dip 55° NE. The width of the vein at the contact or portal of the short 14-foot adit is 3 feet and gradually becomes smaller down to 12 inches at the end of the 170-foot open-cut to the northwest. The average width is 2 feet. The vein material is characterized by large crystals and masses of chalcopyrite. Other metallic minerals such as pyrite, galena, sphalerite, molybdenite, gold and silver are associated in lesser amounts. Six channel samples

taken across the vein gave results of less than one percent to over four percent, probably averaging two percent, with low values in gold and silver and some lead. The group of claims known as the Blasher group is owned by Frank Blasher of Hyder. The vein showing is within easy access to the Texas Creek road.

The Wrangell, Sitka and Skagway precincts of Southeastern Alaska contain a few known copper prospects. However, none is known to have made shipments of ore. Some may be found to be of value with more development work.

In the Sitka precinct small amounts of copper in the mineral chalcopyrite are contained in the nickel-copper deposits of Baranof, Chichagof and Yakobi islands. Also the nickel-copper deposit at Funter Bay, Admiralty Island contains copper associated with pyrrhotite. In these deposits the nickel represents the greater value and in most of them is also present in larger percentage than is copper. These deposits are discussed later in this report under nickel deposits.

Territory of Alaska
DEPARTMENT OF MINES

Prepared by:
J. C. Roehm
Associate Engineer

IRON

Utilization of vast amounts of iron and iron ore in the numerous war industries has created a demand which places this metal in the critical list. The iron and steel industry has in the past been situated, both from the standpoint of its manufacture and the reduction of its ores, in the central and eastern portion of the United States. Political and industrial control on the part of the larger eastern iron and steel companies, combined with the aid of the larger railroads, accounts in the greater part for the lack of development of this industry in the western United States. This has had its effect upon Alaskan mineral development. The general assumption that there is a lack of iron deposits and lack of markets for iron and steel products in the western portion of the United States is contrary to the general facts. Minable deposits of iron ore exist along the west coast ranging from southern Mexico to southeastern Alaska. Those in Alaska, British Columbia, and Mexico are within easy access to salt-water transportation and those in the coastal states within easy access to roads and railroads. Further, the west coast has the associate materials such as coal and limestone. An abundance of hydroelectric power is also available. Prior to the present emergency the yearly total of iron and steel products transported to and utilized on the west coast of the United States was over two million tons.[1] Since the present emergency this figure has undoubtedly been doubled or trebled. Within the last year two iron reduction plants have

[1]Figures compiled by Geo. Watkin Evans, Consulting Engineer, Seattle, Washington in a study of possible steel industries for the Pacific Northwest, oral communication.

begun operations on the Pacific coast, one in Canada and the other in the United States. Utilization of their products will be largely within their own associated manufacturing organizations. To utilize the iron ores of Southeastern Alaska requires; first, either a reduction plant within the Territory; or second, the transportation of ore from Alaska for reduction.

The reduction of iron ore in Alaska will be confronted by many perplexing economic problems. The development of hydroelectric power, which is abundant on the mainland of Southeastern Alaska, for the reduction of iron ore, is one problem to be considered. This would require considerable expenditure both for a hydroelectric plant and a reduction plant, and also large-scale production of ores and reduction. Further, there would be the necessity of transporting the ore from its location on the islands to the mainland, and also the transportation, at least in part, of the fluxing materials. Thence the iron products, due to lack of associated iron and steel industries in Alaska, would have to compete in west coast markets, which would require further transportation. Lack of an abundance of labor in Southeastern Alaska makes its importation necessary, a factor requiring a higher wage scale. Known iron ore reserves of Southeastern Alaska are not of sufficient tonnage to support a large iron and steel industry over a long period of years, a very essential factor in large industry. The known iron deposits in Southeastern Alaska are contact metamorphic in origin and widely scattered. Thus they are not adaptable for large-scale mining

operations. Large known deposits of associated metals used in steel making such as chromite, manganese and others are lacking and prospects are undeveloped. Reduction of iron ore with small-scale methods is, however, more feasible for Southeastern Alaska, and it should be considered in the planning of future Alaskan development. Small-scale production is to be considered as more feasible under existing economic conditions, and might result in the utilization of Alaskan iron ores. Small brick kilns using coal or charcoal, located near the deposits could, under the recently developed process by the Bureau of Mines, produce a sponge iron product. This product, providing impurities of the ores are first removed, could possibly compete with the sponge iron discs or grindstones formerly imported into the United States from Sweden. These are further reduced in electric furnaces to a tool-grade steel. These Swedish discs were made from the high grade magnetite ores of Sweden, and commanded prices for the highest grade of $130 to $150 per ton and second grade $40 to $70 per ton. Brick kilns are easily erected and do not require large capital expenditures. Even a small-scale steel industry for Alaska in the future depends upon future trends and governmental policies.

The second consideration with regard to mining these Alaskan iron ores is their transportation for reduction outside of Alaska. This offers some possibility in the future, depending upon the expansion of the steel industry on the west coast of the United States and Canada. However, under the present trends, costs and policies applicable to Alaska, transportation of these ores is not economical.

The iron deposits of Southeastern Alaska are mainly confined to Prince of Wales Island. They are magnetite bodies, contact metamorphic in origin, and confined mainly to two small areas. These areas are known as Kasaan Peninsula and Copper Mountain. The deposits are associated and in some instances contained with the copper deposits of these areas. As a result, large tonnages of iron ore with a low content of copper have been developed during copper mining activities. Only rough estimates have been made with regard to the total available tonnage, which further development would probably increase. Again some deposits contain copper in the form of chalcopyrite in such amounts that its removal would become necessary due to excess sulphur and copper. The deposits containing only small amounts of copper are of good grade and contain, according to Wright,[1] no phosphorus or other detrimental impurities. From the known magnetite bodies along Kasaan Peninsula and in the vicinity of Copper Mountain, estimates ranging from 15 to 20 million tons have been made as the probable tonnage. The copper content of this ore varies in different deposits, however, the average as shown by assays of ore from a few of the deposits is less than one percent. Thus in some deposits concentration would be necessary to remove the copper from the ore, but the contained copper would help to defray mining and concentrating expenses.

Some of the larger known iron deposits are herewith described, including a deposit of siderite, which may in the future become a source of iron.

[1]Wright, C. W., Copper Mountain and Kasaan Peninsula, U. S. Geol. Survey Prof. Paper 87, p. 102.

