STATE OF ALASKA

DEPARTMENT OF NATURAL RESOURCES

DIVISION OF GEOLOGICAL & GEOPHYSICAL SURVEYS

IN COOPERATION WITH THE UNITED STATES

BUREAU OF MINES

December 1991

Report of Investigations 91-4

ECONOMIC GEOLOGY OF HAINES-KLUKWAN-PORCUPINE AREA, SOUTHEASTERN ALASKA

By

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STATE OF ALASKA
Department of Natural Resources
DIVISION OF GEOLOGICAL & GEOPHYSICAL SURVEYS

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(in pocket)

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ABSTRACT

Placer gold was discovered in the Haines-Klukwan-Porcupine area in 1898 during the Klondike gold rush, and placer mining in the Porcupine Creek area has continued intermittently to the present. Silver was mined from veins in the Lost Silver Ledge prospect in the 1930s; the Klukwan-lode iron deposit was staked in 1946. Massive sulfide-barite deposits were discovered in the Glacier Creek area in the late 1960s.

The Porcupine area contains Kuroko-like volcanogenic massive-sulfide, vein gold, polymetallic vein silver, and skarn deposits, prospects, and occurrences. The Main deposit along Glacier Creek and the Mount Henry Clay prospect are the most important volcanogenic massive sulfide-barite showings. Samples from two barite-sulfide lenses in the Main deposit contain up to 9.98 ppm gold, 356 ppm silver, 7.8 percent zinc, 1.8 percent copper, 7.2 percent lead, and 56.5 percent barium. Most diamond-core drill holes into the Main deposit did not intersect the mineralized zone, and the downdip extension of the deposit remains unexplored.

Sphalerite-barite-pyrite-chalcopyrite-banded massive-sulfide boulders are found along the terminus of a glacier on the north side of Mount Henry Clay. The highest grade boulders contain 44 percent zinc and 5 percent copper. The grade of mineralization intersected by diamond-core drilling does not approach that found in the boulders.

Additional volcanic-associated massive-sulfide showings in the Glacier Creek area include the Hanging Glacier prospect, Cap prospect, Nunatak prospect, Little Jarvis Glacier prospect, Jarvis Glacier Gulches prospect, and the Boundary occurrence. Elevated values of zinc and barium were collected from slate and phyllite in the Summit Creek drainage. Samples from the Iron Bridge prospect and from an area south of Pyramid Harbor contain anomalous copper.

Seven gold-bearing vein prospects and occurrences are known within the Porcupine area. Most of the occurrences are associated with "dike-ladder" veins cutting Late Paleozoic slate. The Golden Eagle prospect along McKinley Creek has produced modest amounts of gold. Other vein gold showings include the McKinley Creek Falls, Annex No. 1, Wolf Den, Quartz Swarm, Big Boulder Quartz Ledge, and LeBlondeau Vein prospects and occurrences.

Three polymetallic vein silver showings crop out in the Tsirku River valley near Summit Creek and Sunshine Mountain. Samples from the Lost Silver Ledge prospect, the Tsirku Silver occurrence, and Merrill's Silver prospect contain anomalous values of silver, zinc, lead, gold, and copper.

Six minor skarn prospects and occurences are found within the Porcupine area along the contacts of Early Cretaceous plutons with calcareous horizons. Float and rubblecrop samples from the Mount Seltat occurrence contain up to 173 ppm silver, 4 percent zinc, 8,400 ppm copper, 2.6 percent lead, and 1,285 ppm tungsten.

The Haines-Klukwan area contains lode and alluvial-fan (placer) iron resources, disseminated copper occurrences, and numerous vein prospects and occurrences. The pyroxenite in the Klukwan ultramafic complex contains about 3.5 million tons of 16 percent iron ore; the Klukwan alluvial fan contains an inferred reserve of

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nearly 1 billion tons of 10 percent iron. The Haines mafic-ultramafic complex has billions of tons of iron resources, but they are scattered and of a low grade.

Minor disseminated copper occurences are exposed at the south end of Klutsha Mountain, on the ridge at the head of Goat Hollow, and on the west slope of Tukago Mountain. A high-grade sample collected from a small chalcopyrite-bornite lens at the Goat Hollow occurrence contained 15 ppm gold, 54 ppm silver, and 21.8 percent copper.

Four vein prospects are located along the west side of the Takshanuk Mountains between Klukwan and Haines. At the Mount Ripinski occurrence, quartz veins in metabasalt contained up to 12 ppm gold and 4 percent copper.

Most prospects and occurences in the Haines-Klukwan area are found within metabasalt of the Chilkat Peninsula and Islands. At the Road Cut prospect, surface mineralization extends for 227 ft, but geophyics suggests that the mineralized zone may extend for 1700 ft. Mineralization was intercepted 25 ft below the surface in one diamond-core drill hole, and the indicated resources of the Road Cut Prospect are 700 tons at 0.09 oz/ton gold, 0.17 oz/ton silver, and 0.8 percent copper at a 3-ft width.

Additional metabasalt-hosted shear zone and dissemimated sulfide copper-zinc occurrences are found at the Road Cut II prospect and at the Zinc Beach, Battery Point, Shikosi Island, and Islands copper occurrences. Shear zones on the Chilkat Peninsula contain rock and stream-sediment samples anomalous in gold and copper.

Most Early Cretacaeous plutons in the northern part of the Porcupine area and plutons in the Haines-Klukwan area that are interpreted to be part of the Great Tonalite Sill Complex have geochemical characteristics that are associated with nonporphyry gold deposits.

The placer geology of the Porcupine area was affected by multiple Holocene glacial episodes that left behind multiple drift limits, bedrock-incised bench channels, trimlines, hanging valleys, and beheaded drainages. Glaciofluvial processes produced perched alluvial and colluvial fans and ice-marginal meltwater channels. The alluvial fan apex at the mouth of Porcupine Creek was probably once at least 1 mi south of its present position, and a distributary channel of this fan probably spilled over into the drainage now occupied by Walker lake. The Porcupine area, as a whole, is immature and nested in a high-energy fluvial environment.

Perched ice-marginal meltwater channels and modern Porcupine Creek sediments are the principal hosts of placer gold. The most important sources of placer gold in the Porcupine area are crosscutting quartz-sulfide-gold fissure veins associated with altered mafic dikes cutting Porcupine Slate. Gold fineness from the Porcupine area averages 837. There are two types of gold present in heavy mineral concentrates: "nugget" gold that shows evidence of fluvial transport, and wirelike grains that show little evidence of stream transport. Fine gold is generally absent from Porcupine Creek and elevated channels, but could be present farther downstream in the Porcupine Creek alluvial fan.

Reconnaissance, channel, and site-specific sampling identified gravel deposits having moderate to high mineral development potential on lower Porcupine, Cahoon, Christmas, McKinley, and Nugget creeks. Abandonned channel and bench deposits on lower Porcupine Creek have the best potential for supporting a small to medium-sized heavy-equipment placer operation. The greatest potential for future mining on a large scale hinges on exploring the Porcupine and Nugget Creek alluvial fans, which together contain at least 8,000,000 yd^3 of potentially auriferous gravel.

INTRODUCTION

The Haines-Klukwan-Porcupine area is drained by the Chilkoot, Chilkat, and Tsirku river systems in the northern part of southeastern Alaska. The area is bounded on the north and west by the Alaska-British Columbia border, to the south by Glacier Bay National Park and Davidson Glacier, and to the east by the Chilkoot River valley and Lutak and Chilkoot inlets (fig. 1, sheet 1). This area was examined as part of a study of the Juneau

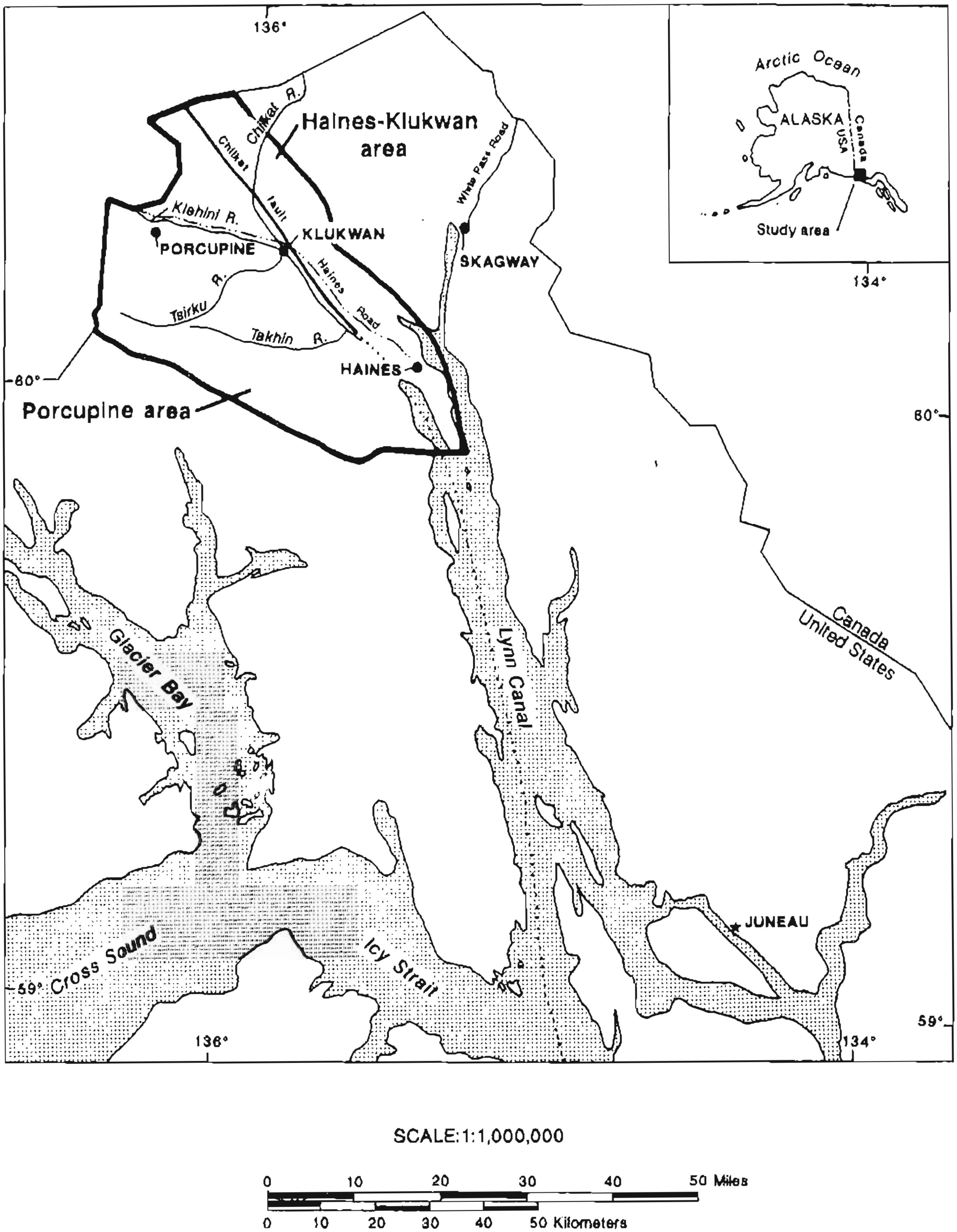


Figure 1. *Location of study area.*

mining district in a cooperative effort between the Alaska Division of Geological and Geophysical Surveys (DGGS) and the U.S. Bureau of Mines (USBM) from 1985 to 1988. In 1984, DGGS and the USBM cooperated in a study of the Glacier Creek-Porcupine Creek area; from 1981 to 1983 the agencies conducted separate studies in the area. Fieldwork was conducted by foot, boat, truck, and helicopter.

The bedrock geology in the area is subdivided into a western and eastern terrane as indicated by Gilbert and others (1991a). The area west of the Chilkat fault is called the Porcupine area and is discussed first; the area east of the Chilkat fault is called the Haines-Klukwan area (fig. 1). Earlier reports by the USBM and DGGS referred to the west-central part of the Porcupine area as the "Porcupine mining area."

This report relies heavily on information on lode deposits, prospects, and occurrences previously reported by Still (1984a, 1984b, 1988) and Still and others (1985, 1987). Brew and others (1978) describe the mineral resources of Glacier Bay National Park immediately south of the study area. The discussion of placer deposits of the Porcupine area is summarized from Bundtzen (1986) and Hoekzema and others (1986). Baggs and Sherman (1987) discuss the feasibility of mining various types of mineral deposits in the study area. The geologic framework of the area is summarized by Gilbert and others (1991a). Analytical data for most deposits and prospects are reported in appendixes A-H, but several minor occurrences refer to locality and geochemical data presented in the companion report to this volume (Gilbert and others, 1991b).

PHYSIOGRAPHY, CLIMATE, AND ACCESS

The physiography of the area ranges from gentle to rugged. Glaciers formed the major features in the area and left U-shaped steep-walled valleys and rugged mountains. The Chilkat, Chilkoot, Klehini, Kelsall, Tsirku, and Takhin Rivers are the major drainages in the area. The higher mountains are glacier-clad, and some glaciers reach the valley floors. Lush forests and dense brush predominate up to timberline at about the 2,000-ft elevation. Elevation ranges from sea level (Haines) to 7,434 ft (Mount Henry Clay).

The average annual precipitation is 60 in. at Haines and is notably less at Klukwan and areas away from tidewater. Long winters with snowfall from October to April characterize the areas away from tidewater. The areas near tidewater have a somewhat milder climate.

The Haines-Klukwan-Porcupine area is serviced by an all-weather road that connects Haines and Klukwan with the Alaska Highway and the interior road systems of Alaska and Canada. Dirt roads connect the old partly abandoned town of Porcupine, the Kelsall River area, and the Chilkat Peninsula area with the Haines Highway. The Alaska Marine Highway System connects Haines with Bellingham, Washington, and most coastal towns in southeastern Alaska. A small airport with a paved 4,500-ft runway at Haines services small aircraft.

LAND STATUS

The Haines-Klukwan-Porcupine area is made up of federal, state, and private land (sheet 2). State and private land occupies most of the Klehini, Chilkat River, and Chilkoot valleys. About one-third of the state land is part of the Chilkat Eagle Preserve and Chilkoot State Park, which are closed to mining; the rest is open to exploration and development under state law. The rest of the area is federal land, administered by the Bureau of Land Management and open to exploration and development under the Mining Law of 1872.

Most of the area lode claims are located between the British Columbia-Alaska border and Porcupine Creek; most of the study-area placer claims are located along Porcupine, Cahoon, McKinley, Nugget, and Cottonwood Creeks. The Klukwan area contains about 75 patented lode and placer claims.

ACKNOWLEDGMENTS

A special thanks goes to former Haines Borough Mayor Robert Henderson (1986-1987), to Haines City administrator Walter Wilcox, and to Pete Lapham, Haines maintenance supervisor for the Alaska Department of Transportation. All helped facilitate our studies. John Gammon of Falconbridge Limited, British Columbia, allowed access to company claims on the Windy Craggy and Klukwan deposits. Doug Perkins of Stryker Resources Limited, Brian Jones of Kennecott Exploration, and Earl Redman and Chuck Hawley of Chuck Hawley and Associates allowed access to company data and prospects. Local prospectors Merrill Palmer, Jim McLaughlin, Jo Jurgeleit, and R.C. Manuel all helped with this study. We are grateful to Mark Robinson for his very helpful review of this report, and we thank Nori Bowman for her extensive cartographic assistance.

LODE DEPOSITS, PROSPECTS, AND OCCURRENCES OF PORCUPINE AREA

Coastal Indian trade routes had long been in use in the Klehini River valley by the time of the first recorded European exploration. G.M. Dawson in 1888, and J.B. Tyrrell in 1892, both members of the Geological Survey of Canada, explored the area as part of a reconnaissance program (Dawson, 1888, Tyrrell, 1898). A.H. Brooks of the U.S. Geological Survey reported on the geology of the area in 1899 (Brooks, 1900). Placer gold was found on Porcupine Creek in 1898 by prospectors en route to the Klondike gold fields. Shortly thereafter, gold placers were discovered along Glacier Creek and other creeks in the area. From 1898 to 1969 geologic mapping and prospecting in the vicinity centered on the Porcupine placer district. The first detailed geologic study of the Porcupine Creek area was made in 1903 by C.W. Wright (Wright, 1904). Eakins (1919) provided an excellent discussion of glaciation and placer-mining operations in the area. Numerous references to the Porcupine Creek area are made in U.S. Geological Survey "Mineral Resources of Alaska" and related series from 1900 to about 1930 (Hoekzema and others, 1986).

Early prospectors tried to find a lode source for the Porcupine placers, and during the early 1930s a local prospector discovered the Lost Silver Ledge prospect near Summit Creek (Manuel, personal commun., 1983-1985). In the early 1980s, Jim McLaughlin discovered the Golden Eagle lode prospect on McKinley Creek.

The first reports of massive sulfide-barite occurrences within the Porcupine area were made by prospector Merrill Palmer of Haines during 1969-1971 (Palmer, personal commun., 1983-1988). From 1969 to 1971 E.M. MacKevett mapped the geology of the Skagway B-3 and B-4 Quadrangles and briefly examined the Glacier Creek barite-sulfide occurrences (MacKevett, 1971; MacKevett and others, 1974). In 1977 Holdsworth (1977) examined the Glacier Creek prospects discovered by Palmer (Holdsworth, 1977), as did Inspiration Development in 1979, and Anaconda Copper in 1980. Anaconda completed three diamond-core drill holes, one of which intersected the Main deposit. In 1981 Coronado Mining mapped the Main deposit in detail (Peterson and others, 1982).

During 1983-1986 DGGS and USBM personnel mapped the geology of the Porcupine area, examined, mapped and sampled the lode and placer deposits, and conducted geochemical studies (Bundtzen and Clautice, 1986; Forbes, 1986; Gilbert and others, 1987, 1988; Gilbert, 1988; Hoekzema and others, 1986; Redman and others, 1985; Still, 1984a, 1984b; Still and others, 1984, 1987). Kennecott Exploration shared with us their geological mapping of the Glacier Creek area (Rosenkrans and Jones, 1985).

VOLCANIC-ASSOCIATED MASSIVE-SULFIDE DEPOSITS

Eight volcanic-associated barite-sulfide prospects or occurrences in the Glacier Creek volcanics (sheet 1, locs. 5-8, 10-13) are located 4 to 8 mi southwest of the Pleasant Camp border station on the Haines Highway. These deposits were discovered between 1969 and 1983 by local prospector Merrill Palmer (personal commun., 1983-1988) and first described and classified as probable volcanogenic syngenetics by Hawley (1976).

The Glacier Creek volcanics consist mainly of northwesterly striking schistose to massive metabasalt and metamorphosed basaltic andesite that locally show pillow structure. The unit includes subordinate black slate, felsic schist (metatuff), and marble. The Glacier Creek volcanics are partly Late Triassic and have undergone regional greenschist-facies metamorphism (Gilbert and others, 1991a). Mineralized zones hosted in these rocks are characterized by lenses of iron-stained quartz-sericite schist, chloritic phyllite, tuff, and hydrothermally altered volcanic rocks. These lenses may be hundreds of feet thick and thousands of feet long. The quartz-sericite schist was probably derived from impure chert with a clay component (Forbes, 1986). Within the mineralized zone, stratiform barite lenses extend parallel to bedding for up to 800 ft and are up to 70 ft thick. These lenses contain interspersed sulfides that consist of varying amounts of sphalerite, pyrite, chalcopyrite, and galena. The volcanic rocks hosting these deposits were emplaced in an island arc, back-arc, or shelf environment, and are submarine exhalative, Kuroko-like volcanogenic massive-sulfide deposits (Forbes and Gilbert, 1989). Zinc-bearing slate also occurs in the Glacier Creek volcanics.

MAIN DEPOSIT

The Main deposit is exposed between 4,000 and 5,000 ft on the west side of Glacier Creek (sheet 1). The deposit was discovered in 1959, examined by U.S. Geological Survey in 1971 (MacKevett, 1971), and named by Mackevett and others (1974). The property has been optioned and examined by a number of mining companies, including Anaconda Copper, Kennecott Exploration, and Newmont Exploration. Both Anaconda and Newmont drilled this prospect. USBM work on this deposit consisted of mapping and sampling at selected locations along its 2,000-ft length and obtaining metallurgical test samples.

The Main deposit is within a section of hydrothermally altered metabasalt and metasedimentary rocks that lies within a thick sequence of basalt (fig. 2). In places, pillow structures were recognised in the basalt flows. The deposit strikes from about 300° on the east to about east-west on the west and dips steeply northward. The Main deposit consists of two barite-sulfide lenses enveloped in orange-red-yellow stained phyllite and schist. The sulfides are predominantly sphalerite, but locally chalcopyrite, galena, or pyrite predominate. Magnetite was observed at some locations. Figure 3 shows sections through the deposit.

The westernmost lens averages 15 ft thick over a strike length of 250 ft; the easternmost lens averages 70 ft thick over a strike length of 800 ft. Samples contain up to 9.98 ppm gold, 356.5 ppm silver, 7.8 percent zinc, 1.8 percent copper, 7.2 percent lead, 56.5 percent barium, 4,000 ppm arsenic, 100 ppm nickel, and 2,000 ppm antimony (app. A-1). Based on an average of 15 composite samples collected by J.A. Robson and C.C. Hawley in 1974, these lenses average 60 percent barite, 1.73 percent zinc, and 60 ppm silver. Peterson and others (1982) estimate that the lenses contain about 0.75 million tons of mineralized rock if the lenses continue at depth for a distance of one-half their strike length and that 9 ft^3 of ore weighs 1 ton.

A 3,000-lb bulk sample was collected from the Main deposit by owner ALYU Mining. It assayed 76.4 percent $BaSO_4$, 3.6 percent zinc, 0.98 percent copper, 0.12 percent lead, and 92 ppm silver. Peterson reports that several metallurgical tests were conducted by the Denver Equipment Division of Joy. The most successful involved grinding, flotation of sulfides, and conditioning of the barite (Peterson and others, 1982):

> "Grinding of the ore to 200 mesh to meet size specifications for the barite product, flotation of the sulfides, followed by conditioning and flotation of the barite, provides a simple flowsheet which yielded recoveries of 93 percent of the barium, 96 percent of the zinc, and 66 percent of the silver. Two stages of cleaner flotation produced a cleaned barite concentrate having a specific gravity of 4.4, and indications are that a single stage of cleaning would be adequate.
>
> "On the basis that the bulk sulfide concentrate is marketable as produced, little work was done on separation of the various sulfide minerals. The bulk concentrate produced contained about 24 percent zinc, 5.5 percent copper, and 11.5 oz/ton of silver as the principal values. The remainder of the concentrate is primarily pyrite which may carry a significant portion of the silver values. The zinc minerals present are highly activated for flotation due to the presence of copper salts, and indications are that any further separation of the sulfide minerals would be very difficult and would probably involve high losses in the copper and silver values."

The USBM collected two metallurgical test samples from the eastern barite-sulfide lens (3S118, 3S258) and one from the western barite-sulfide lens (3S112). Head analysis for these three samples ranged from 43.4 to 56.5 percent barium, from 0.01 to 0.87 percent copper, from less than 0.01 to 4.64 percent zinc, from 0.08 percent to 4.98 percent lead, from 0.004 to 0.005 oz/ton gold, and from 0.36 to 1.02 oz/ton silver (app. A-2).

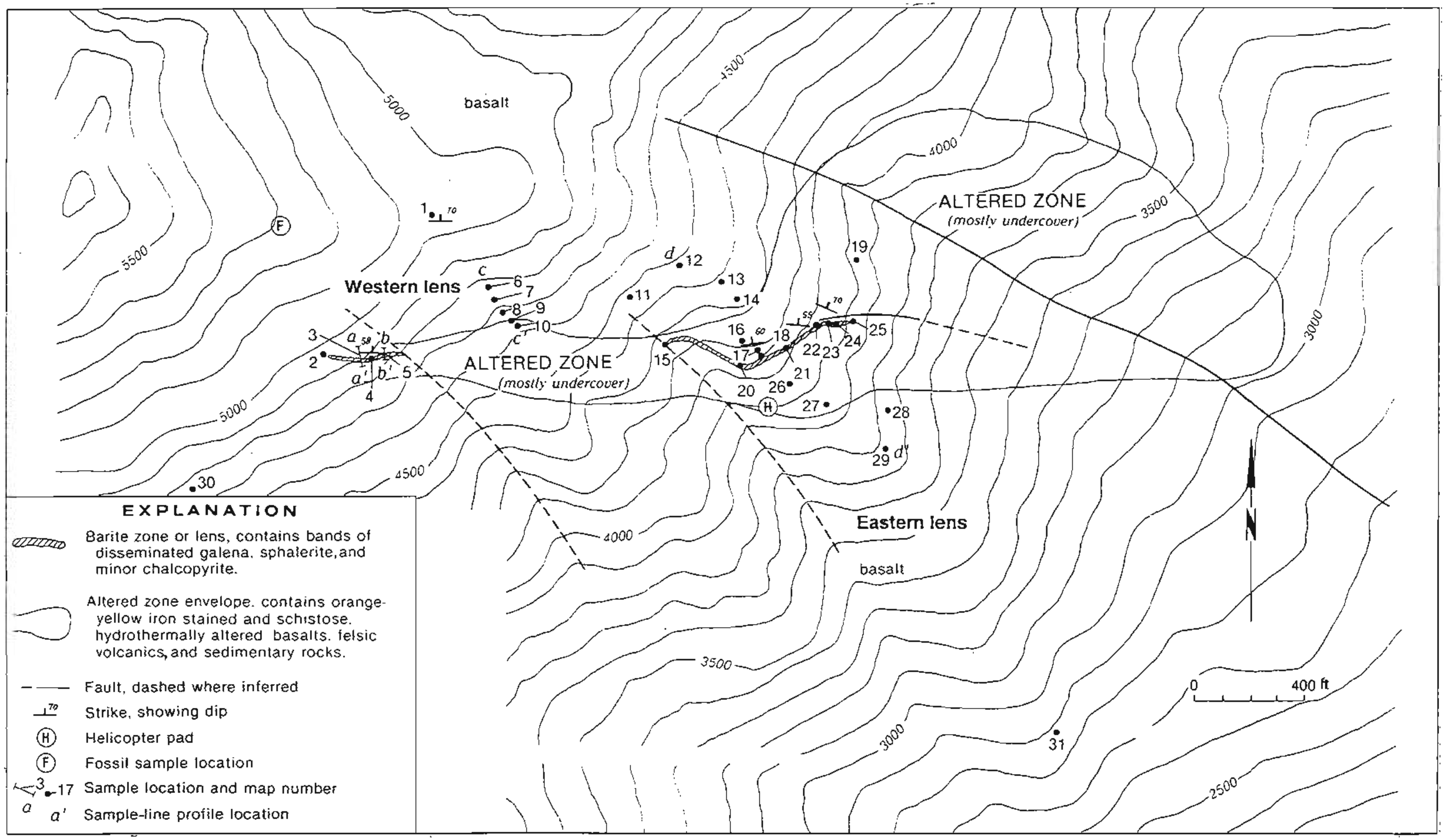


Figure 2. *Main deposit geology and sample locations. Mapped by J. Still and K. Weir, 1984.*

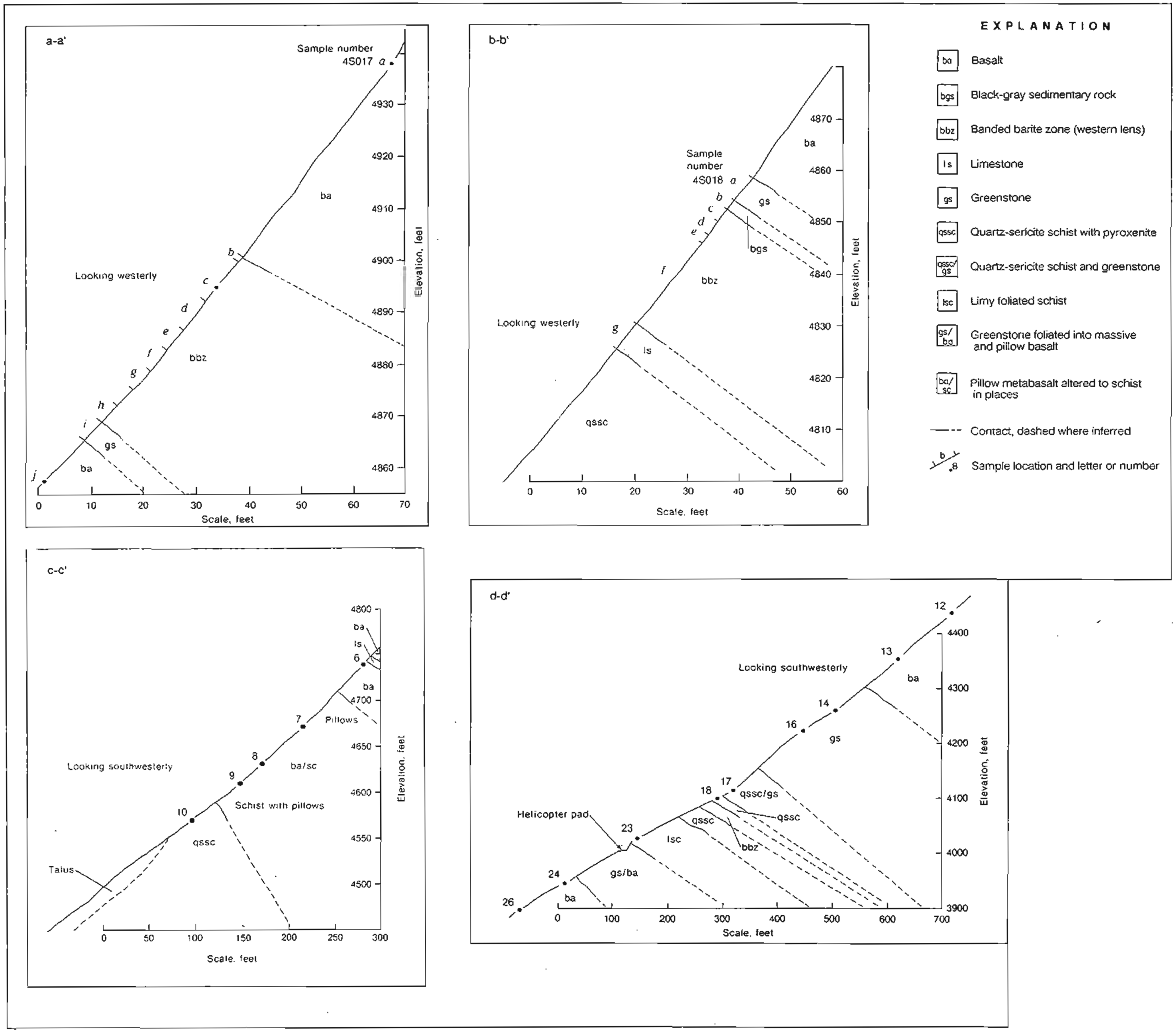


Figure 3. *Main deposit sample-line profiles.*

Samples were collected across the mineralized zone at several locations (fig. 2). Samples of metabasalt, collected well out of the mineralized zone, contained significantly elevated zinc and lead values (figs. 2, 3; app. A-1).

The Main deposit is well exposed and its surface outcrops have been examined in detail. However, most of the diamond-core holes were drilled outside the mineralized zone, and the largest part of the downdip extension of the deposit remains unexplored.

MOUNT HENRY CLAY PROSPECT

The Mount Henry Clay prospect is located along the Alaska-British Columbia border on the rugged glacier-clad north side of Mount Henry Clay, about 5 mi southwest of the Pleasant Camp border station on the Haines Highway (sheet 1, fig. 4). The prospect was discovered in August 1983 by Merrill Palmer. A few days after Palmer's discovery, USBM personnel mapped and sampled the Mount Henry Clay prospect and collected metallurgical test samples (Still, 1984b). In 1984 and 1985 Kennecott Exploration optioned the Mount Henry Clay prospect, mapped the geology of the prospect, conducted geophysical surveys and drilled seven holes totaling 5,661 ft (Rosenkrans and Jones, 1985). Kennecott dropped its option on the property in 1986. In 1987 Newmont optioned the property but dropped it in 1988. Additional work on the prospect has not been reported.

A brief examination of the Canadian part of the deposit was made in 1983 (Still, 1984b). During 1984, Stryker Resources and Freeport Resources (hereafter referred to as Stryker) mapped and sampled the British Columbia part of the prospect in detail, discovering in-place barite-zinc mineralization and a train of barite-sphalerite boulders at the snout of a hanging glacier. In 1985, Stryker drilled five holes totaling 2,787 ft (Rosenkrans and Jones, 1985).

Massive-sulfide mineralization was not found in place on the U.S. part of the Mount Henry Clay prospect; however, sphalerite-barite-pyrite-chalcopyrite-banded massive-sulfide boulders, up to 6 ft thick, are found along the terminus of a small hanging glacier on the north side of Mount Henry Clay for a distance of 4,300 ft (fig. 4; app. A-3). Most sulfide-bearing boulders have rounded edges and appear to have been carried underneath the glacier to near their present location. The greatest abundance of massive-sulfide boulders was located between gullies 2 and 4 where the largest, highest-grade boulders were also found (figs. 4-7). Samples collected here indicated that most of the sulfide boulders between 1 and 6 ft thick contain from 20 to 44 percent zinc, about 5 percent barium, and several percent of copper. A 6-ft chip sample (figs. 6, no. 27) across the largest boulder found assayed 33 percent zinc, 2.5 percent copper, 5 percent barium, 65 ppm silver, and a trace of gold. Sulfide boulders between gullies 1 and 2 and between gullies 4 and 12 were mostly smaller, of a lower grade, and much less abundant (figs. 5-7). However, higher grade boulders were distributed throughout the hanging-glacier terminus area. Abundant massive-sulfide boulders were found at gully 12 and were generally higher in barium and lower in zinc than those found between gullies 2 and 4.

Most of the sulfide boulders are crudely banded from fractions of an inch up to 1 foot. The bands represent differences in sulfide or sulfate composition from sphalerite to barite to pyrite to chalcopyrite to galena. The predominant ore mineral is sphalerite, with lesser amounts of barite, pyrite, chalcopyrite, and galena. Bornite was observed in polished sections. One boulder (fig. 6, no. 40) was found with attached host rocks of chlorite-epidote phyllite (altered andesite). The rest of this boulder is silicified with chalcopyrite (the predominant sulfide) and lesser amounts of barite, pyrite, and sphalerite. Most of the sulfide boulders in the area have unoxidized surfaces and blend in with the greenish-gray andesite float.

Samples collected from bedrock exposures and stream sediments near the hanging-glacier terminus contain elevated values of zinc, silver, copper, lead, and barium (app. A-3). Bedrock samples collected from the east and west areas of the hanging glacier also contained elevated base-metal values. The west area contains a 4-ft-thick band of weak barite-zinc mineralization, whereas the east area contains quartz-barite veins (fig. 4, no. 46).

Kennecott Exploration drilled seven diamond-core drill holes (five of which were collared in the ice) and Stryker drilled five holes (figs. 8, 9). Correlating the geology of the diamond-drill holes (DDH) beneath the

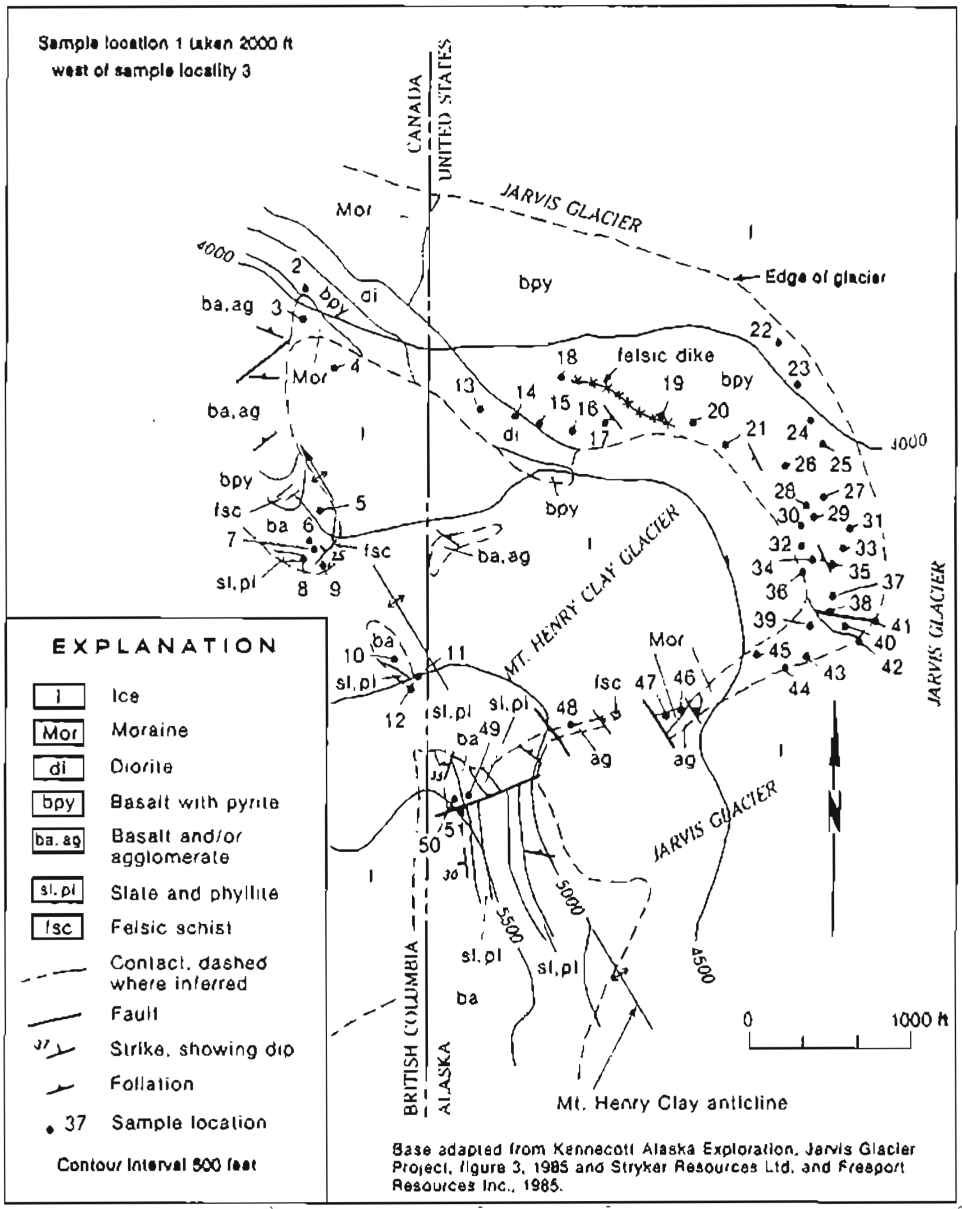


Figure 4. *Mount Henry Clay prospect sample locations and geology.*

glacier with that exposed in bedrock is difficult because of faulting, major folds, rapid facies changes in the volcanic rocks, and a lack of marker horizons (figs. 9, 10). According to Rosenkrans and Jones (1985):

> "The structure appears to be that of a major anticline on the east face of Mount Henry Clay with a possible syncline with axial plane faulting near the east edge of the Mount Henry Clay Glacier."

Two felsic schist horizons have been identified by drilling. The eastern horizon is penetrated by DDH 1 to 4 and the western horizon by DDH 5 to 7. The felsic schists host barite-sphalerite mineralization and are underlain by pyrite-chalcopyrite stringer zones in chloritized metabasalt. The best mineralized zones reported by Rosenkrans and Jones (1985) are as follows:

Kennecott drill holes

DDH 1:	55 ft (835-880 ft) grading 0.21% Cu
DDH 2:	35 ft (650-686 ft) grading 0.42% Zn
	35 ft (725-760 ft) grading 0.44% Cu
DDH 3:	161 ft (678 -839 ft) grading 0.19% Cu
DDH 6:	20 ft (230-250 ft) grading 0.70% Zn

Stryker drill holes

MCH 1:	1 m (37.6-38.6 m) grading 0.67% Zn
	2 m (152-154.0 m) grading 0.29% Cu
MCH 2:	63.1 m (30.9-94.0 m) grading 0.10% Zn
MCH 3:	24 m (30-54 m) grading 0.32% Zn
	1 m (52-53 m) grading 2.0% Cu
MCH 4:	21 m (68-89 m) grading 0.15% Zn
MCH 5:	1 m (80-81 m) grading 0.18% Zn

The grade of mineralization intersected by drill holes does not approach that found in the boulders along the terminus of the hanging glacier.

HANGING GLACIER PROSPECT

The Hanging Glacier prospect is located between elevations of 5,100 and 5,700 ft on the west side of the Saksaia Glacier (sheet 1, fig. 11). This prospect consists of an iron-stained zone of metasedimentary rocks and hydrothermally altered metabasalt several hundred feet thick and about 2,000 ft long that strikes northeast and dips steeply northwest. It contains barite lenses up to several feet thick and quartz calcite ladder veins up to 0.5 ft thick. Both the lenses and ladder veins contain pyrite, sphalerite, galena, and chalcopyrite. Samples from the lenses and veins contain up to 54.0 percent barium, 14.1 percent zinc, 3,600 ppm copper, 2.3 percent lead, 198.9 ppm silver, 1,575 ppm gold, 60 ppm tin, and 900 ppm arsenic (app. A-4).

Figure 5. *Geologists examine sphalerite boulders at the Mount Henry Clay prospect.*

Figure 6. *Eastern part of the Mount Henry Clay prospect showing high-grade zinc, silver, and barium sample locations and gully numbers.*

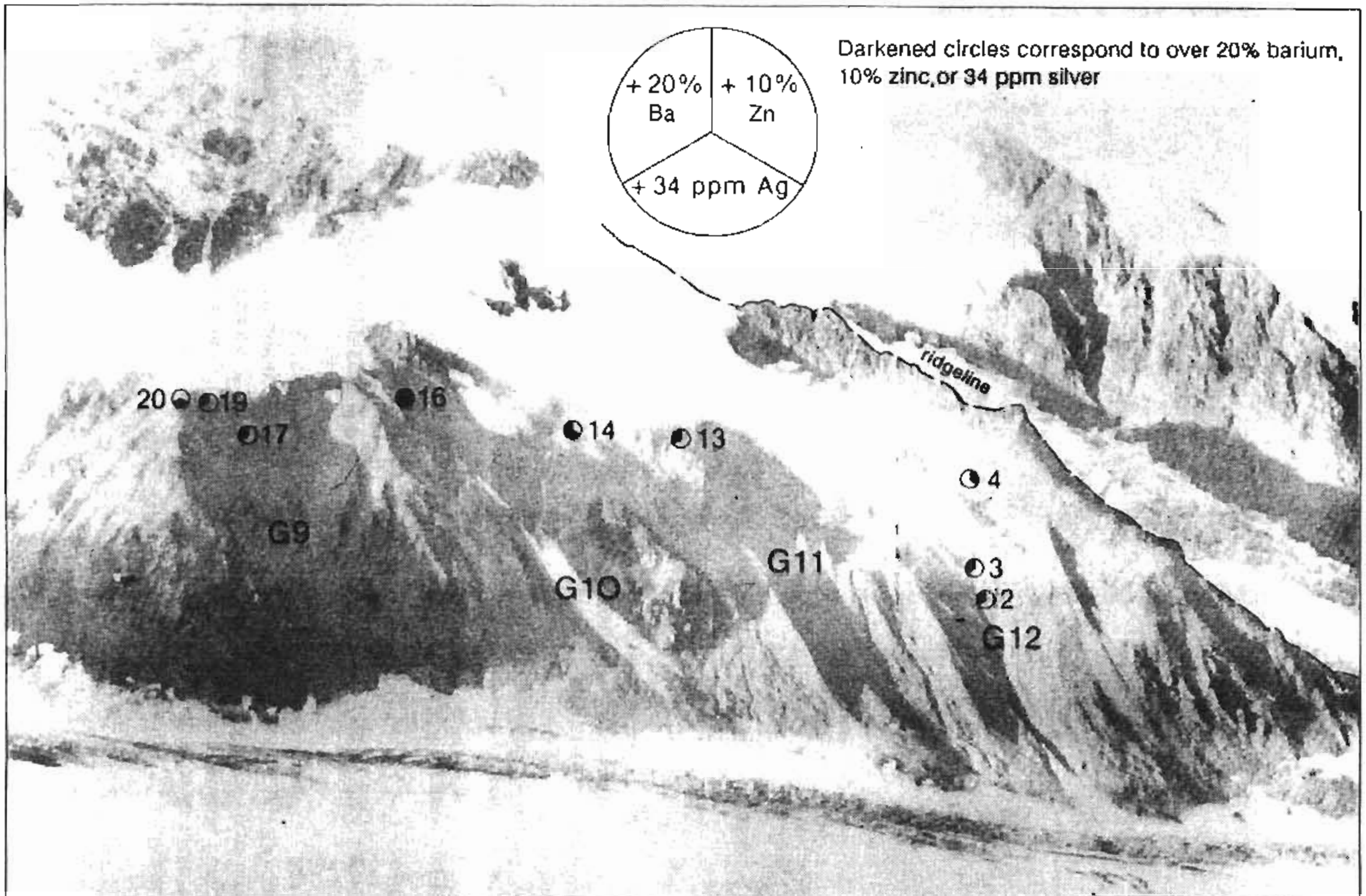


Figure 7. *Western part of the Mount Henry Clay prospect showing high-grade zinc, silver, and barium sample locations and gully numbers.*

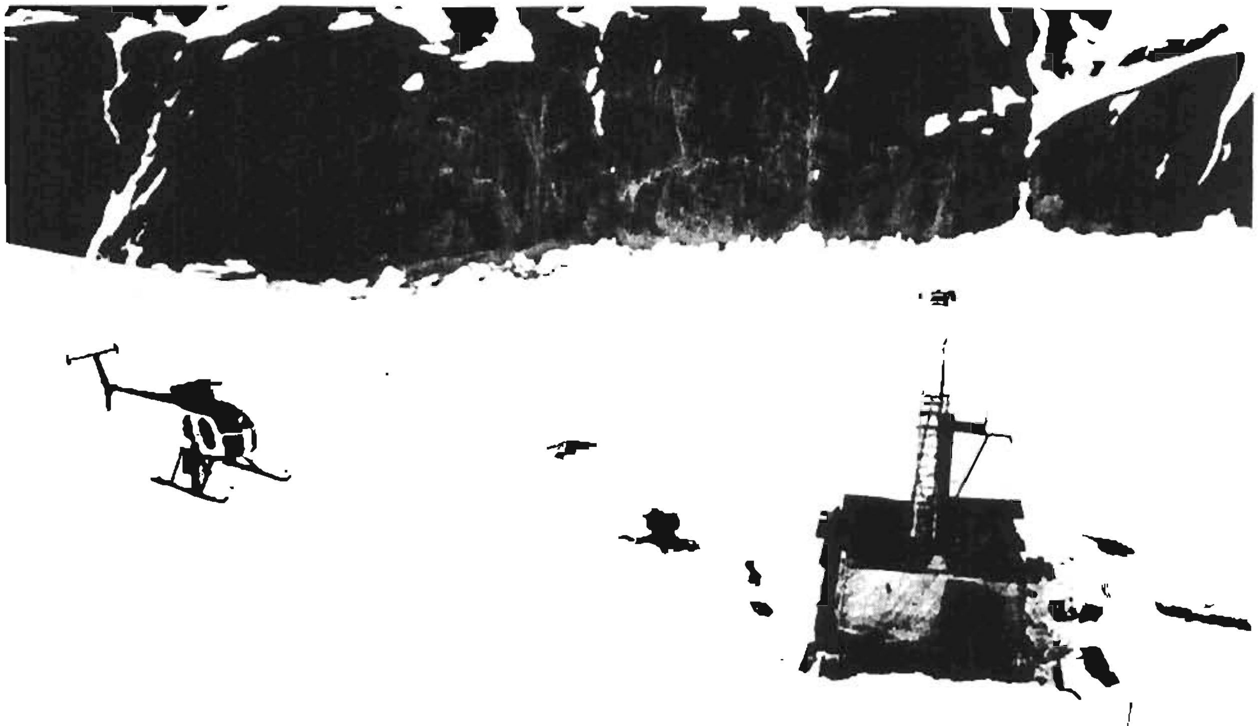


Figure 8. *Kennecott Exploration diamond-core drill project on the Mount Henry Clay prospect.*

CAP PROSPECT

The Cap prospect is located at an elevation of 3,800 ft on the west side of the Saksaia Glacier (sheet 1; figs. 11, 12). It consists of an iron-stained zone about 50 ft thick and 220 ft long, capped by volcanics that crop out just above the Saksaia Glacier and whose extent is hidden by the glacier and cover. The iron-stained zone, which consists of metasedimentary rocks and hydrothermally altered metabasalt, has barite lenses up to 8 ft thick. Pyrite, sphalerite, galena, and tetrahedrite are found in the barite-rich horizon. Samples collected from this occurrence contained up to 55 percent barium, 1.1 percent zinc, 3,300 ppm lead, 227.7 ppm silver, 1.371 ppm gold, and 130 ppm cobalt (app. A-5). In 1988 Newmont explored and drilled the mineralized zone, but details of the drilling were not made available for this report.

NUNATAK PROSPECT

The Nunatak prospect is located between elevations of 3,800 to 4,500 ft on the east side of the Saksaia Glacier (sheet 1, fig. 11). The prospect consists of an iron-stained zone of quartz sericite schist and altered volcanic rocks exposed for 1,500 ft across the face of a nunatak. Within this zone, barite lenses and beds containing interbedded and remobilized sulfides crop out. Rubblecrop indicates that some of the barite-bearing beds may be up to 20 ft thick. Samples of the barite-rich rock contained up to 2.58 ppm gold, 335.3 ppm silver, 2.38 percent zinc, 1,820 ppm copper, 2.0 percent lead, 48 percent barium, and 1,000 ppm arsenic (app. A-6).

LITTLE JARVIS GLACIER PROSPECT

The Little Jarvis Glacier prospect is located along both sides of the Little Jarvis Glacier (sheet 1, fig. 13). The prospect consists of small discontinuous sulfide bands hosted in metasedimentary and metavolcanic rocks. Samples from the prospect contained up to 0.345 ppm gold, 11.8 ppm silver, 13.6 percent zinc, 1,900 ppm copper, 3.8 percent lead, 1.44 percent barium, and 2,000 ppm arsenic (app. A-7).

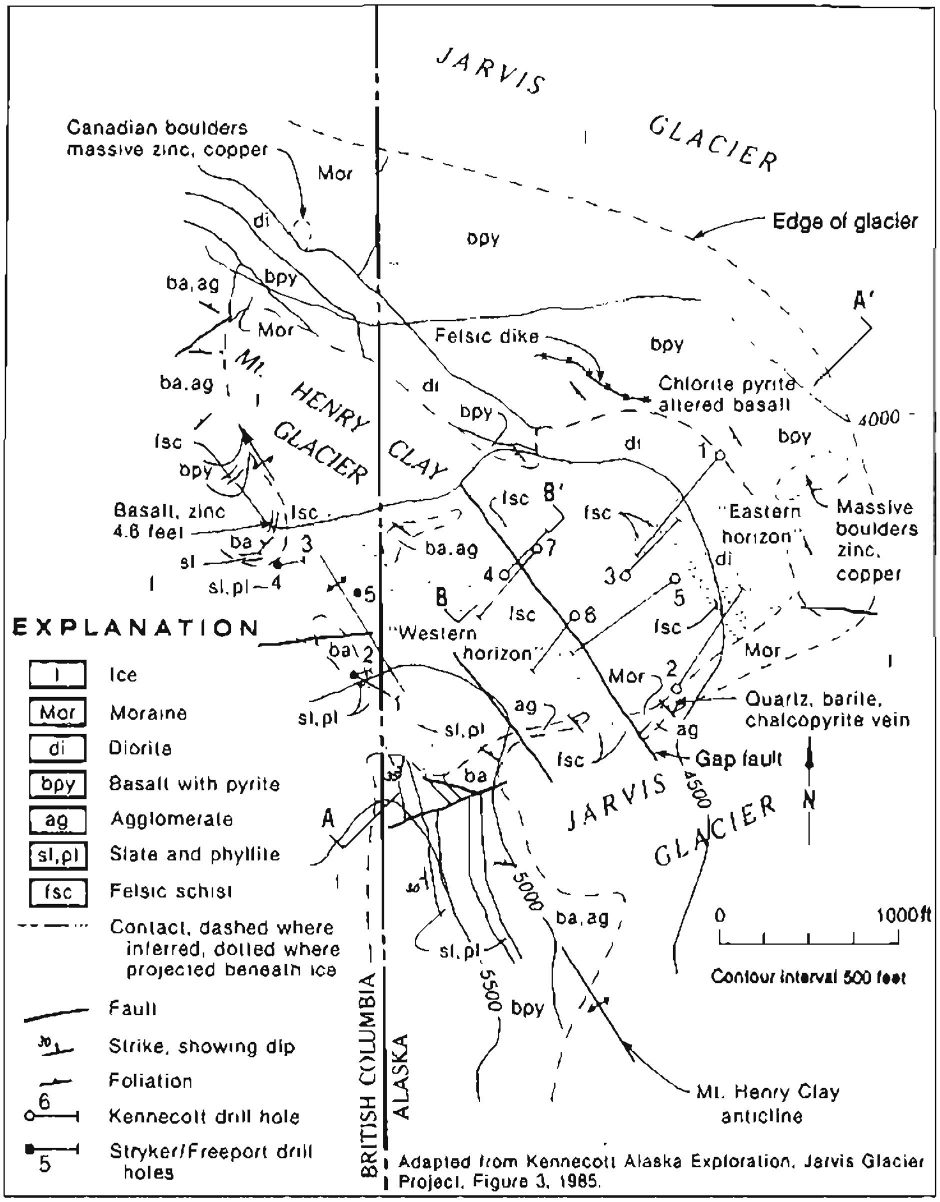


Figure 9. *Mount Henry Clay prospect geology, diamond-core drill hole and cross-section locations.*

JARVIS GLACIER GULCHES PROSPECT

The Jarvis Glacier Gulches prospect is located on the south side of the Jarvis Glacier in a steep-walled canyon about 4 mi east by southeast from the Pleasant Camp border station (sheet 1; fig. 14; app. A-8). Sulfide float found at the mouth of the canyon led to the discovery of some of the occurrences in August 1983 by USBM personnel. Other occurrences discovered in September 1983 by ALYU Mining consist of small showings of stratabound or stratiform sulfides such as sphalerite, pyrite, pyrrhotite, chalcopyrite, galena, and barite. Four occurrences have the best exposures of mineralization (fig. 14, nos. 14, 17, 18, and 24). Most of the occurrences are contained within a northwesterly striking volcanic-sedimentary unit of slate, limestone, and andesite, which is capped by meta-andesite and metamorphosed pillow basalt.

Alternating bands of limestone, slate, and volcanic rocks are exposed for thousands of feet along the southwest side of the canyon. Some of the beds are prominently iron stained. Only a few locations were examined in this canyon, and the extent of sulfide mineralization may be much greater than that indicated by the

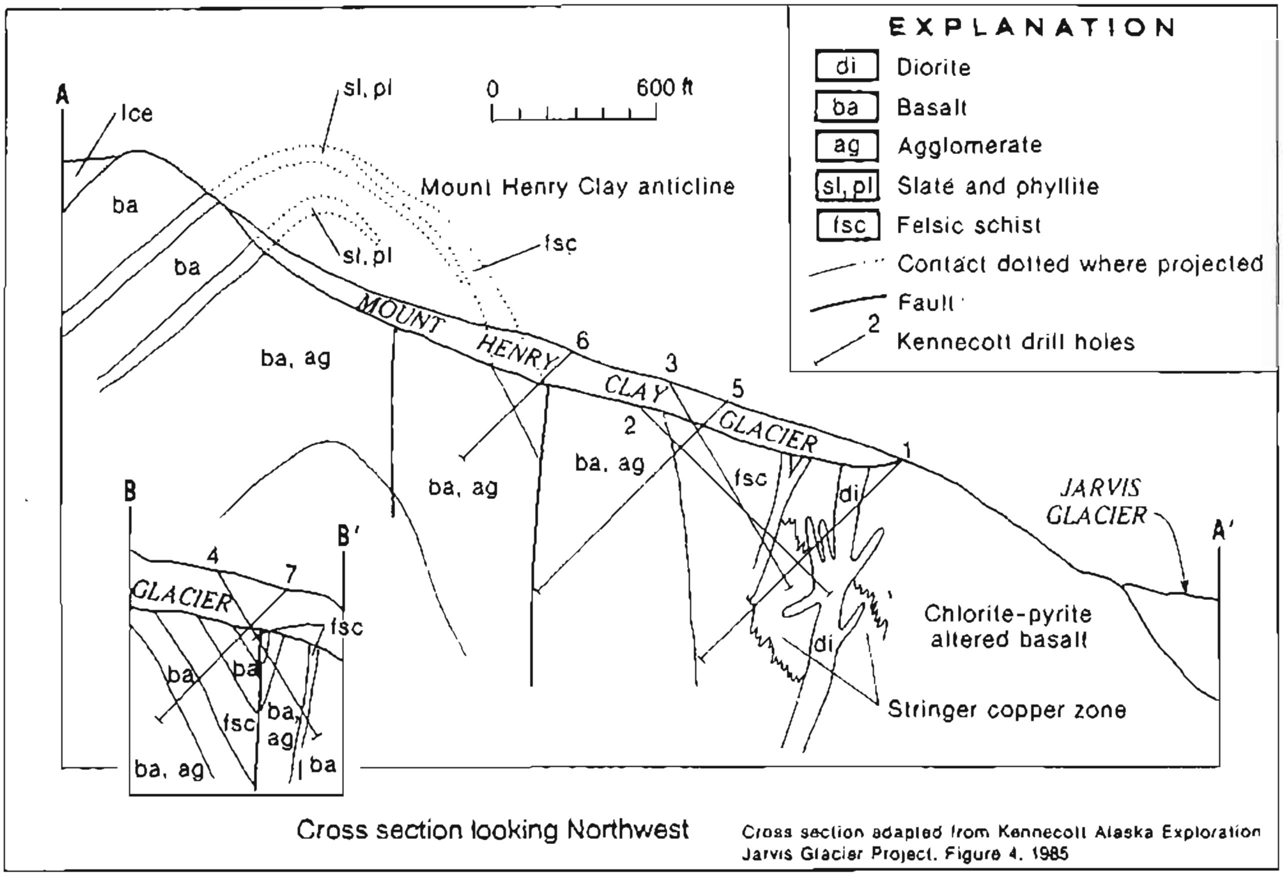


Figure 10. *Mount Henry Clay prospect cross sections.*

small occurrences discussed below. The most interesting occurrence examined was located at an elevation of 3,600 ft on the southeast side of the canyon (fig. 14, no. 18) and consists of a zone of chlorite-altered metasedimentary rocks and meta-andesite containing lenses of massive- and disseminated sulfide mineralization. The zone follows bedding, is up to 5 ft across, and contains massive sulfide lenses up to 0.5 ft thick. It can be traced for at least 100 ft. The sulfide lenses consist of pyrite, sphalerite, chalcopyrite, and galena in calcite- and quartz-rich rock. Samples collected from the zone contained up to 17.8 percent zinc, 230 ppm lead, 1.3 percent copper, 0.163 ppm gold, and 11.6 ppm silver. A 0.4-ft-thick quartz-sulfide lens contained up to 5.4 percent zinc, 3,000 ppm lead, 160 ppm cobalt, 980 ppm copper, 0.416 ppm gold, and 25 ppm silver (fig. 14, no 17); and a 4- by 15-ft lens of iron-stained calcite, quartz, goethite, chlorite, pyrrhotite, and chalcopyrite assayed 790 ppm copper (fig. 14, no. 14).

Quartz stringer zones and sulfide zones occur on the north side of the canyon at an elevation of 3,200 ft, just above the canyon floor (fig. 14, no. 24). Sulfides occur in narrow lenses and disseminated zones, up to 9.5 ft thick, in meta-andesite. A chip sample across a 0.7-ft-thick rubble zone of barite, pyrrhotite, sphalerite, chalcopyrite, quartz, calcite, and chlorite assayed 5,600 ppm copper, 1.57 percent zinc, 1.1 ppm silver, and 122 ppm cobalt. Other samples of sulfide zones taken at this locality contained up to 6.1 percent zinc, 7,600 ppm copper, 110 ppm cobalt, 0.127 ppm gold, and 4.6 ppm silver. The quartz stringer zones consist of veins up to 0.5 ft thick that contain sparse knots of pyrrhotite and chalcopyrite.

BOUNDARY OCCURRENCE

The Boundary occurrence is located about 1.75 mi south of Mount Henry Clay at elevations between 5,700 and 6,000 ft (sheet 1; also sheet 1, no. 132 and F54-F56 and sheet 2, nos. 185-186 of Gilbert and others, 1991b). It consists of narrow bands of iron-stained metasedimentary rocks and altered metabasalt that crop out

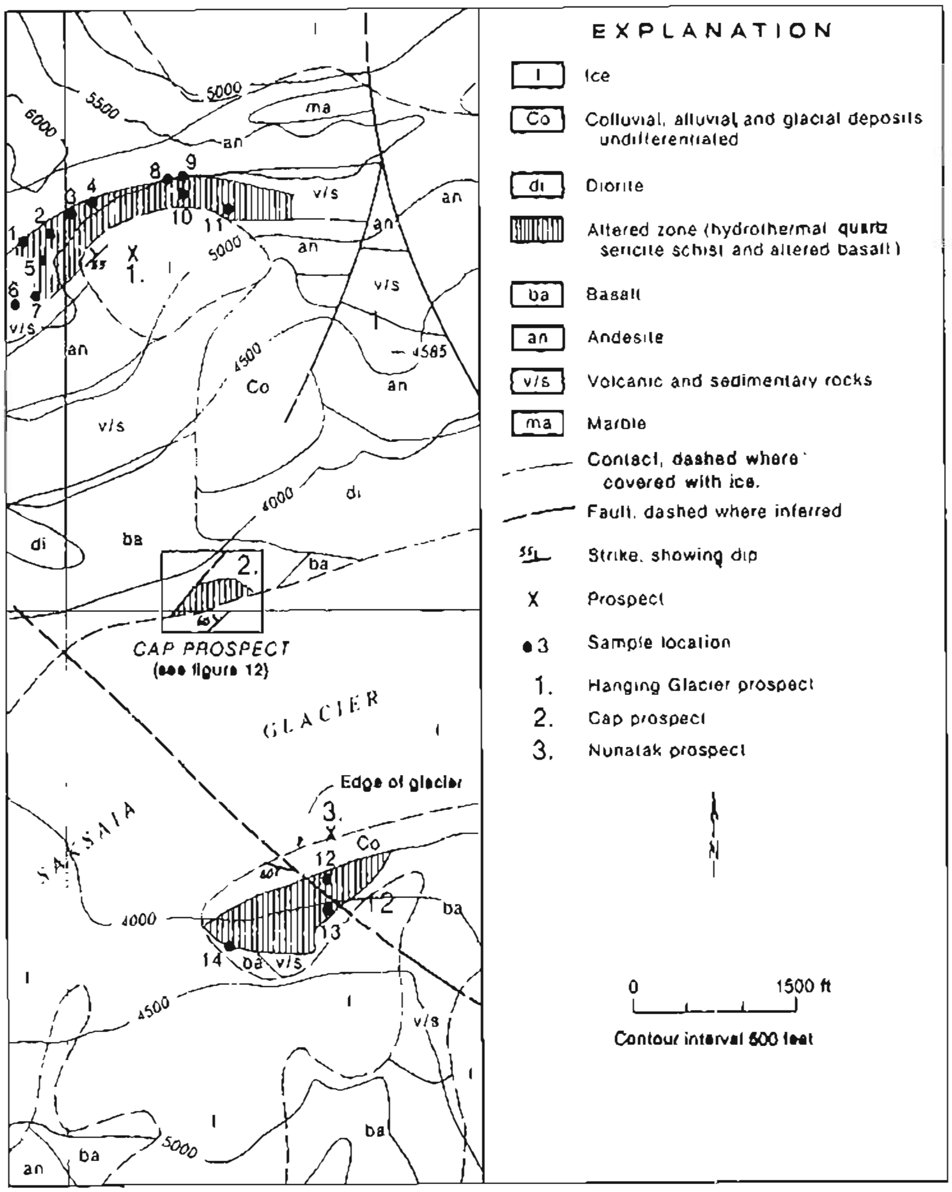


Figure 11. *Hanging Glacier, Cap, and Nunatak prospects showing geology and Hanging Glacier and Nunatak sample locations. Base modified from USGS Skagway B-4 1:63,360 Quadrangle.*

through glacial ice. A barite-rich band hosted in white phyllite contained 47 percent barium. Other samples collected from this prospect contained up to 960 ppm copper, 330 ppm cobalt, 400 ppm arsenic, and 200 ppm nickel.

