MINERAL LAND ASSESSMENT OF THE WEST PORTION OF WESTERN CHICHAGOF ISLAND, SOUTHEAST ALASKA

By J.C. Still and K.R. Weir, Alaska Field Operations Center, Juneau, Alaska

* Open File Report 89-81

UNITED STATES DEPARTMENT OF THE INTERIOR

James G. Watt, Secretary

BUREAU OF MINES

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MINERAL LAND ASSESSMENT OF THE WEST PORTION OF WESTERN CHICHAGOF ISLAND, SOUTHEAST ALASKA

by

Jan C. Still[1] and Kevin R. Weir[2]

ABSTRACT

The Bureau of Mines in 1978 and 1979 surveyed the mineral potential of the west portion of western Chichagof Island as one part of the examination of the western Chichagof and Yakobi Islands wilderness study area, Tongass National Forest, Southeast Alaska. The study included literature and claims records search, field examinations of the reported mines, prospects or claims and field evaluation of geochemical anomalies noted by the Geological Survey during concurrent investigations. Two types of mineralized zones were found. One is east of the head of Slocum Arm where a 2 by 6 mile area, called the Slocum Arm molybdenum area, is estimated to have moderate potential for the development of porphyry or vein type molybdenum deposits. The second, called the West Coast gold area, an 8 by 27 mile area extending from near the head of Slocum Arm northward to Goulding Harbor, is estimated to have moderate potential for the development of fault controlled gold-silver lode deposits. The center of mining activity within this area of moderate potential is a 5 by 6 mile zone of estimated high mineral potential for the same type of gold-silver deposits. This zone surrounds Doolth Mountain and is called the Doolth Mountain area. It contains 52 patented

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claims and all the measured, inferred, hypothetical and marginal reserves; 715,000 oz. gold and 203,000 oz. silver. Almost the entire recorded mineral production of the study area was from this zone; 793,000 oz. gold and 233,000 oz. silver produced between 1906 and 1943 mostly from the Chichagoff* and Hirst-Chichagof Mines.

INTRODUCTION

Authorization and Purpose of Study

In accordance with the provisions of the Wilderness Act (Public Law 88-577, September 3, 1964) and the Joint Conference Report on Senate Bill 4, 88th Congress, the U.S. Geological Survey and the U.S. Bureau of Mines** have been conducting mineral surveys of wilderness and primitive areas. The act provides that areas under consideration of wilderness designation be studied for suitability for incorporation into the wilderness system. The mineral surveys constitute one aspect of the suitability studies. This report presents the results of a mineral survey of some national forest lands (Tongass National Forest) in the west portion of western Chichagof Island within the 633 square mile West Chichagof - Yakobi Islands wilderness study area, Southeast Alaska. This area was being considered for wilderness designation. The area was closed to mineral entry as part of a two year Secretarial withdrawal, on December 5, 1978. Public Law 96-487 (December 2, 1980) rescinded the withdrawal, again opening the area to mineral entry, but also created wilderness status for almost all of the west portion of western Chichagof Island. The area designated as wilderness will be opened to mineral entry until December 31, 1983 under the Wilderness Act of 1964 (88 577).

* Chichagof (or "ff") is spelled with the single "f" when referring to geographic or geologic names. Names of prospects and mines are found with both the single and double "f".

** Referred to as Bureau of Mines in text and BuMines in reference section

The area studied is about 35 miles northwest of the town of Sitka and 75 miles west of the town of Juneau in southeastern Alaska. Figure 1 shows the area location.

Scope

The western Chichagof - Yakobi Islands wilderness study area was divided into two sections for field study and for report presentation. This report covers the gold mines and prospects within the West Coast gold area and the molybdenum occurrences in the Slocum Arm molybdenum area, all located within the west portion of western Chichagof Island. Figure 1 shows these areas and their location within the larger wilderness study area. Another report (Kimball, Rataj, 1981) will cover the gold, nickel-copper-cobalt and other occurrences within the remainder of the wilderness study area. It also covers some minor occurrences and geochemical anomalies mostly within the Goon Dip Greenstone in the southeast part of the west portion of western Chichagof Island.

Setting

The west portion of western Chichagof Island is within the Tongass National Forest and is bounded on the southwest by the Pacific Ocean. The area is approximately 30 miles long by 10 miles wide.

The topography of the area is moderately rugged with high peaks and ridges at about 3000 feet in the interior of the island, separated by river valleys and lakes at near sea level elevations. The coastline is particularly irregular, consisting of a myriad of small islands, peninsulas, fiords, and rocks. The weather in the study area is typically maritime and extremely wet. Temperature extremes are moderate by proximity to the ocean, but low clouds, fog and light rain are typical at sea level

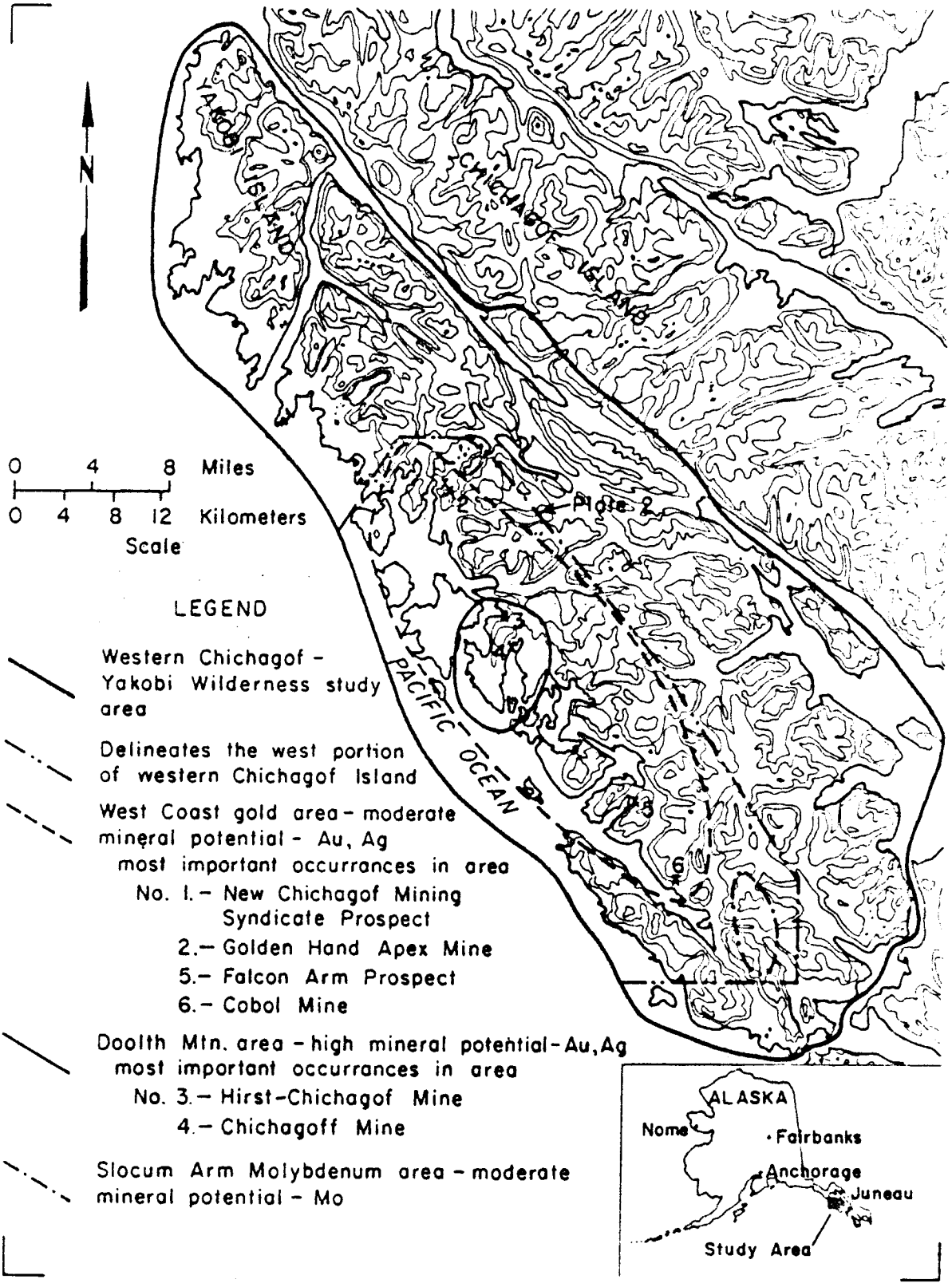


FIGURE 1. - Showing the study area location, west portion of western Chichagof Island and the West Coast gold, Doolth Mountain and Slocum Arm molybdenum areas covered by this study.

throughout the year with added freezing rain and snow in the winter months. The large number of fiords and inlets allows easy access to the shoreline for small boats except along the outermost coastline, which is exposed to the ocean swells. The ridgetops are generally rounded and easily traversed on foot. Due to the heavy rainfall, vegetation is extremely dense between sea level and about 2000 feet. Access to this area is difficult and time consuming.

Previous Studies

Gold was discovered within the area in 1905 near the head of Klag Bay. U.S. Geological Survey publications on the mineral deposits and geology of the district begin in 1905 with a report by C.W. Wright. Detailed descriptions of subsequent mining and prospecting activity are provided by the following publications: Knopf, 1912; Overbeck, 1919; Buddington, 1925; Reed and Coats, 1941; Rossman, 1955; and Loney and others, 1975.

U.S. Bureau of Mines publications on the mineral deposits of the area include reports on the Chichagof mining district (Thorne, 1967; Metz, 1978), Chichagoff mine (Smith, 1916; Humphrey, 1936), Hirst-Chichagof Mine (Humphrey, 1936, 1938), and the Slocum Arm molybdenum deposit (Thorne, 1952).

The Territory of Alaska Department of Mines engineers examined mineral deposits in the area, resulting in reports beginning in 1918 and continuing until 1959.

Unpublished reports by Alaska-Juneau Gold Mining Company engineers and various prospectors and engineers working in the area are available at the U.S. Bureau of Mines Library in Juneau.

Acknowledgements

The efficient and skillful support provided by P. Johnson and E.N. Davis, owner and operator, respectively, of the M/V Mowich is gratefully acknowledged. The skill and judgement of Eagle Air helicopter pilots C.M. Wilkerson and T. Freeburg is most appreciated. I. Miller of the Sitka Historical Society provided documents of the Chichagoff Mining Company and the Hirst-Chichagof Mining Company for research purposes. Information on mineral deposits of the area was provided by various miners and prospectors, including J. Breseman, J. and N. Brockway, J. Ballard, F. Branson, M. Lynch, A. and L. Parker and O. Lillegraven.

Analytical support was provided by the following U.S. Geological Survey Branch of Exploration Research personnel: J.D. Hoffman, C. Forn, G.W. Day, J.C. Lucus and F.N. Ward.

Sample preparation was by D. King, petrographic studies were by W.L. Gnagy and fire assays were by C.W. Merrill, Jr. and K. Weir. Additional analyses were done by the U.S. Bureau of Mines Reno Research Center, Skyline Labs, Wheatridge, CO., and Barringer Research, Inc., Wheatridge, CO.

Present Studies

The present study of the west portion of western Chichagof Island embraces pre-field, field and post-field activity consituting research of known data, on-site collection of new data and synthesis of both into a public report.

The pre-field activity consisted of claims records and literature research; contact with exploration companies, consultants and prospectors; cooperative work with the U.S. Geological Survey regarding local and regional geology; and identification of geochemically anomalous areas.

The information thus obtained on deposits, prospects, claims, anomalous areas and stained zones was synthesized to identify important field targets.

During field studies on-site examinations of claims, prospects, mines, workings, stained zones, and geochemically anomalous localities were made. Also, geological and engineering mapping and quantitative sampling was done in detail at most sites.

Post-field work consisted of synthesizing information generated during the field study with that of previous studies. Additional infomation has been drawn from previous studies, mine reports, and from claim owners. In addition to the references cited, past reports have been freely drawn upon. Where there was sufficient data, resource estimates were made using the Bureau of Mines Mineral Availability System (MAS) computer analysis. The final product for the mineral land assessment is this report with engineering back-up data.

Thirty person weeks in June, July and August, of 1978 and May, June, July, August and September of 1979 were spent conducting field studies. Base camps for the two man crew making the field examinations were located on the 40 foot charter boat M/V Mowich (11.5 weeks), at an old cabin on Lake Anna (2 weeks), and in Sitka (1.3 weeks). About half the field days a skiff was utilized for transportation, while a Sitka based helicopter called by radio was utilized the rest of the time.

During the two field seasons of this study over two miles of underground workings in more than 50 adits were examined and in most cases mapped and sampled. Gold prospect pits and trenches were most often flooded, sloughed, or badly overgrown and often could not be found. Old underground workings were found in most cases to be accessible and afforded the best and often the only exposures of the gold occurrences.

Sampling

Sample Types

About 1300 representative rock samples were obtained from mined material, veins, mineralized zones, mineral-stained areas and anomalous sample sites on the surface, in open cuts and in underground workings. Representative samples were of four types: 1) channel sample - moiled across a measured width; 2) chip sample - uniform-sized chips taken continuously along a measured line; 3) spaced-chip sample - chip samples taken at a uniform interval along a measured line; and 4) composite grab sample - random or select fragments composited from a small estimated or measured area. Grab samples composed of single rock fragments, usually float, were sometimes collected as well.

Petrographic specimens were obtained from many of the sample sites to establish rock type and mineralogy. About 70 stream sediment samples were collected to serve as geochemical indicators or were taken at or near specific sites for back-up or verification of previously obtained anomalous samples.

Sample Tables and Analyses

Samples were analyzed by the U.S. Geological Survey and Barringer Research, Inc. Method of analysis, elements sought and the lower limit of detection are given in Table 1. In addition, U.S. Bureau of Mines laboratories in Reno and Juneau provided analyses for gold and silver by fire assay. The lower limit of detection for fire assay analysis is 0.005 oz. per ton for gold and 0.1 oz. per ton silver; however, in some instances, about half of these amounts can be estimated on a reasonable basis.

Spectrographic analyses (spec.) utilize 10 milligrams of sample,

TABLE 1. - Methods of sample analysis, elements sought and lower limit of detection.

U.S. Geological Survey Branch of Exploration Research Analyses

1. Thirty-one element Semiquantitative Spectrographic Analysis

Element	Detection limit, %	Element	Detection limit, ppm	Element	Detection limit, ppm
Fe	0.05	Mn	10	Mo	5
Mg	.02	Ag	0.5	Nb	20
Ca	.05	As	200	Ni	5
Ti	.002	Au	10	Pb	10
		B	10	Sb	100
		Ba	20	Sc	5
		Be	1	Sn	10
		Bi	10	Sr	100
		Cd	20	V	10
		Co	5	W	50
		Cr	10	Y	10
		Cu	5	Zn	200
		La	20	Zr	10
				Th	100

2. Atomic Absorption analysis

Element	Detection limit, ppm	Element	Detection limit, ppm
Cu	5	Zn	5
Pb	5	Au	0.05 (may be higher for samples weighing less than 10 grams)

Barringer Research, Inc., analyses

1. Atomic absorption

Element	Detection limit, ppm	Element	Detection limit, ppm
Cu	1	Mo	1
Pb	1	Au	0.02
Zn	1		

2. Colorimetric analysis for W, detection limit of 4ppm; for WO_3, 5ppm

while atomic absorption analyses (AAS) require 10 grams. Fire assay uses an assay-ton or nearly 30 grams of sample and is considered the most reliable of the three methods for gold and silver determination. Gold and silver values provided by fire assay are expressed in troy ounces per ton. Atomic absorption values for gold and silver are expressed in parts per million (ppm).

The atomic absorption type gold analysis developed by the U.S. Geological Survey, and used for analysis of some Bureau of Mines samples in this study, is intended for rapid reconnaissance analysis of samples containing small amounts of gold, but is not considered suitable for detailed evaluation of gold properties. Where gold content was greater than 0.1 oz. gold per ton, the U.S. Geological Survey atomic absorption gold analysis was found to give significantly higher values than the corresponding fire assay. Checks against standards and replicate samples fire assayed at the Bureau of Mines Reno Laboratory confirmed that the U.S. Geological Survey atomic absorption values were inflated. However, the U.S. Geological Survey atomic absorption values are reported because they detect gold below the lower limit of fire assay methods and because some grab samples (not to be used in detailed evaluations) were not fire assayed.

Tables of analytical results that accompany individual prospect descriptions in the text report sample values for the elements considered important for the particular type of deposit sampled. Symbols used in the tables are defined as follows:

G	Greater than value shown
H	Interference
-	Not looked for
N or Nil	Not detected at limit of detection
L or Tr	Detected but below limit of determination
INS	Indicates insufficient sample for analysis

Mining Activity

Both the Chichagoff and Hirst-Chichagof mines at Doolth Mountain were discovered in 1905. The Chichagoff mine, initially financed on high grade gold ore float, operated from 1906-1942 while the Hirst-Chichagof mine operated from 1922-1943. They jointly produced 791,000 oz. gold and 233,000 oz. silver from over 740,000 tons of ore. Four other mines in the study area produced from a few to 1,450 oz. of gold and a small amount of silver.

Mining Claims

At the Sitka Recording District office a search was made of claims records that date back to 1890. Certificates of location and any affidavits of annual assessment work for all recorded claims in the study area were examined. More than 1200 mining claims were staked in the study area and 52 of these located in the Doolth Mountain area are patented.

The courthouse records show more claims than were actually found in the field. Claim locations sometimes reference a mountain or bay with a local name that has not been preserved. Monuments of possible workings on the old claims may have been obliterated. Many claims are relocations of formerly held ground. The distribution of claims within the study area is shown on plate 1.

West Coast Gold Area

Introduction

The West Coast Gold Area is 8 miles wide by 28 miles long and is characterized by gold-quartz occurrences along a series of northwesterly striking, steeply dipping shear zones within graywacke, schist and marble. The western boundary is the Pacific Ocean and the eastern boundary is the eastern contact of the Whitestripe Marble. To the east past the Whitestripe Marble the rock type and structure change substantially. The northern boundary is drawn to include the most northwesterly similar gold occurrences in the vicinity of Goulding Harbor and Pinta Bay and the southern boundary includes the occurrences at the abandoned townsite of Cobol.

The highly mineralized Doolth* Mountain area is located in the middle of the West Coast gold area, while the remainder of the area is divided between the Pinta Bay area to the north and the Cobol area to the south. Plate 2 shows the spatial location of the areas and lists the individual occurrences.

There are numerous gold occurrences within the West Coast gold area and approximately 1200 mining claims (Plate 1) have been recorded. Most of the production and prospecting activity occurred between 1905 and 1943. Production from the area is 793,000 oz. gold and 233,000 oz. silver. Most of the claims and almost all the production and estimated reserves and marginal reserves are from the Doolth Mountain area.

* A Tlingit Indian name meaning plentiful and abundant

Geological Setting

The geological setting of the West Coast gold area consists of a series of three northwest striking, southwest dipping bedded units ranging in age from Triassic to late Cretaceous. From oldest to youngest (east to west), the series consists of the Whitestripe Marble (Trw), the Kelp Bay Schist (Kkb) and the Sitka Graywacke (Ks). Cutting these units and forming the major control on ore deposition are a series of strong northwesterly-striking, steeply southwesterly dipping faults that generally strike more northerly and dip more steeply than the enclosing rocks. Many of these faults have known strike lengths in excess of several miles and at least one traverses the length of the West Coast gold area. Plate 2 shows the area geology and selected faults. They are part of the larger Sitka fault system and indications are that movement occurred on them from 25 million years to 45 million years ago (Loney 1975, p. 71). Loney (1975, p. 94) suggests Tertiary plutonism as a source for the hydrothermal gold solutions. Geology and faults are shown on plate 2.

Ore Deposits

The ore deposits, as exposed by mining activity in the Doolth Mountain area, consist of hydrothermal gold bearing quartz veins deposited along the major faults or splits off the major faults. The ore contains 2 to 3 percent sulfides (pyrite, arsenopyrite, galena, sphalerite and chalcopyrite) and gold in the form of tiny specks in the quartz and less frequently in the sulfides. About 70-90 percent of the recovered gold was free milling and the remainder was recovered in the sulfide concentrate.

About 40 percent of the silver was extracted from the concentrates. The ore gangue minerals are quartz and calcite. Hydrothermal alteration products are sericite and chlorite. In places, the graywacke wall rock is silicified and pyritized.

The tabular but irregular ore shoots have a long dimension down the rake toward the south and a short dimension along strike. Ore zone widths to 15 feet, strike lengths to 700 feet and vertical heights to 1900 feet are known. The ore shoots exposed in the mines are scattered along the faults so that they occupy less than one-fourth of the fault area exposed by mine development. One 14 foot wide stope at the Chichagoff Mine averaged 6 oz. gold per ton; however, the ore zones in the area averaged about 5 feet in width and the average recovered tenor was about 1 oz. gold per ton and 0.25 oz. silver per ton.

The mineralization in the gold prospects and occurrences in the Pinta Bay and Cobol area are in most cases similar to that of the mines described above but in general are not as persistent. Some prospects also have significantly greater amounts of arsenic, lead, zinc or tungsten associated with the gold values.

Doolth Mountain Area

Introduction

Within the West Coast gold area the center of mining activity and production is at Doolth Mountain. The Doolth Mountain area, (delineated on plate 2) approximately 5 by 6 miles, contains 52 patented claims and most of the 1150 unpatented claims in the West Coast gold area. Almost all the production of 793,000 oz. gold and 233,000 oz. silver in the area came from the Chichagoff and Hirst-Chichagof Mines.

The locations of mines and prospects within the Doolth Mountain Area are shown on plate 2. Those with the most evident mineralization will be discussed first and those with the least available information will be relegated to a table.

In general, the mines and most highly mineralized kprospects are not found along the same fault, but are located across the northwest fault trend from each other, in a north-south direction.

Chichagoff Mine

Introduction - History

The Chichagoff Mine is located on Doolth Mountain on the Chichagof fault, which has a traceable strike length of at least 12 miles. Plate 2 shows its location along the fault and Plate 3 shows the claim configuration.

In 1905, John Newell and Ralph Young, discovered gold bearing quartz float in a creek near the head of Klag Bay. Later that year, at an elevation of 275 feet, a quartz outcrop was found that was so rich the ore was sacked and shipped to the Tacoma Smelter and the proceeds used to finance a mill and further mining. This mine was initially called the DeGroff. By 1907, two mortars, plates and Wilfley concentrators were installed and by 1909 a Lane slow-speed mill was added (Reed and Coats, 1941, p. 87).