Occurrences

KX 119-58 The Mount Andrew mine, located on the southwest side of Kasaan Peninsula, three-fourths of a mile from tide water at an elevation of 1400 feet, contains a good grade of magnetite iron ore. This property was operated as a copper mine intermittently from 1905 to 1917. Ore consisting mainly of magnetite containing copper of a grade down to two percent was mined and shipped. The greater portion of the magnetite bodies contained less than two percent copper and these un-mined portions still remain in the workings. The mine was developed by three adit levels. Above the No. 2 level some of the ore bodies were mined to the surface. Six ore bodies are developed and partly mined above this level. They are described by Wright[1] as follows:

> "Ore Bodies - Six ore bodies, consisting of irregular masses of magnetite-chalcopyrite associated with the garnet-epidote contact rock, have been developed, and have been mined to a considerable extent. These bodies of ore are 10 to 50 feet wide, 40 to 80 feet long, 100 feet or more in depth, and have a general northerly strike and pitch. They are separated by barren areas of contact rock and dikes 20 to 60 feet wide of altered syenite porphyry. * * *
>
> "At other points on Mt. Andrew large masses of the magnetite carrying an amount of copper insufficient to make a copper ore have been formed. These deposits, though not valuable for their content of copper alone, may sometime be a source of iron."

According to Axel Carlson[2], superintendent for the company prior to the termination of activities in 1917, an English engineer by the name of Stevenson made an estimate of the magnetite ore on the property. This estimate amounted to three million tons of magnetite ore containing one-half percent copper.

[1]Op. cit., Prof. Paper 87, p. 94.
[2]Personal communication.

The present development on the property reveals ten magnetite bodies exposed in the No. 2 adit, and some on the surface not explored underground. Assays from samples of nine of these ore bodies of the No. 2 adit gave results ranging from 46.7 to 57.4 percent iron and 0.60 to 2.82 percent sulphur. Portions of these ore bodies have been mined above No. 2 adit, but none have been mined below. The No. 3 adit, vertically 300 feet below, reaches under the ore bodies in part of No. 2 adit, but reveals only small bunches of magnetite. This lower adit offers a readily accessible means for mining.

The Mount Andrew property consists of numerous claims in a group covering a considerable portion of Mt. Andrew. These and several mill sites are held under patent rights and are owned by the Andrews Estate of Sheffield, England.

K4119-55 The Mamie mine, located 3,000 feet east of the Mt. Andrew mine on Kasaan Peninsula, contains another series of chalcopyrite-magnetite deposits which were mined for their copper content. These deposits compare favorably with those of the Mt. Andrew property, being situated in the same geologic complex and have the same mode of origin and mineral content. However, more development was accomplished on this property and the ore bodies were more extensively mined. Originally the ore was reduced for its copper content at the Hadley smelter located on the beach on the north side of Kasaan Peninsula. These operations were carried on from 1904 to 1908. Later the property was purchased by the Granby Consolidated, which still holds the patent rights, and the ore

was mined and shipped to the Granby smelter in British Columbia. According to Axel Carlson,[1] who was familiar with these operations, the ore was used for fluxing in the Granby smelter and portions of the chalcopyrite-magnetite bodies, where copper content ranged above one-half of one per-cent, were mined. However, large blocks of magnetite ore are evident in the old workings and an estimated reserve of a million tons is believed to be not exaggerated. The magnetite ore remaining in the Mamie mine is of higher grade and contains less sulphur on an average than in the Mt. Andrew deposits.

KK119-19 The Poorman copper prospect, located on Kasaan Peninsula, 2 miles northwest of Kasaan and less than one-half mile from tide water, contains two notable magnetite ore bodies. This property is owned by Jim Coleman of Ketchikan. The Bureau of Mines, under the strategic minerals appropriation for Alaska, is now engaged in diamond drilling these ore bodies. According to Mr. Sanford,[2] two magnetite bodies have been outlined from the old surface workings. These are to be drilled to determine depth. The largest lens of magnetite is 900 feet in length and averages approximately 80 feet in width, while the smaller lens has a length of 550 feet and averages approximately 80 feet in width. While depth has not been proven, an assumed depth of 100 feet on each ore body would contain over three million tons of ore. The grade of the ore ranges from 50 to 60 per cent iron. Small amounts of chalcopyrite and pyrite are associated. These deposits are contact metamorphic in origin

[1]Oral communication.
[2]Sanford, R. S., District Engineer for the Bureau of Mines in Alaska, oral communication.

and are situated along a contact of granitic intrusives and Devonian limestone.[1] According to Leibrant,[2] numerous other magnetite outcrops have been observed by him three-fourths of a mile north of the Poorman outcrops. These were never developed due to lack of associated chalcopyrite in commercial amounts.

KX119-52 Another area on Kasaan Peninsula, which contains chalcopyrite-magnetite bodies, is situated inland from the east shore of Tolstoi Bay. The Mahoney or Iron Cap prospect received the most development of the various properties. Old workings extend from near the beach to an elevation of 1100 feet on the northwest slope of Tolstoi Mountain. In the year 1901 considerable diamond drilling was done on the lower showings, according to Brooks.[3] Later a short adit was driven on the upper magnetite bodies. This adit and three magnetite outcrops were examined and sampled by the writer. Records and logs of the diamond drill holes were not obtainable, however, reports were to the effect that considerable magnetite was encountered in them. This ore contained a copper content too low for commercial exploitation at that time. As a result the property was abandoned.

The magnetite occurrences are similar to those of the Mount Andrew property. They exist on a contact zone between granodiorite and greenstones. This contact extends for 3 miles in a northwest-southeasterly direction. Wright[4] describes the upper magnetite bodies on the Iron Cap and their related geology as follows:

[1]Op. cit., Prof. Paper 87, Plate XV.
[2]Leibrant, S., Hollis, Alaska, oral communication.
[3]Brooks, A. H., Ketchikan Mining District, Alaska, U. S. Geol. Survey Prof. Paper No. 1, p. 104.
[4]Op. cit., Prof. Paper 87, p. 101.

" * * * * * The country rock consists principally of greenstone tuff and a fine conglomerate intruded by syenitic dikes of considerable width, which are apparently related to the ore deposits. Three ore bodies have thus far been located, the largest 20 feet wide and traceable for 50 feet, the major axis striking N. 45° W. A second ore body, separated from the first by a 30-foot dike of altered syenite, is 12 feet wide and is limited on the footwall side (to the southwest) by a fault plane showing a considerable seam of gouge; toward the hanging wall it grades into a garnet-epidote contact rock. The third ore body, which lies just above the other two at an elevation of 1,080 feet, appears to be a flat-lying magnetite deposit only a few feet thick."

Samples taken by the writer in the ore lens encountered in the last 16 feet of the tunnel gave results of 50.5 percent iron and 0.14 percent sulphur. A sample taken from the larger lens on the surface gave results of 59.9 percent iron and 2.16 percent sulphur. Other magnetite bodies were reported, but were not observed in the lower workings due to filled in and caved conditions.