SUMMIT CREEK ZINC OCCURRENCES

Zinc occurrences are located in the Summit Creek drainage (sheet 1). Bedrock in the area consists predominantly of slate and phyllite, limy slate, and minor limestone. Stream-sediment samples collected during 1985 at the mouth of Summit Creek and from small springs near the head of Summit Creek contained up to 0.020 ppm gold, 1.2 ppm silver, 1,620 ppm zinc, 1950 ppm barium, and 600 ppm bismuth (sheet 1, nos. 209-217 and F83-F90 of Gilbert and others, 1991b). In an attempt to locate the source of the metals in these highly anomalous samples, bedrock and float samples were collected at scattered locations across the Summit

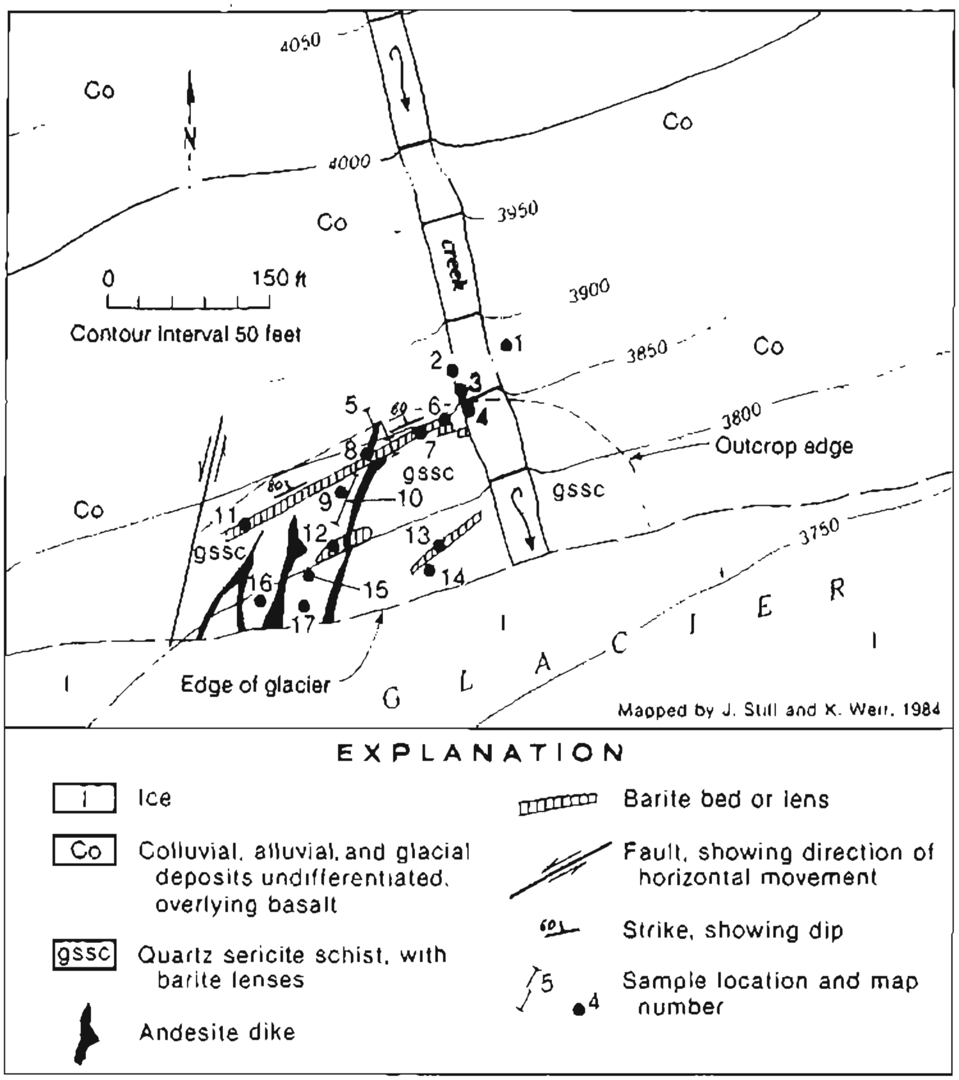


Figure 12. *Cap prospect geology and sample locations.*

Creek drainage (sheet 2, nos. 385-402, 408-432, and 439-447 of Gilbert and others, 1991b). Quartz-calcite-sulfide float samples collected from talus slopes and moraine contained up to 0.686 ppm gold, 380.9 ppm silver, 2.5 percent zinc, 700 ppm copper, 4.1 percent lead, and 375 ppm percent barium. Bedrock slate samples contained up to 570 ppm zinc.

A stream sediment sample collected below a spring surrounded by an iron-stained gossan contained 1.9 percent zinc. A sample of iron-stained calcite-cemented slate scree, collected several hundred feet below the above sample and in the same stream contained 1.2 percent zinc. This calcite cement precipitated from the spring water and contains an unusual occurrence of sphalerite precipitated from groundwater.

IRON BRIDGE PROSPECT

The Iron Bridge prospect is located just northeast of the junction of Nataga Creek and the Kelsall River (sheet 1). During the 1970s a logging road was built across the Kelsall River and the area north and east of this bridge was logged. Mr. Jones, a local prospector, prospected the cuts in the newly built logging roads and discovered copper mineralization in metamorphosed volcanic and sedimentary rocks.

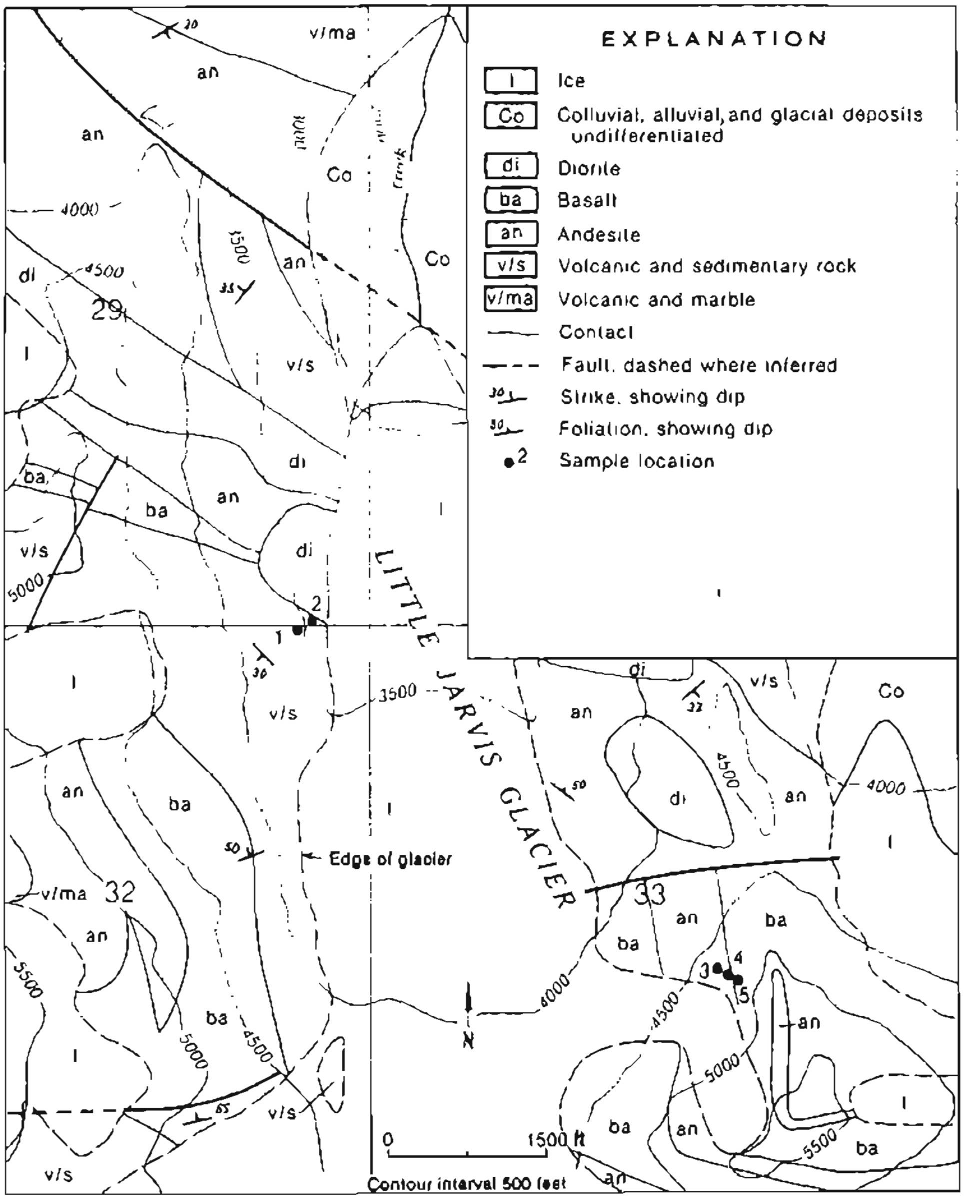


Figure 13. *Little Jarvis Glacier prospect geology and sample locations. Base modified from USGS Skagway B-4 1:63,360 Quadrangle.*

During 1988 we investigated the area roads, which are now thickly overgrown. Shallow trenches and stockpiles of malachite-stained silicified rocks were uncovered. One of three samples collected here contained up to 0.041 ppm gold, 5.6 ppm silver, and 2,960 ppm copper (sheet 2, no. 28 of Gilbert and others, 1991b).

OTHER ANOMALOUS AREAS

Numerous anomalous samples were collected in areas underlain by Paleozoic metavolcanic rocks (Gilbert and others, 1991b). Of particular interest is the area about 3 km south of Pyramid Harbor, where thin layers of massive pyrrhotite anomalous in copper are found with Paleozoic exhalite in meta-andesite and metabasalt (Gilbert and others, 1991a, 1991b). A brief reconnaissance survey in the fall of 1989 suggests that a massive-sulfide prospect (Bull, 1991) along the west side of Lynn Canal 13 km south of the study area is located near the top of a unit of metavolcanic and volcaniclastic rocks within the Kleheni metavolcanic belt (Gilbert and others 1991a, 1991b). Another anomalous area in unit Pzv includes the pyrrhotite-rich metavolcanic rocks on the ridge 2 km

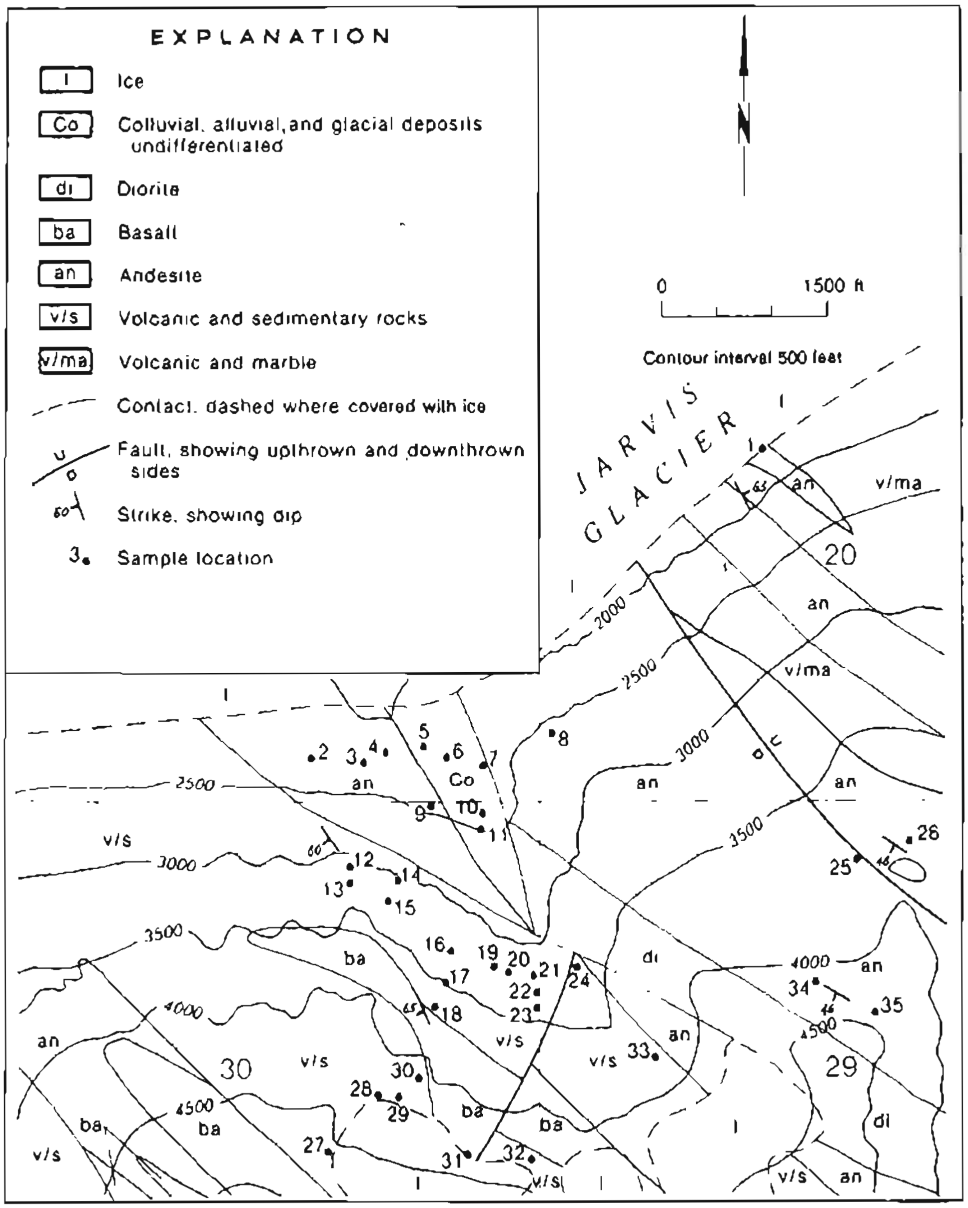


Figure 14. *Jarvis Glacier Gulches prospect geology and sample locations. Base modified from USGS Skagway B-4 1:63,360 Quadrangle.*

west of Chilkat Lake. Finally, in the Herman Lake - Walker Lake - Sunshine Mountain area sparse outcrops of metabasalt in unit Pzvs are anomalous in copper (Gilbert and others, 1991b). Bedrock in this area is overlain by thin deposits of glacial drift; further prospecting is warranted.

ADJACENT BRITISH COLUMBIA PROSPECTS AND DEPOSITS

The Upper Triassic metavolcanic rocks that host the volcanic-associated massive-sulfide prospects in the Porcupine area extend north into British Columbia, where they crop out over a large area (fig. 15). These rocks trend to the area of the Windy Craggy deposit, where they are less metamorphosed than in the Porcupine area. The characteristics of the British Columbia deposits were briefly studied for a comparison to the deposits found in the Porcupine area.

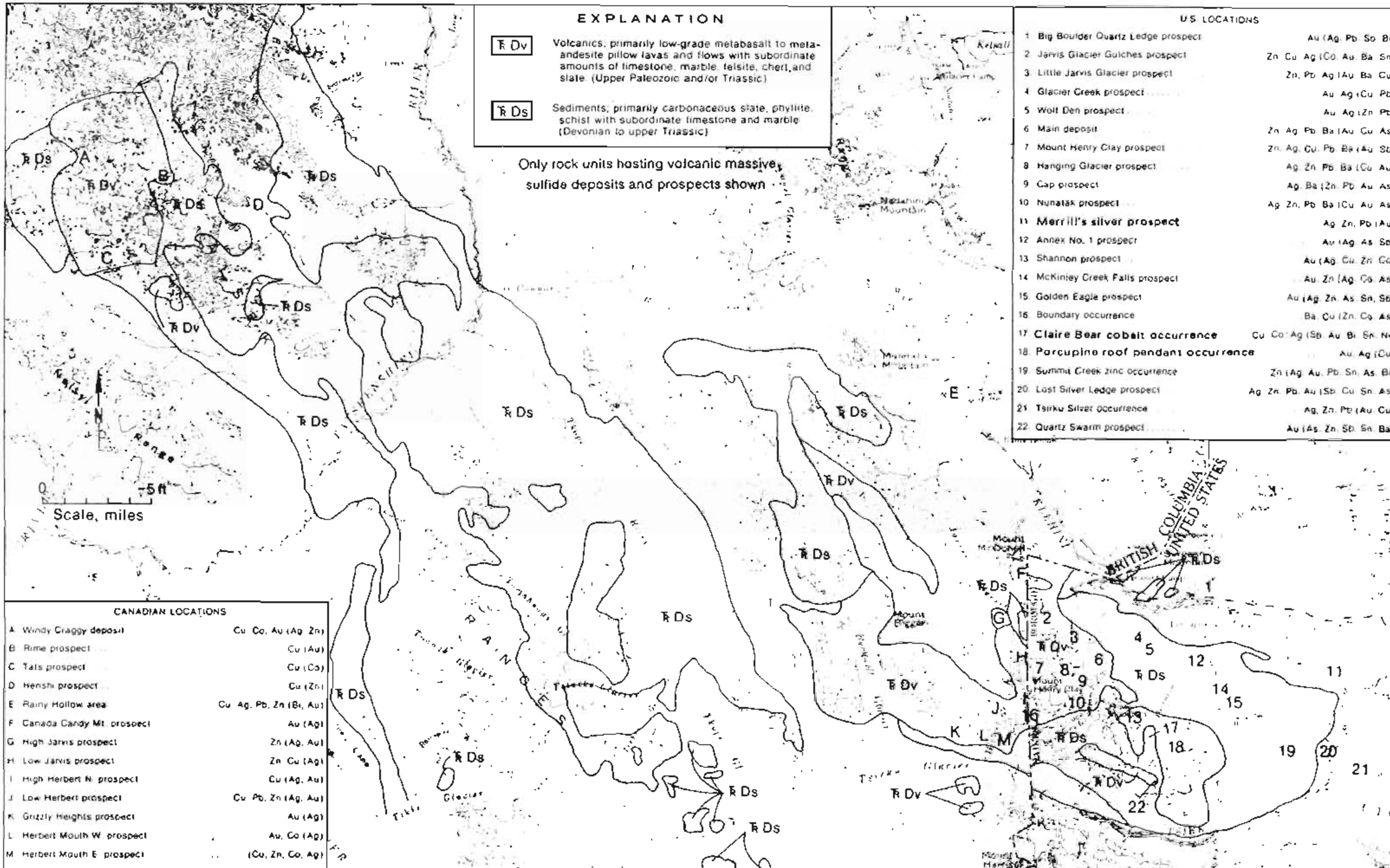


Figure 15. *Simplified geology of the area between the Porcupine area and Windy Craggy deposit showing prospect locations. Geology modified from Gilbert and others (1987), Campbell and Dobb (1979, 1983) and Macintyre (1983). Base modified from USGS Skagway 1:250,000*

The High Jarvis, Low Jarvis, High Herbert, Grizzly Heights, and Herbert Mouth prospects (fig. 15) are described by MacIntyre (1983) and Cambell and Dodds (1983). Most of these prospects are volcanic-associated massive-sulfide zinc-copper-barium-silver-gold prospects, hosted in felsic schists and altered volcanic rocks located within metabasalt believed to be equivalent to the Glacier Creek volcanics in Alaska.

The Windy Craggy and associated volcanic-associated massive-sulfide deposits (fig. 15) are hosted in metabasalt and thin metasedimetary sequences. Between 1981 and December 1988, 78 holes totaling 87,000 ft were drilled, and 9,000 ft of drift and adit were driven at the deposit. The most recent geological estimates place Windy Craggy reserves at 114.3 million tons grading 1.92 percent copper, 0.08 percent cobalt, 0.006 oz/ton gold, and 0.138 oz/ton silver (Downing and others, 1990). In 1982 a test sample was collected from Windy Craggy diamond-drill core and submitted for metallurgical testing (app. A-9).

CLASSIFICATION OF VOLCANOGENIC MASSIVE-SULFIDE DEPOSITS IN STUDY AREA

According to Dawson (1990), the Windy Craggy deposit shows some similarities to Cyprus-type massive-sulfide deposits; yet the alkaline-to-subalkaline composition of host volcanic rocks (Forbes, 1986; MacIntyre and Schroeter, 1986) and enclosing continental-clastic sediments are more characteristic of Beshi- or Kuroko-type mineralization (Fox, 1984). Lead isotopes from the Windy Craggy deposit plot in the Beshi field (Dawson, 1990). The proximity of massive barite and sulfides to an altered submarine vent led Hawley (1976) to suggest that the Glacier Creek deposit formed as Kuroko volcanic massive sulfides. Hence, we believe that the massive sulfide-barite deposits and occurrences in the Porcupine area could be classified as either Beshi- or Kuroko-type volcanogenic massive-sulfide deposits, depending on their proximity to volcanic vent systems.

VEIN GOLD PROSPECTS

Seven gold-bearing vein prospects and occurrences are known within the Porcupine area (sheet 1, nos. 4, 9, 15, 18, 20, 21, 26). Most of the occurrences are associated with "dike-ladder" quartz veins that cut slate. One, the Golden Eagle prospect, has gold values in the host slate. In British Columbia just north of the Porcupinie area near the west edge of the Jarvis Glacier, a fault-controlled quartz vein that extends for thousands of feet is hosted in diorite; it was extensively explored between 1915 and 1985 by shallow shafts, trenches, and diamond drilling.

GOLDEN EAGLE PROSPECT

The Golden Eagle prospect is centered at an elevation of 1,850 ft on McKinley Creek, a tributary of Porcupine Creek, which has had a long history of placer-gold production (sheet 1). In 1983, Haines prospector Jim McLaughlin discovered visible gold hosted in quartz and sulfides at what is now called the Vug vein and staked the seven Golden Eagle lode claims (fig. 16). In 1984 and 1985 we examined, mapped, and sampled 2,000 ft of bedrock exposed along McKinley Creek (figs. 17-19, app. B-1).

The prospect area consists of gray slate and phyllite intruded by numerous altered tan dikes that range in thickness from a few feet to over 20 ft. These dikes both crosscut and follow the foliation of the slate. Both dikes and slate generally strike east to northeasterly and dip steeply.

Almost all the quartz veins examined are transverse fracture fillings in altered dikes. The dikes exhibit extensive silica-carbonate alteration and were probably originally mafic. Most samples of dikes are not mineralized, but a few contained up to 0.560 ppm gold. Usually, the dike margins are tight and rarely contain quartz veins. The veins are usually are confined in length by the width of the dike, and only rarely does a quartz vein extend more than a few feet into the slate. The veins range in thickness from a few inches to 2 ft, and at some locations are regularly spaced and could be termed ladder veins. One vein is 30 ft long, but most are well under 10 ft.

The discovery vein (Vug vein) is the largest, most highly mineralized vein yet discovered on the prospect and is located at the west edge of McKinley Creek at an elevation of 1,800 ft (figs. 18, 19). It consists of a 0.3- to 2.0-ft-thick quartz vein exposed for 18 vertical ft and 9 horizontal ft in a 12-ft-thick dike. The dike strikes

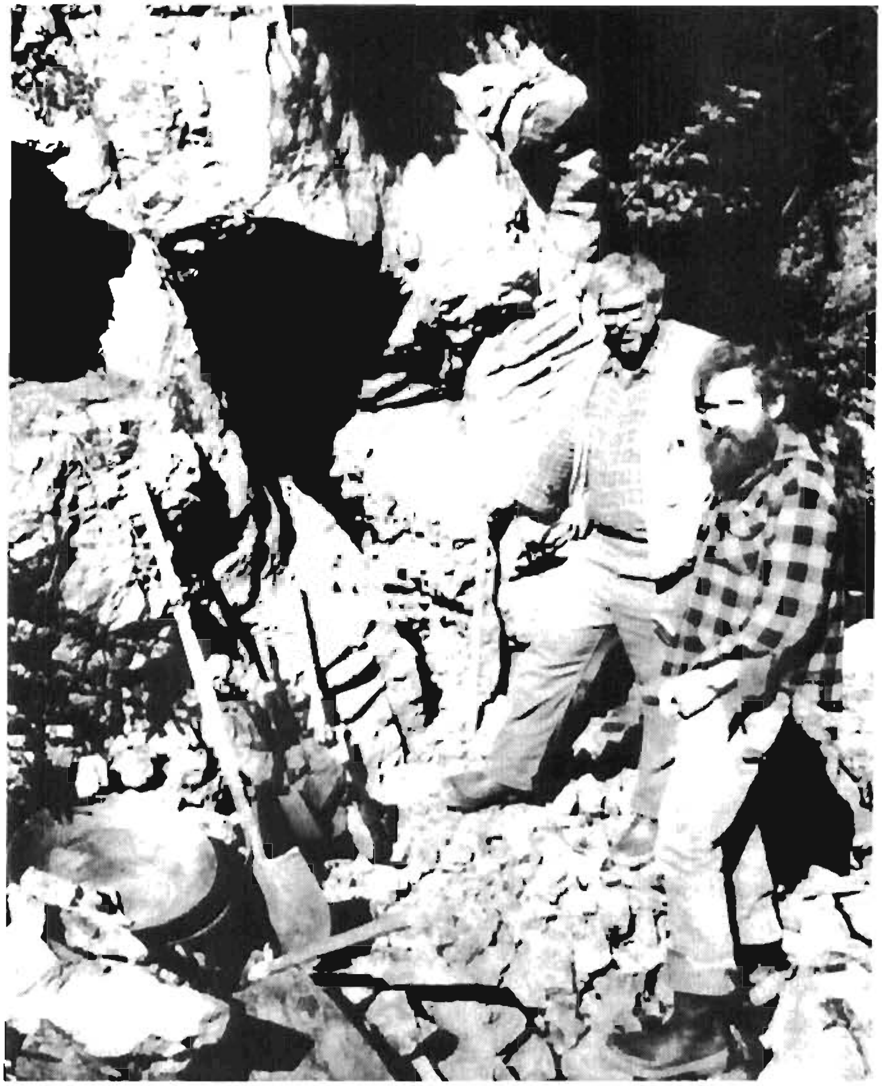


Figure 16. *Claim holder and project geologist examine vug vein on the Golden Eagle prospect.*

75° and dips 84° south, whereas the slates follow the same strike but dip about 78° south. The vein strikes (at about right angles to dike) 340° and dips 60° to 70° east. Assuming this vein is confined by dike margins, its maximum strike length is about 13 ft.

A 1-ft-wide by 4.5-ft-high by 8-ft-deep vug occupies the lower 4.5 ft of the Vug vein. Both walls of the vug are coated with up to 0.1-ft-thick quartz crystals and coated with red gossan and sulfur. The floor and back of the vug are filled with masses and lenses of crystalline pyrite, pyrrhotite, and lesser sphalerite. Visible gold is found in both the iron sulfides and sphalerite, but rarely in the quartz. Over 150 lb of sulfides were reported mined from the vug with a recovery of about 0.5 oz (15 g) of gold. Samples collected from the vug sulfides contained from 48.86 to 531.1 ppm gold. Samples of vug quartz with sulfides contained from 11.93 to 75.43 ppm gold, and a sample from the vug wall of vuggy crystalline quartz contained 0.738 ppm gold. A 1-ft-long channel sample across the quartz vein, at a location 0.2 ft above the vug, contained 20.35 ppm gold, and chip channel samples across the vein at heights of 8 and 15 ft above the creek contained from 0.075 ppm to 1.957 ppm gold (fig. 19).

Additional quartz veins located along McKinley Creek to 1,300 ft southeast of the vug vein and to 650 ft northwest of it were mapped and sampled. Small vugs, quartz crystals, and small pyrite-sphalerite lenses locally

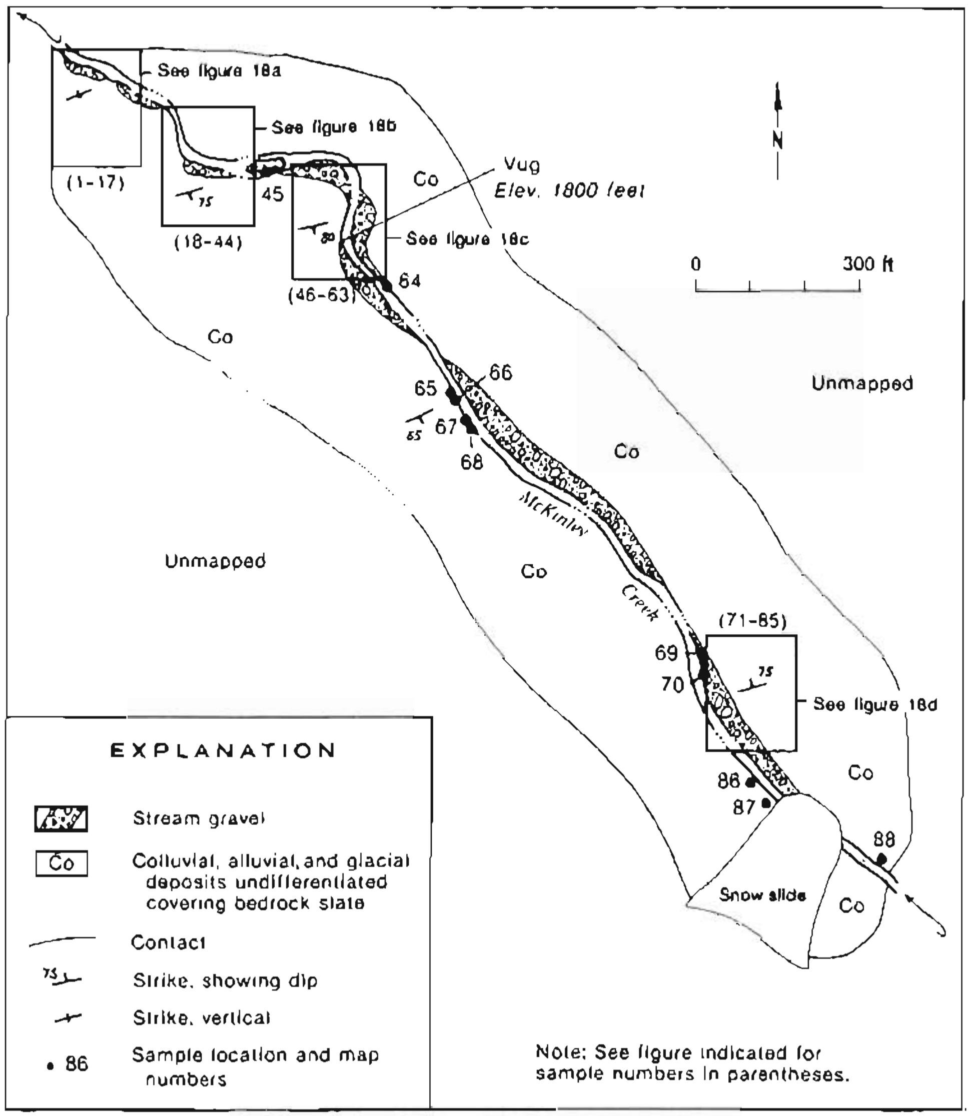


Figure 17. *Golden Eagle prospect showing geology, detailed map locations, and sample locations. (Mapped by J. Still and K. Weir, 1985.)*

occur in these veins. Samples of quartz veins southeast of the vug contained up to 0.05 ppm gold and 150 ppm zinc (figs. 17, 18). Those to the northwest contained up to 182.13 ppm gold and 1.14 percent zinc (figs. 17, 18). The highest grade vein sample, 182.13 ppm, was from a 0.25-ft-thick by 8-ft-long vein with 1-in.-long-pyrite crystals (fig. 18, no. 23). Two adjacent samples of the vein contained 0.245 and 1.501 ppm gold. Eight of the remaining highest grade vein samples contain from 4.24 to 36.62 ppm gold.

Four samples from the host Porcupine slate did not contain detectable gold, and 30 contained from 0.005 to 2.65 ppm gold. The highest value sample (fig. 18, no. 40) was collected from a pyrite-rich band about 0.1 ft thick. A 5-ft-long chip sample that included the same band assayed 0.095 ppm gold. Petrographic examination of the sulfides in the slate revealed gold within some of the pyrite cubes.

Except for the Vug vein, the 30 or so quartz ladder veins examined on this prospect are not large enough or close enough to be considered for mine development. The Vug vein may indicate potential for isolated spots of high-grade gold mineralization, but finding such high-grade areas may be very difficult. However, the gold values in the quartz veins do encourage further exploration for faults or other structures where potential veins

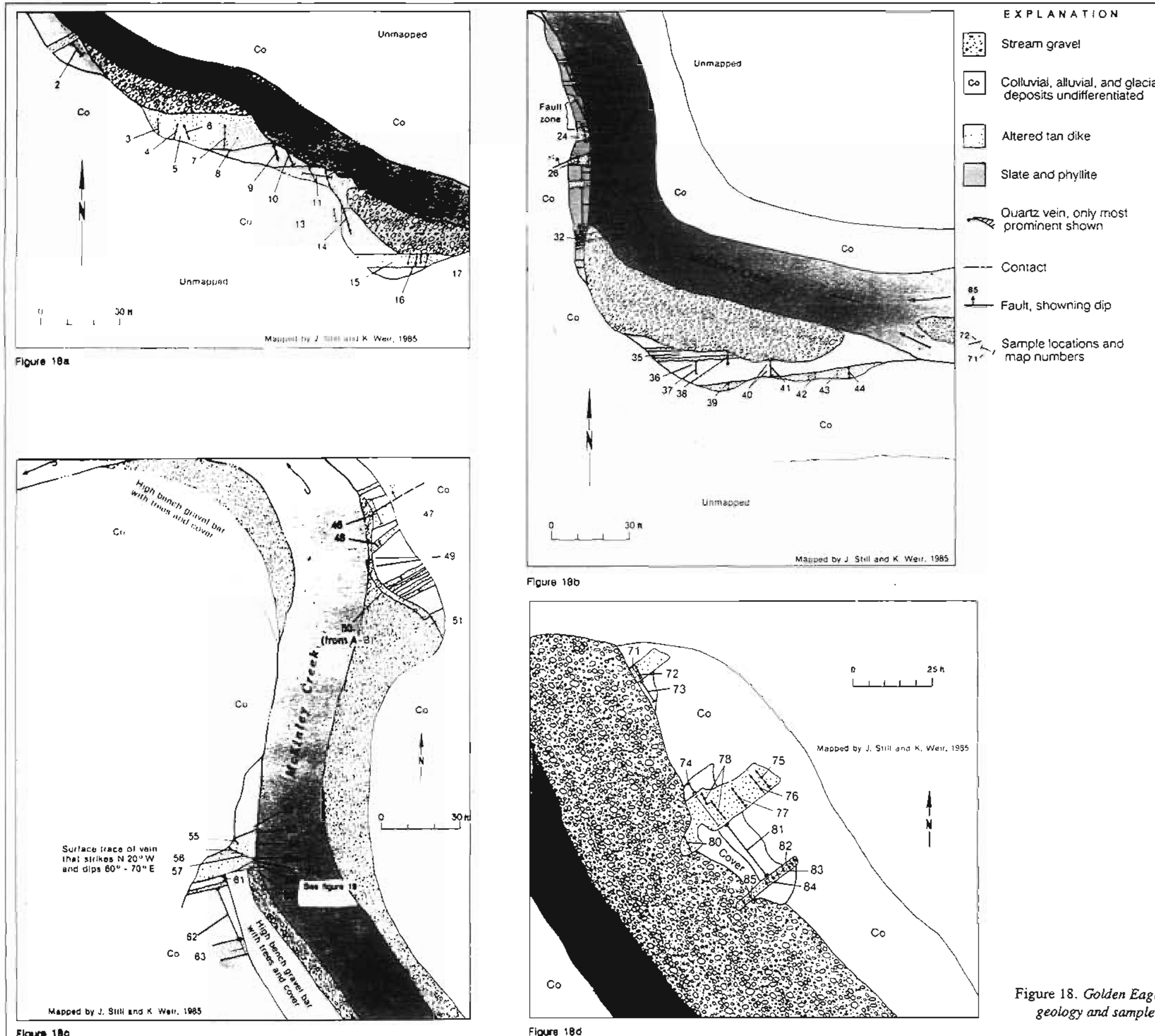


Figure 18. *Golden Eagle prospect showing detailed geology and sample locations (a-d).*

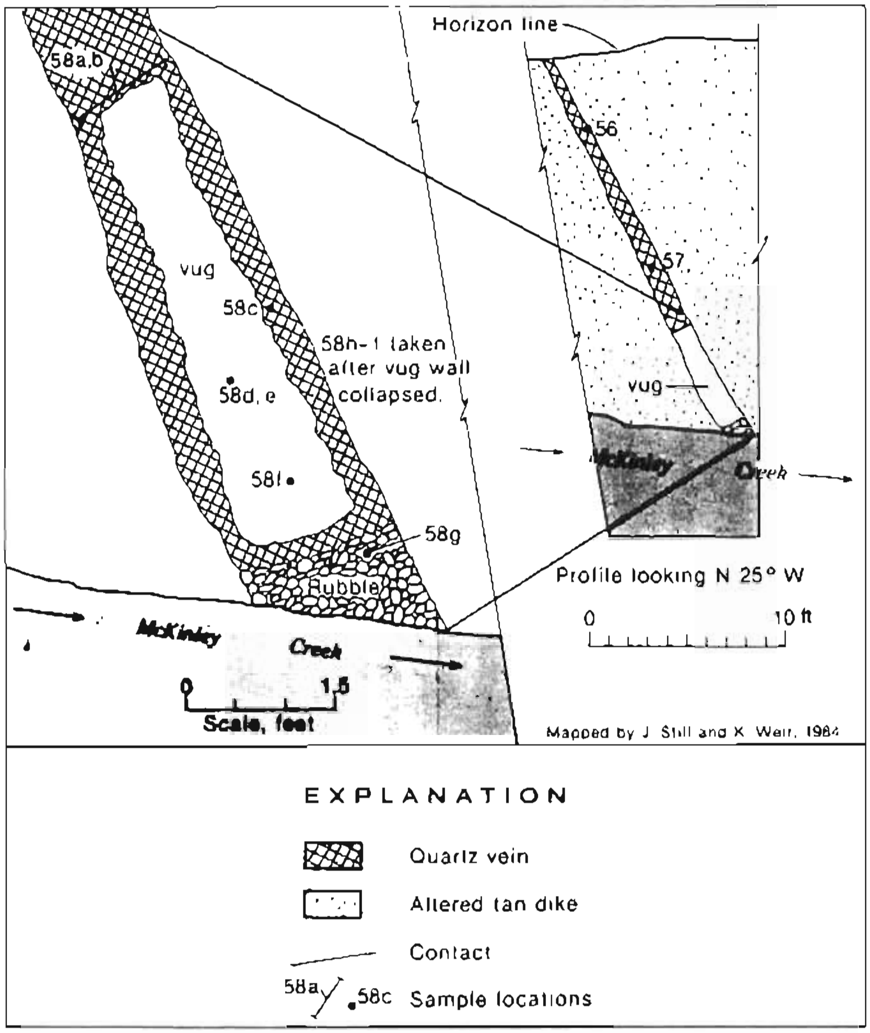


Figure 19. *Golden Eagle prospect showing the vug geology and sample detail.*

could be large enough to attract serious interest. The gold values in the slate suggest a possibility of low-grade, large-volume gold mineralization.

MCKINLEY CREEK FALLS PROSPECT

A gold-zinc prospect near the base of a falls in the steep-walled canyon containing McKinley Creek was examined (sheet 1). The area consists of slate with interbedded limestone that is cut by altered tan dikes. Narrow discontinuous quartz, sphalerite veins, or silicified bands were found hosted in the dikes, and to a lesser extent, in the slate and limestone.

Selected high-grade samples of quartz-sphalerite veins, hosted in dikes, contained up to 13.4 percent zinc and 8.959 ppm gold, and a 2.5-ft-long chip sample across a limy silicified band hosted in limy slate contained 24.83 ppm gold and 280 ppm zinc (sheet 1, no. 143, and sheet 2, no. 307 in Gilbert and others, 1991b).

ANNEX NO. 1 PROSPECT

The Annex No. 1 prospect, located on the cliffs above the west side of Porcupine Creek, was discovered by Jerry Fabrizio, a local prospector, in 1983 (sheet 1). The prospect consists of pyrite-bearing quartz veins associated with tan to gray altered dikes, exposed in a narrow gulch.

Samples of narrow, discontinuous pyrite-bearing quartz veins in the margins of dikes and in slate contained from 0.2 to 114.140 ppm gold (fig. 20). Samples of dike and slate contained from 0.005 ppm to 0.315 ppm gold. Selected high-grade samples also contained up to 9 ppm silver, 840 ppm zinc, 100 ppm tin, and 0.8 percent arsenic (app. B-2).

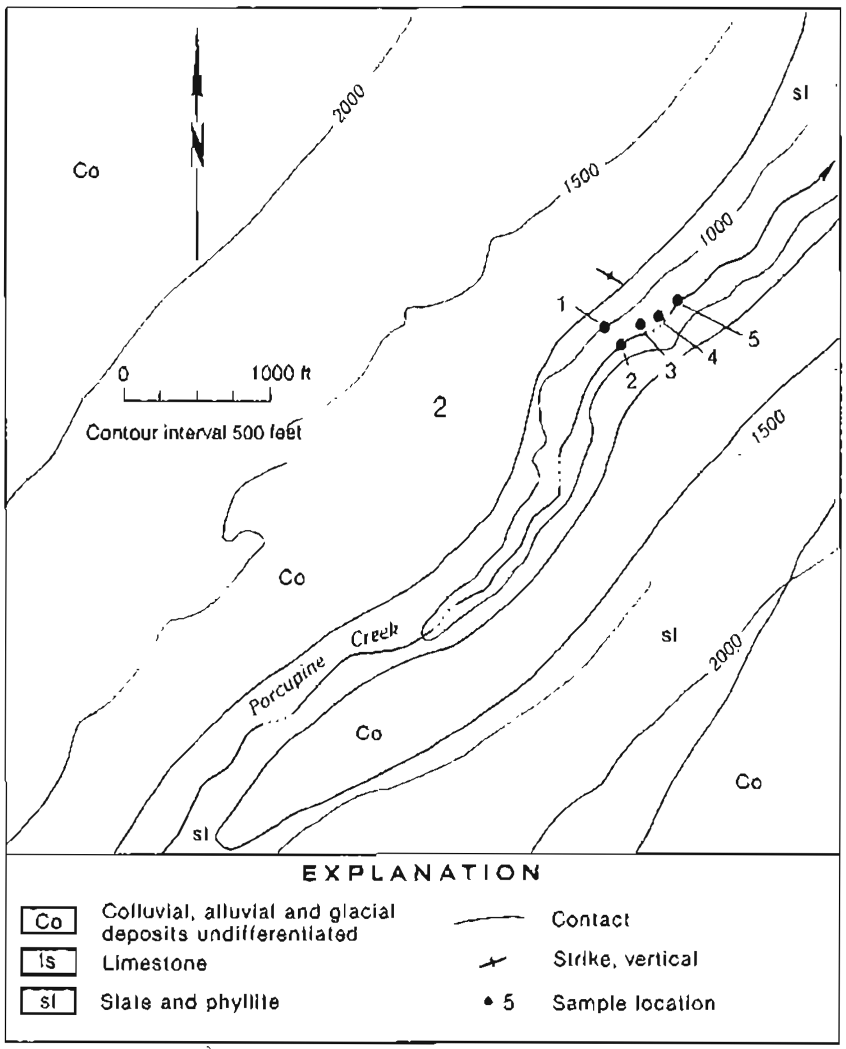


Figure 20. *Annex No. 1 prospect showing geology and sample locations. Base modified from USGS Skagway B-4 1:63,360 Quadrangle.*

WOLF DEN PROSPECT

The Wolf Den prospect, located on the north slopes of Flower Mountain, was discovered and staked by Merrill Palmer in 1987 (sheet 1, fig. 21). It consists of quartz-pyrite-arsenopyrite-sphalerite veins hosted in a tan dike less than 10 ft thick. The veins are up to 0.3 ft thick and extend up to 5 ft, and are confined to the dike. Samples from the veins contained up to 11.417 ppm gold and 3,500 ppm zinc. A 5-ft-long chip sample of slate with pyrite bands collected upstream from the dike contained 0.103 ppm gold and 225 ppm zinc; a sample collected from quartz-sphalerite-galena-pyrite vein float contained more than 2 percent zinc, 0.171 ppm gold, and 645 ppm lead (app. B-3).

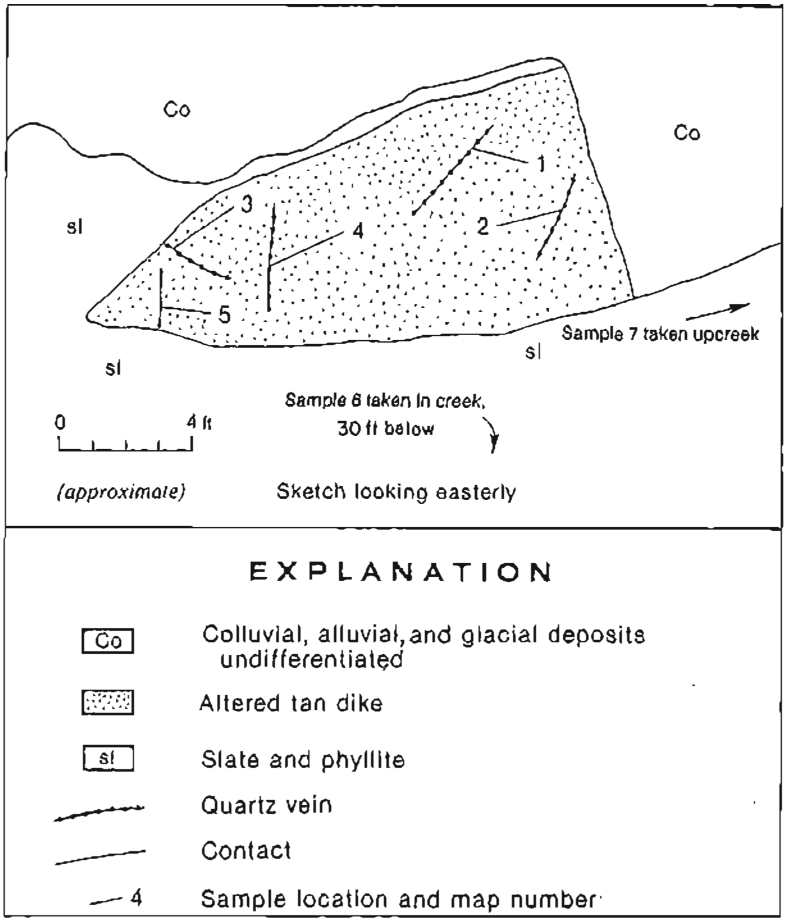


Figure 21. *Wolf Den prospect showing geology and sample locations. Sketch by J. Still and K. Weir (1987).*

QUARTZ SWARM PROSPECT

The Quartz Swarm prospect is located on a mountain surrounded by glaciers that feed the headwaters of Porcupine Creek (sheet 1). It was discovered in 1984 by Palmer. It consists of quartz-vein swarms hosted in slate and metabasalt exposed in a prominent cliff exposure from 3,600 to 5,400 ft (fig. 22). These veins average about 0.5 to 1.5 ft thick and extend for hundreds of feet along strike. The swarms of veins are many hundreds of feet across and extend for thousands of vertical feet (fig. 23).

Sixty samples were collected from the veins and surrounding wall rock at various locations and elevations (fig. 22). Six of these samples, mostly quartz veins, contained from 0.005 to 0.09 ppm gold. The 60 samples contained up to 2.4 ppm silver, 390 ppm zinc, 150 ppm copper, 3,000 ppm barium, 700 ppm arsenic, 200 ppm nickel, and 3,000 ppm antimony (app. B-4). Although trace amounts of gold and favorable geochemistry were found in these quartz swarms, significant gold values were not found in samples collected through 1,500 ft of elevation and 4,000 ft across structure.

BIG BOULDER QUARTZ LEDGE PROSPECT

The Big Boulder Quartz Ledge prospect, located at an elevation of 1,500 ft east of Big Boulder Creek, consists of a shallow adit and a series of felsic dikes in slate-bearing quartz segregations and veins (sheet 1). The quartz-bearing dikes strike north-northwest and have steep dips, are up to 1.3 ft thick, and crop out for up to 60 ft along strike. The adit was likely driven about 80 years ago, judging from a 1.5-ft-thick spruce tree growing on the dump near the adits portal. The adit was driven through a felsic dike for 18 ft and cuts a quartz band for

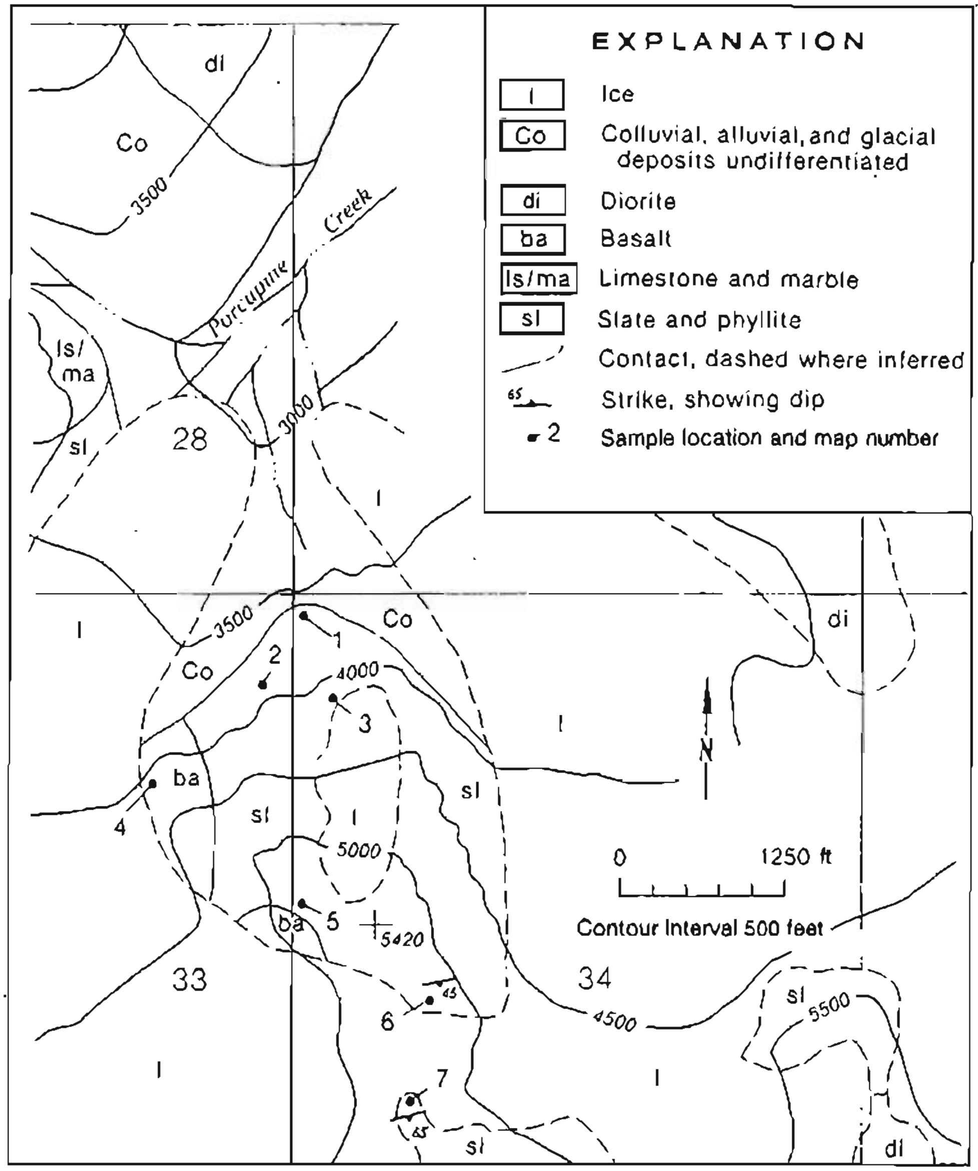


Figure 22. *Quartz Swarm prospect showing geology and sample locations. Base modified from USGS Skagway B-4, 1:63,360 Quadrangle.*

about 5 ft (fig. 24). None of the 20 samples of quartz and dike rock contained anomalous gold, but they had up to 1.8 ppm silver, 308 ppm lead, 100 ppm tin, 500 ppm arsenic, 700 ppm bismuth, and 900 ppm antimony (app. B-5).

LEBLONDEAU VEIN OCCURRENCE

The LeBlondeau vein occurrence is located on the south side of the Tsirku River near the 4-mi-long retreating LeBlondeau Glacier (sheet 1). The snout of this glacier is the site of some limited placer activity, including the staking of placer claims. A reconnaissance of the area revealed gold mineralized float near the glacier snout (sheet 1, no. F70-72 of Gilbert and others, 1991b), and followup examination revealed gold-bearing quartz veins in an area exposed within the last 2 years by the retreating glacier (sheet 2, no. 614-616 of Gilbert and others, 1991b). Irregular quartz veins up to 0.8 ft wide and 50 ft long contained pyrrhotite and were found near the face of the retreating glacier. The veins cut bedding and are hosted in dikes and metachert. Samples from the veins contain up to 1.561 ppm gold, 2.3 ppm silver, and 251 ppm cobalt.

Figure 23. *Quartz-sulfide veins at Quartz Swarm prospect at the head of Porcupine Creek.*

POLYMETALLIC VEIN SILVER PROSPECTS

Three polymetallic vein silver prospects and one occurrence are known in the study area. One is located near Glacier Creek; the other three are located near the Tsirku River in the vicinity of Summit Creek and Sunshine Mountain (sheet 1). These localities mostly consist of silver-bearing galena-sphalerite quartz veins hosted in limestone or dolomite. All lack sufficient volume to attract serious development; however, the high silver grades (up to 100 oz/ton) in some occurrences and the silver-zinc-lead geochemical anomalies reported in dolomite and limestone (Still and others, 1985, 1987; Gilbert and others, 1991b) might encourage exploration for larger mineralized zones.

LOST SILVER LEDGE PROSPECT

The Lost Silver Ledge prospect is located on a ledge in the middle of a 500 ft-high east-facing cliff about 0.5 mi south of the mouth of Summit Creek (sheet 1, figs. 25, 26). R.C. Manuel, a local prospector, originally discovered the prospect and mined a high-grade silver lens from it during the 1930s.

The Lost Silver Ledge prospect consists of quartz-sulfide veins hosted in dolomitic limestone. The veins do not continue into adjacent slate. Workings consist of a 5-ft adit and stope across a narrow rib, where a silver-rich lens was reportedly mined out. The stope is about 10 ft high, 3 to 5 ft wide, and 20 ft long (fig. 27). Examination of the stope revealed a narrow quartz-sulfide vein striking 45° and dipping 40° west that extended about 8 ft. The sulfides consist predominantly of jamesonite with lesser amounts of galena and tetrahedrite. The vein is up to 0.4 ft wide and is adjacent to a felsic dike. Samples contained up to 14.19 ppm gold, 871.6 ppm silver, 1,540 ppm zinc, 1.70 percent copper, and 42.5 percent lead (fig. 25, no. 3).

The most prominent vein system on the prospect starts 25 ft southeast of the stope, continues 55 ft, and then extends down the cliff face for hundreds of feet (fig. 25, nos. 6-11; fig. 26, no. 10). Samples from this vein system contained from 0.05 to 1.32 ppm gold, 346.0 to 3,423.1 ppm silver, 0.194 to 4.89 percent zinc, and 4.36 to 39.3 percent lead. Samples of quartz veins near the base of the dolomitic limestone cliff 500 ft below these workings (fig. 25, no. 16) contained up to 0.04 ppm gold, 8.9 ppm silver, 54.5 percent zinc, and 4,580 ppm lead (app. C-1).

TSIRKU SILVER OCCURRENCE

The Tsirku silver occurrence (sheet 1) is located on the east side of the Tsirku River at a location across from Summit Creek and the Lost Silver Ledge prospect. It was discovered by this study in 1986 and consists of scattered, narrow, and discontinuous silver-bearing zinc-galena quartz veins hosted in dolomite and limy slate. A representative chip sample across the highest grade vein contained 0.38 ppm gold, 653.5 ppm silver, 18.4 percent zinc, and 6.2 percent copper (sheet 1, nos. F80-F82, and sheet 2, nos. 497-502 in Gilbert and others, 1991b).

MERRILL'S SILVER PROSPECT

A silver prospect 1.5 to 2 mi southwest of VABM knob 1,720 (sheet 1) was first discovered by Palmer in 1980. It is in an area penetrated by overgrown logging roads, with few outcrops. It consists of narrow silver-bearing galena-sphalerite quartz veins scattered over a distance of at least 1,500 ft, between elevations of 700 to 950 ft (fig. 28). Sulfide vein mineralization is hosted in dolomite and argillite, and selected high-grade samples contained up to 0.471 ppm gold, 610.3 ppm silver, 13 percent zinc, 1640 ppm copper, and 15.7 percent lead (app. C-2).

GLACIER CREEK PROSPECT

A 10-ft-long adit, driven along a pyrite-bearing shear zone in limestone, is located on the east bank of Glacier Creek (sheet 1, fig. 29) (MacKevett, 1971). Samples from the adit and its vicinity contained up to 0.59 ppm gold, 3 ppm silver, 1,100 ppm zinc, 550 ppm copper, and 140 ppm lead (app. C-3).

SKARN PROSPECTS AND OCCURRENCES

CLAIRE BEAR COBALT OCCURRENCE

The Claire Bear occurrence (sheet 1) is located east of Flower Mountain at an elevation of 3,700 ft in an area of considerable turf cover. It consists of narrow, discontinuous pyrrhotite-pyrite-chalcopyrite lenses in marble within the contact aureole of Early Cretacaeous quartz diorite - tonalite (fig. 30). Selected high-grade samples from these lenses or the rubblecrop below them contain up to 0.028 ppm gold, 56.2 ppm silver, 2,290 ppm copper, 1,070 ppm cobalt, 700 ppm tin, 1,000 ppm arsenic, 800 ppm nickel, 1,000 ppm bismuth, and 7,000 ppm antimony (app. D-1).

PORCUPINE ROOF-PENDANT OCCURRENCE

A 400- by 1,000-ft roof pendant surrounded by diorite is located at an elevation of 3,500 ft, near the headwaters of Porcupine Creek (sheet 1). A sample of gossan rubblecrop collected 500 ft below the pendant contained 6.33 ppm gold, 18.2 ppm silver, and 515 ppm copper. The pendant consists of metamorphosed slate and limestone that form bands of garnet and diopside at some locations. Samples from the pendant contained up to 0.068 ppm gold, 1.1 ppm silver, 192 ppm zinc, and 230 ppm copper (sheet 1, no. F44 and sheet 2, nos. 340-345 of Gilbert and others, 1991b).

