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BUREAU OF MINES

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War Minerals Report 455

RUSH AND BROWN MINE

KASAAN BAY, PRINCE OF WALES ISLAND

SOUTHEASTERN ALASKA

Copper



WASHINGTON: 1940

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WAR MINERALS REPORT
UNITED STATES DEPARTMENT OF THE INTERIOR - BUREAU OF MINES

W.M.R. 456 - Copper

November 1945

RUSH AND BROWN MINE
Kasian Bay, Prince of Wales Island, Southeastern Alaska

SUMMARY

The Rush and Brown mine has been one of the most consistent small producers of copper ore in the history of Alaskan mining. Approximately 60,000 tons have been shipped to smelters from the property. Production has been made from two distinct and separate, dissimilar ore bodies. The Shear Vein deposit has been mined to a depth of 500 feet below the surface without reduction in size of the ore shoot or grade of ore. The Magnetite ore body has been partly mined to a depth of 200 feet below the surface and has not been fully explored.

Apparently no attempt was made to ship any ore of a grade below 4 percent copper. Based upon old assay records, it is estimated that a minimum of 7,160 tons of blocked-out ore averaging 4.25 percent copper, 0.12 ounce gold, and 0.60 ounce silver per ton is available for stoping in the workings of the Shear Vein ore body between the 200-foot level and bottom level. There is no complete record of the tonnage available in the workings of the Magnetite ore body, but examination by Bureau of Mines engineers indicates an "inferred" tonnage of 13,000 tons averaging 1.23 percent copper, 0.03 ounce gold, and 0.30 ounce silver per ton and 30 percent iron.

An additional 18,000 tons of ore averaging 1.33 percent copper, 0.04 ounce gold, and 0.28 ounce silver per ton is available in surface dumps. The downward extension of the Shear Vein ore body below the 500-foot level may produce 80 tons of 6-percent copper ore for each inclined foot of depth.¹ Extension in depth of this ore body appears to offer the only safe opportunity for additional ore reserves. Bureau of Mines exploration by diamond drilling for new ore bodies and for the extension of the Magnetite ore body was unfavorable. The amount of drilling done by the Bureau of Mines and by the Solar Development Co. was not sufficient, however, to eliminate entirely the possibility of new discoveries.

Although the Bureau of Mines undertook no metallurgical investigation of the Rush and Brown ore, it is believed that the iron content of the

¹ Data from assay maps by Solar Development Co.

Magnetite ore body may be of some consequence. It has been recommended that provision be made to recover a marketable iron concentrate from the Salt Chuck ores,² and a similar consideration might be investigated by future operators of the Rush and Brown property.

There are no surface buildings or equipment at the property. However, the owners also control the Salt Chuck mine,³ 1 mile distant, which has the necessary surface plant to provide power, mill equipment for treating the ore, and housing facilities. The ore may be concentrated at the Salt Chuck straight flotation mill after providing for transportation through the construction of 1 mile of access road.

The Alaska Gold & Metals Co., owners, plan to put the property into production as soon as labor and materials are available.

No further work by the Bureau is proposed at this time.

INTRODUCTION

Because of the favorable production record of the Rush and Brown mine, the present need for copper, and the fact that the owners are attempting to place the mine in production, it was deemed advisable to investigate this property. A preliminary investigation of the mine was made on August 18, 1942, by an engineer of the Bureau of Mines.⁴ A second examination was made on March 20, 21, and 22, 1943, by engineers of the Bureau of Mines⁵ accompanied by A. L. Howard, president and manager of the Alaska Gold and Metals Co. The location of the Rush and Brown mine is shown in figure 1.

A diamond-drilling program was undertaken by the Bureau of Mines⁶ in August 1943. In December 1943, the upper levels of mine were examined by engineers of the Bureau of Mines.⁷

LOCATION AND ACCESSIBILITY

The Rush and Brown mine is at longitude 132° 35' W. and latitude 55° 37' 30" N., near the head of Kasaan Bay, Prince of Wales Island, Southeastern Alaska, about 45 miles from Ketchikan. It is about 1 mile from the tidewater of the Salt Chuck, a lagoonlike arm of Kasaan Bay, which is navigable by barges and shallow-draft boats at high tide. A fair, nearly level trail 1 mile in length leads from the Salt Chuck to the unfinished tunnel. Ore was formerly transported 2-3/4 miles by surface railroad to a deep-water harbor, known as Rush and Brown Harbor, at the head of Kasaan Bay. This railroad has completely deteriorated, except that about 2 miles of 16-pound rails still remain.