K4 119-86 The Jumbo group of claims, located on Copper Mountain at the head of Hetta Inlet on the west side of Prince of Wales Island, contains notable amounts of magnetite ore. This property was operated by the Alaska Industrial Company as a copper mine and was one of the larger copper producers of Southeastern Alaska. Among the various copper deposits on this group, most of which have been mined to a considerable extent, is a large showing of magnetite ore. This is described by Wright[1] as follows:

"The ore body on Jumbo claims Nos. 1, 1A, and 2 is characterized by lower values in copper than in the deposit on Jumbo claim No. 4, and by a large percent of magnetite, which mineral was conspicuously absent in the former deposit. Granite

[1]Wright, F. E. & C. W., The Ketchikan and Wrangell Mining Districts, Alaska, U. S. Geol. Survey Bull. 347, pp. 100-101.

forms the footwall and both limestone and quartzite the hanging-wall side. Erosion has exposed the ore body over broad areas, so that it appears to form a relatively thin covering on the granodiorite, and becomes thinner as the elevation increases. The deposit outcrops in this manner between the 1,500 and 2,000 foot contours, but above 2,000 feet granodiorite alone was observed. This contact deposit between the hanging wall and footwall generally varies from 10 to 60 feet in width, but in direct contact with each other, as was observed at a point a few hundred yards northwest of the workings. * * * * *

The ore bodies on this group are contact metamorphic deposits formed usually in a contact zone between granodiorite and both limestone and quartzite. Estimates of the approximate amount of magnetite ore, made by engineers during the copper operations, ranged up to ten million tons. This ore in its location as to elevation, near surface exposures, and within tramming distance of salt water transportation, offers an unusual opportunity for the mining of iron ore. Due to the similarity of these iron ores to those of Kasaan Peninsula, the same problems of concentration for the removal of sulphur, copper and some rock minerals applies. However, a much greater tonnage is apparent on this than any individual property of the Kasaan Peninsula. The Jumbo group consists mainly of patented claims now held by the Charles A. Sulzer Estate.

K+120-96 A deposit of carbonate iron ore, consisting of the mineral siderite, is located at Nehenta Bay on the southwest end of Gravina Island, Ketchikan district. This occurrence is a vein deposit, which has an average width of 20 feet and a known length of 1,000 feet. Geologically, it lies between a conglomerate on the southeast or footwall and a limestone hanging wall. The vein has a general strike of

northeast-southwest and the dip is northwesterly at a steep undetermined angle. This deposit of siderite represents a replacement deposit with the siderite replacing the crystalline calcite and dolomite into which the limestone has been altered. These sediments in the area are classified by Buddington[1] as of upper Triassic age and are shown in contact with the intrusive mass of quartz diorite which forms the southern and eastern end of Gravina Island. The contact between the conglomerate and limestone was apparently a zone of weakness in which a brecciated zone was formed. This zone was also the path of ascending hot solutions carrying large amounts of iron, a little copper, sulphur, and minor amounts of lead and zinc, together with silica. Replacement of the fractured pirces in the zone is evident, together with fracture filling.

Specimen T.D.M. 477 of the fresh siderite vein material shows in thin section 75-80 percent siderite, which has replaced the calcite and dolomite crystals of the limestone. Slight oxidization is evident along the outer faces of the crystals and minute fractures. A fresh bluish vein quartz has formed small veinlets through the original rock and replaced a portion of the original minerals. The amount of quartz averages from 15 to 20 percent, with less than one percent sulphides of pyrite, chalcopyrite, etc.

Siderite contains, when pure, 62 percent iron oxide or 48 percent metallic iron. It is mined for an iron ore in some European countries where found in nearly massive form. This deposit may be of future value due to its fluxing qualities with combined lime, silica and iron. On the date of the writer's visit this deposit was not held.

[1]Buddington & Chapin, Geology and Mineral Resources of Southeastern Alaska, U. S. Geol. Survey Bull. 800, Plate I.

Other prospects and properties on which magnetite bodies of good grade have been reported in Southeastern Alaska

(Ketchikan Precinct)

Name	Owner	Location	Remarks
Goodhope KK 121-49	None	One-half mile inland from head of Hunter Bay, west coast of Prince of Wales I.	Contact metamorphic deposit, lens along contact 15 feet wide exposed, 80 ft. length. Sample by Geo. Lemmons, Ketchikan gave iron 65.5%, sulphur 0.09%
Tah Bay deposits KK 121-1	None	Tah Bay, west coast of Prince of Wales Island	Contact metamorphic magnetite deposit. Extensive outcrops. None developed. Reported to be large. See U. S. Geol. Survey Bull. 662, "Mineral Resources of Alaska, 1916"
Mammoth prospect KK 119-70	Unknown	Kasaan Peninsula, 6 miles NW. of Kasaan, 1/3 mile from beach, Prince of Wales Island	Chalcopyrite-magnetite ore body--limits unknown
Rush & Brown property KK 119-2	Alaska Gold & Metals Co., Ketchikan	2 miles inland from head of salt chuck, Kasaan Bay, Prince of Wales Island	Chalcopyrite-magnetite body developed to 100 feet length, 30 feet wide.
		(Juneau Precinct)	
Coughlin property	Robert Coughlin & Associates, Juneau.	Glacier Bay area between Dundas Bay and Glacier Bay, north side of North Passage	Reported million tons magnetite ore near tide water. Sample obtained gave 63.7% iron, 0.6% phosphorus, 0.1% sulphur
Snettisham KK 115-19	None	Port Snettisham, 100 yards east of first point, opposite P. O. 30 mi. SE. of Juneau	6-foot vein of solid titaniferous magnetite--reported to carry 4 to 5 percent titanium.

LEAD AND ZINC

Southeastern Alaska contains several occurrences of lead and zinc. The lack of nearby facilities for the reduction of these two metals, the high costs of transportation, and the low price scale, has retarded both the mining and development of the known prospects. The past production in Alaska of these metals has consisted mainly of that recovered in concentrates as a by-product of gold mining, and a few shipments of high-grade ores. The present war stimulation for increased production of metals,and the government bonus for newly mined metals, has not in Southeastern Alaska caused any noticeable change. While there are many economic conditions which contribute to this situation, one factor, which is generally true for the whole coastal area of Alaska, is the lack of extensive lead-zinc deposits warranting large-scale production. The future holds the possibility of a reduction plant in British Columbia, which would with regard to Southeastern Alaska, providing tariff barriers are favorable, allow development and some mining of this type of ore.