In 1906 the Golden Gate Mine was discovered at an elevation of 1200 feet along the Chichagof Fault. Later, a 10 stamp mill (called the Golden Gate mill) was installed about 1000 feet northerly from the DeGroff mill.

In 1909 the DeGroff and Golden Gate interests installed a power plant at Sisters Lake and by 1912 both companies were consolidated into

the Chichagoff Mining Company. By 1915 the mill was expanded to 15 stamps, a tube mill was installed and by 1916 flotation equipment was added.

In 1920, 114 people were employed both underground and on the surface by the Chichagoff Mining Company.

In 1923 the Chichagoff Development Company took over the mine. By then the mine was developed to the 900 foot level and the 1100 foot level had been reached. At that time the ore was being extracted by overhand stoping with most of the stopes being timbered. In narrow stopes, the waste was blasted first and then used for fill. The wider ore shoots were timbered with square sets. By 1923, the Chichagoff mill had 20 stamps and a capacity of 100 tons per day. Sea water was used throughout the mill and ore was processed by amalgamation, table concentration and flotation (Bauman 1924, p. 876-879).

Mine records indicate that in 1925 a cyanide plant was installed that was later converted into a flotation mill.

In 1927, the mine was reorganized as the Chichagoff Mines Ltd. and in 1935, as the Chichagoff Mining Company.

By 1942, when the mine was closed, stoping had reached the 2100 foot level and the number 6 shaft had reached a depth of 2200 feet. Plate 4 shows the mine levels and stopes.

The property is covered by 29 patented claims and currently the feasibility of reopening the mine is under study.

Production

From 1906-1942 the Chichagoff Mine produced gold each year. By 1942 over 600,000 tons (recorded production-596,478 tons but records are

incomplete) had been mined with an extraction of 660,000 oz. of gold and over 200,000 oz. of silver. In the most productive years, 1918 to 1921, production averaged 76,000 oz. gold per year from ore with an average grade of 2.12 oz. of gold recovered per ton. In 1938, 13,599 tons of ore was mined with a recovery of 4,896 ounces of gold. Average recovered tenor of the ore based on the years with known ore and gold production was 1.09 oz. gold per ton, or an in place value of about 1.20 oz. gold per ton (tailings average 0.11 ounces gold per ton). Records are incomplete, but in the years 1939-1942 apparently little ore was mined and most production came from rerunning tailings (about 71,000 tons of tailings with 6219 oz. gold recovered). From 1942 to 1973 small amounts of tailings were reworked. Table 2 lists the mine production from 1906-1970.

Structure

The width of the Chichagof fault zone exposed by underground workings ranges from a few inches to 20 feet. It is recognized underground by a series of strong shears containing fault gouge and brecciated graywacke or crushed to ribbon to massive quartz, while on the surface it is most often recognized by a linear depression.

The average strike of the Chichagof Fault on the main mine level is N40°W and it dips 70°SW. However, the fault has a distinct warp and dips to the northeast below the 1900 foot mine level. Mine workings explore the fault for 4800 feet horizontally and 4300 feet vertically. The wall rock consists of massive or shaly graywacke, at an average strike and dip of N58°W and 68°SW (Reed and Coats, 1941, p. 94), with shaly graywacke predominating in the vicinity of the fault.

Table 2. - Chichagoff Mine gold production (Chichagoff Mine records)

	CRUDE ORE PRODUCED - TONS		CONCENTRATES PRODUCED		RECOVERED IN BULLION
Year	Ore	Old Tailings etc.	Dry Tons	Gold (ounces)	Gold (ounces)
1906	60	-	-	-	350*
1907	1,353	-	-	-	3,196*
1908	2,071		65	959	1,809
1909	744	-	-	-	991*
1910	4,283	-	-	1.646	6,138
1911	10,577	-	258	1,335	6,571
1912	22,290	-	625	2,412	9,035
1913	22,000	-	644	2,629	8,738
1914	24,584	-	681	2,918	12,207
1915	33,850	-	563	3,672	40,847
1916	36,822	-	-	3,609	35,846
1917	38,794	-	-	238	39,319
1918	33,978	-	812	5,427	54,777
1919	42,187	-	1,084	6,962	82,143
1920	33,243	-	820	6,837	76,250
1921	33,855	-	1,313	6,677	64,667
1922	38,307	-	1,093	4,980	43,165
1923	11,079	-	460	3,161	22,660
1924	38,267	-	433	1,249	14,107
1925	62,350	-	481	1,456	14,910
1926	25,906	-	428	-	17,025*
1927	NA	NA	NA	NA	70
1928	347	-	-	-	121
1929	1,971	-	-	-	1,231
1930	NA	NA	NA	NA	439
1932	25,000	-	188	968	12,056
1933	4,986	-	86	-	5,761*
1934	NA	NA	NA	-	4,650*
1935	12,854	-	171	481	3,752
1936	est 13,000	-	101	271	4,146
1937	7,321	-	164	396	2,050
1938	13,599	-	113	488	4,408
1939	-	9,900	198	934	-
1940	-	25,450	509	1,941	266
1941	-	35,500	900	3,078	-
1942	600	2	99	287	352
1944	est 200	-	-	-	22
1950	-	537	9	188	209
1951	-	100	20	143	8
1952	clean-up	-	-	-	19*
1954	do	-	-	-	76*
1955	do	-	-	-	38*
1970		2000			188*
Total	596,478	73,487	12,318	65,342	594,613

*Total production, concentrate value not given

Total gold production with corresponding recorded mine tonnage - 647,708 ounces

Average recovered grade over the life of the mine $\frac{647,708}{596,478}$ = 1.09 oz. gold per ton

Total production 659,955 oz. gold

The small difference in attitude of the fault and wall rock bedding results in subparallel splitting into the hanging wall of the fault along the bedding and into the footwall of the fault against the bedding (Reed and Coats, 1941, p. 65). On a small scale, the closely spaced series of small splits are a good host for the deposition of ore, while on the larger scale ore shoots are localized near major splits. The footwall ore shoot (see plate 4) diverges 60 feet into the footwall from the main fault, while the Big Croppings split (see plate 5) diverges over 80 feet into the hanging wall of the main fault .

Within the area of the Chichagoff claim group subparallel splits or faults are explored by near surface workings or at depth by a 1550 foot long crosscut off the main mine level and by a 625 foot long crosscut off the 400 foot mine level. Figure 2 shows the near surface workings and the crosscuts relative to the location of the main Chichagof fault.

Ore Shoots

The ore shoots consist of hydrothermal gold bearing quartz veins deposited along the Chichagof and subsidiary faults and they may occupy all or only a small part of the fault zone width. They form tabular but irregular bodies and have a long dimension down the rake towards the south and a short dimension along strike. Ore shoot widths to 15 feet, strike lengths to 700 feet and vertical heights to 1800 feet are known. The average ratio of ore shoot strike length to vertical height is about 1 to 2.5. Plate 4 shows the underground workings and the locations of the ore shoots (stoped areas). Five large ore shoots were recognized

during mining. These are the DeGroff (includes the footwall split of the DeGroff), Golden Gate, Temby, Rust, and the Temby-Rust. The Temby-Rust consists of the scattered stopes below the 1000 foot level that are erratic extensions of the Rust and Temby ore shoots. Only the DeGroff and Golden Gate ore shoots extend to the surface.

Some of these ore shoots are blunt at their ends and others thin out gradually. Most of the quartz contains gold but it is reported by Reed and Coats (1941 p. 38) that in the lower levels of the mine there are considerable quantities of quartz that carry too little gold to be regarded as ore.

The ore shoots most often contain ribbon quartz in which the banding is composed of graphite and sheared graywacke; locally, however, ore may consist of white massive quartz. Sulfides constitute less than 2 percent of the ore and are predominately pyrite with very minor arsenopyrite, sphalerite, chalcopyrite and galena. The gangue minerals are quartz and calcite, while sericite and chlorite constitute the hydrothermal alteration products. In places the wall rock is silicified and pyritized and may contain graphite.

Gold is found as isolated particles in the quartz, in the ribbon structure or more rarely intergrown with the sulfides. About 10 percent of the recovered gold was from the sulfide concentrate. Gold is occasionally found in fault gouge and rarely in the graywacke. One small stope consisted of fault gouge, fragments of graywacke, gold and sulfides with little if any visible quartz. One 14 foot wide stope averaged 6 oz. of gold per ton, while the average tenor for the life of the mine was 1.20 oz. gold per ton.

Mine Developement

Mine development along the Chichagof Fault consists of a main haulage level drift at an elevation of 60 feet driven mostly along the fault for 4950 feet (see plate 4). Off this level the #1 shaft reaches the lower levels of the DeGroff oreshoot, the #2 shaft reaches to the 700 level and a long raise reaches the Golden Gate ore shoot at the Golden Gate #4 drift. The Golden Gate #1-4 drifts and workings were driven early in the life of the mine. Access to the lower levels of the mine was provided by the #3 shaft reaching from the 700 level to the 1200 level, by the #4 shaft from the 1200 to the 1900 level, by the #5 shaft from the 1900 to the 2000 level (eventually stoped out) and by the #6 shaft from the 1900 to the 2200 level. This inefficient haulage system was a serious impediment to exploration and production from the lower levels of the mine.

On the surface, exploration along the fault was confined to trenches and pits along the Big Croppings, a few pits and trenches located between the Big Croppings and the Mine Portal, and a few trenches and a short adit on the Rising Sun and Over the Hill Claims.

The main exploration effort into the footwall portion of the Chichagof Fault consisted of two crosscuts, one driven 1550 feet off the main haulage level and the other driven 625 feet off the 400 level. About 1600 feet of drifting a short shaft and some mining occurred off these crosscuts. Figure 2 shows these crosscuts.

On the surface, short exploration adits were driven on the Aurum #2 and #4 Claims, the Sitka Claims, the Big 4 Claim and the Aurum #13 Claim where two adits (the OB and Wet Feet) were driven near sea level.

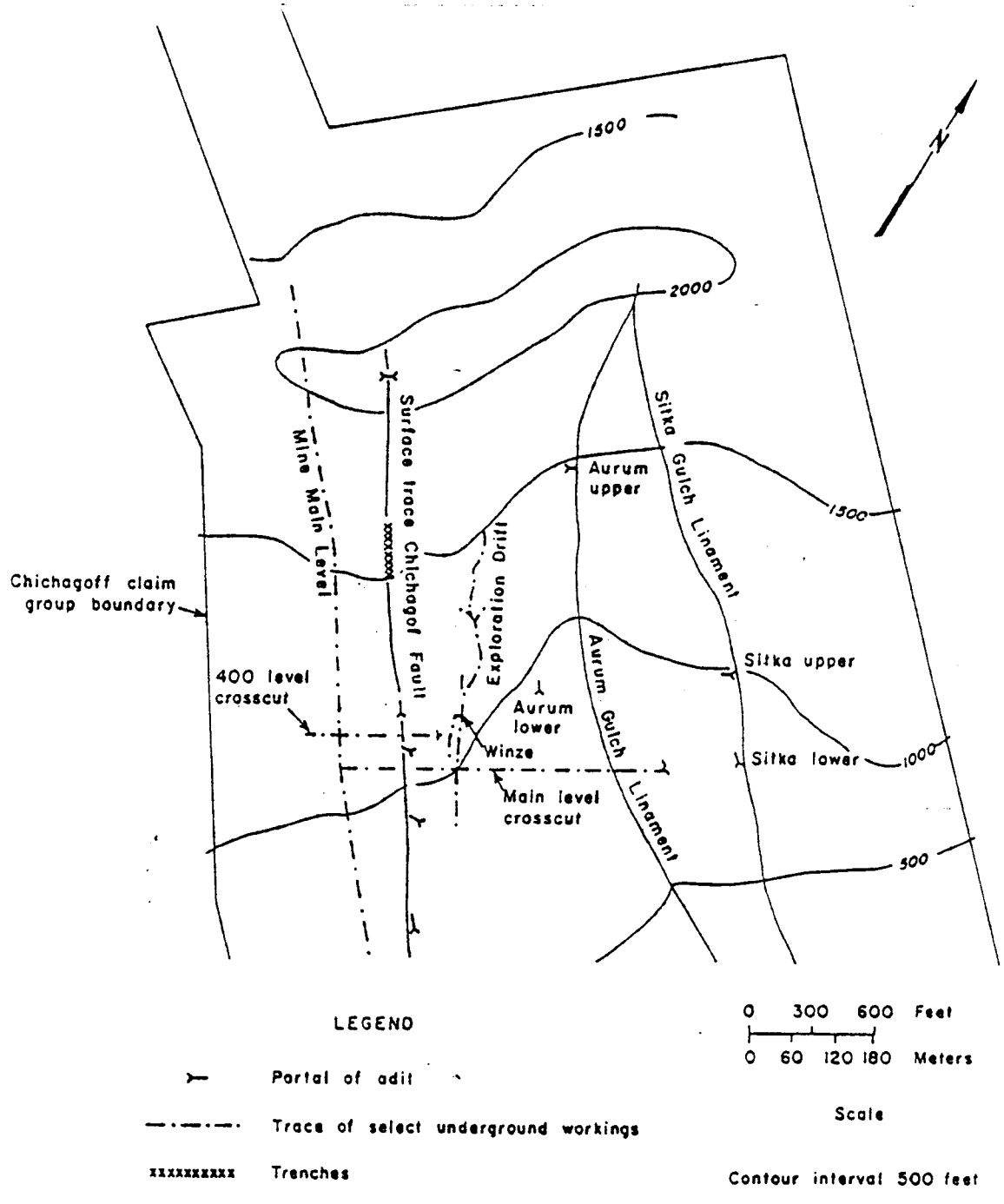


FIGURE 2.- Sketch map showing footwall crosscuts off the Chichagof Fault and near surface workings on the Chichagoff claim group and showing the relationships between near surface workings and mine workings.

Present Investigations

Along the Chichagof Fault

All the mine workings below the main haulage level are flooded. The partly caved portal to this level has a large volume of water coming from it and is currently inaccessible. The four Golden Gate crosscuts to and drifts along the Chichagof Fault are accessible for a distance of 80 to 500 feet along the fault. The adit and most of the old pits along the Big Croppings vein are caved, but the veins are accessible in outcrop and a few pits. Figure 3 shows quartz float from the Big Croppings veins. On the Rising Sun and Over the Hill claims, a short adit near the Chichagof Fault and a trench where the fault crosses Doolth Mountain are open. Plate 5 shows the locations of these mine workings and table 3 summarizes the results of the field investigations. Immediately following this table are the figures for the workings discussed. Assay data is in Appendix A.

Sampling and investigation of mine workings and outcrops along the Chichagof Fault revealed the following:

1. Gold mineralization is pervasive along the fault. Almost all of the samples taken along the fault contain some gold. Generally, samples taken of quartz veins contain much more gold than those taken of fault gouge which in turn contain much more than those taken of the graywacke wall rock. Significant gold mineralization (above 0.1 oz. gold per ton) was found in the Golden Gate # 1,2, and 3 drifts, on 3 of the 4 Golden Gate dumps, in the Big Croppings area and in the Rising Sun adit.
2. There was sufficent data to estimate reserves for the Golden Gate #3 and the Big Croppings area. The latter may be economic.

Table 3. - Examination and information on workings along the Chichagof Fault and within the Chichagoff Claim group. Assay data given in Appendix A.

Claim name and prospect workings or occurrence found during this study (unless noted otherwise)	Elevation (feet)	Plate, Figure or Table (T) no.	Disc. text pg. no.	Comments
Young #2 Claim Mine main haulage level portal	60	Pl. 3, #26	19	Fairly large volume of water streaming from partly caved portal and held by dam near portal. Dam must be eliminated to gain access to mine.
Young #3 Claim Golden Gate #4 crosscut and drift	680	Pl.3 #30 Pl.5 T-A-1	19	Access along drift requires climbing over numerous caves. Access past 500 feet from portal is judged dangerous. Fault contains only stringer zones of quartz. Samples of fault zone contain only traces of gold while a grab sample of quartz on the dump assayed 2.27 oz. gold per ton.
Golden Run Fraction Claim Golden Gate #3 crosscut and drift	940	Pl.3 #29 Pl.5 Fig. 4 T-A-2	19 & 23	Accessable to 360 feet past portal to where rotten timbers support large blocks and further access is dangerous. Some portions of back along drift caved to 15 feet above rail but still accessible. Drift exposed quartz vein along Chichagof fault that averaged 0.12 oz. gold per ton across a 3 foot mining width for 180 feet. Sufficient data for reserves, see text. Select dump sample of quartz assayed 0.97 oz. gold per ton.
Golden Gate #2 crosscut and drift	1100	Pl. 3 #28 Pl. 5 T-A-2	19	Accessable to 240 ft. past portal (just past filled chute) where drift caved tight. Sample across Chichagof fault stringer zone ran 4 ppm gold across 3 foot width. Quartz dump sample assayed 0.045 oz. gold per ton.
Golden Horn Lode Claim Golden Gate #1 crosscut and drift	1190	Pl. 3 #27 Pl. 5 T-A-1	19	Drift stoped out, access over fill in stope to about 80 feet past portal where no floor in adit and stoped to surface. Quartz float on stope floor assayed 1.38 oz. gold per ton.

Table 3. Continued

Claim name and prospect workings or occurrence found during this study (unless noted otherwise)	Elevation (feet)	Plate, Figure or Table (T) No.	Disc. text pg. no.	Comments
Golden Horn Lode Claim Surface outcrop Chichagof Fault and vein at stope edge	1300	Pl. 5 T. A-1	24	Chichagof fault and vein exposed at stope edge. Sample 8S153B (0.9 foot) taken of quartz vein at southern stope edge assayed 3.09 oz. gold per ton.
Big Croppings adit	1500	Pl. 5 fig. 5	22	Portal of adit is caved tight. According to 1913 dated company reports values in adit are: 0.07 oz. gold per ton across 3 1/2 feet of quartz and 0.23 oz. gold per ton across 2 feet of quartz.
Golden Horn Lode and Golden Gate Lode Claims Big Croppings veins - surface outcrops and exposures in pits	1450 - 1650	Pl. 3 #31 Pl. 5 Fig. 5 T. A-3	19 & 22-24	Two large persistent veins exposed in outcrops and pits (most pits are sloughed and overgrown) vein shown on early company maps and pits shown on 1911 dated patent maps. The Big Cropping area not mentioned in mine reports or literature after 1913. The west vein is a hanging wall split off the Chichagof fault and joins the east vein at an elevation of 1675 feet. USBM sampling indicates that east vein averages 0.23 oz.gold per ton across a 3 ft. width for 372 feet while the west vein averages 0.28 oz. gold per ton across a 4.5 foot width for 288 feet. Sufficient data for reserve calculations, see text.
Over the Hill Claim Trench at Chichagof Fault notch. Note: an adit shown on patent maps on the south side of the fault notch was searched for and not found	2000	Pl. 3 #33 Pl. 5 T. A-1	19	Walls of fault may be sloughed into notch and sample may not be in place. Sample 9S425D contained 200 ppm arsenic and no other significant metal values.
Rising Sun Claim Rising Sun adit	1850	Pl. #32 Pl. Fig. 6 T. A-4	19	Northerly striking and shallow dipping quartz vein, 30°SW, exposed on cliff and explored by 20 foot adit and trench-ledge. Samples contain up to 0.11 oz.gold per ton

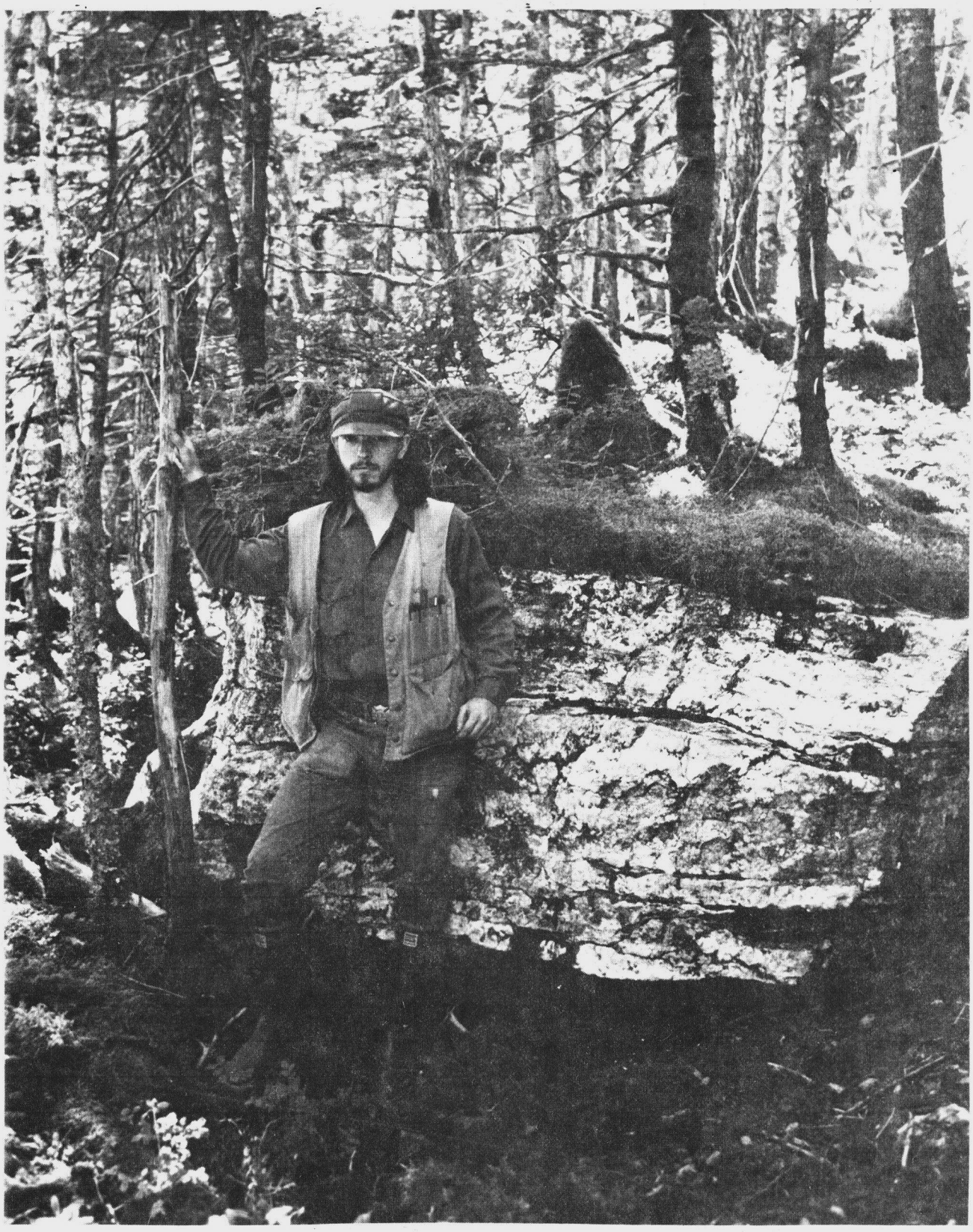


Figure 3. - Quartz float from the Big Croppings veins. A 5-foot sample across this vein (9S055) assayed 0.19 oz. gold per ton and 0.3 oz. silver per ton and contained no other significant metal values.