2 W. M. E. 423, Salt Chuck Mine, Kasaan Peninsula, Prince of Wales Island, Southeastern Alaska.

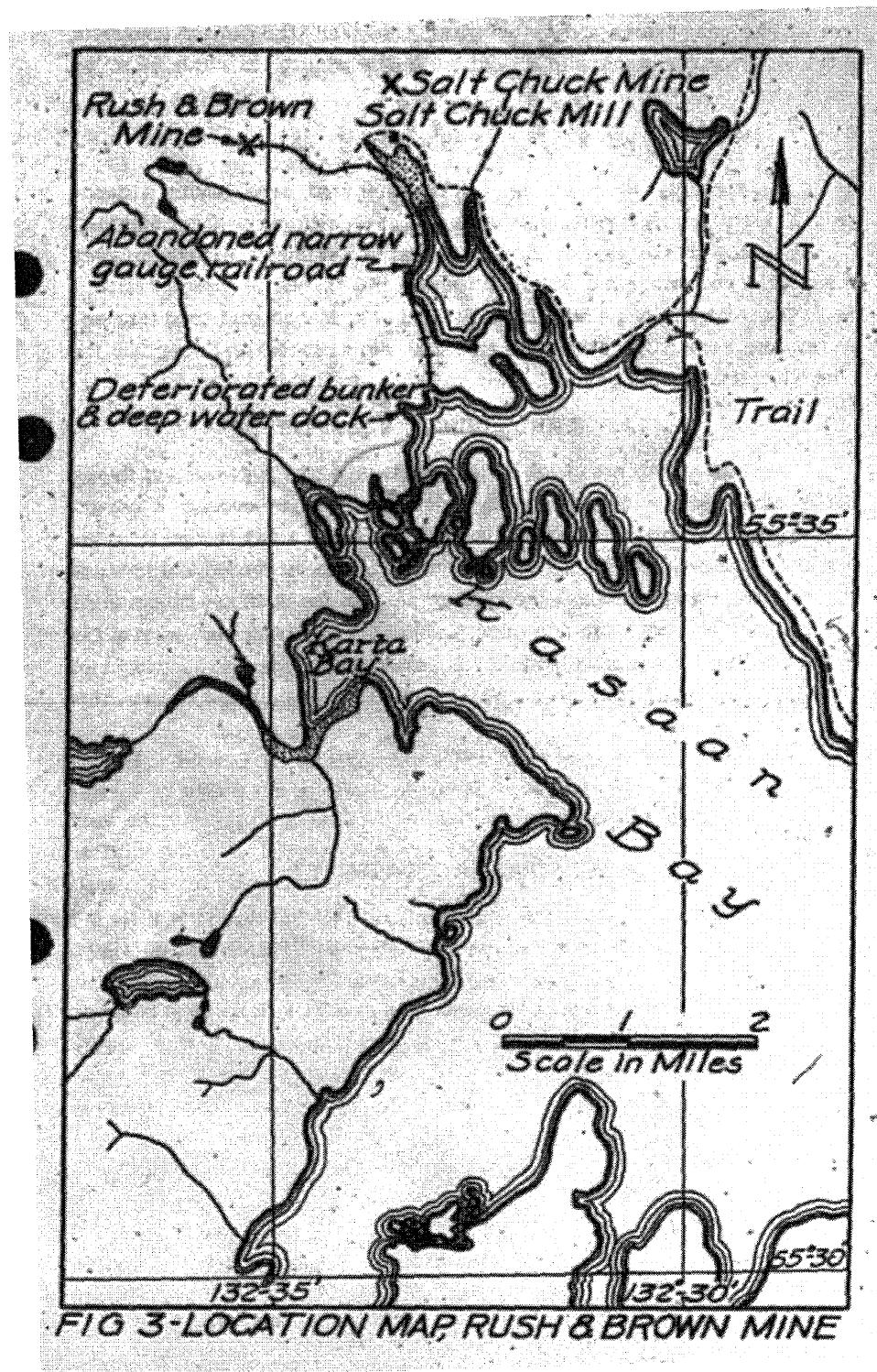
3 See footnote 2.