LEBLONDEAU SKARN OCCURRENCE

At elevations between 3,800 ft and 5,200 ft on the west wall of the LeBlondeau Glacier, a magnetite-chalcopyrite skarn crops out near a diorite-marble contact (sheet 1). This skarn is characterized by massive magnetite lenses up to 10 ft across with associated grossularite garnet, epidote, and marble. Chalcopyrite and pyrite are present in small amounts. Selected high-grade samples from this skarn contained up to 0.068 ppm

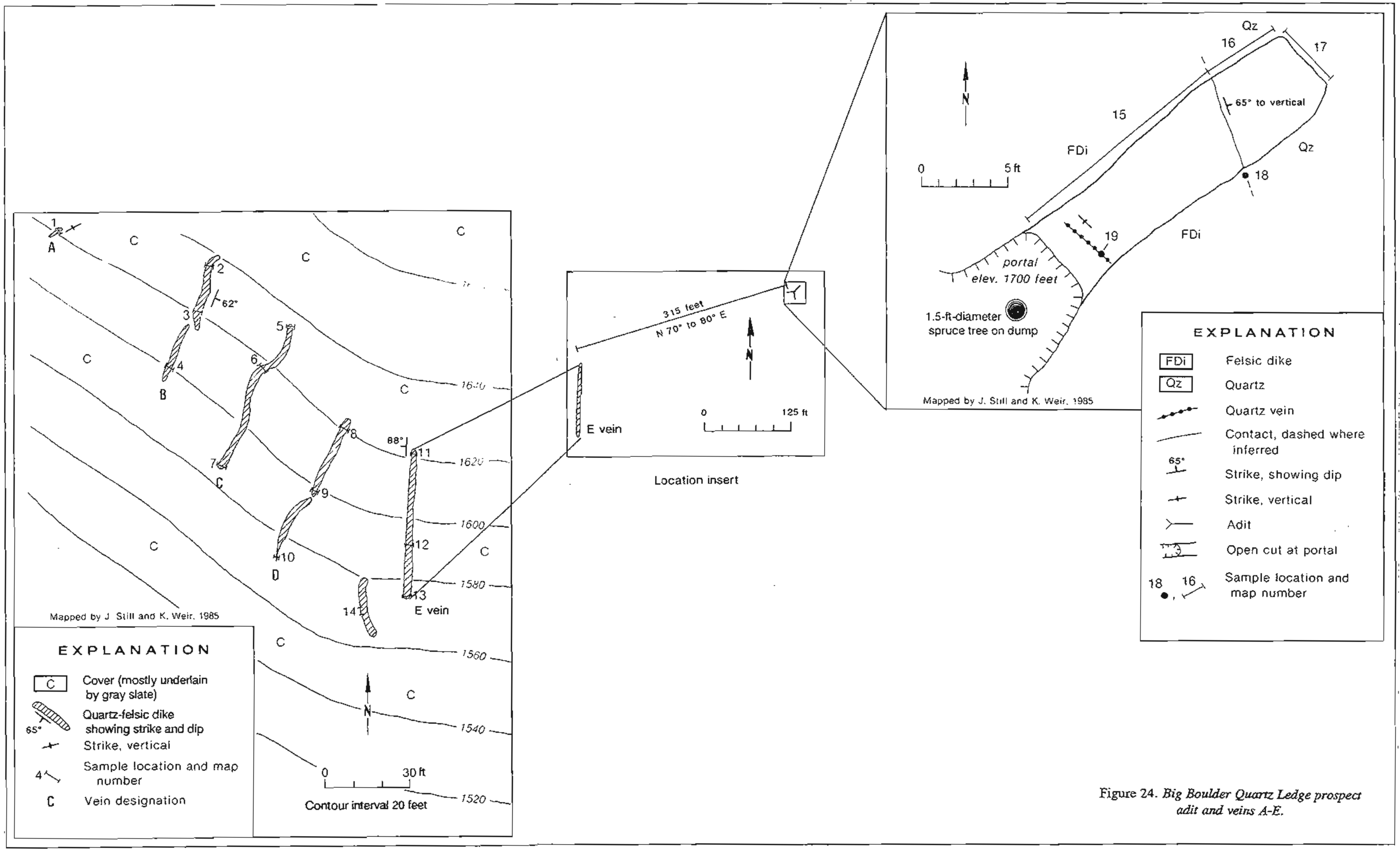


Figure 24. *Big Boulder Quartz Ledge prospect adit and veins A-E.*

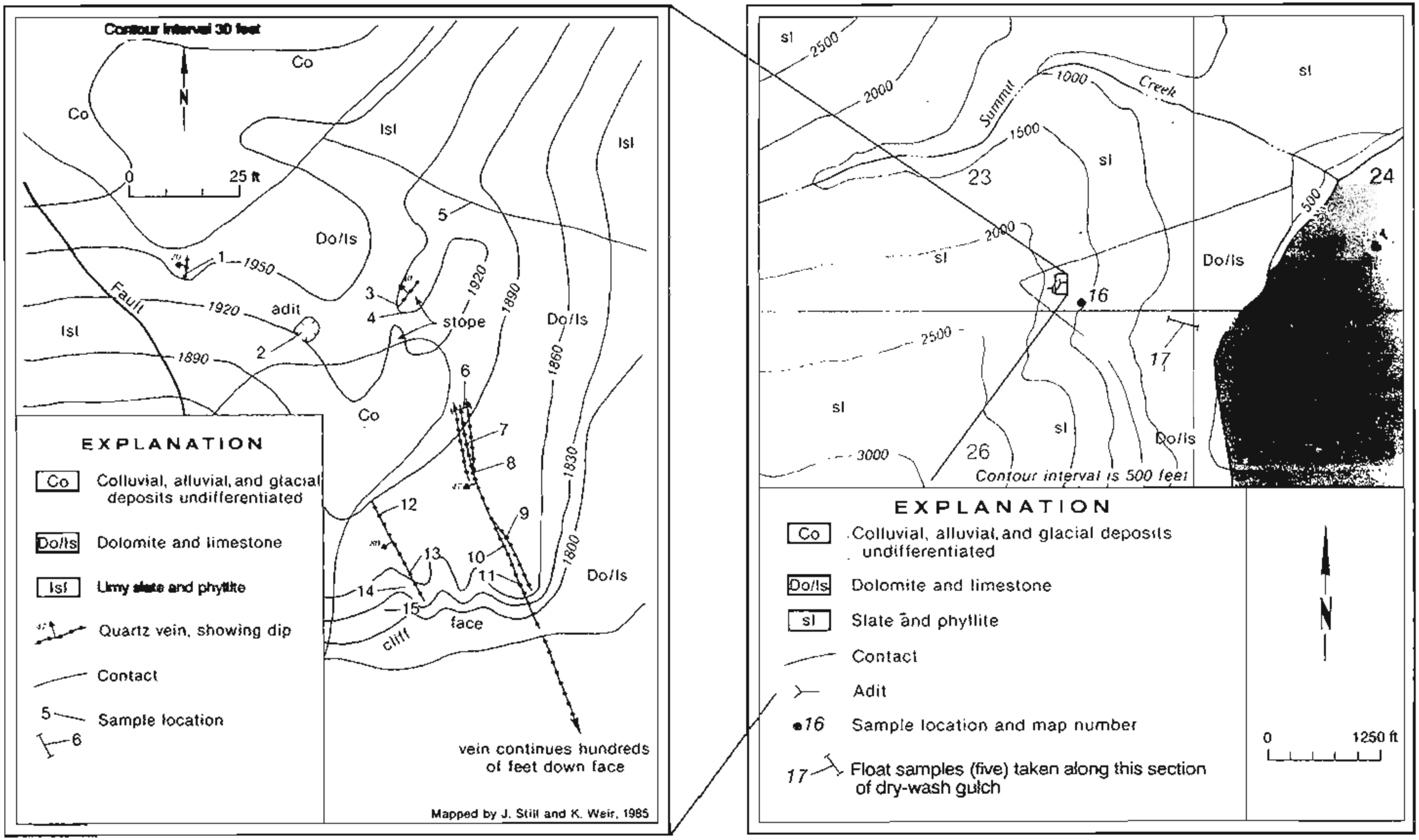


Figure 25. *Lost Silver Ledge prospect-area geology, workings, and sample locations.*

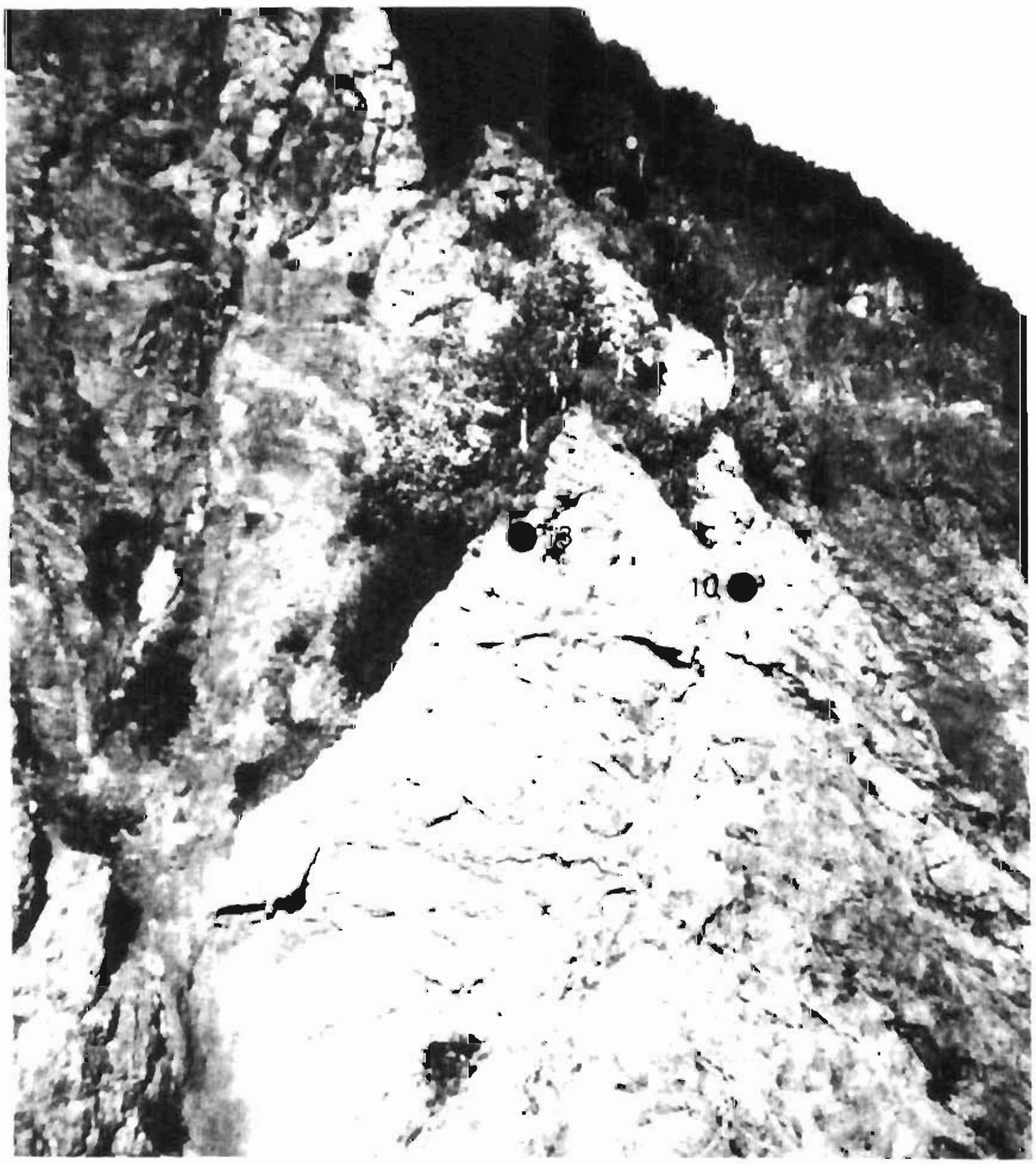


Figure 26. *Lost Silver Ledge prospect showing veins in cliff and sample locations 10 and 13.*

gold, 4 ppm silver, 1,070 ppm zinc, 8,540 ppm copper, 620 ppm cobalt, 3 ppm tungsten, 35 ppm tin, and 92 ppm nickel (sheet 2, nos. 619-624 of Gilbert and others, 1991b).

SHANNON PROSPECT

The Shannon prospect (sheet 1), discovered in 1987 by Merrill Palmer, is located on the north slopes of the Flower Mountain at an elevation of 4,500 ft. It consists of a small iron-stained lens of grossularite garnet-sulfide-magnetite skarn. Selected high-grade samples from this lens contained up to 0.068 ppm gold, 1.3 ppm silver, 600 ppm zinc, 3,400 ppm copper, and 245 ppm cobalt (sheet 2, no. 227 of Gilbert and others, 1991b).

NATAGA SKYLINE PROSPECT

The Nataga Skyline prospect is located next to the Alaska-British Columbia border in the northwestern part of the study area, 12 mi north of the Pleasant Camp border station (sheet 1). The prospect, which was probably

Figure 27. *Project personnel examine the Lost Silver Ledge prospect.*

developed before World War II, has a 40-ft adit and several prospect pits driven into sphalerite-rich skarn; an open cut is dug into highly weathered gossan, which contains abundant arsenopyrite.

According to A.H. Clough (personal comm., 1989):

"Mineralization noted is within a skarn zone whose minimum dimensions are 300-ft wide and 2,500-ft long. Thickness is unknown. Rocks noted within the skarn zone include coarse grained gray marble, biotite schist, and garnet-epidote-diopside-actinolite-quartz skarn. Metallic minerals of interest noted in the skarn zone include magnetite, sphalerite, galena, chalcopyrite, arsenopyrite, pyrite, pyrrhotite, and scheelite (noted under short-wave UV light-examination). Granitic rocks outside the skarn zone vary in composition and texture. Fine to medium grained diorite was the most common phase noted. Porphyritic latite dikes were also noted, as were very fine grained siliceous alaskite. Granular iron-stained granite was noted to the southwest of the skarn zone which contained sparse fine-grained molybdenite and ferrimolybdenite.

"Mineralization is scattered throughout the skarn zone as currently identified. Sphalerite seems to be the most common metallic mineral present. The skarn-granite contact was not noted; therefore no comment can be offered as the contact geometry. Magnetite and/or pyrrhotite were accessory at all skarn outcrops examined; therefore a ground magnetic survey could prove very useful in delineating boundaries of the Nataga Skyline prospect."

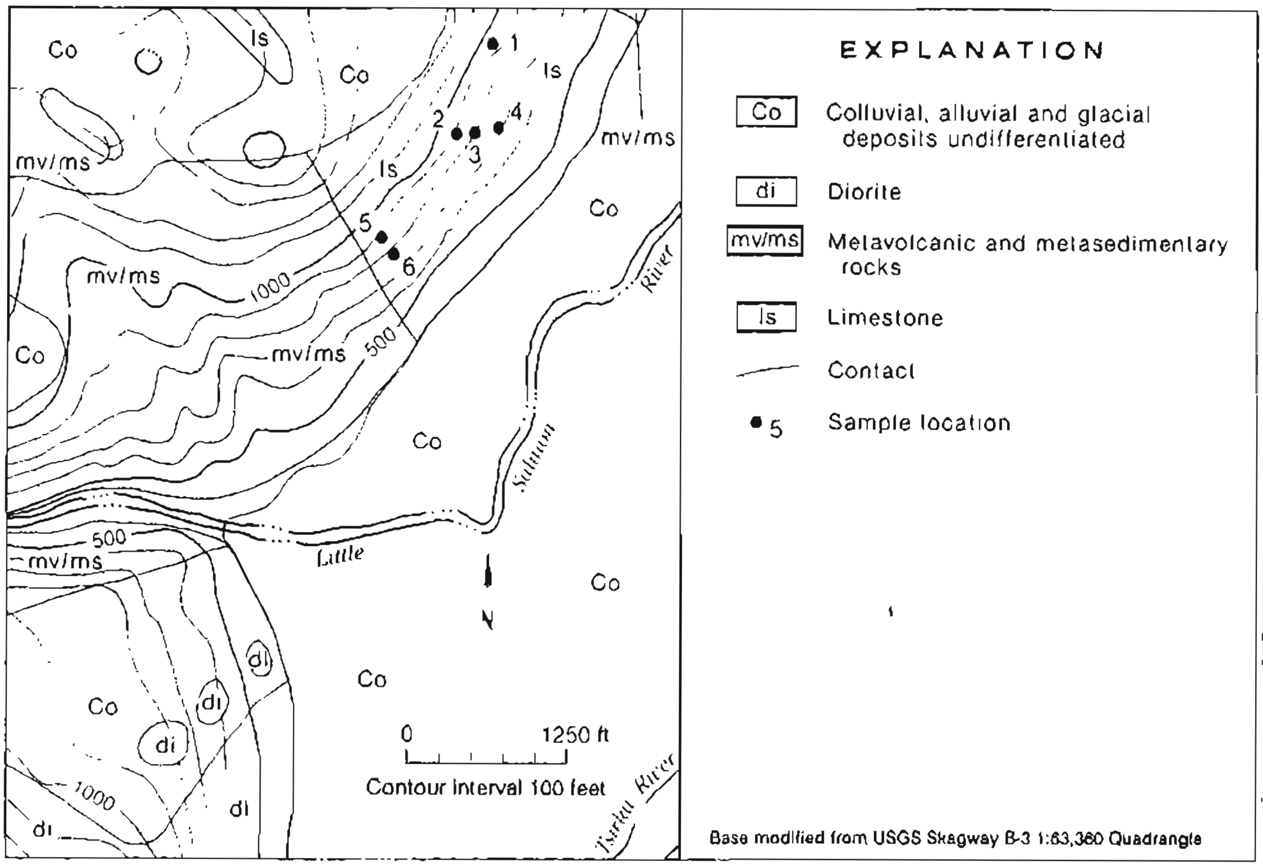


Figure 28. *Merrill's silver prospect showing geology and sample locations.*

A selected sample of skarn with visible chalcopyrite and galena from the adit contained 511 ppm copper and 1,883 ppm zinc. A selected sample of gossan with visible arsenopyrite and pyrite from the open cut contains 15.7 ppm silver, 4,206 ppm copper, and 17,982 ppm zinc (app. D-2). Rocks at this site are actinolite skarn with abundant sphalerite, minor galena, local magnetite, and traces of fine-grained scheelite.

MOUNT SELTAT OCCURRENCE

About 1.5 mi southwest of the Nataga Skyline prospect near Mount Seltat (sheet 1), reconnaissance sampling indicates silver-bearing skarn mineralization, including pyrrhotite, magnetite, chalcopyrite, sphalerite, and galena. Most of the mineralization was found in the talus piles that drain the north and south sides of the rugged eastern ridge of Mount Seltat. The source of the mineralized float appears to be brown-black manganese-stained bands that crop out between elevations of 4,000 and 6,000 ft on the east ridge of Mount Seltat. Float and rubblecrop samples of skarn or massive sulfides from this occurrence contained up to 0.137 ppm gold, 173.1 ppm silver, 4.13 percent zinc, 8,400 ppm copper, 2.6 percent lead, and 1,285 ppm tungsten (sheet 1, nos. F1-F4 and sheet 2, nos. 1-6 of Gilbert and others, 1991b).

PLUTONIC GOLD DISCRIMINANT, PORCUPINE AREA

Some plutonic rocks in the Haines-Klukwan-Porcupine area are spatially associated with gold-bearing veins, hornfels, skarns, and placers. Because plutonic rocks can be a major source of gold, a discriminant analysis was used in this study to predict which unaltered, quartz-normative plutonic rocks are similar in composition to those that formed nonporphyry gold systems elsewhere. A set of discriminant functions for porphyry gold systems was not available.

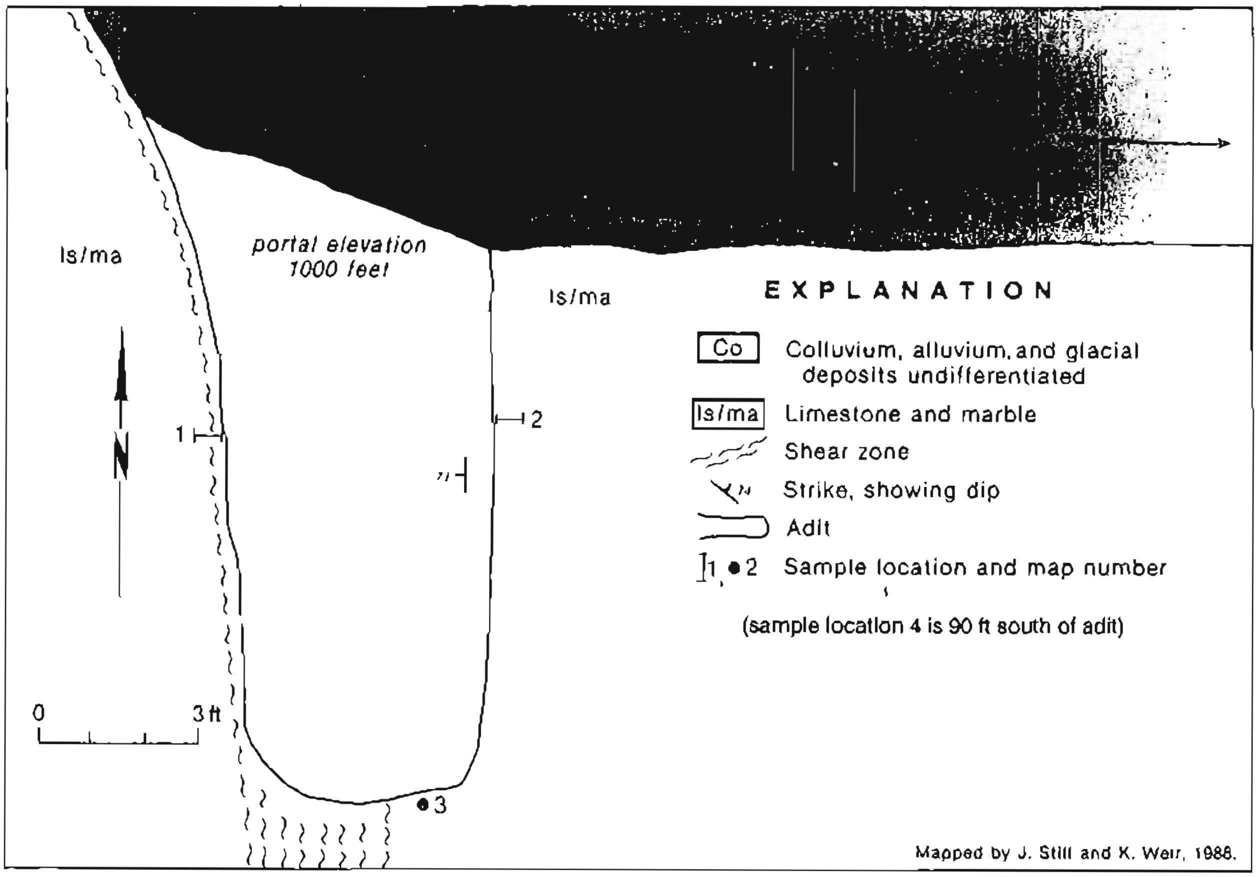


Figure 29. *Glacier Creek prospect showing geology, workings, and sample locations.*

The set of discriminant functions used here were developed by Newberry and Burns (1988, 1989) and were constructed from about 650 major-oxide analyses of unaltered rocks collected at 150 geographic locations throughout the world. About 40 percent of the plutons in the worldwide study were associated with gold systems. Five quadratic discriminant equations were computed on random subsets of the data. These discriminant functions predict which unaltered rocks have the chemical characteristics of plutons related to gold systems. Variables included SiO2, Al2O3, Fe2O3, FeO, MgO, CaO, Na2O, K2O, Fe2O3/FeO, and an alkalinity term, [Na2O + K2O + 16 - (0.372* SiO2)]. The main discriminating factor was oxidation state (expressed, for example, by the Fe2O3-FeO ratio), with a low oxidation state (ratio) being more favorable for nonporphyry gold systems. Rocks with normative corundum greater than 3 and normative hematite, nepheline, leucite, or Ca-orthosilicate cannot be evaluated with the presently existing data set and these discriminant functions. Also, the level of erosion, which should be minimal for lode-gold deposits and deeper for placer-gold deposits, is not addressed by this methodology. For more information on the set of discriminant functions and its application, see Burns and others (1991).

Major-oxide analyses of plutonic rocks from both the Haines-Klukwan-Porcupine area and the Skagway area, to the east, were run through the discriminant program. Computation of favorabilities for the plutons were based on the average posterior probability, a set of five discriminant functions (table 1). On the basis of experience outside the Haines area, when the average of the posterior probabilities for being related to nonporphyry gold is below 60 percent, the regional favorability is assumed to be extremely low; when between 60 and 85 percent, the regional favorability suggests an altered or weak gold system; and when greater than 85 percent, the plutons are probably associated with gold-producing systems. Aplites and border phases tend to yield very low discriminant scores.

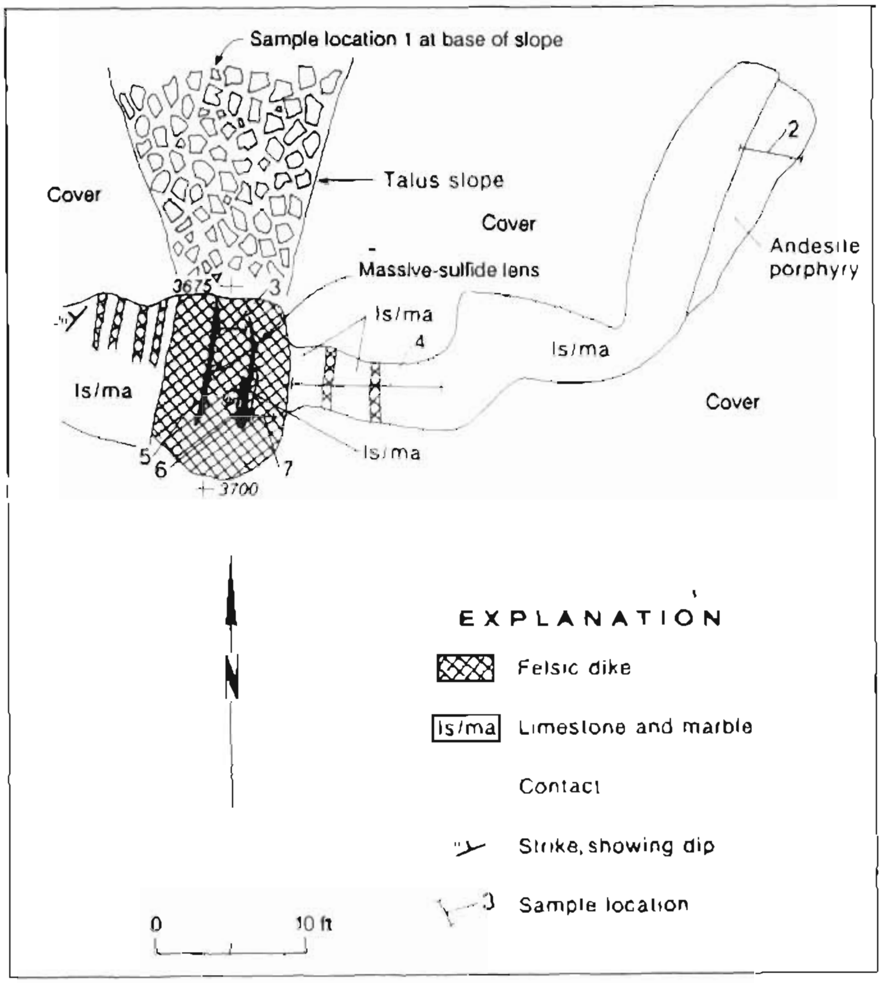


Figure 30. *Claire Bear cobalt occurrence showing geology and sample locations. Mapped by J. Still, 1984.*

Two major episodes of plutonism occurred in the Porcupine area. The first episode occured during Early Cretaceous time and produced a diorite-gabbro suite and a quartz diorite - tonalite suite of plutons. During mid-Tertiary time the second plutonic episode produced plutonic suites of tonalite-granodiorite and of granite (fig. 31; Gilbert and others, 1991a).

Most Early Cretaceous plutons in the northern part of the Porcupine area, particularly the diorite and mixtures of diorite and tonalite, are predicted by the gold discriminant to be related to gold deposits (fig. 31; table 1). The lower values of posterior probability for some of the Early Cretaceous rocks are from altered rocks. Placer and lode activity in the Porcupine area is near and in drainages from many of the Early Cretaceous plutons.

The variable and generally moderate discriminant scores suggest that the Early Cretaceous Bertha Glacier pluton is weakly favorable for gold-bearing systems (fig. 31; table 1). However, the absence of nearby placer activity may partly reflect the scouring effect of recent glaciation rather than a lack of source material.

Discriminant scores from the three Tertiary tonalite-granodiorites from the Chilkat Lake and west Takhin Ridge plutons indicate moderate probabilities for gold-related systems. The discriminant function from the single, unaltered sample from the Mount Emmerick granite predicted no potential for nonporphyry gold systems (fig. 31; table 1).

Table 1. *Scores for plutonic discriminant formations from Haines-Klukwan-Porcupine-Skagway area*

PORCUPINE AREA

Early Cretaceous plutons

Map no.	Pluton	Field no.	1	2	3	4	5	Ave.
1		84WG96	0.1547	0.0857	0.1249	0.2029	0.1425	14.21
2		84WG76	0.9989	0.9936	0.9975	0.9991	0.9999	99.78
3		84WG68	1	1	1	1	1	100.00
4		84WG154	1	1	1	1	1	100.00
5		84ER43	1	1	1	1	1	100.00
6	PC	84WG113	0.2552	0.1268	0.6168	0.2085	0.5078	34.36
7		84ER85	0.614	0.607	0.6271	0.5716	0.6945	62.28
10	CM	85WG167	0.8775	0.9684	0.9943	0.8068	0.9983	92.91
12	ETR	85WG138	1	1	1	1	1	100.00
13	ETR	85WG161	1	1	1	1	1	100.00
14	BG	85WG168	0	0	0	0	0	0.00
15	BG	88WG108	0.8096	0.8527	0.8293	0.8267	0.8945	84.26
16	BG	86WG261	0.9822	0.9796	0.9572	0.9946	0.9948	98.17
18	BG	87WG32	0.6449	0.6096	0.5686	0.6924	0.6836	63.98
19	BG	87WG67	0.6556	0.535	0.4372	0.6411	0.4528	54.43
20	PY	87WG106	0.7072	0.8086	0.9989	0.5888	0.9993	82.06
21	BG	87WG64	0.8609	0.8404	0.9711	0.4901	0.9675	82.60
22		87WG65	1	1	1	1	1	100.00
23	BG	87WG22	0.9977	0.994	0.9968	0.9999	0.9999	99.77

Mid-Tertiary pluton

Map no.	Pluton	Field no.	1	2	3	4	5	Ave.
8	WTR	85WG54	0.7859	0.7414	0.724	0.7356	0.7505	74.75
9	WTR	85WG169	0.4831	0.4123	0.3779	0.4359	0.4078	42.34
11	CL	85WG282A	0.871	0.8794	0.7719	0.8385	0.8144	83.50
17	ME	86WG260	0.0002	0	0.0002	0.0002	0	0.01

PC - Porcupine Creek, CM - Chunckuklek Mountain, ETR - East Takhin Ridge, BG - Bertha Glacier, PY - Pyramid, WTR - West Takhin Ridge, CL - Chilkut Lake, ME - Mount Emerick

HAINES-KLUKWAN AREA

Early Cretaceous plutons

Map no.	Pluton	Field no.	1	2	3	4	5	Ave.
24	NB	WG129	1	1	1	1	1	100.00
25	NB	WG292	1	1	1	1	1	100.00
24	NB	WG101	1	1	1	1	1	100.00
39	T	H1dio	0.0687	0.0889	0.1136	0.0679	0.0474	7.73
40	T	H2dio	0.0765	0.066	0.0946	0.0935	0.0662	7.94

NB - Northern Border, T - Tanani

Table 1. *Scores for plutonic discriminant formations from Haines-Klukwan-Porcupine-Skagway area (continued)*

Map no.	Pluton	Field no.	1	2	3	4	5	Ave.
				Mid-Cretaceous plutons				
27	MK	WG300	0.5234	0.0918	0.8293	0.0461	0.709	43.99
28	MK	WG303	0.2394	0.0062	0.5994	0.0275	0.3713	24.88
29	MK	WG302	0.4925	0.0274	0.7805	0.0084	0.6934	40.04
30	MK	87WG77	0.0138	0.0004	0.0611	0.0005	0.0044	1.60
31	MK	K2dio	0.1653	0.0163	0.7872	0.0011	0.8633	36.66
32	MK	w06___	0	0	0	0	0	0.00
32	MK	SHE16 (dup)	0.0008	0.0003	0.0026	0.0006	0.0008	0.10
33	MK	w11	0.0282	0.703	0.0939	0.4846	0.2185	17.91
33	MK	SHE167 (dup)	0	0	0	0	0	0.00
34	MK	w10___	0	0	0.0001	0	0	0.00
35	MK	88WG116	0.5056	0.4101	0.4683	0.4321	0.4085	44.49
36	MK	w1234R058	0.2109	0.3599	0.8069	0.1101	0.493	39.62
37	MK	w1334R053	0.0021	0.0015	0.0088	0.0021	0.0025	0.34
38	MK	89K3	0.9825	0.9143	1	0.0001	1	77.94
				SKAGWAY AREA				
				Late Cretaceous-Early Tertiary plutons				
41	FC	w1SNE082	0.9991	0.9959	0.9975	0.999	0.9991	99.81
42	FC	w2SNE150	1	1	1	1	1	100.00
43	FC	w3SHE070	1	0.9998	0.9999	1	1	99.99
44	FC	w4SNE048	0.9853	0.9786	0.9823	0.988	0.987	98.42
45	FC	w5SHE007	0.9983	0.9948	0.996	0.9985	0.999	99.73
46	FC	w7SHE06E	1	1	1	1	1	100.00
47	FC	w8SHE177	0.9994	0.9975	0.9984	0.9996	0.9998	99.89
48	FC	w9SHE126	0.9993	0.9971	0.9974	0.9993	0.9996	99.85
49	FC	88WG124	0	0	0	0	0	0.00
50	FC	86WG280/4	0.6924	0.6601	0.6949	67.06		
51	FC	86WG271/3	0.9986	0.9987	0.998	0.9997	0.9998	99.90
52	CG	86JTK342	0.1	0.0368	0.1689	0.1229	0.0381	9.33

MK - Mount Kashagnak, FC - Ferebee Complex, CG - Clifton Granite

LODE DEPOSITS, PROSPECTS, AND OCCURRENCES OF HAINES-KLUKWAN AREA

PREVIOUS WORK

Parts of the mafic-ultramafic complex near Klukwan have been extensively investigated as an iron resource. In 1946, claims covering both the ultramafic (pyroxenite) lode and the alluvial fan were staked and Alaska Iron Mines was incorporated to develop the deposit. Development work proceeded from that date and by 1961 consisted of surface sampling and diamond drilling of the lode, pit sampling, and churn drilling of the placer, aeromagnetic and ground magnetic surveys, and surface mapping. In addition, a pilot mill was constructed and concentrates were produced for metallurgical testing. In 1948, the USBM collected samples of the deposit for metallurgical testing (Wells and Thorne, 1953), and in 1953 and 1954, the U.S. Geological Survey examined and mapped the deposit (Robertson, 1956). In 1961, Columbia Iron Mining (U.S. Steel) leased the claims for 75 years, and in 1964 parts of the property were patented. The lease by Columbia Iron Mining reverted back to Alaska Iron Mines in the 1970s.

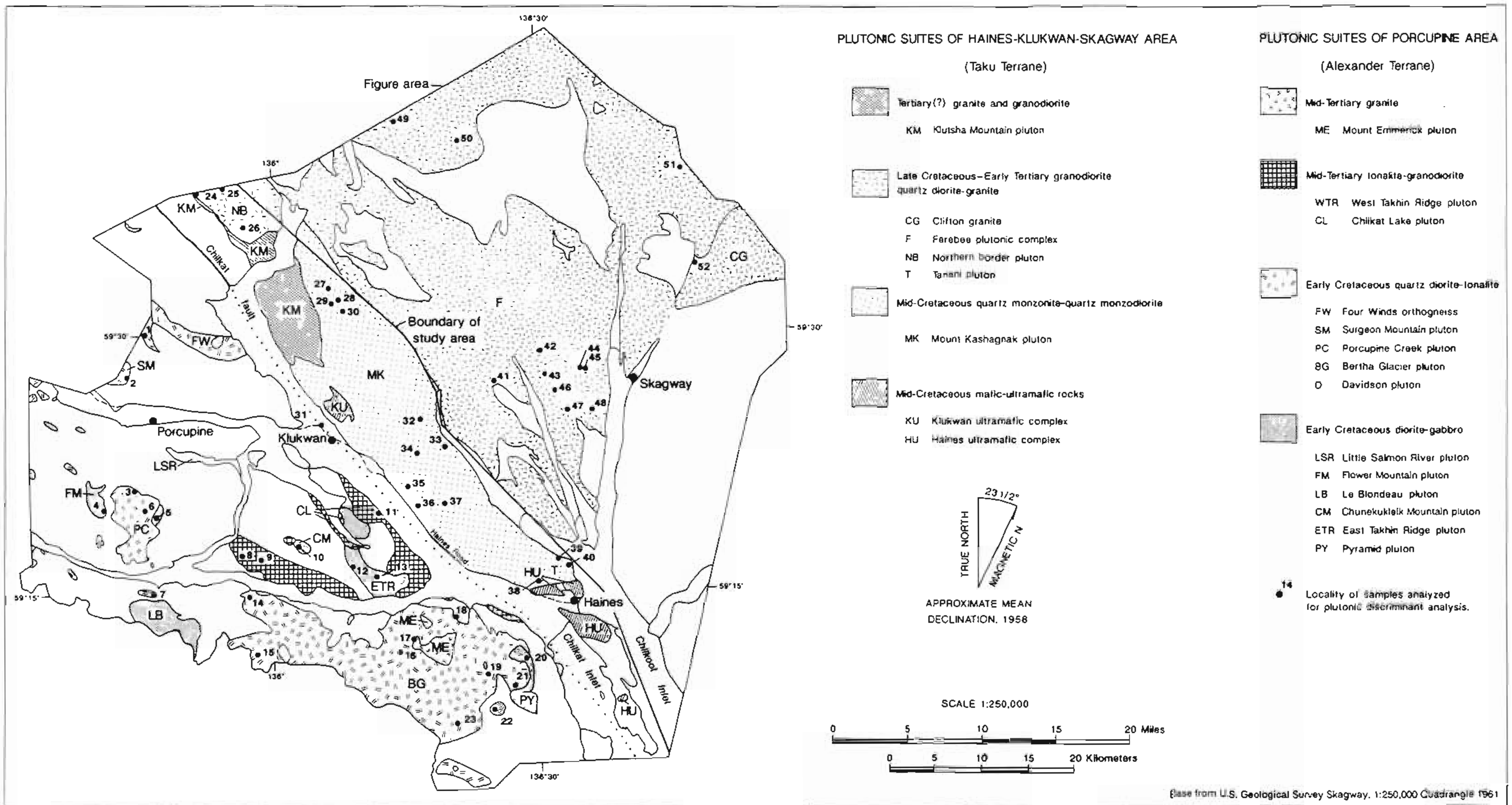


Figure 31. *Plutonic rocks of Haines-Klukwan-Porcupine area showing favorability for gold association based on major-oxide discriminant analysis.*

Clark and Greenwood (1972) reported results of 10 samples collected at Klukwan that averaged 0.046 ppm platinum and 0.040 ppm palladium, and Brobst and Pratt (1973) indicate 500 million tons of titaniferous magnetite that averages 0.092 ppm platinum-group metals.

In addition to thorough studies of the Klukwan complex, several reconnaissance studies of the geology and mineral-resource potential of the Haines-Klukwan area have been completed. MacKevett and others (1974), Redman and others (1985), Gilbert and others (1987, 1988) mapped geology and collected geochemical samples in the Haines-Klukwan area. Winkler and MacKevett (1970) report analyses from bedrock samples in the Chilkat Peninsula area, and Plafker and others discuss the geologic setting of the Chilkat Peninsula. Wells and others (1986) list prospects, occurrences, claim groups, and pertinent geochemical bedrock and stream-sediment samples in the Chilkat Peninsula area; they report samples from the the Battery Point gold-copper occurrence that contained 150 ppm chromium, 300 ppm copper, and "some" cobalt and nickel.

KLUKWAN MAFIC-ULTRAMAFIC COMPLEX

The Klukwan mafic-ultramafic complex is located 24 mi northwest of the city of Haines near the Native village of Klukwan (sheet 1). The ultramafic part of the complex has an exposed length and width of 3 by 1 mi along the 5,000-ft-high west side of the rugged Takshanuk Mountains. Below the ultramafic body is an extensive alluvial fan partly made up of ultramafic float. The fan and ultramafic body have long been recognized as a significant iron deposit (sheet 3). The complex is transected by a series of deep canyons that form steep cliffs thousands of feet high and provide excellent rock exposures (fig. 32).

GEOLOGY

The Klukwan mafic-ultramafic complex lies within the Taku Terrane (Berg, 1978), which is bordered on the west by the Chatham Strait - Chilkat fault system and is part of the Klukwan-Duke belt of concentrically zoned mafic-ultramafic complexes of estimated middle Cretaceous age (Brew and Morrell, 1978). This belt extends the length of southeastern Alaska and includes numerous mafic-ultramafic intrusions.

The Klukwan mafic-ultramafic complex is surrounded by hornblende diorite, which is in contact with metabasalt to the west and quartz monzodiorite to the east (Gilbert and others, 1991a). The hornblende diorite shows epidote alteration near the complex. Ultramafic magmas most likely intruded a warm diorite (Gilbert and others, 1991a).

Ultratramafic rocks at Klukwan consist of clinopyroxenite, hornblendite, and magnetite clinopyroxenite. Pegmatitic hornblende gabbro dikes are also present. Sulfides are typically chalcopyrite, but pyrrhotite, pyrite, and bornite occur locally. The largest concentration of titaniferous magnetite occurs in the lower parts of the mafic-ultramafic complex.

KLUKWAN LODE IRON DEPOSIT

The lode part of the Klukwan iron deposit consists of vanadium-bearing titaniferous magnetite hosted in pyroxenite. The magnetite occurs as massive bodies, irregular stringers, and coarsely and finely disseminated grains in the pyroxenite. The deposit has been diamond drilled and sampled extensively by Columbia Iron. The results of this work indicate that the entire pyroxenite mass contains between 12 and 20 percent soluble iron, with rich, localized zones of magnetite in the lower parts of the ultramafic of up to 50 percent iron. The pyroxenite mass constitutes about 3.5 million tons, if one assumes it extends downdip about 2 mi. The soluble-iron content is reported at 16.8 percent iron (Henry J. Kaiser Company, undated). The TiO_2 content averages 1.5 to 4.4 percent and the V_2O_5 content averages 0.2 percent, according to unpublished company analyses.

KLUKWAN ALLUVIAL-FAN IRON DEPOSIT

The Klukwan alluvial-fan iron deposit is located at the foot of the lode iron deposit and consists of float of diorite and magnetite pyroxenite that ranges in size from silt to 8-ft boulders. The fan extends for an approximate

Figure 32. *The Klukwan mafic-ultramafic complex, which contains the 3.5-billion-ton Klukwan Iron Lode deposit.*

radius of 1 mi, slopes an average grade of 11 percent, and ranges in elevation from 130 ft at its perimeter to 950 ft at its apex. The fan resulted when retreating glaciers left a steep-walled canyon along the Chilkat Valley near the west edge of the easily eroded pyroxenite lode deposit. Erosional downcutting and mass wasting of the mafic-ultramafic complex resulted in a large part of it being spilled out onto the floor of the Chilkat Valley, forming the alluvial fan.

Industry and government workers have mapped the Klukwan fan in detail and conducted extensive geophysical testing (Still, 1984a). Test pits, trenching, churn drilling, and Becker drilling were completed, and test shafts sunk. The samples collected were used to determine composition and size distribution of the fan material. The material was run through a pilot plant, and a mine feasibility study was conducted (Still, 1984a).

The iron content of the fan occurs as massive bodies, irregular stringers, and coarsely and finely disseminated grains of magnetite in pyroxenite float. Gangue minerals, in decreasing order of abundance, are: pyroxene, amphibole, ilmenite, chlorite, epidote, calcite, feldspar, quartz, and apatite. The minable reserve above and below the water table 989,761,700 dry tons with an overall average grade of 10.8 percent soluble iron (Henry J. Kaiser Company, undated). According to unpublished company results, the deposit averages 1.7 percent titaniam (TiO_2) and 0.1 to 0.3 percent vanadium. A 0.10 yd^3 sluice-box sample collected of material from the central stream that flows across the fan assayed 0.1 ppm platinum and 0.02 ppm palladium.

INVESTIGATIONS AT KLUKWAN FOR COPPER, GOLD, PLATINUM, AND PALLADIUM

The Klukwan mafic-ultramafic complex was investigated briefly in the fall of 1981 and in more detail in the spring and early summer of 1982. A helicopter was used for access to some parts of the area. Over 400 rock, pan-concentrate, and stream-sediment samples were collected and analyzed for an array of elements (app. E-1). Metallurgical test samples collected at five locations were submitted to the USBM Albany Research Center for metallurgical testing (app. E-2) (Still, 1984a).

Sheet 3 shows sample locations from this study and iron- and copper-mineralized zones in the Klukwan area. Earlier workers numbered the canyons that drain the Klukwan area 1 through 8 from south to north; these numbers have been retained. Canyon 9 has been added to the sequence, along with the "South Canyon," located at the extreme south end of the area studied. The area south of Canyon 1 has been termed the "Southern area."

Appendix E-1 summarizes geological and analytical results from the various areas investigated. Elevated values in precious metals and copper are found in a variety of geologic settings extending from the South Canyon to canyon 9. Areas of intermittent low-grade copper mineralization (areas sampled are estimated to average from 750 to 1,500 ppm copper) extend along the basal contact of the pyroxenite unit (Kp) from the south side of canyon 1 to the north side of canyon 2, in the upper part of canyon 2, and in canyon 3.

Gold, platinum, or palladium mineralization was generally associated with sulfides—predominantly chalcopyrite—and not often found associated with magnetite. Parts of areas with copper mineralization contained low-grade gold, platinum, and palladium mineralization. Estimated combined gold, platinum, and palladium values ranged from less than 0.030 to 0.068 ppm.

South of canyon 1, a series of hydrothermal pinch and swell veins with irregular sulfide mineralization occupy northerly striking, steeply dipping shear zones. The veins are composed of probable residual material from the mafic-ultramafic complex and contain chalcopyrite, bornite, and malachite. Assays run up to 4.80 ppm gold, 0.1 ppm platinum, 0.27 ppm palladium, and up to 6.5 percent copper. This area is worthy of examination for structural or contact zones that might have controlled deposition.

A pan-concentrate sample and a stream-sediment sample taken in canyon 9 contained low gold, platinum, and palladium values. However, because the mafic-ultramafic complex is the likely source of the mineralization, and because only diorite is mapped in this drainage, the area may have exploration potential.

Samples of diorite float collected in the South Canyon contained veins of bornite and chalcopyrite up to 0.1 ft thick, with up to 4.8 ppm gold and 2.95 percent copper. A brief examination of the area revealed similar mineralization in place at an elevation of 4,500 to 5,000 ft on the mountain above the canyon. This area is worthy of detailed examination.

Metallurgical test samples were collected at copper-rich areas of the Klukwan complex in canyons 1 and 2. Head analysis of these samples ranged from 0.082 to 0.34 percent copper and up to 25.5 percent iron; most precious-metal values fell below the detection limit. Although both copper and precious-metal contents are low, samples responded well to bulk floatation. Copper recoveries ranged from 57 to 76 percent and enough platinum, palladium, gold, and silver were present to concentrate for analysis (app. E-2).

HAINES MAFIC-ULTRAMAFIC COMPLEX OCCURRENCE

The Haines mafic-ultramafic complex crops out discontinuously for about 10 mi along the Chilkat Peninsula and north of Haines (sheet 1). Only a small part of the complex that is predicted by gravity studies is exposed. Outcrops consist of clinopyroxenite, hornblendite, pegmatitic hornblende gabbro, and lesser magnetite clinopyroxenite. Where observed, the complex is very similar to the Klukwan mafic-ultramafic complex, but contains less magnetite and more biotite. The character of the exposed part of the Haines mafic-ultramafic complex suggests that the potential billions of tons of iron resources are of too low a grade and scattered too much throughout the complex to be given serious economic consideration. Reconnaissance samples indicate that the Haines mafic-ultramafic complex and vicinity may have potential similar to that of the Klukwan mafic-ultramafic complex for platinum-group element deposits.

Samples were collected of various phases of the complex and also of the associated hornblende, plagioclase, epidote, and pegmatite found in fractures in the ultramafic rocks. Stream-sediment and beach-sand samples were also collected. (Sample locations on sheet 1, nos. 435-440, F133 and sheet 2, nos. 830-831, 841-849, 854-856 of Gilbert and others 1991b.) Samples collected of the ultramafic and pegmatite contained up to 0.068 ppm gold, 790 ppm copper, 0.05 ppm platinum, and 0.05 ppm palladium. A stream-sediment sample collected at the head of Piedad Road, in a gulch near the City of Haines water source, contained 0.015 ppm gold, 337 ppm copper, 0.02 ppm platinum, 0.025 ppm palladium, and 1.4 ppm thorium.

DISSEMINATED COPPER OCCURRENCES

SOUTH KLUTSHA OCCURRENCE

On the south end of Klutsha Mountain (sheet 1), malachite and azurite occur as disseminated grains in hematitic granodiorite and granite. Analyses from 11 selected high-grade samples (sheet 2, nos. 754-760 of Gilbert and others, 1991b) contain up to 7.10 percent copper.

UPPER GOAT HOLLOW OCCURRENCE

On the ridge at the head of Goat Hollow (sheet 1), a sample collected from a 0.6- by 0.5-ft chalcopyrite-bornite lens contained 15.052 ppm gold, 54.2 ppm silver, and 21.8 percent copper. Other bedrock and float samples collected at this locality contained up to 0.72 ppm gold, 4.1 ppm silver, and 1.2 percent copper (sheet 1, nos. F103-F105 and sheet 2, nos. 766-771 of Gilbert and others, 1991b).

NINETEENMILE RIDGE OCCURRENCE

On the west slope of Tukago Mountain east of Klukwan (sheet 1),. 12 selected high-grade bedrock and float samples of diorite contained up to 3.84 percent copper (sheet 1, nos. F106-117 and sheet 2, nos. 777-780 of Gilbert and others, 1991b).

VEIN PROSPECTS AND OCCURRENCES

FIFTEEN-SIXTEENMILE HIGHWAY OCCURRENCE

Thirteen samples taken from between miles 15 and 16 of the Haines Highway contained anomalous values of zinc, copper, and gold (sheet 1; sheet 2, nos. 789, 799 of Gilbert and others, 1991b).

TWELVEMILE GOLD-COPPER PROSPECT

Eakins (1919) first mentioned gold-bearing bornite-chalcopyrite veins at a location 10 mi from Haines. His report is the last mention of this prospect in literature until 1984, when Redman and others (1984) reported sampling silver-copper-bearing quartz veins in the same area. At one locality (sheet 1, fig. 33, app. F), a bornite-chalcopyrite-bearing quartz-feldspar vein that averages less than 0.3 ft thick, strikes 80°, and dips 20° south was traced for an exposed extent of 110 ft along a cliff face. Samples collected from the vein contained up to 0.343 ppm gold and more than 10 percent copper.

CHILLY OCCURRENCE

Stream-sediment samples collected at the mouth of Shakuseyi Creek contained 0.137 and 0.014 ppm gold (sheet 1, nos. 407-408 of Gilbert and others, 1991b) and led to more detailed examination of the area near Point Chilly (sheet 1). Four stream-sediment samples collected in the Shakuseyi Creek drainage at elevations from 1,700 to 3,600 ft contained from nil to 0.343 ppm gold (sheet 1, nos. 397-406 of Gilbert and others, 1991b).

The Chilly-occurrence area consists of metabasalt and amphibolite roof pendants surrounded by hornblende diorite, granodiorite, and monzonite (Gilbert and others, 1991a). There are sporadic narrow and discontinuous quartz veins in the area, mostly near the northwesterly trending Tukgahgo Mountain fault. Samples collected from the veins contained up to 0.824 ppm gold, 2.7 ppm silver, and 2,140 ppm copper (sheet 1, no. F118 and sheet 2, no. 805-817 of Gilbert and others, 1991b). A sample collected across a vein with visible molybdenite (sheet 2, no. 810 of Gilbert and others, 1991b) contained 1,240 ppm molybdenum. Seven samples were analyzed for platinum and palladium. They contained from nil to 0.09 ppm platinum and from 0.004 to 0.07 ppm

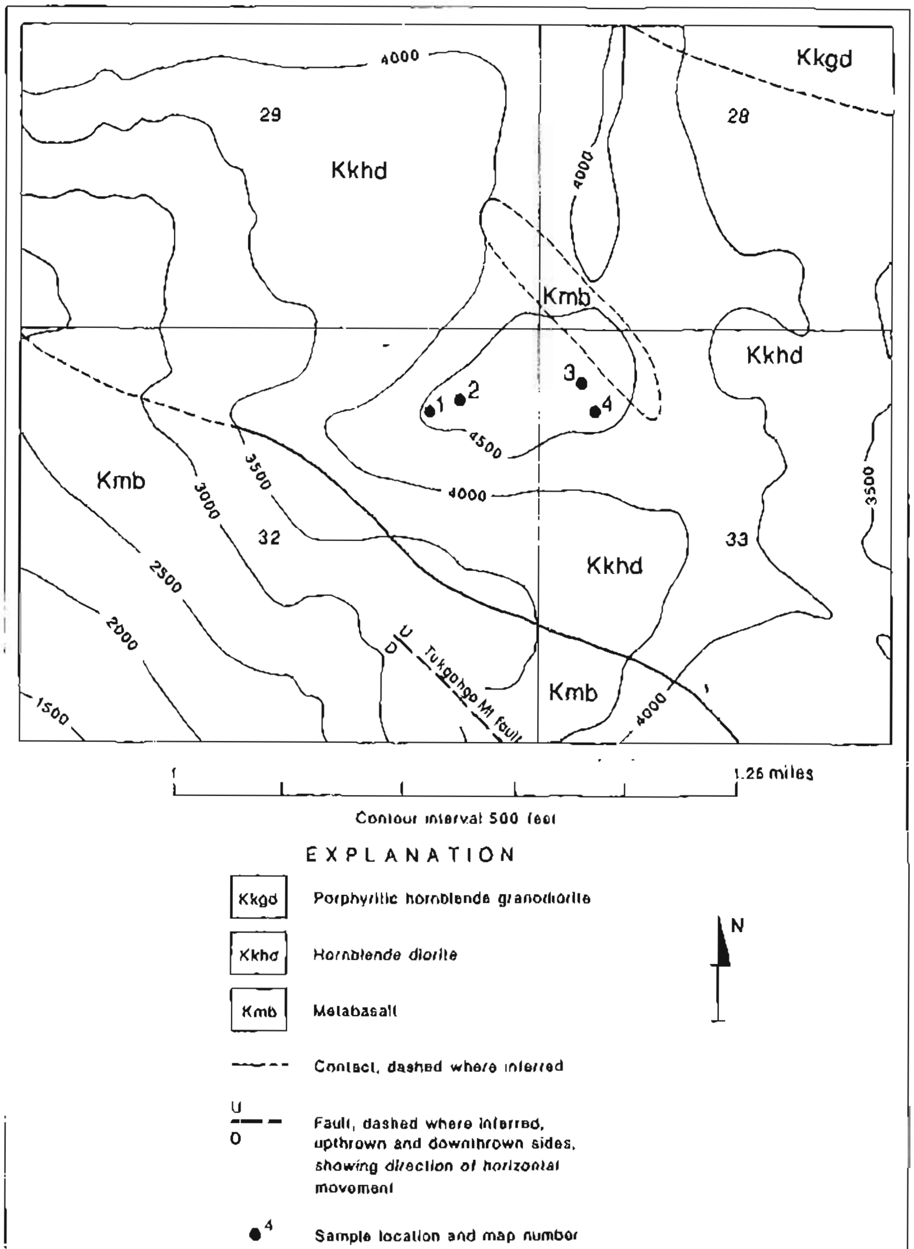


Figure 33. *Twelvemile gold-copper prospect. Base modified from USGS Skagway B-2 1:63,360 Quadrangle.*

palladium. An almost-universal association of platinum and palladium with ultramafic rocks suggests that the source of platinum and palladium in these veins may be associated with the ultramafic rocks that crop out several miles southeast of this prospect.

MOUNT RIPINSKI OCCURRENCE

Samples were collected from metabasalt cliffs and from rubble beneath the cliffs south of Mt. Ripinski (sheet 1). Most samples were of chalcopyrite-bornite-bearing quartz-calcite veins, and the rest were from chalcopyrite-bearing metabasalt rubblecrop. Almost all the quartz veins in the occurrence vicinity contain low gold values, but some veins contained up to 12.034 ppm gold and 3.97 percent copper. The metabasalt contained up to 0.605 ppm gold and 3.50 percent copper. Eighteen of the 27 samples (both metabasalt and quartz veins) were assayed for platinum and palladium. The samples contained from 0.01 to 0.06 ppm palladium and one sample contained 0.02 ppm platinum (sheet 1, nos. F119-132 and sheet 2, nos. 830-835 of Gilbert and others, 1991b). These results may indicate either an association with ultramafic rocks in the area or an ultramafic body not exposed at the surface.

CHILKAT PENINSULA AND ISLANDS BASALT-HOSTED PROSPECTS AND OCCURRENCES

This study identified six gold-copper prospects or occurrences in the Chilkat Peninsula and Islands area (sheet 1). All are hosted in the Chilkat basalt (Gilbert and others, 1991a); the Road Cut, Road Cut II, Zinc Beach, Shikosi Island, and Islands copper prospects or occurrences are shear controlled and located adjacent to major faults.

ROAD CUT PROSPECT

In 1986, examination of a recently blasted and excavated roadcut, located 3.1 mi south of Haines on the Mud Bay Road found gold-copper mineralization buried under roadcut rubble in what is now known as the Road Cut prospect (fig. 34). The Road Cut mineralized zone was excavated by hand and exposed intermittently through the rubble for 180 ft along strike (sheet 4). Investigations were hampered by the roadway fill and the newly paved Mud Bay Road to the west and by the roadway or surficial cover to the north and south. Samples collected during 1986 and geologic mapping indicated that a 128-ft length of the zone averaged 14 ppm gold and 4.25 percent copper across a 1.2-ft width. Average grades for parts of the mineralized zone were high enough to encourage more surface and subsurface work and, because bedrock exposures were limited, a program that included trenching, geophysics, and, finally, diamond-core drilling was initiated.

During 1986 and 1987, 13 geophysics lines with a cumulative length of 7,600 ft were run by one or more of three geophysical techniques: magnetic, radiometric, and electromagnetic (see Still, 1988, for methodology).

To examine and evaluate the Road Cut gold-copper mineralized zone at depth, where it is under cover, and to examine the geophysical anomalies, a drilling and trenching program was initiated in 1987 (sheet 4, figs. 35, 36). Seven holes totaling 980 ft were drilled to explore the Road Cut mineralized zone for 600 ft along strike, 200 ft across structure, and to a depth of 170 ft below the surface. Six trenches, up to 6 ft deep and 20 ft long, were dug to explore the zone where it is covered by rubble and fill from the roadcut (see Still, 1988, for methodology).

Summary of Geophysics

The 1986 geophysics program defined three anomalous areas whose source was potentially a sulfide-bearing zone or a shear zone (fig. 37). The anomalous areas are: a magnetic low over the gold-copper mineralized zone where it is exposed in surface trenches between lines H and E (hydrothermal solutions that form such mineralized zones destroy magnetite); an anomaly located 70 ft east of the baseline, characterized by a magnetic low similar in character and intensity to the Road Cut anomaly; and an anomaly located 120 ft east of the baseline, characterized by low resistivity and definable electromagnetic anomalies (VLF and VLEM) (Still, 1988). Detailed information on these anomalies is contained in reports by the geophysical contractors (Adler, 1986, 1988; Adler and Adler, 1987; Kruger, 1986). Diamond-core drilling tested the three anomalies in 1987 without encountering significant zones of mineralization (Still, 1988).

The 1987 program extended the 1986 grid to the north, south, and east (fig. 37), and revealed that the Road Cut fault continues beyond the boundaries of the grid for 1,700 ft or more. To the east, between 350 and 420 ft from the baseline, two faults (fig. 37) were defined by both electromagnetics (VLF) and magnetics. These signatures are similar in character to the anomaly over the Road Cut fault.

Mineralized Zones

The Road Cut prospect mineralization is hosted in a thick sequence of metabasalt that is within 0.4 km of the Haines mafic-ultramafic complex. The mineralization is fault controlled and is contained within a shear zone, named the Road Cut fault, that is up to 40 ft thick, strikes 320° to 325° and dips steeply to the northeast. The

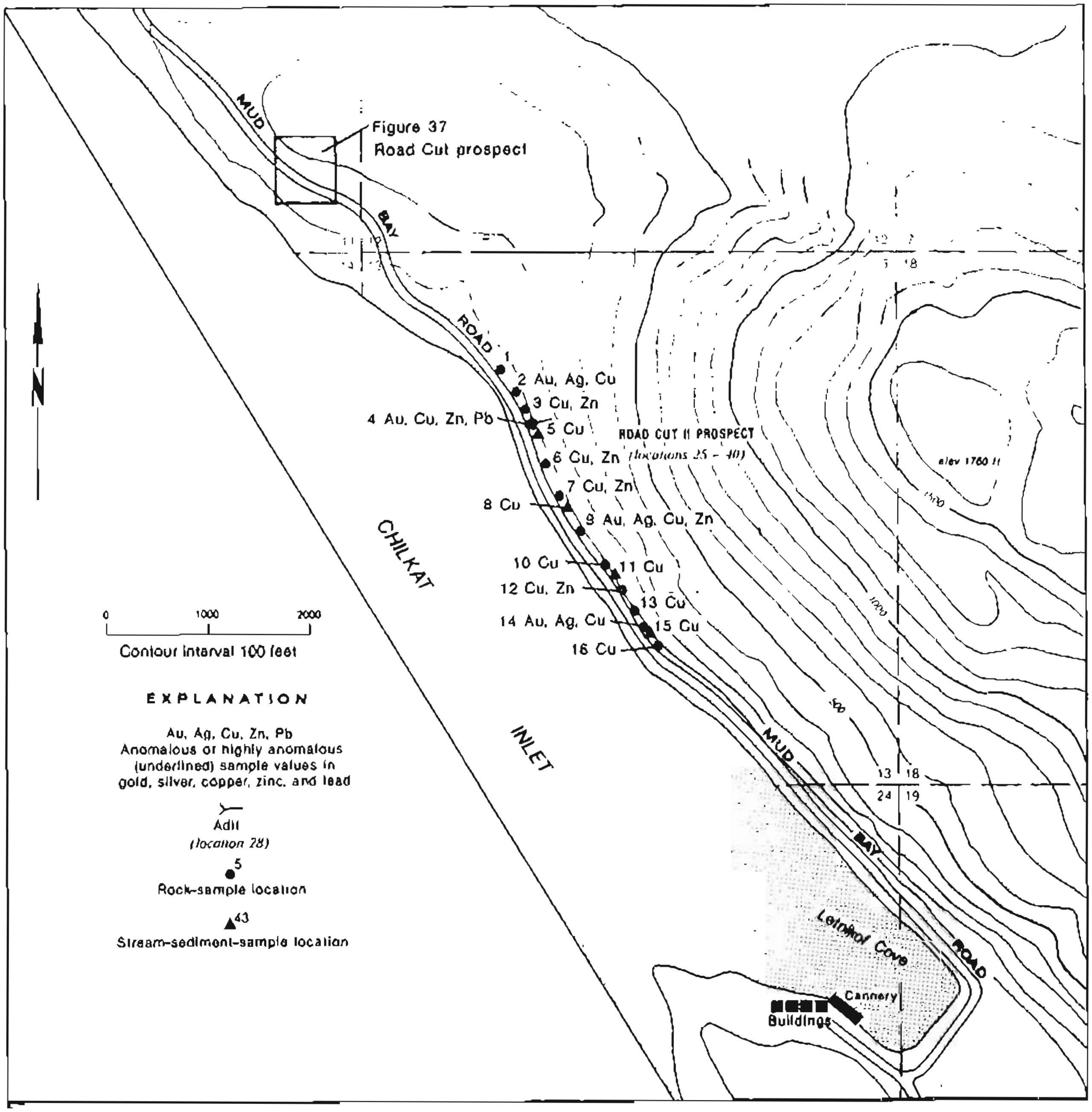


Figure 34. *Road Cut prospect location map, Road Cut II sample location map. Base modified from USGS Skagway A-2 1:63,360 Quadrangle.*

fault zone consists of silicified, brecciated, and sheared metabasalt and locally sheared and brecciated diorite. Mineralization consists of both a high-sulfide zone, called the "gold-copper mineralized zone," which contains the best copper-gold values, and a low-sulfide zone, called the "DDH zone" (Still, 1988).