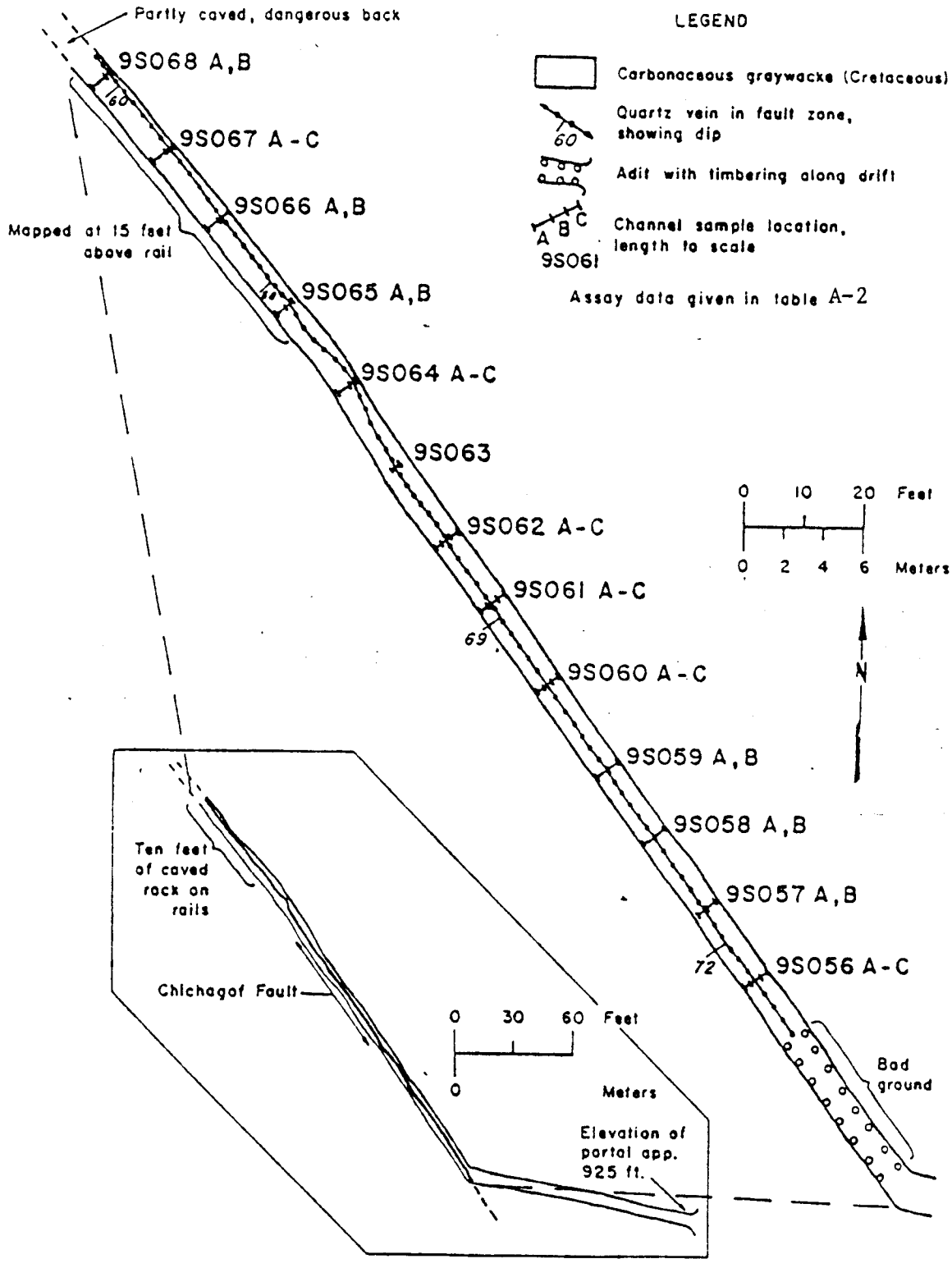


FIGURE 4.- Golden Gate No. 3 drift showing the 240 foot long section mapped and sampled during by this study (Mapped by J. Still and K. Weir, May 1979)

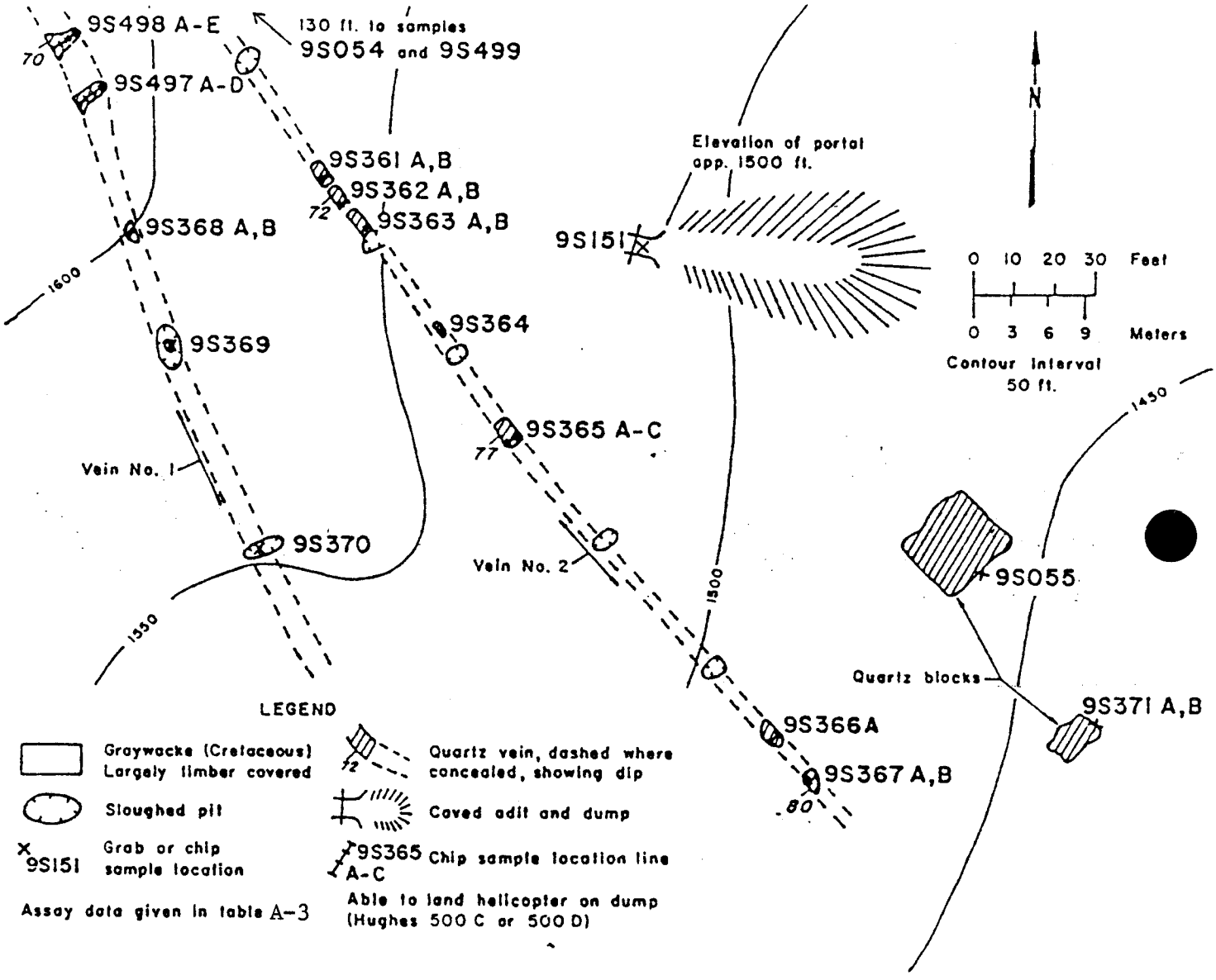


FIGURE 5.- Big Croppings veins, sample locations, See plate 5 for mine map showing extent of veins. (Mapped by J. Still and K. Weir, July 1979)

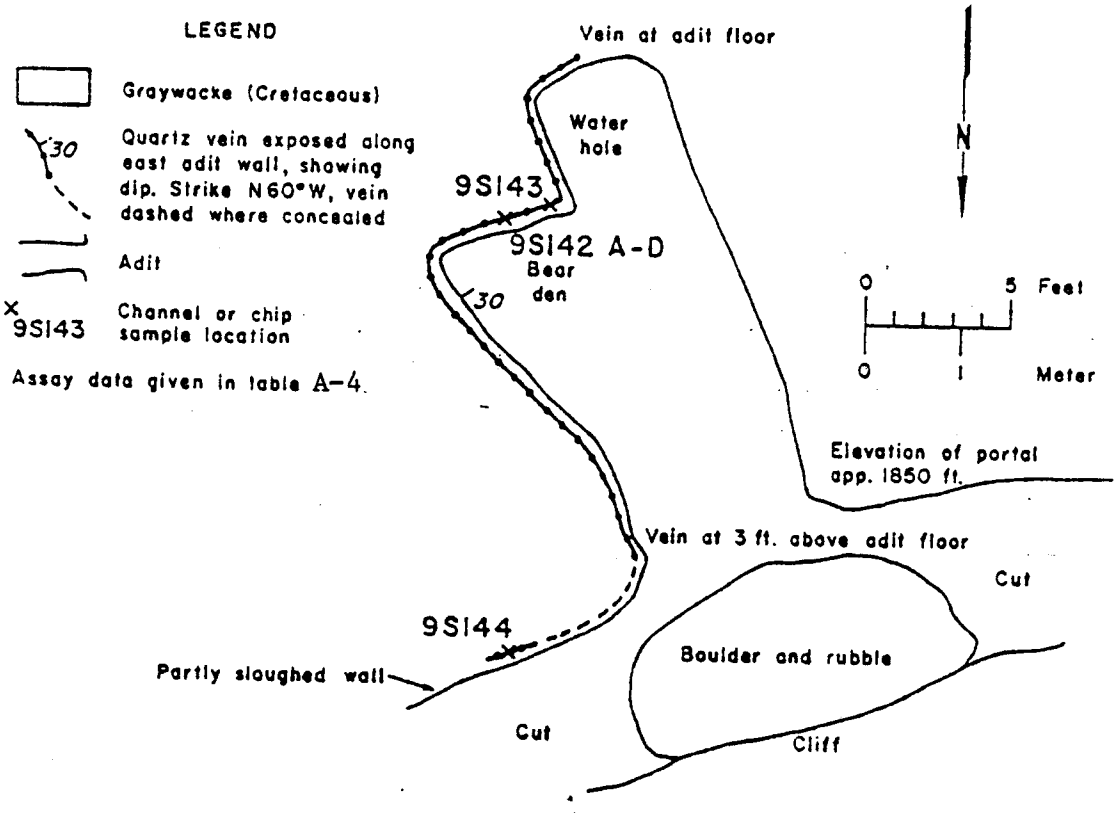


FIGURE 6. - Rising Sun adit, sample locations. (Mapped by J. Still and K. Weir, June 1979)

3. The mine workings are in reasonably good shape considering they have been open for 60-70 years.

Within the Chichagoff Claim Group but not on the Chichagof Fault

This section covers investigations of workings within the Chichagoff claim group but not on the Chichagof fault. Six adits (elevations from near sea level to 1300 feet) were investigated and only one (the upper Sitka) was caved. Plate 3 shows the adit locations. Significant gold values (+0.1 oz. gold per ton) were found in five of the six adits investigated. Table 4 summarizes the results of the field investigation and other data. Immediately following this table are figures for the workings discussed. Assay data is in Appendix A. These investigations revealed the following:

Significant gold values (up to 6.7 oz. gold per ton) are found in quartz veins found throughout the claim area. The Aurum and Sitka workings are located in or near deep gulches that are probably fault related.

The Aurum and Sitka near surface workings may expose fault zones intercepted by the 1550 foot long crosscut off the main level and the 625 long crosscut off the 440 level. Figure 2 shows the relationship between the underground workings and the near surface adits. The Lower Aurum adit may be located on or near a fault zone intercepted 550 feet along the main level crosscut. About 1600 feet of drifting, a short shaft, and some mining occurred along this zone but details are lacking. According to Reed and Coats (1941 p. 95), this zone converges with the Chichagof fault at greater depth.

Table 4. - Examination and information on prospects workings and outcrops not on the Chichagof Fault but within the Chichagoff Claim group. Assay data in Appendix A.

Claim name and prospect workings or occurrence found during this study (unless noted otherwise)	Elevation (feet)	Plate, figure or table (T.) No.	Disc. text pg. No.	Comments
Aurum #13 Claim OB prospect, adit and surface trench. First 110 feet on Aurum #13 Claim, last 110 feet on Pluto Claim	10	Pl. 3 #40 Fig. 7 T. A-5	20 & 25 53-56	A 250 foot long adit exposes a northwesterly striking southwesterly dipping fault zone with quartz and a strong split off the Chichagof Fault striking N10°W and dipping 75°E and containing ribbon quartz up to 1.42 feet thick and values (Roehm,1947)up to 0.36 oz. gold per ton. This N10°W fault is exposed in the portion of the adit on the Pluto claim but the structure is strong and probably continues into the Aurum #13 claim. Workings discussed in text under McKallick Chichagoff claim group.
Wet Feet adit*	5 ±	Pl. 3 #39		One hundred fifty foot long drift along narrow steeply dipping, northwesterly striking fault zone. Last 40 feet follows fault gouge zone up to a few tenths of a foot thick with sparse quartz. Two samples of this zone contained no significant metal values while a quartz sample off the dump assayed 53 ppm gold.
Aurum #4 Claim Aurum lower adit	890	Pl. 3 #35 Fig. 2 Fig. 8 T. A-6	20 & 25	Seventeen foot long drift exposing NW at 70°SW fault zone containing quartz veins. Values up to 3.19 oz. gold per ton across 0.67 foot thick vein and high grade select dump assayed 6.515 oz. gold per ton. Located just west of large fault gulch and about 650 feet from Chichagof fault. This may be the same fault as exposed in crosscut 550 feet from the main level and on which 1600 feet of drifting and some mining occurred.

*Prospect workings are often referred to with the prospect name, i.e., the Wet Feet adit is part of the Wet Feet Prospect.

Table 4. Continued.

Claim name and prospect workings or occurrence found during this study (unless noted otherwise)	Elevation (feet)	Plate, figure or table (T.) no.	Disc. text pg. no.	Comments
Aurum #2 Claim Aurum upper adit	1300	Pl. 3 #34 Fig. 2 Fig. 9 T. A-7	20 & 25	Fifteen foot long drift exposes fault zone that strikes NE and dips 40°NW and contains quartz veins up to 1.3 feet thick. Samples assay up to 0.355 oz. gold per ton and G10,000 ppm arsenic. Located under waterfall at head of deep gulch mentioned above.
Sitka #2 Claim Sitka lower adit	700	Pl. 3 #37 Fig. 10 T. A-8	20 & 25	Fifty-eight foot long drift along narrow fault zone striking NW and dipping 60°SW. Three of four samples taken of fault zone assayed nil gold while one assayed 0.25 ppm gold and 700 ppm arsenic. Located 1650 feet from the Chichagof Fault at the west edge of a deep gulch. According to Reed and Coats (1941 p.95) this zone correlates with the "Mundy shear zone" found along main level crosscut.
Sitka Quartz Claim Sitka Upper adit	990	Pl. 3 #36 Fig. 11 T. A-8	20 & 25	Northwesterly striking adit caved tight at portal. Overbeck (1919 p.119) reports it to be 150 feet long and to expose a shear zone with sparse quartz. Dump sample of quartz assayed 0.47 oz. gold per ton. Samples of NE striking quartz stringers near portal assayed up to 6.7 oz gold per ton across 0.25 feet. 1600 feet from Chichagof fault and located in deep gulch. May correlate with "Mundy" shear zone found 1550 feet along the Main level crosscut.
Big Four Claim Big Four adit	300-400	Pl. 3 #38		Adit shown on Big 4 claim patent survey map, briefly searched for and not found during this study

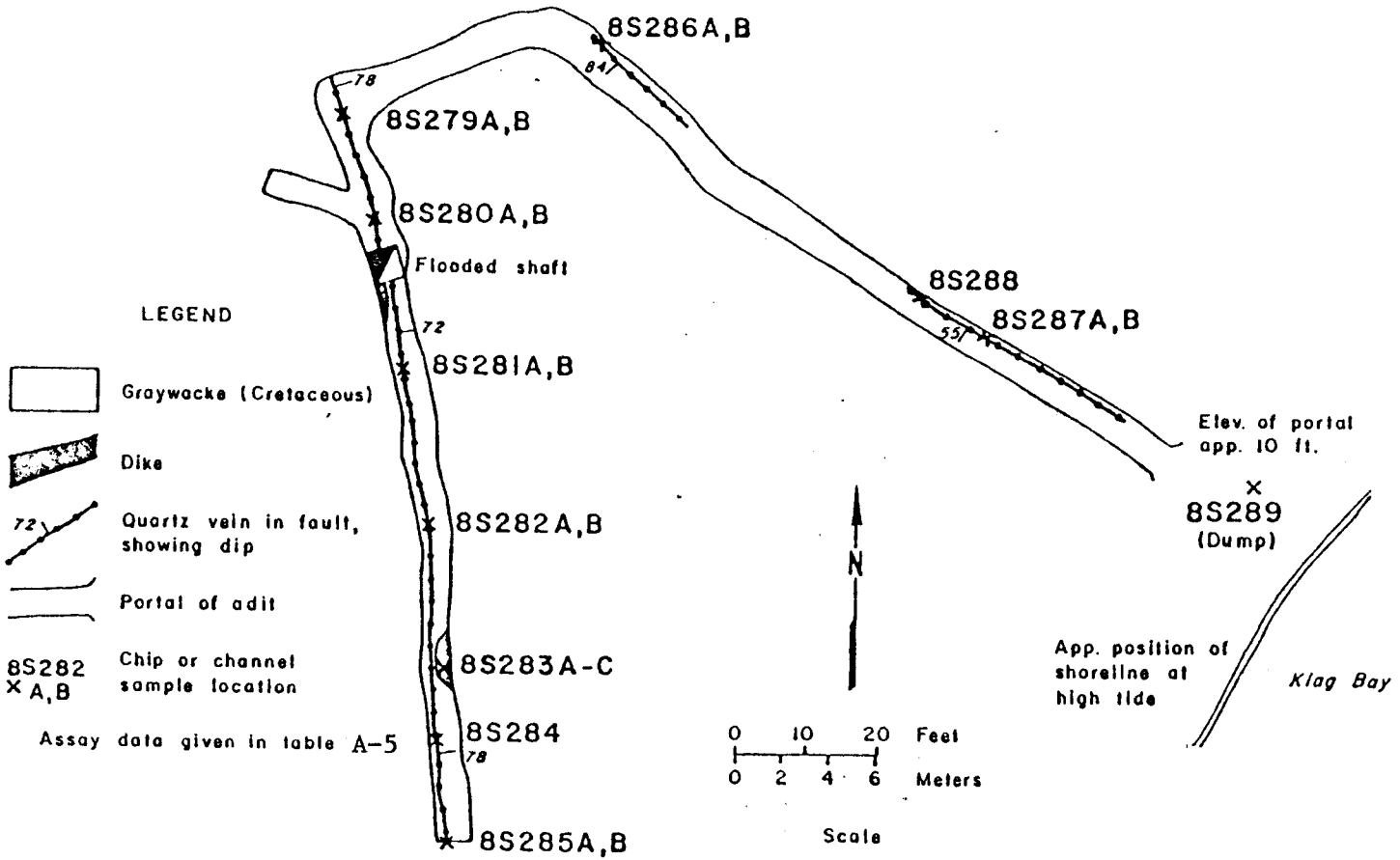


FIGURE 7.- OB Adit, sample locations. (Mapped by J. Still and K. Weir August 1978)

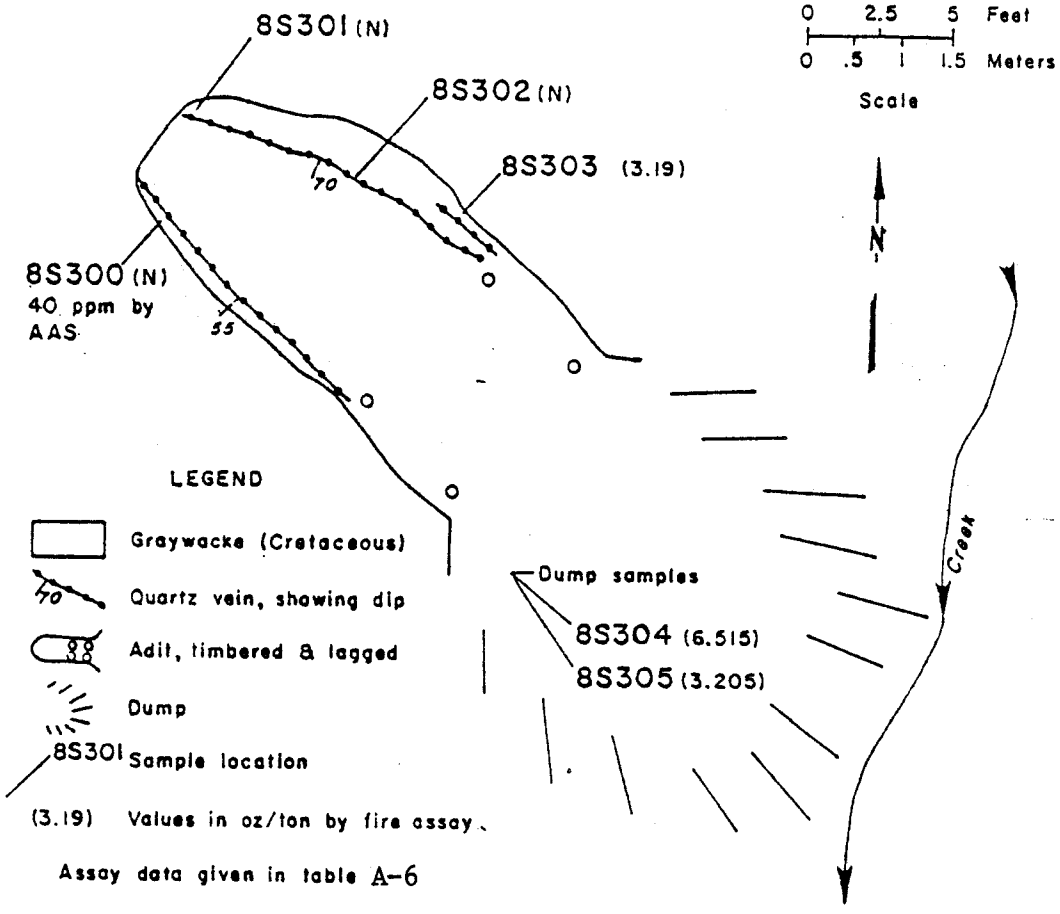


FIGURE 8._ Aurum lower adit, sample locations. (Mapped by J. Still and K. Weir August 1978)