4 Robert L. Thorne.

5 J. G. Shepard, senior engineer; S. P. Holt, mining engineer.

6 S. P. Holt, A. W. Tolonen, and E. L. Yousse, engineers.

7 A. W. Tolonen and E. L. Yousse.



WAR MINERALS REPORT 456

A small mail boat calls once each week. This boat carries mail, freight, and passengers and is based at Ketchikan, the nearest source of supply. A regular steamship lane of the inside passage is within 25 miles of the property.

PHYSICAL FEATURES AND CLIMATE

The property is in a low, thickly timbered area having a dense ground cover of underbrush. Outcrops are at an altitude of about 400 feet.

Climate in the area is similar to that of Ketchikan, Alaska, winters being mild and summers cool, with about 140 inches of precipitation a year. Considerable snow falls from November to March, and zero temperatures are rare. Operations may be and were carried on throughout the year without difficulty.

LABOR AND LIVING CONDITIONS

The nearest source of labor is Ketchikan, with a population of 6,000. Laborers are scarce at present and wages are high. However, it is thought that enough workmen can be obtained locally at \$8 a day to man the contemplated operation. All personnel would have to be housed and boarded at a company camp. Although the surface plant of the Rush and Brown mine has completely deteriorated, a crew of 30 men could be housed adequately in the buildings of the Salt Chuck mine 1 mile distant.

HISTORY AND PRODUCTION

Original location of this property was made by U. S. Rush and his partner about 1904. The Alaska Copper Co. leased it for a short time and shipped some ore to the company smelter at Copper Harbor on the west coast of Prince of Wales Island. This lease was dropped after the smelter ceased operations. The property was operated intermittently by Rush until 1926, when it passed from his ownership. The original owners did all mining by hand. Their operation necessitated handling the ore six times after breaking and before hand-sorting. From the mine bin, the ore was trammed to lower bunkers at the head of a 2-3/4-mile trestled railroad leading to bunkers at the Rush and Brown Harbor near the head of Kasaaan Bay. The ore was then placed aboard ocean steamships and taken to the smelter. The owners were never able to accumulate enough cash reserves to modernize equipment and methods.

Data assembled by A. L. Howard, president and manager of the Alaska Gold & Metals Co., appear to be reasonably correct. Apparently the Magnetite ore body produced 35,000 tons of ore containing 3.25 percent copper, 0.06 ounce gold, and 0.25 ounce silver per ton. The owner's records show that 9,700 tons of sorted ore averaging 10.5 percent copper, 0.26 ounce gold, and 1.60 ounce silver per ton was shipped from the Shear Vein deposit. Ore from both ore bodies was hand sorted.

RUSH AND BROWN MINE, ALASKA

5

During 1939, the Solar Development Co. optioned the property. They pumped out the workings and sampled the ore remaining in stope pillars and walls and also sampled the bottom level. An adit tunnel designed to meet the inclined shaft near the 300-foot level was started and advanced 1,250 feet from the portal. The tunnel was driven to within 180 feet of its objective for the purpose of providing a permanent haulageway for mine production, permanent drainage above the 300-foot level, and to explore the territory along the projected route. A hole bearing northwesterly and at an angle of minus 46 degrees was diamond-drilled from the tunnel 220 feet without encountering ore. There may be a change in the strike of the shear zone, and it is possible that the drill hole cut through the zone in a barren area, as it terminated in intrusive rocks.

PROPERTY AND OWNERSHIP

The property consists of four claims and two mill sites, all unpatented, the title to which is held by the Alaska Gold & Metals Co.

ORE DEPOSITS

The ore bodies lie in contact zones between diorite intrusives and greenstones. They are of two types - a contact metamorphic deposit of magnetite containing chalcopyrite and a vein type containing sulfide minerals in a tabular ore body within a shear zone.

Mineralization in both types consists of chalcopyrite with associated gold and silver. Gangue is principally metamorphosed greenstone with associated magnetite, pyrite, quartz, calcite, garnet, and amphibole. The contact replacement deposit contains very much more magnetite than the Shear Vein deposit.

The contact metamorphic deposit, which is an irregular mass of magnetite enriched locally with disseminated chalcopyrite and pyrite, has been named the Magnetite ore body. This deposit is cut by numerous basic dikes and horses of country rock. About 160 feet north of the Magnetite ore body a shear zone exists that contains a tabular sulfide ore shoot called the Shear Vein ore body. Some faulting and cross fracturing occurs. The faulting, however, was not complex and was easily solved. At least one other parallel shear zone is known to exist.

