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Summary report on the mineral deposits of Annette Island, southeastern Alaska

by

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Work by the U. S. Geological Survey during the summer of 1934 demonstrates that there is sufficient evidence of mineralization in parts of Annette Island to justify further development of its prospects. All known deposits of metallic minerals on the island are associated with the stratified rocks, which are briefly discussed below and there is likelihood that other deposits, as yet undiscovered may be found in similar association.

Geology:

For practical purposes the rocks of the island may be grouped into intrusive igneous rocks and stratified rocks. The intrusive igneous rocks consist of a number of different types, the most widely distributed of which consists chiefly of white granite that is not known to be mineralized. The stratified rocks include rocks of both sedimentary and volcanic origin. They form a fringe bordering the igneous rocks along the north, east, and south sides of the island and are the only formations known to be mineralized. They consist chiefly of limestone, chert, and slate and a series of altered and somewhat mineralized volcanic rocks.

The most encouraging mineralization is found in the limestone, chert, and slate, but chiefly in the limestone and chert of the Crab Bay region on the east side of the island. Barite and a little lead ore have also been found in limestone and chert in Sylburn Harbor on the west side of Annette Island north of Metlakatla, indicating that all the limestone and chert formations on the island are mineralized to a certain degree. Mineral deposits in the limestone and chert occur chiefly in the form of veins but in places, as west of Crab Bay, they occur as irregular small disseminated masses.

The mineral deposits in the limestone and chert contain the precious metals gold and silver as well as the base metals copper, lead, and zinc, and the total value of the ore is thus derived from more than one metal. Seven samples were collected from different mineral deposits in the Crab Bay region and these were assayed in the laboratory of the U. S. Geological Survey. The results are shown in Table I. In considering these figures it should be borne in mind that the full assay value of an ore is never realized by the miner. In all of the processes of mining, milling, and smelting, part of the metal content is inevitably lost, and therefore the amount of metal actually paid for is only a part of the value shown by the assay. In fact, in the treatment of some ores certain metals are not

recovered at all, or are even so obnoxious that they not only are not paid for but are penalized. Thus zinc is usually paid for only at a zinc smelter. At other smelters it is a deleterious constituent and ore with a zinc content greater than about 5 percent is penalized.

TABLE I

Vein samples from Annette Island, southeastern Alaska.
Assays by E. T. Erickson, U. S. Geological Survey.

	Width of vein in feet	Gold oz. per ton	Silver oz. per ton	Lead Percent	Copper Percent	Zinc Percent
K-319(a)	3	.04	None	- - -	- - -	- - -
K-409(a)	1	.04	20.60	9.75	4.63	13.14
K-409(b)	3	.05	13.20	4.00	1.86	5.00
K-411 A	4	.04	0.92	None	0.05	0.21
K-412(a)	1½	.36	0.91	2.00	0.83	0.23
K-412(b)	3	.17	0.34	0.84	0.85	16.75
K-414(a)	1	.03	9.64	12.43	1.26	3.56
K-416(a)	2	.71	0.91	- - -	- - -	- - -

A--The relatively barren portion of K-409(b)

Mineralization in the slate and to a smaller degree in the altered volcanic rock occurs in veins and irregular masses and consists chiefly of gold-bearing quartz, with only minor amounts of base metals. The veins are short and irregular. The irregular masses are more common than the veins, and occur as bodies with a length up to 50 feet. Groups of these small ore bodies, which in places crop discontinuously within a zone of slate about 100 feet wide, and which extend laterally for a few hundred feet, may well be regarded as single ore bodies. Sample K-416 represents material collected from the slate belt on the north end of Annette Island, west of Nadzaheen Cove, the assay results of which are also shown in Table I. The small amount of prospecting that has been done on quartz veins west of Nadzaheen Cove indicates that they pinch and swell in an irregular manner. Nevertheless, they are more or less continuous for at least 600 feet. Abundant irregular quartz veins are also found on the south end of Ham Island off the east coast of Annette Island, and smaller veins in the slate on the south end of Annette Island.

Exploration and prospecting on the island in general have been very meager and superficial, and it is therefore impossible to predict the lateral and vertical extent of the veins. The vein represented by samples K-409 and K-411 is exposed for about 200 feet and is reported to be 900 to 1,000 feet long. The disseminated ore west of Crab Bay, represented by sample K-414(a), is found over an area at least 600 feet in diameter and the gold-quartz lenses west of Nadzaheen Cove are more or less continuous for about 500 feet. The veins may persist at depth to at least corresponding and even greater distances than the surface exposures.

Mining and treatment costs:

In order to show the grade of ore that can be profitably mined under normal conditions the following summary is given of the most important items and cost of each. The mineral deposits of Annette Island consist of two types, namely the complex deposits, consisting of mixed ores, and the gold-quartz deposits. Table II shows the most important items and costs of mixed ore bodies. It should be understood that these figures are only approximate, as costs vary in different mining camps. The figures here used are average figures of several mining operations and are therefore probably lower than would be realized in the early development of mining projects on Annette Island. The cost per ton of such items as management, interest and amortization of capital, exploration and development can only be roughly approximated, as too many variable factors are involved, such as the daily tonnage produced, and size of plant, but this will probably be upwards of $2 a ton. From these figures it is evident that mining and treatment costs for small deposits, located in an undeveloped region, will probably not be less than $18 per ton.

TABLE II

Approximate mining and treatment costs on complex ores

	Cost per ton
Mining	$4.00
Milling	2.00
Freight	4.00 (A)
Smelting charge.	6.00 - 12.00
Management, interest and amortization of capital ($100,000), exploration and development.	2.00 ?
Total	$18.00 - 24.00

(A) Alaska Steamship Co. rate from Ketchikan to Tacoma on ore valued at less than $60 per ton, with higher rates for higher grades of ore.

The cost of mining and treatment of gold-quartz ore would be less than the figures given for complex ores. Gold-quartz ore could be treated in a local mill and most of the free gold recovered. Such items as freight and smelting charges, which are the largest items in treating the complex ores, are thus eliminated and such ores in small-scale operations may be mined and treated at an estimated cost of perhaps $8 a ton.

Conclusions:

The information at hand clearly indicates that the stratified formations on Annette Island in general are mineralized and those parts of the island underlain by them can be considered mineral land. From the foregoing cost figures it can be seen that complex ores with an aggregate metal content of less than $18 to $24 a ton can hardly be considered commercial ore under present market conditions. Three of the veins of mixed ores that were sampled exceed $18 a ton in value, as shown in Table I, and show by their intense degree of mineralization that future exploratory work is warranted. Gold-quartz veins can probably be mined and treated for about $8 to $10 a ton, and these, especially the veins west of Nadsahean Cove, deserve favorable attention.