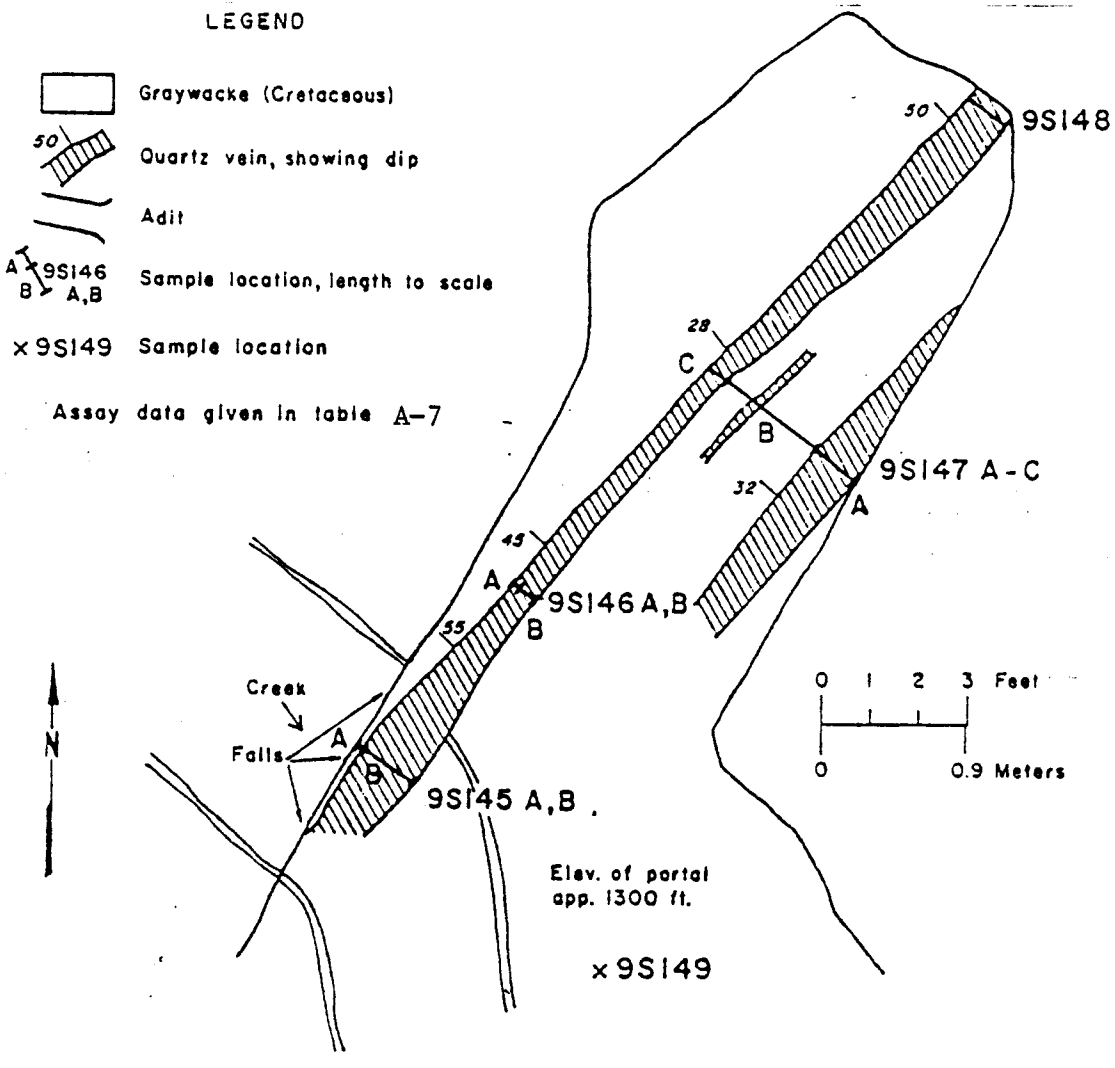


FIGURE 9.- Aurum upper adit, sample locations. (Mapped by J. Still and K. Weir June 1979)

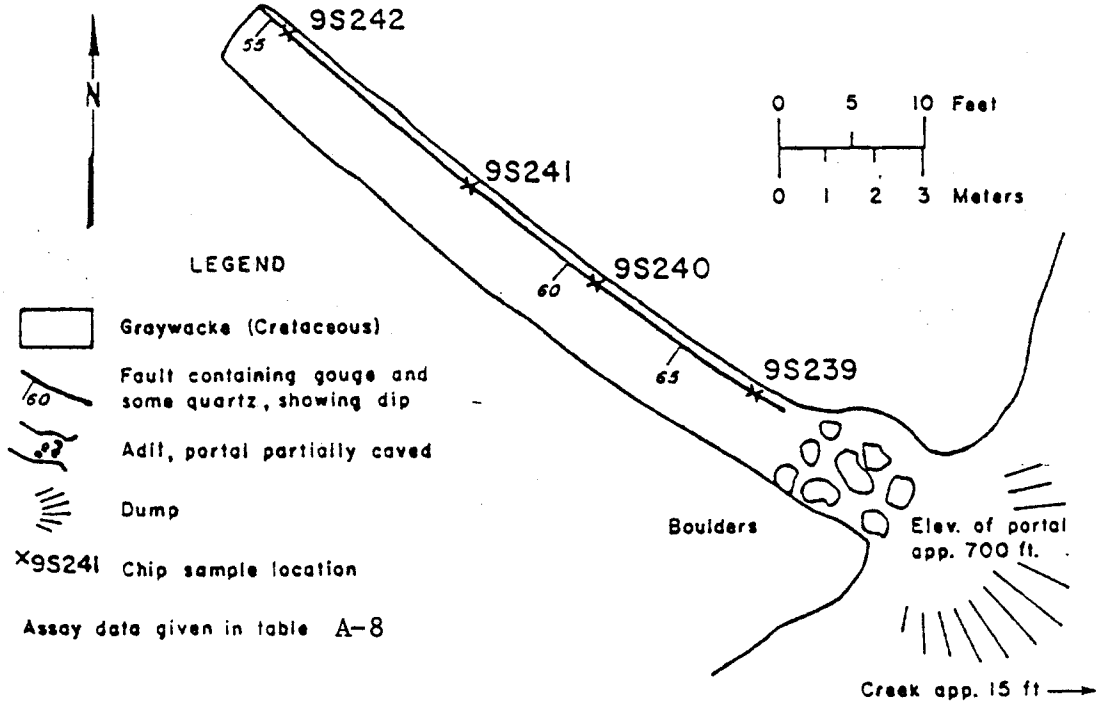


FIGURE 10.-Sitka lower adit, sample locations. (Mapped by J. Still and K. Weir July 1979)

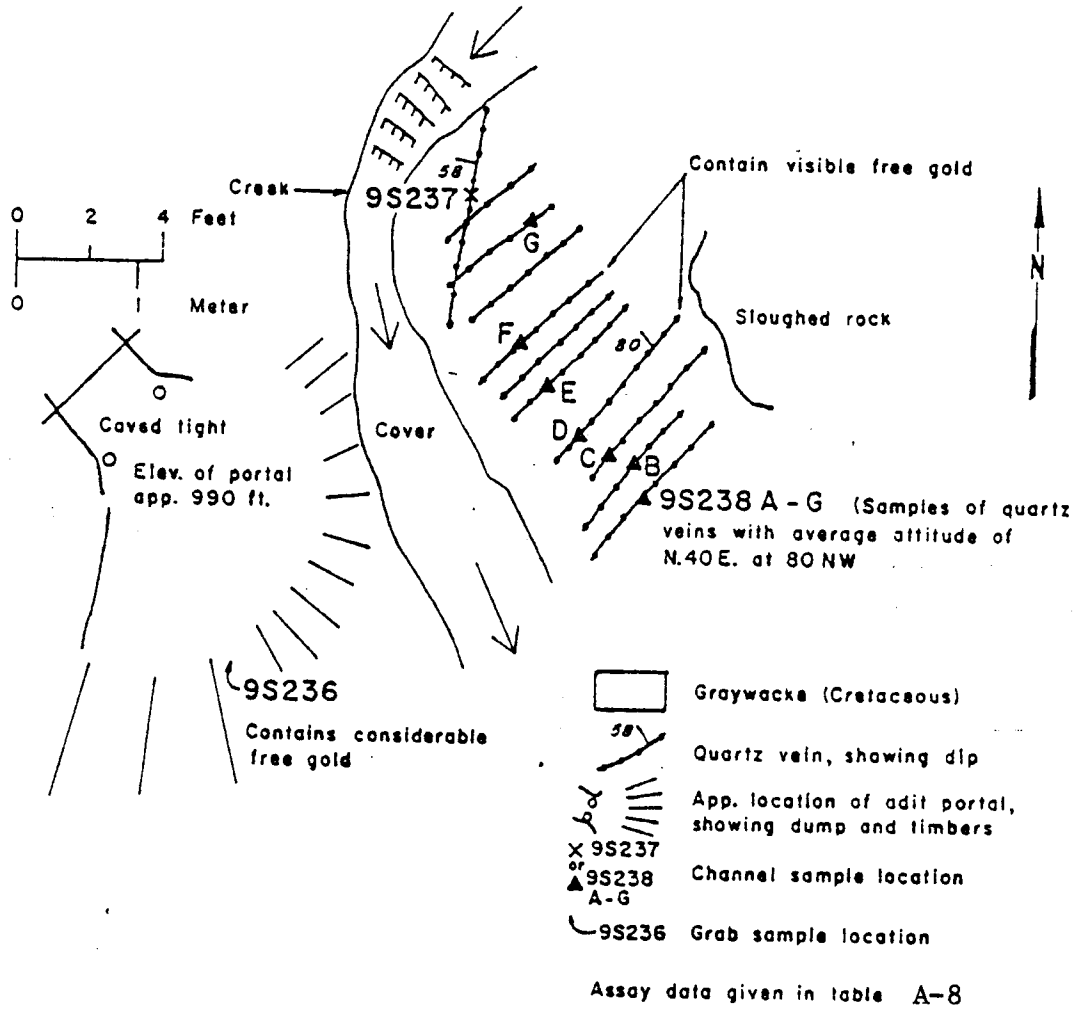


FIGURE 11. Sitka upper adit and outcrop, sample locations. (Mapped by J. Still and K. Weir, July 1979)

Mine Dump and Tailings

A brief investigation was made to estimate the grade of the mine dump and tailings. Thirty-eight shovel samples 1/2 foot in depth and weighing 15-20 pounds each were taken in 4 sample lines across the mine dump. Thirty-six shovel and Shelby tube (3 inch) tailings samples were taken to a depth of 1 to 1-1/2 feet in 3 lines across the tailings to the mean low tide line. Figure 12 shows the location of the sample lines on an aerial photograph and figure 13 shows the sampling detail. Tables A-9 and A-10 give the assay results. Much more extensive investigation of the tailings and dump are necessary to accurately determine tonnage and grade.

Resources

Resource estimates for the Chichagoff claim area were made based on Bureau of Mines sampling of lode veins, dump and tailings, and mine records. Economic viability was roughly estimated based on the following:

1. Inflation in the price of gold from 1940 to 1980 is 18-20 times while the inflation in operating and capital mine costs is somewhat less. Material can be mined at a profit in 1980 with a lower grade than required in 1940. In its last several years of operation, the Chichagoff Mine operated on ore from below the 1600 foot level with an inefficient hoisting system with a recovery of 0.31 oz. gold per ton.
2. The Bureau of Mines Minerals Availability System section ran an order-of-magnitude economic analysis of the Chichagoff Mine based on 235,000 short tons of ore being located above the main haulage

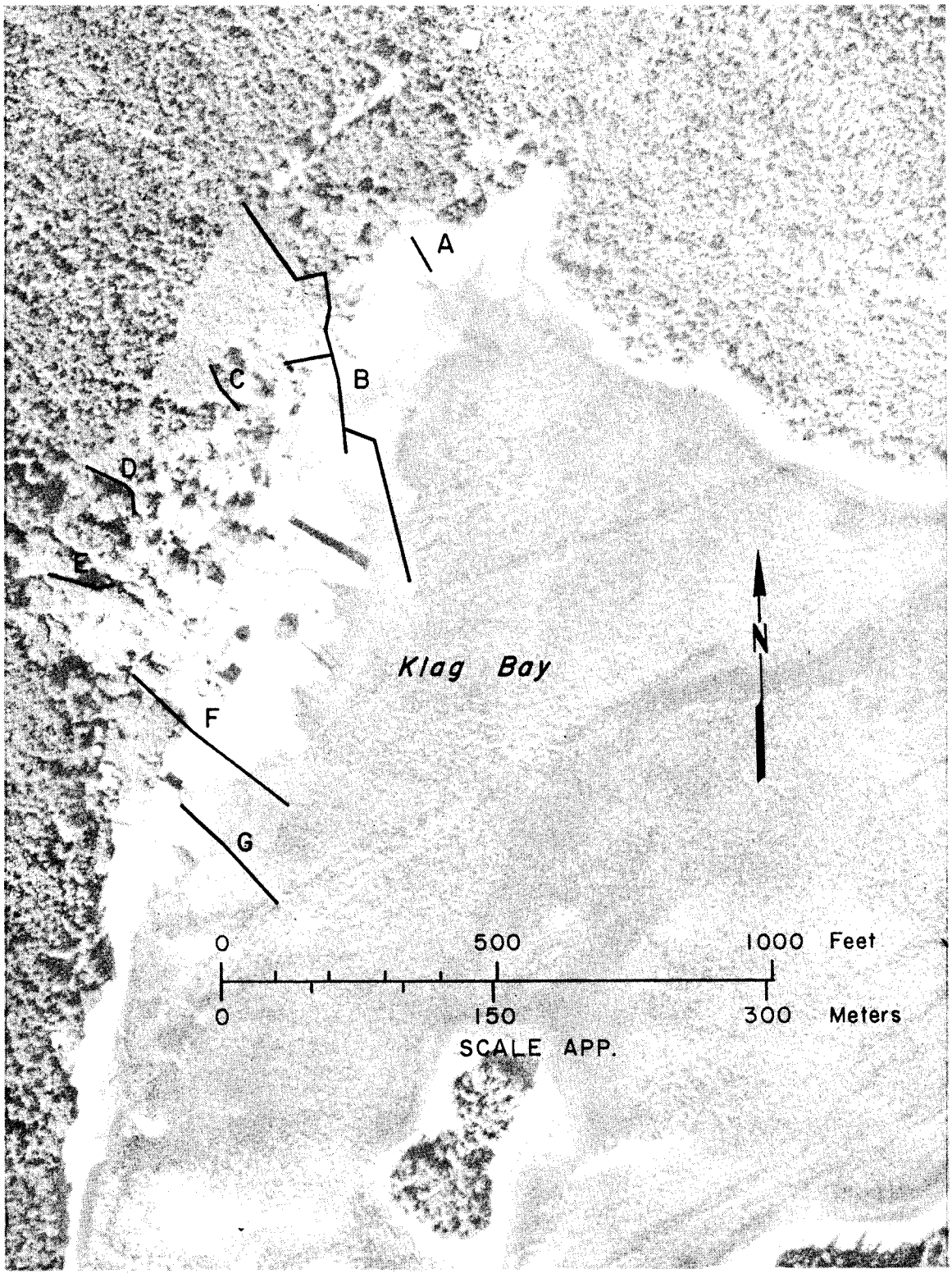


Figure 12. - Aerial photograph showing Chichagoff dump and tailings sample line locations.

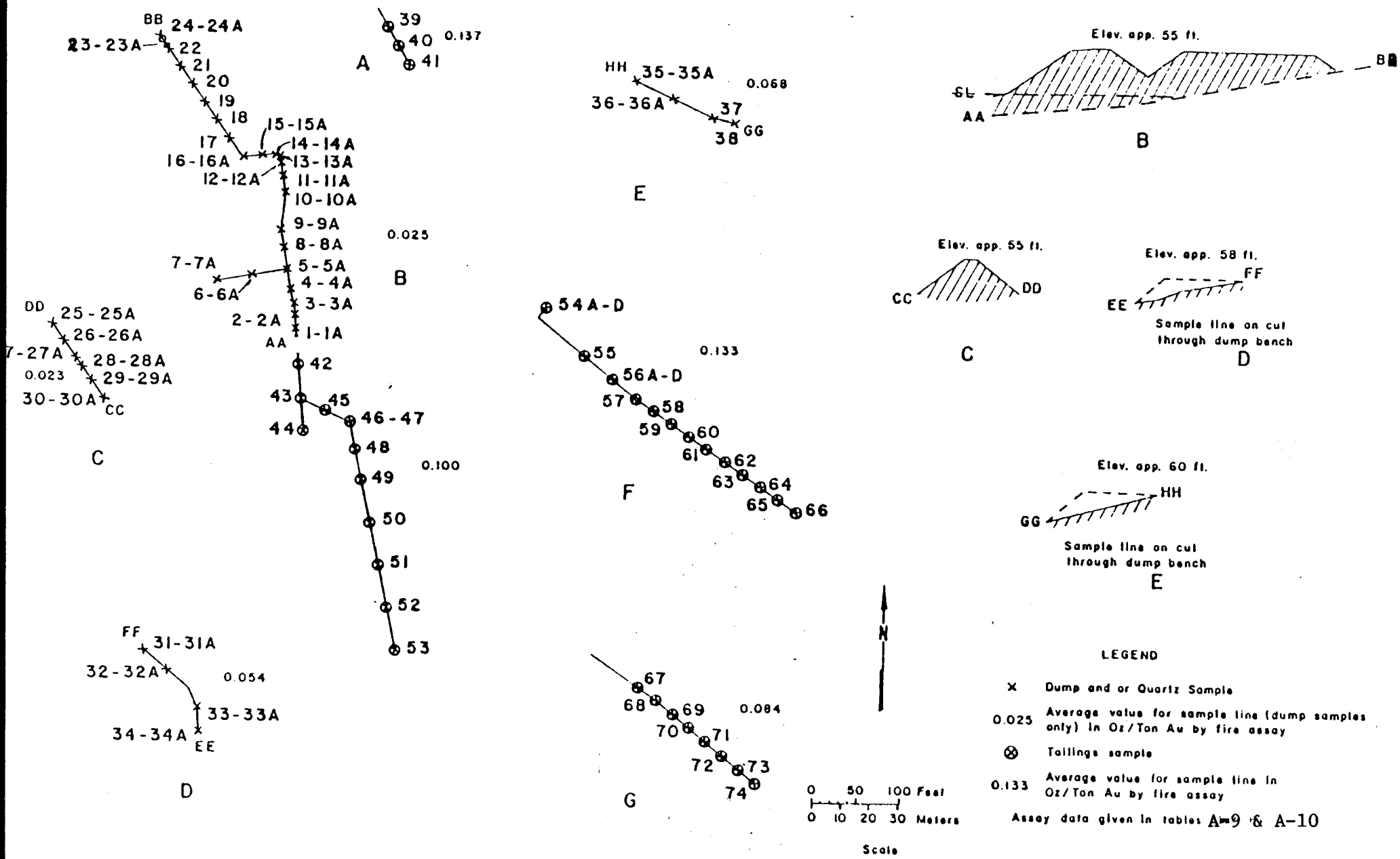


FIGURE 13.--Chichagoff dump and tailings sample line detail. (Mapped in 1979 by J. Still and K. Weir)

level that averaged 0.28 oz. gold per ton with a recovery of 85 percent. An eight year mine life was assumed. The gold price necessary for the property to break even was $513.00 per oz. at a zero percent rate of return.

Following are the Chichagoff claim area resource estimates made by this study and the basis for each estimate. Resource and reserve definitions are found in appendix C.

1. Big Croppings area: Two veins are located between 1450 and 1650 foot elevation along the Chichagof fault. Between 1906 and 1913 an adit and a series of trenches were driven or cut across the veins. The adit is now tightly caved and most of the trenches are sloughed and overgrown. Figure 5 shows the veins as exposed in 1979 and sample locations, while plate 5 shows the extent of the vein and location of the underground workings according to old mine maps. According to mine maps the veins join at an elevation of about 1675 feet. Twenty-two samples were taken in 12 lines at locations where the veins outcrop and in a few pits. Vein widths ran to 7.9 feet and grades to 0.78 oz. gold per ton (for an 1.8 foot width). Table A-3 gives the analytical results. Based on mine records and exposures in outcrops and pits, the west vein (shown as #1 in figure 5) is estimated to have a strike length of 288 feet and the east vein (shown as #2 in figure 5) a strike length of 372 feet. Vein depth is estimated at 1.25 times greater than the strike length (one half the average 1 to 2.5 ratio of ore zone strike length to vertical height) and for the purpose of reserve calculations it is assumed the vein has

a 3 foot width where it is only partially exposed. The western vein has an estimated average mining width of 4.5 feet and the eastern an average mining width of 3.0 feet. Inferred marginal reserves for both veins are: 80,000 tons at 0.25 oz. gold per ton (20,000 oz. gold) and 0.08 oz. silver per ton (6,400 oz. silver).