The gold-copper mineralized zone is exposed for 227 ft along strike in shallow trenches through the roadcut rubble (sheet 4, sample lines 5-36). Its eastern boundary is the hanging wall of the Road Cut fault. At most locations it contains a 0.2- to 3.5-ft-thick quartz-calcite zone with up to 75 percent combined pyrite and chalcopyrite. The rest of the width of the gold-copper mineralized zone consists of a copper-bearing shear zone composed of silicified metabasalt with from 0.06 to 3 percent chalcopyrite and up to 5 percent pyrite. The western boundary of the zone is formed by a poorly mineralized, poorly silicified part of the Road Cut fault zone

Figure 35. *Trenching with a backhoe at the Road Cut gold-copper prospect.*

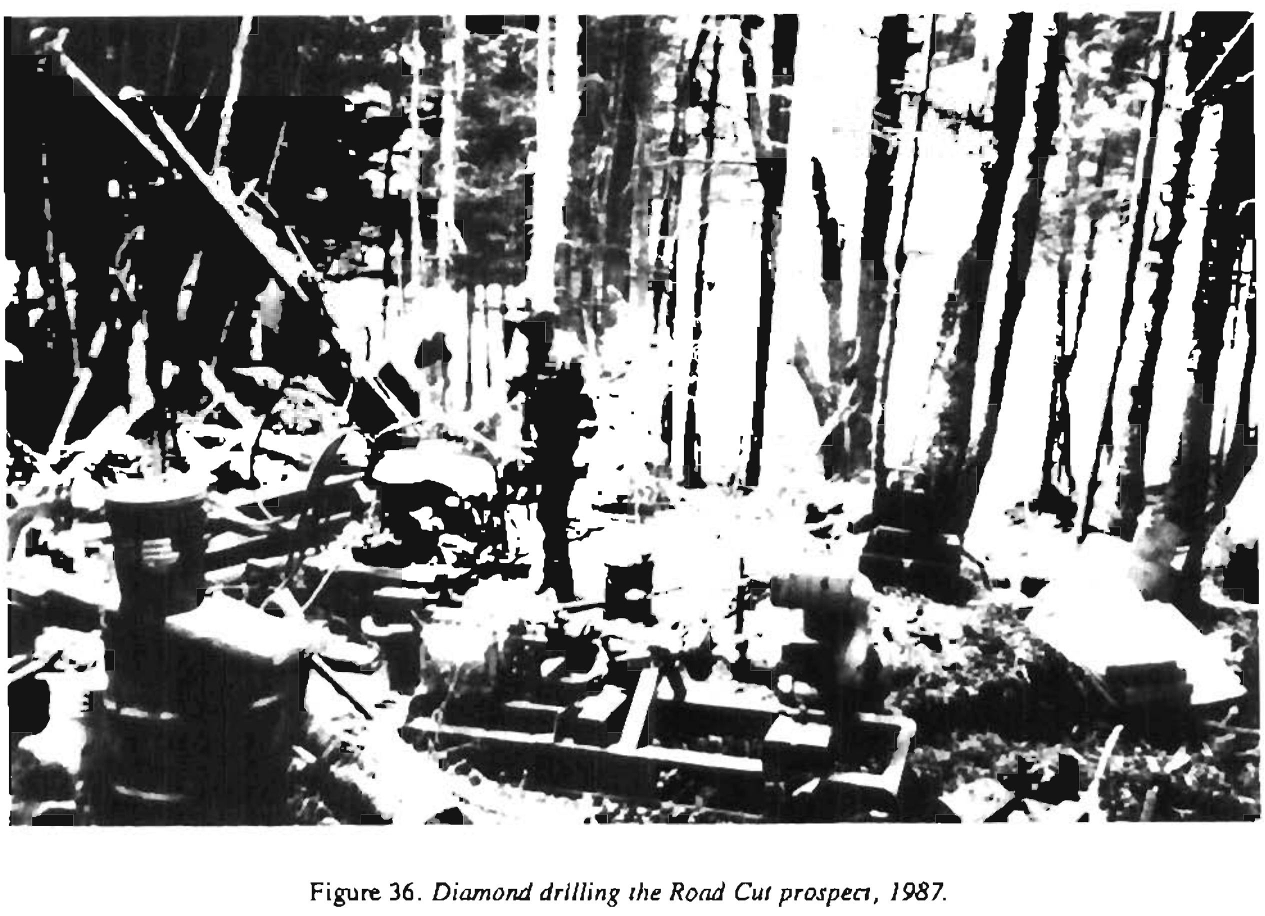


Figure 36. *Diamond drilling the Road Cut prospect, 1987.*

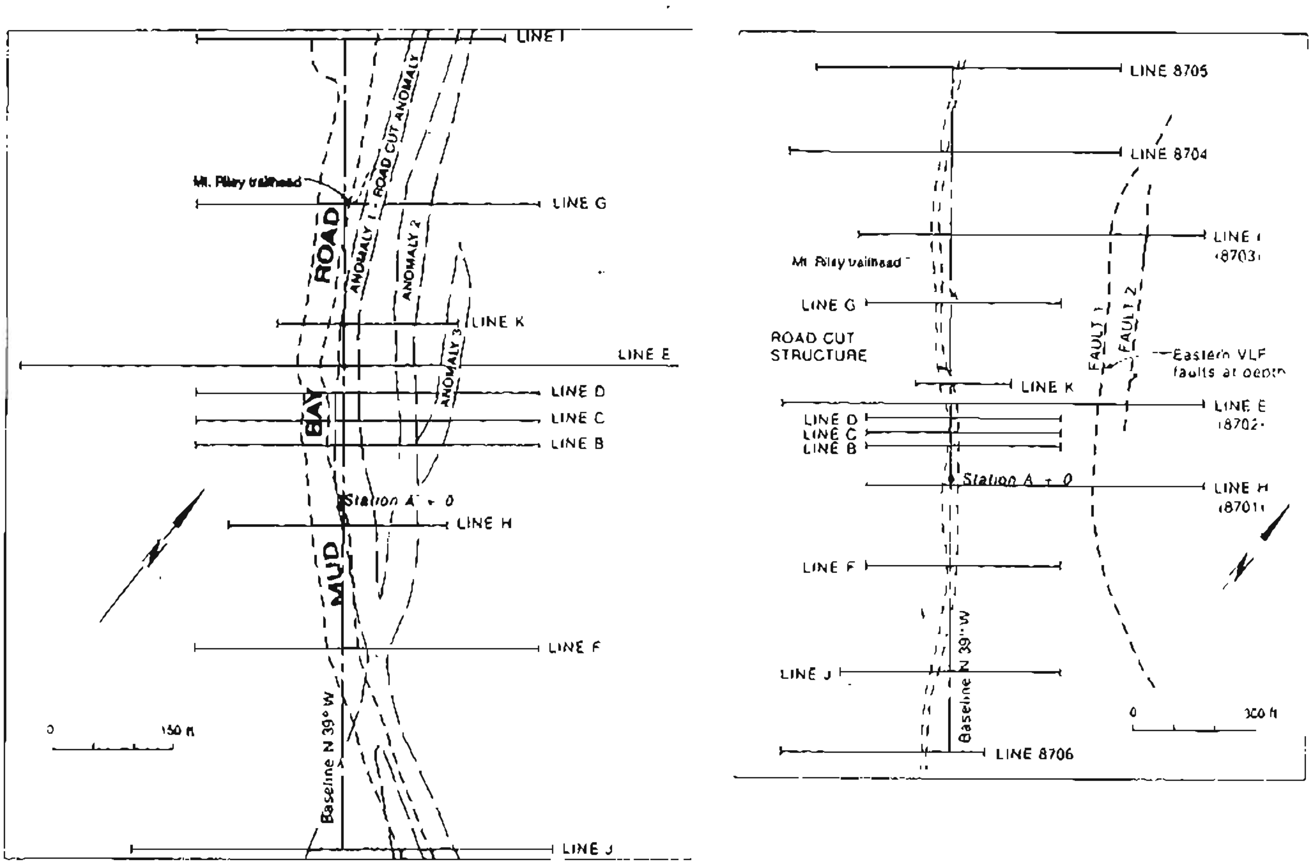


Figure 37. *Road Cut prospect geophysical summaries, 1986 and 1987.*

that consists of brecciated or unbrecciated metabasalt. At most locations this rock was less resistant than the gold-copper mineralized zone. To the south, mineralization of the gold-copper mineralized zone decreases and disappears under cover at sample line 36. To the north, past sample line 4, the gold-copper mineralized zone was not exposed on the surface or located by drilling.

Samples were collected at 32 locations along the 227-ft-long surface exposure of the gold-copper mineralized zone (sheet 4, app. G-1). Values are as much as 33.26 ppm gold and 22.7 percent copper. The best part of the zone is the 91.5-ft strike length that extends from sample lines 7 to 21. A high-sulfide horizon across a width of 1.2 ft averages 15.44 ppm gold, 31.9 ppm silver, and 4.78 percent copper. At a 3-ft mining width, the same zone averages 6.14 ppm gold, 13.5 ppm silver, and 1.99 percent copper. The 227-ft length of the zone, exposed between sample lines 4 and 36, averages 3.01 ppm gold, 5.9 ppm silver, and 0.8 percent copper across a 3-ft mining width. At depth, the gold-copper mineralized zone was located in only DDH 1. The zone is 4 ft wide and averages 0.67 ppm gold and 980 ppm copper—values reach 1.61 ppm gold and 1.84 percent copper—to a depth of 25 ft below the outcrop.

Sulfides in the gold-copper mineralized zone were examined with a microprobe. Gold occurs in a free state and as small inclusions of 910 fineness in chalcopyrite. Gold also occurs in chalcopyrite as inclusions of the gold-silver telluride, sylvanite (fig. 38). Silver was detected in another telluride, hessite. Other telluride occurrences of note from southeastern Alaska include the Kensington and Jualin (Harvey and Kirkham, 1991) intrusion-hosted lodes in the Berners Bay area north of Juneau.

The DDH zone is located under road fill and cover at most locations. It is intersected in DDH 1 to DDH 5 and DDH 7 for a strike length of 590 ft and to a depth of 125 ft. It strikes 320°, dips from 70° to 75° to the northeast, and ranges from 12 to 40 ft wide. It consists of silicified (and in places pyritized) brecciated

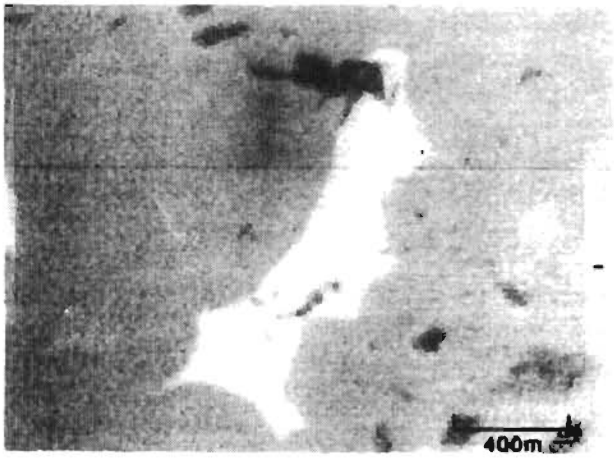


Figure 38. *Sylvanite (Au, Ag, Ta) in chalcopyrite from the Road Cut prospect.*

metabasalt, and in places brecciated diorite (Still, 1988). Its chalcopyrite content is sparse at most locations, but locally contains more than 0.06 percent copper. Areas with above 0.06 percent copper in the DDH zone are indicated on the figures as the copper-bearing shear zone. At some locations the higher copper values correlate with higher gold values. Average DDH zone values range from 0.48 ppm gold and 268 ppm copper to less than 0.07 ppm gold and 31 ppm copper.

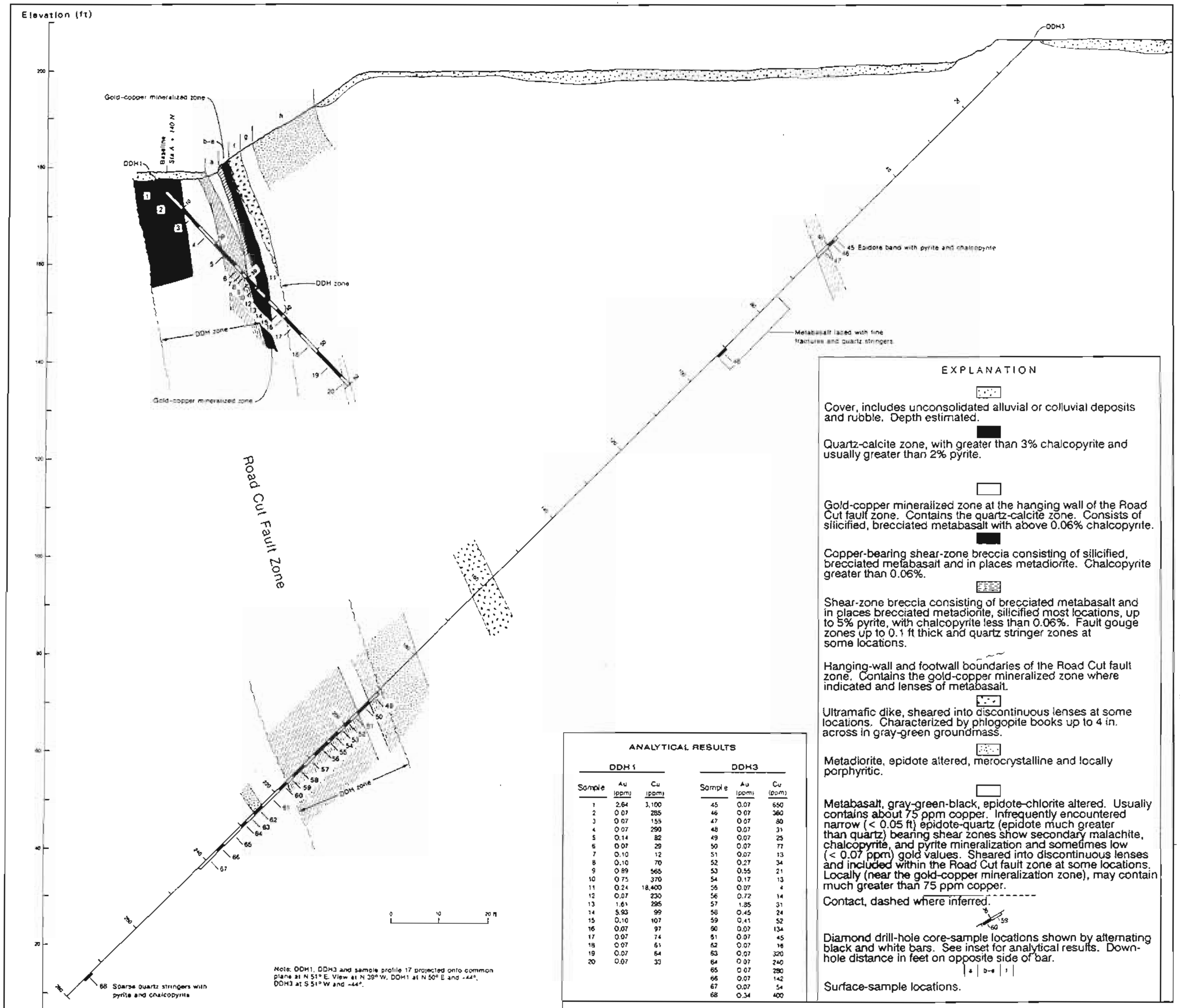
The best gold-copper values found by diamond-drilling the Road Cut fault were found in DDH 1 (fig. 39), where an 18-ft interval through the fault zone (58 ft downhole) averages 0.49 ppm gold and 348 ppm copper. This hole was collared to intercept, at a depth of 25 ft, the downward projection of the best gold-copper mineralization exposed by surface trenching. Values in this hole are as much as 5.93 ppm gold and 1.84 percent copper, and a 4-ft-thick section of this hole averages 980 ppm copper. The remaining 14-ft-thick part of the fault zone intersected in DDH 1 averages 0.48 ppm gold and 268 ppm copper and is included in the DDH zone. DDH 1 does not intersect the western side or footwall of the Road Cut fault zone, which is projected to be located 5 ft west of the DDH 1 collar.

DDH 3 intersects the Road Cut fault zone directly below DDH 1 at a depth of 125 ft below the surface (fig. 39). Values across the 25-ft-wide zone are as much as 1.85 ppm gold and 135 ppm copper, and average 0.45 ppm gold and 31 ppm copper. Gold and copper values in the fault zone between surface sample line 17, DDH 1, and DDH 3 fall off sharply at depth. Maximum copper values drop from 6.88 percent on the surface to 1.84 percent in DDH 1 and to 134 ppm in DDH 3. Maximum gold values drop from 6.75 to 1.85 ppm. The remaining diamond-core drill holes (DDH 2, DDH 4-7) yielded background values of copper and gold within the DDH zone (Still, 1988).

Resources

The 227-ft-long by 3-ft-wide gold-copper mineralized zone contains the highest-grade material exposed on this prospect to date. The best grade material is located in the 47 ft between sample lines 13 and 21, where the sulfide-rich quartz-calcite part of the zone averages 0.57 oz/ton gold, 1.27 oz/ton silver, and 7.46 percent copper over a 1.2-ft thickness. A 3-ft wide zone averages 0.23 oz/ton gold, 0.56 oz/ton silver, and 3.09 percent copper. This 47-ft part represents only a few hundred tons across a 3-ft mining width. To the north, south, and at depth, copper values drop off sharply from several percent to less than 200 ppm, and gold values drop from 5-15 ppm to less than a few tenths of 1 ppm.

The gold-copper mineralized zone was intercepted at a depth of 25 ft below the surface in DDH 1, but was not intercepted in DDH 3 at a depth of 125 ft. A 3-ft width along the 227-ft length of the gold-copper mineralized zone on the surface averages 0.09 oz/ton gold, 0.17 oz/ton silver, and 0.8 percent copper. In DDH 1 the gold-copper mineralized zone averages 0.02 oz/ton gold and 0.1 percent copper across a 4-ft width. If the surface grade and width extend downdip for a distance halfway to the DDH 1 intercept (12.5 ft) and the DDH 3 grade and width extend from that point to halfway to DDH 3 (62.5 ft), the indicated resources would be 700 tons



ANALYTICAL RESULTS

DDH1			DDH3		
Sample	Au (ppm)	Cu (ppm)	Sample	Au (ppm)	Cu (ppm)
1	2.64	3,100	45	0.07	650
2	0.07	285	46	0.07	360
3	0.07	155	47	0.07	80
4	0.07	290	48	0.07	31
5	0.14	82	49	0.07	25
6	0.07	29	50	0.07	77
7	0.10	12	51	0.07	13
8	0.10	70	52	0.27	34
9	0.89	565	53	0.55	21
10	0.75	370	54	0.17	13
11	0.24	18,400	55	0.07	4
12	0.07	230	56	0.72	14
13	1.61	295	57	1.85	31
14	5.93	99	58	0.45	24
15	0.10	107	59	0.41	52
16	0.07	97	60	0.07	134
17	0.07	74	61	0.07	45
18	0.07	61	62	0.07	16
19	0.07	64	63	0.07	320
20	0.07	33	64	0.07	240
			65	0.07	280
			66	0.07	142
			67	0.07	54
			68	0.34	400

Figure 39. *Road Cut prospect vertical cross section XS3, showing diamond drill-holes 1 and 3, and surface-sample profile 17.*

at 0.09 oz/ton gold, 0.17 oz/ton silver, and 0.8 percent copper at a 3-ft width (this includes the highest grade 47 ft previously described) and 4,729 tons at 0.02 oz/ton gold and 0.1 percent copper at a 4-ft width.

Conclusions

Although the grade of material within the Road Cut fault zone was not high enough to constitute an economic deposit, sufficient grades for small tonnages have been found that encourage further examination of the unexplored 1,100-ft length of the fault zone. Also, the data generated encourage tracing and physical testing of the Road Cut fault zone beyond its presently known 1,700-ft length. Geophysics indicates targets for physical testing, additional geophysical tests, and soil sampling to the east of the Road Cut fault zone (Still, 1988).

ROAD CUT II PROSPECT

Mineralization of the Road Cut II prospect is about 1 mi south from the Road Cut prospect between the 4- and 5-mi signs along the Mud Bay Road (fig. 34). At most locations a cliff consisting of metabasalt (or at some locations, diorite) forms the east edge of the roadway, possibly representing a fault-line scarp along an eastern splay of the Chilkat fault zone. Mineralization consists of epidote-altered metabasalt and epidote bands up to 2 ft thick that contain pyrite, chalcopyrite, and local sphalerite.

An old adit, located several hundred feet southeast of the 4-mi road sign, penetrates metabasalt for about 30 ft. The adit was not driven on mineralized rock, but a band of metabasalt adjacent to it contains chalcopyrite.

Two 440-ft-long magnetic lines were run over the beach and road and then up the escarpment near the 5-mi sign (5 mi from Haines along the Mud Bay Road). Here a prominent magnetic low striking 323° is located about 35 ft east of the roadway (Still, 1988).

Samples were collected on the east side of the road through shallow excavations in the roadway rubble and at a few bedrock exposures. Selected high-grade samples contained up to 0.21 ppm gold, 2.5 ppm silver, 0.695 percent copper, and 1.83 percent zinc (fig. 34, app. G-3). Samples were limited to the eastern fault margin (east side of the road) because roadway fill, marine sediments, and the waters of the Chilkat Inlet hamper examination of the main fault zone itself.

ZINC BEACH OCCURRENCE

The Zinc Beach occurrence, 1.5 mi south of Flat Bay on the east side of the Chilkat Peninsula, is located in metabasalt on a north-northwest striking lineament that is likely a splay off the fault that runs through Flat Bay (sheet 1). Analytical results are in sheet 1, F140-141 and sheet 2, no. 885, locs. 37 and 38 of Gilbert and others (1991b).

Two stream-sediment samples collected from a dry stream that drains the northwest trending lineament contained up to 0.583 ppm gold, 1 ppm silver, 162 ppm zinc, and 164 ppm copper. A soil sample collected in the roots of a tree contained 0.019 ppm gold, 240 ppm zinc, and 460 ppm copper. Samples from brecciated sphalerite-bearing basalt boulders up to 1 ft thick and 2 ft long contained up to 6.23 ppm gold, 13 ppm silver, 27 percent zinc, 2,600 ppm copper, 13 ppm tungsten, and 50 ppm arsenic. The source of these boulders is likely the lineament or cliffs adjacent to it. Iron-stained metabasalt rubblecrop with chalcopyrite, pyrite, and malachite in a quartz knot contained 0.446 ppm gold, 220 ppm zinc, and 8,400 ppm copper. The source of the rubblecrop was an iron-stained shear zone near the top of a basalt cliff near the beach.

A stream-sediment sample collected at a location 0.8 mi north from the Zinc Beach occurrence and along the lineament that includes Zinc Beach contained 0.024 ppm gold, 1.5 ppm silver, 3,000 ppm zinc, 1,150 ppm copper, and 580 ppm lead. This trend is a target for detailed examination.

BATTERY POINT OCCURRENCE

The Battery Point occurrence is located on the east side of the Chilkat Peninsula, about 0.5 mi south of Battery Point, where a 100-ft-high metabasalt cliff has a few patches of malachite stain (sheet 1). The occurrence is near the contact between metabasalt and an ultramafic intrusion. Selected high-grade samples of metabasalt from the cliff and float below it, containing disseminated chalcopyrite, contained up to 0.51 ppm gold and 2,650 ppm copper (sheet 1, F134 and sheet 2, no. 850 of Gilbert and others, 1991b). A 100-ft-long random chip of metabasalt with disseminated chalcopyrite contained 290 ppm copper and less than 0.07 ppm gold.

SHIKOSI ISLAND OCCURRENCE

The Shikosi Island occurrence is located on the north end of Shikosi Island and consists of a narrow epidote-altered silicified shear zone that contains chalcopyrite and chalcopyrite hosted in metabasalt (fig. 40). Samples collected from this zone contain up to 0.05 ppm gold, 6.7 ppm silver, 3,000 ppm zinc, and 2.74 percent copper (app. G-4). This shear zone approximately aligns with similar mineralization found at the Islands Copper prospect, described below.

ISLANDS COPPER OCCURRENCE

The Islands copper occurrence is located on the south end of Kataguni Island (fig. 40). The mineralization is located in metabasalt sea cliffs up to 50 ft high that contain numerous narrow shear zones at various orientations. Some of the shears are silicified and contain copper or copper-zinc mineralization. Samples collected from these 0.2- to 1.4-ft-thick shear-controlled veins contain up to 2.54 ppm gold, 22.5 ppm silver, 6.9 percent copper, and 2.14 percent zinc (app. G-4).

TALSANI ISLAND JADEITE OCCURRENCE

A jadeite occurrence has been reported on Talsani Island (Wells and others, 1986). The area was briefly investigated and jadeite was not found. However, some epidote-rich bands in metabasalt were anomalous in copper (fig. 40).

ANOMALOUS AREAS

To follow up discoveries of gold-copper mineralization in the Chilkat Peninsula, examinations were made near major Chilkat Peninsula fault systems. This work consisted of sampling mineralized rock and collecting stream sediment samples. Sheets 1 and 2 of Gilbert and others (1991b) and figure 34 show the locations of samples. Sixty-eight rock, five pan-concentrate, one soil, and 46 stream sediment samples were collected. Of these 120 samples, 79 are anomalous in gold, silver, copper, or zinc. Samples contain up to 0.79 ppm gold, 5.7 ppm silver, 1.23 percent copper, and 3,000 ppm zinc. There is pervasive gold-copper mineralization in the Chilkat Peninsula mineralized zones; the largest part of the anomalous samples collected border the fault that cuts the middle of the Peninsula at Letnikof Cove and Flat Bay. Areas with a significant clustering of anomalous or highly anomalous samples are:

1. The Road Cut prospect and Mount Riley gulch area. Here stream-sediment samples, collected in intermittent drainages just east of the Road Cut gold-copper mineralized zone, and a series of samples collected in the streams and gulches that drain the northwest side of Mount Riley are anomalous or highly anomalous in gold and copper (up to 0.31 ppm gold and 611 ppm copper) (sheet 2 of Gilbert and others, 1991b).

2. A series of narrow gulches that drain the southwest side of Mount Riley between the Road Cut II prospect and south to Letnikof Cove. Stream-sediment samples collected from these gulches are anomalous in copper or copper and gold (sheet 2 of Gilbert and others, 1991b). The samples contain up to 465 ppm copper and 0.79 ppm gold.

3. The area that drains the south side of Mount Riley. Stream-sediment samples collected here are anomalous in gold and copper (sheet 2 of Gilbert and others, 1991b); they contain up to 0.07 ppm gold and 286 ppm copper.

4. The east side of the Chilkat Peninsula. Bedrock, float and stream-sediment samples collected here are anomalous in gold, silver, copper, and zinc (sheets 1 and 2 of Gilbert and others, 1991b). The samples contain up to 0.114 ppm gold, 2.5 ppm silver, 5,300 ppm copper, and 3,000 ppm zinc.

CONCLUSIONS

Although examination of the Road Cut prospect did not reveal an economic deposit, it did reveal sufficient tonnages and grades to encourage additional examination along its defined structure and parallel structures to determine its extent beyond its present known limits. Samples collected from prospects, bedrock locations, and from streams indicate that gold-copper mineralization (and local zinc mineralization) is pervasive in the shear and fault zones of the Chilkat Peninsula. A number of these samples indicate areas with important exploration potential for fault-controlled gold-copper mineralization.

PLUTONIC GOLD DISCRIMINANT, HAINES-KLUKWAN AREA

Three major episodes of plutonism formed most of the plutonic rocks in the Haines-Klukwan area (Taku terrane) (Gilbert and others, 1991a). The first episode occured during mid-Cretaceous time and includes the Haines mafic-ultramafic complex, the Mount Kashagnak pluton, and the Klukwan mafic-ultramafic complex. During Late Cretaceous - Early Tertiary time the second episode of plutonism produced the Northern Border and Tanani plutons, interpreted by Gilbert and others (1991a) to be the western margin of the Great Tonalite Sill complex. The third episode produced a few bodies of granite and granodiorite, including the Klutsha Mountain pluton, during Tertiary(?) time (Gilbert and others, 1991a).

Major-oxide chemical analyses of plutonic rocks from the Haines-Klukwan area were scored by the gold discriminant analysis described earlier (table 1). Most of the mid-Cretaceous Mount Kashagnak pluton exhibits too high an oxidation state to appear favorable for producing nonporphyry gold deposits (table 1, fig. 31). However, many of the analyses of the gold-bearing Jualin-deposit "diorite" 15 km southeast of the study area indicate oxidation states similar to those of the Mount Kashagnak pluton; they also appear unfavorable with nonporphyry gold discriminant functions (Newberry, written communication). Because of the similarities between the Mount Kashagnak pluton and Jualin "diorite" discussed by Gilbert and others (1991a), there may have been a gold-bearing episode in the history of the Mount Kashagnak pluton, perhaps represented by the Road Cut prospect.

The Northern Border pluton, located within the map area, and the Ferebee Plutonic Complex, to the east of the map area (Redman and others, 1984; Gilbert and others, 1990), are the only plutons that appear to be favorable for nonporphyry gold association in the Haines-Klukwan-Skagway area. The favorability of these Great Tonalite Sill-related plutons for nonporphyry gold systems is consistent with the spatial and, perhaps, genetic relationship between some gold deposits within the Juneau gold belt and the Great Tonalite Sill. The Tanani pluton, also thought to be part of the Great Tonalite Sill, yields low discriminant scores, but the pluton's elevated strontium content suggests that alteration of the body has reduced the accuracy of the discriminant analysis (table 1, fig. 31). Samples from the Tertiary(?) Klutsha Mountain pluton were too altered to yield reliable discriminant scores.

PLACER DEPOSITS OF PORCUPINE AREA

MINING HISTORY

In the spring of 1898, packers on the Dalton Trail panned gold from the gravels of the Klehini River. Shortly after the discovery, most of the streams in the Porcupine area were staked; however, many claims were

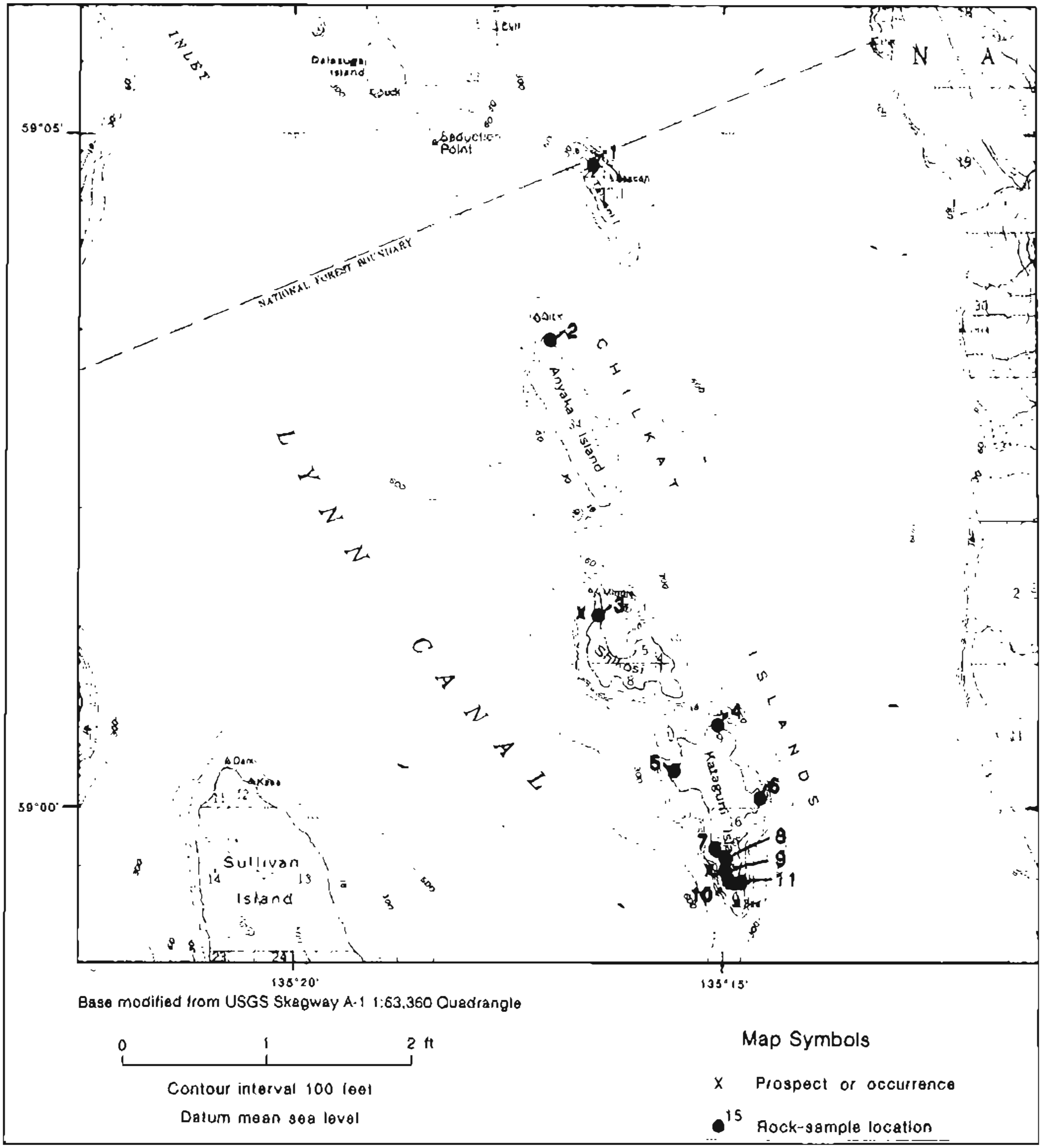


Figure 40. *Occurrences on Shikosi, Kataguni, and Talsani Islands.*

subsequently dropped because of the low quantities of gold found on many of the drainages. During the past 90 years several drainages in the Porcupine area have produced gold, including Porcupine, McKinley, Cahoon, Nugget, Cottonwood, and Christmas Creeks.

Following the studies of Wright (1904) and Eakins (1919), B.D. Stewart reported on placer operations in the Porcupine area in 1926 (Stewart, 1926). W.B. Beatty worked on Porcupine Creek in 1936 and wrote a comprehensive thesis concerning the placer deposits of the Porcupine Creek area (Beatty, 1937). An account of mining history of the Porcupine Creek area has been compiled by Roppel (1975). Bundtzen (1986) and Hoekzema and others (1986) reported on the placer deposits and described the glacial geology of the Porcupine Creek area; the following discussion of placer deposits is taken largely from their work.

Production records for the Porcupine placer deposits are sparse. Minimum estimated production through 1985, compiled by Hoekzema and others (1986), is 79,650 oz. Only very minor production has been reported since 1985. Placer-gold occurrences are found on several other drainages in the area, including Big Boulder and Little Boulder Creeks, the Tsirku and Klehini Rivers, and western drainages to the Chilkat River north of Mosquito Lake, but no production is known.

PORCUPINE CREEK

Mining started on Porcupine Creek in 1898. Reported production averaged as high as 9,000 oz of gold per year until 1906, when high water destroyed much of the workings (Beatty, 1937). During the early years relatively primitive methods of mining, such as pick and shovel, small sluices, and rockers were used to recover the gold. Ground sluicing (booming) also became a popular method of mining gold. This technique requires the diversion of the creek into a flume or a predug channel to remove large boulders from the original channel and loosen gravel deposits. Water is then allowed to flow back into the original channel to remove the loosened gravel and concentrate the gold in depressions. Gold is then recovered after the stream has been diverted back into the flume or diversion ditch.

In 1907, Porcupine Mining was organized to consolidate the workings in the area. The company erected a flume 1 mi below the junction of McKinley and Porcupine Creeks at a reported cost of $200,000 (Roppel, 1975). This developement opened up the lower end of Porcupine Creek to gold mining. The company operated until the flume was destroyed by a disastrous flood in 1915; it had an average yearly production of 3,000 oz (Beatty, 1937).

In 1916, the operations of Porcupine Mining were taken over by the Alaska Corporation. The old flume was repaired and a new flume constructed to feed water to hydraulic mining operations. Mining continued until September 1918, when another flood destroyed the flume. Over 6,000 oz of gold was produced between 1916 and 1918 (Beatty, 1937).

The next large mining operation began in 1926, when Porcupine Gold Mines, which subsequently became Alaska Sunshine Gold Mining, managed by August Fritsch, took over the Porcupine Creek property. This company constructed several of the existing buildings at the townsite of Porcupine and a 12,000-ft-long elevated flume to supply hydraulic water at any needed location on Porcupine Creek below its junction with McKinley Creek. The headgate of the flume was located 0.5 mi above the mouth of McKinley Creek. McKinley Creek was spanned by a bridge 160 ft above the creekbed, a few hundred yards above its junction with Porcupine Creek. The flume and related structures were completed near the end of 1928. Mining began in 1929 but was shut down at the end of the season because of poor returns. Following extensive exploration work, mining operations on Porcupine Creek restarted in 1935 by processing gravels from the MacElvery (dry) channel (Beatty, 1937). Work continued into 1936, until the bridge over McKinley Creek was destroyed by a rockslide. Fritsch died in 1936 and large-scale mining on Porcupine Creek ceased. Fritsch's records claimed that Alaska Sunshine Gold Mining recovered $1,700,000 worth of gold from the Porcupine claims, but this production has not been substantiated by either U.S. Mint records or Smith (1933).

Activities since the World War II have been sporadic, but a brief mining resurgence occurred in 1959-1960, when five small operations employing 15 people worked various claims on Porcupine Creek and its tributaries (Williams, 1960). When gold prices soared in the late 1970s and early 1980s, mechanized placer mining produced up to several hundred ounces annually until 1984. Jo Jurgeleit, James McLaughlin, Merrill Palmer, John Schnabel, the Peterson family, and others continue to take out small amounts of placer gold from their claims. Activity since 1985 has been limited to small-scale hand-placer mining or limited mechanized operations.

MCKINLEY CREEK

Mining on lower McKinley creek (below Cahoon Creek) began at about the same time as activity on Porcupine Creek. Most of this section was mined out by 1904. From 1903-1916, old channels of McKinley creek up to 200 ft above the current creek level were mined successfully by Cahoon Creek Mining. Their last operation consisted of driving a tunnel through a narrow bedrock spur above McKinley Falls to divert the creek into Porcupine Creek and dry up the plunge pool and lowermost section of McKinley Creek (Beatty, 1937). Over 4,400 oz of gold were recovered during a few weeks' time in 1916 from the plunge pool and streambed below the falls.

The lower section of McKinley Creek has been hand mined sporadically by individuals and small groups through the years. Recent attempts have been made to mine the plunge pool below McKinley Falls, and suction dredges have been used to mine the channel.

Stewart (1926) reported that in 1926, six men were mining on Upper McKinley Creek (above Cahoon Creek) about 1 mi above its mouth using "booming" techniques. Reportedly, $60,000 was expended on the property, but no production figures are known. Upper McKinley Creek has been prospected in recent years by using suction dredges and hand-placer techniques; production has not been reported.

CAHOON CREEK

The lower 0.5-mi section of Cahoon Creek was extensively mined by Cahoon Creek Mining from 1908 to about 1913. Wright (1904) reports that a small hydraulic plant was set up and operated at the face of Cahoon Glacier in 1902 and 1903. On the basis of the limited extent of the workings, this operation was apparently unsuccessful. A hydraulic plant was also worked on Cahoon Creek from 1910-1913 (Brooks and Capps, 1924). Hand-placer methods have been used to prospect the creek gravels in more recent years.

GLACIER AND CHRISTMAS CREEKS

Glacier Creek and its tributaries were originally prospected and staked in 1899 and 1900, but were undeveloped because of the great gravel depths and low ore grades (Beatty, 1937). A keystone drill was used to prospect lower Glacier Creek in 1911, apparently with encouraging results. A mill was erected and a 2,000-ft-long flume constructed. Mining operations began in 1916 and continued into 1918. Recovery was poor and the operation closed down after working a 1/4-mi section of stream channel. Beatty (1937) reports that a $250,000 was spent to develop the property based on the drilling returns, which later proved to have been salted.

A small eastern tributary to Glacier Creek, known locally as Christmas Creek, was worked by a small hydraulic plant in 1910; the property was patented in 1916. A small heavy equipment operation worked near the mouth of Christmas Creek during the late 1970s with meager results. A total production of 200 oz of gold is estimated on the basis of tailings present and grades determined during 1985 field work.

NUGGET CREEK

Placer gold was discovered in Nugget Creek in 1899. Sporadic mining is reported to have occurred from 1902 to 1913, 1929, and since 1980 (Hoekzema and others, 1986). Eakins (1919) reports that about 350 oz of gold was produced by a small hydraulic operation between 1902 and 1909. The operation processed gravels near the mouth of Nugget Creek canyon by diverting the creek into a flume. This developement both freed the creek channel from water and supplied power to run a derrick used to remove large boulders from the creek. The remains of a small hydraulic plant exist on the east side of Nugget Creek about 1.5 mi above its junction with the Tsirku River. Suction dredges were used to test the gravels in the lower section of Nugget Creek canyon between 1980 and 1985 with encouraging results. The alluvial fan at the mouth of Nugget Creek was patented in 1934 (Hoekzema and others, 1986).

COTTONWOOD CREEK

Gold was discovered on Cottonwood Creek in 1899, but workings on the creek never produced gold in significant amounts. The alluvial fan extending along the Tsirku River from Cottonwood Creek to below Nugget Creek was prospected with encouraging results before 1912, and a company was formed to dredge the alluvial-fan gravels about that time (Brooks, 1913). Fifty claims were staked to cover the fan, but the ground was abandoned in 1916. Parts of the Nugget-Cottonwood Creek fan were patented in 1934.

OTHER STREAMS

Gold has been discovered on several other drainages in the Porcupine area. These include Big Boulder and Little Boulder Creeks and the Little Salmon River. None of these drainages have been producers, according to available historical data. However, evidence of recent suction dredging and hand-placer work exists on the Little Salmon River.

GLACIAL GEOLOGY

The bedrock in the Porcupine area consists of metamorphosed sedimentary rocks (slate, phyllite, and marble), which have been intruded by igneous rocks of Early Cretaceous and mid-Tertiary age (Gilbert and others,1991a). Impressive results of extensive glaciation are also evident (sheet 5), but specific limits of the various Pleistocene and Holocene glacial advances are not well understood. Recent glaciation throughout southeastern Alaska has masked all evidence of ice activity before about 70,000 years before present (BP) (Mann, 1986), and virtually all glacial deposits and landforms observed today in the Porcupine area are probably Late Wisconsinian (30,000 to 10,000 year BP) and younger.

The Holocene glacial chronology worked out by Mann (1986) in the adjacent Glacier Bay region shows a four-phase history of glacial maxima at 9,000 to 13,000 year BP, 5,000 to 6,000 year BP, 2,500 to 3,600 year BP, and about 1,500 year BP, each separated by periods of deglaciation, downcutting or incision of former glacial valleys, and stream aggradation of major-trunk meltwater streams. These Pleistocene glacial advances and retreats resulted in at least three, and possibly four, bedrock-incised channels or terrace levels in the valleys of Porcupine, Cahoon, and McKinley Creeks (shown as Qat_1, Qat_2, and Qat_3 on sheet 5 and fig. 41). In most cases, the remnants of these channels apparently avoided ice scour and were unaffected by later events, except for deposition of glacial drift. The oldest recognized terrace level occurs at 250 to 300 ft above present canyons of McKinley and Porcupine Creeks, followed downstream by channels at 140 to 200 ft, 50 to 75 ft, and a final and most youthful terrace that is 25 to 40 ft above the modern drainages. The oldest terrace level (Qat_1) may be a composite of fluvial material and drift not incised into bedrock. Radiocarbon ages suggest that the third terrace level on Porcupine Creek was deposited after the third Holocene glacial advance (2,500 to 3,600 year BP) (Bundtzen, 1986).

The last Holocene advance (1000-1500 year BP?) occupied 1- to 2-mi stretches of Porcupine, McKinley, and Glacier Creek valleys below present glacial termini. Beatty (1937) reports that the glacier on Cahoon Creek retreated nearly 1 mi from 1898 to 1937, indicating that the region is still undergoing deglaciation.

Besides leaving behind multiple drift limits, bedrock-incised bench channels, trimlines, and hanging valleys, multiple glacial episodes also produced perched alluvial and colluvial fans and ice-marginal meltwater channels (sheet 5, fig. 41). The alluvial-fan complex of Porcupine and Glacier Creeks (sheet 5) encountered more than one period of aggradational development, and the former fan apex was probably once at least 1 mi south of its present position. A distributary channel of this fan probably spilled over into the drainage now occupied by Walker Lake.

Development of alluvial fans on Cottonwood and Nugget Creeks have been significantly influenced by earlier west-to-east glacial-meltwater features that drained Late Wisconsin or Holocene valley ice in the Tsirku River. Former ice marginal meltwater channels have left notched, beheaded drainages in the Herman Creek and Walker Lake area (fig. 41), along the Klehini River near the United States-Canada border, and in isolated sections

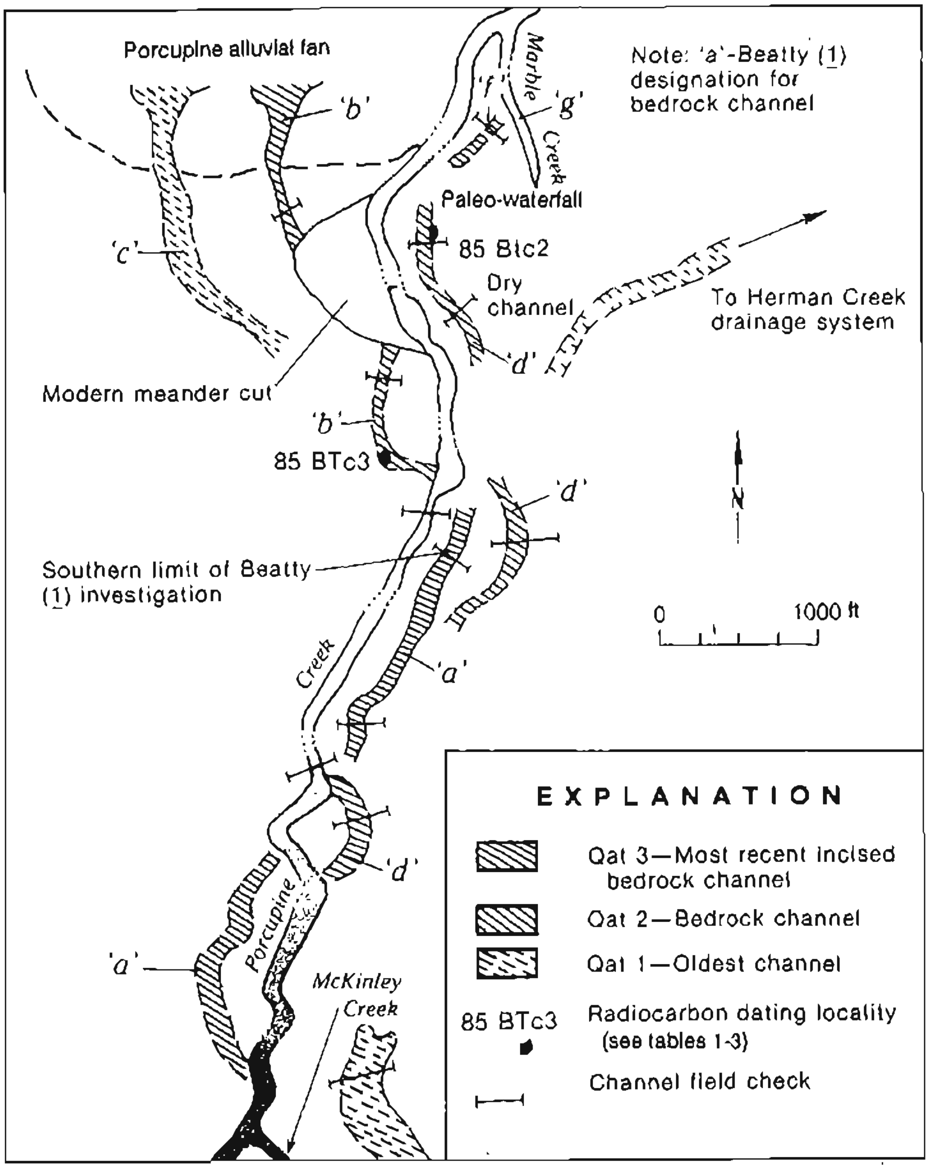


Figure 41. *Abandoned channels on lower Porcupine Creek.*

of the Tsirku River. Modern meltwater channels are incised in glacial drift, in contrast to the bedrock incision of fluvial channels in the Porcupine Creek watershed. Elevated, modern terrace alluvium and alluvial fans of Late Holocene age parallel the modern floodplains of the Tsirku and Klehini Rivers and are a result of recent periods of stream aggradation during distributary channel development.

PLACER GEOLOGY

Heavy-mineral placer deposits in the Porcupine area formed during multiple glaciofluvial cycles. Heavy-mineral placer concentrations occur in bench deposits in incised bedrock channels and glacial till, alluvial fans, and modern-stream incisions. High stream gradients (fig. 42) indicate that the Porcupine area, as a whole, is immature and is nested in a high-energy fluvial environment. The average stream gradient of the study area is about 500 ft/mi, compared with averages of 80 to 150 ft/mi in many interior-Alaska placer districts.

Bedrock sources of most heavy-mineral concentrations, including the placer gold, have been identified by Eakins (1919), Beatty (1937), Still and others (1985), Bundtzen and Clautice (1986), and Hoekzema and others

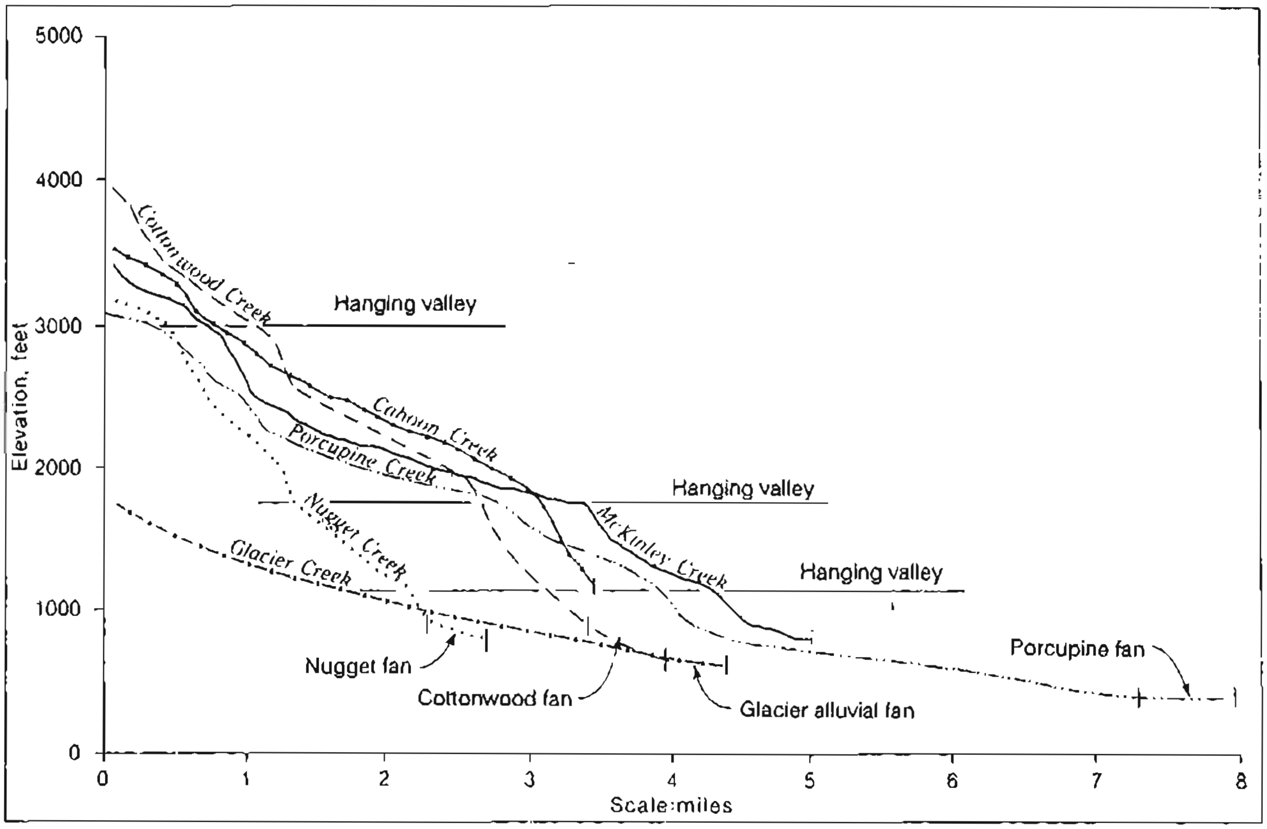


Figure 42. *Stream gradients in the Porcupine area.*

(1986). The most likely bedrock sources are crosscutting quartz sulfide - gold fissure veins associated with altered mafic dikes cutting Porcupine Slate in the McKinley and Cahoon Creek drainages. Pyritiferous zones in the Porcupine Slate also contain anomalous gold values ranging up to 2 ppm gold. Localized silver-lead-(gold) deposits, such as those identified in the Summit Creek drainage, may also contribute to heavy-mineral placer concentrations (Still and others, 1985, 1987; Gilbert and others, 1991b). Placer gold in Christmas and Herman Creeks may be derived from the Porcupine Slate, or alternatively from stratiform mineral concentrations in metavolcanic rocks, such as in the Glacier Creek deposits.

Gold fineness on Porcupine Creek and its incised bench deposits ranges from 841 to 909 and averages 866 (seven samples) (app. H-1). There does not appear to be a noticeable difference in fineness between the lower elevated fluvial channels and the modern stream, though Beatty (1937) mentions that the highest bench levels on Porcupine Creek have a distinctly lower fineness than gold mined in the modern stream.

Placer-gold fineness from McKinley and Cahoon Creeks ranges from 786 to 859 and averages 821 (four samples); gold extracted from two quartz veins in the area averages 750 (app. H-1) Hoekzema and others, 1986). Fineness predictably increases downstream with increasing distance from the probable lode sources in these two drainages (Koshman and Yugay, 1972). Fineness downstream changes from an average of 821 on McKinley and Cahoon Creeks to an average of 866 on Porcupine Creek.

Fineness of placer gold collected from Nugget and Cottonwood Creeks averages 779 (three samples), whereas that of Glacier and Christmas Creeks drainage averages 865 (two samples), which is very close to that found in lower Porcupine Creek (app. H-1).

The average overall fineness from the Porcupine area, with the Boyle (1979) method, is 837, compared to 820 reported by Smith (1941), who used records from four locations on Porcupine Creek. The range of fineness in the Porcupine area is consistent with those reported by Moiser (1975) for epithermal and lower mesothermal temperatures of formation. Bullion was analyzed for the trace metals copper, lead, zinc, and antimony besides the precious metals (app. H-1). Significantly, samples containing detectable copper were found in McKinley and Cahoon Creeks, perhaps suggesting recent association with lode sources. The gold-to-copper ratio is much too high for typical gold placers of any temperature range, but the presence of antimony in single samples on Cahoon and Porcupine Creeks also suggests formation in epithermal or lower mesothermal temperature ranges (Moiser, 1975).

Bundtzen (1986) and Hoekzema and others (1986) report analyses of heavy-mineral concentrates from nine streams in the Porcupine area (app. H-2). A preponderance of magnetite in virtually all drainages suggests that magnetometer exploration techniques may be useful in delineating buried channels and other heavy-mineral concentrations. Pyrite is predictably abundant in Porcupine, Cahoon, McKinley, Nugget, and Cottonwood Creeks, where it may be derived from both pyritiferous zones in the slate and epigenetic-vein deposits. Scheelite and (uncommonly) cassiterite are present in McKinley, Cahoon, and Cottonwood Creeks, but the concentrations are probably not economical. Barite is abundant in Glacier Creek and in the immature placers of the Herman Creek area. Its presence in the Herman Creek drainage suggests that barite mineralization may exist in the metavolcanic rocks underlying the glacial drift that blankets the area. Massive barite-sulfide deposits in metavolcanic rocks at the head of Glacier Creek are probably the source of barite in this drainage.

Placer gold from McKinley, Porcupine, Nugget, and Christmas Creeks was microscopically examined to delineate characteristics of transport and origin of the gold that has been mined. Consistently, two distinctive types of gold are present in the analyzed concentrates: well-worn, rounded, bright "nugget" gold which shows evidence of fluvial transport; and small wirelike grains with quartz and undetermined gangue mineralogy that show little evidence of stream transport. Either more than one lode source is present, or proximal lode gold and "nugget" gold have been transported by fluvial mechanisms (Bundtzen, 1986).

Bundtzen (1986) and Hoekzema and others (1986) report gold size ranges from placer samples from the Porcupine area. Beatty (1937) and the authors have noted a general lack of fine gold (100 mesh or smaller) in the Porcupine area. The extremely high-energy nature of placer formation in the area suggests that virtually all fine gold has been flushed down the streams and possibly out of the study area. However, the Glacier Creek, Porcupine Creek, and Nugget Creek alluvial fans represent significantly lower energy fluvial environments than those of the main feeder streams entering into the lower valleys, which suggests that alluvial fans may have accumulated part of the fine-gold fraction absent in the main-production streams.

Gold was panned from a thick section of glacial till exposed in Christmas Creek, a tributary of Glacier Creek. The gold was apparently interspersed throughout at least the lower 6 ft of till with no apparent concentration on bedrock. The gold is very fine grained, well-worn "glacial" gold, possibly due to the milling effects of glaciation. Although Christmas Creek was the only locality where gold was recognized in till, its existence both there and in till of other drainages mentioned by Beatty (1937) suggest that "glacial gold" may be an intermediate host between hard-rock sources and downstream accumulations in fluvial deposits.

RESULTS OF SAMPLING

In 1985, the USBM collected 78 reconnaissance, 53 channel, and four site-specific bulk-placer samples. All the major streams in the placer area were sampled, with at least one sample taken from each drainage (app. H-3; fig. 43). All site-specific bulk samples were taken from lower Porcupine Creek (app. H-3). The procedure for collecting reconnaissance, channel, and site-specific placer samples is given by Hoekzema and others (1986).

Sample locations are plotted on sheet 5 (map nos. 1-22, 79-132), figure 44 (map nos. 23-64), and figure 45 (map nos. 65-78); sample results are listed in appendix H-3. Of the 78 reconnaissance and 53 channel samples collected, 35 were found to contain values greater than 0.005 oz/yd^3 gold.

Results from reconnaissance and channel sampling were used to give each stream a mineral-development-potential rating for placer gold by using one of four levels: "high," "moderate," "low," and "unknown" (table 2).

Figure 43. *Using placer samples to evaluate placer deposits in the Porcupine area.*

These ratings are estimates based on an evaluation of grade and extent of mineralization as well as other factors such as depth of overburden, presence of large boulders, and stream configuration. A deposit of high mineral-development potential would, by definition, have grades greater than 0.01 oz/yd gold and probable continuity of mineralization. A deposit of moderate mineral development potential would have either a high metal content or continuous mineralization identified, but not both. A deposit with low mineral development potential would contain uneconomic grades or show little evidence of continuity of mineralization (Hoekzema and others, 1986).

Resource estimates were made for streams having moderate or high potential for placer-gold mineral development and for the Nugget and Porcupine Creek fans (Hoekzema and others, 1986). All streams have low mineral-development potential, except Porcupine, McKinley, Cahoon, Nugget, and Christmas Creeks, discussed below.

Porcupine Creek is a steep, rapidly downcutting drainage, with an average gradient of 350 ft/mi (fig. 42). Reportedly, little gold was produced from Porcupine Creek above its junction with McKinley Creek, and during this study six reconnaissance samples taken above the junction contained undetectable to 0.004 oz/yd^3 gold (81, 107-111).