Magnetite Ore Body

The contact-metamorphic Magnetite ore body, having been discovered first, was the first to be put into production. A glory hole was started and mined to a shallow depth. Numerous hard dikes and horses of country rock were encountered. As the operators were mining by hand methods, single jack and hand steel being used, this as well as the fact that copper mineralization was not uniform made profitable mining questionable. The operators made an estimated production of 35,000 tons of ore from this

8. WAR MINERALS REPORT 455

deposit containing 3.25 percent copper, 0.08 ounce gold, and 0.25 ounce silver per ton.

The ore body was drained to the 200-foot level by a Bureau of Mines drill hole and the old workings at the 100-foot level were examined. A considerable tonnage of ore was found remaining in large pillars and as a shell around the perimeter of the old glory hole. It is estimated that 3,000 tons of "inferred" ore averaging 2.0 percent copper and 10,000 tons averaging 1.0 percent copper can be recovered. The ore also carries 20 to 40 percent iron.

Old workings showed that lateral limits of the main ore body had been reached and that only small veins extended any distance into the walls. Bureau of Mines drilling confirmed the opinion that no ore extended to the west on the 300-foot level.

Shear Zone Ore Body

Upon the discovery of the Shear Vein ore body, mining was centered on this ore shoot because of its higher copper, gold, and silver content and greater regularity. A drift was driven from the 200-foot level to the Shear Vein. This shoot was developed laterally and was stoped through to the surface. Some ground above the 200-foot level remains unexplored. Maps and other information would indicate that the ore shoot was about 200 feet long and had an average width of 4 feet. The ore on the 500-foot level does not appear to have diminished either in grade or size from that mined in the stope above. A considerable tonnage of minable ore was left by the operators, who appear to have chosen a mining cut-off of 4 percent.

EXPLORATION BY BUREAU OF MINES

At the time of the preliminary examination, reliable records indicated that a considerable tonnage of ore could be obtained from the Shear Vein ore body. Records of the Magnetite ore body were incomplete, but its past production suggested that marginal ore might be left in the old workings and also that a small amount of exploration was justified. The old workings were filled with water during the preliminary work.

A program of drilling was laid out by the Bureau to accomplish the following:

1. To explore the lateral extension of the Shear Vein system for new ore shoots.
2. To explore for lateral and vertical extensions of the Magnetite ore body.
3. To explore for new ore bodies in a second shear zone, which was indicated by the geologic structure.
4. To unwater the mine to the 200-foot level by means of one of the exploratory drill holes.

RUSH AND BROWN MINE, ALASKA

7

Four drill holes, varying from approximately 36 feet to 165 feet in length, were drilled for a total footage of 431 feet and 7 inches. No ore or favorable indication was encountered in any of the holes. However, it is not believed that this small amount of drilling has eliminated all favorable areas.

In December 1943, the property was again examined, as the mine had been drained to the 200-foot level by drill hole RB-4. The Magnetite ore body was accessible on the 100-foot level and a rough estimate was made of the tonnage remaining in the ore body.

DEVELOPMENT

Shortly after discovery of the Magnetite ore body, an open pit or glory hole was started. This method of mining was followed to a shallow depth. Subsequently, a 200-foot vertical shaft was sunk just outside of the ore body, and ore from the bottom of the glory hole was mined by means of short "V" cuts and raises and hoisted through this shaft to the surface. The drifts and raises were not timbered and are reported to be in good condition. Maps of these workings are not available, but the workings are known to be rather limited. No exploration was carried on outside the glory hole.

The Shear Vein deposit was developed by cross cutting a distance of 165 feet from near the shaft on the 200-foot level. After encountering the ore body, drifts were driven along the vein until the grade of ore was below the economic cut-off. An inclined winze was sunk along the dip of the Shear Vein to the 500-foot level, and levels were opened at 50-foot intervals and were extended beyond the confines of the ore shaft. Walls of green-stone stood well, and very little timber beyond an occasional stull was used. No serious faulting existed, and the mine made very little water. Stopes were left open and were 4 to 12 feet wide. Blocks of ore that were considered low grade by the owners remain in place. It is reported that in 1929 the open stopes could readily be traversed.

ORE RESERVES

Ore reserves in the Shear Vein consist of pillars and submarginal ore left in the stopes by previous operators. Although there is an unexplored area above the 200-foot level, only the ore remaining between the 200- and 500-foot levels is included in the reserves. As the mine workings were full of water below the 200-foot level, it was necessary to calculate the ore reserves from assay maps of the Solar Development Co.