2. Golden Gate #3: A quartz vein on the Chichagof Fault is exposed for a strike length of over 200 feet in the Golden Gate #3 drift. Figure 4 shows the drift and sample locations and Table A-2 gives the analytical results. Although at places the drift has caved to a height of 15 feet above the drift floor - access is reasonably safe to 240 feet. Thirty-one samples were taken across 13 sample lines spaced at approximately 15 foot intervals along the vein. The maximum vein width was 1.32 feet, where it was also the highest grade, 0.94 oz. gold per ton. For a distance of 180 feet along strike the vein averaged (26 samples in 11 lines) 0.12 oz. gold per ton at a 3 foot mining width. Using an estimated ore zone vertical height of 300 feet there are 13,500 tons of inferred subeconomic resources at an average grade of 0.12 oz. gold per ton (1,620 oz. gold) and 0.04 oz. silver per ton (540 oz. silver).

3. Unmined area explored by underground workings: Only 23 percent of the area explored by underground workings along the Chichagof Fault was mined. This area is delineated on plate 4. This area was explored by drifts that have a vertical spacing from 100 feet to 600 feet or greater. Early in the life of the mine,

mine records (Miller, dated 11/6/1913) indicate a cut off grade of about 0.3 oz. gold per ton. Later records (1930's) indicate that to justify stope development an area had to average 0.3 oz. gold per ton. Leasing problems (25 percent royality) arose when the rich Rust ore shoot was mined on the Over the Hill claim. There are reports of hangingwall and footwall ore zones that parallel each other at a sufficent distance apart to be missed in a drift width. Stopes either ended at blunt edges or graded or narrowed to an assay wall. Significant gold mineralization (above 0.1 oz. gold per ton) was found in all the mine workings examined along the Chichagof Fault and the sampled edge of a stope ran over one ounce per ton (3 foot mining width). The Big Croppings ore zone that ran 0.25 oz. gold per ton was not mined. It is important to note that the mine dump averages at least 0.04 oz. gold per ton while the tailings ran over 0.1 oz. gold per ton.

Based on the above, it is estimated that a cutoff grade halo exists around the stopes and that ore zones such as the Big Croppings veins are located in the area explored by underground workings but not mined. The mining width would range from 3 to 15 feet. It is estimated that 23 percent (percent of explored mine area that was stoped) of this unmined area averages at least 1/4 of the average grade mined from the stopes over the life of the mine. The marginal inferred reserves are: 155,000 tons at 0.30 oz. gold per ton (46,500 oz. gold) and 0.09 oz. silver per ton (13,950 oz. silver) above the main haulage level. 308,000 tons at 0.30 oz. gold per ton (92,400 oz. gold) and 0.09 oz. silver

per ton (27,720 oz. silver) below main haulage level.

4. Claim area not explored, or with very limited exploration underground: For the purpose of explanation, this area is divided into two parts. The first area is along the Chichagof Fault outside the area explored by underground workings as shown on plate 4. It extends below the lowest mine level mined (2700 feet below sea level) and includes the areas just beyond the rich Rust and Temby ore shoots and the area below the Golden Gate and DeGroff ore shoots. Mine records indicate little exploration occurred during the life of the mine and there were some leasing problems. The second area consists of the fault zones subparallel to the Chichagof Fault that traverse the 29 mine claims. Some of these fault zones are exposed by near surface workings containing significant gold values. The OB workings open ground along a hanging wall split to the west of the Chichagof Fault and the Aurum and Sitka workings, containing in place gold values up to 6.7 oz. gold per ton, explore ground to the east of the Chichagof Fault. The Aurum and Sitka workings are on or near fault zones that may be opened up by a crosscut driven 1550 feet to the east off the main mine level. Over 1600 feet of drifting and some mining occurred in the zone that correlates with the Aurum lower adit on the surface (see figure 2.)

Based on the above it is estimated that significant ore shoots are located along the Chichagof Fault in the area without

underground exploration and in fault zones subparallel to the Chichagof Fault that traverse the 29 patented Chichagoff Claims. The mining widths would range from 3 to 15 feet. It is estimated that the average grade of these ore shoots is 1/2 the average grade mined over the life of the Chichagoff Mine and the tonnage is 1/2 million tons or: 500,000 tons hypothetical reserves at 0.6 oz. gold per ton (300,000 oz. gold) and 0.18 oz. silver per ton (90,000 oz. silver).

5. Chichagoff tailings: (figure 12 and 13 and table A-1) Over the mine life somewhat less than 600,000 tons of tailings were produced. Between 1939 and 1940, approximately 71,000 tons of tailings were processed by the mine with a recovery of 6219 oz. of gold. Between 1945 and 1973 small amounts of tailings were also processed. The bulk of the tailings are located in the tide flats or littoral zone. In 1967 the claim owners drilled 15, 4-inch power auger holes to a depth of 4 feet in the littoral zone and split and mixed the material from the 15 holes. This sample assayed 0.14 oz. gold per ton. The Bureau of Mines took 36 Shelby tube and shovel samples along 4 sample lines, (see p. 21 for sampling details) that averaged 0.11 oz. gold per ton. In 1980, D.G. Bryant, Inc., (Lynch, 1981) sampled the tailings by driving 17 holes (up to 25 feet deep) into, and sometimes through, the tailings. The gold occurs predominately as very fine grained native gold interlocked with sulfide and quartz and sampling to depth did not reveal any preferential concentrations. They estimate 456,000 measured tons of reserves

at an average grade of 0.1105 oz. gold per ton in the tide flats (50,000 oz. gold). It is estimated that the average silver grade would be 0.03 oz. silver per ton (14,000 oz. silver). A small additional tonnage is on the beach and over 100,000 tons are scattered along the bottom of Klag Bay and may not be recoverable.

6. Chichagoff dump: (figure 12 and 13 and table A-10) The dump extends 900 feet in a northerly direction from the mine portal to just below the mean high tide line. It is up to 400 feet wide and 60 feet high and has an almost impenetrable brush covering. The extent of back fill underground is not known and it is not clear what portion of the underground workings the dump represents. Thirty-six dump samples were taken in four sample lines (see p.21for sampling details) that averaged 0.04 oz. gold per ton.(The quartz samples from the dump often contained much higher gold values than did the dump samples.) These samples represent the surface of the dump at only a few locations and are insufficient to accurately estimate the average grade for the dump. The contours of the land prior to the dump are not known and without this knowledge it is impossible to accurately estimate the dump tonnage without drilling or digging pits. It is roughly estimated that the dump contains 200,000 tons of material at an average grade of about 0.04 oz. gold per ton and 0.012 oz. silver per ton. These would be subeconomic inferred resources.

Hirst-Chichagof Mine

Introduction - History

The Hirst-Chichagof mine is located on Doolth Mountain on the Hirst Fault which is almost parallel to, and approximately 3600 feet northeast of, the Chichagof Fault. It has a traceable strike length of at least 8.5 miles. Plate 2 shows its location along the fault. This mine is very similar to the Chichagoff Mine in terms of structure and ore zones.

The Hirst-Chichagof Mine was discovered in 1905 by Peter Romanoff, Andrew Dixon and Bernard Hirst. In 1918, the Hirst-Chichagof Mining Co. was formed and by 1920, three drifts had been started and mill equipment consisting of 10 stamps, a jaw crusher, ore feeder, amalgamation plates, and assay equipment were delivered to the mine site.

By 1922, mining had started above the main level on the #1 ore shoot and this ore was being processed in the newly completed mill. By 1925, the No. 2 ore shoot was found on the main level and the #3 ore shoot was found above the main level. Plate 6 shows selected mine workings.

From 1924-1927 the #1 and 2 shafts were sunk, and in 1929 arrangements were made to utilize power from the Sisters Lake powerhouse. From 1930 to 1933 the #3 shaft was raised from the 500 foot to the main level and was sunk to the 1900 foot level (lowest mine level) by 1941. In 1932 a flotation circuit was installed at the mill (Reed and Coats, 1941, p. 103).

In 1939 the Kay ore shoot was found 4600 feet along the main level drift on the Kay Split of the Hirst Fault. From 1939 to the end of 1941 a 500 level drift along the Kay Split to the Kay ore shoot was driven and a winze and raise reached the main level on the Kay ore shoot.

Because of shortages of men and equipment created by L208, the mine closed in 1942. It was reopened briefly in 1943 and attempts were made to reopen it in 1946 and 1950 but the workings and mill had deteriorated so that conditions were reported as unfavorable [1942 and 1943 mine reports (Miller, 1980), 1946 and 1950 newspaper reports].

Production

From 1922 to early 1943 the Hirst-Chichagof Mine produced gold each year and by 1943 over 140,000 tons (records incomplete) had been mined with an extraction of about 131,000 oz. gold and 33,000 oz. silver. Production in 1941 was 7089 oz. of gold from 10,419 tons of ore and in 1942 it was 4442 oz. gold from 3584 tons of ore. About 30 percent of the gold and 40 percent (1934-1942) of the silver were produced from concentrates. Average tenor of the ore based on the years with known ore and gold production was 0.86 oz. gold per ton extracted or an in place value of about 1.0 oz. gold per ton (tailings run 0.14 oz. gold per ton). In 1950, 57 oz. of gold was recovered from tailings and in 1954, 67 oz. of gold was recovered from mill clean-up. Table 5 lists the mine production from 1922 to 1954.

Structure

The width of the Hirst-Chichagof Fault ranges from a few feet to 50 feet. The average strike on the main level of the mine is about N30°W and the dip is 75° SW. At most locations the fault is very similar to the Chichagof Fault. The major exceptions are as follows:

1. At several locations the Hirst Fault disperses into a zone up to 50 feet thick, consisting of a series of weak shears. The most important such location is where the main level mine workings

TABLE 5. - Hirst-Chichagof Mine production (Bureau of Mines records)

	Dry Tons			Concentrates Produced					Recovered in Bullion	
					Gross Metal Content					
Year	Ore	Old Tailings etc	Treatment	Dry Tons	Gold (oz)	Silver (oz)	Copper (lbs)	Lead (lbs)	Gold (oz)	Silver (oz)
1922	?		Am	-	-				566	241
1923	560		Am	-	-				315	102
1924	5,600		AmGr CtSm	84	512	-	-	-	2,468	591
1925	4,120	(wet)	do.	165	1,003	352	-	-	5,241	1,098
1926	4,657	(wet)	do.	70					3,193	699
1927	5,040		do.	165	1,590	254	-	-	5,176	1,117
1928	?		do.	?	405?	133	-	-	2,916	634
1929	2,100		do.	95	548	229			2,095	440
1930	1,760		do.	14	53	22	-	-	440	144
1931	12,584		AmGrCtFloCtSm	67	482	198	-	-	5,782	1,432
1932	9,283		do.	150	1,975	685	-	-	2,829	585
1933	?		?	?	?				5,117	?
1934	12,382	1085	AmFlo CtSm	?	?				4,404	1,120
1935	11,606		do.	299	3,650	1,205	460	126	6,854	1,461
1936	8,460		do.	643	2,811	937	130	184	4,616	970
1937	14,504		do.	417	3,522	1,293	580	276	9,187	2[illegible]
1938	11,464		do.	736	7,309	2,517	918	1,348	9,036	1[illegible]
1939	11,090		do.	525	4,844	1,848	1,470	228	8,955	1,932
1940	12,620		do.	415	3,756	1,491	1,371	12	6,982	1,560
1941	10,419		do.	289	1,993	908	922	300	5,096	1,106
1942	3,584		do.	110	726	331	298	46	3,716	809
1943	534		do.	36	359	110	113	-	417	98
1950		Clean-up	Am	-					57	12
1954		Clean-up	Am	-					67	
Total	142,367			4,280	35,538	12,513	6,262	2,520	95,525	20,270
Total Gold Production with corresponding recorded Mine tonnage					35,133				86,802	

Average recovered grade over the life of the mine $\frac{121,935}{142,367}$ oz. gold = 0.86 oz. gold per ton

Total Production 131,063 oz. gold and 32,733 oz. silver

lose the Hirst Fault and follow the Kay Split into the Hirst hanging wall at a distance of about 2800 ft from the mine portal.

2. The Kay Split is reported to be not as strong as the Hirst Fault. A significant ore shoot, the Kay ore shoot, is found at a distance of 2200 feet along the Kay split. It is located about 200-300 feet into the hanging wall of the Hirst fault and serves as an indication that important ore zones may exist on splits some distance from major faults.
3. Aplite dike material forms the footwall and in some places the hanging wall in a significant portion of the mine. At other locations shaly graywacke or less often massive graywacke forms the hanging wall and foot wall. The average strike of the graywacke is N65° W and the dip is 64° SW (Reed and Coats 1941, p. 107).

The Hirst Fault has a warp or bend that is recognizable from the 180 through the 700 foot level and according to Reed and Coats (1941, p. 110) it is related to ore deposition.

Ore Zones

The ore zones consist of gold bearing quartz veins deposited along the Hirst Fault or Kay Split that are in general very similar to those at the Chichagoff Mine. The quartz veins may occupy all or only a small part of the fault zone width. They form tabular but irregular zones that have a long dimension down the rake towards the south and a short dimension along strike. Ore zone widths to 10 feet, strike lengths to 425 feet and vertical heights to 1900 feet are known. The average tenor for the life of the mine was about 1.00 oz. gold per ton. Plate 6 shows the underground

workings and locations of the ore shoots. There are 5 ore shoots, four of these are designated by number, one by name - the Kay ore shoot. Some of the ore bodies are blunt at their edges and others thin out gradually to an assay wall. Most often ore zones consist of ribbon quartz but at places quartz is white and massive with no layers.

Sulfides constitute less than 3 percent of the ore and consist predominately of pyrite and arsenopyrite and rarely sphalerite, galena and chalcopyrite. There is more arsenopyrite in the Hirst ore than Chichagoff ore. The ore gangue minerals are quartz and calcite, while hydrothermal alteration products are sericite and chlorite. In places the wall rock is silicified or pyritized. Graphite is found in the graywacke wall rock, fault gouge and in ribbons in the quartz itself.

Reed and Coats (1941, p. 114) reporting on microscopic work by American Cyanamid and Chemical Corporation on ore from the Hirst-Chichagof Mine indicates that the order of deposition of sulfides is as follows: pyrite is the first metallic mineral deposited, with the possible exception of arsenopyrite whose relationship in the deposition sequence is not known, sphalerite appears to have followed pyrite in the sequence of deposition and to have preceded galena, chalcopyrite and gold. Galena seems to bear the same age relationship to the enclosing minerals as the gold.

Gold is found in isolated particles in the quartz, in the graphitic ribbon structure in quartz or more rarely interwoven in the sulfides. Gold is occasionally found in the fault gouge and more rarely in the graywacke or aplite dike material.

Mine Development

Mine development along the Hirst Fault consist of a 90 foot elevation main haulage drift that reaches the Hirst Fault at a distance 950 feet from the portal and follows it for 1950 feet to where it veers off into the hanging wall of the Hirst fault to follow the Kay split. Plate 6 shows the mine workings. Off this main level a raise reaches the 250 and 450 foot elevation drifts on the #1 ore shoot, the #1 shaft reaches the 300 level, a raise reaches the # III ore shoot, and the #3 shaft reaches the bottom of the mine at the 1900 level (1800 feet below sea level). The #2 shaft reaches from the 300 to the 500 level.

Mine development along the Kay Split consists of a main level drift driven 2800 feet to within several hundred feet of a breakout on the Klag Bay side of Doolth Mountain, a 500 foot level drift to the Kay ore shoot and a shaft from the main level to the 500 level of the Kay ore shoot.

Surface development on the north side of Doolth Mountain is restricted to some pits and cuts located from above the main level to where the #1 ore shoot outcrops. On the south side of Doolth Mountain, development along the Hirst Fault is absent and development along the Kay split consists of trenches and pits exposing a quartz vein from an elevation from 100 to 150 feet along the Rarus Isis claims sideline (plate 3, location 17). The only information on this quartz vein is in a 1939 mine report and subsequent correspondence indicating the grade of the outcrop could not be found (Sorenson, 1939).

Mine development not on the Hirst Fault or Kay Split consists of the following: a short adit was driven on the Elsinor claim, an adit and several trenches are located on the Bear Extension claim, and adits are

located on Johanna, Glengary and Sunday Queen claims. Underground a 550 foot long crosscut was driven into the footwall of the Hirst Fault and a 660 foot long crosscut was driven into the hanging wall of the Kay Split. A 230 foot long and 35 foot long drift were driven off the latter crosscut along faults that may roughly correlate with near surface workings on the Johanna and Glengary Claims. Figure 14 shows the relationship between the 660 foot long crosscut workings and near surface workings.

Present Investigations

Along the Hirst Fault and Kay Split

Field investigation of the main haulage level and the 250 foot elevation crosscut drift revealed the following (see Plate 6):

1. The main level haulage drift is caved tight about 850 feet from the portal just before it reaches the Hirst Fault. As some water is running through the cave undoubtedly all the underground workings below the main level are flooded.
2. The 250 foot elevation crosscut drift has a bad roof 150-200 feet from the portal and appears caved further back.

Several tons of caved rock were excavated to clear an entrance past the caved portal of the 450 foot elevation drift to gain access to examine the mine workings in the vicinity of the #1 ore shoot. These are accessable to 290 feet past the portal where downed timbers and a cave prevent further access (see fig. 15). The connecting raise from the main haulage level occurs at a distance of 285 feet from the portal and is open at least to a depth of 75 feet. Samples taken of the #1 ore shoot (Plate 6) along this drift but outside of the stoped area contained up to 1.688 oz.

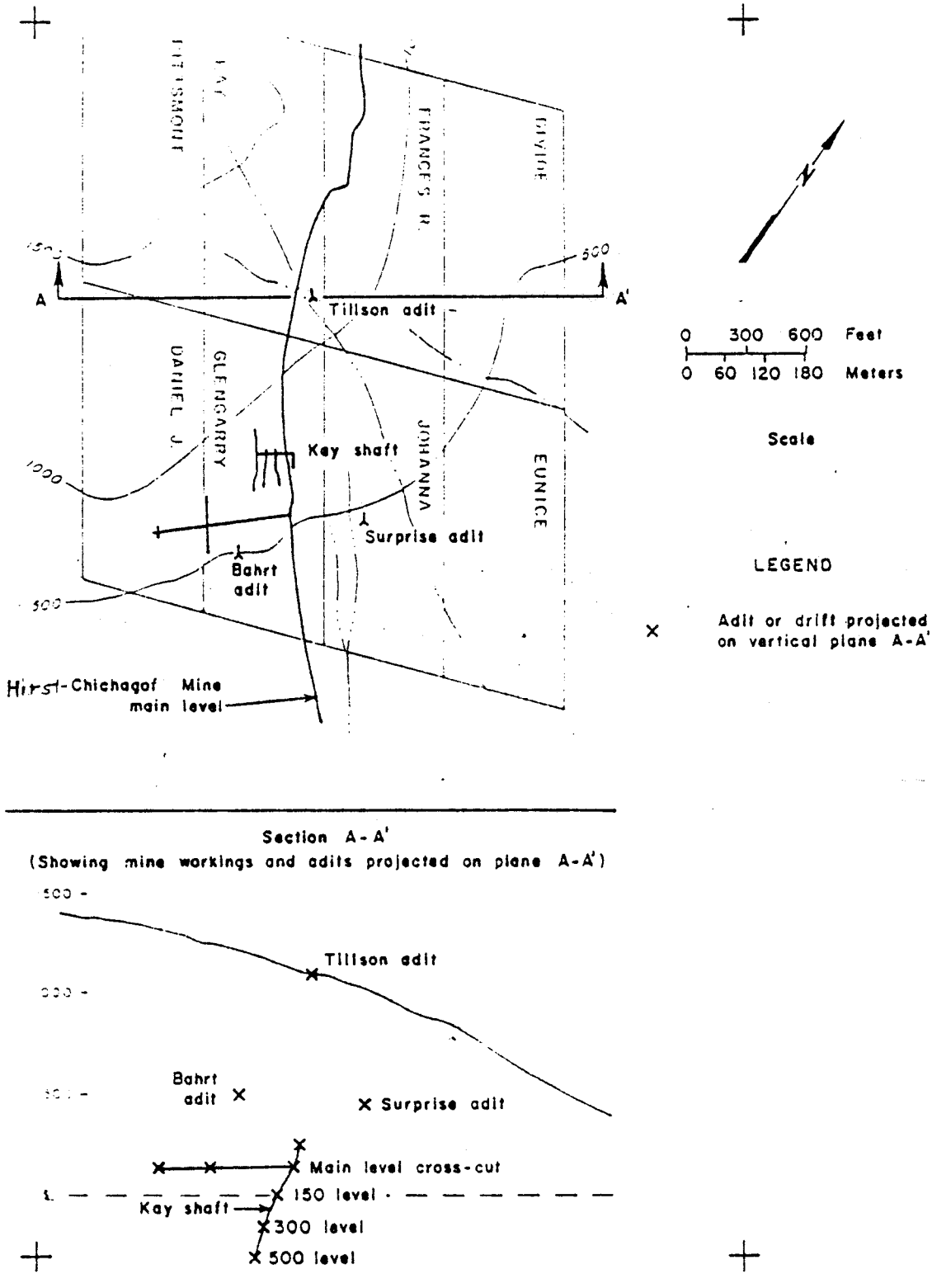


FIGURE 14.- Sketch map of the Kay Split, Hirst-Chichagof mine, showing the hanging wall crosscut off the main level drift and near surface workings. Section shows the relationship between near surface workings and mine workings

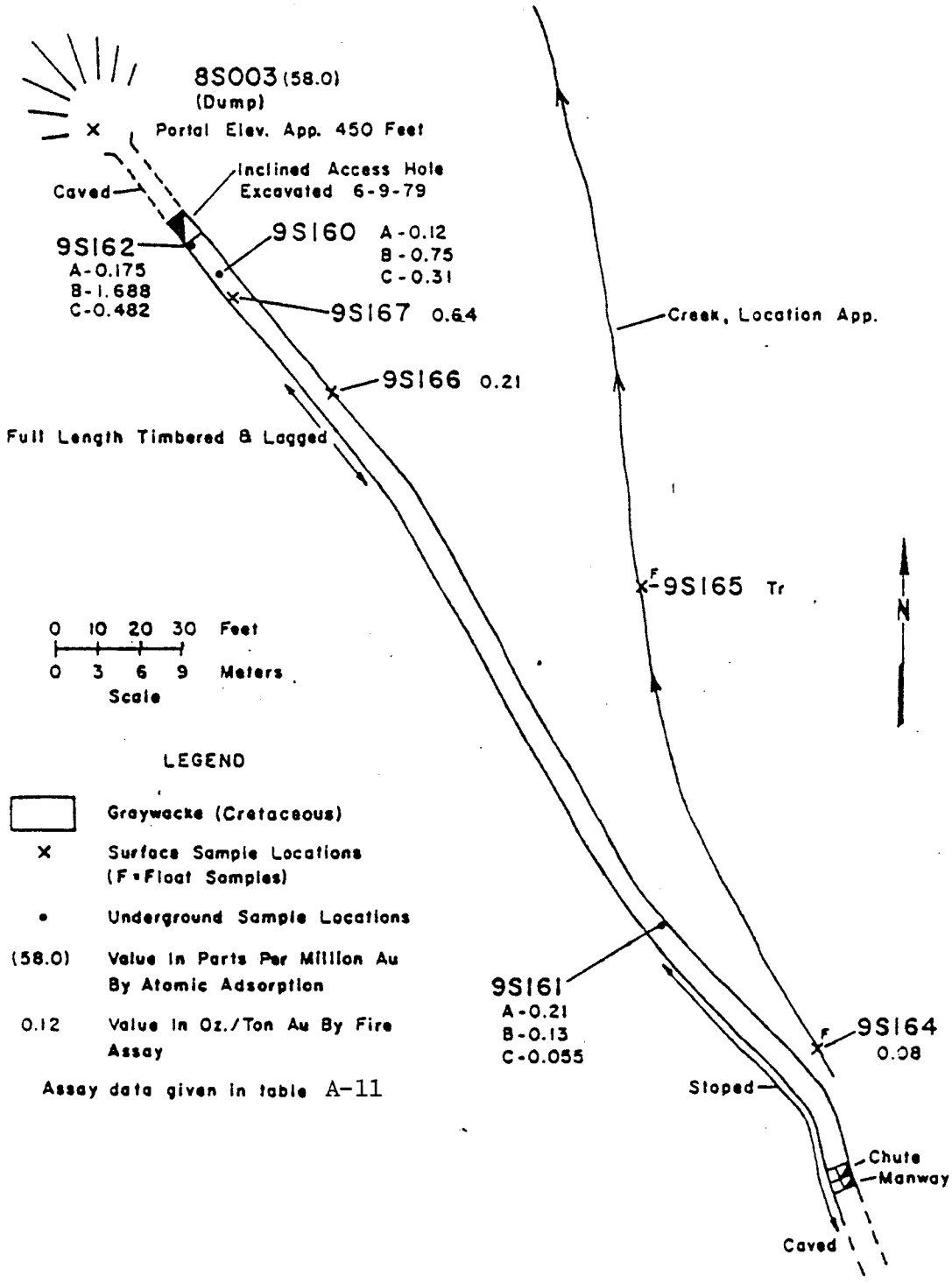


FIGURE 15.- Accessible portion of Hirst-Chichagof 450 foot elevation drift, sample locations. (Mapped by J. Still and K. Weir June 1979)

gold per ton (1.3 foot channel). Pits located on structure and above the drift were overgrown and sloughed and quartz fragments dug from them contained up to 0.64 oz. gold per ton. Figure 15 shows the drift and surface pits and table A-11 gives the analytical results.