The Hyder precinct in Southeastern Alaska contains the greatest amount of silver-lead and zinc prospects. Others are highly scattered in the Ketchikan, Petersburg and Juneau precincts. With regard to the many known prospects, none is equipped for concentration nor are any producing at the present time. Some are, however, developed to the extent that partly proven ore bodies are known, and shipments of ore could be made in a relatively short period.

Occurrences

The Hyder precinct, which is favorably situated with regard to salt water transportation at the end of Portland Canal, contains several silver-lead and zinc prospects. Some of these have already produced small shipments of ore, which has been of a high-grade tenor. Transportation within the area is favorable with the existing system of roads. Since no single prospect or property offers extensive tonnages, several prospects combined under a leasing system with custom concentration, would supply a continuous tonnage. Those properties from which shipments of ore have been made, and those known to contain commercial ore, are mentioned in the following list under this precinct. Descriptions of these prospects are contained in U. S. Geol. Survey bulletin 807, "Geology of Hyder and Vicinity, Southeastern Alaska" by A. F. Buddington.

The Ketchikan precinct contains a few known zinc and lead-zinc properties which contain minable amounts of ore. Two are worthy of more consideration. These are locally known as the Moth Bay zinc and the Mahoney lead-zinc prospects.

K-120-48 The Moth Bay zinc property is located about 14 miles south of Ketchikan at the head of Moth Bay at the entrance to Thorne Arm. The showings are situated 2,600 feet from tide water at an elevation of 300 to 400 feet. A small group of patented claims is held by the Freeburn Development Company which is represented by Martin Bugge of Ketchikan. The main adit workings consist of 370 feet of crosscut and 450 feet of drift, the latter paralleling the mineralized zone, and from which short crosscuts cut the sulphide bodies. Sulphide ore, with sphalerite predominating, is exposed in the crosscuts of the east drift for a distance

of 240 feet. Whether this is a continuous ore body or a series of parallel lenses, has not been definitely proven. These ore bodies, as exposed in the adits and surface cuts, are situated along a contact of diorite and mica schist. The ore bodies entered from the diorite contact into the mica schist, and according to Stewart,[1] represent

> "An impregnation of metallic sulphides along folia of the mica schist apparently accompanied by silicification, and to some extent as replacement of the schists by sulphides. Localization of ore shoots appears to be dependent on the structural features of the rocks."

The width of ore sampled in the main adit varied from 10 to 16 feet and the samples contained amounts of zinc ranging from 0.25 to 14.2 percent, with low percentages of lead and copper and low gold and silver values.

XX120-6 The Mahoney prospect is located 10 miles northeast of Ketchikan, on the west shore of George Inlet midway between the head and the entrance at the mouth of Mahoney Creek. This lead-zinc showing consists of a compound bedded vein averaging 4 feet in width exposed 400 feet on the surface by 12 surface cuts and for 80 feet in one adit. The vein and its associated formation of black slate in which it is inclosed, and due to their overlying position relative to a small tongue of quartz diorite to the south, have been folded into low plunging anticlines and synclines. These alternating folds have a width of nearly 150 feet measured from crest to crest. This folding was followed by the injection of three different kinds of dikes into the sediments paralleling the

[1]Stewart, B. D., Report of Cooperative Mining Investigations, March 31, 1931, p. 19.

bedding and occupying the crests and limbs of the developed folds. One siliceous type of dike is associated with the vein and acts as the footwall. The vein follows in dip the plunge of the folds, approximately 20° to the north.

The hanging wall half of the compound vein consists of nearly massive galena and sphalerite, while the footwall half is made up of banded quartz containing a dissemination of these sulphides with a little chalcopyrite and pyrite. A total of 18 channel samples were taken in the adit and surface cuts ranging in width from 12 to 40 inches, average 24 inches, of the hanging wall portion. These gave an average of 7.03 percent lead and 27.55 percent zinc.

12X117-6 In the Wrangell precinct, the Ground Hog Basin lead and zinc prospect is one of the most promising in Southeastern Alaska. This group of patented claims is located on the mainland 13 miles northeast of Wrangell. The claim group is owned by W. D. Grant of Wrangell. Active development, which consists of diamond drilling, is being carried on by a Canadian company at the present time.

Three lead-zinc veins are exposed and the main vein has an exposed length of 3,200 feet. This vein is situated on the General Sherman and General Grant claims and has been developed by three crosscut adits and nineteen trench cuts. According to Brooks,[1] a report by Campbell, Wells & Elmendorf of Seattle, Washington indicates

> "The width of the vein ranges from 1½ to 9 feet and averages 3 feet. The average of 24 assays, each made on the full width of the vein, is approximately zinc, 17 percent; lead, 2½ percent; silver 1¼ ounces. * * * * *

[1]Brooks, A. H. et. al., Mineral Resources of Alaska, 1921, U. S. Geol. Survey Bull. 739, pp. 60-61.

"About 25 feet below the main vein is a parallel vein similar in character which pinches and swells and ranges from 10 inches to 4 feet in width. * * * * *

About 350 feet beneath the main ore vein, measured at right angles to the dip, is another parallel vein. This has been crosscut by an adit where it is from 1 to 2 feet thick and of similar character to the others."

The geology of the area enclosing these veins is of note, since the ore bodies are held to be tabular replacement veins in a fine grained gneiss. The formations are alternating layers of schist, quartzite and micaceous bands with younger injections of aplitic dike rocks and sheets of quartz porphyry. The ore bodies of this property and the other known prospects are included in a slate-schist belt ranging in width 2 to 3 miles and situated between two intrusive masses of quartz diorite. The eastern mass represents the main western contact of the coast batholith. The eastern margin of the belt grades into gneiss and contains numerous acidic intrusions apparently associated and representing the later phase of the batholith. Since the schistosity of the gneiss generally follows the strike of the main contact and the veins formed in long shears and fissures which conform to this strike, a long continuous structure resulted. This factor, and the replacement tendencies of the veins, are worthy of careful consideration in large-scale mining. According to Shepard,[1] an estimated 200,000 tons of minable ore is exposed by surface exposures and workings. This estimate is based on a depth to the lowest adit below the surface exposures.

The other prospects in the vicinity are listed below under the Wrangell precinct. They are the Berg, Glacier Basin and Lake groups. They appear to be smaller in extent; however, they lack development and exist in similar geological surroundings.

[1]Shepard, J. G., unpublished report for the Territorial Department of Mines.