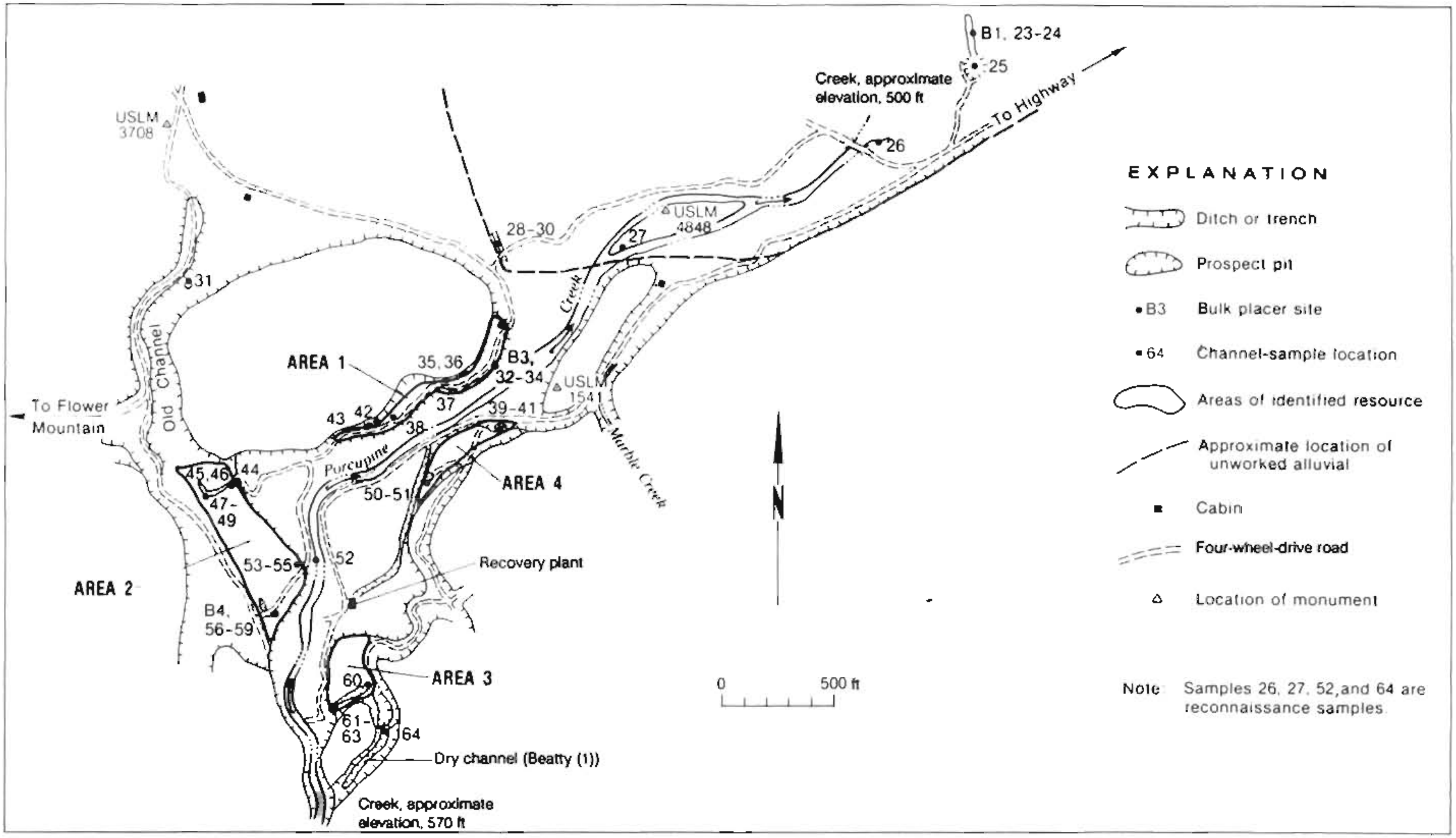


Figure 44. *Placer sample locations, lower Porcupine Creek area.*

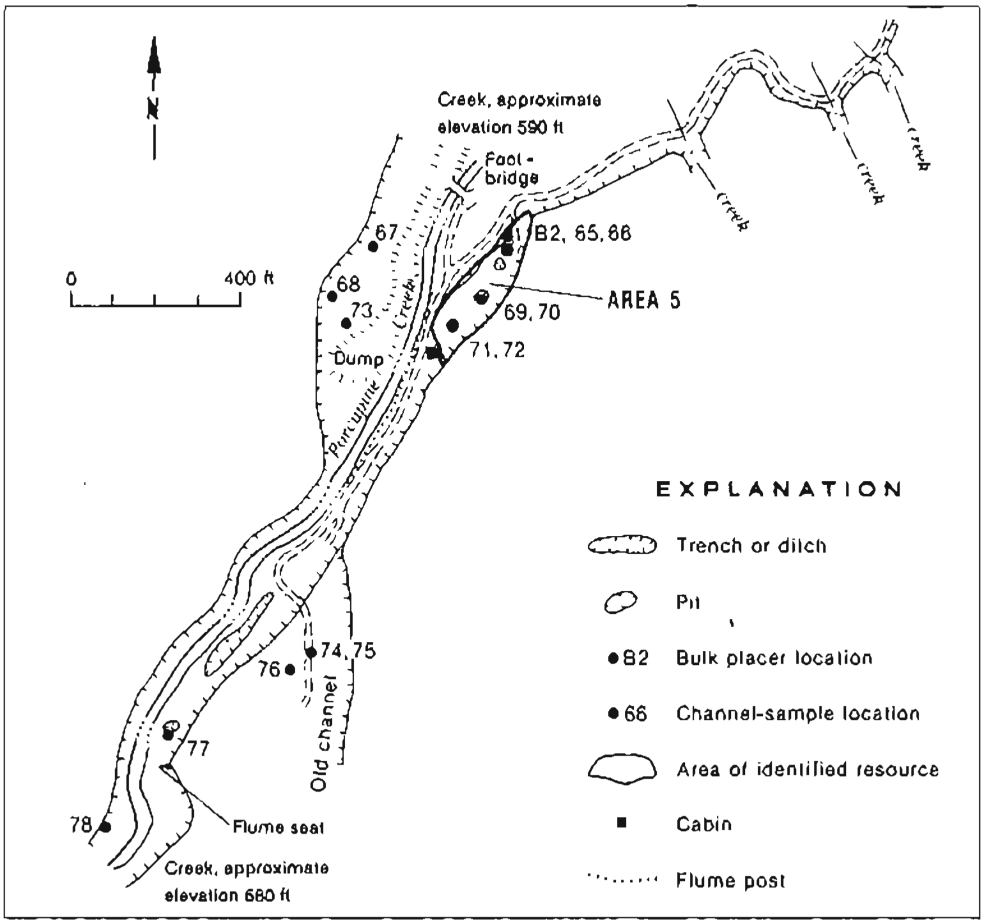


Figure 45. *Placer sample locations, middle Porcupine Creek area.*

PORCUPINE CREEK

Three categories of placer deposits occur on lower Porcupine Creek, below McKinley Creek: abandoned channel and bench deposits, recent stream gravels, and an alluvial fan. Sampling identified the highest grades in the abandoned channels and bench deposits, but the identified resources are limited in quantity. A larger resource occurs in the alluvial fan, but grades are unknown.

Abandoned Channels and Bench Deposits

Five gravel-resource areas on lower Porcupine Creek were blocked out on the basis of channel samples collected in 1985 (figs. 44, 45). These areas consist of abandoned channel and bench gravels, some of which correlate with old channels identified by Beatty (1937). Figures 41 and 44 show where 12 samples were taken from channels labeled b (sample 31), d (60-63), e (64), f (39-41, 50-51), and g (22). These samples contained from a trace to 0.022 oz/yd^3) gold (table 3). Thirty-eight additional channel samples were collected from abandoned channels and bench deposits located farther upstream in the area referred to locally as the "mushroom" (fig. 45, samples 67-68, 73), area 5 (65-66, 69-72), and old channel (74-76). Samples were also taken from bench deposits in areas 1 (32-43) and 2 (44-49, 53-59) of figure 44; these samples contained from a trace to 0.058 oz/yd^3 gold.

Hoekzema and others (1986) report results from four site-specific bulk-placer samples collected from previously unworked gravels on Porcupine Creek for analyzing gravel and gold particle sizes. Figure 46 is a graph of the cumulative results for all four site-specific samples. The graph indicates that over 90 percent of the gold is from -10 to +50 mesh in size and that over half of the gravel is greater than 1 mesh.

Table 2. *Mineral-development-potential ratings and identified resource estimates for drainages in the Porcupine area*

Drainage	Mineral development potential: High	Moderate	Low	Unknown	Identified resources (yd³)[a]
Big Boulder			X		ND
Cahoon		X			10,000
Christmas		X			42,000
Cottonwood				X	ND
Glacier			X		ND
Klehini				X	ND
Little Boulder			X		ND
Little Salmon			X		ND
McKinley	X				20,000
Nugget Channel		X			3,000
Alluvial fan				X	2,000,000
Porcupine (lower)					
Channel		X			500,000
Bench	X				152,000
Alluvial fan				X	6,000,000
Porcupine (upper)			X		ND
Summit			X		ND
Tsirku				X	ND

[a]Identified resources include auriferous gravels identified by USBM in 1985. Additional hypothetical resources are likely to exist but were not evaluated.
ND - Not determined.

Table 3. *Identified resources in bench and abandoned channel deposits in the lower and middle Porcupine Creek drainage area*

Area	Figure	Volume (yd³)[a]	Grade (oz/yd³ Au)[b]	Samples
1	44	21,000	0.0215	B3, 32-43
2	44	75,000	0.0087	B4, 44-59
3	44	23,000	0.0106	60-63
4	44	20,000	0.0038	39-41, 50, 51
5	45	13,000	0.0145	B2, 65-72
Total		**152,000**	**0.0106**	

[a]Volumes were calculated by multiplying the surface area of the block times a thickness chosen on the basis of field information; thickness figures used tended to be minimum values.
[b]Grades were calculated by averaging the grades determined for each channel.

Samples collected indicate a collective identified resource in the five resource areas (figs. 44, 45) of about 152,000 yd³ grading 0.0106 oz/yd³ gold (tables 2, 3). These values are likely to be lower than actual values, as bedrock was not reached at all channel-sample sites.

Additional resources are known to exist along upstream parts of Porcupine Creek but were not evaluated as part of this study. Some of these deposits, such as at Bear Gulch (sheet 5), have been previously mined, but unmined deposits that warrant further evaluation also remain.

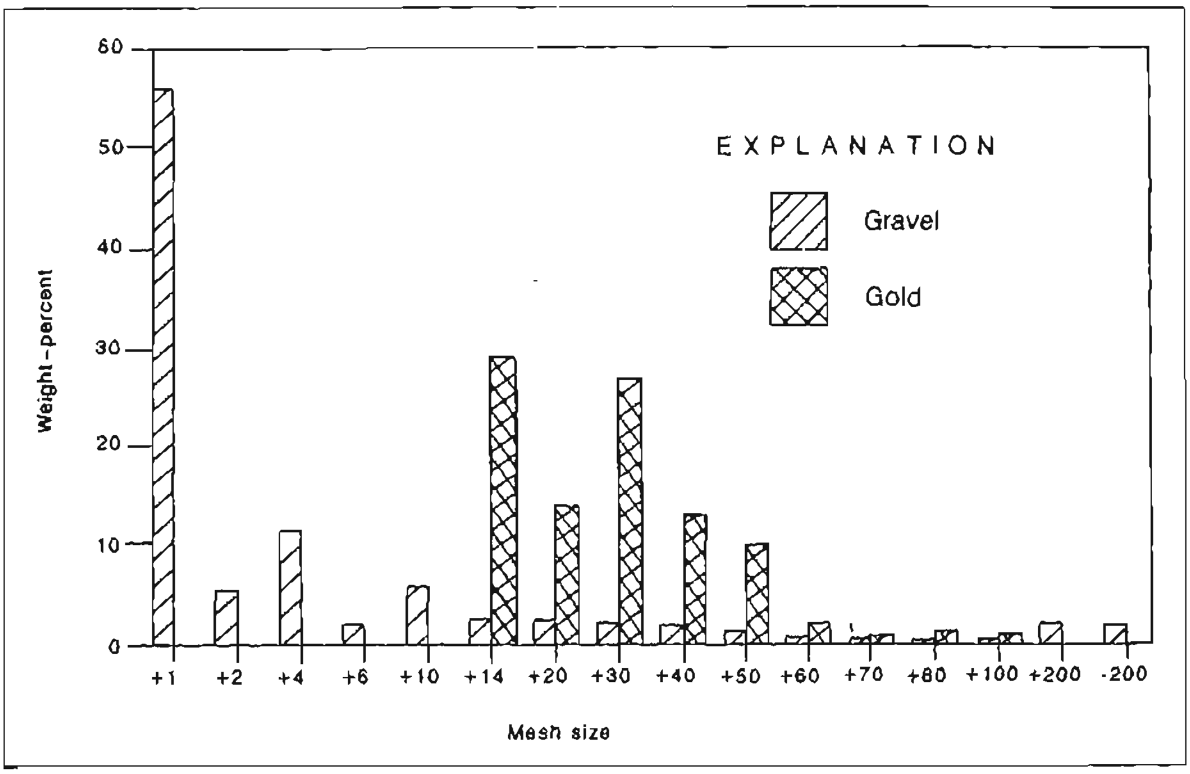


Figure 46. *Histogram of cumulative gold and gravel weight percents for varying sieve sizes, Porcupine Creek samples B1-B4 (figure 44 and 45).*

Recent Stream Gravels

The present-day Porcupine Creek stream deposits consist of poorly to moderately well-sorted gravels containing appreciable silt and boulders weighing up to several tons. Historically, the gravel has been worked with apparently good results. Five samples (figs. 44-45, nos. 26-27, 52, 77, 80) were collected from recent gravel deposits. These samples, which contained from a trace to 0.004 oz/yd^3 gold (sample 80), are representative of surface values only. Because gold values in the Porcupine Creek area are concentrated on bedrock, higher values should be expected at depth. The gold sizes were 3 percent between 0.04 and 0.08 in., 11 percent from 0.02 to 0.04 in., and 86 percent less than 0.02 in.

The best values in stream gravels along Porcupine Creek are concentrating just below McKinley Creek, which is the source of most of the Porcupine Creek placer gold. Apparently, placer gold in this area reconcentrates during periodic flooding. Several thousand feet of streambed beginning about 1,000 ft below McKinley Creek have not been mined completely. This section is virtually inaccessible to large heavy equipment, but suction dredging might be possible. The channel gravels of lower Porcupine Creek comprise an identified resource of at least 500,000 yd^3 of unknown grade based on an average thickness of 18 ft and an average width of 90 ft (table 2). Actual thickness of mined sections is reported to have exceeded 40 ft in some locations (Beatty, 1937).

Alluvial-fan Deposits

Eight samples (sheet 5, nos. 9-10, 23-25, 28-30) were collected on the alluvial fan. However, these samples are mostly representative of recent surface gravels and, with the possible exception of samples 24 and 30, did not test older channel deposits that may exist at depth. Results were encouraging; the samples recovered from a trace to 0.011 oz/yd^3 gold (sample 30). The gold sizes consisted of 1 percent greater than 0.08 in., 23 percent between 0.04 and 0.08 in., 24 percent between 0.02 and 0.04 in., and 52 percent less than 0.02 in.

On the basis of a length of 2,400 ft, width of 1,800 ft, and depth of 40 ft, the Porcupine Fan contains more than 6 million yd^3 of gravel resources (table 2). There may be several potentially high-grade channels at depths of less than 100 ft.

MCKINLEY CREEK

McKinley Creek is the largest northwest-flowing tributary of Porcupine Creek. The average gradient of the creek is nearly 500 ft/mi (fig. 42). Several auriferous gold deposits and occurrences described in this study are located adjacent to the creek at the 1,800-ft elevation about 1-2 mi above its junction with Porcupine Creek (sheet 1).

By 1904, the lower mile of McKinley Creek below Cahoon Creek had been mined. It was remined in 1908. Abandoned channels have also been mined on the west and east sides of McKinley creek below Cahoon Creek. About 4,500 oz of gold was taken before World War I from below McKinley Falls, which is located at the junction of McKinley and Porcupine Creeks.

Reconnaissance samples (sheet 5, nos. 92-98) collected above the Golden Eagle prospect (sheet 1) contained up to 0.0056 oz/yd^3 gold. Samples taken below the lode deposit (sheet 5, nos. 83-91) contained up to 0.0539 oz/yd^3 gold. Identified resources consist of narrow point-bar deposits and channel deposits consisting of a few hundred to 2,000 yd^3 each. About 20,000 yd^3 grading from 0.001 to 0.054 oz/yd^3 gold are estimated to occur on McKinley Creek between sample location 91 and Cahoon Creek (sheet 5). Additional resources exist below Cahoon Creek, but this section has been mined several times in the past, and grades of the remaining gravels are unknown.

CAHOON CREEK

Cahoon Creek is a steep, northeast-flowing tributary to McKinley Creek. The average gradient is 650 ft/mi (fig. 42). Very little gravel is present in the channel of the creek; much of the stream flows on bedrock. Cahoon Creek has been recognized by miners as a source for the gold on McKinley and Porcupine Creeks. The lower 0.5 mi of the creek has been extensively worked.

Steep terrain and the presence of large amounts of brush precluded sampling of the lower 1 mi of Cahoon Creek. Sampling of the rest of the creek was impeded by the lack of gravel present. The nine samples taken indicate that the gold concentration increases as the junction with McKinley Creek is approached (sheet 5, nos. 99-106). The samples contained up to 0.045 oz/yd^3 gold.

Limited quantities of channel gravel occur in Cahoon Creek (table 3). Some potential for abandoned channels or bench deposits may exist, but these deposits have largely been covered or diluted with colluvium and avalanche debris. The channel gravels might be successfully mined on a small scale with suction dredges, especially along the lower 1.5 mi of the creek. An abandoned channel of Cahoon Creek that joins McKinley Creek about 0.25 mi upstream from the current junction should also be investigated.

NUGGET CREEK

Nugget Creek flows south into the Tsirku River. Its average gradient is over 900 ft/mi (fig. 42). Placer deposits are present in the stream bottom, in abandoned channels at high elevations on the east side of the creek, and in an alluvial fan at the mouth of the creek. Alluvium in the lower canyon of the creek is from 12 to 20 ft deep. Gold is found on or near bedrock, with little gold found in the overlying gravel.

Eleven reconnaissance samples were collected from Nugget Creek and its alluvial fan (sheet 5, nos. 116-126). The best value (0.0138 oz/yd^3 gold) was in a sample (116) collected at the mouth of an abandoned channel of Nugget Creek adjacent to the Tsirku River. Only minor amounts of gold (trace to 0.0007 oz/yd^3 gold) were found in the creek itself. A sample (122) collected from a hydraulic cut at the 2,550-ft elevation on the east side of the creek contained 0.0006 oz/yd^3.

Gravel resources in the existing stream channel are limited, but do contain coarse gold. The alluvial fan contains an estimated 2,000,000 yd^3 of identified resource, but the grade remains unknown. Only parts of this volume would be mineable; high grades would likely be restricted to channels.

COTTONWOOD CREEK

Cottonwood Creek, a southeast-flowing tributary of the Tsirku River is located about 1 mi west of Nugget Creek. The average gradient of the creek is 750 ft/mi (fig. 42). Encouraging amounts of gold have been found in the creek, but no extensive mining has been done. Three reconnaissance samples (sheet 5, nos. 113-115) were taken from the creek and found from less than 0.0004 to 0.0005 oz/yd^3 gold.

Gravel resources in the creek channel are small because of the steep gradient and narrow bedrock canyon. The alluvial fan at the mouth of the creek represents a significant resource. This fan coalesces with the Nugget Creek fan. Abandoned channels in the fan between Cottonwood and Nugget Creeks should be investigated.

GLACIER CREEK

Glacier Creek is a northeast-flowing tributary of the Klehini River, located about 2 mi west of Porcupine Creek. The creek is less steep than most of the creeks of the area (fig. 42). Reconnaissance sampling of the drainage found no significant recoverable gold values in seven samples collected (sheet 5, nos. 8, 12-14, 19-21). Christmas Creek is the only auriferous tributary to Glacier Creek identified to date.

CHRISTMAS CREEK

Christmas Creek is a small, northward-flowing eastern tributary of Glacier Creek with a gradient of 1,000 ft/mi (fig. 42). Four reconnaissance samples were collected from gravels exposed in the mining cut near the junction of Christmas and Glacier Creeks (sheet 5, nos. 15-18). Results indicate that there is a relatively equal distribution of gold through 8 ft of gravel. The gold content of the gravel averages 0.0065 oz/yd^3 gold.

Identified resources are largely restricted to the lower 0.5 mi of the creek. The lowermost section of the creek near the workings is estimated to contain 12,000 yd^3 of identified resource grading 0.0065 oz/yd^3 gold. An additional resource of up to 30,000 yd^3 is estimated to occur farther upstream (table 2).

SUMMARY

Reconnaissance sampling in 1985 identified gravel deposits with moderate to high mineral-development potential on lower Porcupine, Cahoon, Christmas, McKinley, and Nugget Creeks. Abandoned channel and bench deposits on lower Porcupine Creek have the best potential for supporting a small to medium-sized (500-1,000 yd^3/day) heavy-equipment placer operation. However, a prospective developer should identify a resource having average grades nearly double those identified by this study (for example, 0.02 oz/yd^3 gold) before making a substantial investment in the area. Recent records compiled by both DGGS and USBM indicate that the average grade being mined by the Alaska placer-mining industry is 0.015 oz/yd^3 and that the average grade is even higher for smaller operations.

A 1-mi-long section of McKinley Creek above Cahoon Creek has high mineral-development potential for small placer operations using suction dredge and hand placer techniques. Moderate development potential for small heavy equipment (50-500 yd^3/day) or hand-placer operations exists on Christmas and Nugget Creeks. However, the greatest potential for future mining on a large scale in the area depends on the results of exploring the alluvial fans of the Porcupine and Nugget Creeks, which together conservatively contain 8,000,000 yd^3 of gravel resource. Site-specific samples collected from lower Porcupine Creek indicate that washing plants should screen to -1 mesh and be designed to recover gold down to +80 mesh.

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APPENDIXES
ABBREVIATIONS AND ANALYTICAL METHODS USED IN APPENDIXES

Sample abbreviations

C	- continuous chip		PC	- pan concentrate
CC	- chip channel		RC	- random chip
CH	- channel		S	- select
Rep or CR	- representative chip		SC	- spaced chip
F	- float		SS	- stream sediment
G	- grab		MTS	- metallurgical test sample

Lithologic and mineralogic abbreviations

aspy	- arsenopyrite	gn	- galena	mz	- monzonite
az	- azurite	hem	- hematite	po	- pyrrhotite
bms	- banded massive sulfide	jm	- jamesonite	py	- pyrite
bn	- bornite	mag	- magnetite	qz	- quartz
calc	- calcite	meta	- metamorphosed	S	- sulfer
cp	- chalcopyrite	ml	- malachite	sl	- sphalerite
ep	- epidote	mn	- manganese	st	- stained
fe	- iron	mo	- molybdenite	sulf	- sulfide
fest	- iron-stained	mv	- metavolcanic		

Additional abbreviations

dissem	= disseminated	-	= not analyzed	El	= elevation
w/	= with	N	= nil	> or G	= greater than
Tr	= trace	<	= less than	SL	= sea level
DDH	= diamond drill hole	NA	= not applicable		

Analytical methods

1983-1985 samples analysed by USBM Research Center in Reno, Nevada, and by Bondar-Clegg, Inc., of Lakewood, Colorado.

1986-1987 samples analysed by Bondar-Clegg, of Lakewood, Colorado.

Most analyses by Bondar-Clegg for Au were by fire assay-atomic absorption spectroscopy (FA-AA); for other elements by atomic absorption spectroscopy (AAS) only.

Supplementary analyses

Analyses consisted of 32-element analysis by plasma or by neutron activation; As by colorimetry; La, Ce, Y, and Ba by X-ray fluorescence; and Pt and Pd by fire-assay inductively coupled argon-plasma spectroscopy (ICP).

APPENDIX A. ANALYTICAL RESULTS FROM VOLCANIC-ASSOCIATED MASSIVE SULFIDE DEPOSITS IN PORCUPINE AREA

Appendix A-1. *Analytical results, Main deposit (map nos. on figs. 2-3)*

Map no.	Sample no.	Sample size (ft)	Sample type	Fire assay: Au (ppm)	Fire assay: Ag (ppm)	Atomic-absorption (ppm unless marked %): Cu	Pb	Zn	Co	X- ray: Ba (%)	Spectrographic (ppm): W	Mo	Sn	As	Ni	Bi	Sb	Lithology, remarks
1	5S156	-	CR	N	0.2	26	2	78	24	0.05	-	-	-	N	32	-	N	pillow metabasalt
2	4S014	-	R	0.035	6.3	62	3200	3500	27	1.10	-	N	N	N	N	N	N	greenschist w/dissem gn
2	4S015	-	R	0.450	103.9	160	1.60%	430	N	52.60	-	N	N	N	N	N	N	barite w/sl,gn
3	4S017A	-	G	N	0.5	67	110	270	87	0.18	-	N	N	N	30	N	N	metabasalt
3	4S017B	1.0	C	1.340	45.4	1470	1.65%	3900	N	42.00	-	N	N	N	9	N	N	barite at contact w/metabasalt
3	4S017C	-	G	2.920	155.4	1830	4.60%	430	N	51.00	-	N	N	N	N	N	N	barite zone w/gn,sl
3	4S017D	7.0	C	1.020	75.6	830	1.33%	250	N	53.00	-	N	N	N	N	N	N	barite zone w/gn,sl
3	4S017E	5.0	C	0.590	138.1	310	1.94%	260	N	51.00	-	N	N	700	N	N	N	barite zone w/gn,sl
3	4S017F	5.0	C	1.340	255.4	1200	2.90%	1420	N	46.00	-	N	N	500	N	N	N	barite zone w/gn,sl
3	4S017G	5.0	C	9.980	356.5	930	9000	290	11	27.70	-	N	N	4000	N	N	N	barite gossan zone
3	4S017H	4.5	C	0.160	150.6	1420	5.70%	6600	N	46.00	-	N	N	N	N	N	N	barite zone
3	4S017I	4.5	C	0.009	2.5	1600	350	3300	21	6.10	-	N	N	N	20	N	N	greenstone
3	4S017J	-	G	0.041	1.1	150	230	1950	90	0.52	-	N	N	N	20	N	N	metabasalt
4	4S019	1.0	C	1.520	258.8	1510	7.20%	7.60%	N	42.00	-	N	N	N	N	N	N	barite w/sl,gn
4	3S118	-	MTS	0.171	34.3	2400	4.98%	1.56%	N	48.40	-	-	-	-	-	-	-	barite w/az,ml,gn
5	4S018A	6.0	CR	N	0.8	120	280	2180	39	0.70	-	N	N	N	10	N	N	greenstone
5	4S018B	2.0	C	N	1.0	210	830	2.65%	30	1.40	-	N	N	N	N	N	N	black-gray fine grained rock
5	4S018C	3.0	C	0.377	3.3	230	780	1610	N	42.00	-	N	N	N	10	N	N	banded barite w/gn,sl
5	4S018D	3.0	C	0.800	19.1	1630	3000	1510	N	45.00	-	N	N	N	N	N	N	banded barite w/gn,sl
5	4S018E	2.0	C	0.680	138.9	1390	1.93%	1430	N	42.00	-	N	N	N	N	N	N	banded barite w/gn,sl
5	4S018F	20.0	SC	0.740	109.5	1270	1.21%	1610	N	45.00	-	N	N	N	N	N	N	banded barite w/gn,sl
5	4S018G	6.0	CR	N	1.2	-	4100	-	N	0.72	-	N	N	N	9	N	N	leminated lmst
6	5S334	5.0	CR	0.040	13.0	127	3350	520	33	0.02	N	N	N	N	20	N	N	altered pillow basalt
7	5S335	4.0	CR	N	1.1	124	266	1540	30	0.78	N	N	N	N	20	N	N	altered pillow basalt in schist
7	5S336	5.0	CR	0.015	1.1	189	265	4080	51	0.82	N	N	N	N	20	N	N	altered pillow basalt to schist
8	5S337	2.0	CR	N	1.0	74	151	1150	20	0.61	N	N	N	N	20	N	N	altered pillow basalt to schist
9	5S338	4.0	CR	0.020	0.8	12	304	41	9	0.34	N	N	N	N	8	N	N	schist w/reminant pillows
10	5S339	4.0	CR	0.010	N	28	26	78	15	0.23	N	N	N	N	20	N	N	qz-sericite schist w/py
11	4S001	15x25	G	N	N	44	24	280	6	0.06	-	N	N	N	20	N	N	ash w/small lens of chert
12	4S002	100.0	CR	N	N	64	65	790	82	0.04	-	N	N	N	N	N	N	altered pillow basalt
13	4S003	0.3	R	N	5.4	91	7800	47	N	0.01	-	N	N	N	20	N	N	qz-calc vein w/gn
14	4S004	0.4	S	N	23.5	21	3.40%	29	N	0.02	-	N	N	N	N	N	N	qz-calc vein w/gn
15	4S010	0.7	C	0.730	124.8	1220	9900	420	N	45.20	-	N	N	300	N	N	N	fest barite zone
15	4S011	6.0	CR	N	1.0	2330	82	3.30%	96	0.14	-	N	N	N	100	N	N	schist
15	4S012	3.0	CR	0.044	11.4	360	870	1390	15	4.50	-	N	N	N	10	N	N	white schistose talc and yellow-st qz
16	4S005	50.0	CR	N	N	88	330	880	62	0.10	-	N	N	N	20	N	N	greenstone w/py
17	4S006	30.0	CR	N	N	260	63	1010	66	0.17	-	N	N	N	40	N	N	qz-mica schist and greenstone
18	4S007	8.0	SC	N	0.5	71	60	140	13	0.14	-	N	N	N	20	N	N	white qz-sericite schist
19	4S023	0.6	C	N	1.1	430	150	1080	39	0.28	-	N	N	N	N	N	N	geothite cemented mica-schist conglomerate
19	4S024	-	G	N	0.7	30	42	110	14	0.16	-	N	N	300	N	N	N	mica-schist /qz-sericite schist w/py
20	3S112	-	MTS	0.171	12.3	100	800	N	N	56.50	-	-	-	-	-	-	-	sandy barite
21	3S258	-	MTS	0.137	35.0	8700	5300	4.64%	N	43.40	-	-	-	-	-	-	-	sericite altered andesite w/py
22	4S027A	1.5	C	0.050	4.4	79	280	160	35	1.38	-	N	N	N	10	N	N	chlorite-sericite schist
22	4S027B	3.4	C	0.350	23.6	160	1720	320	N	50.00	-	N	N	N	9	N	N	barite and gossan w/greenschist
22	4S027C	3.0	C	0.560	29.8	1330	2770	4400	N	54.00	-	N	N	N	N	N	N	barite w/some sulf
22	4S027D	4.0	C	0.202	12.7	140	750	2320	17	12.80	-	N	N	400	20	N	N	barite,schist,gossan,qz
22	4S027E	2.0	C	0.008	1.1	690	53	700	52	1.16	-	N	N	N	20	N	N	qz-mica schist
23	4S026A	2.5	C	-	-	31	N	270	27	0.32	-	N	N	N	N	N	N	meta-andesite or metabasalt
23	4S026B	1.6	C	-	-	48	82	190	29	1.17	-	N	N	N	30	N	N	fault gouge
23	4S026C	2.5	C	N	1.4	360	200	270	43	1.52	-	N	N	N	20	N	N	meta-andesite or metabasalt w/fault gouge,gossan

Appendix A-1. *Analytical results, Main deposit*-Continued

23	4S026D	7.0	C	0.670	19.9	840	2050	1230	N	52.00	-	N	N	N	N	N	N	barite w/sulf
23	4S026E	1.5	C	0.062	13.2	420	700	1210	30	0.78	-	N	N	N	10	N	N	barite lens in greenstone,schist
23	4S026F	0.5	C	0.160	18.8	35	640	62	11	13.90	-	N	N	N	N	N	N	greenstone or schist
24	3S106	0.2	S	N	6.1	8900	4600	7.80%	8	45.00	-	-	-	-	-	-	-	barite w/dissem sl,cp,gn,py
24	3S107	3.0	C	0.607	14.1	1.20%	4700	3.70%	17	22.00	-	-	-	-	-	-	-	barite w/dissem sl,cp,gn,py
24	3S107B	2.0	C	0.043	17.1	1100	2200	1900	4	40.00	-	-	-	-	-	-	-	gossan
24	3S107C	5.0	C	Tr	116.6	6500	5200	2.10%	6	38.00	-	-	-	-	-	-	-	barite w/sl,cp,gn,py
24	3S108	0.4	S	0.343	147.4	1.80%	1800	3.00%	7	42.00	-	-	-	-	-	-	-	barite w/sl,cp,ml
25	4S025A	0.5	C	N	0.4	27	230	730	18	3.20	-	N	N	300	40	N	N	greenstone
25	4S025B	2.8	C	0.012	1.9	120	49	1410	N	29.20	-	N	N	N	N	N	N	massive barite
25	4S025C	0.8	C	N	0.4	43	86	1010	15	9.70	-	N	N	N	60	N	N	banded barite
25	4S025D	0.15	C	N	1.2	130	42	1100	N	43.00	-	N	N	N	N	N	N	barite
26	4S008	-	G	N	0.8	200	100	3900	46	0.44	-	N	N	N	10	N	N	gray schist
27	4S009	-	G	N	N	83	45	720	86	0.21	-	N	N	N	30	N	N	altered porphyritic andesite
28	4S016	6.0	CR	N	0.8	910	120	6800	110	0.36	-	N	N	N	N	N	N	metabasalt
29	5S365	3.0	CR	N	0.5	237	57	970	66	-	-	-	-	-	-	-	-	metabasalt
30	4S013	6.0	C	N	N	39	49	310	74	0.10	-	N	N	N	20	N	N	meta-andesite
31	5S320	2.0	CR	N	N	30	10	157	31	0.017	N	N	N	N	30	N	2000	pillow metabasalt

APPENDIX 2-A
METALLURGICAL TESTS ON BARITE SAMPLES FROM THE MAIN DEPOSIT AND MOUNT HENRY CLAY PROSPECT

Five samples were collected along the Windy Craggy structure in southeast Alaska during the 1983 field season, three from the Main deposit and two from the Mount Henry Clay prospect. The samples were processed at the USBM Albany Research Center (ALRC). The USBM Alaska Field Operations Center (AFOC) and ALRC sample identification numbers are:

	AFOC	ALRC	
Main deposit	3S112	ME 1536	
	3S118	ME 1537	PS 1790
	3S258	ME 1538	PS 1791
Mount Henry Clay prospect	3S323A	ME 1539	PS 1792
	3S323B	ME 1540	

Mineralogical Characteristics

Main deposit

Sample 3S112 (ME 1536). This sample is a white, porous, coarsely crystalline, sugary-textured, considerably dissolved-leached (weathered) friable barite. About 20 percent of the barite and other minerals once contained have been dissolved away. Very minor random iron-oxide stain is present. No sulfide minerals were observed.

Sample 3S118 (ME 1537). This sample is a variably weathered and altered, sugary-textured, equigranular massive barite containing random dark bands of mixed sulfide minerals and magnetite representing about 20 percent of the sample. Most of the bands are thin and discontinuous, but in some areas they are an inch or more thick. The thick bands contain barite mixed with variable amounts of galena and magnetite with minor pyrite, sphalerite, and covellite. Where the specimens show weathering and alteration, some of the barite and all of the sulfide minerals have been altered and leached away, resulting in considerable porosity and leaving crystal molds and scattered magnetite grains. Some of the porous areas contain considerable anglesite and at least two unidentified secondary copper-bearing minerals, one of which may be tenasite $(Cu, Zn)_5(SO_4)_2(OH)_6.6H_2O)$. In the altered areas limonite emphasizes the layering.

Polished surface and SEM examinations of areas selected for high sulfide content (for example, the dark thick bands) show that in addition to the galena, magnetite, and covellite, a fair amount of very fine grained anglesite is present, filling cracks in the barite and closely associated with the covellite. Approximate amounts of each mineral over several areas are as follows: barite 45 percent, galena 20 percent, magnetite 15 percent, anglesite 10 percent, and covellite 10 percent.

Considerable liberation of the samples minerals would be accomplished at 65 mesh; 100 mesh provides more complete liberation with minor locking to finer sizes.

Sample 3S258 (ME 1538). This sample is a sugary-textured, equigranular, massive banded-bedded barite. The banks are generally dark and contain concentrations of honey-colored sphalerite with variable pyrite and small amounts of bornite and galena. The grain size of the sulfide minerals ranges down from about that of the barite to much finer sizes. Some of the exposed surfaces and fracture surfaces are iron oxide stained. Thin layers of muscovite-sericite occur on some fractures parallel to the apparent bedding. A few random solution channels are also present.

Polished-surface, SEM, and SEM-EDAX examinations show that, in addition to the minerals mentioned above, the sample contains variable amounts of celsian, covellite, and tennantite. The celsian contains only

0.9 percent K. The tennantite is a zincian variety with the following analyses: 42.3 percent copper, 8.6 percent zinc, 14.2 percent arsenic, 6 percent antimony, and 28.9 percent sulfur.

Approximate amounts of each mineral over several areas is as follows: barite 54 percent, celsian 15 percent, sphalerite 10 percent, pyrite 10 percent, bornite 5 percent, covellite 3 percent, galena 2 percent, and tennantite 1 percent.

Practical liberation of the mineral components would be at about 100 mesh. Some locking would be evident even at finer sizes.

Mount Henry Clay prospect

Sample 3S323A (ME 1539). This sample is a medium- to fine-grained, sugary- textured, equigranular, bedded mixture of light-yellow to dark-brown sphalerite associated with pyrite and barite with some scattered chalcopyrite and small veins of calcite. The bedding is not selective, and layers contain variable amounts of barite and the sulfide minerals. A few random veins or fracture fillings of mixed pyrite and chlorite were noted. Variable amounts of iron-oxide minerals are present on fracture surfaces. Deposition appears nearly contemporaneous.

Polished-surface, SEM, and SEM-EDAX examinations show that minor amounts of quartz and galena are present in addition to the abovementioned minerals. The matrix appears to be sphalerite and there are no intercrystalline intergrowths of sulfide in one another or in the barite crystals. Chalcopyrite is the finest grained on average; there is some very fine grained pyrite present. The large pyrite crystals show considerable fracturing. Approximate amounts of each mineral over several areas is as follows: sphalerite 47 percent, pyrite 25 percent, barite 15 percent, chalcopyrite 5 percent, calcite 5 percent, quartz 2 percent, and galena 1 percent.

Good liberation should be achieved at 65 mesh with better liberation through 100 mesh.

Sample 3S323B (ME 1540). This sample is a massive, large to medium crystalline gray to white barite containing variably abundant small lenses, veins, and smears of very fine grained chlorite with accompanying small euhedral to subhedral crystals of magnetite. Some small magnetite crystals are scattered in the barite. A trace of pyrite is also present. No other sulfides were observed. Minor iron oxide minerals are present.

SEM micrographs and element display maps are filed with the original of this report and are available for reference.

Beneficiation Characterization

Head analysis of the samples are shown in table A2-1. Zinc analyses ranged from 0.01 to 21.2 percent; copper ranged from 0.01 to 1.15 percent; cobalt and gold were negligible; and significant silver values (about 1 oz/ton) were found in three of the samples.

Sample 3S112 (ME 1536) from the Main deposit and sample 3S323B (ME 1540) from the Mount Henry Clay prospect are high-grade barite. The 1979 Mineral Commodity Profile on barite gives specifications for barite according to its different uses. These are:

1. Weighing mud: .90 to 95 percent minus 325 mesh
.specific gravity of 4.2 or higher
.free of soluble salts
.low percentage of iron oxide.

2. Chemical manufacturing: .minimum 94 percent $BaSO_4$
.maximum 1 percent Fe_2O_3
.maximum 1 percent $SrSO_4$

.trace F
.size range of 4 to 20 mesh.

3. Glass manufacturing: .minimum 95 percent $BaSO_4$
.maximum 2.5 percent SiO_2
.maximum 0.15 percent Fe_2O_3
.preferred size range of 30 to 140 mesh.

Tables A2-2 and A2-3 show the results of sizing samples 3S112 and 3S323B on 28 and 150 mesh and comparing analyses with the above specifications. Only the minus 150 mesh fractures, ground to minus 325 mesh and lached in water, exceeded specifications. The other size fractions very nearly met specifications, and additional tests would be necessary to determine whether they could be sufficiently upgraded.

Tables A2-4 to A2-7 show the results of flotation studies on samples 3S118 (ME 1537), 3S258 (ME 1538), and 3S323A (ME 1539). The objective was selective flotation to produce a barite product and a sulfide product.

Tables A2-4, A2-6, and A2-7 describe methods in which $Cuso_4$ was used as an activator for sphalerite prior to sulfide flotation with a xanthate collector and silica flotation with an amine collector. Barite remained in the nonfloat tailings. Recovery of zinc in the sulfide products ranged from 87 percent to 99 percent, and recovery of Ba in the nonfloat barite products ranged from 89 percent to 90 percent. The specific gravity of the barite product was 4.3 g/cc in two of the tests and 3.7 g/cc in the other.

Table A2-5 describes a study on sample 3S258 (ME 1538) in which sulfides were floated with $CuSO_4$ and a xanthate collector, and then barite was floated with $Na_2O.SiO_2$ and a petroleum sulfonate-type promoter. Recovery of zinc was 98 percent in the sulfide float product and Ba recovery was 94 percent in the two barite float products.

The results reported here ae the best to date, but they should not be regarded as the best obtainable. No attempts have been made to optimize conditions, reagent selection, or reagent addition.

Table A2-3. *Analysis of sized fractions of sample 3S323B (ME 1540) from the Mount Henry Clay prospect*

Size fraction	Analysis (%)								
	Ba	SO_4	$BaSO_4$[1]	Fe_2O_3	Total Fe	$SrSO_4$	F	SiO_2	Specific gravity (g/cc)
Plus 28 mesh	53.6	38.4	92.2	0.56	0.48	1.43	0.71		4.3
Chemical-grade barite specifications			G94.0	L1.00		L1.00	trace		
28 by 150 mesh	55.0	39.4	94.6	0.50	0.49			2.82	4.4
Glass-grade barite specifications			95.0	L0.15				L2.50	
Minus 150 mesh, ground to minus 325 mesh and leached[2]	55.2	39.1	94.4	0.52					4.6
Weighting mud barite specifications									G4.2

[1]Average value calculated from the Ba and SO_4 analyses.

[2]Tap-water leach, 50°C, 5 hour, 5% pulp density, agitation. Magnetite (0.2%) collected on the magnetic stirring bar and was removed before chemical analysis. H_2O - soluble weight loss of 0.4%.

Table A2-4. *Results of flotation of sample 3S118 (ME1537) from the Main deposit*

Metallurgical results

Product	Weight (%)	Analysis (%)					Distribution (%)				
		Ba	SO_4	Pb	Zn	SiO_2	Ba	SO_4	Pb	Zn	SiO_2
Pb sulfide float	10.1	31.2	22.4	15.0	12.4	L0.05	6.4	6.6	32.7	80.3	0.0
Zn sulfide float	2.8	38.2	26.5	14.4	4.0	2.90	2.2	2.2	8.7	7.2	1.5
Silica float	1.5	39.0	26.2	9.7	1.6	8.40	1.2	1.2	3.1	1.5	2.3
Barite tailings[1]	85.6	51.5	35.8	3.0	0.2	6.10	90.2	90.0	55.5	11.0	96.2
Composite or total	100.0	48.9	34.0	4.6	1.6	5.40	100.0	100.0	100.0	100.0	100.0
Head		48.4	34.4	5.0	1.6	6.30					

Test procedure

Reagents	Condition	Pb sulfide float	Condition	Condition	Zn sulfide float	Condition	Silica float
$CuSO_4$			0.1 lb/st				
Potassium amylxanthate	0.05 lb/st			0.05 lb/st			
Frother	0.05 lb/st						
Amine Promoter						0.1 lb/st	
pH (natural = 5.8)	5.8		6.0	6.0		6.1	
Time (minutes)	1	4	10	1	2	3	2

[1]Specific gravity 4.3 g/cc

Table A2-5. *Results of flotation of sample 3S112 (ME 1536) from the Main deposit*

Metallurgical results

Product	Weight (%)	Analysis (%) Ba	SO_4	Zn	Distribution (%) Ba	SO_4	Zn
Sulfide float	18.0	5.9	4.8	23.9	2.4	2.9	97.7
Barite float I	73.2	55.1	38.1	0.1	91.0	92.2	1.7
Barite float II	3.6	42.5	26.3	0.3	3.5	3.1	0.2
Tailings	5.2	26.2	10.3	0.3	3.1	1.8	0.4
Composite or total	100.0	44.3	30.2	4.4	100.0	100.0	100.0
Head		43.4	31.0	4.6			

Test procedure

Reagents	Condition	Condition	Sulfide float	Condition	Condition	Barite float I	Condition	Barite float II
$CuSO_4$	0.5 lb/st							
Potassium amylxanthate		0.1 lb/st						
Frother		0.05 lb/st						
$Na_2O.SiO_2$				4 lb/st				
Petroleum sulfonate promoter					2 lb/st		1 lb/st	
pH (natural = 6.2)	5.9	6.2		9.3	9.2		8.9	
Time (minutes)	10	1	4	2	2	3	2	3

Table A2-6. *Results of flotation of sample 3S258 (ME 1538) from the Main deposit*

Metallurgical results

Product	Weight (%)	Analysis (%) Ba	SO_4	Zn	SiO_2	Distribution (%) Ba	SO_4	Zn	SiO_2
Sulfide float	19.4	17.1	7.7	22.9	2.4	7.2	4.8	97.5	12.7
Silica float I	2.1	34.4	24.4	1.4	11.7	1.6	1.6	0.6	6.7
Silica float II[1]	1.5	28.2	19.6	0.7	17.9	0.9	0.9	0.2	7.3
Barite tailings	77.0	53.8	37.4	0.1	3.5	90.3	92.7	1.7	73.3
Composite or total	100.0	45.9	31.1	4.6	3.7	100.0	100.0	100.0	100.0
Head		43.4	31.1	4.6	4.4				

Test procedure

Reagents	Condition	Condition	Sulfide float	Condition	Sulfide float 1	Condition	Silica float II
$CuSO_4$	0.5 lb/st						
Potassium amylxanthate		0.1 lb/st					
Frother		0.05 lb/st					
Amine Promoter				0.1 lb/st		0.01 lb/st	
pH (natural = 5.9)	5.6	5.9		6.4		6.6	
Time (minutes)	1	10	5	3	3	3	3

[1] Specific gravity 4.3 g/cc

Table A2-7. *Results of flotation of sample 3S323A (ME 1539) from the Mount Henry Clay prospect*

Metallurgical results

Product	Weight (%)	Analysis (%)				Distribution (%)			
		Ba	SO_4	Zn	SiO_2	Ba	SO_4	Zn	SiO_2
Sulfide float I	61.3	1.3	1.0	29.0	1.5	6.4	6.8	84.1	16.9
Sulfide float II	6.3	5.6	4.2	49.7	2.6	2.9	2.9	14.8	3.0
Silica float	0.9	24.2	16.9	2.8	17.4	1.8	1.7	0.1	2.9
Barite tailings[1]	31.5	34.9	25.4	0.7	13.3	88.9	88.6	1.0	77.2
Composite or total	100.0	12.4	9.0	21.2	5.4	100.0	100.0	100.0	100.0
Head		11.9	7.3	21.2	5.4				

Test procedure

Reagents	Condition	Condition	Sulfide float I	Condition	Sulfide float II	Condition	Silica float
$CuSO_4$	1 lb/st						
Potassium amylxanthate		0.1 lb/st		0.1 lb/st			
Frother		0.05 lb/st		0.05 lb/st			
Amine Promoter						0.5 lb/st	
pH (natural = 5.9)	6.6	6.7		7.2		7.4	
Time (minutes)	10	1	7	1	4	3	2

[1] Specific gravity 3.7 g/cc

Table A2-1. *Head analyses*

Sample		Location	Analysis (%)											
AFOC No.	ME No.		Ba	Ca	Cu	Co	Fe_2O_3	Total Fe	Pb	S	SO_4	SiO_2	Sr	Zn
3S112	1536	Main Deposit	56.5	0.07	0.01	L0.005	0.64	0.48	0.08	14.3	39.0	1.54	0.10	L0.01
3S118	1537	Main Deposit	48.4	0.41	0.24	L0.005	0.41	1.51	4.98	13.4	34.4	6.27	0.09	1.56
3S258	1538	Main Deposit	43.4	0.44	0.87	L0.005	4.19	4.17	0.53	17.5	31.1	4.44	0.06	4.64
3S323A	1539	Mt. Henry Clay	11.9	1.58	1.15	0.005	18.80	14.60	0.17	32.0	7.3	5.40	0.04	21.20
3S323B	1540	Mt. Henry Clay	54.3	0.86	0.01	L0.005	0.63	0.59	L0.02	14.1	38.2	3.81	0.42	L0.01

Sample		Analysis (oz/st)			
AFOC No.	ME No.	Pt	Pd	Au	Ag
3S112	1536	L0.001	L0.001	0.005	0.36
3S118	1536	L0.001	L0.001	0.005	1.00
3S258	1538	L0.001	L0.001	0.004	1.02
3S323A	1539	L0.001	L0.001	0.006	1.22
3S323B	1549	L0.001	L0.001	L0.0008	L0.04

Table A2-2. *Analysis of sized fractions of sample 3S112 (ME 1536) from the Main deposit*

Size fraction	Analysis (%)								
	Ba	SO_4	$BaSO_4$ [1]	Fe_2O_3	Total Fe	$SrSO_4$	F	SiO_2	Specific gravity (g/cc)
Plus 28 mesh	57.2	40.4	97.7	0.31	0.29	1.13	0.19		4.5
Chemical-grade barite specifications		G94.0	L1.00		L1.00	trace			
28 by 150 mesh, unleached	57.9	40.9	98.9	0.24	0.22			0.29	4.5
28 by 150 mesh, H_2SO_4 leached[2]				0.20	0.14				
28 by 150 mesh, HCl leached[2]				0.21	0.15				
Glass-grade barite specifications			G95.0	L0.15				L2.50	
Minus 150 mesh, ground to minus 325 mesh and leached[3]	56.0	39.7	95.9	0.88					4.5
Weighting mud barite specifications									G4.2

[1] Average value calculated from the Ba and SO_4 analyses.

[2] 10% acid, 3.5 hour, 25% pulp density, agitation.

[3] Tap-water leach, 50°C, 5 hour, 5% pulp density, agitation. H_2O - soluble weight loss of 0.4%.

Appendix A-3. *Analytical results from Mount Henry Clay prospect (map nos. on figs. 4, 6-7)*

Map no.	Sample no.	Sample size (ft)	Sample type	Fire assay Au (ppm)	Fire assay Ag (ppm)	Atomic absorption (ppm unless marked %) Cu	Pb	Zn	Co	X-ray Ba (%)	Spectrographic (ppm) W	Mo	Sn	As	Ni	Bi	Sb	Lithology, remarks
1	4S198	-	R	N	N	-	-	-	-	N	-	-	-	-	-	-	-	foliated diorite
2	4S102	0.5	F	-	-	17.	22	50	N	50.000	-	-	-	-	-	-	-	barite w/sparse sulf
2	4S103	0.5	F	-	-	1.93%	2540	6.30%	N	29.900	-	-	-	-	-	-	-	barite w/cp,py,sl
2	4S104	0.6	F	-	-	5300	2690	4.50%	26.	17.200	-	-	-	-	-	-	-	barite w/cp,sl
2	4S105	-	SS	-	-	200	53	490	51	0.154	-	-	-	-	-	-	-	
3	4S100	1.0	CR	-	-	2020	6600	3.20%	N	8.500	-	-	-	-	-	-	-	felsite sulf boulder w/ barite,cp,sl
3	4S101	0.6	CR	-	-	1.23%	4.40%	5.50%	N	20.400	-	-	-	-	-	-	-	qz-barite w/po,sl,gn
4	4S099	1.8	CR	-	-	5200	800	4.10%	26	11.000	-	-	-	-	-	-	-	felsite sulf boulder w/ barite,cp,sl
4	3S352	0.3	F	Tr	6.9	3600	97	18.00%	66	0.400	-	N	N	N	N	N	N	chloritic phyllite w/sl,cp
4	3S353	-	F	Tr	Tr	550	60	3000	33	0.340	-	N	N	N	10	N	N	chloritic phyllite w/ ez,sl,cp,py
5	4S197	10.0	CR	N	N	-	-	-	-	0.086	-	-	-	-	-	-	-	fest greenschist
6	3S378	-	G	N	N	65	1300	510	22	0.030	-	N	N	N	10	N	N	altered tuff w/mag,sulf
7	3S377	5.0	SC	Tr	Tr	33	1400	620	29	0.070	-	N	N	N	N	N	N	argillite w/sulf
7	5S356	6.0	CR	N	N	32	2	850	33	-	-	-	-	-	-	-	-	metabasalt
7	5S357	6.0	CR	N	0.5	143	42	735	12	-	-	-	-	-	-	-	-	agglomerate
7	5S358	1.5	CR	N	0.3	11	7	26	1	-	-	-	-	-	-	-	-	siliceous tuff
8	5S359	2.0	CR	0.015	1.3	233	173	810	10	-	-	-	-	-	-	-	-	shale
9	5S354	5.0	CR	0.025	0.5	61	91	258	7	-	-	-	-	-	-	-	-	fest meta-andesite
9	5S355	5.0	CR	N	N	13	23	263	23	-	-	-	-	-	-	-	-	fest meta-andesite w/ 0.05 ft py bands
10	5S353	4.0	CR	N	0.7	96	60	170	20	-	-	-	-	-	-	-	-	greenschist
11	5W875	0.5	R	N	N	154	22	58	19	-	-	-	-	-	-	-	-	qz vein
12	5S352	5.0	CR	0.005	0.7	14	32	32	N	-	-	-	-	-	-	-	-	shale
13	3S349	-	F	Tr	Tr	12	160	N	18	1.250	-	N	N	N	9	N	N	sericite phyllite w/py
13	3S350	-	F	0.340	0.3	220	3300	3400	N	47.000	-	N	N	N	N	N	N	barite w/sl,gn,py
13	3S351	-	F	Tr	Tr	5700	51	N	15	0.408	-	N	N	N	10	N	N	qz-calc vein in phyllite w/cp
14	3S347	-	F	0.680	82.0	600	3700	9600	N	38.000	-	N	N	N	N	N	N	banded barite w/sl,gn
15	3S341	-	CR	N	3.4	170	43	280	15	0.020	-	N	N	N	N	N	N	fest schist w/py
15	3S342	-	F	Tr	Tr	19	30	N	18	11.400	-	N	N	300	30	N	N	muscovite schist w/barite,py
15	3S343	-	F	Tr	24.0	1.	N	64	23	0.160	-	N	N	N	10	N	N	qz and phyllite
15	3S344	-	G	Tr	Tr	51	39	N	26	0.020	-	N	N	N	N	N	N	phyllite w/mag
15	3S345	-	SS	-	-	170	54	300	34	0.140	-	N	N	N	30	N	N	
15	3S346	-	F	Tr	3.4	140	N	5.	12	0.070	-	N	N	N	8	N	N	muscovite phyllite w/py
16	3S271	-	SS	Tr	Tr	240	47	910	47	0.250	-	N	N	N	20	N	N	
16	4S029	0.3	F	0.024	42.4	2800	440	2.90%	8	40.000	-	N	N	N	9	N	N	barite w/cp,sl
17	3S317	-	G	Tr	Tr	670	110	410	N	0.110	-	N	N	N	10	N	N	silicified tuff w/mt,cp
17	3S318	-	F	Tr	14.0	700	5000	1.30%	N	49.000	-	N	N	N	9	N	N	bms w/barite,sl,gn,py
17	3S381	0.05	F	Tr	17.0	5.20%	49	470	48	0.030	-	N	N	N	N	N	N	chloritic phyllite w/ 0.05 ft band of cp,ml
17	3S382	3.0	F	Tr	Tr	2200	40	360	46	0.040	-	N	N	N	10	N	N	same boulder as above w/py,cp
18	3S379	0.1	RC	Tr	Tr	3.50%	52	520	76	0.070	-	N	N	N	60	N	N	cp,py,qz-calc band
18	3S380	10.0	RC	N	N	380	41	200	50	0.010	-	N	N	N	N	N	N	chloritic phyllite w/py,mag
19	3S316	-	F	0.170	Tr	3500	9200	8.1%	N	40.000	-	N	N	N	9	N	N	barite boulder w/sl,cp,gn,py
19	4S028	-	G	N	N	74	N	460	21	0.220	-	N	N	N	20	N	N	greenstone w/py
20	3S315	0.6	F	Tr	34.0	2.20%	210	850	53	0.090	-	N	N	N	100	N	N	bms w/cp,py
20	3S322	-	F	N	3.4	46	N	660	N	0.070	-	N	N	N	9	N	N	chloritic phyllite w/py
20	3S383	0.8	F	Tr	10.0	8000	200	1600	64	0.020	-	N	N	700	N	N	N	massive py w/cp,calc
21	3S319	0.25	F	0.170	Tr	160	490	29	20	0.180	-	N	N	N	N	N	N	meta-andesite tuff w/py
21	3S320	-	F	4.110	62.0	5300	6500	7.60%	N	41.000	-	N	N	N	20	N	N	bms w/barite,sl,gn,cp,py
21	3S321	-	F	Tr	21.0	3600	1600	35.00%	N	16.800	-	N	N	N	20	N	N	bms w/barite,sl,cp,py
22	3S313	-	F	Tr	3.4	31	89	450	N	0.130	-	N	N	N	N	N	N	altered silicified andesite w/ py

Appendix A-3. *Analytical results from Mount Henry Clay prospect*-Continued

22	3S314	-	F	N	27.0	840	1.20%	3.30%	N	45.000	-	N	N	N	N	N	N	barite boulder w/sl,gn
23	3S310	0.6	F	Tr	27.0	1.10%	2700	10.90%	N	40.000	-	N	N	1000	10	N	N	banded barite w/sl,cp,gn
23	3S311	1.3	F	N	3.4	33	31	260	N	0.100	-	N	N	N	N	N	N	altered tuff w/py
23	3S312	0.8	F	Tr	27.0	400	6100	10.00%	N	41.000	-	N	N	N	N	N	N	bms w/barite,sl,gn,py
24	3S309	-	F	Tr	27.0	5900	8400	8.00%	N	44.000	-	N	N	N	8	N	N	banded barite w/sl,cp,gn
25	3S291	2.0	F	Tr	21.0	1.10%	3700	8.30%	N	34.000	-	N	N	400	30	N	N	chloritic phyllite w/ barite,sl,cp
25	3S292	1.0	F	Tr	24.0	8700	1500	21.00%	N	20.900	-	N	N	N	10	N	N	bms w/barite,sl,py,cp
26	3S308	0.8	F	0.340	14.0	5300	36	5000	N	3.300	-	N	N	N	N	N	N	calc boulder w/barite,cp,sl
27	3S281	6.0	F	Tr	65.0	2.50%	1100	33.00%	N	5.000	-	N	N	600	N	N	N	bms w/barite,sl,cp,gn,py
27	3S289	1.0	F	Tr	24.0	9800	940	30.00%	N	4.300	-	N	N	900	50	N	N	bms w/barite,sl,cp,py
27	3S290	1.0	F	Tr	21.0	7000	160	20.00%	100	0.650	-	N	N	600	N	N	N	bms w/barite,sl,cp,py
28	3S279	-	S	Tr	38.0	7.40%	61	1.50%	N	0.060	-	N	N	N	10	N	N	cp lens in qz-calc vein
29	3S280	-	RC	N	N	250	32	630	15	0.300	-	N	N	N	N	N	N	chloritic phyllite w/hem
30	3S278	2.4	F	0.690	34.0	3.10%	1400	30.00%	N	4.500	-	N	N	1000	30	N	N	bms w/barite,sl,py,cp
30	3S339	1.5	F	Tr	62.0	2800	3000	37.00%	N	4.800	-	N	N	600	40	N	N	bms w/barite,sl,py,cp
30	3S340	2.4	F	Tr	45.0	1.60%	2500	29.00%	N	12.800	-	N	N	800	30	N	N	bms w/barite,sl,py,cp
30	4S030	1.0	F	N	N	37	N	250	N	49.000	-	N	N	N	N	N	N	barite
30	4S031	0.75	F	N	115.3	12.50%	650	3.70%	27	0.340	-	N	N	N	N	N	N	massive cp,sl boulder
30	4S032	1.8	F	0.200	38.9	5800	1.50%	24.40%	N	19.100	-	N	N	900	10	N	N	bms w/barite
31	3S287	-	F	Tr	Tr	N	N	26	N	49.000	-	N	N	N	N	N	N	barite boulder
31	3S288	1.0	F	Tr	45.0	8700	530	38.00%	N	5.900	-	N	N	700	30	N	N	bms w/barite,sl,cp,py
31	4S112	3.0	F	0.240	28.8	2.00%	900	21.10%	7	2.110	-	N	300	700	300	N	3000	bms boulder w/sl,cp
31	4S113	0.4	F	N	1.9	310	84	750	24	8.800	-	N	N	600	300	N	4000	white-gray schist
32	3S282	1.2	F	0.340	44.0	1.50%	1600	44.00%	N	2.900	-	N	N	400	N	N	N	bms w/barite,sl,cp
32	3S283	-	F	Tr	17.0	1900	90	4.40%	N	16.300	-	N	N	300	50	N	N	bms w/barite,sl,py,cp
32	3S284	-	F	Tr	51.0	4800	1700	31.00%	N	8.900	-	N	N	N	30	N	N	bms w/barite,sl,py,gn,cp
33	3S293	-	F	Tr	48.0	3.20%	660	28.00%	N	12.700	-	N	N	700	20	N	N	bms w/barite,sl,cp
34	3S305	-	F	0.023	5.3	1.40%	N	91	N	5.600	-	N	N	N	9	N	N	barite-calc boulder w/cp,py,ml
35	3S294	-	F	Tr	3.4	83	N	670	15	0.020	-	N	N	N	9	N	N	chloritic phyllite w/py,mag
36	3S286	-	F	Tr	Tr	80	120	980	19	0.790	-	N	N	N	N	N	N	chloritic phyllite w/py
36	3S285	-	F	Tr	24.0	1.80%	990	5400	35	1.680	-	N	N	300	60	N	N	chloritic phyllite w/ barite,cp,py,ml
37	3S270	-	F	0.023	N	210	42	1100	31	0.060	-	N	N	N	20	N	N	
38	3S276	-	F	-	-	2.50%	-	2050	3	-	-	-	-	-	-	-	-	altered tuff w/cp,sl,ml
38	3S277	-	F	Tr	Tr	210	N	380	N	45.000	-	N	N	N	8	N	N	barite boulder w/py
39	3S275	-	F	Tr	17.1	2.20%	N	240	N	0.160	-	N	N	N	N	N	N	silicified tuff w/cp
40	3S326	-	F	Tr	65.0	8.00%	74	4.60%	17	0.090	-	N	N	N	30	N	N	chloritic phyllite w/ qz bands,cp,sl
41	3S325	-	F	N	3.4	1700	N	130	N	34.000	-	N	N	N	N	N	N	barite boulder w/cp,mag
42	3S324	-	F	N	Tr	33	43	360	24	0.010	-	N	N	N	40	N	N	chloritic phyllite w/mag
43	3S328	-	F	Tr	3.4	690	N	1000	N	10.900	-	N	N	N	10	N	N	barite boulder w/sl,cp
44	3S327	-	F	N	Tr	1300	74	4.60%	30	26.000	-	N	N	N	N	N	N	banded barite w/sl,cp,ml,mag
45	3S274	-	F	N	N	570	N	12	N	14.000	-	N	N	N	N	N	N	qz-barite w/cp,ml
46	3S411	-	F	Tr	1.0	2.10%	47	190	17	0.120	-	-	-	-	-	-	-	chloritic phyllite w/qz,py,cp
46	3S412	-	F	Tr	Tr	290	N	130	N	49.000	-	-	-	-	-	-	-	barite
46	4S106	2.0	RC	0.204	1.3	150	N	120	N	0.080	-	N	50	400	9	N	N	qz-barite vein
46	4S107	6.0	RC	N	N	63	N	210	39	0.052	-	N	N	500	100	N	2000	massive meta-andesite
46	4S108	1.5	RC	N	0.6	310	N	190	5	25.300	-	N	30	400	20	N	N	three barite veins 0.3 ft thick
47	3S272	2.0	G	Tr	Tr	610	N	170	10	14.600	-	N	N	N	8	N	N	calc,qz,barite lens w/cp,ml
47	3S272A	-	F	N	6.9	140	N	130	35	0.320	-	N	N	N	10	N	N	chloritic phyllite w/py
47	4S111	0.3	F	N	N	26	20	90	6	0.046	-	N	N	N	N	N	N	qz-barite w/greenschist
48	3S410	-	G	Tr	Tr	26	66	190	21	0.030	-	-	-	-	-	-	-	chloritic phyllite
48	4S109	3.0	RC	N	N	39	20	140	48	0.030	-	N	N	400	90	N	2000	meta-andesite
48	4S110	5.0	C	N	N	47	N	370	46	0.098	-	N	N	N	70	N	2000	fest greenschist
49	5S306	20.0	CR	0.025	0.7	32	58	150	9	0.560	N	N	N	N	20	N	N	fest sericite schist w/py
49	5S307	0.25	C	N	0.7	18	105	112	4	N	N	N	N	N	N	N	N	qz-calc vein
49	5S308	20.0	CR	N	N	27	51	136	27	0.032	N	N	N	N	20	N	1000	meta-andesite
50	5S309	3.0	CR	0.030	0.9	121	372	735	16	0.206	N	N	N	N	20	N	N	fest slate
51	5S310	-	G	N	N	15	42	200	19	0.116	N	N	N	N	N	N	N	greenstone,meta-andesite

Appendix A-4. *Analytical results from Hanging Glacier prospect (map nos. on fig. 11)*