The quartz vein reported in 1939 mine correspondence, to outcrop along the Rarus Isis claim sideline along the Kay Split, was not examined in the field because this information was not gained until late in 1979, after the field time alloted for this project had been completed (plate 3 location 17).

Within the Original Hirst Claim Group but not along the Hirst Fault or Kay Split

Field work and other information on the near surface occurrences within the Hirst-Chichagof claim group, but not on the Hirst Fault, are summarized in table 6. Plate 3 shows the locations of these workings and figures 16 to 20 are detailed maps of the occurrences while the analytical results are located in appendix A. These investigations revealed the following.

Gold is found in quartz veins found throughout the claim area. Of the workings examined the Bahrt adit located on the Glengarry claim contains the most significant gold values.

The 140 foot long Bahrt drift exposes a north to northwesterly striking, narrow fault zone containing quartz that dips about 48° to the southwest. Figure 19 shows the adit. The wall rock is massive solid graywacke and there is little fault gouge along the margins of the quartz vein. Northeasterly striking, northwesterly dipping stringer zones are found at the portal and near the end of the adit. The quartz vein is up

Table 6. - Examination and information on prospects, workings and outcrops not on the Hirst Fault but within the Hirst-Chichagof Claim group.
Assay data in Appendix A.

Claim name and prospect workings or occurrence found during this study (unless noted otherwise)	Elevation (feet)	Plate, figure or table (T.) no.	Disc. text pg. No.	Comments
Elsinor Claim Elsinor adit	50	Pl. 3 #11 Fig. 16 T. A-12		A 105 foot long drift located 600 feet east of the Hirst fault exposes a fault zone (strikingN58° E and dipping 65°NW) that contains up to 2 feet of quartz near the portal. At about 6 feet from the portal is a 9 foot wide zone of quartz cemented, brecciated gray-wacke that trends N15°E. Values in drift up to 0.03 oz. gold per ton, nil on dump.
Sunday Queen Claim Sunday Queen adit	900 ±	Pl. 3 #12 Fig. 17 T. A-12		A 27 foot long drift exposes a narrow, NW striking quartz vein in massive greenstone that pinches out 8 feet from the portal. No significant metal values in adit or dump. 1200 feet NE of Hirst fault.
Lena Claim Kay pits	1500 ±	Pl. 3 #13		Reed (1941 p. 117-118) describes a quartz vein up to 2 1/2 feet thick that strikes N7°W and dips 55°W as exposed in three prospect pits. BuMines examination found 12 pits aligned at N7°W for a distance of 450 feet. Almost no quartz found in-place because the pits are sloughed and overgrown. Samples of quartz float assayed up to 0.5 ppm gold. About 1200 feet SW of the Hirst Fault.
Bear Extension Claim Tillson adit	1100 ±	Pl. 3 #14 Fig. 14 T. A-14	35	A 95 foot long drift exposes two NW striking SW dipping fault zones containing quartz veins up to 1.1 foot thick. Samples from the veins assay up t 0.015 oz. gold per ton, 0.1 oz. silver per ton and 1500 ppm arsenic. Samples from two pit dumps (8S306 & 307) located just NW from the adit assayed up to 0.6 ppm gold and 1000 ppm arsenic.

Table 6. Continued

Claim name and prospect workings or occurrence found during this study (unless noted otherwise)	Elevation (feet)	Plate, figure or Table (T.) no.	Disc. text pg. no.	Comments
Glengarry Claim Bahrt adit and pit	500 ±	Pl. 32 #15 Fig.14 Fig. 14 T. A-15	34 & 35	A 140 foot long drift (and flooded shaft) exposed a NW striking SW dipping fault zone in massive solid graywacke that contains up to 0.95 feet of quartz. Samples of the vein assay up to 0.67 oz. gold per ton and 0.2 oz. silver per ton. A high grade dump sample with pyrite, galena and sphalerite assayed 0.16 oz. gold per ton, 0.1 oz. silver per ton, 1900 ppm lead and 1100 ppm zinc. May correlate with fault exposed in hanging wall crosscut of the Hirst-Chichagof Mine.
Johanna Claim Surprise adit	450±	Pl. 3 #16 Fig. 13 Fig. 19 T. A-16		An 80 foot long drift exposes a northerly striking SW dipping fault zone that contains quartz up to 1.10 foot thick. Samples from the vein and adit dump contain no significant metal values.

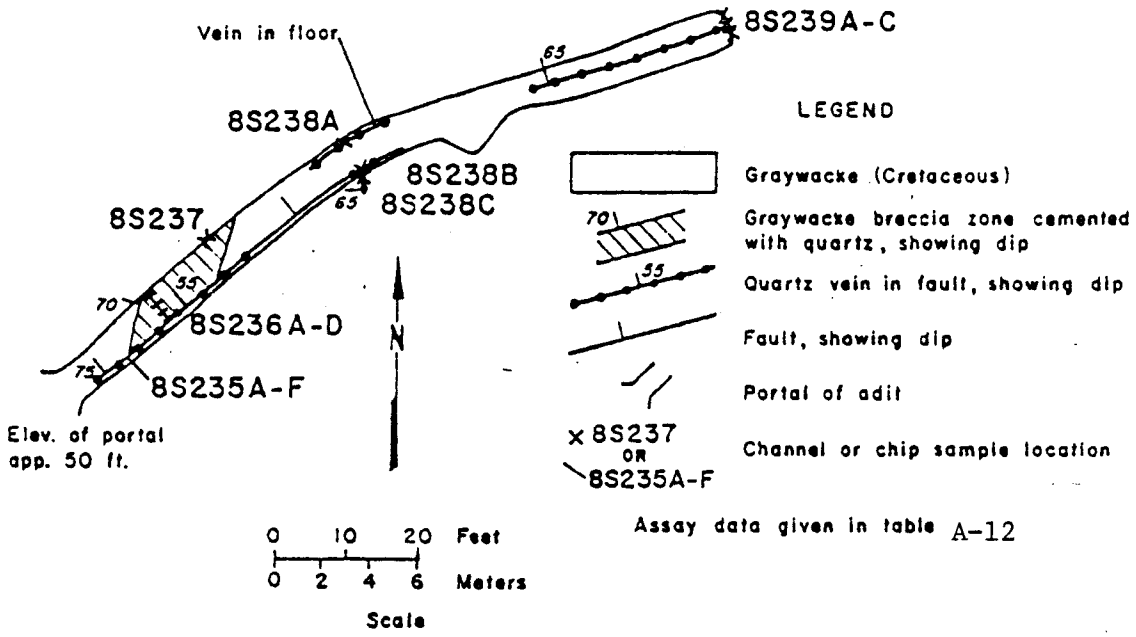


FIGURE 16.- Elsinor adit, sample locations (Mapped by J. Still and K. Weir August 1978)

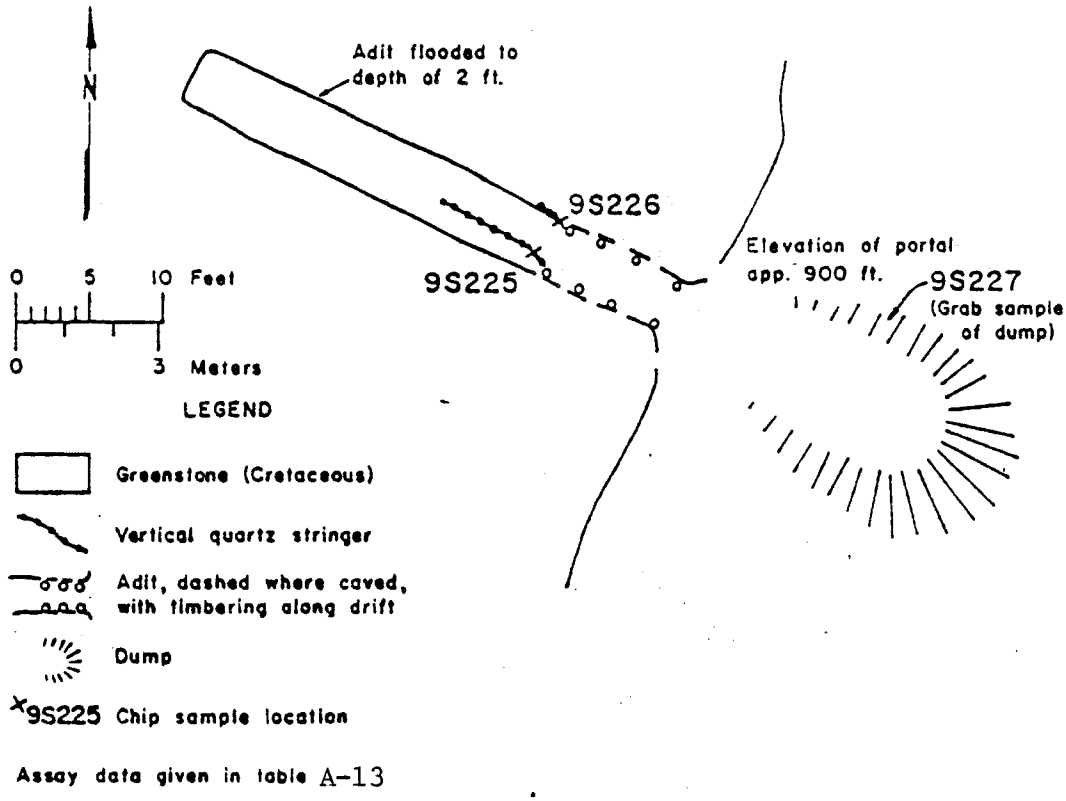


FIGURE 17.- Sunday Queen adit, sample locations. (Mapped by J. Still and K. Weir, June 1979)

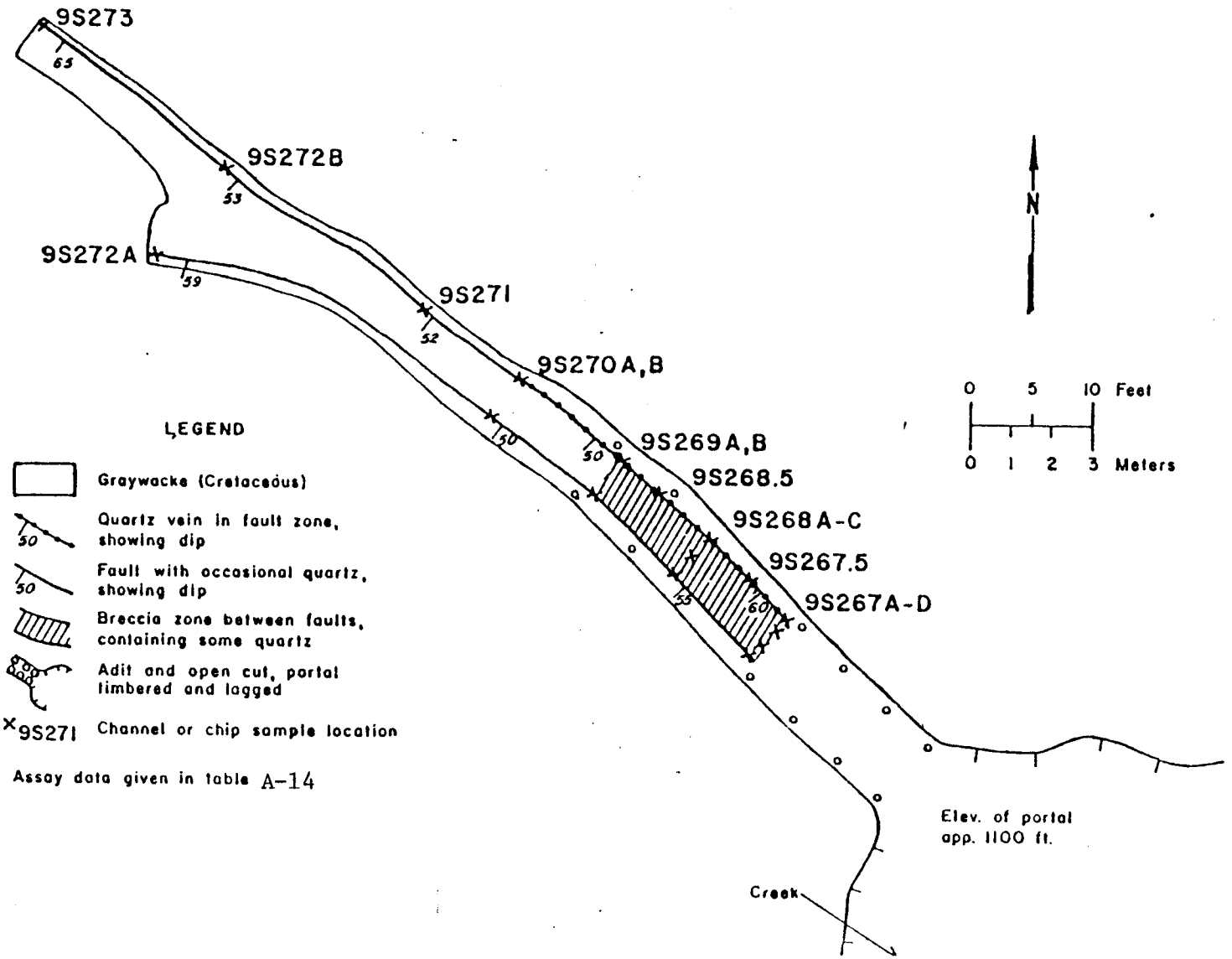


FIGURE 18.-Tillson adit, sample locations. (Mapped by J. Still and K. Weir, July 1979)

LEGEND

Greywacke (Cretaceous)

89 Quartz vein, showing dip

45 Quartz vein in fault, showing dip

70 Fault, showing dip

Adit and open cut, portal timbered and lagged

9S246 A-C Channel or chip sample location, length to scale

× 9S244 Channel or chip sample location

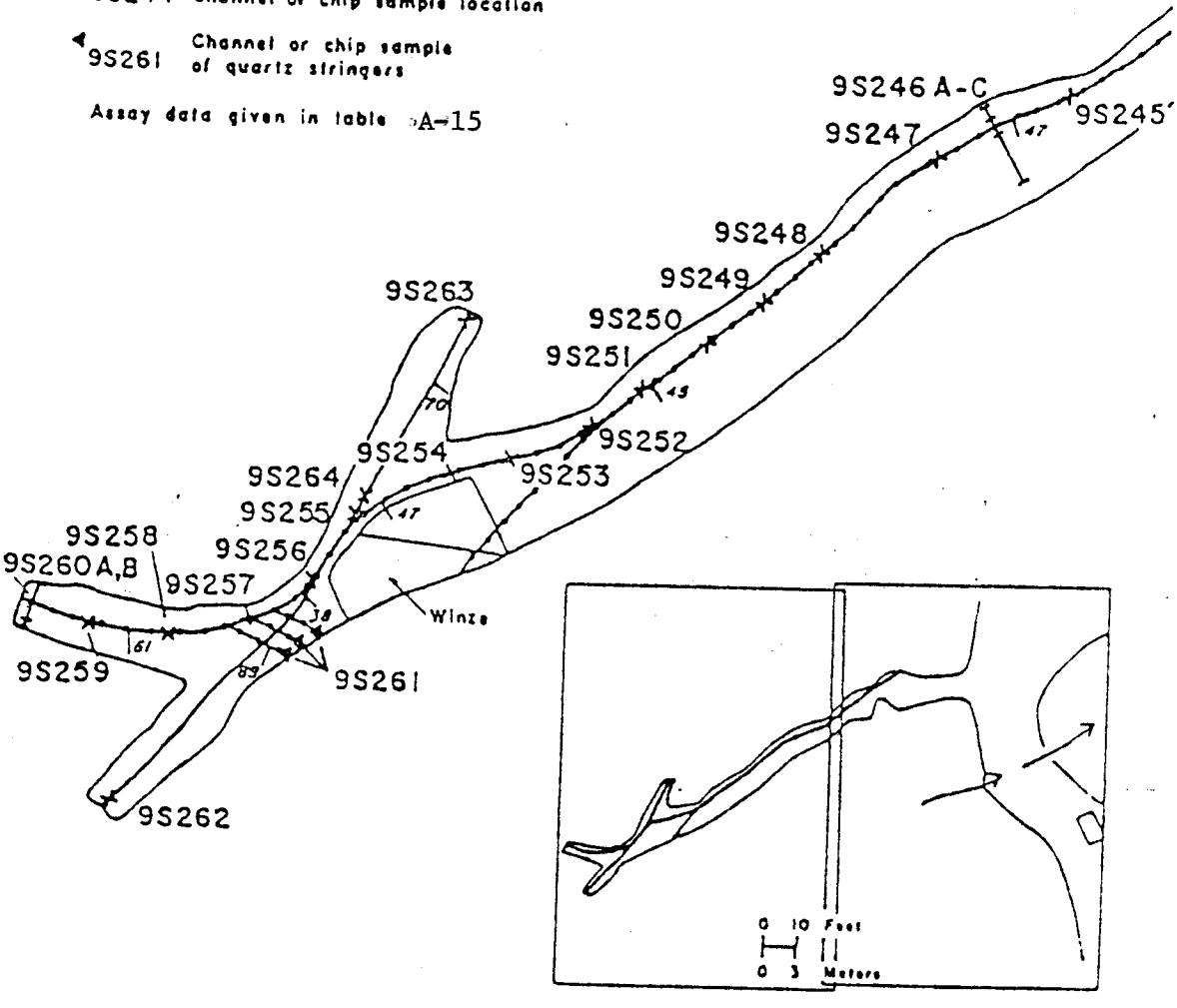
9S261 Channel or chip sample of quartz stringers

Assay data given in table A-15

N

0 5 10 Feet

0 1 2 3 Meters



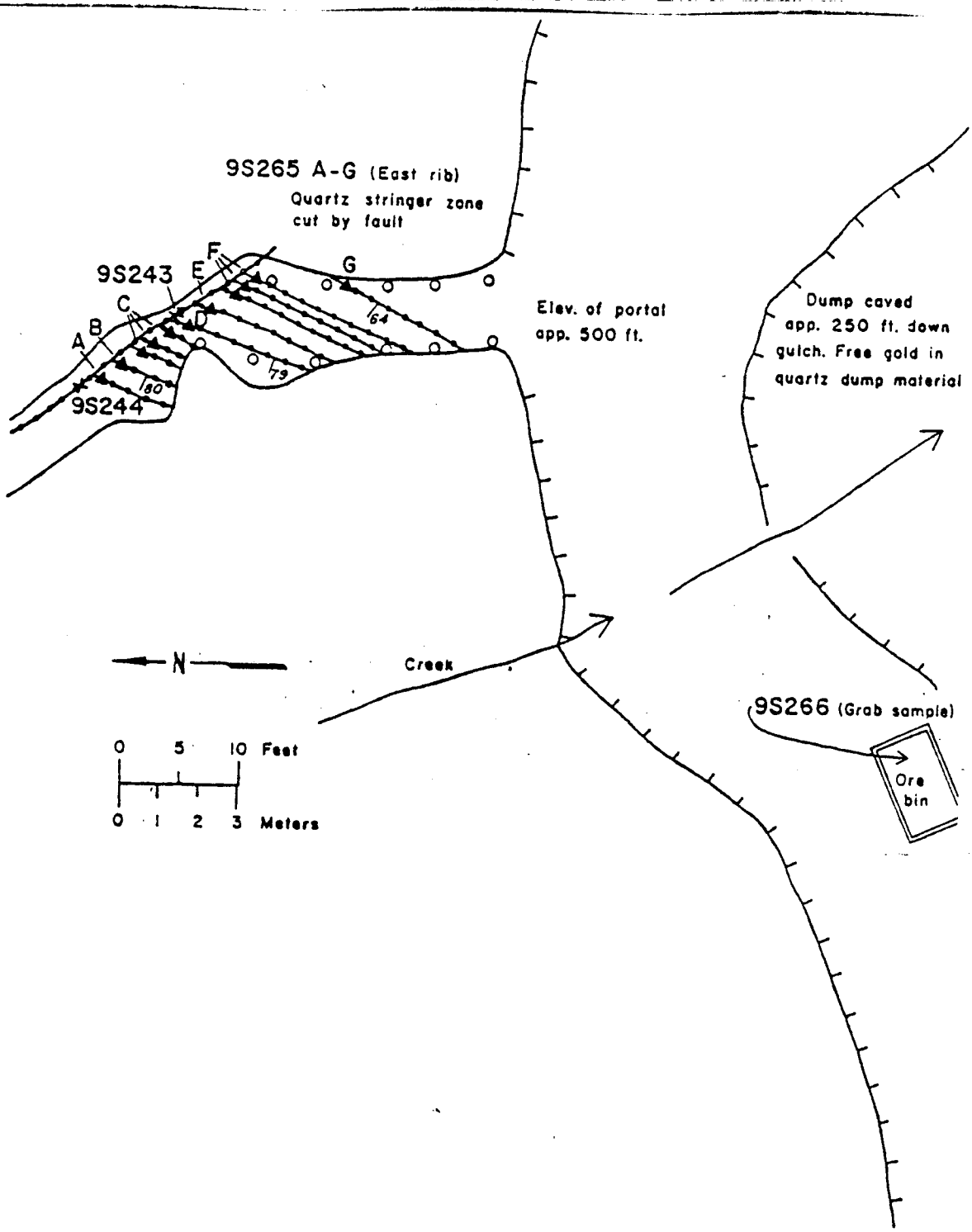


FIGURE 19.-Bahrt adit, sample locations. (Mapped by J. Still and K. Weir, July 1979)