LIST OF PROSPECTS CARRYING COMMERCIAL BODIES OF LEAD OR ZINC, TOGETHER WITH GOLD, SILVER AND OCCASIONAL COPPER

(Hyder Precinct)[1]

Name	Owner	Location	Remarks
Daly-Alaska KX 118-50	Unknown	Mile 11, Hyder Road, south side Salmon R.	High-grade silver-lead ore with some zinc.
Cantu KX 118-44	Cronholm & McDonald	Cantu Mtn., adjacent to International boundary, west side of Salmon Glacier.	Shipment of 20 tons of sorted ore returned $88.10 to $108.79 a ton gross value, mainly lead values.
Homestake KX 118-33	Hewitt & Carlson	1¼ miles north of West Fork near Ibex Creek, Texas Creek Road.	9½ tons shipment, $116.80 per ton gross value, 50 percent lead.
Ibex KX 118-31	Hewitt & Carlson	West side of Ibex Gulch, Texas Creek Road.	Contains small shoots composed mainly of galena
Engineer KX 118-23	Unknown	East side of Ferguson Glacier near end of Texas Creek Road.	Small shoots galena ore, 11.3 to 55.3 percent lead.
Olympia, Nevada & Starboard claims KX 120-63	British-American Holding & Dev. Co.	Ridge between Fish & Skookum creeks	Shipment of 64 tons averaged $90 a ton - mainly lead.
		(Ketchikan Precinct)	
Coning Inlet prospect	Henry Foster	Coning Inlet, E. side of Long I., 1¼ mi. from beach.	Undeveloped prospect, limits and grade unknown.
Moonshine Group KX 119-33	Abandoned.	Prince of Wales I., 1½ mi. inland from central west portion of South Arm of Cholmondeley Sound.	Shipment of high grade galena ore

[1]Buddington, A. F., Geology of Hyder and Vicinity, Southeastern Alaska, U. S. Geol. Survey Bull. 807.

(Petersburg Precinct)

Name	Owner	Location	Remarks
Coronation Island KH 119-150	Abandoned	Coronation I. near west coast of Prince of Wales I., mouth of Sumner Strait.	Shipments of high grade galena ore.
Kuiu Zinc KH 116-7	J. C. B. Hawkes & Associates	Keku Strait, Kuiu Island	Partly developed body of zinc-manganese ore - assay of zone up to 10 percent.

(Wrangell Precinct)

Berg	J. Mundy, Wrangell	Berg Bay, Blake Channel, 6 miles inland.	Stockwork containing lead and zinc sulphides - lacks development.
Glacier Basin	Unknown	6½ miles inland from mouth of Mill Cr. on on Eastern Passage, east of Wrangell	Tabular deposit formed by replacement - lacks development.
Lake Group KH 117-26	In 1925 owned by Lake Virginia Min. Co. - present unknown	4 miles east of mouth of Mill Cr. on Eastern Passage, east of Virginia Lake.	Several small fissure fillings of high grade lead ore - lacks development.

(Juneau Precinct)

Point Astley KH 5-12 115-13	H. Ahrenstedt, Juneau	Point Astley, Holkham Bay.	Zinc-copper-silver ore, undeveloped, on beach.
Enterprise KH 113-4	Unknown	Tracy Arm	Zinc-copper sulphide ore, small vein.

MANGANESE

Manganese deposits containing commercial shipping grade ore are not known to exist in Southeastern Alaska. Little attention has been given to this metal in the ~~entire~~ Territory, ~~due to~~ on account of the high costs of transportation, and lack of markets in the past on the Pacific Coast. The present development of an iron and steel industry on the Pacific Coast may lead to further prospecting and development of this metal in Southeastern Alaska.

The known manganese occurrences of Southeastern Alaska are found in three geologic periods. The most extensive occurrences are those associated with the upper Tertiary lavas. These lavas cover extensive areas on Kupreanof and Kuiu islands, and the southern end of Admiralty Island. Another is associated with the upper Carboniferous or Permian age, as the manganese of the northeastern end of Kuiu Island. While these deposits are associated with limestone of Permian age, their origin may be associated with the Triassic extrusives which have invaded the earlier limestones. The third occurrence, and one of undetermined age, is found within the schist belt of interbedded greenstone, phyllite, limestone and quartzite on the southern extension of the Juneau Gold Belt. The age of this group of metamorphic schists is not definitely known, but is classified by Buddington[1] as probably Ordovician to Jurassic or later.

The various manganese occurrences noted by the writer, are associated with the Tertiary lavas, consist mainly of hot spring deposits, highly scattered and usually small in extent, and small amounts contained in residual deposits associated with the iron oxides and hydroxides weathered from the

[1]Buddington & Chapin, Geology and Mineral Deposits of Southeastern Alaska, U. S. Geol. Survey Bull. 800, Plate 1.

lavas. None of this latter type were noted worthy of further mention; however, these lavas warrant future prospecting for this metal.

The deposits associated with the Permian limestones, as noted on Kuiu Island, are of two types. One type is associated with sphalerite and galena and the manganese mineral associated are carbonates and silicates. The deposits represent replacement deposits in dolomitic limestone strata. The other type exists as loose wad and in the form of an unconsolidated blanket overlying both limestone and Triassic lava. These are found near the former and may have originated from the weathering of the silicates and carbonates found in the limestones.

The manganese occurrences associated in the metamorphic complex of the Juneau Gold Belt are confined to good structures, are of fair grade, but are the refractory type.

The known manganese occurrences in Southeastern Alaska are confined to the Juneau and Petersburg precincts.

Occurrences

Juneau Precinct:

KK 113-1 The Sunrise Canyon manganese prospect, owned by Henry Olson and associates of Juneau, is located on the divide between Slocum Inlet and Limestone Inlet on the mainland 25 miles southeast of Juneau. Transportation from the deposits would require 4 miles of road from the head of Slocum Inlet and one mile of aerial tramway.

The undeveloped showings consist of several outcroppings of small manganese-bearing veins confined to a zone of siliceous schists across a width of 200 feet. The zone represents a contact between quartzite

on the west or footwall and amygdaloidal basaltic lavas and tuffs on the h hanging wall. These lavas, with accompanying tuffs, are intercalated between the sedimentaries as a flow now upturned, and both have been subject to intense shearing. Underlying these formations, as noted near sea level 2,000 to 3,000 below, is the diorite and granodiorite of the coast batholith.

The manganese veins are exposed for 1,000 feet from the top of the divide (3000 ft. elevation), northwest on the Slocum Inlet drainage. Thence they are covered with talus, with considerable float showing, for one mile. Thence the veins are again exposed for 500 feet and disappear under talus to the northwest. Float pieces occur in the talus for one-half mile southeasterly down the Limestone drainage side of the divide. The veins are believed to extend for a distance of nearly two miles.