				Fire assay		Atomic absorption (ppm unless marked %)				X- ray		Spectrographic (ppm)						
Map no.	Sample no.	Sample size (ft)	Sample type	Au (ppm)	Ag (ppm)	Cu	Pb	Zn	Co	Ba (%)	W	Mo	Sn	As	Ni	Bi	Sb	Lithology, remarks
1	3S153	2.0	C	N	0.8	5	33	5	N	0.010	-	N	50	N	20	N	N	fe-st qz vein w/chlorite
2	3S149	3.0	G	N	15.2	10	1.20%	2100	N	54.000	-	N	N	N	N	N	N	barite w/gn,sl
3	3S154	2.5	C	1.029	58.3	3600	2.30%	9.50%	14	8.400	-	N	N	N	N	N	N	qz-calc w/barite,sl,gn,cp,py
3	3S155	2.0	CR	1.575	15.1	1300	1600	14.10%	22	7.000	-	N	N	N	8	N	N	brown schist w/barite,sl,cp,gn, py
3	3S156	3.0	C	N	16.0	140	9000	2.10%	18	2.700	-	N	N	N	N	N	N	rock w/qz-calc veins w/sl,gn, py
4	3S157	-	F	N	0.9	45	81	N	43	0.210	-	N	N	N	20	N	N	altered andesite w/qz,py, epidote
4	3S158	-	F	N	0.7	35	N	N	42	0.300	-	N	N	N	20	N	N	fest chloritic phyllite w/py
5	3S150	-	S	Tr	174.9	10	1.50%	6100	N	11.000	-	N	60	N	10	N	N	qz-barite w/gn,sl
5	3S151	-	G	-	-	-	-	-	-	-	-	-	-	-	-	-	-	schist w/py,ml
5	3S152	-	G	-	113.1	33	120	2400	22	0.110	-	N	N	N	20	N	N	altered andesite w/chlorite, epidote,sl,ml
5	4S063A	3.5	C	0.023	13.2	19	1230	280	37	7.100	-	N	N	N	20	N	N	yellow schist w/barite,sl,gn
5	4S063B	3.5	C	N	28.9	14	1750	1540	29	12.900	-	N	N	N	20	N	N	50% schist,50% barite
5	4S063C	-	G	N	0.6	33	41	650	8	0.188	-	N	N	N	10	N	N	shale
5	4S064A	1.0	G	N	N	64	22	210	87	0.300	-	N	N	N	40	N	N	meta-andesite
5	4S064B	9.5	SC	N	96.9	420	1280	840	20	19.500	-	N	N	N	N	N	N	yellow schist w/barite
5	4S064C	1.0	CH	N	5.8	120	80	1710	38	1.580	-	N	N	900	30	N	N	black shale
6	3S144	-	G	N	12.1	25	950	6	15	0.710	-	N	N	N	N	N	N	silicified tuff
6	3S145	-	G	N	N	130	380	110	97	0.040	-	N	N	N	10	N	N	chlorite altered andesite
7	3S146	-	S	N	133.4	120	6900	5200	21	9.200	-	N	N	N	10	N	N	phyllite w/barite,sl,gn
7	3S147	-	G	N	N	57	120	48	62	0.070	-	N	N	N	20	N	N	phyllite w/py
7	3S148	-	G	N	198.9	110	6500	2100	25	42.000	-	N	N	N	N	N	N	barite w/sl,gn
8	4S065	-	G	N	0.4	42	26	180	44	0.058	-	N	N	N	20	N	N	fest greenstone w/py
9	4S066	-	G	N	N	44	18	100	84	0.038	-	N	N	N	30	N	N	meta-andesite
10	4S067	8.0	SC	N	N	15	N	110	10	3.300	-	N	N	N	10	N	N	fest schist w/barite
11	4S068	-	G	N	N	16	N	150	63	0.046	-	N	N	N	N	N	N	meta-andesite,greenstone

Appendix A-5. *Analytical results from Cap prospect (map nos. on fig. 12)*

Map no.	Sample no.	Sample size (ft)	Sample type	Fire assay Au (ppm)	Fire assay Ag (ppm)	Atomic absorption (ppm unless marked %) Cu	Pb	Zn	Co	X-ray Ba (%)	Spectrographic (ppm) W	Mo	Sn	As	Ni	Bi	Sb	Lithology, remarks
1	3S126	-	G	N	0.6	66	120	1	100	0.240	-	-	-	-	-	-	-	metabasalt
2	4S033	6.0	CR	N	.9	140	130	1040	130	0.400	-	N	N	N	20	N	N	greenstone
3	4S034	6.0	CR	0.084	9.3	66	88	250	35	7.400	-	N	N	600	30	N	N	fest qz sericite schist
4	4S035	1.5	CR	0.052	22.9	31	N	340	N	55.000	-	N	N	N	9	N	N	barite w/py,sl
5	4S036A	-	G	N	N	29	22	-	90	0.380	-	N	N	N	30	N	N	altered basalt w/some sulf
5	4S036B	1.0	C	0.039	2.9	82	41	180	48	17.800	-	N	N	500	20	N	N	black shale
5	4S036C	0.8	C	N	2.2	33	30	270	21	1.460	-	N	N	N	40	N	N	dike
5	4S036D	-	G	0.008	15.8	82	95	780	27	2.200	-	N	N	700	20	N	N	fest schist
5	4S036E	7.0	SC	0.120	62.2	20	640	810	N	53.000	-	N	N	N	N	N	N	barite w/py
5	4S036F	-	G	0.129	14.9	34	30	88	N	3.100	-	N	N	500	10	N	N	fest qz sericite schist w/py
6	3S123	1.5	C	0.093	23.3	89	270	590	41	10.000	-	-	-	-	-	-	-	altered tuff w/py
7	3S121	8.0	C	1.371	227.7	10	700	1800	N	50.000	-	-	-	-	-	-	-	barite,qz w/sulf
8	3S122	-	S	-	82.3	53	390	2000	N	39.000	-	-	-	-	-	-	-	barite,qz,py,sl
9	4S038	40.0	CR	0.450	140.2	11	570	1130	N	18.100	-	N	N	400	8	N	N	qz-sericite schist w/barite lens
10	3S124	-	S	0.626	157.7	150	3300	1.10%	N	37.000	-	-	-	-	-	-	-	barite w/td,sl,gn
11	3S127	8.0	C	N	8.1	5	40	25	19	20.000	-	-	-	-	-	-	-	phyllite w/py
11	3S128	5.0	RG	0.007	16.3	12	150	530	16	8.900	-	-	-	-	-	-	-	fest schist w/py
12	4S037	1.0	C	0.082	21.7	31	130	3300	N	51.000	-	N	N	N	N	N	N	barite
13	4S041A	2.0	CR	0.040	73.2	190	380	1700	N	15.800	-	N	N	300	10	N	N	barite w/py
13	4S041B	2.0	C	0.022	14.1	43	53	98	25	1.000	-	N	N	300	30	N	N	qz-mica schist w/abundant py
14	4S042	-	S	N	131.7	460	1170	4400	N	34.000	-	N	N	400	30	N	N	barite w/sl,gn
15	3S125A	0.8	C	N	15.1	65	180	1100	77	1.300	-	-	-	-	-	-	-	phyllite w/sulf
15	3S125B	-	G	Tr	13.7	30	N	N	10	0.970	-	-	-	-	-	-	-	phyllite w/py
16	4S039	6.0	CR	0.074	8.2	13	60	130	N	1.760	-	N	N	300	8	N	N	qz-sericite schist
17	4S040	10.0	CR	0.009	2.3	9	30	66	7	2.200	-	N	N	N	N	N	N	qz-sericite schist

Appendix A-6. *Analytical results from Nunatak prospect (map nos. on fig. 11)*

Map no.	Sample no.	Sample size (ft)	Sample type	Fire assay Au (ppm)	Fire assay Ag (ppm)	Atomic absorption (ppm unless marked %) Cu	Pb	Zn	Co	X-ray Ba (%)	Spectrographic (ppm) W	Mo	Sn	As	Ni	Bi	Sb	Lithology, remarks
12	4S047	20.0	C	0.340	136.4	140	6300	3900	N	31.000	-	N	N	300	10	N	N	barite zones
12	4S048	-	G	0.033	46.4	600	1.00%	8000	N	17.400	-	N	N	600	N	N	N	barite zone w/gn
12	4S049	-	G	0.320	18.4	110	360	8100	N	1.890	-	N	N	400	9	N	N	qz-sericite schist w/sl
12	4S050	0.6	C	Tr	52.9	1280	8000	1.23%	N	47.700	-	N	N	300	N	N	N	banded barite w/sl,gn
13	4S051	-	G	N	N	90	68	450	70	0.230	-	N	N	N	30	N	N	meta-andesite
13	4S052	0.5	C	N	N	34	53	370	42	0.150	-	N	N	N	30	N	N	qz-sericite schist w/py
14	4S043	-	G	.007	1.0	21	18	1280	36	0.370	-	N	N	N	50	N	N	metabasalt
14	4S044	-	F	2.580	335.3	1820	2.00%	2.38%	N	48.000	-	N	N	1000	20	N	N	barite w/sl,gn
14	4S045	75.0	RC	0.150	21.7	18	170	110	N	29.600	-	N	N	N	N	N	N	barite (outcrop and float)
14	4S046	7.5	CR	N	120.3	85	1180	1410	N	43.000	-	N	N	N	N	N	N	barite w/sulf bands

Appendix A-7. *Analytical results from Little Jarvis Glacier prospect (map nos. on fig. 13)*

				Fire assay		Atomic absorption (ppm unless marked %)				X-ray		Spectrographic (ppm)						
Map no.	Sample no.	Sample size (ft)	Sample type	Au (ppm)	Ag (ppm)	Cu	Pb	Zn	Co	Ba (%)	W	Mo	Sn	As	Ni	Bi	Sb	Lithology, remarks
1	4S146	0.75	CH	0.072	1.5	1710	3.80%	13.60%	43	H	-	N	N	N	N	N	N	barite bed w/sl in greenschist
1	4S147	-	CR	0.225	0.8	42	260	710	57	0.11	-	N	N	N	20	N	N	greenschist
2	4S148	1.0	R	0.039	N	73	530	1060	15.1	N	-	N	N	N	20	N	N	jasper
3	4S202	1.0	CR	0.190	8.0	78	160	940	46	0.18	-	N	N	N	N	N	N	sericite schist w/sl,gn
4	4S200	1.5	C	0.018	N	31	180	530	N	0.22	-	N	N	N	N	N	N	barite lens
4	4S201	-	CR	0.133	11.8	1130	1.73	3.50%	39	0.49	-	N	N	N	N	N	N	schist, barite w/sl,gn
5	4S199	5.0	CR	0.345	1.1	1900	1.23	3.10%	N	1.44	-	N	N	2000	80	N	N	gossan band w/some py

Appendix A-8. *Analytical results from Jarvis Glacier Gulches prospect (map nos. on fig. 14)*

Map no.	Sample no.	Sample size (ft)	Sample type	Fire assay Au (ppm)	Fire assay Ag (ppm)	Atomic absorption (ppm unless marked %) Cu	Pb	Zn	Co	X-ray Ba (%)	Spectrographic (ppm) W	Mo	Sn	As	Ni	Bi	Sb	Lithology, remarks
1	3E022	-	F	N	0.6	120	48	N	110	0.54	-	N	N	N	100	N	N	metabasalt
2	3S189	-	F	0.019	N	94	40	360	44	0.05	-	N	N	N	20	N	N	metatuff w/py
3	3S190	-	F	0.034	N	50	N	N	38	0.02	-	N	N	N	20	N	N	calc breccia
3	3S191	-	SS	N	N	98	55	N	53	0.02	-	N	N	N	40	N	N	
3	3S192	-	F	N	N	210	45	N	73	N	-	N	70	N	20	N	N	qz vein w/py
4	3S193	-	SS	N	N	140	100	N	78	0.02	-	N	N	N	30	N	N	
4	3S194	-	SS	N	N	130	120	N	82	0.03	-	N	N	N	20	N	N	
5	3S195	-	F	N	2.2	3400	77	6.50%	56	0.03	-	N	N	N	N	N	N	qz breccia w/sl,cp,po
5	3S196	-	F	N	N	320	39	N	53	N	-	N	30	N	30	N	N	qz vein w/cp
6	3S197	-	F	N	1.2	720	51	N	230	N	-	N	200	N	N	N	N	qz vein w/po,cp
7	3S199	-	SS	N	N	170	170	N	91	0.02	-	N	N	N	30	N	N	
8	3E016	-	F	-	-	-	-	-	-	-	-	-	-	-	-	-	-	meta-andesite w/py
9	3S229	-	F	N	0.7	660	330	N	200	N	-	N	N	N	N	N	N	metasediment w/sulf
9	3S230	-	F	N	0.4	320	51	N	110	0.02	-	N	N	N	N	N	N	calc-qz phyllite w/py
10	3S198	-	F	0.942	20.3	4.60%	710	7.90%	130	0.14	-	N	N	N	N	N	N	gossan w/sulf-core of sl,cp
11	3S200	-	F	N	N	120	85	N	7.1	N	-	N	200	N	N	N	N	jasper
11	3S201	-	F	0.012	1.0	520	110	5100	20	N	-	N	N	N	20	N	N	gossan w/qz,sulf
11	3S202	-	F	N	N	210	190	N	120	N	-	N	N	N	30	N	N	limey meta-andesite w/py,cp
12	3S227	-	G	0.014	N	59	N	N	6.4	N	-	N	N	N	9	N	N	qz-calc vein
12	3S228	-	G	0.030	N	65	44	N	16	N	-	N	N	N	10	N	N	altered rock w/py
13	3S224	-	G	N	N	26	N	N	3.2	N	-	N	20	N	10	N	N	graphitic gossan w/calc
13	3S225	-	G	0.032	N	190	80	N	60	N	-	N	N	N	N	N	N	qz-calc altered sediment
13	3S226	-	G	N	N	140	56	N	50	N	-	N	N	N	N	N	N	calc
14	3S218	0.4x2	G	N	1.0	790	110	N	50	N	-	N	N	N	N	N	N	qz gossan w/py,cp
14	3S219	0.5x2	G	N	N	700	13	46	11	N	-	N	N	N	N	N	N	calc-qz breccia w/po,cp
14	3S220	-	F	-	-	330	N	N	41	N	-	N	60	N	20	N	N	qz vein w/cp
14	3S221	-	RG	0.024	N	46	130	N	86	N	-	N	N	N	N	N	N	chlorite altered andesite
14	3S223	0.4	G	N	1.0	52	50	N	13	N	-	N	N	N	N	N	N	calc w/py
15	3S222	-	G	0.037	N	40	34	N	21	N	-	N	N	N	20	N	N	metasediment
16	3S204	-	G	N	0.6	870	170	250	84	N	-	N	N	N	N	N	N	gossan in altered andesite
17	3S205	0.4	G	0.416	25.0	980	120	N	160	N	-	N	N	N	N	N	N	qz w/sulf
17	3S206	0.4	G	0.077	18.5	470	3000	5.40%	49	N	-	N	N	3000	N	N	N	sulf zone w/py,sl,gn
18	3S207	0.5	G	0.163	11.6	5700	230	17.80%	110	N	-	N	N	N	N	N	N	calc-qz zone w/sl,cp,py
18	3S208	0.5	C	0.027	3.5	2000	90	6400	31	N	-	N	20	N	N	N	N	calc-qz zone w/sl,cp,py
18	3S209	-	RG	-	-	3100	-	5200	35	-	-	N	N	N	10	N	N	gossan zone in altered andesite
18	3S210	0.3	C	0.011	2.5	1.30%	140	2000	41	0.18	-	N	N	N	N	N	N	chloritic phyllite w/cp
19	4S166	0.7	C	N	1.2	-	-	-	-	N	-	-	-	-	-	-	-	rich band of po
20	4S165	0.6	C	0.019	2.0	-	-	-	-	N	-	-	-	-	-	-	-	rich band of po w/cp
21	4S161	0.45	C	0.049	1.4	-	-	-	-	0.02	-	-	-	-	-	-	-	qz vein w/po,cp
21	4S162	-	CR	0.012	0.4	-	-	-	-	N	-	-	-	-	-	-	-	meta-andesite /meatbasalt
22	4S164	0.15	G	0.025	1.1	-	-	-	-	0.01	-	-	-	-	-	-	-	metasediment w/po
23	4S163	-	CR	0.017	0.6	-	-	-	-	N	-	-	-	-	-	-	-	po portion of silicified rock
24	3S259	0.2	G	-	0.5	74	7	44	12	-	-	N	N	300	N	N	N	qz vein w/py
24	3S260A	0.5	C	N	4.6	7600	160	6.10%	110	N	-	N	N	N	N	N	N	massive po w/sl,cp
24	3S260B	2.5	G	N	0.9	570	89	2700	29	N	-	N	N	N	N	N	N	schistose tuff w/sulf
24	3S261A	0.5	C	N	2.0	3300	150	2.00%	110	N	-	10	N	N	N	N	N	qz rich phyllite w/po,sl,cp
24	3S261B	2.0	C	N	1.2	1000	130	9300	52	N	-	20	N	N	N	N	N	altered tuff and gossan w/sulf
24	3S262A	-	G	N	N	58	65	8100	45	N	-	N	N	N	30	N	N	chloritic phyllite w/sulf
24	3S262B	6.0	C	N	N	490	120	1600	49	N	-	N	N	N	N	N	N	chloritic phyllite w/sulf
24	3S262C	1.5	C	N	0.5	920	100	4000	62	N	-	N	N	N	N	N	N	limey meta-andesite w/py
24	3S262D	1.0	C	0.127	3.5	810	100	1900	9.6	N	-	N	500	N	N	N	N	gossan,qz and sulf
24	3S262E	-	G	N	0.4	510	110	890	38	N	-	N	N	N	N	N	N	chlorite altered andesite
24	3S263	0.7	F	-	1.1	5600	11	1.57%	122	-	-	N	N	N	N	N	N	barite w/qz,po,sl,cp
25	3E012	-	G	N	0.4	680	170	N	81	N	-	N	N	N	20	N	N	meta-andesite w/py

Appendix A-8. *Analytical results from Jarvis Glacier Gulches prospect (map nos. on fig. 14)*-Continued

26	3E013	-	G	N	N	81	240	N	75	N	-	N	N	N	N	N	N	meta-andesite w/py
27	3S212	-	F	N	0.8	180	270	N	150	N	-	N	N	N	N	N	N	meta-andesite w/mag,sulf
28	3S211	-	G	-	1.5	52	32	47	113	-	-	N	N	N	N	N	N	py lens up to 0.2 ft across
29	3S264	-	G	0.014	0.4	270	75	N	25	0.04	-	N	N	N	H	N	N	altered tuff
29	3S266	-	G	N	N	47	97	N	65	0.07	-	N	N	N	40	N	N	meta-andesite
30	3S265	-	G	N	N	92	160	N	41	N	-	N	N	N	10	N	N	metasediment
31	3S267	-	F	N	N	13	49	N	N	N	-	N	N	N	8	N	N	qz breccia w/py
32	3S268	0.5	F	0.103	0.6	510	49	N	15	N	-	N	N	N	N	N	N	qz vein w/cp,po
33	3S269	-	F	N	0.4	240	1000	1.20%	23	0.10	-	N	N	N	N	N	N	metasediment w/cp,py,sl
34	3E015	-	G	N	N	59	74	N	44	N	-	N	N	N	N	N	N	chlorite altered andesite w/py
35	3E014	-	G	N	N	92	160	N	41	N	-	N	N	N	N	N	N	chlorite altered andesite w/py

Appendix A-9. *Metallurgical test results from Windy Craggy deposit core*

The Windy Craggy deposit is located in Canada along the same geologic trend that contains the Main deposit and Mount Henry Clay prospect. It contains 300 million tons of material averaging 1.52 percent copper and 0.08 percent cobalt. During 1982 a test sample was collected from the Windy Craggy deposit diamond-drill cores and supplied to ALRC for testing. The AFOC sample number is 2S417 and the ALRC numbers are ME 1463 and PS 1651.

Mineralogical Characterization

The sample, as received, was crushed to minus 0.5 inches and represents a massive-sulfide deposit consisting essentially of pyrrhotite with small to very small amounts of randomly dispersed pyrite, chalcopyrite, quartz, siderite, ferromagnesian silicate minerals, chlorite, and iron-oxide minerals as inclusions and small veins.

Polished-surface, SEM, SEM-EDAX, and microprobe examinations show that the scattered pyrite is partly and variably cobaltiferous, varying from grain to grain and within grains. It appears to be sulfur deficient with the deficiency apparently related to the cobalt content. It also appears to be zoned relative to the cobalt content which averages about 2 percent and ranges from 0.1 to 5 percent cobalt. The pyrite ranges in size from less than 10 to about 100 micrometers, with an average of 20 to 30 micrometers. There is a tendency for the pyrite to be agglomerated and some mounted fragments showed up to 15 percent pyrite while others contained very little pyrite. Pyrrhotite contains from 0.13 to 0.33 percent cobalt. The chalcopyrite content is less than that of the pyrite. It is associated both with the pyrite and as separate small crystals included in pyrrhotite. Grain sizes are similar to those of the pyrite. No precious metal-containing minerals were observed.

As will be seen in the following beneficiation results, the minerals are not liberated from each other at any practical size and no concentration of metals of any consequence was produced.

Beneficiation Characterization

After petrographic specimens were selected, the rest to the sample was crushed to minus 0.25 inch and split for head analysis and beneficiation tests. The head sample contained 0.46 percent copper, 0.01 percent nickel, 0.21 percent cobalt, 55.3 percent iron, 0.03 percent zinc, 0.02 percent arsenic, 35.1 percent sulfur, <0.01 oz/ton platinum, <0.02 oz/ton palladium, <0.0004 oz/ton gold, and <0.01 oz/ton silver. Precious metals analyses were done at Reno Research Center; the other analyses were done at ALRC.

A series of tests were done on 1-kg splits to try to selectively concentrate the copper and cobalt values. Table A9-1 contains the results. Sizing, selective flotation, and magnetic separation were tried with little success. Copper was concentrated by flotation with recoveries up to 90 percent, but the grade was low (generally 1 to 2 percent copper). Cobalt concentration was not successful: grades of concentrates that were produced by flotation or magnetic separation were essentially the same as that of the head, and consequently recoveries were nearly the same as the weight distributions in a test (no concentration).

As stated earlier, SEM and microprobe data show that cobalt is concentrated in pyrite in solid solution. However, it also occurs in pyrrhotite, and because pyrrhotite is the predominant mineral, a pyrite-pyrrhotite separation would result in about 50 percent of the cobalt reporting to each fraction.

The attached metallurgical balance shows the procedures and results of a flotation test in which a bulk sulfide flotation scheme produced a rougher concentrate and a scavenger concentrate that were combined and subjected to a selective cleaner flotation step in which pyrrhotite was depressed by $KMNO_4$. The cleaner concentrate represented 45 percent of the sample weight and contained 84 percent of the copper at a grade of 0.95 percent copper and 55 percent of the cobalt at a grade of 0.23 percent cobalt.

Appendix A-9. *Metallurgical test results from Windy Craggy deposit core*-Continued

A cursory chlorite-oxygen leach on Windy Craggy complex sulfide, ALRC sample number ME-1463, was conducted at RRC. Analysis of the test products are shown in table A9-2. Table A9-3 shows the metals distribution. The chlorine-oxygen test was conducted at 110°C and 50 psig with O_2. The chlorine source was HCl and $CaCl_2$. An excess of hydrochloric acid was used and oxidation of iron sulfide to sulfate resulted in 20 percent of the iron going into solution. With additional tests, good copper and cobalt extractions could be achieved without leaving iron in solution. Methods for recovering copper and cobalt from solution could be developed. However, in view of the low-grade nature of this ore, it is unlikely that any hydrometallurgical approach for recovering values from this ore would be economical.

Table A9-1. *Results of flotation of sample 2S417 (ME 1463-9) from the Windy Craggy deposit*

Grind: Initial: -0.25 inch   Final: +100 mesh 0%   Time: 10+5 minutes
Addition: none   -400 mesh 100%   Percent solids: 50
-500 mesh 100%

Metallurgical results

Product	Weight (%)	Analysis (%) Cu	Co	Fe	S	Distribution (%) Cu	Co	Fe	S
Cleaner concentrate	44.8	0.95	0.23	57.8	38.7	83.6	55.1	47.2	52.7
Cleaner tailings	39.9	0.19	0.19	57.8	35.7	14.8	40.6	42.0	43.3
Scavenger tailings	15.3	0.05	0.05	38.6	8.6	1.6	4.3	10.8	4.0
Composite or total	100.0	0.51	0.19	54.9	32.9	100.0	100.0	100.0	100.0
Head		0.46	0.21	55.3	35.1				

Test procedure

Reagents	Condition (lb/st)		Rougher flotation	Condition	First scavenger flotation	Condition	Second scavenger flotation	Condition	Cleaner flotation
Sodium isobutyl xanthate		0.3		0.4 lb/st		0.4 lb/st			
Frother		0.05				0.05 lb/st			
$CuSO_4$	0.8								
$KMnO_4$								0.2 lb/st	
pH (natural = 6.6)	6.1	6.3	6.7	6.8	7.0	7.1	7.1	6.6	6.9
Time (minutes)	3	1	4.5	1	3.25	1	3.75	1	2.5

Table A9-2. *Analysis (%)*

	Cu	Co	Zn	Fe	$SO_4^{=}$	S^{o}	$S^{=}$	Ca
Filtrate, g/l	2.3	0.80	5.1	6.1	45	-	-	1.4
Wash, g/l	0.34	0.12	10	11	11	-	-	1.0
Residue, %	0.024	0.028	L.001	43.3	14.8	17.0	2.79	5.0

Table A9-3. *Distribution (%)*

	Cu	Co	Zn	Fe	$SO_4^{=}$	S^{total}	Ca
Filtrate	46.5	40.8	G6	10.3	15.8	4.9	2.2
Wash	49.1	43.7	87	10.6	27.6	8.4	11.3
Residue	4.4	15.5	L7	79.1	56.6	86.7	86.5

APPENDIX B. ANALYTICAL RESULTS FROM VEIN GOLD PROSPECTS IN PORCUPINE AREA

Appendix B-1. *Analytical results from Golden Eagle prospect (map nos. 17-19)*

		Sample		Fire assay		Atomic absorption (ppm unless marked %)				X-ray	Spectrographic (ppm)								
Map no.	Sample no.	size (ft)	Sample type	Au (ppm)	Ag (ppm)	Cu	Pb	Zn	Co	Ba (%)	W	Mo	Sn	As	Ni	Bi	Sb		Lithology, remarks
1	5S141	3.0	CR	N	0.2	38	4	82	13	0.224	N	N	N	N	20	N	N		dike
2	5S142	6.0	CR	0.020	1.0	53	12	147	6	0.169	N	N	N	N	8	N	N		slate w/some py and qz
3	5S089	0.5	CC	N	N	5	4	2280	N	0.014	-	N	N	N	N	N	N		qz-ankerite vein
3	5S090	0.5	CR	N	0.5	13	5	61	4	-	-	-	-	-	-	-	-		slate
3	5S091	-	G	N	0.2	18	7	123	37	-	-	-	-	-	-	-	-		dike
4	5S143	0.3	CC	N	0.3	5	2	362	2	0.154	N	N	N	N	N	N	N		qz vein
5	5S144	2.0	C	N	0.5	57	3	36	2	0.800	N	N	N	N	10	N	N		slate
6	5S145	0.1	CC	1.890	0.2	3	2	34	31	0.033	N	N	N	N	N	N	N		qz vein w/py
7	5S146	0.3	CC	4.240	0.6	8	N	21	12	0.076	N	N	N	N	8	N	N		qz vein w/py
8	5S147	-	CR	0.005	0.5	82	6	197	19	0.290	N	N	N	N	N	N	N		dike
9	5S148	0.2	CC	0.040	0.3	17	2	4.43%	4	0.054	N	N	20	N	10	N	N		qz vein w/sl
10	5S149	10.0	CR	0.005	0.4	40	4	158	3	0.440	N	N	N	N	N	N	N		slate
11	5W941	10.0	CR	0.205	N	35	10	135	16	0.144	-	N	N	N	10	N	N		dike
12	5W939	0.3	CC	36.620	2.6	4	6	9600	54	0.058	N	N	400	2000	N	N	N		qz vein in dike w/py,sl
13	5W940	5.0	CR	0.030	0.4	35	4	59	5	0.360	-	N	N	N	N	N	N		slate
14	5W938	0.4	CC	22.220	1.3	2	4	20	45	0.070	N	N	N	1000	N	N	N		qz vein w/sulf
15	5W942	3.0	CR	0.005	N	28	10	116	14	0.200	-	N	N	N	N	N	N		dike
16	5W937	0.3	CC	0.090	0.2	5	2	57	6	0.021	N	N	800	3000	N	N	N		qz vein w/sulf
17	5W935	0.3	CC	N	N	3	2	159	2	0.007	N	N	20	N	N	N	N		qz vein w/sulf in dike
17	5W936	0.3	S	18.580	1.0	3	8	24	85	0.017	N	N	N	N	8	N	N		select of 935
18	5S140	1.4	CR	0.095	0.3	40	3	42	10	0.130	-	N	N	N	N	N	N		dike w/py
19	5S139	0.05	CR	0.065	0.2	26	4	21	5	0.149	-	N	N	N	N	N	N		slate w/py
20	5S138	-	CR	0.010	0.5	48	4	74	5	0.200	-	N	N	N	N	N	N		slate
21	5S137	1.0	CC	0.020	0.2	24	3	367	25	0.095	-	N	N	N	20	N	N		fault gouge
22	5S136	9.0	CR	0.005	0.4	39	4	112	7	0.231	-	N	N	N	N	N	N		slate and fault gouge
23	5S086	0.35	CC	0.245	0.2	2	4	24	36	0.013	-	N	100	500	10	N	N		qz vein w/1 in py crystals
23	4S135	0.25	CH	182.130	17.1	20	N	39	32	N	-	N	N	400	30	N	N		qz vein w/1 in py crystals
23	4S136	0.35	G	1.501	N	8	N	16	130	N	-	N	N	3000	N	N	N		qz vein w/1 in py crystals
24	5S088	0.6	CR	0.010	N	N	3	39	2	0.169	-	N	N	N	N	N	N		dike
25	5S087	0.6	CR	0.065	0.8	58	11	110	4	0.233	-	N	N	N	10	N	N		slate
26	5S135	2.0	CR	0.010	0.2	22	4	131	20	0.079	-	N	N	N	10	N	N		dike
27	5S133	0.7	CC	1.210	0.6	341	2	121	85	0.012	-	N	80	N	N	N	N		qz vein w/py,sl,cp
27	5S134	0.2	CC	0.435	3.4	1360	5	1.14%	13	N	-	N	N	N	N	N	N		select of 133
28	5S132	7.0	CR	0.025	0.5	40	7	151	5	0.231	-	N	N	N	N	N	N		slate
29	5S131	2.0	CR	0.045	0.3	31	3	212	10	0.092	-	N	N	N	N	N	N		dike w/py
30	5S130	15.0	CR	0.175	0.7	41	8	144	8	0.220	-	N	N	N	N	N	N		slate w/py rich bands
31	5S085	2.0	CR	0.030	0.5	53	12	93	4	0.218	-	N	N	N	10	N	N		slate
32	5S128	6.0	CR	0.005	0.7	72	6	53	8	0.201	-	N	N	N	N	N	N		slate w/py
33	5S084	0.35	CC	5.230	1.3	1	2	19	44	N	-	N	200	800	10	600	N		qz vein w/py
33	5S129	0.35	CC	18.860	3.5	2	6	21	61	0.009	-	N	300	800	N	N	N		qz vein w/py
34	5S127	1.0	C	0.170	0.3	35	2	48	12	0.133	-	N	N	N	N	N	N		dike w/sulf
35	5W934	0.5	R	0.015	0.8	50	5	113	5	0.197	-	N	N	N	10	N	N		slate w/large py crystals
36	5W933	0.05	R	0.030	0.6	43	10	118	10	0.450	-	N	N	N	10	N	N		slate w/band of py
37	5W932	5.0	R	0.055	0.4	30	6	93	N	0.184	-	N	300	N	30	N	N		slate w/thin bands of sulf
38	5W931	0.1	R	4.590	1.5	9	6	745	12	0.026	-	N	40	N	10	N	N		qz vein w/sulf
38	4S137	0.1	G	2.474	0.7	11	N	260	45	N	-	N	N	700	50	N	N		qz vein w/sulf
39	5W930	0.2	CC	0.025	0.4	5	2	32	5	0.006	-	N	N	N	30	N	N		vuggy qz vein w/large py crystals
40	4W929	0.1	S	2.650	2.6	48	31	42	18	0.213	-	N	N	N	N	N	N		slate w/py,select of 928
41	5W928	5.0	C	0.095	0.5	42	7	85	4	0.189	-	N	90	N	50	N	N		slate w/py
42	5W927	2.0	CC	0.255	1.4	425	2	153	9	0.023	-	N	30	N	7	N	N		qz vein w/cp,sl
43	5W925	4.0	C	0.160	0.2	38	5	156	20	0.081	-	N	N	N	40	N	N		dike w/sulf
44	5W926	0.4	CC	4.660	0.4	10	2	251	1	0.009	-	N	N	N	N	N	N		qz vein w/sulf
45	4S138	-	SS	0.031	N	33	N	200	18	0.092	-	-	-	-	-	-	-		
46	5W811	5.0	CR	N	N	14	3	120	11	0.076	N	N	N	N	N	N	N		dike w/slate and sulf
47	5W810	0.5	C	0.005	N	25	8	83	13	0.104	N	N	N	N	10	N	N		fault gouge of dike and slate
48	4S142	0.3	C	5.637	1.1	31	N	2.04%	200	N	-	N	N	900	100	N	N		qz vein w/sl,py

Appendix B-1. *Analytical results from Golden Eagle prospect (map nos. 17-19)*-Continued

49	5W813	0.1	S	0.725	0.3	10	19	87	10	0.010	N	N	40	N	10	N	N	py rich bands in slate
50	5W812	15.0	CR	0.020	0.4	32	13	43	7	0.184	N	N	N	N	10	N	N	slate w/py
51	4S141	0.5	C	0.345	N	10	N	26	52	N	-	N	N	500	20	N	N	qz vein w/py
52	4S124	1.5	C	0.023	N	31	N	280	6	0.420	-	N	N	N	20	N	N	slate
53	4S123	0.8	C	N	N	11	N	560	N	0.016	-	N	N	N	20	N	N	qz lens at contact
54	4S122	10.0	SC	5.150	0.7	100	N	240	37	0.310	-	N	N	N	40	N	N	dike w/qz stringers
55	4S126	0.3	C	0.007	N	8	N	2710	N	0.041	-	N	N	N	N	N	N	qz vein
56	4S125	0.3	CC	0.075	N	9	N	51	6	N	-	N	N	N	20	N	N	qz vein w/sulf
57	4S127	-	C	1.957	N	10	N	26	N	N	-	N	N	N	20	N	N	qz vein w/sulf
58a	4S121	0.9	CC	N	N	20	N	1730	14	0.019	-	N	N	300	20	N	N	qz w/aspy and creek sand
58b	4S134	-	C	20.350	3.3	42	N	300	20	0.028	-	N	N	500	100	N	N	qz w/sulf
58c	4S128	0.2	CR	27.530	4.8	20	N	820	21	0.013	-	N	N	2000	50	N	N	qz w/boxworks
58d	4S130	-	G	158.370	10.3	16	N	510	140	0.016	-	N	N	2000	50	N	N	aspy and S
58e	4S130A	-	G	531.100	6.9	21	57	1320	110	0.018	-	N	N	4000	30	N	N	S and aspy
58f	4S129	-	G	171.360	20.6	36	N	800	40	0.013	-	N	N	500	70	N	N	sl and S
58g	4S131	-	G	0.738	N	17	N	160	N	N	-	N	N	300	10	N	N	vuggy qz
58h	5S151	1.5	CC	11.930	2.4	5	10	211	12	0.017	N	N	N	N	20	N	N	qz w/py
58i	5S152	1.2	C	48.860	3.8	5	8	875	24	0.016	N	N	N	N	70	N	N	50% sulf from back of vug
58j	5S153	2.0	CR	0.060	0.2	21	4	845	3	0.510	N	N	N	N	20	N	N	slate
58k	5S154	3.0	CR	0.560	N	24	4	219	25	0.360	N	N	N	N	10	N	N	dike
58l	5S155	1.0	S	75.430	9.1	34	14	86	83	0.105	N	N	N	600	90	600	N	qz w/py,sl,S
59	4S120	1.0	C	N	N	58	N	450	46	0.530	-	N	N	N	30	N	N	fest orange rock
60	4S119	1.5	C	0.009	N	79	N	140	14	0.430	-	N	N	N	20	N	N	slate w/fest qz stringers
61	4S118	2.0	C	0.011	N	59	19	93	10	0.500	-	N	N	N	20	N	N	slate
62	5S251	20.0	SC	0.015	0.4	29	14	84	3	0.310	N	N	N	N	20	N	4000	slate w/py
63	5S252	6.0	CR	N	N	21	2	142	25	0.052	N	N	N	N	10	N	N	dike
64	5W814	0.2	C	1.600	0.5	22	21	57	27	0.201	-	N	N	N	10	N	N	qz vein w/sulf
65	5S255	-	S	0.015	0.3	21	11	56	3	0.310	N	N	N	N	20	N	6000	select py in slate
66	5S253	0.2	C	0.050	N	64	3	26	16	0.030	-	N	80	N	40	N	10000	qz vein w/10% py
66	5S254	5.0	CR	N	N	15	16	101	19	0.093	N	N	N	N	N	N	N	dike
67	5S256	0.3	C	N	N	10	11	21	2	0.020	N	N	N	N	N	N	N	qz vein w/30% py
68	5S257	-	CR	N	N	2	4	41	N	0.012	N	N	N	N	N	N	N	qz vein w/50% py
68	5S258	8.0	CR	N	N	67	5	80	31	0.218	N	N	N	N	40	N	N	dike
69	5W815	0.5	F	0.010	N	57	17	388	9	0.173	-	N	N	N	20	N	N	cemented slate gravel
69	4S139	18 yds.Sluced		57.290	6.9	120	430	490	65	0.191	-	N	N	800	100	N	N	18 yds. w/coarse Au out
69	4S140	5x20	PC	0.189	0.5	160	43	430	43	0.171	-	N	N	N	60	N	N	
69	4G227C	-	G	N	0.6	35	12	44	6	-	-	7	-	N	17	-	N	slate
69	4G227D	-	G	N	N	17	4	65	18	-	-	2	-	N	11	-	N	felsic dike
69	4G227E	-	G	N	0.1	12	3	15	2	-	-	2	-	N	7	-	N	qz vein in felsic dike
70	4S143	-	PC	0.269	0.5	37	24	390	20	0.168	-	N	N	N	40	N	N	
71	5S260	5.0	CR	N	N	73	8	108	32	0.096	N	N	N	N	30	N	N	dike w/py
72	5S259	0.35	CC	0.030	N	3	5	21	5	0.016	N	N	60	400	20	500	1000	qz vein w/py
73	5S261	7.0	CR	0.005	N	33	4	108	6	0.300	N	N	N	N	20	N	3000	slate w/py
74	5S268	5.0	CR	0.075	N	43	9	88	10	0.500	N	N	N	N	30	N	7000	slate w/py
75	5S266	0.3	CC	N	N	3	31	101	2	0.015	N	N	N	N	N	N	N	qz vein
76	5S265	0.3	C	N	N	4	2	23	3	0.014	N	N	N	N	N	N	N	qz vein
77	5S264	0.4	C	N	N	1	3	35	2	0.005	N	N	N	N	N	N	N	qz vein
78	5S263	0.4	CR	N	N	3	6	35	2	0.019	N	N	N	N	N	N	N	qz vein
79	5S267	12.0	CR	N	N	63	14	127	33	0.087	N	N	N	N	40	N	N	dike w/py
80	5S262	0.3	C	N	N	3	7	21	4	0.024	N	N	N	N	N	N	N	qz vein
81	5S273	22.0	CR	0.450	N	36	7	107	9	0.330	N	N	N	300	30	N	4000	slate
82	5S271	0.5	C	N	N	10	3	31	3	0.019	N	N	N	N	N	N	N	qz vein
83	5S270	0.2	C	0.020	N	35	5	52	5	0.046	N	N	30	N	20	N	9000	qz vein
84	5S272	1.8	CR	N	N	54	6	70	29	0.143	N	N	N	N	N	N	N	dike
85	5S269	0.3	C	0.050	N	7	8	49	4	0.011	N	N	N	N	20	N	9000	qz vein
86	5S274	0.3	C	0.015	N	11	2	165	6	0.032	N	N	20	N	10	N	3000	qz lens in dike
86	5S275	1.5	CR	N	N	29	7	108	21	0.128	N	N	N	N	20	N	N	dike
87	5S276	0.4	C	N	N	51	5	50	16	0.025	N	N	N	N	N	N	N	qz-calc lens in dike
88	4S132	-	G	5.538	0.9	6	N	73	28	0.011	-	N	N	700	20	N	N	fest qz w/sulf
88	4S133	-	SS	0.058	N	59	N	290	57	0.126	-	N	N	400	60	N	N	
88	5W816	-	SS	0.020	N	44	7	210	14	-	-	-	-	-	-	-	-	
88	5W817	0.2	S	0.015	0.7	20	19	205	30	0.240	-	N	N	N	90	N	N	py rich bands in slate
88	5W818	-	SS	N	N	46	6	229	15	0.100	-	N	N	N	30	N	N	
88	5W819	5.0	CR	N	N	133	11	208	10	-	-	-	-	-	-	-	-	slate w/sulf

Appendix B-2. *Analytical results from Annex No. 1 prospect (map nos. on fig. 20)*

				Fire assay		Atomic absorption (ppm unless marked %)				X-ray			Spectrographic (ppm)					
Map no.	Sample no.	Sample size (ft)	Sample type	Au (ppm)	Ag (ppm)	Cu	Pb	Zn	Co	Ba (%)	W	Mo	Sn	As	Ni	Bi	Sb	Lithology, remarks
1	5S214	-	S	0.020	N	26	36	465	26	0.030	N	N	30	N	10	N	N	vuggy qz vein w/py
1	5S215	1.0	CR	0.075	N	77	9	137	26	0.219	N	N	N	N	10	N	N	dike w/py
1	5S216	-	CR	0.055	N	33	12	615	30	0.176	N	N	N	8000	10	N	N	dike and qz w/py
1	5S217	0.05	CR	114.140	9.0	5	4	265	2	0.081	N	N	N	N	N	N	N	vuggy qz vein
1	5S218	-	S	0.230	0.2	28	17	580	23	0.237	N	N	N	N	N	N	N	slate w/py
1	5S219	1.0	CR	0.005	N	72	N	177	25	0.049	N	N	N	N	40	N	N	brecciated dike in fault zone
1	5S220	0.4	S	0.230	0.3	5	5	13	15	0.450	N	N	N	N	10	N	N	slate w/py
2	5S221	0.5	CR	0.015	N	10	N	59	6	0.006	N	N	30	N	N	N	N	vuggy qz vein w/py
2	5S222	-	CR	0.315	1.2	69	29	61	32	0.260	N	N	N	N	40	N	N	slate w/+20% py
2	5S223	0.7	CR	0.145	N	N	N	6	3	0.008	N	N	60	N	10	N	N	vuggy qz w/slate,py and S
2	5S224	-	S	0.150	N	155	12	840	147	0.270	N	N	N	N	N	N	N	gossan
3	5W803	0.1x.3	CR	5.345	1.7	5	19	32	2	0.031	N	N	30	N	N	N	N	6 qz veins
3	5W804	20.0	SC	0.055	0.2	11	6	38	2	0.410	N	N	N	N	N	N	N	slate
3	5W806	0.4	G	0.420	N	3	10	15	78	0.083	N	N	N	2000	40	N	N	qz and dike w/sulf
4	5W800	0.3	C	0.700	0.8	21	24	188	7	0.050	N	N	100	N	N	N	N	qz vein w/sulf
4	5W801	0.05	C	3.860	1.4	18	20	166	5	0.035	N	N	70	N	N	N	N	qz vein w/sulf
4	5W802	0.4	C	0.220	0.2	21	12	116	9	0.080	N	N	40	N	8	N	N	qz vein w/sulf
4	5W805	-	SS	N	N	44	3	100	11	0.089	N	N	N	N	20	N	N	
4	5W1000	0.3	R	3.125	1.6	2	100	71	4	0.020	N	N	20	N	N	N	N	qz vein float w/sulf

Appendix B-3. *Analytical results from Wolf Den prospect (map nos. on fig. 21)*

				Fire assay		Atomic absorption (ppm unless marked %)				Spectrographic (ppm)								
Map no.	Sample no.	Sample size (ft)	Sample type	Au (ppm)	Ag (ppm)	Cu	Pb	Zn	Co	Ba (%)	W	Mo	Sn	As	Ni	Bi	Sb	Lithology, remarks
1	7W1733	0.3	CC	3.394	2.3	8	14	3550	1	-	-	-	-	-	-	-	-	qz vein in dike w/aspy,py, fest,gossan
2	7W1734	0.3	CC	0.583	0.5	4	7	210	3	-	-	-	-	-	-	-	-	qz vein in dike w/aspy,py, fest,gossan
3	7S613	0.15	CH	11.417	-	5	37	225	1	-	-	-	-	-	-	-	-	qz vein in dike w/15% py,aspy
4	7W1735	0.03	S	7.028	5.3	26	42	685	9	-	-	-	-	-	-	-	-	aspy veinlet in dike w/gossan
5	7S612	0.3	CH	1.783	-	4	N	575	6	-	-	-	-	-	-	-	-	qz vein in dike w/15% py,aspy
6	7W1736	-	SS	0.206	1.4	126	13	785	25	-	-	-	-	-	-	-	-	
7	7S614	5.0	CR	0.103	-	56	7	225	7	-	-	-	-	-	-	-	-	slate w/py bands
7	7S615	0.2	F	0.171	-	34	645	>20000	22	-	-	-	-	-	-	-	-	qz vein in dike w/sl,gn,py

Appendix B-4. *Analytical results from Quartz Swarm prospect (map nos. on fig. 22)*

Map no.	Sample no.	Sample size (ft)	Sample type	Fire assay Au (ppm)	Fire assay Ag (ppm)	Atomic absorption (ppm unless marked %) Cu	Pb	Zn	Co	X-ray Ba (%)	Spectrographic (ppm) W	Mo	Sn	As	Ni	Bi	Sb	Lithology, remarks
1	4S117	-	F	N	N	150	31	260	78	0.050	-	N	N	400	80	N	3000	dike w/dissem po + sparse cp
1	4S114A	3.0	C	N	N	73	N	220	24	0.094	-	N	N	500	70	N	N	3 qz veins 50% of sample
1	4S114B	3.0	C	N	N	100	N	240	N	0.071	-	N	N	400	60	N	800	40% qz
1	4S114C	2.5	CR	0.007	N	37	N	71	31	0.017	-	N	60	400	20	N	N	qz vein sparse calc w/sulf
1	4S114D	4.5	CR	0.015	N	110	N	260	N	0.041	-	N	N	400	90	N	2000	qz veins 0.2 ft and 0.8 ft knot of po
1	4S114E	3.0	C	-	-	15	N	83	N	-	-	N	20	500	10	N	N	irregular qz vein
1	4S114F	1.5	C	N	N	110	N	390	57	0.118	-	N	N	N	100	N	2000	fest slate
1	4S114G	1.0	C	N	N	26	N	130	N	0.017	-	N	40	400	10	N	N	qz vein
2	4S115A	-	C	N	N	8	N	19	N	0.007	-	N	N	400	10	N	N	
2	4S115B	-	C	N	N	9	N	20	N	0.027	-	N	N	500	10	N	N	
2	4S115C	-	C	N	N	10	N	25	N	N	-	N	N	300	9	N	N	
3	4S116A	2.1	CR	N	N	7	N	76	N	N	-	N	N	N	N	N	N	qz vein w/calc
3	4S116B	1.6	C	N	N	9	N	20	N	0.062	-	N	N	500	10	N	N	qz vein
3	4S116C	1.1	C	N	N	10	N	35	N	0.010	-	N	60	700	20	N	N	qz vein
3	4S116D	0.9	C	N	N	9	N	14	N	0.017	-	N	20	500	10	N	N	qz vein
3	4S116E	2.0	C	N	N	96	N	260	45	0.142	-	N	N	400	200	N	N	dike
3	4S116F	1.8	C	N	N	38	N	46	N	N	-	N	30	400	20	N	N	qz vein
4	5S111	0.75	CC	N	0.2	33	3	44	10	-	-	-	-	-	-	-	-	qz vein w/5% calc
4	5S112	4.0	CR	N	N	91	7	128	35	-	-	-	-	-	-	-	-	metabasalt w/calc incluion
4	5S113	0.8	CC	N	N	30	9	30	6	-	-	-	-	-	-	-	-	qz vein w/5% calc
4	5S114	4.0	CR	N	N	67	16	96	29	-	-	-	-	-	-	-	-	metabasalt
4	5S115	1.0	CC	N	N	38	5	48	9	-	-	-	-	-	-	-	-	qz vein w/5% calc
4	5S116	-	S	N	0.2	33	14	40	12	-	-	-	-	-	-	-	-	select qz w/mo
4	5W910	1.0	CR	N	N	26	9	43	18	-	-	-	-	-	-	-	-	metabasalt
4	5W911	1.8	C	N	0.2	5	6	4	N	-	-	-	-	-	-	-	-	qz vein
4	5W912	7.0	CR	N	0.2	91	4	56	29	-	-	-	-	-	-	-	-	metabasalt w/sulf
4	5W913	0.3	C	N	N	3	11	2	N	-	-	-	-	-	-	-	-	qz vein
4	5W914	0.3	C	N	N	10	5	7	2	-	-	-	-	-	-	-	-	qz vein
4	5W915	1.0	CR	N	0.2	81	15	42	24	-	-	-	-	-	-	-	-	metabasalt w/sulf
4	5W916	1.0	C	N	0.4	5	6	6	1	-	-	-	-	-	-	-	-	qz vein
4	5W917	2.0	CR	N	0.2	46	7	56	23	-	-	-	-	-	-	-	-	metabasalt
5	4S167	0.8	C	0.023	N	25	N	240	N	-	N	N	N	N	N	N	N	qz vein
6	5S100	0.2	CC	N	0.6	13	4	46	2	-	-	-	-	-	-	-	-	qz vein
6	5S101	17.0	CR	N	0.4	62	7	95	10	-	-	-	-	-	-	-	-	slate w/some 0.05 ft qz stringers
6	5S102	0.3	CC	N	0.4	14	5	27	2	-	-	-	-	-	-	-	-	qz vein
6	5S103	-	CR	N	0.4	67	2	245	8	0.118	-	N	N	N	8	N	N	slate
6	5S104	0.7	CC	N	0.4	22	3	54	5	-	-	-	-	-	-	-	-	qz vein
6	5S105	0.5	C	N	0.2	22	4	70	3	-	-	-	-	-	-	-	-	qz vein w/calc
6	5S106	-	CR	N	0.5	67	9	113	6	-	-	-	-	-	-	-	-	slate
6	5S107	0.6	CC	N	0.6	2	15	12	2	-	-	-	-	-	-	-	-	qz vein
6	5S108	9.0	CR	N	0.2	87	8	67	6	-	-	-	-	-	-	-	-	slate
6	5S109	1.0	C	N	N	7	6	26	N	-	-	-	-	-	-	-	-	qz vein
6	5S110	0.05	C	0.035	2.4	64	33	125	15	0.059	-	N	N	N	10	N	N	qz vein w/py
6	5W901	-	G	N	0.5	64	15	151	8	-	-	-	-	-	-	-	-	slate w/sulf
6	5W902	0.4	C	N	N	10	27	37	N	-	-	-	-	-	-	-	-	qz vein
6	5W903	1.0	CR	N	N	8	8	25	2	-	-	-	-	-	-	-	-	qz veins
6	5W904	2.0	CR	N	0.4	61	14	150	16	-	-	-	-	-	-	-	-	fest slate
6	5W905	17.0	CR	N	0.3	98	8	63	10	-	-	-	-	-	-	-	-	slate w/sulf
6	5W906	1.0	C	N	N	6	5	8	1	-	-	-	-	-	-	-	-	qz vein
6	5W907	6.0	CR	N	N	77	7	98	9	-	-	-	-	-	-	-	-	slate w/sulf
6	5W908	0.7	C	N	N	6	6	13	N	-	-	-	-	-	-	-	-	qz vein
6	5W909	5.0	CR	0.005	N	30	17	76	4	0.129	-	N	N	N	10	N	N	slate
7	5S092	0.5	C	N	0.2	12	4	21	3	-	-	-	-	-	-	-	-	qz vein
7	5S093	-	CR	N	N	13	3	46	25	-	-	-	-	-	-	-	-	dike
7	5S094	-	G	N	0.2	73	4	48	18	-	-	-	-	-	-	-	-	banded silicified rock
7	5S095	0.3	C	N	0.3	17	5	84	17	-	-	-	-	-	-	-	-	qz vein
7	5S096	-	G	N	0.2	52	5	82	21	-	-	-	-	-	-	-	-	silicified and marblized sediments
7	5S097	-	G	N	0.2	47	6	127	38	-	-	-	-	-	-	-	-	banded silicified sediment w/po
7	5S098	0.4	C	N	0.3	43	6	57	13	-	-	-	-	-	-	-	-	qz vein w/po
7	5S099	-	CR	0.090	N	73	7	89	16	0.300	-	N	N	N	N	N	N	silicified green sediment

Appendix B-5. *Analytical results from Big Boulder Quartz Ledge prospect (map nos. on fig. 24)*

		Sample		Fire assay		Atomic absorption (ppm unless marked %)				X-ray	Spectrographic (ppm)								
Map no.	Sample no.	size (ft)	Sample type	Au (ppm)	Ag (ppm)	Cu	Pb	Zn	Co	Ba (%)	W	Mo	Sn	As	Ni	Bi	Sb	Lithology, remarks
1	5S313	1.0	C	N	0.3	9	99	21	3	0.008	N	N	N	N	N	N	N	qz
2	5S314	5.0	C	N	1.1	9	163	30	3	N	N	N	N	N	N	N	N	felsite and qz vein
3	5S315	8.0	CR	0.005	o.4	15	66	37	7	N	N	N	N	N	10	N	N	felsite and qz vein
4	5S316	4.0	CR	N	1.8	5	308	97	2	o.007	N	N	N	N	N	N	N	felsite and qz vein
5	5S317	2.0	CR	N	N	8	12	12	4	N	N	N	N	N	N	N	N	qz and felsite vein
6	5M893	11.0	C	N	N	9	3	29	1	o.006	-	N	N	N	10	N	N	felsite and qz vein
7	5M894	10.0	C	o.005	N	8	8	43	N	N	N	N	N	N	N	N	N	felsite and qz vein
8	5M890	10.0	C	N	N	9	6	31	4	o.026	-	N	N	N	10	N	N	qz and felsite vein
9	5M892	10.0	C	N	N	5	7	32	5	N	-	N	N	N	N	N	N	felsite and qz vein
10	5M891	10.0	C	N	N	8	2	28	2	N	-	N	N	N	N	N	N	felsite and qz vein
11	5W852	6.0	C	N	N	7	17	10	1	o.005	N	N	N	N	N	N	900	qz and felsite vein
12	5W853	4.5	C	N	N	23	3	20	3	N	N	N	100	500	20	700	N	qz and felsite vein
13	5W854	5.7	C	N	N	5	9	7	3	o.007	N	N	40	300	N	N	N	qz and felsite vein
14	5W855	1.0	C	N	N	8	6	27	2	N	N	N	30	N	N	N	N	qz vein
14	5W856	1.5	C	N	o.2	13	12	21	4	o.009	N	N	N	N	N	N	N	felsite
15	5S050	13.0	SC	N	o.2	52	14	62	2	-	-	-	-	-	-	-	-	felsite
16	5S051	4.0	SC	N	N	24	15	33	4	-	-	-	-	-	-	-	-	qz vein fest some sulf
17	5S052	4.0	C	N	N	6	4	22	N	-	-	-	-	-	-	-	-	fest qz
18	5S053	o.1	G	N	0.2	33	20	26	1	-	-	-	-	-	-	-	-	qz, felsite contact zone
19	5S054	o.1	G	N	N	11	13	68	2	-	-	-	-	-	-	-	-	qz vein w/py
	Not on map 20 ft above adit in trench																	
	5S055	10.0	SC	N	.3	25	18	19	2	-	-	-	-	-	-	-	-	fest qz and felsite

APPENDIX C. ANALYTICAL RESULTS FROM POLYMETALLIC VEIN SILVER PROSPECTS IN PORCUPINE AREA

Appendix C-1. *Analytical results from Lost Silver Ledge prospect (map nos. on figs. 25 and 26)*

Map no.	Sample no.	Sample size (ft)	Sample type	Fire assay Au (ppm)	Fire assay Ag (ppm)	Atomic absorption (ppm unless marked %) Cu	Pb	Zn	Co	X-ray Ba (%)	W	Mo	Sn	As	Ni	Bi	Sb	Lithology, remarks
1	5S361	-	S	0.650	545.2	5330	4.06%	1.17%	1	-	-	-	-	-	-	-	-	select qz-calc vein w/jm,gn,ml
2	5W862	0.4	G	N	0.2	33	51	337	13	0.252	N	N	N	N	20	N	N	qz,lmst sl,dike w/sulf
3	5W878	1.1	C	0.025	2.0	177	254	860	51	-	-	-	-	-	-	-	-	dike w/sulf
3	5W879	0.3	C	12.170	871.6	1.43%	6.10%	282	4	-	-	-	-	-	-	-	-	jm w/some qz,py
3	5S332	0.3	CR	6.150	410.8	6020	19.90%	211	4	N	N	N	N	N	30	N	N	qz vein w/jm
3	5S333	0.07	CR	14.190	560.2	1.70%	42.50%	1540	2	-	-	-	-	-	-	-	-	jm
4	5W877	2.0	CR	N	N	85	27	585	5	-	-	-	-	-	-	-	-	dolomite w/qz veins
5	5S362	0.5	CR	0.015	5.1	82	101	160	28	-	-	-	-	-	-	-	-	qz,slate,lmst and gossan
6	5M897	0.2x.6	C	1.320	392.9	1620	8.80%	1940	4	N	N	N	N	N	N	N	10000	4 qz veins w/gn,sl
7	5M898	1.5	C	0.095	346.0	396	4.36%	2.53%	4	0.005	N	N	20	N	N	N	N	qz vein w/gn,sl,ml
8	5S331	1.2	CC	0.100	696.0	311	8.60%	1.93%	2	N	N	N	30	500	N	N	50000	qz vein w/gn
9	5S329	0.4	C	0.060	626.1	189	6.90%	4.89%	2	0.007	N	N	N	N	N	N	2000	qz vein w/gn
10	5S330	0.85	CC	0.095	3423.1	77	39.30%	1.87%	3	N	N	N	30	N	8	N	N	qz vein w/gn
11	5S328	0.9	C	0.050	467.0	19	5.30%	7810	2	N	N	N	N	N	N	N	N	qz vein w/gn
12	5W881	0.5	C	N	7.5	32	585	133	2	-	-	-	-	-	-	-	-	qz vein w/gn
13	5W880	0.6	C	0.120	915.1	2430	27.40%	1.09%	3	-	-	-	-	-	-	-	-	qz vein w/gn
13	5W882	0.1	S	2.120	2452.5	1.24%	>7500	7.40%	1	-	-	-	-	-	-	-	-	qz vein w/jm,gn,sl
14	5S363	0.15	CR	0.055	83.3	40	35.90%	7960	N	-	-	-	-	-	-	-	-	qz-calc vein w/gn
14	5S364	0.5	CR	N	8.4	19	925	795	N	-	-	-	-	-	-	-	-	fest qz-calc vein w/gn
15	5W863	-	CR	0.330	417.3	1110	6.90%	1.88%	3	N	N	N	N	N	N	N	3000	11 qz veins w/gn,sl,cp,py
15	5W864	-	S	0.585	2912.6	3720	36.20%	8340	4	N	N	N	N	N	N	N	6000	gn w/ml
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	FIGURE NO. 34
16	5S366	0.7	CC	N	0.8	5	96	60	3	-	-	-	-	-	-	-	-	qz-calc vein w/py
16	5S367	0.7	CC	N	N	2	30	55	1	-	-	-	-	-	-	-	-	qz-calc vein w/py
16	5S368	0.8	CC	N	0.6	5	82	26	5	-	-	-	-	-	-	-	-	qz-calc vein w/py
16	5W887	0.4	C	N	3.0	3	62	107	2	-	-	-	-	-	-	-	-	qz-calc vein w/py
16	5W886	0.35	C	N	0.6	5	74	1090	3	-	-	-	-	-	-	-	-	qz-calc vein w/py
16	5W885	0.5	CR	N	1.4	7	184	1370	4	-	-	-	-	-	-	-	-	qz-calc vein w/py
16	5W884	0.3	S	0.010	3.1	87	72	54.50%	1	-	-	-	-	-	-	-	-	sl w/some qz
16	5W883	0.5	C	0.010	8.9	56	835	13.50%	2	-	-	-	-	-	-	-	-	qz vein w/sl,py
17	5M895	0.3x.4	F	0.040	2.2	12	860	790	1	N	N	N	20	N	N	N	N	qz vein w/sulf
17	5M896	0.6x.4	F	N	N	5	6	1.95%	4	N	N	N	20	N	N	N	N	qz vein w/sl,py
17	5W859	0.1	F	N	N	22	18	20	5	N	N	N	70	400	10	N	N	qz vein w/sulf
17	5W860	0.5	F	0.005	34.3	5	4580	1.20%	2	N	N	N	30	N	N	N	N	qz vein w/gn,sl,py
17	5W861	0.4	F	N	7.4	2	1410	1730	3	N	N	N	N	N	N	N	N	qz vein w/gn,sl,py

Appendix C-2. *Analytical results from Merrill's Silver prospect (map nos. on fig. 28)*

Map no.	Sample no.	Sample size (ft)	Sample type	Fire assay Au (ppm)	Fire assay Ag (ppm)	Atomic absorption (ppm unless marked %) Cu	Pb	Zn	Co	X-ray Ba (%)	W	Mo	Sn	As	Ni	Bi	Sb	Lithology, remarks
1	5S377	5.0	SC	N	1.8	58	280	1590	40	-	-	-	-	-	-	-	-	dike
1	5S378	-	S	0.295	89.3	710	1.34%	13.00%	24	-	-	-	-	-	-	-	-	qz-calc vein w/gn,green mica
1	5S379	0.3	CR	0.025	8.3	169	765	5020	19	-	-	-	-	-	-	-	-	qz vein w/py and sericite
2	3S237	0.1	CH	0.023	1.3	16	410	1.01%	N	N	N	-	-	-	-	-	-	qz vein w/sl,gn,py,ml
2	3S238	0.2	CH	N	0.6	16	410	1.02%	N	N	N	-	-	-	-	-	-	argillite
3	3S239	0.1	C	0.059	3.5	89	280	7700	N	N	N	-	-	-	-	-	-	qz-calc w/sl,py
4	3S235	0.5	CH	0.343	610.3	30	15.70%	5400	N	N	N	-	-	-	-	-	-	qz gossan breccia w/gn
4	3S236	0.4	G	0.471	22.2	170	5500	1.89%	68	N	N	-	-	-	-	-	-	argillite w/sl,gn
5	5S380	0.2	CR	0.035	97.7	26	1.95%	2240	1	-	-	-	-	-	-	-	-	qz-calc vein w/gn,sl
5	5S381	0.5	C	0.175	129.9	11	2.77%	2.42%	N	-	-	-	-	-	-	-	-	qz-calc vein w/gn,sl
5	5S382	-	G	0.005	4.3	6	760	700	N	-	-	-	-	-	-	-	-	dolomite
5	3S240	0.1	C	0.010	253.7	24	3.90%	5700	N	0.010	N	-	-	-	-	-	-	qz vein w/gn,sl
6	3S241	-	R	N	0.8	N	190	59	N	.030	N	-	-	-	-	-	-	qz w/sulf
6	3S242	0.2	R	-	96.0	1640	1.37%	5.80%	N	N	N	-	-	-	-	-	-	qz-calc breccia w/gn,sl

Appendix C-3. *Analytical results from Glacier Creek prospect (map nos. on fig. 29)*

				Fire assay	Atomic absorption (ppm unless marked %)						Spectrographic (ppm)							
Map no.	Sample no.	Sample size (ft)	Sample type	Ag (ppm)	Ag (ppm)	Cu	Pb	Zn	Co	Ba (%)	W	Mo	Sn	As	Ni	Bi	Sb	Lithology, remarks
1	3S028	-	S	0.590	3.0	550	140	130	11	-	-	-	-	-	-	-	-	lmst w/py
2	8W1852	0.7	CH	N	2.5	52	109	820	4	0.110	-	-	-	-	-	-	-	lmst w/sulf,fest
3	8W1853	0.5	CH	0.035	0.3	117	16	1100	4	N	-	-	-	-	-	-	-	lmst w/sulf,fest
Not on map																		
4	8S1066	1.0	CR	0.007	1.3	126	12	325	11	0.370	-	-	-	-	-	-	-	fault zone in slate and lmst w/ py,fest

APPENDIX D. ANALYTICAL RESULTS FROM SKARN PROSPECTS AND OCCURRENCES IN PORCUPINE AREA

Appendix D-1. *Analytical results from Claire Bear occurrence (map nos. on fig. 30)*

Map no.	Sample no.	Sample size (ft)	Sample type	Fire assay Au (ppm)	Fire assay Ag (ppm)	Atomic absorption (ppm unless marked %) Cu	Pb	Zn	Co	X-ray Ba (%)	Spectrographic (ppm) W	Mo	Sn	As	Ni	Bi	Sb	Lithology, remarks
1	4S095	0.4	F	N	1.7	2160	30	69	1040	N	-	N	600	600	700	1000	N	massive py + sparse cp
1	4S096A	0.7	F	.028	56.2	1450	22	50	1070	N	-	N	700	N	800	N	7000	massive sulf w/po,py,cp
1	4S096B	0.3	F	N	N	120	N	150	69	0.016	-	N	N	400	300	N	2000	dike
2	5S288	6.0	CR	N	N	13	6	72	12	0.080	N	N	N	N	8	N	N	meta-andesite porphyry
3	5S286	1.8	CR	N	N	100	9	28	26	0.023	N	N	N	N	60	N	N	fest dike
4	5S289	10.0	CR	N	N	11	7	12	2	0.043	N	N	N	N	N	N	N	marble
5	5S287	0.15	CC	0.015	.9	2290	8	30	905	0.012	N	N	N	N	40	N	N	sulf lens w/po,cp
6	4S098	1.5	C	N	N	63	N	95	63	0.025	-	N	N	1000	200	N	N	dike
7	4S097	0.3	C	N	1.1	1330	22	110	490	0.013	-	N	N	300	400	N	3000	sulf lens w/po,py,cp

Appendix D-2. *Analytical results from Nataga-Skyline prospect*

Sample no	Fire assay AA[1] Au ppb	ICP[2] Ag ppm	Cu ppm	Pb ppm	Zn ppm	Co ppm	XRF[3] Ba ppm	ICP As ppm	Bi ppm	Cr ppm	Mn ppm	Mo ppm	Ni ppm	Sb ppm	Se ppm	W ppm	Cold Vapor AA Hg ppm	Lithology, remarks
89WG NS-1	N	1.5	511	4	1883	13	50	N	3	75	2580	8	1	N	N	N	36	adit
89WG NS-2	40	15.7	4206	141	17982	33	–	451	91	112	339	24	65	12	N	N	340	open cut

[1]AA=Atomic absorption
[2]ICP=Inductively coupled argon plasma spectroscopy
[3]XRF=X-ray fluorescence

APPENDIX E. ANALYTICAL RESULTS FROM KLUKWAN LODE AND ALLUVIAL FAN DEPOSITS

Appendix E-1. *Analytical methods for Appendix E-1*

Au, Pt, and Pd analyses were by Fire Assay - Atomic Absorption (Fa-AA), Inductively Coupled Argon Plasma Spectroscopy (ICP) or Fire Assay (FA).