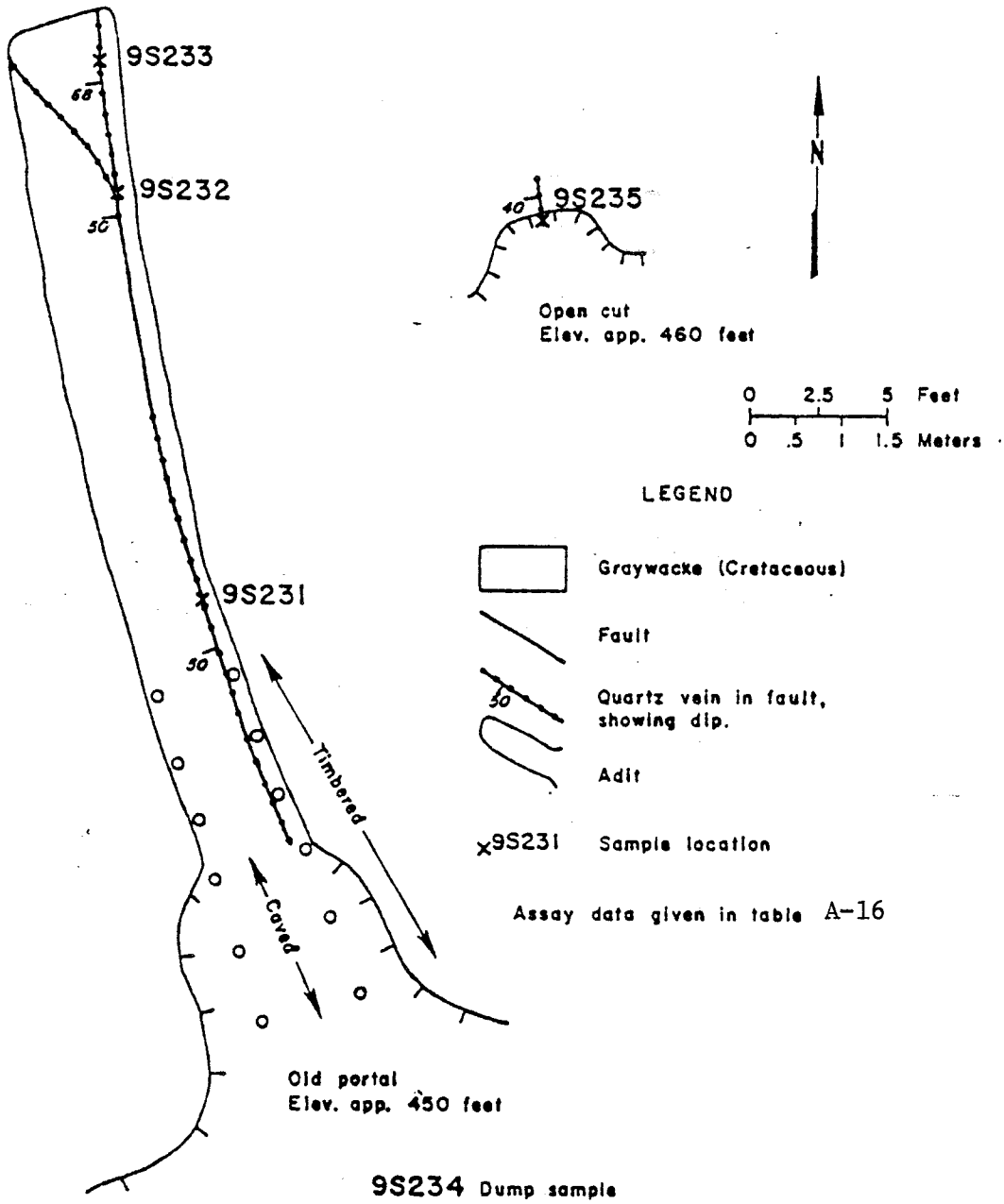


FIGURE 20.-Surprise adit, sample locations. (Mapped by J. Still and K. Weir, July 1979)

to 0.95 feet thick and contains up to 0.67 oz. gold per ton (a 0.4 foot channel). Table A-15 gives the assay data. This adit roughly correlates with a fault zone located 350 feet below and 430 feet along the main level crosscut off the Kay Split. However, the dips do not correlate. The Tillson adit located at 1100 feet elevation also approximately aligns with the Bahrt. Figure 14 is a sketch showing the near surface workings relative to the underground crosscut.

Mine Dump and Tailings

A brief investigation was made to roughly estimate the grade of the mine dump and tailings. Thirteen shovel samples 1/2 foot deep and weighing 15-20 pounds each were taken in 2 sample lines across part of the top and down one side of the dump. A chainsaw was needed to clear these sample sites on the dump . Eleven shovel and Shelby (3 inch dia.) tube samples were taken to a depth from 1 to 1 1/2 feet in 3 lines across the tailings to the low tide line. Figure 21 shows the sample lines on an aerial photograph and figure 22 shows the sampling detail. Tables A-17 and A-18 give the sample results. Much more extensive investigation of the tailings and dump is necessary to accurately determine tonnage and grade.

Resources

Resource estimates for the Hirst-Chichagof claim area (1938 configuration, plate 3) were made based on mine records and Bureau of Mines sampling and mapping of lode veins, dump and tailings. Economic viability estimates were based on the same order-of-magnitude criteria as used in the evaluation of the Chichagoff Mine (page 21). It is important to note that

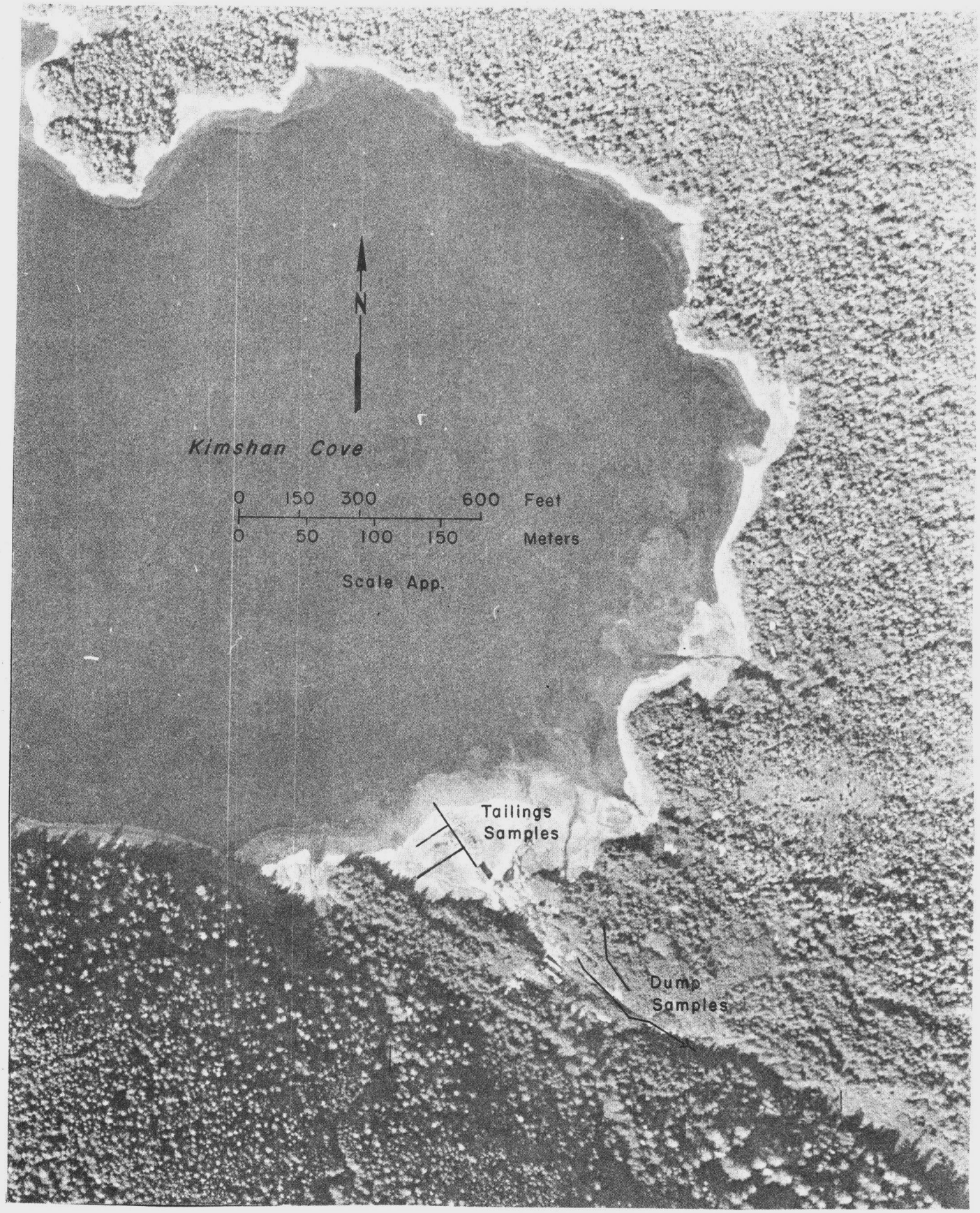


Figure 21. - Aerial photograph of Hirst-Chichagof dump and tailings showing sample line locations.

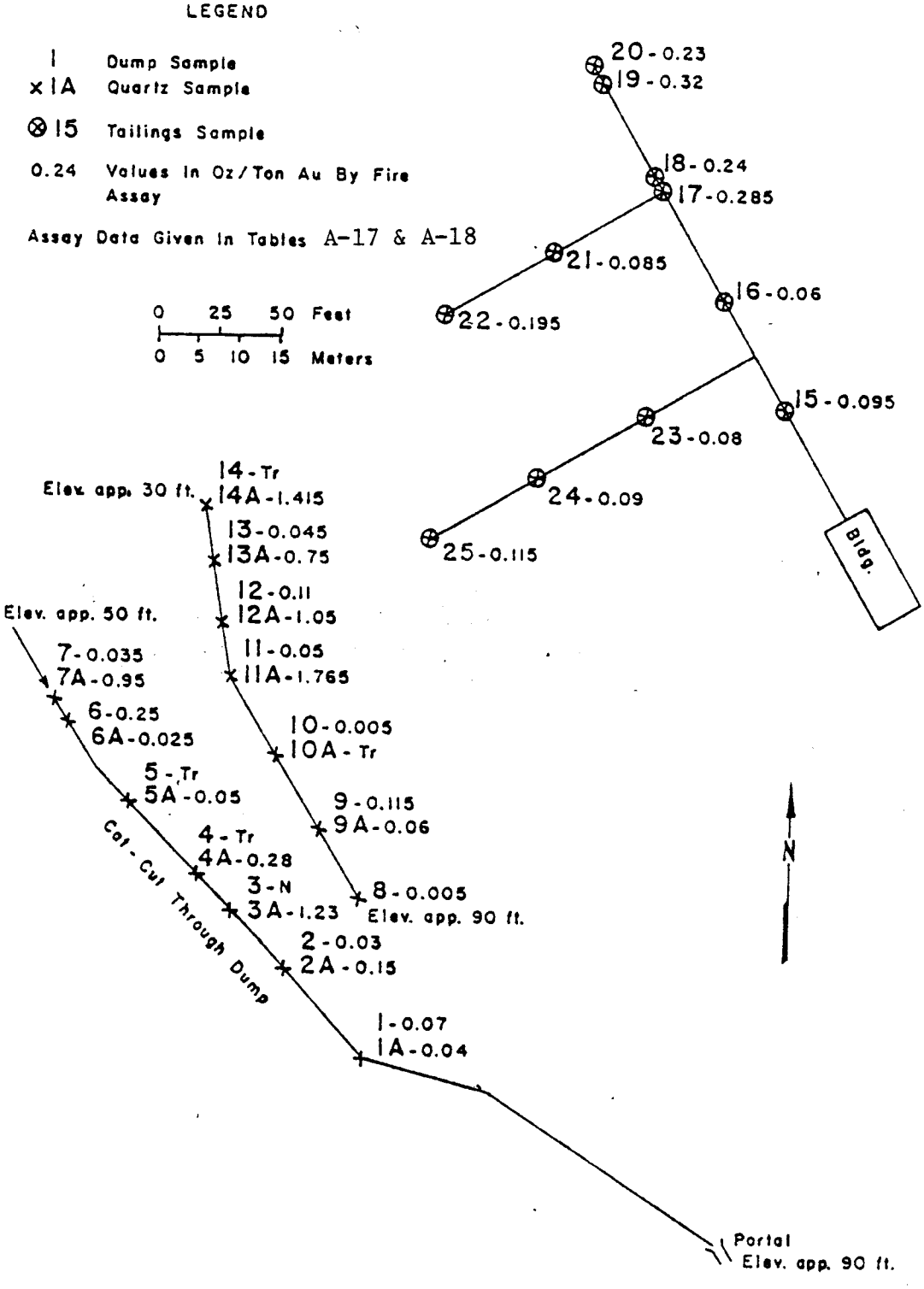


FIGURE 122.-Hirst-Chichagof dump and tailings sample line detail. (Mapped by J. Still and K. Weir in 1979)

significant portions of the Hirst Fault and the Kay Split that were once held by the Hirst-Chichagof Mining Company are not now held by active claims. Following are the Hirst-Chichagof Claim area resource estimates made by this study and the basis for each estimate.

1. Kay ore shoot: The Kay ore shoot is located 4600 feet from the main level portal and is developed by a shaft from the main level to the 500 level and by drifts on the 500, 300, 150 and main levels. Plate 6 shows the Kay ore shoot. It was discovered along the main level drift in 1939 and the only information on it is from old mine reports and telegrams dated 1939, 1940 and 1941 (Sorenson 1939-1941). These records indicate the following:

   A) The ore zone was not delineated at depth.

   B) The ore shoot was fairly high grade as indicated by the following information extracted or quoted from 1939-1941 dated mine reports (Sorenson, 1939-1941):

      - Shaft values from 0 to 25 feet from main level 25 feet at 12 inches quartz at $37 (1.06 oz. gold per ton)

      - 150 level, shaft sump at bottom, quartz 1 foot wide at $10 per ton (0.29 oz. gold per ton)

      - 150 level drift from 101-123 feet from shaft 22 feet at 20 inch wide quartz at $66.97 (1.9 oz. gold per ton)

      - 300 level drift, 195 feet from shaft, 35 foot length at 18 in wide quartz at $200 (5.7 oz. gold per ton)

      " We are now in fairly high grade ore out there (Kay 300 level) and the mill feed is quite high, suggest we continue for the rest of July and probably all of August to mill ore from the Kay 300 only. This will, I think, put our bank balance in pretty good shape."

      - 500 level, seventy feet beyond winze 5 inches of quartz in face that runs over 1.7 oz. gold per ton.

In general these records indicate that at least a portion of the Kay shoot ran well above the average mine grade.

C) There was some stoping on the Kay 500,300 and 150 levels in 1941. In July 1941 stoping was halted on the 500 level because of a severe labor shortage. In 1943, the mine was closed.

The Kay ore shoot is inferred to be similar to the #4 ore shoot and to continue from the 500 level (400 feet below sea level) to the 1900 foot level (1800 feet below sea level). The mining width would exceed 3 feet. It is estimated to contain 80,000 tons of inferred reserves at 1.00 oz. (the mine average) gold per ton (80,000 oz. gold) and 0.25 oz. silver per ton (20,000 oz. silver).

2. Unmined area explored by underground workings: Less than 10 percent of the area explored by underground workings along the Hirst Fault and Kay Split was mined. It is estimated from mine records that the cut-off grade was about 0.2 to 0.3 oz. gold per ton. There is considerable quartz showing on mine maps of the main level along the Kay Split that was not mined. A mine report dated Oct. 13, 1939, reports a large quartz outcropping at an elevation of 100 to 150 feet along the Kay Split on the Rarus Isis Claims sideline. Considerable effort was expended by the mine to clear this outcropping, but subsequent reports indicating grade of the quartz could not be found. Samples taken in the 450 foot elevation drift of an unstoped quartz vein contained up to 0.5 oz. gold per ton across a 3.8 foot width.

It is estimated that a cutoff grade halo exists around stopes and that ore zones undiscovered or unrecognized by previous mining activity are located in the area explored by under-

gound workings but not mined. Mining width would exceed 3 feet. It is estimated that this amounts to 1/2 the tonnage mined over the life of the mine at 1/4 the average grade for the life of the mine or 70,000 tons of inferred marginal reserves at an average grade of 0.25 oz. gold per ton (17,500 oz. gold) and 0.06 oz. silver per ton (4,200 oz. silver).

3. Unexplored portion of the Hirst Fault: Within the original claim group (Pl. 2) at least 5500 feet of the Hirst Fault is unexplored by mine workings. This includes the area on the Bertha Claim from the beach to where the fault is intercepted by the main level cross-cut and the area on the Frances, Johanna and Isis Claims where the main level drift "lost" the Hirst Fault and follows the Kay Split. Exploration along 5000 feet of the Hirst Fault and Kay Split resulted in the discovery of 5 major ore shoots with a production of 131,000 oz. of gold and 33,000 oz. of silver. Only one of these ore shoots out crops.

   Hypothetical reserves, with a mining width exceeding three feet, in the unexplored 5500 feet of the Hirst fault are: 100,000 tons at 1.00 oz. gold per ton (100,000 oz. gold) and 0.25 oz silver per ton (25,000 oz. silver).

4. Hirst tailings (figures 21 and 22 and table A-17): The Hirst tailings are located on the beach, tide flats, and past the low tide line. The bulk of the material is located on the tide flats in the littoral zone. From May 1932 to about June 1933 the mill operated on tailings. In 1950, fifty-seven ounces of gold was recovered from tailings and clean-up. Eleven Bureau of Mines tailings samples in three lines averaged 0.14 oz. gold per ton. Based on the assumption that gold

values continue to depth and that at least 1/2 of the original 140,000 tons of tailings has not been reprocessed and is at practically accessable locations to mining, the inferred marginal reserve is 70,000 tons of tailings at 0.14 oz. gold per ton (9800 oz. gold) and 0.03 oz. silver per ton (2100 oz. silver).

5. Hirst Dump (figures 21 and 22 and table A-18): The dump extends 400 feet in a northeasterly direction from the main level portal. It extends from an elevation of 90 feet to about 20 feet and is about 400 feet wide. It has an almost impenetrable brush covering. It is not clear what portion of the underground workings this dump represents. Thirteen USBM dump samples were taken in two sample lines that average 0.04 oz. gold per ton. Samples of quartz were also taken at most sample localities and most often these samples contained much higher gold values than the dump samples. These samples represent the surface of the dump at only a few locations and are insufficient to accurately estimate the average grade for the whole dump. The contours of the land before the dump are not known and without this knowledge it is impossible to accurately estimate the dump tonnage without drilling or digging pits. It is roughly estimated that this dump contains 70,000 tons at an average of about 0.04 oz. gold per ton and 0.01 oz. silver per ton. This would be an inferred subeconomic resource.