Several veins containing manganese occur within the 200-foot schist zone, but only three have widths greater than one foot. The largest vein has a uniform width of two feet and it is located in the footwall portion of the zone. The next larger vein averages 18 inches in width and is situated near the central portion of the zone. The No. 3 vein averages slightly over 12 inches in width and is situated near the hanging wall of the zone. These veins contain the same type of refractory ore and the highest grade of the two types noted. They have parallel strikes and dips, which conform to that of the siliceous schists, and maintain a persistent definite structure. The vertical range of the ore, as observed between the lowest and highest outcropping, is 1,000 feet and the manganese content apparently is much the same. However, more rhodonite was noted in the lower croppings.

The second or red type of manganese veins are numerous within the schist zone; however, they are narrow in width and contain greater amounts of impurities with resultant lower manganese content. Both types contain oxides of manganese, which is the higher grade or black vein, and make up 20 to 30 per cent of the manganese content.

Assays from several samples of both the low grade and higher grade veins ranged from 10.76 percent to 38.45 percent manganese. Additional data is included in an unpublished report by the writer, entitled "Summary and Itinerary Report of Mining Investigations in Limestone Inlet and Seymour Canal," 1942, on file at the Juneau office of the Territorial Department of Mines.

Samples have been received from the vicinity of Hood Bay on Admiralty Island which contained economic values in manganese. These samples consisted of manganese oxides, together with iron oxides. The geology of this area, according to Buddington,[1] consists of Tertiary volcanics. These occurrences have not been investigated by this department, and the amount of ore or extent of the showings is not known.

MX 11 2-52 Manganese minerals also occur associated with metallic sulphides in the showings of the Mammoth prospect, a group of patented claims located inland 4 miles from the head of Young Bay, northern section of Admiralty Island. No minable amounts of manganese were noted in the present workings.

[1] Op. cit., Bull. 800, Plate 1.

Petersburg Precinct:

K+116-3 Manganese in the form of wad occurs on certain ridges on the northeast end of Kuiu Island opposite Keku Straits. T. Hungerford of Petersburg holds several claims situated along the top of the first ridge inland from the beach at the mouth of Hungerford Creek on Keku Strait. The manganese is found directly beneath the mantle of vegetation on the nearly level top of the ridge. Development work is lacking, hence the depth of this material is not known. The underlying formations of this ridge are lavas, portions of which are highly folded and fractured. The manganese is believed to have originated in overlying limestone beds, which have been worn away, with occasional remnants remaining. Samples taken from this unconsolidated material near the surface gave results varying from 8.22 percent to 39 percent manganese.

K+116-1 Manganese minerals ranging from oxides and carbonates to silicates are contained in the zinc-lead ore of the Keku prospect. This property is held by the Kuiu Zinc Company, and is situated on the northeast end of Kuiu Island at a point 5 miles southeast of Point Cornwallis, the most northerly tip of the island. The major showing consists of a dolomite limestone outcrop 400 feet inland from the beach opposite Twin Islands in Keku Strait. The showing is mentioned under zinc deposits, but contains manganese ranging up to 16 percent. Both the manganese and zinc minerals, with small amounts of galena, are contained in the limestone strata which have been partly replaced by these minerals and others, including silica. The extent of this deposit has not been determined; however, a short adit and some diamond drilling has been done.

MOLYBDENUM

Molybdenum in the sulphide form molybdenite is found widely distributed in Southeastern Alaska. Most of these occurrences contain molybdenite in minor amount in that it is associated with other sulphides in gold and copper ores. Others are found where the molybdenite is disseminated in granitic type rocks and in contact rocks closely related to the intrusives. These two types of deposition, as observed in Southeastern Alaska, in many instances are of too low grade for further consideration; however, occasionally samples of good grade can be obtained. The molybdenite occurrences of note are those confined to quartz veins, dikes and shear zones which are represented by thermal deposition of a later origin than the intrusives themselves. These types of deposition represent a greater concentration, and are more likely to contain commercial amounts of molybdenum than the contact deposits. The prevailing intrusives with which molybdenite is associated in Southeastern Alaska are diorite, granodiorite, and quartz diorite which are the major intrusives of the Coast Batholith and generally held to be of Upper Jurassic or Lower Cretaceous period.

There are many economic factors to be taken into account with regard to molybdenum deposits. Many of these apply to Alaska and extensive or high grade deposits only are to be considered. With regard to the known occurrences of molybdenum in Southeastern Alaska, only one is indicative of extensive limits. Another contains good commercial values, but is limited as to tonnage.

Occurrences

Ketchikan Precinct:

Kt 117-33 A group of claims, namely, Alaska Chief, is situated on Kosciusko Island in the vicinity of Shakan Village on the west coast of Prince of Wales Island. The group is owned by the Alaska Treadwell Mining Company. Here a quartz-albite vein occurs in diorite and has been developed by an adit and surface cuts for a known distance of 520 feet. The vein, according to Smith,[1] ranges in width from 2 to 6 feet and has an average width of 4.1 feet. Hess[2] mentions a report by F. W. Bradley in Min. and Sci. Press, Vol. 117, p. 48, 1918 with regard to ore values and tonnage as follows:

> The ore averages from 1 to 2.28 percent MoS_2 in large lots; 6,270 tons of the high grade ore was blocked out, and 100,000 tons of ore assaying 1.58 percent was indicated."

The development on this property consists of an adit 360 feet in length and surface cuts. The elevation of the deposit is 600 feet. This deposit is very accessible to salt water on Shakan Bay, requiring a short aerial tram to a point where an adequate dock could be built.

Kt 119-145 The San Antonio Metals Company holds a group of claims at the entrance to Port San Antonio on the west coast of Baker Island. Development by this company has consisted of diamond drilling to the extent of four holes and some surface stripping. The major showings consist of shear zones which intersect along tide water and are exposed along the rocky shore. The zone exposed ranges over 600 feet in width, is contained in quartz diorite, and extends inland in a northwesterly direction (note accompanying sketch). The shear zones at their intersections in the

[1]Smith, Philip S., Occurrences of Molybdenum Minerals, U. S. Geol. Survey Bull. 926-C, p. 169.
[2]Hess, Frank L., Molybdenum Deposits, U. S. Geol. Survey Bull. 761, pp. 14-15.

mineralized zone are impregnated with silver, forming numerous small narrow veinlets. These and the fractured quartz diorite contain a sparse mineralization of molybdenite, pyrite and chalcopyrite. Low gold values were also reported.