Ag, Cu, Fe, V, and Ti analyses were by Atomic Absorption or X-ray fluorescence.

Where a number of analyses for either Au, Pt, and Pd were completed for a sample, the value estimated to be most accurate from available data is given.

Sample analyses were by USBM Research Center in Reno, Nevada; TSL Laboratories in Spokane, Washington; and Bondar-Clegg, Inc., of Lakewood, Colorado.

Units of measure abbreviation used: ppm - parts per million; L0.0003 = not detected above the lower limit of detection, that is, 0.0003 oz/ton; G10.00 = greater than 10.00 percent; - = not analyzed.

Appendix E-1. *Klukwan rock, stream-sediment, and pan-concentrate (map nos. on sheet 3)*

Map number	Lab & field sample number	Sample type & length (ft)	Analyses[2] (oz/ton)			Analyses[3] (units as shown)					Comments
			Au	Pt	Pd	Ag	Cu ppm	Fe %	V ppm	Ti %	
149	J81-180 1S033	SS	------	------	-------	L0.003	79	L10.00	940	0.60	
	J81-181 1S034	Float	0.000*	L0.001	L0.001	L0.003	12	G10.00	2370	1.00	Mag pyroxenite boulder
	J81-182 1S035	Float	0.000*	0.001	0.001	L0.003	61	10.00	795	0.70	Pyroxenite
10	J82-699 2S164	Float grab	0.077	L0.0003	L0.0003	0.408	10200	1.00	174	0.51	Diorite with 0.01 ft thick fracture filled with cp and bn
11	J82-698 2S163	Float grab	0.012	L0.0003	L0.0003	0.111	7400	1.30	156	0.44	Diorite fracture coated with ml and cp
12	J82-697 2S162	SS	0.000*	L0.0003	L0.0003	0.006	106	1.20	190	1.16	
13	J82-696 2S161	Float grab	L0.0002	L0.0003	L0.0003	0.029	2300	2.80	440	1.56	Hnbd diorite with ml stain and cp
14	J82-695 2S160	Float grab	0.019	L0.0003	L0.0003	0.087	6000	2.70	400	1.28	Diorite with ml stain and cp
15	J82-689 2S154	Float grab	0.156	L0.0003	L0.0003	0.437	24600	1.15	165	0.52	Granodiorite with bn and az coating fractures
	J82-692 2S157	Float grab	0.035	L0.0003	L0.0003	0.102	29500	1.30	30	0.05	Qtz diorite with az and cp coating fractures
	J82-693 2S158	PC	L0.0001	L0.001	L0.001	------	-----	-----	------	-----	
	J82-694 2S159	SS	L0.0002	L0.0003	L0.0003	------	-----	-----	------	-----	
16	J82-690 2S155	PC	0.0015	L0.0003	L0.0003	------	-----	-----	------	------	
	J82-691 2S156	PC	L0.0001	L0.0003	L0.0003	------	-----	-----	------	------	
17	J82-902 20893	Float grab	0.004	L0.001	L0.001	0.108	6050	2.55	362	1.14	Near in place, diorite with ml and bn in mafic segregations
18	J82-900 20768	Float grab	L0.0002	L0.0003	L0.0003	0.006	16	1.75	134	0.13	Iron stained altered siltstone with calc and qz stringers and veinlets
							Canyon 9				
18	J81-1047 1S183	SS	0.003	0.002	L0.0009	L0.0009	105	7.00	300	0.6	
	J81-1048 1S184	PC	L0.0002	L0.0009	L0.0009	0.003	71	7.00	300	0.4	
	J82-288 2S077	SS	L0.0002	L0.0009	L0.0009	L0.003	145	5.40	240	0.8338	
17	J82-287 2S076	Float grab	L0.0002	L0.0009	L0.0009	L0.003	105	3.00	127	0.3856	Diorite with disseminated po
16	J82-286 2S075	Float grab	L0.0002	L0.0009	L0.0009	0.006	1700	6.30	173	0.1871	Silicified diorite with disseminated po and cp
	J82-285 2S074	SS	L0.0002	L0.0009	L0.0009	0.003	100	5.30	226	0.7146	
15	J82-284 2S073	PC	L0.0002	L0.0009	L0.0009	L0.003	72	6.70	306	0.6693	
14	J82-283 2S072	Float grab	L0.0002	L0.0009	L0.0009	L0.003	205	0.29	L 10	0.0120	Qz vein 0.3 ft thick with ml stain
13	J82-282 2S071	Float grab	0.002	L0.0009	L0.0009	0.041	2200	5.90	480	0.2238	Iron stained diorite with disseminated po and cp

Appendix E-1. *Klukwan rock, stream-sediment, and pan-concentrate (map nos. on sheet 3)*-Continued

12	J82-281 2S070	SS	L0.0002	L0.0009	L0.0009	L0.003	165	6.50	315	0.9597	
11	J82-280 2S069	PC	L0.0002	0.0021*	0.0022*	L0.003	91	7.80	360	0.8072	
10	J82-279 2S068	Float grab	0.002	L0.0009	L0.0009	0.012	4000	7.60	240	0.8258	Fine grained diorite rock with disseminated po and cp
9	J82-278 2S067	Chip 0.1 ft	L0.0002	L0.0009	L0.0009	L0.003	9	0.54	L 10	0.560	Qz vein in fault
	J82-277 2S066	Chip 0.1 ft	L0.0002	L0.0009	L0.0009	L0.003	27	4.15	100	0.4262	Fault gouge
8	J82-276 2S065	Chip 0.4 ft	L0.0002	L0.0009	L0.0009	L0.003	110	4.20	120	0.4509	Fault gouge and iron stained diorite
7	J82-275 2S064	PC	L0.0002	L0.0009	L0.0009	L0.003	88	6.00	220	0.4749	
6	J82-899 20767	Grab	L0.0002	L0.001	L0.001	0.006	28	0.55	20	0.050	Fine grained "aplitic" rock with less than 3% mafics
						Area east of Canyon 9					
5	J82-291 2S080	PC	L0.0003	L0.002	L0.002	L0.003	29	39.20	2271	1.0800	
4	J82-292 2S081	SS	L0.0003	L0.002	L0.002	L0.003	49	14.00	793	0.9797	
	J82-293 2S082	PC	L0.0004	L0.002	L0.002	L0.003	25	39.30	2284	1.2190	
	J82-294 2S083	SS	L0.0003	L0.002	L0.002	L0.003	37	7.40	386	0.9557	
	J82-799 2S261	PC	L0.0001	L0.001	L0.001	------	------	-----	------	-------	
	J82-800 2S262	SS	L0.0002	L0.0003	L0.0003	0.006	44	1.90	339	2.00	
3	J82-801 2S263	PC	L0.0002	L0.001	L0.001	------	------	-----	------	------	
	J82-802 2S264	SS	-------	------	------	0.006	31	1.35	376	2.09	
2	J82-803 2S265	SS	L0.0008	L0.001	L0.001	------	------	-----	------	------	
1	J82-804 2S266	PC	0.0003	L0.001	L0.001	------	------	-----	------	------	
	J82-805 2S267	SS	L0.0002	L0.0003	L0.0003	0.006	29	4.20	575	1.84	
						Upper portions of Canyons 8, 7, and 6					
19	J82-897 20765	Grab	L0.0002	L0.0003	L0.0003	0.015	1000	5.60	220	1.89	Porphyritic hnbd pyroxenite with trace cp
	J82-898 20766	Float grab	L0.0002	L0.0003	L0.0003	0.006	960	4.55	276	1.86	Mag, pyx, hornblendite with ml and traces of cp, near in place
20	J82-295 2S084	Grab	L0.0003	L0.002	L0.002	L0.003	31	16.80	1379	1.5112	Hnbd pyroxenite and mag
21	J82-296 2S085	PC	L0.0003	L0.002	L0.002	L0.003	135	18.00	1272	1.2308	
	J82-297 2S086	Float grab	L0.0003	L0.002	L0.002	L0.003	170	11.60	1112	1.2967	Fragments of hnbd pyroxenite and mag
	J82-298 2S087	Float grab	L0.0003	L0.002	L0.002	L0.003	145	20.30	2031	1.9167	Hnbd pyroxenite ml stained and mag
	J82-299 2S088	Float grab	L0.0003	L0.002	L0.002	L0.003	150	21.00	2111	2.1072	Hnbd pyroxenite and mag

Appendix E-1. *Klukwan rock, stream-sediment, and pan-concentrate (map nos. on sheet 3)*-Continued

Map Number	Lab & field sample number	Sample type[1] & length (ft)	Analyses[2] (oz/ton) Au	Pt	Pd	Ag	Analyses[3] (units as shown) Cu ppm	Fe %	V ppm	Ti %	Comments
23	J82-889 20757	Float grab	L0.0002	L0.0003	L0.0003	0.006	69	1.45	206	0.79	Near in place coarse grained diorite
22	J81-1194 10095	Grab	L0.0002	L0.001	L0.001	L0.20	115	G10.00	800	0.6	
24	J82-890 20758	Float grab	L0.0002	L0.0003	L0.0003	0.006	89	2.35	242	0.81	Near in place rock containing 20% qz,30% feldspar, 40% pyx
	J81-1195 10097	Grab	L0.0002	L0.001	L0.001	L0.20	690	G10.00	800	0.70	Hnbd pyroxenite with ml staining
25	J82-891 20759	Grab	0.001	L0.0003	L0.0003	0.006	1650	4.15	330	2.20	Mag pyroxenite from contact with diorite/gabbro
27	J82-896 20764	Float grab	L0.0002	L0.0003	L0.0003	0.058	440	3.65	410	0.85	Near in place rubble crop of iron stained zone showing carbonate alteration
26	J82-895 20763	Chip 20 ft	L0.0002	L0.0003	L0.0003	0.006	705	4.90	425	1.90	Hnbd pyroxenite with traces of ml and cp
30	J81-1041 1S177	Grab	0.003	L0.001	L0.001	L0.200	1550	8.00	500	0.60	Hnbd pyroxenite with mag, cp, and ml, forms iron stained band up to 20 ft across
	J81-1042 1S178	Grab	L0.0002	L0.001	L0.001	L0.200	175	8.00	500	0.50	Same band as above, hnbd pyroxenite and mag
31	J81-1035 1S171	Grab .04 ft	------	------	------	L0.200	62000	10.00	500	0.60	Same band as above, cp vein in hnbd pyroxenite
	J81-1036 1S172	Grab	0.003	L0.001	L0.001	L0.200	6500	8.00	500	0.80	Same band as above, higher grade
	J81-1037 1S173	Rep chip 10ft long	L0.0002	L0.001	L0.001	L0.200	3500	8.00	500	0.60	Same band as above, sample taken across band
	J81-1038 1S174	Grab	L0.0002	L0.001	0.003	L0.200	1850	8.00	500	0.70	Sample taken 50 ft below 1S173; po, cp, and ml in hnbd pyroxenite
	J81-1039 1S175	0.5 ft chip 5 ft long	L0.0002	L0.001	L0.001	L0.200	18000	7.00	400	0.60	Same band as above, higher grade portions, po,cp,ml in hnbd pyroxenite
	J81-1040 1S176	Soil sample	0.002	L0.001	L0.001	0.020	530	7.00	500	0.4	Same band as above, iron stained soil
28	J82-828 20842	Float grab	0.001*	L0.0003	L0.0003	0.012	880	5.15	397	1.93	Mag pyroxenite with ml and disseminated cp, near in place
29	J82-734 2S198B	Grab	L0.0002	L0.0003	L0.0003	0.006	32	5.85	1040	1.84	Hnbd pyroxenite
	J82-735 2S199	Grab	L0.0002	L0.0003	L0.0003	0.006	490	5.65	890	2.03	Hnbd pyroxenite with disseminated cp
	J82-736 2S200	Grab	L0.0002	L0.0003	L0.0003	0.006	358	6.35	950	2.04	Hnbd pyroxenite with disseminated cp, ml, and mag
	J82-827 20841	Grab	0.003	L0.0003	L0.0003	0.017	990	5.80	450	2.74	Mag pyroxenite with ml and cp

Appendix E-1. *Klukwan rock, stream-sediment, and pan-concentrate (map nos. on sheet 3)*-Continued

39	J82-875 20451	SS	L0.0004	L0.0006	L0.0006	------	------	-----	------	-----	
38	J82-232 2S022	Float grab	L0.0002	L0.0009	L0.0009	0.009	980	5.60	942	1.21	Hnbd pyroxenite with bleb of cp
37	J82-881 20457	SS	L0.0002	L0.0003	L0.0003	------	------	------	------	-----	
	J82-882 20458	Float grab	L0.0002	L0.0003	L0.0003	0.012	1010	4.90	605	1.51	Hnbd mag pyroxenite with traces of ml and cp, sample high-graded
36	J82-876 20452	SS	L0.0004	L0.0006	L0.0006	------	------	------	------	-----	
	J82-877 20453	Float grab	0.001	L0.0003	L0.0003	0.41	2800	3.05	385	1.10	Gabbro with trace of cp, ep, and ml
36	J82-884 20460	Float grab	L0.0002	L0.0003	L0.0003	0.006	470	2.55	415	1.30	Pyx "segregations" bearing calc and cp in foliated gabbro, high-graded
35	J82-883 20459	Float grab	0.001*	L0.0003	L0.0003	0.020	1590	5.50	695	2.55	Mag hnbd pyroxenite with trace ml and cp. Sample high-graded
34	J82-878 20454	SS	L0.0004	L0.0006	L0.0006	------	------	------	------	-----	
33	J82-885 20461	Float grab	0.001	L0.0003	L0.0003	0.012	1400	7.65	870	2.01	Mag hnbd pyroxenite with trace cp and ml. Sample high-graded
32	J82-879 20455	SS	L0.0004	L0.0006	L0.0006	------	------	------	------	------	
	J82-880 20456	Grab	L0.0002	L0.0003	L0.0003	0.006	206	2.85	376	1.04	Gabbro
							Canyon 5				
52	J81-1045 1S181	PC	L0.0002	L0.001	L0.001	L0.0009	125	10.00	600	0.06	
	J81-1046 1S182	SS	L0.0002	L0.001	L0.001	0.003	225	8.00	400	0.04	
51	J82-244 2S034	Float grab	L0.0003	L0.002	L0.002	0.015	500	15.40	1098	1.18	Hnbd mag pyroxenite and ml and cp
50	J82-242 2S032	SS	L0.0003	L0.002	L0.002	L0.003	210	11.20	743	0.99	
	J82-243 2S033	PC	L0.0003	L0.002	0.00072	0.003	130	23.50	1538	1.43	
49	J82-241 2S031	PC	L0.0003	L0.002	L0.002	0.003	160	24.50	1449	1.24	
48	J82-239 2S029	Float grab	L0.0003	L0.0009	L0.0009	0.006	640	7.00	936	1.07	Hnbd pyroxenite with cp and ml stain
48	J82-240 2S030	SS	L0.0003	L0.0009	L0.0009	0.032	155	4.10	644	0.99	
47	J82-230 2S020	PC	L0.0003	L0.0009	L0.0009	L0.003	150	9.00	1573	1.38	
	J82-231 2S021	Float grab	0.003	L0.0009	L0.0009	0.012	525	6.00	954	1.05	Hnbd pyroxenite with disseminated cp and ml
	J82-237 2S027	SS	L0.0003	L0.0009	L0.0009	0.003	215	4.20	656	0.98	
	J82-238 2S028	Float grab	L0.0003	L0.0009	L0.0009	0.026	2500	4.60	432	0.79	Gabbro with cp and ml

Appendix E-1. *Klukwan rock, stream-sediment, and pan-concentrate (map nos. on sheet 3)*-Continued

Map number	Lab & field sample number	Sample type[1] & length (ft)	Analyses[2] (oz/ton)				Analyses[3] (units as shown)				Comments
			Au	Pt	Pd	Ag	Cu ppm	Fe %	V ppm	Ti %	
46	J82-236 2S026	Float grab	0.005	L0.0009	L0.0009	0.015	1750	6.60	930	1.08	Hnbd pyroxenite with cp and ml
45	J82-233 2S023	Float grab	L0.0003	L0.0009	L0.0009	0.009	1850	4.60	819	1.17	Hnbd pyroxenite with bleb of cp
	J82-235 2S025	Float grab	0.003	L0.0009	L0.0009	0.012	880	6.60	999	1.13	Hnbd pyroxenite with ml stain
44	J82-234 2S024	SS	L0.0003	L0.0009	L0.0009	0.003	245	4.20	729	0.97	
43	J82-262 2S051	Rep grab	L0.0003	L0.002	L0.002	0.006	1250	10.30	533	0.74	Pyroxenite-diorite contact zone. Iron stained hnbd diorite with disseminated po, cp
	J82-260 2S049	Float grab	L0.0003	L0.002	L0.002	0.009	800	14.00	1192	1.13	Hnbd pyroxenite with po, cp
42	J82-261 2S050	Grab	L0.0003	L0.002	L0.002	L0.003	20	11.70	979	1.29	Hornblendite with po
41	J82-259 2S048	SS	L0.0003	L0.002	L0.002	L0.003	115	10.80	1032	1.10	
40	J82-255 2S044	Float grab	L0.0003	L0.002	L0.002	0.012	955	14.20	1005	1.17	Hnbd pyroxenite with cp alteration along fracture which contains ml stain and cp
	J82-256 2S045	Grab	L0.0003	L0.002	L0.002	0.003	730	12.70	1324	1.14	Hnbd pyroxenite with ml stain and cp
	J82-257 2S046	PC	L0.0003	L0.002	L0.002	0.003	135	23.60	2204	1.37	
40	J82-258 2S047	Float grab	L0.0003	L0.002	L0.002	L0.006	560	14.00	1305	1.24	Iron stained hnbd pyroxenite boulder with mag
63	J82-716 2S181	Float grab	L0.0002	L0.003	L0.003	0.009	450	5.40	995	1.03	Hnbd pyroxenite with disseminated cp
62	J82-273 2S062	0.25 ft Chip 6 ft long	L0.0002	L0.0009	L0.0009	L0.003	395	7.10	420	0.688	Banded hnbd diorite with po and cp
	J82-274 2S063	Grab	L0.0002	L0.0009	L0.0009	L0.003	425	9.40	460	0.708	Higher grade portion of above sample
	J82-715 2S180	Float grab	L0.0002	L0.0003	L0.0003	0.006	405	1.60	520	1.32	Hnbd diorite with ep and cp
61	J82-272 2S061	Float grab	L0.0002	L0.0009	L0.0009	L0.003	850	5.00	253	0.5475	Diorite with ml stain
61	J82-712 2S177	Float grab	L0.0002	L0.0003	L0.0003	0.023	1130	1.25	212	0.57	Diorite with ml stain and cp
	J82-713 2S178	PC	L0.0001	L0.001	L0.001	------	------	------	------	------	
	J82-714 2S179	Grab	L0.0002	L0.0003	L0.0003	0.006	27	2.70	445	0.89	Hnbd gabbro with ep
60	J82-271 2S060	1 ft Chip 20 ft long	L0.0003	L0.002	L0.002	0.003	13	46.20	2837	2.89	Massive magnetite
	J82-857 20877	Rep grab	L0.0002	L0.0003	L0.0003	0.006	43	7.15	1300	5.65	Massive magnetite
59	J82-270 2S059	Float grab	L0.0003	L0.002	L0.002	L0.003	8	21.30	1598	1.55	Iron stained hnbd pyroxenite

Appendix E-1. *Klukwan rock, stream-sediment, and pan-concentrate (map nos. on sheet 3)*-Continued

58	J82-268 2S057	Float grab	L0.0003	L0.002	L0.002	0.012	410	12.40	946	0.87	Pyroxenite with ml stain and cp
	J82-269 2S058	Grab	L0.0003	L0.002	L0.002	0.003	230	10.40	852	1.01	Ep along fracture in pyroxenite with py and cp
	J82-858 20878	Rep grab	L0.0002	L0.003	L0.003	0.006	13	G10.00	620	2.23	Hnbd pyroxenite with 10-15% mag
57	J82-726 2S191	SS	L0.0002	L0.003	L0.003	------	------	------	------	------	
56	J82-267 2S056	Float grab	L0.0003	L0.002	L0.002	0.003	82	5.55	413	0.61	Diorite with ml stain
55	J82-263 2S052	PC	L0.0003	L0.002	L0.002	0.087	24	33.50	2611	1.89	
	J82-264 2S053	Float grab	L0.0003	L0.002	L0.002	0.012	820	11.80	1332	1.35	Hnbd pyroxenite with ml stain and cp
	J82-265 2S054	0.25 ft chip 4 ft long	L0.0003	L0.002	L0.002	0.003	18	16.30	1585	1.26	Iron stained mag pyroxenite
	J82-266 2S055	Float grab	L0.0003	L0.002	L0.002	0.017	1000	17.50	1865	1.49	Mag pyroxenite with ml stain and disseminated cp
54	J82-859 20879	Rep grab	0.0003	L0.003	L0.003	0.006	63	4.65	1120	3.25	Mafic to ultramafic dike rock, orange weathering with mag and carbonate stringers
53	J82-727 2S192	Rep grab	L0.0002	L0.0003	0.000*	0.017	1000	5.40	1030	1.81	Hnbd pyroxenite with cp
	J82-860 20880	Grab	L0.0002	L0.0003	L0.0003	0.052	3100	4.15	380	2.63	Higher grade hnbd pyroxenite with cp
						Ridge above Canyons 3, 4, 5					
70	J82-888 20756	Grab	L0.0002	L0.0003	L0.0003	0.006	6	6.60	605	2.05	Pyroxenite
69	J82-887 20754	Grab	L0.0002	L0.0003	L0.0003	0.006	8	7.25	590	1.26	Pyroxenite
68	J82-894 20762	Grab	0.009	L0.0003	L0.0003	0.076	4000	1.35	264	0.84	Diorite with ml stain
67	J82-886 20753	Grab	L0.0002	L0.0003	L0.0003	0.006	142	1.65	246	0.95	Diorite with ep
66	J82-892 20760	Grab	L0.0002	L0.0003	L0.0003	0.006	185	0.80	57	0.24	Anorthosite dike
65	J82-893 20761	Grab	L0.0002	L0.0003	L0.0003	0.006	78	1.65	144	0.61	Medium gray quartzite?
64	J82-787 2S249	Grab	0.001	L0.0003	L0.0003	0.006	71	1.70	320	0.81	Hnbd diorite with ep,chl alteration
						Canyon 3					
100	J82-861 20881	Grab	L0.0002	L0.0003	L0.0003	0.006	72	2.45	435	1.20	Hnbd gabbro with mag and po
	J82-862 20882	Grab	L0.0002	L0.0003	L0.0003	0.006	61	3.30	410	1.94	Basalt
99	J82-822 20835	Grab	0.003	L0.0003	L0.0003	0.006	90	3.25	318	1.19	3 ft wide mafic dike
98	J82-225 2S015	SS	L0.0003	L0.0002	L0.0002	L0.003	26	6.60	1184	1.04	

Appendix E-1. *Klukwan rock, stream-sediment, and pan-concentrate (map nos. on sheet 3)*-Continued

Map number	Lab & field sample number	Sample type[1] & length (ft)	Analyses[2] (oz/ton) Au	Pt	Pd	Ag	Analyses[3] (units as shown) Cu ppm	Fe %	V ppm	Ti %	Comments
97	J82-832 20847	Grab	L0.0003	L0.0003	L0.0003	0.006	255	1.95	295	1.40	Iron stained gabbro with po
96	J82-224 2S014	SS	L0.0002	L0.0009	L0.0009	L0.003	27	10.60	1359	1.09	
95	J82-223 2S013	SS	L0.0002	L0.0009	L0.0009	L0.003	38	7.00	1047	0.95	
94	J81-1217 1S210	SS	L0.0002	L0.0009	0.0010*	L0.012	65	8.00	400	0.30	
	J81-1219 1S212	Float grab	L0.0032	0.001	0 0.002	L0.20	450	8.00	500	0.60	Hnbd pyroxenite with ml stain and cp
93	J82-222 2S012	SS	L0.0002	L0.0009	L0.0009	0.055	36	6.00	894	0.96	
92	J82-221 2S011	SS	L0.0003	L0.002	L0.002	0.003	52	5.20	757	0.95	
91	J82-220 2S010	Float grab	0.002	L0.0009	0.0024	0.085	495	7.20	1005	1.01	Hnbd pyroxenite with ml stain and cp
90	J82-218 2S008	Float grab	0.013	L0.0009	L0.0009	0.029	1000	8.00	1128	1.15	do.
	J82-219 2S009	Float grab	L0.0003	L0.002	L0.002	0.003	23	18.40	1986	1.79	Mag pyroxenite
89	J82-217 2S007	SS	L0.0002	L0.0009	0.0010	0.003	47	4.10	745	0.82	
88	J82-867 20888	Float grab	L0.0004	L0.0006	L0.0006	0.006	18	G 10.00	2730	2.88	Chips of mag from 3000 ft elevation to 1500 ft elevation Canyon 3
87	J82-216 2S006	SS	L0.0002	L0.0009	L0.0009	0.003	41	5.20	877	0.85	
86	J82-214 2S004	SS	L0.0003	L0.002	L0.002	0.003	34	6.40	855	0.83	
	J82-215 2S005	Float grab	L0.0002	L0.0009	L0.0009	0.012	820	8.10	1042	1.04	Mag & pyroxenite with ml stain and cp
85	J82-843 20860	Float grab	0.001	L0.0003	L0.0003	0.015	2500	8.00	268	1.10	Mag pyroxenite with ml stain and cp
84	J82-213 2S003	SS	L0.0003	L0.002	L0.002	0.003	55	4.00	844	0.89	
83	J82-211 2S001	Grab	L0.0002	L0.0009	0.0018	0.012	700	8.60	1160	1.18	Mag pyroxenite with ml and cp
81	J82-212 2S002	Grab	0.0008	L0.0009	L0.0009	0.041	2500	7.65	1065	1.36	Brecciated pyroxenite with cp
82	J82-821 20834	Float grab	0.000*	0.001	L0.0003	0.006	21	7.60	800	1.61	Red weathering pyroxenite
80	J82-844 20861	Float grab	L0.0002	L0.0003	L0.0003	0.006	31	G 10.00	306	6.29	Mag rubble
79	J82-845 20862	Grab	L0.0002	L0.0003	L0.0003	0.006	109	3.25	344	1.35	Hnbd gabbro
71	J82-846	Grab	L0.0002	L0.0003	L0.0003	0.017	610	6.55	820	1.86	Hnbd pyroxenite with ml stain 20863and cp
72	J82-869 20889	PC	-------	------	------	------	------	-------	------	------	

Appendix E-1. *Klukwan rock, stream-sediment, and pan-concentrate (map nos. on sheet 3)*-Continued

73	J82-866 20887	Grab	L0.0004	L0.0006	L0.0006	0.006	17	9.75	1386	1.61	Mag hnbd pyroxenite
74	J82-850 20867	Chip	L0.0002	L0.0003	L0.0003	0.006	435	7.45	675	2.00	Hnbd pyroxenite with ml stain
75	J82-849 20866	Float grab	0.001	0.001*	0.001	0.009	910	7.60	845	1.96	Hnbd, mag pyroxenite with cp,ml,ep, and iron stain
76	J82-848 20865	Grab	L0.0002	L0.0003	L0.0003	0.006	840	6.70	815	4.80	Plag hornblendite with sulfides, iron, and ml stain
77	J82-865 20886	Grab	L0.0002	L0.0003	L0.0003	0.006	358	G 10.00	655	1.70	Pyroxenite with ml stain and cp
78	J82-226 2S016	Soil sample	L0.0002	L0.0009	L0.0009	L0.003	22	6.40	905	1.00	
	J82-227 2S017	1 ft chip 15ft long	L0.0002	L0.0009	L0.0009	0.003	11	6.40	938	0.99	Hnbd pyroxenite
148	J82-856 20876	Grab	L0.0002	L0.0003	L0.0003	0.006	86	2.50	465	1.64	Basalt with pyrrhotite
145	J82-830 20845	Float grab	L0.0002	L0.0003	L0.0003	0.006	129	4.20	410	1.66	Hydrothermally altered basalt
147	J82-776 2S228	Rep chip	L0.0002	L0.0003	L0.0003	0.006	295	3.80	286	0.99	Meta basalt
146	J81-179 1S032	Float grab	L0.0002	L0.001	L0.001	L0.2	110	7.00	420	0.60	Near in place basalt with po
	J82-765 2S227	Rep chip	L0.0002	L0.0002	L0.0003	0.006	78	3.05	565	2.76	Meta basalt
144	J82-764 2S226	Rep chip	L0.0002	L0.0003	L0.0003	0.006	19	0.95	273	0.52	Meta basalt
143	J82-763 2S225	Rep chip	L0.0002	L0.0003	L0.0003	0.006	65	1.35	317	1.65	Meta basalt
142	J82-762 2S224	Rep chip	L0.0002	L0.0003	L0.0003	0.006	174	3.95	500	2.66	Meta basalt with sulfides
							Canyon 2				
141	J82-175 1S028	PC	0.000*	0.001*	L0.001	L0.200	82	G 10.00	760	0.60	
	J82-176 1S029	SS	0.000*	0.001*	L0.001	L0.200	66	G 10.00	900	0.80	
	J82-177 1S030	Float grab	0.000*	L0.001	L0.001	L0.200	9	2.00	140	0.08	Qz boulder with py and po
	J81-178 1S031	Float grab	0.000*	L0.002	L0.002	L0.200	21	G 10.00	2540	0.80	Composite of mag float from 825ft elevation to 1575ft elevation in Canyon 2
140	J81-173 1S026	PC	L0.0002	L0.001	L0.001	L0.200	82	G 10.00	1650	0.80	
	J81-174 1S027	SS	0.000*	L0.001	L0.001	L0.200	101	G 10.00	740	0.70	
139	J81-171 1S024	SS	L0.0002	L0.001	L0.001	L0.200	84	G 10.00	795	0.80	
	J81-172 1S025	Float grab	0.000*	L0.001	L0.001	L0.200	7	3.00	93	0.02	Qz boulder with sulfides
138	J81-170 1S023	SS	0.000*	0.001*	L0.001	L0.200	71	G 10.00	801	0.70	
132	J82-670 2S135	Rep chip	L0.0002	L0.0003	L0.0003	0.006	54	2.35	300	1.29	Ep diorite

Appendix E-1. *Klukwan rock, stream-sediment, and pan-concentrate (map nos. on sheet 3)*-Continued

Map number	Lab & field sample number	Sample type[1] & length (ft)	Analyses[2] (oz/ton) Au	Pt	Pd	Analyses[3] (units as shown) Ag	Cu ppm	Fe %	V ppm	Ti %	Comments
					North Side Canyon 2						
130	J82-725 2S190	SS	L0.0002	L0.0003	0.001*	------	------	------	------	------	
129	J82-723 2S188	SS	L0.0002	L0.0003	0.001*	------	------	------	------	------	
	J82-724 2S189	Float grab	0.002	0.001	0.001	0.015	900	5.40	726	1.65	Hnbd pyroxenite with cp
	J82-229 2S019	SS	L0.0002	L0.0009	L0.0009	0.003	330	55.00	741	0.99	
	J82-669 2S134	Float grab	L0.0002	L0.0003	L0.0003	0.006	495	1.50	1020	1.82	Hnbd pyroxenite with cp
128	J82-228 2S018	SS	L0.0002	L0.0009	L0.0009	0.006	370	5.60	849	1.04	
	J82-722 2S187	Float grab	0.019	L0.0003	L0.001*	0.015	1020	4.70	1025	1.27	Fine grained pyroxenite with hem and cp
	J82-668 2S133	Float grab	L0.0002	L0.0003	L0.0003	0.006	410	6.80	1300	2.13	Pyroxenite with ml stain
127	J82-721 2S186	SS	L0.0002	L0.0003	L0.0003	------	------	------	------	-----	
					South Side Canyon 2						
133	J82-823 20836	Random chip	L0.0002	L0.0003	L0.0003	0.012	1170	6.45	565	1.01	Mag hornblendite with ml stain & cp
134	J82-824 20837	Grab	L0.0002	0.001*	L0.0003	------	------	-------	------	------	Mag hnbd pyroxenite with ml and cp
135	J82-847 20864	SS	L0.0004	L0.0006	L0.0006	------	------	-------	------	------	
136	J82-825 20838	Grab	L0.0002	0.001*	L0.0003	0.006	341	7.40	480	1.64	Mag pyroxenite
137	J82-826 20839	Random chip	L0.0002	L0.0003	L0.0003	0.023	1230	7.45	685	2.03	Pyroxenite with ml stain
					Canyon 2						
131	J82-168 1S021	PC	0.000*	0.001*	0.002*	L0.200	66	G 10.00	1230	1.6	
	J82-169 1S022	SS	L0.0002	L0.001	L0.001	------	------	------	-------	------	------
	J82-671 2S136	Rep chip	L0.0002	L0.0003	L0.0003	0.015	1250	3.40	625	2.02	Hnbd pyroxenite with ml and cp
126	J82-854 20874	Float grab	0.001	0.001*	0.000*	0.020	1340	7.20	710	2.16	Hnbd pyroxenite with ml
	J82-855 20875	Float grab	L0.0002	L0.0003	0.001*	0.015	1540	7.65	625	1.26	Hnbd pyroxenite with ml and cp
125	J81-166 1S019	High-grade grab	0.002	0.001*	0.001*	L0.200	11300	10.00	625	0.60	Pyroxenite with cp and ml
	J81-167 1S020	SS	L0.0002	0.001*	L0.001	L0.200	97	G 10.00	815	0.80	
124	J82-672 2S137	PC	0.0003	L0.001	L0.001	------	------	------	------	-----	
	J82-254 2S043	PC	L0.0003	L0.002	L0.002	0.003	36	43.50	269	1.55	

Appendix E-1. *Klukwan rock, stream-sediment, and pan-concentrate (map nos. on sheet 3)*-Continued

Canyon 2 Lower Copper Area

123	J82-245 2S035	Random chip 100ft long	L0.0003	L0.002	L0.002	0.006	540	18.50	1216	1.22	Mag hnbd pyroxenite with cp
	J82-246 2S036	Grab	L0.0003	L0.002	L0.002	0.012	850	13.70	1046	1.08	Mag hnbd pyroxenite with cp
	J82-247 2S037	Random grab 100ft long	L0.0003	L0.002	L0.002	0.017	585	19.70	1305	1.26	Mag hnbd pyroxenite with cp
	J82-248 2S038	Float grab	L0.0003	L0.002	L0.002	0.017	730	16.50	1081	1.12	Mag hnbd pyroxenite with cp near in place
	J82-249 2S039A	Float grab	L0.0003	L0.002	L0.002	0.017	1100	16.20	1056	1.07	Mag hnbd pyroxenite with cp near in place
	J82-250 2S039B	Float grab	L0.0003	L0.002	L0.002	0.009	495	17.30	1183	1.17	Mag hnbd pyroxenite with bleb of cp
	J82-251 2S040	Random chip 175ft long	L0.0003	L0.002	L0.002	0.009	950	14.80	1022	0.99	Mag pyroxenite with cp
	J82-810 2S272	Bulk 193 lb	0.0005	0.0010	------	0.018	850	25.50		1.54	Mag hnbd pyroxenite with cp

Canyon 2

121	J81-164 1S017	SS	L0.0002	0.002*	L0.001	0.300	130	10.00	695	0.60	
	J81-165 1S018	Float grab	0.010	0.031	0.001*	L0.200	2800	7.00	255	0.40	Hnbd gabbro with knot of cp
122	J82-252 2S041	Grab	L0.0003	L0.002	L0.002	0.023	1150	15.60	1092	0.98	Mag pyroxenite with ml stain & cp
	J82-253 2S042	Grab	L0.0003	L0.002	L0.002	0.023	870	15.90	995	1.0.	Mag pyroxenite with ml stain & cp
120	J81-161 1S014	Grab	0.000*	L0.001	L0.001	L0.200	455	2.00	231	0.20	Shear zone pinch and swell with calc, qz, and cp
	J81-162 1S015	PC	L0.0002	0.001*	L0.001	L0.200	48	G 10.00	1330	0.04	
	J81-163 1S016	SS	L0.0002	L0.001	L0.001	------	------	------	-----	-----	
119	J82-675 2S140	Grab	L0.0002	L0.0003	L0.0003	0.006	154	1.25	265	0.54	Schistose mafic xenolith ± 50ft across
	J82-820 20833	Grab	L0.0002	L0.0003	L0.0003	0.006	305	0.50	37	0.14	Anorthosite cobble from within schistose mafic xenolith ± 50ft across. Some cp, hem, and mag
118	J82-851 20869	Grab	L0.0002	0.001*	L0.0003	0.006	183	1.45	191	0.71	Schistose mafic xenolith from above
	J82-310 2S099	Float grab	L0.0002	L0.001	0.004	0.070	12500	3.50	333	0.49	Qz feldspar in pyroxenite with cp

Canyon 2 upper copper area

117	J81-160 1S013	Float grab	0.001	L0.001	L0.001	L0.200	2150	G 10.00	750	0.80	Hnbd pyroxenite with ml stain po and cp
	J82-710 2S175	SS	L0.0002	L0.0003	L0.0003	0.006	102	4.15	695	1.26	
	J82-711 2S176	Rep chip	L0.0002	L0.0003	L0.0003	0.006	22	G 10.00	1630	3.12	Mag pyroxenite with hem
	J82-841 20858	PC	L0.0001	0.001	L0.001	------	------	------	------	------	

Appendix E-1. *Klukwan rock, stream-sediment, and pan-concentrate (map nos. on sheet 3)*-Continued

Map number	Lab & field sample number	Sample type[1] & length (ft)	Analyses[2] (oz/ton) Au	Pt	Pd	Ag	Analyses[3] (units as shown) Cu ppm	Fe %	V ppm	Ti %	Comments
117	J81-158 1S012A	Rep chip	0.000*	L0.001	L0.001	L0.200	49	8.00	560	0.04	Iron stained mafic dike
	J81-159 1S012B	Grab	L0.0002	L0.001	L0.001	L0.200	21	10.00	705	0.50	Fault gouge
	J82-759 2S221	Float grab	L0.0002	L0.0003	L0.0003	0.047	1530	9.50	2300	3.85	Mag pyroxenite with cp
	J82-760 2S222	Bulk high grade 189 lb	0.0017	L0.0003	------	0.017	1820	19.50		1.13	Bulk sample of hnbd pyroxenite with mag, cp, and ml, float and in place
115	J82-704 2S169	Float grab	L0.0002	L0.0003	L0.0003	0.006	331	5.70	100	1.43	Dunite
114	J82-709 2S174	Float grab	L0.0002	L0.0003	L0.0003	0.006	1500	4.75	875	2.63	Pyroxenite with cp
113	J82-708 2S173	Float grab	L0.0002	L0.0003	L0.0003	0.006	420	5.20	905	1.68	Coarse grained pyroxenite with mag and cp
112	J82-705 2S170	Chip 0.2ft long	L0.0002	L0.0003	L0.0003	0.006	31	0.70	585	0.10	Anorthosite dike
	J82-706 2S171	Grab	L0.0002	L0.0003	L0.0003	0.006	14	8.50	1200	1.79	Mag pyroxenite
	J82-707 2S172	Float grab	L0.0002	L0.0003	L0.0003	0.006	730	4.35	855	1.80	Hnbd pyroxenite with cp
111	J82-853 20873	Float grab	0.001	L0.0003	L0.0003	0.006	840	2.80	116	2.40	Coarse grained hnbd pyroxenite with blebs of cp
110	J82-839 20856	Float grab	L0.0002	L0.0003	L0.0003	0.006	22	G 10.00	310	3.94	Segregation of massive mag in hnbd pyroxenite
	J82-840 20857	Rep chip 100 sq ft	L0.0002	0.001*	L0.0003	0.006	289	5.95	600	1.71	Hnbd pyroxenite with some ml and cp
109	J82-719 2S184	Float grab	L0.0002	L0.0003	L0.0003	0.009	690	4.90	815	1.59	Pyroxenite with ml and cp
	J82-720 2S185	Chip 1 ft long	L0.0004	0.002	0.001*	0.026	2230	2.05	168	0.08	Qz feldspar vein with blebs of cp
108	J81-155 1S009	Grab	0.000*	L0.001	0.001*	L0.200	1770	10.00	560	0.30	Mag pyroxenite with po and cp at adit
	J81-156 1S010	Grab	0.000*	L0.001	L0.001	L0.200	16	G 10.00	1910	0.80	Mag pyroxenite at adit
	J81-157 1S011	Chip 2.2ft long	L0.0002	L0.001	L0.001	L0.200	190	5.00	410	0.02	Pegmatite pyroxenite at adit
107	J82-703 2S168	Random grab	L0.0002	L0.0003	L0.0003	0.006	105	1.70	320	0.46	Hnbd gabbro
106	J82-308 2S097	High-grade grab	L0.0004	0.014	0.011	0.143	41000	12.90	766	1.08	Pyroxenite with ep and cp
	J82-309 2S098	Grab	L0.000*	L0.001*	0.0003	0.015	950	11.70	1078	2.15	Pyroxenite with cp
105	J82-852 20871	Grab	L0.0002	L0.0003	L0.0003	0.006	17	5.45	127	1.34	Coarse grained hnbd pyroxenite with mag

Appendix E-1. *Klukwan rock, stream-sediment, and pan-concentrate (map nos. on sheet 3)*-Continued

104	J82-701 2S166	Chip 1.0ft long	L0.0002	L0.0003	L0.0003	0.006	5	0.25	70	0.05	Anorthosite dike
	J82-702 2S167	Rep chip 5 ft long	L0.0004	L0.0006	L0.0006	0.006	15	G 10.00	2000	4.07	Mag pyroxenite
103	J82-306 2S095	Float grab	L0.0002	L0.001	L0.001	0.012	1400	13.20	1193	1.32	Mag pyroxenite with cp
	J82-307 2S096	Float grab	0.001*	L0.002	L0.002	0.017	1000	21.50	2458	2.13	Mag pyroxenite with cp
102	J82-303 2S092	Grab	L0.0003	L0.002	L0.002	0.023	1500	14.10	1112	1.15	Mag pyroxenite with cp
	J82-304 2S093	Grab	L0.0002	0.001*	0.002*	0.003	490	12.90	1059	1.10	Mag pyroxenite with cp
	J82-305 2S094	Float grab	0.003	0.001*	0.001*	0.017	730	19.50	1885	1.67	Mag pyroxenite with cp
101	J82-302 2S091	Float grab	0.001*	L0.002	L0.002	0.012	430	26.30	2258	2.36	Mag hnbd pyroxenite with cp
						Canyon 1					
179	J82-322 2S111	SS	L0.0002	0.001*	0.002*	L0.003	155	10.90	1096	1.23	
178	J82-321 2S110	SS	L0.0002	0.001*	0.002*	L0.003	150	16.30	1422	1.24	
177	J82-656 2S121	PC	L0.0001	L0.001	L0.001	------	------	------	------	------	
176	J82-337 2S120	SS	0.002	L0.0003	L0.0003	0.009	350	7.50	613	0.94	
175	J82-320 2S109	SS	L0.0002	L0.001	0.001	0.003	120	10.00	1015	1.12	
173	J82-717 2S182	High-grade bulk sample	0.0005	0.0003	------	0.018	1300	19.40	-----	1.26	Near in place float, hnbd pyroxenite with cp
	J82-718 2S183	Float grab	L0.0004	0.001*	0.002	0.006	9	1.60	95	0.05	Gabbro with pyrite
	J82-657 2S122	PC	L0.0001	L0.001	L0.001	-----	-----	------	-----	-----	
174	J82-316 2S105	Float grab	0.001	0.0003	0.0003	0.035	3200	5.70	224	0.616	Gabbro with ml and cp in mafic band
						South side Canyon 1					
170	J81-1224 1S217	High grade grab	0.0022	0.0015	0.0014	L0.20	3000	10.00	500	0.05	Pyroxenite with cp, bn, and mag
	J82-300 2S089	Rep chip 1ft long	0.0002	0.0016	0.0004	0.015	1100	13.20	1119	1.094	Pyroxenite with cp, bn, and mag
	J82-313 2S102	0.5ft chip 20ft long	0.0006	0.002	0.003	0.012	1000	12.60	1119	1.04	Pyroxenite with cp, bn, and mag

Appendix E-1. *Klukwan rock, stream-sediment, and pan-concentrate (map nos. on sheet 3)*-Continued

Map number	Lab & field sample number	Sample type[1] & length (ft)	Analyses[2] (oz/ton)				Analyses[3] (units as shown)				Comments
			Au	Pt	Pd	Ag	Cu ppm	Fe %	V ppm	Ti %	
170	J82-314 2S103	Chip 1ft long	0.0009	0.0016	0.002	0.032	2200	13.20	745	1.186	Pocket of cp and bn mineralization
	J82-315 2S104	Rep grab 36 sq ft	L0.0004	L0.0006	L0.0006	0.017	1450	13.60	1159	0.982	Pyroxenite with cp, bn, and mag
	J82-728 2S193s	Bulk sample	0.0009	0.0005	------	0.022	1300	19.70	-----	1.16	55 lb bulk sample, same as 2S089
	J82-729 2S194s	Bulk sample	0.0006	L0.0003	------	0.018	1400	19.10	-----	1.13	18 lb higher grade portion of 2S193
	J81-1228 1S221A	.25 ft chip 12ft long	L0.0002	L0.0009	L0.0009	L0.200	450	10.00	600	0.60	Hnbd pyroxenite with cp
	J81-1229 1S221B	Chip 8ft long	0.0003*	L0.0009	L0.0009	0.30	900	8.00	600	0.40	Hnbd pyroxenite with cp
172	J82-676 2S141	.5ft chip 12ft long	0.0003	0.0015	0.001	0.012	1115	4.90	910	1.82	Pyroxenite with cp
	J82-677 2S142	.5ft chip 4ft long	L0.0002	L0.0003	L0.0003	0.006	68	2.10	230	0.91	Gabbro/diorite
	J82-678 2S143	.25ft chip 2.5ft long	L0.0002	L0.0003	L0.0003	0.006	345	2.90	360	1.36	Fault zone sheared diorite, fault gouge with cp
	J82-679 2S144	.5ft chip 10ft long	0.0004	0.0015	0.0004	0.012	1120	5.15	850	1.86	Pyroxenite with cp
	J82-680 2S145	1ft chip 15ft long	0.0006	0.0016	0.0016	0.006	785	5.30	1000	2.60	Pyroxenite with cp
	J82-681 2S146	1ft chip 11ft long	0.0003	0.0019	0.0016	0.006	950	5.40	1000	1.87	Pyroxenite with cp
	J82-682 2S147	1ft chip 9ft long	0.001	L0.0003	L0.0003	0.006	555	4.90	700	1.16	Pyroxenite with cp
171	J81-1225 1S218	Chip 5ft long	0.0010	0.0021	0.0038	L0.200	8000	7.00	500	0.06	Pyroxenite with cp, bn, and mag
	J81-1226 1S219	High-grade grab	0.0016	0.0071	0.0055	L0.200	5600	7.00	400	0.30	Pyroxenite with cp, bn, and mag
	J82-311 2S100	High-grade grab	0.0012	0.0073	0.0067	0.105	6700	8.50	793	0.70	Pyroxenite with cp and bn (replicate 1S219)
	J82-312 2S101	Chip 5ft long	0.0008	0.0006	0.0003	0.055	4000	8.40	912	1.106	Approx. replicate 1S218
	J82-730 2S195	High-grade grab 16 lb	0.0014	0.0085	0.0085	0.099	8300	3.10	600	0.93	Sample approx. replicate 1S219
	J82-761 2S223	High-grade grab 16 lb	0.0004	0.0015	0.0004	0.012	1430	6.10	805	1.51	Sample approx. replicate 1S219
	J81-1227 1S220	3ft chip 70ft long	L0.0002	L0.0009	L0.0009	L0.200	430	8.00	500	0.40	Pyroxenite with sparse cp

Appendix E-1. *Klukwan rock, stream-sediment, and pan-concentrate (map nos. on sheet 3)*-Continued

North side Canyon 1

168 thru 167	J82-317 2S106	Random grab 12 sq ft area	L0.0002	0.001*	0.002*	0.015	1500	11.90	1108	1.18	Hnbd pyroxenite with ml stain, cp, and mag
	J82-318 2S107	Chip .5ft long	L0.0002	0.001*	L0.001	0.017	1300	13.00	1116	1.25	Hnbd pyroxenite with cp,ml stain, and mag
	J82-319 2S108	Grab	L0.0002	L0.001	L0.001	0.012	740	12.95	1062	1.13	Hnbd pyroxenite with cp, ml stain, and mag
	J82-323 2S112A	.5ft chip 6ft long	L0.0002	0.001*	L0.001	L0.003	300	8.40	611	1.00	Hnbd pyroxenite with cp and ep
	J82-324 2S112B	Chip 1.1ft long	L0.0002	0.001*	0.001*	L0.003	610	6.50	963	1.02	Iron stained fine grained rock with cp
	J82-325 2S112C	.5ft chip 9ft long	L0.0002	0.001*	0.001*	0.009	840	11.80	1214	1.27	Hnbd pyroxenite with mag and cp
	J82-326 2S113A	.5ft chip 11ft long	L0.0002	0.001*	0.001*	0.006	570	7.50	768	1.06	Hornblendite with cp and po
	J82-327 2S113B	.5ft chip 7ft long	0.001	L0.002	L0.002	0.012	1200	12.50	1091	1.28	Hornblendite with cp and po
	J82-328 2S114A	.5ft chip 5ft long	L0.0002	0.001*	0.001*	0.006	800	9.80	844	1.01	Hornblendite with cp and po
	J82-329 2S114B	.5ft chip 4.6ft long	L0.0002	0.001*	L0.001	0.009	1150	11.10	1062	1.19	Hnbd pyroxenite with cp
	J82-330 2S115A	.5ft chip 10ft long	L0.0002	L0.001	0.001*	0.012	1150	12.60	1107	1.13	Hnbd pyroxenite with cp
	J82-331 2S115B	.5ft chip 10ft long	L0.0002	L0.001	0.001*	0.015	1600	13.30	1019	0.89	Hnbd pyroxenite with cp
	J82-332 2S116	.5ft chip 6ft long	L0.0002	0.001*	0.002*	0.015	1550	12.90	992	0.87	Hnbd pyroxenite with cp
	J82-333 2S117	.5ft chip 4ft long	L0.0002	0.002*	0.002*	0.008	840	11.50	986	0.89	Hnbd pyroxenite with cp
	J82-334 2S118A	1ft chip 18ft long	L0.0002	0.002*	0.002*	0.003	430	8.80	673	0.82	Hnbd diorite with ep and cp
	J82-335 2S118B	1ft chip 16ft long	L0.0002	0.002*	0.002*	0.003	195	6.50	506	0.56	Hnbd diorite with ep
	J82-336 2S119	Grab	L0.0002	L0.0003	L0.0003	0.006	1250	13.90	872	1.23	Hnbd pyroxenite with ep and cp
	J82-741 2S205	1ft chip 17ft long	L0.0002	L0.0003	L0.0003	0.006	1150	5.50	1000	1.81	Hnbd pyroxenite with cp
	J82-742 2S206	1ft chip 20ft long	L0.0002	L0.0003	L0.0003	0.012	1050	5.40	940	1.50	Hnbd pyroxenite with cp
167	J82-684 2S149	1ft chip 9ft long	L0.0002	L0.0003	L0.0003	0.006	890	4.70	960	1.42	Pyroxenite with po and cp
	J82-685 2S150	1ft chip 15ft long	-------	-------	-------	------	------	------	------	-----	Pyroxenite with po and cp
	J82-686 2S151	1ft chip 15ft long	0.003	L0.0003	L0.0003	0.023	1670	6.30	1110	1.57	Pyroxenite with cp
	J82-687 2S152	Rep chip 8ft long	0.001	L0.0003	L0.0003	0.017	1440	5.10	825	1.66	Pyroxenite with cp
	J82-688 2S153	Grab	0.001	L0.0003	L0.0003	0.009	1470	5.60	880	1.98	Hnbd pyroxenite with cp
165	J82-683 2S148	Grab	L0.0002	L0.0003	L0.0003	0.006	1200	4.40	655	2.86	Hnbd pyroxenite with cp

Appendix E-1. *Klukwan rock, stream-sediment, and pan-concentrate (map nos. on sheet 3)*-Continued

Map number	Lab & field sample number	Sample type[1] & length (ft)	Analyses[2] (oz/ton) Au	Pt	Pd	Analyses[3] (units as shown) Ag	Cu ppm	Fe %	V ppm	Ti %	Comments
166	J82-743 2S207	1ft chip 11ft long	L0.0002	L0.0003	L0.0003	0.012	1130	5.15	900	1.27	Hnbd pyroxenite with ml, cp, and ep
	J82-746 2S208	1ft chip 7ft long	L0.0002	L0.0003	L0.0003	0.015	880	6.80	1140	1.35	Hnbd pyroxenite with ml and cp
	J82-744 2S207A	High-grade Grab	L0.0002	L0.0003	L0.0003	0.642	6950	3.85	655	0.88	Hnbd pyroxenite with coarse cp
	J82-745 2S207B	Grab	L0.0002	L0.0003	L0.0003	0.044	3050	4.00	660	1.07	Hnbd pyroxenite with coarse cp
	J82-747 2S209	1ft chip 12ft long	L0.0002	L0.001	L0.001	0.023	1300	6.35	1080	1.80	Hnbd pyroxenite with ml and cp
	J82-748 2S210	1ft chip 6ft long	L0.0002	L0.0003	L0.0003	0.008	1420	6.00	1120	1.59	Pyroxenite with ml and cp
	J82-749 2S211	1ft chip 10ft long	L0.0002	L0.0003	L0.0003	0.015	1390	5.85	1110	1.90	Pyroxenite with ml and cp
164	J82-750 2S212	1ft chip 20ft long	L0.0002	L0.0003	L0.0003	0.015	955	5.65	990	1.39	Pyroxenite with ml and cp
	J82-751 2S213	Rep chip 2ft long	L0.0002	L0.0003	L0.0003	0.023	1630	5.60	950	2.07	Pyroxenite with ml and cp
	J82-752 2S214	1ft chip 9ft long	L0.0002	L0.0003	L0.0003	0.012	720	5.65	1020	1.47	Hnbd pyroxenite with cp
	J82-753 2S215	1ft chip 14ft long	L0.0002	L0.0003	L0.0003	0.006	1180	6.65	1050	1.73	Hnbd pyroxenite with cp
	J82-754 2S216	1ft chip 25ft long	L0.0002	L0.0003	L0.0003	0.006	910	6.30	1130	1.63	Hnbd pyroxenite with cp
163	J82-758 2S220	Grab	L0.0002	L0.0003	L0.0003	0.020	1670	5.85	1090	1.60	Hnbd pyroxenite with cp
162	J82-756 2S218	1ft chip 20ft long	L0.0002	L0.0003	L0.0003	0.006	378	7.50	715	1.53	Hnbd pyroxenite with cp
	J82-757 2S219	Grab	L0.0002	L0.0003	L0.0003	0.009	399	5.60	690	1.32	Hnbd pyroxenite with cp
161	J82-755 2S217	Grab	L0.0002	L0.0003	L0.0003	0.006	52	6.05	1000	1.32	Hnbd pyroxenite
							Canyon 1				
169	J81-1236 1S228	Float grab	L0.0002	L0.001	L0.001	L0.20	730	8.00	500	0.30	Pyroxenite with ml and cp
	J81-1237 1S229	SS	L0.0002	L0.001	L0.001	0.020	88	6.00	400	0.30	
160	J82-658 2S123	PC	L0.0001	L0.001	L0.001	-----	-----	------	------	-----	
	J82-659 2S124	Float Grab	L0.0002	L0.0003	L0.0003	0.012	900	5.40	820	2.06	Pyroxenite with ml and cp
	J82-660 2S125	Float Grab	L0.0002	L0.0003	0.001*	0.023	1360	6.10	885	2.16	Pyroxenite with ml and cp
159	J81-1235 1S227	SS	0.002*	0.005*	0.007	0.041	84	7.00	500	0.40	
158	J82-667 2S132	SS	L0.0002	L0.0003	L0.0003	0.006	130	3.80	850	1.68	

Appendix E-1. *Klukwan rock, stream-sediment, and pan-concentrate (map nos. on sheet 3)*-Continued

157	J81-1233 1S225	Float grab	0.003	L0.001	L0.001	L0.200	2200	4.00	200	0.08	Gabbro with disseminated po and cp
	J82-1234 1S226	Grab	L0.0002	L0.001	L0.001	L0.200	860	8.00	300	0.01	Iron stained pyroxenite with po and cp
	J82-665 2S130	Float grab	L0.0002	L0.0003	L0.0003	0.009	1375	4.60	815	2.12	Pyroxenite with disseminated cp
	J82-666 2S131	PC	L0.0001	0.004	L0.001	------	------	-------	------	-----	
156	J82-663 2S128	PC	0.0002	L0.001	L0.001	------	------	------	-----	-----	
	J82-664 2S129	Float grab	L0.0002	L0.0003	L0.0003	0.012	1720	4.40	725	2.39	Hnb pyroxenite with cp and ml
155	J81-1230 1S222	Float grab	L0.0002	L0.0009	L0.0009	L0.200	240	10.00	800	0.80	Hnbd pyroxenite with ml
154	J81-1231 1S223	Float grab	0.0003*	L0.0009	L0.0009	L0.200	960	7.00	300	0.40	Hnbd diorite with po and cp
	J81-1232 1S224	SS	0.0002	L0.0009	L0.0009	0.047	43	7.00	500	0.40	
153	J82-661 2S126	Float grab	L0.0002	L0.0003	L0.0003	0.038	4850	3.10	610	1.55	Hnbd pyroxenite with cp and ep
	J82-662 2S127	Float grab	L0.0002	L0.0003	L0.0003	0.035	3600	3.05	570	1.37	Hnbd pyroxenite with cp and ep
152	J82-833 20848	High-grade grab	L0.0002	L0.0003	L0.0003	L0.006	1760	4.00	307	1.54	Hnbd-pyx gabbro with ml
	J82-834 20849	Grab	L0.0002	L0.0003	L0.0003	0.006	4800	0.60	53	0.06	Feldspathic dike rock with ml stain
	J82-835 20850	High-grade grab	L0.0002	L0.0003	L0.0003	0.006	625	4.05	480	1.78	Plagioclase hnbd pyroxenite with cp,po, and py
151	J82-836 20851	High-grade grab	L0.0002	L0.0003	L0.0003	0.006	452	3.30	475	1.05	Plagioclase hnbd gabbro with cp,po, and ml
150	J82-837 20853	Grab	L0.0002	L0.0003	L0.0003	0.006	23	8.20	480	1.80	Fine grained sill, andesitic?
	J82-838 20854	Grab	L0.0002	L0.0003	L0.0003	0.006	9	6.80	399	2.03	Hnbd pyroxenite with mag
						Southern area					
180	J82-786 2S248	Grab	L0.0002	L0.0003	L0.0003	0.006	38	5.55	775	1.13	Hnbd pyroxenite with mag
182	J82-789 2S251	Grab	0.004	L0.0003	L0.0003	0.029	4620	4.10	265	0.99	Altered hnbd diorite with disseminated cp and po. Alteration clinozoisite and chlorite
181	J82-788 2S250	Float grab	L0.0002	L0.0003	L0.0003	0.006	17	3.20	865	1.64	Hornblendite with ep and mag
	J82-791 2S253	Float grab	L0.0002	L0.0003	L0.0003	0.006	16	G 10.00	1240	2.92	Mag pyroxenite
183	J82-790 2S252	SS	L0.0002	L0.0003	L0.0003	------	------	-------	------	-----	
184	J82-731 2S196	Chip .3ft long	L0.0002	L0.0003	L0.0003	0.006	41	0.65	65	0.08	Altered plagioclase with ep and chl
	J82-732 2S197	Grab	L0.0002	L0.0003	L0.0003	0.006	200	2.80	450	0.82	Hnbd diorite with ep and cl
197	J82-733 2S198	Float grab	L0.0002	L0.0003	L0.0003	0.006	8	9.35	2100	2.36	Mag pyroxenite