Alaska Chichagoff Mine

Introduction - History

The Alaska Chichagoff Mine is located near sea level on the west side of Klag Bay along a fault zone that can be traced for at least one mile. This fault zone is 2800 feet southwest of, and about parallel to, the

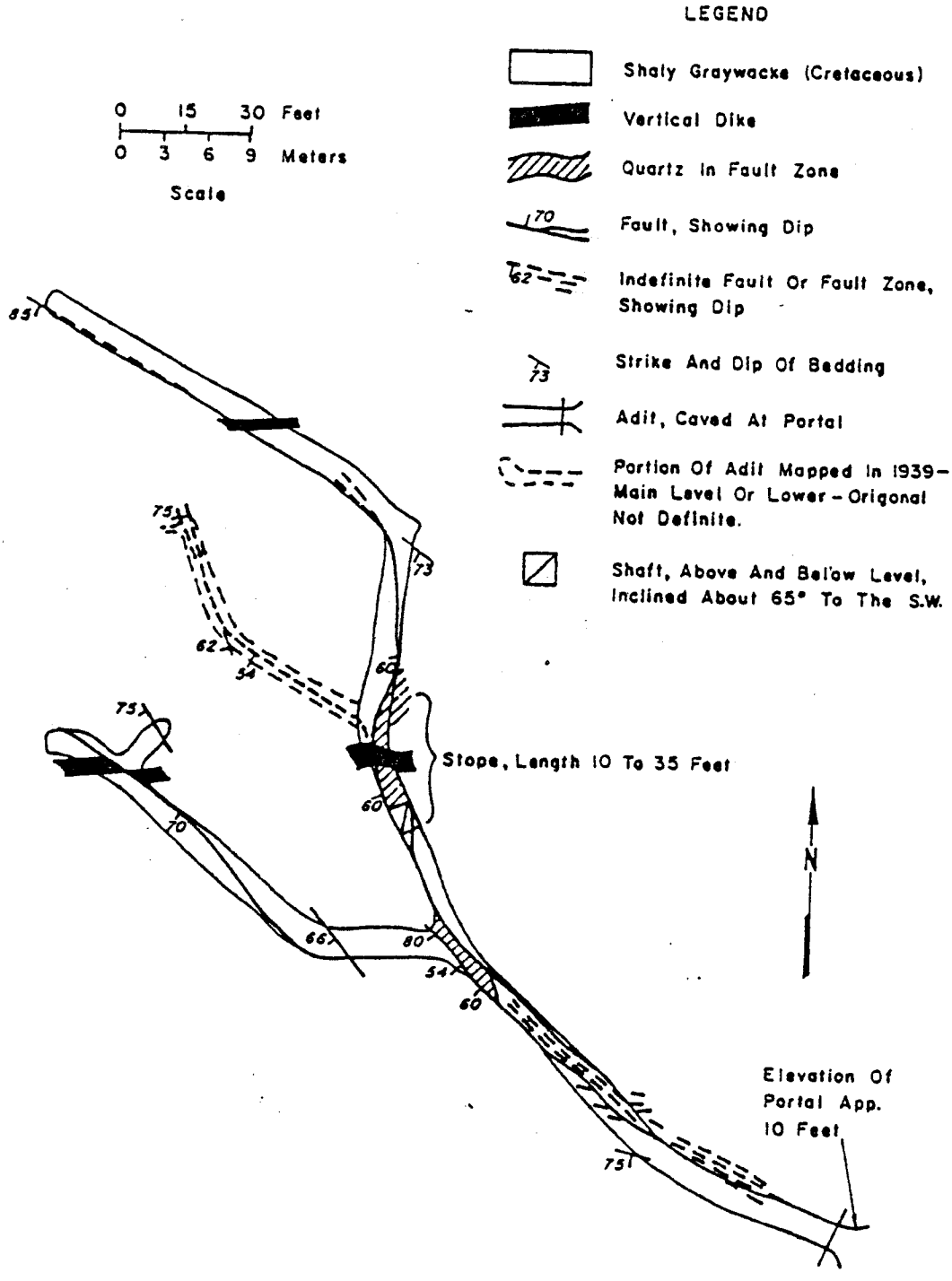


FIGURE 23.–Alaska Chichagoff Mine workings, sample locations. (modified from Reed and Coats 1941, p. 121)

Chichagof Fault. Plate 2, #31 shows the mine and fault location and plate 3, I shows the claim configuration.

The first recorded activity on this property was in 1928 by Mike McKallick. It was later (1930?) purchased by Nick Bez. By 1930, a 30 foot drift had been driven at an elevation of 500 feet and a drift had been started on the same structure near sea level. In 1931 the mine was incorporated into the Alaska Chichagoff Mining Company and consisted of 14 claims reaching across the Doolth Mountain peninsula. A test shipment of ore was made in 1932. In 1936 the property was optioned by the Chichagoff Mining Company and it is reported in a July 15, 1936, Chichagoff Mine report that 660 tons to date had been mined from the property with an average recovery of 1.0 oz. gold per ton. A 1939 dated map of the prospect (figure 23) by Reed and Coats (1941, p. 131) indicated 310 feet of drift along a north to northwesterly striking fault zone, another 90 feet of drifting along a northwest split off the above zone and 110 feet of drifting along another northwest striking fault zone to the south. A shaft from the surface reaches the drift at a distance of 140 feet from the portal and a 22 foot long by 125 foot high stope is located off the north side of the shaft. Reed and Coats (1942 p. 130) report that just past the shaft the drift contains quartz 5 feet wide for 20 feet. From Reed and Coats description, the character of the ore and ore zone (120 feet high by 10 to 30 feet long) are similar to those at the Chichagoff Mine.

There is little information on the prospect after 1939, however, annual assessement work on the Memont, Viola and Dumont claims is recorded to 1976.

Present Investigations

Investigations of the Alaska Chichagoff Mine indicated that the mine portal was caved tight but the shaft was open. An attempt to clear the portal indicated the adit may be backfilled. A sample of quartz containing gold from the dump assayed 36 ppm gold and 150 ppm silver. A series of sloughed pits extend from the shaft along structure to over an elevation of 100 feet. Quartz fragments from one pit assayed 0.45 ppm gold while a quartz block from a nearby stream assayed 0.70 ppm gold.

At an elevation of 550 feet on the Dumont claim a 25 foot long adit was found driven along a weak northwesterly striking fault zone in massive graywacke. Plate 3, #44 shows the adit location. Samples taken of the fault zone contained no significant metallic mineralization but a sample of quartz fragments on the dump assayed 1.5 ppm gold.

At an elevation of 525 feet just to the east of the above adit an open cut at a waterfall in a small creek exposes a fault zone striking N28°W and dipping 68°SW. A 0.25 foot wide sample of quartz in the fault zone assayed 0.55 ppm gold while 0.15 feet of fault gouge assayed 0.15 ppm gold.

Conclusions

Past production of 660 oz. of gold, similarities between character of the ore and the ore zone to that of the nearby Chichagoff Mine and the finding of low gold values north of the mine along structure to an elevation of 550 feet, encourage exploration of this prospect.

Jumbo Mine

Introduction-History

The Jumbo Mine is located on a fault zone that is traceable for at

least one mile and is 3200 feet southwest of and parallel to the Chichagof Fault. Plate 3 shows the claims and mine workings and plate 2 shows the fault.

This prospect was discovered in 1909 at the high tide line where 1450 oz. of gold (L. Parker, 1980) were mined from a high grade pocket. Between 1909 and 1912, four claims were staked along the structure from Klag Bay to Ogden Passage. In 1917 it is reported (Overbeck, 1919, p. 118) that the richest ore and free gold specimens in the district were found at the Jumbo Mine. In 1921 the Jumbo claim had a 50 foot shaft, a 45 foot adit and 35 feet of drift which exposed a quartz stringer on the beach cliff near the original discovery. In 1921 a 1/2 ton test mill was installed on the property and a little ore run through it.

From 1924 to 1926 the Klag Bay Mining Company optioned the property and a short distance from the beach on the Jumbo claim sank a 400 foot inclined shaft from which were turned a 200 and 400 foot level. The 200 foot level was driven 50 feet S53°E and 200 feet N53°W from the shaft and the 400 foot level was driven 230 feet southeast and about 1100 feet northwest from the shaft. On the Gold Reef claim another shaft was sunk to a depth of 230 feet with two short levels turned from it. The Klag Bay Mining Co. also dug numerous pits along the structure across the Jumbo, Minnesota and Gold Reef claims (Reed and Coats, 1941, p. 127).

Pits and trenchs dug in 1930-1931 exposed the structure on the Minnesota claim. A crude sketch of these trenches and pits was included in a 1931 report by Nelson (PE 114-6). It indicates that for a distance of 336 feet along strike 18 samples were taken with values up to 0.07 oz. gold per ton, quartz thicknesses up to 1.5 foot and an average value of

0.025 oz. gold per ton and an average thickness of 1.03 feet of quartz.

These claims remained active until 1947 and in 1975 they were restaked and are active today.

Present Investigation

Investigation of this prospect in 1978 and 1979 revealed on the Jumbo claim a 48 foot drift near sea level, two flooded shafts (one in the adit) and a number of sloughed pits extending to the Minnesota Claim. Plate 3 shows the location of the workings. On the Minnesota claim at an elevation of 100 feet a series of trenches (and a small flooded shaft) exposing a quartz vein up to 2.0 feet thick were found. On the Gold Reef Claim a flooded shaft and a series of sloughed trenches were found.

The 48 foot long drift near sea level exposes a narrow fault zone striking N50°W and dipping 55° SW that contains quartz in places and brecciated graywacke, and fault gouge. Figure 24 shows the adit and table A-19 gives the analytical results. Samples across the fault zone contained up to 0.15 oz. gold per ton (0.4 feet across quartz and graywacke).

The Minnesota claim trenches are shown in figure 25. They expose a 0.65 to 2 foot thick vein of ribbon quartz that follows a N35° W striking and 58°SW dipping fault zone for a strike distance of 90 feet. Table A-20 gives the assay data. Five sample lines were taken across the vein and the values ranged from 0.01 to 0.035 oz. gold per ton. These values compare well with those obtained in 1931 from these same trenches.

A sample of quartz containing sulfides from the Gold Reef shaft dump (plate 3,#47) assayed 0.015 oz. gold per ton while a sample from the Jumbo shaft dump (plate 3,#45) assayed 0.20 ppm gold and L <50 ppm) tungsten.

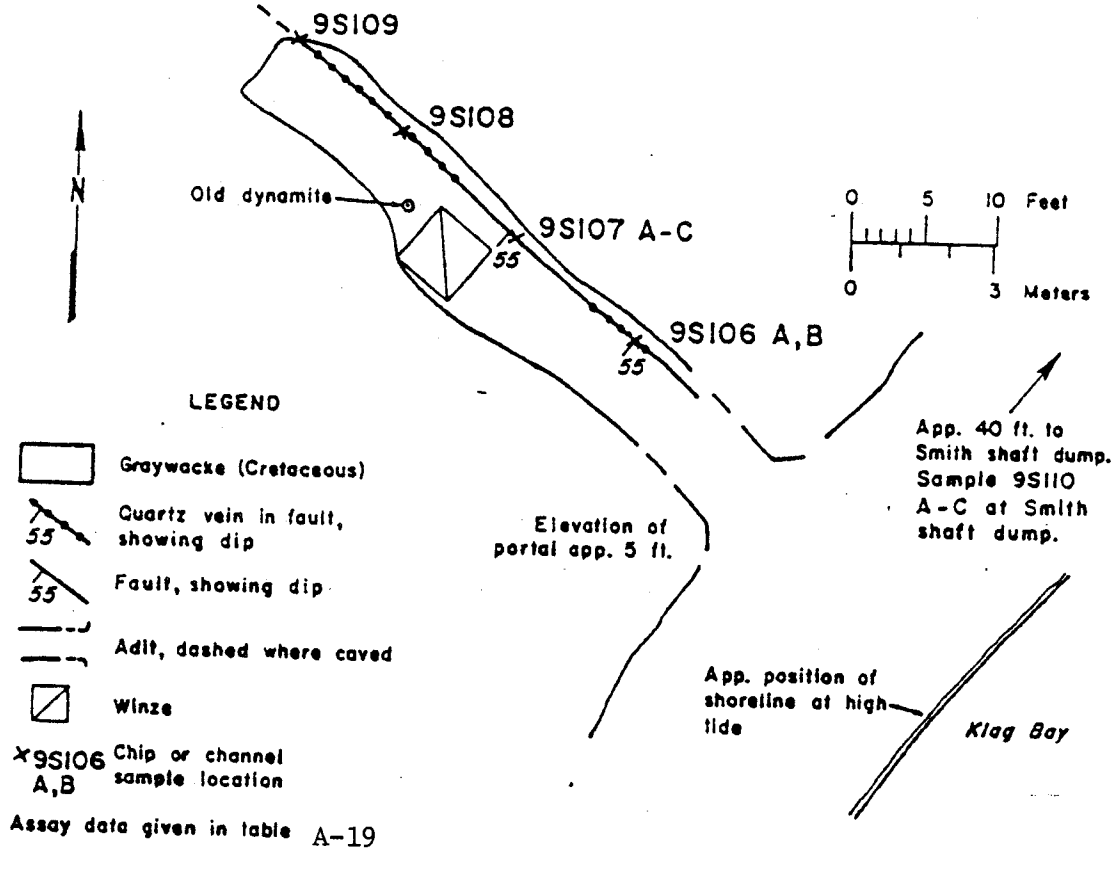


FIGURE 24.- Smith adit on Jumbo Claim showing sample locations. (Mapped by J. Still and K. Weir, June 1979)

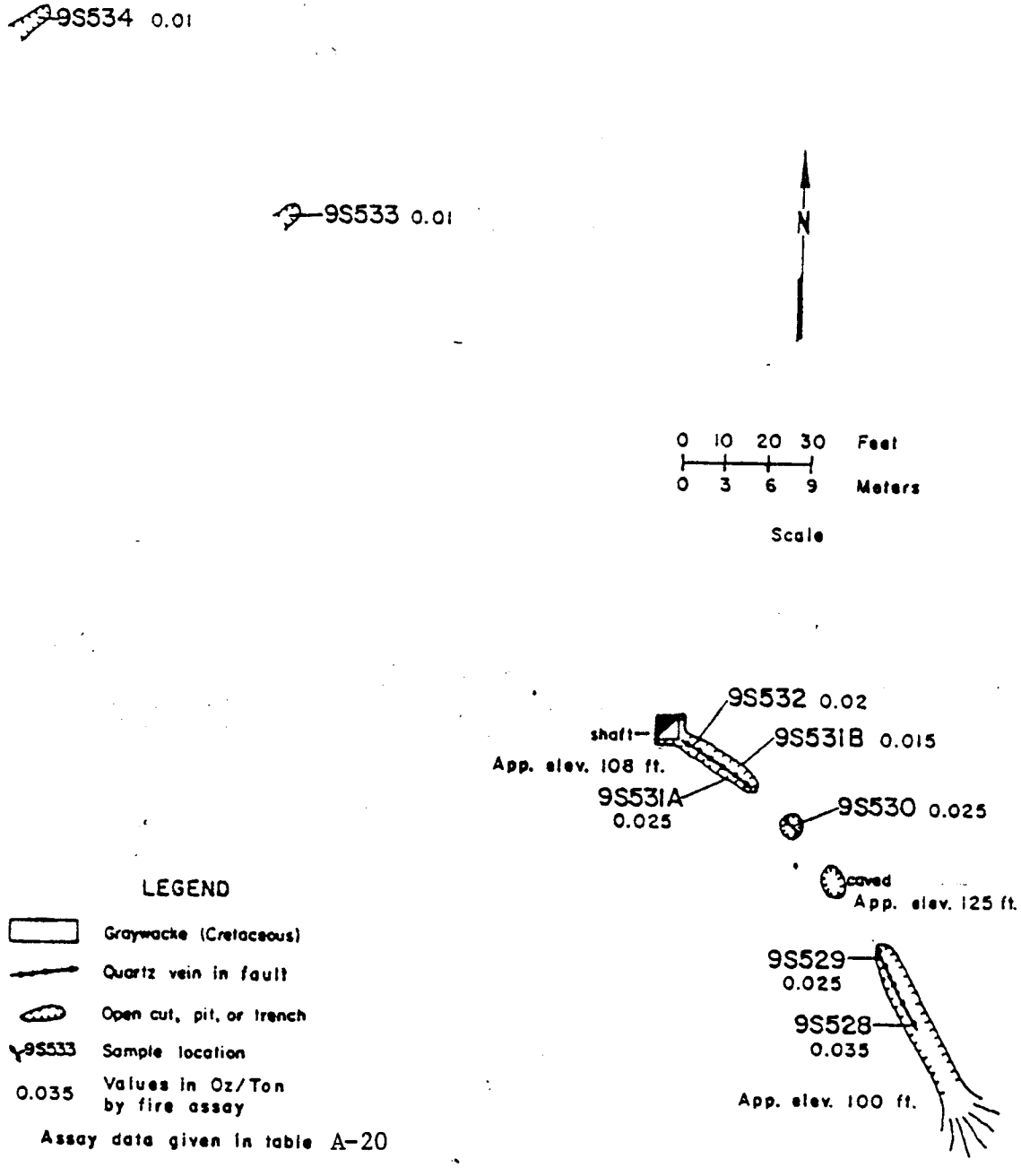


FIGURE 25.- Minnesota Claim trenches sample locations. (Mapped by J. Still and K. Weir August 1979)

Conclusions

This prospect is shrouded by mystery. There is over 1600 feet of drifting on the prospect that is now inaccessable because of flooded shafts and there is neither information on the character or grade of mineralization found in these drifts nor on what grade and quantity of ore the company felt was necessary to justify mining. The highest grade sample (located in the 48 foot long drift) obtained by this study was only 0.15 oz. gold per ton.

Results from surface sampling on the Minnesota claim trenches were persistent but very low grade (up to 0.07 oz. gold per ton).

Although the low grades of mineralization found by this study and apparent negative results of underground exploration do not encourage exploration on this property, the apparent persistency of structure for 3000 feet and reported rich ore near the beach encourage some additional examination.

Baney Prospect

Introduction-History

The Baney Prospect is located near the southern tip of the Doolth Mountain peninsula in a flat swampy area where a series of pits, trenches, and a shaft driven in the 1930's (the shaft and most workings are now flooded) expose or exposed both a northwesterly and a northeasterly striking fault zone in graywacke that contains quartz. Plate 2, #46 shows the prospects location.

Prior to 1931 W.P. Baney staked the four Ora claims on the property now known as the Baney. According to a 1931 report (Nelson, 1931) the prospect consists of open cuts in the bottom of a drained swampy basin

where a northwesterly quartz vein in a graywacke shear has been exposed and traced for 300 feet showing widths from 3 to 36 inches. The quartz shows some pyrite and occassionally small amounts of galena.

By 1938 (Reed and Coats, 1941 p. 120) workings, consisting of cuts, pits, trenches, and a 22 foot deep (flooded) shaft, extended over a distance of 600 feet and exposed both a fault striking N55°W and dipping 50° to 70° SW and a fault striking N60°E and dipping 85°NW. One 14-inch thick veinlet in the N60°E fault is reported to carry 0.5 oz. gold per ton. Figure 26 shows Reed's map of the prospect.

Assessment work is recorded on some of those claims to 1958.

Present Investigations

Investigations of the claims in 1978 revealed that all the workings along the northwesterly striking zone are sloughed or flooded while a portion of the northeasterly striking zone was above the water level and exposed or could be dug out. Figure 26 shows the sample locations and table A-21 gives the analytical results.

The northeasterly striking zone is exposed at one outcrop and was further exposed by digging small pits in the bottom of an old sloughed trench at four locations. These exposures revealed quartz up to 0.96 foot thick and some fault gouge along side the quartz. The fault zone strikes N45° to 50°E and dips 85°NW to vertical. Samples taken across the fault zone contain from nil to 0.15 oz. gold per ton, from 2 to 3200 ppm tungsten, up to 0.1 oz. silver per ton, 1000 ppm arsenic, and 50 ppm lead.

A dump of quartz vein material up to 1 foot thick is located by an old cabin. A sample (8S046) of quartz containing arsenopyrite, galena

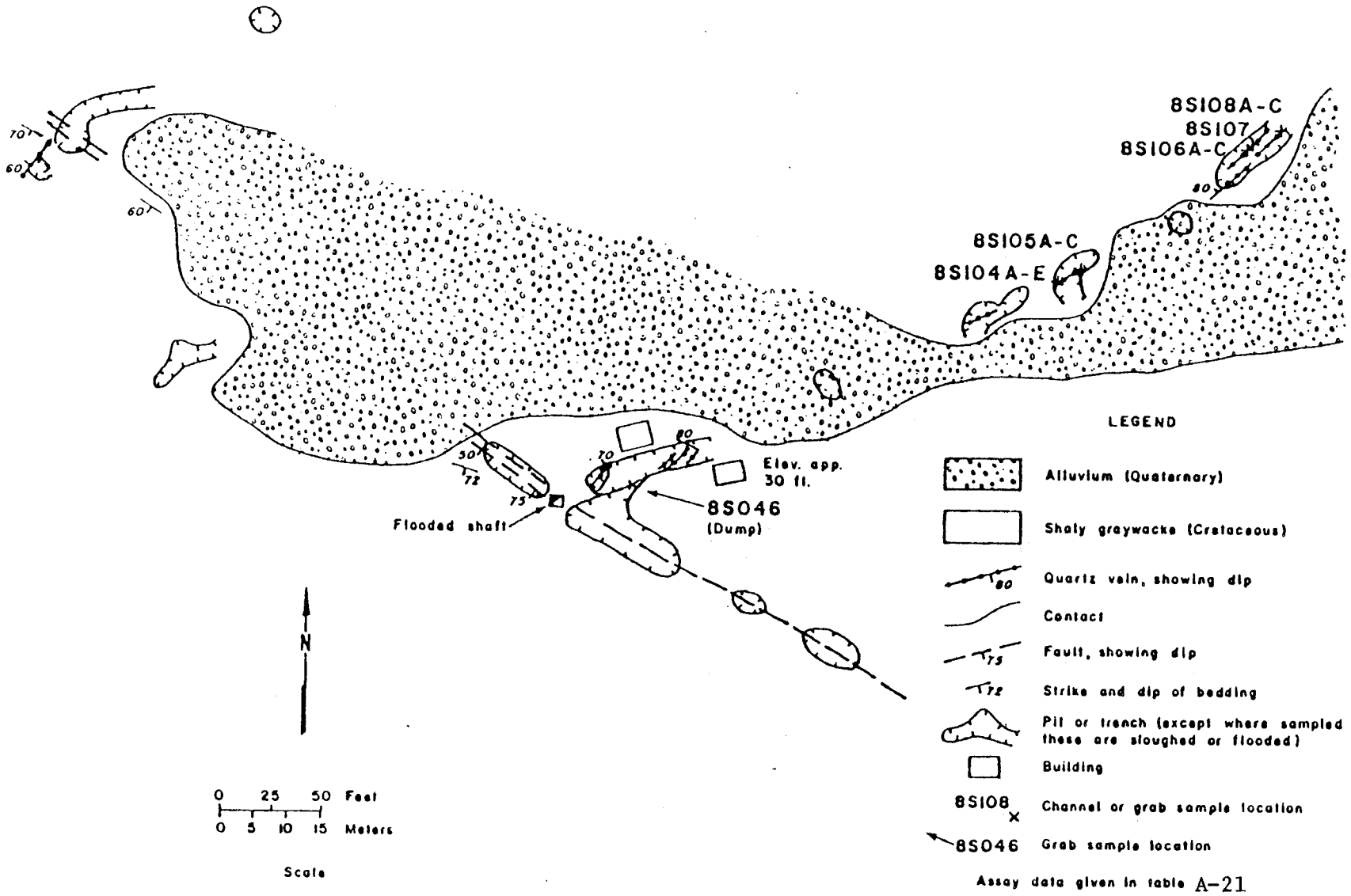


FIGURE 26.-Baney Prospect, sample locations. (Modified from Reed and Coats, 1941, fig. 14 p. 120)