Average of a number of samples by M. Reese, as mentioned by Smith,[1] contained 0.276 percent of MoS_2. An average of $3 per ton in gold was reported to the writer. An estimate of 100,000 tons has been made by Reese as showing above drainage level. Details regarding this prospect can be obtained from an unpublished report by the writer entitled "Preliminary Report on the San Antonio Metals Company, June 18, 1936" on file at the office of the Territorial Department of Mines.

M-1120-40 A molybdenite prospect held by Langloe Bros. of Ketchikan is located one-half mile west of Roe Point on the south shore of Behm Canal. At a point 400 feet from tidewater, and located along the bed of a small creek, a quartz vein is exposed by outcroppings, cuts and a 12-foot crosscut for a distance of 200 feet. Its traceable length is over 1,000 feet, in a hornblende granite and within a few feet of a contact with a thin stratum of altered magnesia limestone. The vein varies in width from 2 to 4½ feet, averaging over 3 feet. The molybdenite occurs in pockets and disseminations in the quartz and gouge along the walls. The heaviest concentration of molybdenite is on the hanging wall gouge. A sample across this gouge for a width of 6 inches gave 4.29 percent molybdenum. Further information regarding this prospect is contained in an unpublished report

[1] Op. cit., Bull. 926-C.

by the writer entitled "Preliminary Report of Mol Group of Claims" on file at the office of the Territorial Department of Mines.

Among the other occurrences of molybdenite in the Ketchikan district, the contact metamorphic copper deposits on Kasaan Peninsula and in the Copper Mountain area contain small scattered amounts. In these, molybdenite occurs highly disseminated in the copper ores and contact rocks. Other occurrences have been reported from the Chickamin River area in the Hyder district; however, these have not been investigated.

Juneau Precinct:

Many occurrences of molybdenite are known in the Juneau precinct. Several of these are described by Smith,[1] two of which have received some development in the past. These are the Whitney claims on Lemesurier Island and the Muir Inlet Molybdenite group in the Glacier Bay area. Both of these deposits are of the contact metamorphic type and as a result the molybdenite is highly scattered within the contact zones. Other occurrences are known to exist in the Glacier Bay area. They are described by Smith,[1] and some apparently need more prospecting and development before definite statements can be made as to their economic status. Considerable molybdenite float has been reported in quartz distributed along Ryan Creek, a small tributary of the Taku River south of Juneau.

[1]Op. cit., Bull. 926-C, pp. 172-180.

Hyder Precinct:

Molybdenite occurs in several localities in the Hyder district. In most instances this mineral is associated sparingly with other sulphides in some of the prospects. However, the amount is insufficient for mining economically. The only known instance where molybdenite occurs as the KH118-19 mineral of major value is in an undeveloped vein on the Blasher property at the end of the Texas Creek road. The vein outcrops within 800 feet of the end of the road on the north side and on the west end of the property. This vein is exposed for 500 feet and averages in width from 2 to 3 feet. Molybdenite occurs in bunches and disseminations through the entire traceable length of the vein. The general tenor is low, probably ranging between one and two percent molybdenum. The country rock is granite diorite and the vein contains contact minerals.

Skagway Precinct:

KH109-53 Molybdenite occurs disseminated in granite along the railroad 8 miles north of Skagway. Samples received at the Department of Mines office are high grade specimens and represent concentrations in joint planes. The area of granitic rock, mineralized and containing molybdenite, is reported to be large. This area warrants more examination and careful testing. The location along a railroad and near a salt-water harbor, is very favorable.

Smith[1] gives the following estimate:

> "The molybdenite is distributed in patches throughout the granitic rock, and an estimate made by Mertie from merely visual inspection indicated that it formed about 1 percent of the rock."

[1]Op. cit., Bull. 926-C, pp. 180-181.

NICKEL

Nickel occurrences in Southeastern Alaska have been known for many years. Until the present emergency they have received little attention and development. Factors that account for this condition are the low tenor of the ore, high costs, technicalities of reduction, and remoteness from steel industries. The extensive deposits of Sudbury, with their expansibility for production, account for the position of nickel today.

The recent developments by the Bureau of Mines and the investigations of the Geological Survey of nickel deposits in Southeastern Alaska have been noteworthy features. Through the efforts of these two government agencies, an estimated tonnage of several million tons containing nickel and copper has been established. While these deposits are seemingly of low grade, they do represent a potential source which may ultimately be utilized along with the growth of the iron and steel industry on the Pacific Coast of the United States and Canada. The nickel, as it occurs in the primary ores of Southeastern Alaska, is contained in the mineral pentlandite. This is associated with the sulphides pyrrhotite, and chalcopyrite. The copper content of the ores is slightly less than the nickel; however, it will be one of the contributing metals in the future mining of these deposits.

Two known nickel occurrences of note are located in the Sitka precinct on Yakobi and Chichagof islands, another in the Petersburg precinct, and one on Admiralty Island in the Juneau precinct. All are favorably located with regard to salt water transportation, and all require more development.

Sitka Precinct:

RR 114-3 The nickel deposits of Bohemia Basin on Yakobi Island are the most extensive known in Alaska. Yakobi Island is located off the north end of Chichagof Island on the west coast. Numerous claims are held within the nickel-bearing area by S. H. P. Vevelstad and associates. Prior to the recent development by the Bureau of Mines, the work done on this property consisted of an adit 165 feet in length and several rock cuts and strippings. Additional stripping and trenching, with diamond drilling, was accomplished by the Bureau of Mines. According to Reed and Dorr[1] eight sulphide-bearing bodies have been prospected with an estimated tonnage of 6,000,000 tons containing 0.36 percent nickel and 0.27 percent copper. Additional undeveloped bodies are known.

These sulphide bodies occur in norite, which represents the most basic phase of a dioritic intrusive. The contained sulphides pyrrhotite, pentlandite, and chalcopyrite, with the iron oxide magnetite, are the products of segregation from solutions contained in the parent magma representing the basic or end phases of the dioritic intrusive. A section of 90 feet across the sulphide body penetrated by the adit on the Tunnel body was sampled by the writer at 10-foot intervals. This section, according to assay, gave an average nickel content of 0.63 percent. The remaining section contains smaller amounts of sulphides disseminated in the norite. These Bohemia Basin deposits represent the most extensive known nickel deposits in Alaska. They require concentration to produce a concentrate suitable for shipment.

[1]Reed, John C. & Dorr, John N., Nickel Deposits of Bohemia Basin and Vicinity, Yakobi Island, Alaska, U. S. Geol. Survey Bull. 931-F.