Appendix E-1. *Klukwan rock, stream-sediment, and pan-concentrate (map nos. on sheet 3)*-Continued

Map number	Lab & field sample number	Sample type[1] & length (ft)	Analyses[2] (oz/ton) Au	Pt	Pd	Ag	Analyses[3] (units as shown) Cu ppm	Fe %	V ppm	Ti %	Comments
198	J82-301 2S090	Grab	L0.0003	L0.002	0.0004	0.006	720	7.50	606	0.803	Ep hnbd diorite with chl and cp
196	J82-864 20885	Grab	L0.0002	L0.0003	L0.0003	0.006	72	1.40	65	2.43	Hnbd pyroxenite dike in foliated hnbd diorite country rock
195	J82-863 20884	Grab	L0.0002	L0.0003	L0.0003	0.006	92	2.25	255	1.09	Hnbd diorite
194	J82-772 2S234	Chip .7ft long	L0.0002	L0.0003	L0.0003	0.006	45	0.15	20	0.06	Hydrothermal vein rock in shear zone
	J82-773 2S235	Chip 1ft long	L0.0002	L0.0003	L0.0003	0.006	160	3.45	316	1.12	Prochlorite, ep, and clinozoisite altered hnbd diorite
193	J82-776 2S238	Chip 1ft long	0.002	0.000*	0.001	0.038	47000	2.85	373	0.37	Hydrothermal vein rock consisting of plagioclase replaced by sericite ep, ml, hem, cp, and bn
	J82-777 2S239	Grab	L0.0002	L0.0003	L0.0003	0.023	3800	2.45	520	1.17	Mafic segregation around 2S238 vein. Hornblendite with chl and ep alteration and cp
	J82-778 2S240	Chip .5ft long	0.001	0.001	L0.0003	0.280	58500	2.75	260	0.18	Hydrothermal vein rock consisting of ep,tr bn, cp, and hem
	J82-779 2S241	Grab	------	------	------	0.006	4650	2.40	470	0.78	Altered hnbd diorite. Plagioclase to clinozoisite with ep, tr, and cp
193	J82-780 2S242	High grade grab	0.14	L0.0003	L0.0003	0.320	30000	0.80	37	1.69	Higher grade portion of 2S238
192	J82-774 2S236	Float Grab	L0.0002	L0.0003	L0.0003	0.006	98	3.25	350	1.60	Iron stained hydrothermal rock
	J82-775 2S237	Float Grab	L0.0002	L0.0003	L0.0003	0.006	341	2.70	442	1.55	Hnbd diorite with ml and cp
	J82-781 2S243	Chip .5ft long	0.005	L0.0003	L0.0003	0.554	65000	3.60	445	1.12	Hydrothermal vein rock with ml, cp, and bn
191	J81-1197 1D106	Float grab	0.166	L0.0003	L0.0003	1.900	39000	7.00	600	0.40	Hydrothermal rock with ml and cp
190	J82-782 2S244	Grab	0.005	L0.0003	L0.0003	0.006	400	1.80	210	0.66	Calcite and chalcedony from iron stained zone
	J82-783 2S245	Chip .5ft long	0.120	0.001*	L0.0003	0.219	1000	3.00	285	0.61	Hydrothermal rock, mostly limonite with cp, po, and ep
	J82-784 2S246	Chip 1ft long	0.090	L0.0003	L0.0003	0.125	19600	4.40	380	0.69	Hydrothermal rock with ml, az, qz, and cp
189	J82-831 20846	Float grab	L0.0002	L0.0003	L0.0003	0.006	37	2.40	184	0.19	Altered fine grained iron stained volcanic rock
188	J82-874 20868	Grab	L0.0002	L0.003	L0.003	0.006	158	2.90	329	1.28	Iron stained altered hnbd diorite

Appendix E-1. *Klukwan rock, stream-sediment, and pan-concentrate (map nos. on sheet 3)*-Continued

186	J82-767 2S229	Chip 20ft long	L0.0002	L0.0003	L0.0003	0.006	156	2.80	201	0.53	Fine grained hnbd diorite
	J82-768 2S230	Chip 1.5ft long	L0.0002	L0.0003	L0.0003	0.006	13	0.25	20	L0.05	Hydrothermal vein rock
	J82-769 2S231	Chip 1.5ft long	L0.0002	L0.0003	L0.0003	0.006	138	3.35	272	1.15	Ep hnbd gabbro with po
	J82-770 2S232	Chip 1ft long	0.030	0.002	0.005	0.671	31500	0.50	22	0.06	Hydrothermal vein with bn,cp, and ml
	J82-771 2S233	Chip .5ft long	0.02	0.003	0.008	0.108	12600	0.65	50	0.06	Hydrothermal vein with bn, cp, and ml
187	J82-829 20843	Grab	L0.0002	L0.0003	L0.0003	0.006	293	3.10	300	1.13	Foliated hnbd diorite
185	J82-785 2S247	Grab	0.005	L0.0003	L0.0003	0.105	4230	1.00	190	0.57	Hydrothermal ep vein rock with ml and az
199	J82-737 2S201	Float grab	L0.0002	L0.0003	L0.0003	0.006	194	2.70	380	1.07	Ep hnbd diorite
	J81-1198 1D110	Float grab	0.010	L0.001	L0.001	0.200	9800	8.00	400	0.40	Hydrothermal rock with ml, cp, and bn
200	J82-738 2S202	Float grab	L0.0002	L0.0003	L0.0003	0.006	1770	3.10	450	1.29	Ep hnbd gabbro
	J82-739 2S203	Float grab	L0.0002	L0.0003	L0.0003	0.006	470	2.45	360	1.08	Hnbd diorite with ml
	J82-740 2S204	Float grab	L0.0002	L0.0003	L0.0003	0.006	870	2.65	400	0.85	Hnbd diorite with ml
204	J82-792 2S254	Float grab	0.004	L0.0003	L0.0003	0.038	5200	3.90	570	2.42	Hornblendite with cp and ml
	J82-793 2S255	Float grab	L0.002	L0.0003	L0.0003	0.085	580	5.15	405	1.90	Iron stained hydrothermal rock
	J82-794 2S256	Float grab	0.004	L0.0003	L0.0003	0.032	2200	4.50	770	2.46	Iron stained hydrothermal rock, clinozoisite ep, and hnbd with cp and po
201	J82-798 2S260	Chip .2ft long	0.001	L0.0003	L0.0003	1.37	560	1.65	19	0.14	Qz vein with py,cp,po hosted in hnbd pyroxenite
203	J82-795 2S257	Grab	0.003	L0.0003	L0.0003	0.131	10000	2.60	480	1.89	Hornblendite with ml and cp
	J82-796 2S258	Grab	L0.0002	L0.0003	L0.0003	0.006	68	2.75	313	1.03	At hnbd diorite/hnbd pyroxenite contact
202	J82-797 2S259	Grab	L0.002	0.000*	0.001*	0.017	1120	G 10.00	1580	4.95	Hnbd diorite with mag and ml stain

Appendix E-2. *Metallurgical test results of sulfide samples from Klukwan lode deposit*

Metallurgical test samples were collected from canyons 1 and 2 of the Klukwan mafic-ultramafic complex. These were processed by ALRC. The sample numbers are as follows:

AOFC	ALRC
2S182	ME 1454-1
2S193	ME 1455-2
2S194	ME 1456-2
2S195	ME 1457-2
2S222	ME 1458-2
2S272	ME 1459-1

Samples including the composite sample of 2S193, 2S194, and 2S195 were stage crushed to minus 0.25 in. after visual examination and removal of petrographic specimens. The crushed samples were blended and split into test samples and analytical samples, which were submitted to ALRC analytical laboratory for base-metal and sulfide analysis and to the ALRC analytical laboratory for precious-metal analyses. Test samples were rod milled and bulk floated in either a Denver 1 kg or Agitair 10-kg flotation machine.

Procedures and results are summarized in the tables. In each test, a rougher and a scavenger bulk-sulfide float was done with potassium amyl xanthate collector and a frother. Although both copper and precious metals contents are low, samples responded well to bulk flotation. Copper recoveries ranged from 57 to 76 percent despite sample grades 0.08 to 0.34. The precious metals reported to concentrates in tests producing sufficient concentrate for analysis.

Appendix E-2. *Metallurgical test results of sulfide samples from Klukwan lode deposit*-Continued

Sample number ME 1454-1 - AFOC number 2S182 - Location: Klukwan

Grind: Initial: -0.25 inch   Final: +100 mesh 0%   Time: 25 minutes
-400 mesh 31%   Percent solids: 50

Metallurgical results

Product	Weight (%)	Analysis, (%) Cu	Co	Fe	S	Ni	Analysis, oz/t Pt	Pd	Au	Ag	Distribution, (%) Cu	Co	Fe	S	Ni
Rougher concentrate	2.3	3.33			2.93		L0.001	L0.001	L0.0008	0.40	53.5			82.8	
Scavenger concentrate	1.2	0.72			0.36		0.025	0.006	0.003	0.12	6.2			4.9	
Tailings	96.5	0.06			0.01		0.001	L0.001	L0.0008	L0.04	40.3			12.3	
Coposite or total	100.0	0.14			0.08						100.0	100.0	100.0	100.0	100.0
Head analysis		0.13		19.4	0.08		L0.002	L0.002	L0.0004	L0.01					

Test Procedure

Reagents	Condition	Rougher flotation	Condition	Scavenger flotation
Potassium amylxanthate	0.1 lb/st		0.05 lb/st	
Frother	0.05 lb/st			
pH (natural = 9.3)	9.4		9.3	9.2
Time (minutes)	1.5	1	1	1

Sample number ME 1455-56-57-2 - AFOC number 2S193-94-95 - Location: Klukwan

Grind: Initial: -0.25 inch   Final: -150 mesh 100%   Time: stage ground
Percent Solids: 50

Metallurgical results

Product	Weight (%)	Analysis, (%) Cu	Co	Fe	S	Ni	Analysis, oz/t Pt	Pd	Au	Ag	Distribution, (%) Cu	Co	Fe	S	Ni
Rougher concentrate	1.0	23.8			17.4		0.055	0.056	0.037	0.089	70.0			87.5	
Scavenger							0.009	0.005	0.003	0.12					
concentrate	2.6	0.81			0.45		0.006	0.023	0.000	L0.02	6.2			6.0	
Tailings	96.4	0.084			0.013						23.8			6.5	
Coposite or total	100.0	0.34			0.20						100.0	100.0	100.0	100.0	100.0
Head analysis							L0.002	L0.002		L0.01					

Test procedure

Reagents	Condition	Rougher flotation	Condition	Scavenger flotation
Potassium amylxanthate	0.1 lb/st		0.05 lb/st	
Frother	0.05 lb/st		0.025 lb/st	
pH (natural = 10.3)	10.3	10.2	10.2	10.2
Time (minutes)	1.5	3	2	2.5

Appendix E-2. *Metallurgical test results of sulfide samples from Klukwan lode deposit*-Continued

Sample number ME 1458-2 - AFOC number 2S222 - Location: Klukwan

Grind: Initial: -0.25 inch Final: -150 mesh 100% Time: stage ground
Percent Solids: 50

Metallurgical results

Product	Weight (%)	Analysis (%)					Analysis, oz/t				Distribution, (%)				
		Cu	Co	Fe	S	Ni	Pt	Pd	Au	Ag	Cu	Co	Fe	S	Ni
Rougher concentrate	1.0	6.60			6.34		0.078	0.150	0.279	0.91	54.6			81.8	
Scavenger concentrate	1.7	0.47			0.25		0.007	0.007	0.006	0.06	6.6			5.2	
Tailings	97.3	0.048			0.010		L0.0004	L0.0006	0.003	L0.02	38.8			13.0	
Coposite or total	100.0	0.12			0.08						100.0	100.0	100.0	100.0	100.0
Head analysis		0.082		19.5	0.07		L0.002	L0.002	0.001	L0.01					

Test procedure

Reagents	Condition	Rougher Flotation	Condition	Scavenger Flotation
Potassium amylxanthate	0.1 lb/st		0.05 lb/st	
Frother	0.05 lb/st		0.025 lb/st	
pH (natural = 10.0)	10.2	10.1	10.1	10.1
Time (minutes)	2	2	2	2

Sample number ME 1459-1 - AFOC number 2S272 - Location: Klukwan

Grind: Initial: -0.25 inch Final: +100 mesh 0.1% Time: 25 minutes
-400 mesh 31% Percent Solids: 50

Metallurgical results

Product	Weight (%)	Analysis, (%)					Analysis, oz/t				Distribution, (%)				
		Cu	Co	Fe	S	Ni	Pt	Pd	Au	Ag	Cu	Co	Fe	S	Ni
Rougher concentrate	3.4	1.38			0.90		0.007	0.006	0.045	0.35	52.8			79.5	
Scavenger concentrate	1.6	0.26			0.08		0.003	0.002	L0.0008	0.045	4.5			2.6	
Tailings	95.0	0.04			0.007		L0.001	L0.001	L0.0008	0.04	42.7			17.9	
Coposite or total	100.0	0.089			0.04						100.0	100.0	100.0	100.0	100.0
Head analysis		0.085		25.5	0.05		L0.002	L0.002	0.001	L0.01					

Test Procedure

Reagents	Condition	Rougher Flotation	Condition	Scavenger Flotation
Potassium amylxanthate	0.1 lb/st		0.05 lb/st	
Frother	.05 lb/st			
pH (natural = 9.3)	9.4		9.4	9.3
Time (minutes)	1.5	1.5	2	0.5

APPENDIX F. ANALYSES FROM TWELVE-MILE GOLD-COPPER PROSPECT

Appendix F. *Analyses from Twelve-mile gold-copper prospect (map nos. on fig. 33)*

				Fire assay		Atomic absorption (ppm unless marked %)				X-ray	Spectrographic (ppm)							
Map no.	Sample no.	Sample size (ft)	Sample type	Au (ppm)	Ag (ppm)	Cu	Pb	Zn	Co	Ba (%)	W	Mo	Sn	As	Ni	Bi	Sb	Lithology, remarks
1	7S0594	0.05	R-S	0.137	6.6	1.35%	N	2	31	0.002	N	N	N	47	3	9	19	qz vein w/ml,az,bn
2	7S0590	-	R-S	0.068	2.5	5550	N	12	97	0.054	N	N	N	13	1	3	N	qz w/bn,cp,ml,hornblende granite
2	7S0591	0.8	CR	0.068	13.0	1.50%	N	4	85	0.051	N	1	N	21	1	17	23	qz vein w/ml,bn,cp
2	7S0592	0.2	R-CR	0.514	48.0	9.50%	15	58	18	0.058	N	7	N	15	3	63	127	qz w/bn,ml
2	7S0593	0.3	R-S	0.377	66.5	12.01%	5	10	43	0.019	N	7	N	57	7	61	155	qz vein in joint w/bn,ml
2	7W1718	0.3	R-C	0.411	29.0	4.60%	N	10	-	-	-	-	-	-	-	-	-	qz-feldspar vein w/bn,ml
2	7W1719	0.6	R-C	0.377	8.3	1.40%	N	24	-	-	-	-	-	-	-	-	-	qz-feldspar vein w/bn,ml
3	7S0595	0.3	R-S	N	1.4	3450	N	26	46	0.008	N	N	N	33	1	3	5	qz vein w/fest,ml,cp
3	7S0596	0.05	R-S	0.651	37.0	9002	4800	66	32	0.031	N	N	N	23	N	59	11	qz vein w/diorite,cp,ml
3	7S0597	0.07	R-CR	0.308	4.9	1.10%	10	50	33	0.026	N	N	N	N	N	19	13	shear w/ml
4	7S0598	0.3	CR	0.343	5.5	1.55%	20	4	54	0.043	N	N	N	27	1	3	13	qz vein w/bn,cp,ml
4	7S0620	0.75	CH	N	-	1600	3	61	2	-	-	-	-	40	-	-	-	qz vein w/feldspar,ml,bn
4	7S0621	0.15	CH	0.274	-	1.00%	3	66	6	-	-	-	-	33	-	-	-	qz vein w/feldspar,ml,bn
4	7S0622	0.2	CH	0.240	-	>2.00%	5	21	2	-	-	-	-	20	-	-	-	qz vein w/feldspar,ml,bn
4	7S0623	0.15	CH	0.137	-	1.70%	N	17	2	-	-	-	-	22	-	-	-	qz vein w/feldspar,ml,bn
4	7S0624	0.4	CH	0.240	-	1.15%	4	13	1	-	-	-	-	12	-	-	-	qz vein w/feldspar,ml,bn
4	7S0625	1.0	CH	N	-	1950	N	11	1	-	-	-	-	11	-	-	-	qz vein w/feldspar,ml,bn

APPENDIX G. ANALYSES FROM CHILKAT PENINSULA AND ISLANDS BASALT-HOSTED PROSPECTS AND OCCURRENCES

Appendix G-1. *Analyses from Road Cut prospect surface samples (map nos. on sheet 4)*

(All values in ppm unless marked %)

Map no.	Sample no.	Sample type	Width (ft)	Au	Ag	Cu	Pb	Zn	Co	Ba	Remarks
1a	1677	SC	5.0	<0.07	<0.1	420	14	71	21	-	metabasalt w/calc veinlet,ml
1b	1678	SC	5.0	<.07	<.1	164	<2	54	19	-	metabasalt
2a	0538	C	0.6	<.07	0.3	380	6	98	-	-	sheared metabasalt and fault gouge
2b	0537	CR	10.0	0.07	0.2	570	6	62	-	-	metabasalt
2c	0536	CH	0.4	6.69	10.0	1.15%	17	73	-	-	fault zone w/cp,py,ml,gouge and qz eyes
2d	0535	C	7.0	0.07	<.1	140	5	38	-	-	metabasalt in fault zone
2e	0534	CH	0.1	10.80	5.9	5,900	11	53	-	-	qz-calc vein w/py,cp,fest,fault gouge
3a	1679	CC	0.05	0.58	5.4	1.05%	22	59	191	-	sulf-qz veinlet w/py,cp,ml,fest
3b	1680	SC	8.5	<.07	<.1	76	4	70	27	-	metabasalt w/calc veinlets
3c	1681	C	1.0	0.55	4.6	1.15%	10	65	19	-	metabasalt w/ml,fest,cp
3d	1682	C	1.0	<.07	0.1	335	6	89	30	-	metabasalt
4a	1631	CH	0.2	0.62	1.0	1,120	7	23	54	250	qz-calc brecciated metabasalt w/cp,py,ml
5a	1632	CH	0.4	7.99	20.0	4.61%	32	50	196	50	qz w/cp,py,ml
5b	0541	C	2.0	<.07	0.1	60	5	74	-	-	metabasalt
5c	0540	C	5.5	<.07	<.1	53	6	60	-	-	altered metabasalt
5d	0542	S	0.5	28.42	22.0	4.67%	22	33	-	-	brecciated metabasalt w/qz-calc,cp,py
5e	0539	CC	2.5	0.14	0.2	79	7	64	-	-	sheared metabasalt w/sparse qz and sulf
6a	1684	C	0.4	6.93	2.1	1,600	12	26	88	-	qz-metabasalt w/cp,py
6b	1685	SC	5.0	0.10	0.2	138	10	76	32	-	metabasalt
7a	1633	CC	0.9	0.65	1.0	1,060	2	39	47	240	altered metabasalt w/cp,py
7b	1634	CH	0.2	4.94	20.0	4.88%	14	36	113	15	qz w/cp,py
7c	1635	CH	1.1	19.89	22.0	2.24%	4	20	120	<5	qz w/metabasalt w/cp,py in bands and blebs
8a	1636	CC	1.0	0.86	0.6	2,000	<2	48	17	210	metabasalt
8b	1637	CH	0.9	9.29	25.0	2.76%	18	22	71	50	fest qz w/cp,py
8c	1638	CC	1.0	0.14	<.1	5,400	4	104	40	340	metabasalt
9a	0476	CC	1.0	0.42	0.5	3,375	4	42	63	180	fest shear or gossan zone w/cp
9b	0475	CC	1.1	2.72	24.0	4.28%	17	52	101	-	qz-calc zone w/cp
10a	1655	CC	0.7	0.07	<.1	320	5	64	22	330	metabasalt
10b	1656	CC	0.7	6.72	11.0	5,400	5	20	113	70	altered metabasalt,qz w/cp,py
10c	1657	CC	1.3	0.34	1.1	2,100	3	40	23	330	altered metabasalt w/cp,py
10d	1658	CC	0.15	<.07	<.1	30	4	30	7	350	metabasalt breccia w/calc,qz
11a	1653	CC	0.7	4.97	2.3	4,400	5	52	54	370	metabasalt w/one 0.01 ft band of cp,py
11b	1654	CH	1.9	2.16	2.3	470	5	40	40	20	qz-calc, metabasalt w/cp,py
12a	1584	CC	1.0	0.65	2.0	1,330	8	56	43	330	fest altered metabasalt
12b	1583	CC	1.6	16.94	26.0	8,370	8	24	165	-	fest altered metabasalt w/cp,py,ml
13a	1652	CC	1.6	33.12	79.5	3.77%	5	24	137	<5	qz-calc w/cp,py
14a	1582	CC	1.1	7.71	8.5	3,340	5	41	56	150	fest altered metabasalt w/cp,py,ml
14b	1581	CC	0.4	19.65	42.2	10.70%	14	46	88	-	fest altered metabasalt w/cp,py,ml
15a	1650	CC	1.5	17.90	24.0	1.26%	3	44	50	10	altered metabasalt,qz w/cp,py,0.1 ft fault gouge
15b	1651	CH	0.3	15.33	56.6	6.44%	15	73	157	20	qz,cp,py,ml w/fest metabasalt
16a	0458	CC	1.0	2.40	26.0	22.70%	10	76	30	-	cp, py
16b	0457	CC	1.5	3.57	9.0	3.09%	7	57	66	120	altered metabasalt w/qz,cp,py
16c	0456	RC	1.0	0.86	7.3	1.17%	3	110	71	120	gossan and fault gouge
16d	0455	RC	4.0	<.07	<.2	475	2	54	30	530	ultramafic dike,ep,phlogopite,sparse cp
16e	0454	RC	3.0	<.07	<.2	28	4	72	25	390	fine grained mafic-ultramafic rock
16f	0453	RC	3.0	<.07	<.2	37	17	43	8	920	porphyritic metadiorite
17a	0580	CR	1.0	0.24	1.0	1,250	2	74	35	-	metabasalt
17b	0579	CH	0.7	<.07	0.4	605	<2	37	11	-	metabasalt w/qz-calc
17c	0578	CH	0.5	6.75	30.0	6.88%	8	37	69	-	qz-calc w/metabasalt,cp,py
17d	0577	CH	0.3	0.72	3.4	4,450	5	67	40	-	metabasalt
17e	0576	CH	0.9	2.78	12.0	2.58%	5	49	86	-	qz-calc w/cp,py,metabasalt
17f	0575	CR	3.0	<.07	<.1	965	2	70	29	-	ultramafic w/phlogopite
17g	0574	CR	3.0	<.07	<.1	90	4	57	19	-	metabasalt
17h	0573	CC	15.0	<.07	<.1	32	4	40	6	-	porphyritic metadiorite
18a	0492	CC	1.4	16.90	37.0	3.30%	7	38	80	<5	altered metabasalt,qz-calc w/cp,py
18b	0493	CC	1.7	1.71	2.4	4,450	8	70	36	30	altered metabasalt w/cp,py
19a	1647	CC	1.4	0.34	0.4	470	2	52	40	90	altered metabasalt w/cp,py
19b	1648	CH	1.1	16.80	40.5	8.36%	10	58	85	10	qz-calc w/py,cp,0.001 ft fault gouge
19c	1649	CC	1.0	5.01	3.1	2,300	4	78	35	130	altered metabasalt w/cp,py,veinlet of qz
19d	0487	CC	1.0	<.01	<.2	220	5	45	25	550	ultramafic dike w/2 in phlogopite

Appendix G-1. *Analyses from Road Cut prospect surface samples (map nos. on sheet 4)*-Continued

20a	0469	CC	1.5	0.10	0.4	765	3	94	40	80	metabasalt
20b	0468	CH	0.7	30.51	61.7	10.90%	10	55	99	-	cp,py w/qz,and 0.05 ft fault gouge
20c	0467	CC	1.6	9.19	16.0	1.11%	4	58	63	150	qz-calc,altered metabasalt w/cp,py
20d	0466	CC	1.5	0.27	0.4	730	3	67	34	390	ultramafic w/phlogopite
21a	0473	CC	1.0	0.31	0.8	640	6	37	20	-	metabasalt
21b	0472	CC	0.5	33.26	62.7	10.60%	8	45	114	-	qz-calc w/cp,py
21c	0471	CC	3.0	10.05	24.0	2.01%	6	40	46	90	altered metabasalt w/cp,py
21d	0470	CC	2.5	<.07	0.2	360	3	38	18	110	ultramafic
22a	1643	CC	1.0	0.07	<.1	78	3	110	40	50	metabasalt
22b	1644	CC	0.9	0.93	0.7	400	4	66	19	<5	altered metabasalt w/cp,py
22c	1645	CH	0.7	4.83	22.5	5.04%	8	88	40	20	qz w/cp,py,0.1 ft of fest fault gouge
22d	1646	CC	1.0	0.17	<.1	310	2	60	27	<5	metabasalt
23a	1570	RC	2.0	0.14	0.2	245	19	111	43	170	sheared ultramafic w/cp,py,fest
23b	1571	CH	0.25	18.03	35.0	6.90%	14	42	53	-	qz-calc w/cp,py
24a	1639	CC	0.5	0.34	0.2	180	4	68	42	100	metabasalt w/cp,py
24b	1640	CC	0.5	0.89	5.0	4,900	3	35	53	200	qz w/cp,py
24c	1641	CH	0.1	1.34	2.7	2,600	9	48	62	70	fault gouge
24d	1642	CC	1.0	<.07	<.1	240	3	72	25	80	metabasalt
25a	1578	CC	1.0	<.07	0.2	112	16	74	32	120	fest altered metabasalt w/cp,py
25b	1577	CC	0.6	1.65	1.8	1,660	7	69	52	110	fest altered metabasalt w/cp,py,ml
25c	1576	CC	1.0	0.31	0.4	250	30	76	30	190	altered metabasalt
26a	1569	CH	1.1	3.02	9.9	1.58%	11	34	89	130	shear zone,cp,fest,ml
26b	1568	RC	5.0	<.07	0.2	81	17	72	28	120	ultramafic
26c	1567	RC	10.0	<.07	<.2	47	15	28	7	990	silicified zone in ultramafic
26d	1566	SC	18.0	<.07	<.2	82	46	39	17	110	ultramafic
27a	1575	CC	0.8	5.97	3.5	405	13	53	93	140	qz-altered metabasalt w/cp,py
27b	1574	CC	0.6	22.05	20.0	1,365	18	62	118	-	fest altered metabasalt w/cp,py
28a	0527	CC	1.3	0.07	<.1	240	2	92	33	260	metabasalt
28b	0526	CC	2.0	2.91	2.6	300	<2	78	45	110	fest greenstone w/sulf
28c	0525	CC	1.7	0.17	<.1	530	4	120	32	200	brecciated metabasalt w/0.4 ft of fault gouge
29a	1573	CC	1.2	0.89	1.2	400	5	100	42	150	fest altered metabasalt
29b	1572	CC	1.0	0.31	0.4	460	5	102	39	220	fest altered metabasalt
30a	0523	CC	0.7	0.07	<.1	370	9	98	37	180	fest altered metabasalt
30b	0522	CC	1.2	0.38	0.4	320	6	60	60	190	fest metabasalt w/calc
30c	0521	CC	1.4	1.47	0.8	20	20	44	95	230	fest altered metabasalt w/fault gouge
31a	1659	CC	1.5	0.10	<0.1	26	3	34	17	150	metabasalt breccia w/qz-calc,some sulf
32a	0488	RC	2.8	0.16	0.2	13	6	27	24	130	metabasalt breccia w/qz-calc,some sulf
33a	1580	CC	2.0	<.07	3.6	220	17	75	28	130	altered metabasalt w/some fest
33b	1579	CC	3.0	<.07	0.3	45	13	78	27	210	fest altered metabasalt
34a	0532	CC	2.3	1.65	1.0	95	2	28	47	140	qz-calc zone w/py,fault gouge
34b	0531	CC	2.0	0.27	<.1	41	7	56	24	140	fest fault gouge,qz,calc,sparse py
35a	0530	CC	0.7	0.58	0.5	35	2	20	60	100	fest fault gouge,qz,calc,sparse py
35b	0529	CC	3.0	0.93	0.2	160	3	24	35	80	qz-calc,zone w/brecciated altered metabasalt,sparse py
35c	0528	CC	1.2	<.07	<.1	110	2	84	30	70	altered metabasalt
36a	1683	CC	3.0	1.71	1.0	179	10	23	55	-	altered metabasalt w/py,fest
37a	0474	RC	1.5	0.07	0.3	357	6	139	67	90	metabasalt

Appendix G-2. *Analytical results from DDH1 and DDH3 (sample nos. on sheet 4)*

(All values in ppm unless marked %)

Sample no.	Depth from	Depth to	Interval	Au	Ag	Cu	Pb	Zn	Co	Remarks
						DDH1				
1	2.00	5.00	3.00	2.64	0.8	3,100	3	86	27	metabasalt w/qz,calc,cp,py
2	5.00	10.00	5.00	0.07	0.1	285	2	69	28	metabasalt w/qz,calc,cp,py
3	10.00	15.00	5.00	<.07	<.1	155	<2	42	19	metabasalt w/ep
4	15.00	20.00	5.00	<.07	<.1	290	<2	79	30	metabasalt w/ep
5	20.00	26.00	6.00	0.14	<.1	82	<2	82	35	metabasalt w/qz-calc
6	26.00	28.00	2.00	0.07	<.1	29	<2	73	27	metabasalt w/qz-calc
7	28.00	28.30	0.30	0.10	<.1	12	<2	100	38	metabasalt w/qz-calc,fest
8	28.30	29.50	1.20	0.10	<.1	70	<2	69	31	metabasalt w/qz-calc
9	29.50	32.00	2.50	0.89	0.7	565	<2	47	35	metabasalt-qz breccia w/cp,py
10	32.00	32.60	0.60	0.75	1.6	370	2	30	84	fault zone w/qz breccia,cp,py
11	32.60	32.80	0.20	0.24	18.0	1.84%	2	29	21	qz-breccia zone w/cp
12	32.80	35.00	2.20	<.07	<.1	230	<2	68	30	metabasalt w/qz-calc,cp,py
13	35.00	36.00	1.00	1.61	<.1	295	<2	70	46	metabasalt w/qz,cp,py
14	36.00	38.50	2.50	5.93	1.7	99	<2	10	107	qz-calc breccia w/py,cp
15	38.50	40.00	1.50	0.10	0.1	107	<2	20	7	qz-calc breccia w/cp,py
16	40.00	40.80	0.80	0.07	<.1	97	<2	30	12	metabasalt breccia w/qz
17	40.80	45.50	4.70	<.07	<.1	74	<2	40	17	metabasalt w/ep
18	45.50	50.50	5.00	<.07	<.1	61	<2	43	18	metabasalt w/ep
19	50.50	57.50	7.00	<.07	0.1	64	<2	32	13	metabasalt w/ep
20	57.50	60.00	2.50	<.07	<.1	33	<2	26	9	chert-ep w/hem st
						DDH3				
45	57.40	58.40	1.00	<0.07	0.2	650	-	-	-	ep-qtz w/cp,py
46	58.40	60.00	1.60	<.07	0.2	360	-	-	-	metabasalt w/ep,dissem py,cp
47	60.00	63.00	3.00	<.07	0.2	80	-	-	-	metabasalt w/qz stringers
48	90.00	92.50	2.50	<.07	0.1	31	-	-	-	metabasalt w/ep,qz
49	190.60	193.20	2.60	<.07	0.2	25	-	-	-	metabasalt breccia w/qz,py
50	193.20	196.50	3.30	<.07	0.1	77	-	-	-	metabasalt w/sparse qz,py
51	196.50	198.50	2.00	0.07	<.1	13	-	-	-	metabasalt w/qz,py
52	198.50	200.30	1.80	0.27	0.3	34	-	-	-	metabasalt w/qz breccia,py
53	200.30	202.30	2.00	0.55	0.7	21	-	-	-	metabasalt-breccia w/qz,py
54	202.30	204.70	2.40	0.17	0.3	13	-	-	-	metabasalt-breccia w/qz,py,cp
55	204.70	205.20	0.50	0.07	0.3	4	-	-	-	metabasalt w/py
56	205.20	208.80	3.60	0.72	0.6	14	-	-	-	metabasalt-breccia w/qz,py,cp
57	208.80	211.90	3.10	1.85	1.3	31	-	-	-	metabasalt-breccia w/qz,py,cp
58	211.90	215.00	3.10	0.45	0.6	24	-	-	-	metabasalt-breccia w/py,cp
59	215.00	217.00	2.00	0.41	0.6	52	-	-	-	metabasalt w/qz,py
60	217.00	219.00	2.00	<.07	0.2	134	-	-	-	metabasalt w/qz,py
61	219.00	224.00	5.00	<.07	0.2	45	-	-	-	metabasalt w/qz,py
62	224.00	226.20	2.20	<.07	0.2	16	-	-	-	metadiorite w/some py
63	226.20	228.50	2.30	<.07	0.2	320	-	-	-	metabasalt w/ep,py,cp
64	228.50	230.00	1.50	<.07	0.2	240	-	-	-	metabasalt w/ep,py,cp
65	230.00	235.00	5.00	<.07	0.2	280	-	-	-	metabasalt w/ep,py,cp
66	235.00	237.00	2.00	<.07	0.1	142	-	-	-	metabasalt w/ep,cp,py
67	237.00	242.00	5.00	<.07	0.1	54	-	-	-	metabasalt w/ep,py,cp
68	273.00	275.00	2.00	0.34	0.7	400	-	-	-	metabasalt w/qz,py,cp

Appendix G-3. *Analyses from Road Cut II prospect (map nos. on fig. 34)*

(All values in ppm unless marked %)

Map no.	Sample no.	Sample type	Width (ft)	Au	Ag	Cu	Pb	Zn	Co	Ba	Remarks
1	1713	G	0.2	<.07	<.1	56	<2	100	-	-	fest zone in metabasalt w/sulf
2	0666	S	0.5	0.07	0.7	2,200	<2	32	4	<20	qz-ep lens in metabasalt w/py,cp
3	0667	CR	0.4	<.07	0.1	300	<2	1,750	30	<20	ep rich metabasalt w/cp,sl
3	0668	S	NA	<.07	0.1	270	<2	3,000	26	<20	ep metabasalt rubble w/qz stringers w/cp,sl,py
4	1776	C	0.2	0.10	0.1	200	3	385	70	-	fest ep zone in metabasalt w/py,sl,cp
4	1777	CC	0.15	<.07	<.1	50	27	740	18	-	shear zone in metabasalt w/calc,sl,fest
5	1783	SS	NA	<.07	0.1	237	12	155	23	360	el 100 ft
6	1775	S	0.3	<.07	0.3	710	<2	8,000	23	-	qz-ep veinlets in metabasalt w/cp,sl,py
7	0665	CR	2	<.07	0.2	510	<2	1	15	<20	metabasalt w/qz-ep stringers w/cp
7	1774	C	0.4	<.07	0.4	1,900	<2	1.83%	29	-	qz-ep veinlet in metabasalt w/cp,sl,py
8	1784	SS	NA	<.07	0.2	192	8	168	26	210	el 75 ft
9	0664	CH	0.2	0.17	2.5	6,950	2	56	13	<20	qz-ep lens in metabasalt w/cp
9	1712	C	1	0.10	0.2	275	<2	1.05%	-	-	qz-calc zone in metabasalt w/ep,py,sl,cp
9	1772	CR	0.4	<.07	0.8	2,000	<2	2,000	20	-	qz-ep veinlets in metabasalt w/sl,cp
9	1773	G	0.5	<.07	<.1	94	<2	114	19	-	sl veinlet in ep zone in metabasalt
10	0663	CR	3	<.07	0.1	500	4	54	12	<20	metabasalt w/qz-ep stringers w/cp,py
11	1785	SS	NA	<.07	0.1	243	7	84	50	320	el 95 ft
12	1771	G	0.1	<.07	0.4	1,750	<2	450	18	-	qz-ep veinlets in metabasalt w/cp,sl
13	1770	C	5	<.07	0.4	1,900	<2	74	21	-	ep zone in metabasalt w/cp,some qz
14	1711	G	0.4	0.21	0.6	2,800	3	32	-	-	fault zone in metabasalt w/cp,py,ml,fest
15	1788	SS	NA	<.07	<.1	465	8	97	26	260	el 50 ft
16	0673	CR	1	<.07	0.3	254	4	43	37	-	tan st qz-calc altered metabasalt w/py,cp

Appendix G-4. *Analyses from Chilkat Islands (map nos. on fig. 40)*

Map no.	Sample no.	Sample size (ft)	Sample type	Fire assay Au (ppm)	Fire assay Ag (ppm)	Atomic absorption (ppm unless marked %) Cu	Pb	Zn	Co	X-ray Ba (%)	Spectrographic (ppm) W	Mo	Sn	As	Ni	Bi	Sb	Lithology, remarks
1	0428	0.5	S	N	0.2	1920	N	8	4	N	-	-	-	-	-	-	-	metabasalt w/ep,qz,cp
2	1800	0.3	C	N	0.1	70	3	38	5	0.068	-	-	-	-	-	-	-	metabasalt contact w/ metabasalt w/calc
	Shikosi Island Occurrence (map No. 52)																	
3	1820	0.5	G	0.050	2.4	1.06%	N	3000	18	N	-	-	-	-	-	-	-	metabasalt flow w/cp,ep,py,ml
3	1902	8.0	CR	N	N	430	2	24	34	N	-	-	-	-	-	-	-	altered zone in metabasalt w/ cp,py,ml
3	1103	0.4	S	0.036	6.7	2.74%	3	14	28	N	-	-	-	-	-	-	-	ep,silica band in meta-basalt w/cp
4	1803	0.4	C	N	0.1	221	N	98	18	N	-	-	-	-	-	-	-	metabasalt shear zone w/ep,py, fest
5	1804	0.5	G	N	3.2	7420	2	95	48	N	-	-	-	-	-	-	-	metabasalt w/ep,cp,py,fest
6	1802	6.0	G	N	0.1	24	24	44	5	0.047	-	-	-	-	-	-	-	fest dike w/py in pillow meta-basalt
7	1003	0.2	S	0.100	22.5	6.78%	6	406	41	N	-	-	-	-	-	-	-	silicified zone in metabasalt w/ep,cp,py
7	1004	0.25	CC	0.930	4.1	4.60%	23	181	15	0.001	-	-	-	-	-	-	-	ep vein in metabasalt w/cp,py, ml
7	1806	4.0	CR	0.070	0.2	906	N	64	11	N	-	-	-	-	-	-	-	metabasalt w/ep,ml,cp,py,fest
7	1807	0.2	CH	N	12.5	6.90%	N	396	139	0.001	-	-	-	-	-	-	-	ep vein in metabasalt w/cp,py, ml
7	1808	0.3	CH	N	1.2	1.34%	43	107	23	0.001	-	-	-	-	-	-	-	ep vein in metabasalt w/cp,py, ml
7	1809	0.25	CH	N	8.6	5.45%	27	75	23	0.001	-	-	-	-	-	-	-	ep vein in metabasalt w/cp,py, ml
7	1810	0.2	CH	N	1.1	1.32%	35	65	13	0.001	-	-	-	-	-	-	-	ep vein in metabasalt w/cp,py, ml
8	1001	0.6	CC	N	N	6	N	21	31	N	-	-	-	-	-	-	-	ep silicified zone in meta-basalt w/py,cp,ml,sl
9	0696	0.4	CC	N	0.8	2070	3	1660	27	N	-	-	-	-	-	-	-	silicified ep shear zone in metabasalt w/py,cp
9	1012	0.2	S	0.031	13.7	5.01%	6	1.00%	56	0.014	-	-	-	-	-	-	-	ep,cp,py in metabasalt shear
10	0694	1.0	CR	N	.3	479	6	101	58	N	-	-	-	-	-	-	-	metabasalt w/ep,py
10	0695	0.6	CR	N	1.2	2.48%	35	386	49	.005	-	-	-	-	-	-	-	metabasalt w/ep,qz,cp,py
10	0697	1.4	CC	N	4.2	1.46%	5	468	58	N	-	-	-	-	-	-	-	qz-ep lens in metabasalt w/ py,cp
10	0698	0.3	CC	N	2.5	1.21%	18	128	42	N	-	-	-	-	-	-	-	ep silicified zone in meta-basalt w/py,cp
10	0699	0.5	CC	0.100	1.5	7200	9	122	55	N	-	-	-	-	-	-	-	ep silicified zone in meta-basalt w/py,cp,bn,sl
10	1013	0.2	CR	0.142	0.5	1700	28	8000	42	0.011	-	-	-	-	-	-	-	qz vein w/ep,cp,py,sl
10	1014	0.3	CR	0.927	0.4	680	13	5750	25	0.006	-	-	-	-	-	-	-	qz-ep vein w/py,cp,sl
11	1801	0.5	C	2.540	1.1	1950	7	2.14%	21	0.015	-	-	-	-	-	-	-	qz-calc breccia in meta-basalt w/cp,py,sl,ml

APPENDIX H. ANALYTICAL RESULTS FROM PORCUPINE PLACER DEPOSITS

Appendix H-1. *Trace-element and gold fineness of placer gold from the Porcupine area*

Map no. Sheet 5	Field no.	Drainage basin locality (creek)	Sample weight (mg)	Gold (ppt)	Silver (ppt)	Copper (ppt)	Antimony (ppt)	Other (ppt)	True fineness[2]	Remarks
a	9047.......	Porcupine.........	21.64	794	140	15	50	1	850	Channel sample 0.1 yd^3, Porcupine Creek.
d	9096.......	Porcupine.........	64.01	902	90	ND	ND	8	909	Channel sample 0.1 yd^3, but below channel.
f	9081.......	Porcupine.........	35.36	817	145	ND	ND	38	849	Channel sample 0.1 yd^3, modern Porcupine channel.
c	9043.......	Porcupine.........	34.75	812	144	ND	ND	44	849	Channel sample 0.1 yd^3, bench upstream from cabin.
h	9002.......	Porcupine.........	64.94	822	155	ND	ND	29	841	3 pans on bedrock from bench west side of creek.
g	9037.......	Porcupine.........	67.18	838	107	ND	ND	55	886	Channel sample 0.1 yd^3.
i	9119.......	Porcupine.........	50.70	838	115	ND	ND	47	879	0.5 pan, dry channel, east side Porcupine Creek.
j	9112.......	McKinley..........	65.82	811	187	ND	ND	2	813	Channel sample 0.1 yd^3, on bedrock.
l	9109.......	McKinley..........	4.97	779	170	ND	ND	51	820	Channel sample 0.1 yd^3, boulder layer under colluvium.
m	9106[3]......	McKinley..........	33.74	669	259	22	ND	50	721	From sulfide vug, 'ladder vein'.
n	84BT313....	McKinley..........	16.15	855	136	9	ND	0	859	3 pans, modern flood-plain, boulder-rich.
n	84BT317a[3]..	McKinley..........	8.15	780	219	ND	ND	1	780	From Golden Eagle vug vein.
k	9054.......	Cahoon...........	70.10	738	201	37	11	13	786	Channel sample 0.1 yd^3, on and in bedrock cracks.
s	9005.......	Glacier..........	36.60	855	136	ND	ND	9	863	Channel sample 0.1 yd^3, 6 in gravel on bedrock.
t	85BT25.....	Christmas.........	9.01	835	129	ND	ND	36	866	3 pans from auriferous till on bedrock.
o	9061.......	Nugget...........	60.09	722	236	ND	ND	42	754	Channel sample 0.1 yd^3, fluvial gravel and till.
p	85BT29.....	Nugget...........	28.40	756	207	ND	ND	37	785	3 pans, modern flood-plain, not on bedrock.
q	85BT28.....	Cottonwood........	18.30	769	193	ND	ND	38	799	3 pans, modern flood-plain, not on bedrock.

[1]Raw placer gold derived from channel and grab samples collected by USBM and ADGGS. All elements presented in parts per thousand; gold and silver determinations by commercial laboratories in Vancouver, B.C., Lakewood, Colorado, and DGGS Mineral Laboratory in Fairbanks, Alaska. Zinc and lead were looked for but, not detected.

[2]'True Fineness' as defined by Boyle (1979, p. 197) is the ratio of gold to gold plus silver times 1 000 or $\frac{Au}{Au + Ag} \times 1000$

[3]Gold panned from 'hardrock' quartz-sulfide vein near Golden Eagle prospect.

Appendix H-2. *Mineral identification of selected pan concentrates and placer samples from the Porcupine area*

Map no. Sheet 5	Field no.	Drainage	Major (>15%)	Minor (3-15%)	Trace (<3%)	Remarks/field notes
c	9043[1]....	Porcupine..........	Magnetite (60%)	Sulfide	Zircon, magnetite	32 gold colors iron stained and smoothed on edges.
h	9012[1]....	Porcupine..........	ND	Pyrite, magnetite	Zircon, garnet, scheelite	24 gold colors; some shiny and rodlike.
g	9037[1]....	Porcupine..........	Magnetite (25%)	Pyrite	Zircon, garnet	22 gold colors, iron stained
e	85BT32[2]..	Porcupine 'Palmer' bench level (Qat_2).	Magnetite (30%), ilmenite (10%)	Pyrite, sphalerite, zircon	Idocrase, cassiterite (?), pyrrhotite	37 flat-shaped colors; 1-2 pennyweight nugget; gold in Fe rug-like features on bedrock; gold heavily Fe stained; derived from pyrite ?
j	85BT35[2]..	McKinley...........	Pyrite (65%), magnetite (15%)	Sphalerite (6-8%)	Scheelite (30 grains), cassiterite, pyrrhotite	7 colors - bright rounded 'glacial gold'?
n n	84BT313[2]. 85BT42.	McKinley...........	Magnetite (65%), amphibole	Garnet, pyrite, ilmenite	Cassiterite, bornite	150 colors; both chunky Fe stained type; bright rounded fine 100 mesh; Bureau sample contains idocrase.
K	9054[1]....	Cahoon.............	Magnetite (70%)	Garnet, zircon	Sulfide (pyrite)	128 colors of gold; biggest smooth; some are bright and shiny and haven't traveled far.
t	85BT25[2]..	Christmas Creek.....	Magnetite (15%), ilmenite (10%)	Pyrite, barite	Scheelite, undetermined sulfides	6 colors of gold, smooth and bright, sample very clay rich.
r	85BT44[2]..	Glacier Creek.......	Magnetite (25%), barite (15%)	Amphibole/pyroxene	Undetermined sulfide	No gold observed; barite grains up to 0.2 in diam.
q	85BT28[2]..	Cottonwood Creek....	Pyrite (30%), magnetite (25%)	Pyroxene	Zircon	35 rounded to angular colors; Bureau sample contains scheelite, olivine.
p	85BT29[2]..	Nugget Creek........	Pyrite (45%), magnetite (35%)	ND	Scheelite, amphibole	Rounded colors indicate transportation.
u	85BT55[2]..	Herman Creek........	Barite (20%), magnetite (15%)	Amphibole	ND	Abundant barite grains; no gold.
b	85BT57[2]..	Marble Creek........	Magnetite (15%), sulfide (pyrite)	ND	Zircon, garnet	No gold observed, some pyrite as cubes up to 0.4 in diam.

[1]Visual inspection including ultraviolet radiation by Steve Fechner, USBM.
[2]X-ray diffraction analyses of 3.3 specific-gravity fractions augmented by visual inspection and ultraviolet radiation; 1984 analyses by N.C. Veach; 1985 analyses by T.K. Bundtzen, DGGS.

Appendix H-3. *Results of reconnaissance and channel placer sampling in the Porcupine area*

Map no. (sheet 5)	Drainage	Sample type	Sample size (yd^3)	Grade (oz/yd^3 Au)	Comments[1]
1	Big Boulder	Sluice	0.1	trace[2]	Alluvial gravel. Fair sample location.
2	do.	do.	0.1	trace	Do.
3	Little Boulder.	do.	0.1	trace	Do.
4	Tributary of Chilkat River	do.	0.1	trace	Do.
5	do.	do.	0.1	trace	Alluvial fan. Fair sample location.
6	Jarvis Glacier.	do.	0.1	none	Alluvial gravel. Fair sample location.
7	Little Jarvis Glacier.	do.	0.1	trace	Do.
8	Glacier	do.	0.1	trace	Do.
9	Porcupine	do.	0.1	trace	Alluvial bar. Fair sample location.
10	Klehini	do.	0.1	trace	Alluvial fan. Fair sample location.
11	do.	do.	0.1	trace	Alluvium. Fair sample location.
12	Glacier	do.	0.1	trace	Do.
13	do.	do.	0.1	trace	Do.
14	do.	do.	0.1	trace	Do.
15	Christmas	Pans	0.05	0.0510	Bedrock. Excellent sample location.
16	do.	Sluice	0.1	0.0260	Alluvial gravel on bedrock. Excellent sample location.
17	Christmas	Sluice	0.1	0.0102	Alluvial gravel. Good sample location.
18	do.	do.	0.1	0.0030	Alluvial gravel on bedrock. Good sample location.
19	Glacier	do.	0.1	none	Alluvium. Fair sample location.
20	do.	do.	0.1	none	Alluvium and till. Fair sample location.
21	do.	do.	0.1	none	Alluvium. Fair sample location.
22	Marble	Hydraulic concentrator	0.1	none	Do.

Appendix H-3. *Results of reconnaissance and channel placer sampling in the Porcupine area*-Continued

23........	Porcupine....	....do.......	0.1	0.0011	Alluvial fan material. Fair sample location.
24........	....do........	....do.......	0.1	0.0032	Do.
25........	....do........	....do.......	0.1	0.0017	Alluvial fan material. Poor sample location.
26........	....do........	Sluice......	0.1	trace	Alluvium. Fair sample location.
27........	....do........	....do.......	0.1	trace	Do.
28........	....do........	Hydraulic concentrator	0.1	trace	Alluvium. Good sample location.
29........	....do........	....do.......	0.1	0.0020	Do.
30........	....do........	... do.......	0.1	0.0109	Do.
31........	....do........	....do.......	0.1	trace	Do.
32........	....do........	....do.......	0.1	0.0273	Alluvium on a bench. Excellent sample location.
33........	Porcupine....	Hydraulic concentrator	0.1	0.0181	Alluvium on a bench. Excellent sample location.
34........	....do........	....do.......	0.1	0.0062	Do.
35........	....do........	....do.......	0.1	0.0580	Do.
36........	....do........	....do.......	0.1	0.0421	Do.
37........	....do........	....do.......	0.1	trace	Bench alluvium. Excellent sample location.
38........	....do........	....do.......	0.1	0.0081	Do.
39........	....do........	....do.......	0.1	0.0040	Alluvium. Good sample location.
40........	....do........	....do.......	0.1	0.0052	Do.
41........	....do........	....do.......	0.1	0.0014	Do.
42........	....do........	....do.......	0.1	0.0004	Alluvium on bench. Good sample location.
43........	....do........	....do.......	0.1	trace	Do.
44........	....do........	....do.......	0.1	trace	Do.
45........	....do........	....do.......	0.1	0.0013	Do.
46........	....do........	....do.......	0.1	trace	Do.
47........	....do........	....do.......	0.1	0.0092	Do.

Appendix H-3. *Results of reconnaissance and channel placer sampling in the Porcupine area*-Continued

Map no.	Drainage	Sample type	Sample size (yd^3)	Grade (oz/yd^3 Au)	Comments
48........	....do........	....do.......	0.1	0.0017	Do.
49........	....do........	....do.......	0.1	0.0012	Do.
50........	Porcupine....	Hydraulic concentrator	0.1	0.0065	Alluvium on a bench. Good sample location.
51........	....do........	....do.......	0.1	0.0015	Do.
52........	....do........	Sluice......	0.1	0.0008	Stream alluvium. Fair sample location.
53........	....do........	Hydraulic concentrator	0.1	0.0035	Alluvium on a bench. Good sample location.
54........	....do........	....do.......	0.1	0.0162	Do.
55........	....do........	....do.......	0.1	0.0373	Alluvium. Good sample location.
56........	....do........	....do.......	0.1	0.0222	Do.
57........	....do........	....do.......	0.1	0.0123	Do.
58........	....do........	....do.......	0.1	0.0013	Do.
59........	....do........	....do.......	0.1	0.0095	Duplicate of sample No. 56.
60........	....do........	....do.......	0.1	0.0007	Alluvium. Good sample location.
61........	....do........	....do.......	0.1	0.0144	Alluvium on bench. Good sample location.
62........	....do........	....do.......	0.1	0.0210	Do.
63........	....do........	....do.......	0.1	0.0069	Do.
64........	....do........	Pan.........	NA	NA	Bench. Gold on bedrock.
65........	....do........	Hydraulic concentrator	0.1	0.0161	Bench alluvium. Excellent sample location.
66........	...do........	...do.......	0.1	0.0420	Do.
67........	Porcupine....	Hydraulic concentrator	0 1	none	Alluvium and colluvium on bench. Good sample location.
68........	....do........	....do.......	0.1	trace	Do.

Appendix H-3. *Results of reconnaissance and channel placer sampling in the Porcupine area*-Continued

69........	....do........	....do.......	0.1	0.0005	Alluvium on bench. Good sample location.
70........	....do........	....do.......	0.1	0.0014	Do.
71........	....do........	....do.......	0.1	0.0139	Alluvium on bench. Excellent sample location.
72........	....do........	....do.......	0.1	0.0132	Do.
73........	....do........	(3) Pans....	NA	NA	Do.
74........	....do........	Hydraulic concentrator	0.1	trace	Bench alluvium. Good sample location.
75........	....do........	....do.......	0.1	trace	Do.
76........	....do........	....do.......	0.1	trace	Do.
77........	....do........	Sluice......	0.1	0.0027	Alluvial bar. Good sample location.
78........	....do........	Hydraulic concentrator	0.2	trace	Alluvium on bench. Poor sample location.
79........	....do........	Sluice......	0.1	trace	Alluvium on bench. Fair sample location.
80........	....do........	....do.......	0.1	0.0041	Alluvial bar. Fair sample location.
81........	....do........	....do.......	0.1	trace	Alluvial bar. Poor sample location.
82........	Tributary of McKinley.	Pans.........	0.04	0.0081	Alluvium on bedrock. Excellent sample location.
83........	McKinley.....	Sluice......	0.1	0.0035	Alluvial bar. Fair sample location.
84........	McKinley.....	Sluice......	0.1	0.0099	Alluvium on bedrock. Good sample location.
85........	....do........	....do.......	0.1	trace	Colluvium on bedrock. Poor sample location.
86........	....do........	....do.......	0.1	0.0539	Alluvium on bedrock. Excellent sample location.
87........	....do........	....do.......	0.1	0.0094	Alluvial bar. Good sample location.
88........	....do........	....do.......	0.1	0.0009	Alluvium on bench. Good sample location.
89........	....do........	....do.......	0.1	0.0162	Do.
90........	McKinley.....	....do.......	0.1	0.0014	Alluvial bar. Fair sample location.
91........	....do........	Pan.........	NA	NA	Gold from quartz vein.
92........	....do........	Sluice......	0.1	0.0057	Alluvial bar. Good sample location.

Appendix H-3. *Results of reconnaissance and channel placer sampling in the Porcupine area*-Continued

Map no.	Drainage	Sample type	Sample size (yd^3)	Grade (oz/yd^3 Au)	Comments
93........	....do........	....do.......	0.1	0.0006	Alluvium and bedrock. Good sample location.
94........	....do........	....do.......	0.1	trace	Alluvial bar. Fair sample location.
95........	....do........	....do.......	0.1	trace	Alluvium and colluvium. Poor sample location.
96........	....do........	....do.......	0.1	trace	Do.
97........	....do........	....do.......	0.1	0.0007	Do.
98........	....do........	....do.......	0.1	trace	Do.
99........	Cahoon.......	....do.......	0.1	0.0450	Alluvium on bedrock. Good sample location.
100.......	....do........	....do.......	0.1	0.0020	Alluvium and colluvium. Fair sample location.
101.......	Cahoon.......	Pans........	0 03	trace	Alluvium and colluvium. Fair sample location.
102.......	....do........	Sluice......	0.1	trace	Alluvium and colluvium. Good sample location.
103.......	....do........	....do.......	0.1	trace	Alluvium on bedrock. Good sample location.
104.......	....do........	....do.......	0.1	0.0006	Do.
105.......	....do........	....do.......	0.1	none	Alluvium and colluvium. Fair sample location.
106.......	....do........	....do.......	0.1	none	Do.
107.......	....do........	....do.......	0.1	trace	Do.
108.......	Tributary of Porcupine.	....do.......	0.1	none	Do.
109.......	Porcupine....	....do.......	0.1	trace	Alluvial bar. Good sample location.
110.......	....do........	....do.......	0.1	none	Alluvium and colluvium. Fair sample location.
111.......	....do........	....do.......	0.1	none	Do.
112.......	....do........	....do.......	0.1	none	Alluvium and till. Fair sample location.
113.......	Cottonwood...	....do.......	0.1	trace	Alluvium. Good sample location.
114.......	....do........	....do.......	0.1	0.0005	Alluvium in fan. Good sample location.

Appendix H-3. *Results of reconnaissance and channel placer sampling in the Porcupine area*-Continued

115.......	....do........	....do.......	0.1	trace	Do.
116.......	Nugget.......	....do.......	0.1	0.0138	Alluvial bar (till?). Poor sample location.
117.......	....do........	Pan.........	0.05	trace	Colluvium. Poor sample location.
118.......	Nugget.......	Sluice......	0.2	trace	Alluvial fan. Poor sample location.
119.......	....do........	....do.......	0.1	trace	Alluvium. Fair sample location.
120.......	....do........	....do.......	0.1	trace	Alluvium on bedrock. Poor sample location.
121.......	....do........	....do.......	0.1	trace	Do.
122.......	....do........	Pans........	0.1	0.0006	Alluvium on bedrock. Fair sample location.
123.......	....do........	Sluice......	0.1	0.0007	Do.
124.......	....do........	Rock........	NA	NA	Calcite vein.
125.......	....do........	Sluice......	0.1	0.0006	Alluvium and colluvium. Fair sample location.
126.......	....do........	....do.......	0.1	trace	Do.
127.......	Little Salmon.	....do.......	0.1	trace	Alluvial bar. Fair sample location.
128.......	....do........	....do.......	0.1	trace	Bench gravel on gray clay. Good sample location.
129.......	....do........	....do.......	0.1	trace	Alluvial bar. Fair sample location.
130.......	Salmon.......	....do.......	0.1	trace	Do.
131.......	....do........	....do.......	0.1	none	Alluvial bar. Poor sample location.
132.......	Summit.......	Pans........	0.025	none	Alluvium on bedrock. Poor sample location.

[1]Comments include a description of the geology of the sample site and an evaluation of the site based on the following criteria:

<u>Excellent:</u> Bedrock reached, little water in hole. Good location for gold to accumulate. Likely high graded sample in excess of average value of gravels in immediate area.

<u>Good:</u> Bedrock reached, may have water in hole, fair to good area for gold to accumulate. Likely representative of value of gravels in immediate area.

<u>Fair:</u> Bedrock not reached or poor location for gold to accumulate. May underestimate value of gravels in immediate area.

<u>Poor:</u> Bedrock not reached and water in hole. Bad location for gold to accumulate. Likely underestimates value of gold.

[2]Trace - less than 0.0001 oz/yd^3 Au recovered.

Appendix H-4. *Results of site-specific bulk-placer samples collected from lower Porcupine Creek*

Sieve size (mesh)	Sample B-1		Sample B-2		Sample B-3		Sample B-4	
	Gravel weight (lb)	Gold weight (g)	Gravel weight (lb)	Gold weight (g)	Gravel weight (lb)	Gold weight (g)	Gravel weight (lb)	Gold weight (g)
+1.............	308	0	300	0	360	0	395	0
+2.............	33	0	40	0	22	0	42	0
+4.............	70	0	78	0	54	0	79	0
+6.............	17.25	0	10.75	0	10.5	0	14	0
+10............	41	0	35.75	0	28	0	42.8	0
+14............	20	0	17.6	0.0989	12.75	0.0824	19.4	0.0405
+20............	20	0.0025	17.5	0.0208	11.8	0.0206	18	0.0314
+30............	18.75	0.0060	15.75	0.0475	10.75	0.0654	16	0.0322
+40............	16.5	0.0049	13	0.0078	9.75	0.0294	13.4	0.0117
+50............	16	0.0028	8.5	0.0094	8.5	0.0202	11.25	0.0163
+60............	6.75	0.0007	4.8	0	4	0.0051	4	0.0038
+70............	5.25	0.0004	3.6	0.0002	3.2	0.0018	3.25	0.0010
+80............	4.8	0.0006	3.5	0	3	0.0025	2.75	0.0026
+100...........	5	0.0005	4.25	0.0004	3.5	0.0005	3.25	0.0016
+200...........	11.75	0	17.25	0	11.4	0	13.4	0
-200...........	10	0	14	0	9.25	0	12.4	0
Total	604.05	0.0184	584.25	0.1850	562.40	0.2279	689.90	0.1411