The Magnetite ore body was examined by a Bureau engineer in December 1943. A large part of the ore body was inaccessible, but the tonnage and grade of ore remaining in stope pillars and walls were estimated:

WAR MINERALS REPORT 455

One small surface dump was sampled by the Bureau of Mines and estimated to contain 8,000 tons of ore. It is also estimated that 10,000 tons of ore can be sorted from another dump containing 30,000 tons of mixed waste and ore.

The Shear Vein ore shoot has continued uniform in size and grade from the surface to the 500-foot level. There is no reason to believe that it will not continue in depth. This ore body may produce 80 tons of 6 percent or better copper ore per foot of depth. The following table shows ore reserves above the 500-foot level:

<u>Mine ore</u>							
Class	Tons	Copper		Gold		Silver	
		Percent	Total lb.	Oz./Ton	Total oz.	Oz./ton	Total oz.
Positive	7,160	4.45	605,600	.12	72,672.00	.60	4,396.0
Inferred	11,000	1.83	119,500	.03	359.00	.30	3,900.0
Total	20,160	2.30	625,100	.05	1,244.00	.50	8,196.0

<u>Dump ore</u>							
Positive	Tons	Percent	Total lb.	Oz./Ton	Total oz.	Oz./ton	Total oz.
Positive	8,000	1.75	250,000	0.05	450	0.25	2,000
Inferred	10,000	1.00	200,000	.03	300	.30	1,000
Total	18,000	1.33	450,000	.04	750	.25	5,000

ECONOMIC CONSIDERATIONS

At current market prices of \$35 an ounce of gold, 50 cents an ounce of silver, and 12 cents a pound of copper, an operating loss would be incurred in exploiting the known reserves.

The ores are readily amenable to treatment, and the following minimum recoveries may be obtained: 90 percent of the copper, 70 percent of the gold, and 65 percent of the silver. Ratios of concentration of the various ores will range between 5:1 and 20:1.

Positive mine ore, 5:1
 Inferred mine ore, 20:1
 Positive dump ore, 10:1
 Inferred dump ore, 20:1

EQUIPMENT

All surface improvements have completely deteriorated except a usable blacksmith shop at the portal of the uncompleted tunnel. There is an air pipe line 6,000 feet long in good condition from the Salt Chuck compressor to the Rush and Brown mine. Four thousand feet of this pipe line is 4 inches; the balance 3 inches in size. Other equipment consists of a No. 7 Cameron sinking pump, a small steam hoist capable of handling the pump, a 16-cubic foot mine ore car, and plenty of 16-pound rail for any anticipated mine requirements. The 1,251 foot tunnel is in good condition and is equipped with air and water pipe lines, and track. Air can be furnished by the Salt Chuck mine compressor, which is 300-cubic foot capacity.

RUSH AND BROWN MINE, ALASKA

9

PROPOSED OPERATIONS

The Alaska Gold & Metals Co. proposes to place the property in production on a 50-ton-a-day basis as soon as labor and supply conditions improve. It is proposed to mine the developed ore, transport it to the Salt Chuck mill for grading and standard flotation treatment, and dispose of the product to the Tacoma smelting plant of the American Smelting & Refining Co. After production has been started, it is proposed to develop the Shear Vein ore body below the 500-foot level by sinking the present winze and to explore the contact metamorphic deposit by drifting and cross cutting on the 200-foot level.

CONCLUSIONS

The Rush and Brown mine has been a steady and consistent small-tonnage producer of copper in spite of operating handicaps. It has enough ore left in sight and favorable enough prospects, particularly in the downward extension of the Shear Vein, to warrant reopening the property.

Bureau of Mines explorations did not discover new ore, but explorations were not extensive enough to thoroughly explore some of the favorable areas.

Much of the ore in the Magnetite ore body and some of the dump ore could not be worked profitably without a premium price for copper. However, it is believed that the ore shoot in the Shear Vein can be developed in depth and exploited profitably in conjunction with the ore remaining in the stopes.

It is still possible that the northeast extension of the Shear Vein has not been explored sufficiently for new ore shoots and that the Magnetite ore body may extend below the 300-foot level, although possibly reduced in size. Exploration in these directions is warranted by any operator, but the property is too small to justify further work by the Bureau of Mines.

The possibility of producing a marketable iron concentrate from the high iron ores from the Magnetite ore body has not been investigated. The small tonnage of proven ore available does not justify further investigation of this possibility now.