KK 114-17

Three similar nickel-copper deposits occur on the west coast of Chichagof Island a few miles south from the Yakobi Island deposits. These deposits are held by S. H. P. Vevelstad and associates. These deposits are occurrences of sulphides containing nickel and copper formed under magmatic segregation in norite. Two of these deposits are of the concentrated variety and contain higher nickel and copper percentages than the Yakobi Island deposits. The Fleming Island deposits, according to Pecora,[1] contains a possible tonnage of more than 10,000 tons of ore that possibly has a content of 2 percent nickel and 1 percent copper. The development on this deposit consists of a 175-foot shaft and 71 feet of underground opening on the 75-foot level.

The second deposit or outcrop of concentrated nickel-copper bearing sulphides is located 3,000 feet southeast of the Fleming Island deposit. The known area, according to Pecora,[1] contains about 500 square feet and the ore resembles the Fleming Island deposit, but is believed to be of lower grade.

The third deposit, as described by Pecora, is exposed 1,000 feet southeast of the second deposit. The formations in this locality are reported to be mainly amphibolite, norite, and gabbro, which contain disseminated sulphides over an extensive area. A few million tons of material is estimated by Pecora to contain perhaps 0.2 percent nickel and 0.1 percent copper.

[1]Pecora, William T., Nickel-copper Deposits on the West Coast of Chichagof Island, Alaska, U. S. Geol. Survey Bull. 936-I, pp. 221-222.

Petersburg Precinct:

KK116-16 Another nickel-copper deposit is described by Reed and Gates,[1] formerly by Buddington,[2] that is located at Snipe Bay on the west coast of Baranof Island. Estimates by Reed and Gates indicate a reserve of 430,000 tons of low-grade nickel-copper bearing material with a probable content of 0.3 percent each of nickel and copper. The boundaries and the grade of the material in the deposit are not adequately known, but indications are that a higher grade and a greater reserve might be determined with development. This deposit is held by S. H. P. Vevelstad and associates.

Juneau Precinct:

KK 112-100 A basic sill located near the north end of Admiralty Island is impregnated with sulphides containing nickel and copper. This sill, known as the Mertie Lode, is situated on the War Eagle Extension No. 2 Claim of the Admiralty-Alaska Gold Mining Company. Development upon this body consists of a 110-foot adit and several diamond drill holes. The formations which enclose this sill consist of phyllite and various types of schist. The length has not been determined; however, a width over 100 feet is known. Reed[3] indicates an approximate reserve of 560,000 tons of material which has an average content of 0.34 percent nickel and 0.35 percent copper. Magnetite and the sulphides pyrrhotite, pentlandite and

[1]Reed, J. C. & Gates, G. O., Nickel-copper Deposit at Snipe Bay, Baranof Island, Alaska, U. S. Geol. Survey Bull. 936-M.
[2]Buddington, A. F., Mineral Resources of Alaska, 1923, U. S. Geol. Survey Bull. 773, pp. 106-107.
[3]Reed, J. C., Nickel-copper Deposit at Funter Bay, Admiralty Island, Alaska, U. S. Geol. Survey Bull. 936-O.

chalcopyrite are the metallic constituents of this basic sill. This deposit offers a problem of concentration on a large scale with indications that a small portion of the nickel is contained in the mineral olivine. Mining conditions and its position near tide water are favorable.

TUNGSTEN

Scheelite is the only tungsten mineral known to occur in Southeastern Alaska. The Riverside mine in the Hyder Precinct has been producing this mineral on a small scale for the last two years. Other occurrences are few and none is developed to the extent of any large proven tonnage of ore. There are many factors favorable to the mining of tungsten ore in Alaska. Due to its relatively high price per pound, it is one of the few metals found in Alaska that can absorb the high labor and transportation costs. The known occurrences of scheelite have been discovered in the mining and development of gold veins, with which they are associated. Little prospecting for tungsten has been carried on in Southeastern Alaska, although many areas are known to be geologically favorable for its existence.

Occurrences

Hyder Precinct:

KA118-41 The Riverside mine is located 7 miles north of Hyder, which is situated at the head of Portland Canal. The mine and mill are favorably located alongside the Salmon River road. The production of scheelite has been confined to the Lindeborg vein, where this mineral occurs in small high grade shoots associated with sulphides of iron, lead, zinc and copper.

The vein occurs in a 50-foot band of green to gray schist enclosed in granodiorite. It is of the shear type, along which small lenses of quartz containing the scheelite and other sulphides have been

formed. One lens has a known length of 200 feet and widths up to 6 feet. The scheelite content has been roughly estimated between one-half and one percent. The small lenses on which mining has been confined are much smaller in extent, but contain high percentages of scheelite. The vein is traceable on the surface for 1,800 feet, and explored underground by two adit levels for a distance of 800 feet.

Scheelite in lesser amounts occurs in one lens in the Ickis vein, which nearly parallels the Lindeborg vein. This vein has a developed length of 750 feet, and has been developed from the same lower adit level. The cross-vein, a vein in granodiorite between the Ickis and Lindeborg veins, appears to be lacking in scheelite.

This property, owned and operated by the J. H. Scott Company, is now under exploratory development by the Bureau of Mines. Favorable results are expected.

K+ 120-6
120-80

The presence of scheelite was found in the Gray Copper vein of the Mountain View Gold Mining Company property, 2 miles southeast of the Riverside mine. This vein has an exposed surface length of 475 feet and a developed length, 300 feet below in the Mountain View adit, of 160 feet. The average width on the surface is between 2 and 3 feet, while underground it has an average width of 12 inches. Scheelite is found associated with sulphides of iron, copper and lead in small amounts over the entire length of the vein both on the surface and underground. Scheelite is lacking in the other veins and showings noted on the Mountain View property.

Sitka Precinct:

RX1145 Tungsten in the form of scheelite occurs in the El Nido vein of the Apex-El Nido mine on Lisianski Inlet, north end of Chichagof Island. The vein was developed for its gold content during the short periodic operation of the mine. The developments on the El Nido vein, according to Buddington,[1] consist of two cross-cut adits totaling 1,000 feet, 420 feet of drift on the vein, and connected by a 200-foot raise.

The vein occurs in aplite in a dioritic country rock. The vein has been traced on the surface for 1,000 feet, and ranges in width from 6 inches to 7 feet. The average width in the lower workings is 16 inches. The amount of metalliferous mineral in the vein is small. The scheelite occurs disseminated through the vein in small amounts and in narrow bands consisting of heavy concentrations of scheelite with quartz, paralleling the vein walls. More investigation is warranted, due to other existing veins and surface showings, with the possibility of locating minable shoots.

The property is patented and is owned by Mrs. J. H. Cann.

[1]Buddington, A. F., Mineral Resources of Alaska, 1923, U. S. Geol. Survey Bull. 773, pp. 116-121.

More investigation is warranted as there are other existing veins and surface showings and it is possible that minable shoots might be located.