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# PROSPECT EXAMINATION OF THE WYRICK PLACER/LODE SYSTEM, GRANITE CREEK, IDITAROD-GEORGE MINING DISTRICT, IDITAROD B-2 QUADRANGLE, ALASKA


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## INTRODUCTION

On July 15 and August 26, 1985 the authors examined hard rock and placer deposits on Granite Creek, a northeasterly tributary of George River in the Iditarod B-2 Quadrangle, southwestern Alaska. The study was undertaken because significant antimony and precious metal values in vein and shear zone deposits were encountered by mine operators while developing a placer gold deposit. This prospect examination was conducted as a cooperative study between the Alaska Division of Geological and Geophysical Surveys and the U.S. Geological Survey under the latter agency's Alaska Mineral Resource Assessment Program (AMRAP) of the Iditarod Quadrangle. Mineral investigations are also conducted as part of data collection needs for the Department of Natural Resources Kuskokwim Area Plan. We thank mine owners L.E. and Marilyn Wyrick for their hospitality during field investigations and Glenn Bass and Anthony (Tony) Gadardi for informative discussions concerning past mining activities in the region.

A reconnaissance geologic map, two prospect geologic sketch maps, assay information, and suggestions for further work are herein presented.

## GEOGRAPHY

The study area lies in the east-central portion of the Kuskokwim Mountains, a maturely dissected upland of accordant rounded ridges and broad sediment filled lowlands. It is part of a poorly known eastern extension of the Iditarod mining district referred to by Bundtzen and others (1985) as the Iditarod-George district (fig. 1). Cobb (1974) referred to the area as part of the Aniak district. The study area comprises a west-southwesterly drainage basin of Willow Creek, (a tributary of the George River) that includes Granite, Homestake, and Bismarck Creeks at SE¼ sec. 16, T. 26 N., R. 42 W., Copper River Meridian. Relief ranges from 350 ft in Granite Creek basin to VABM 2424 (ft), about 8 mi north of the mine site. The study area is heavily vegetated with white spruce and birch on the slopes and terraces and with willow, alder, and shrub in the valleys.

Access to this remote portion of the Kuksokwim Mts. is provided via one 800 ft long and one 1,100 ft long airstrip respectively just east-northeast and west-southwest of the mine site.

## GEOLOGY OF THE GRANITE CREEK AREA

The Granite Creek area is underlain by sheared medium brown to gray, friable siltstone, mudstone, and calcareous medium grained lithic sandstone

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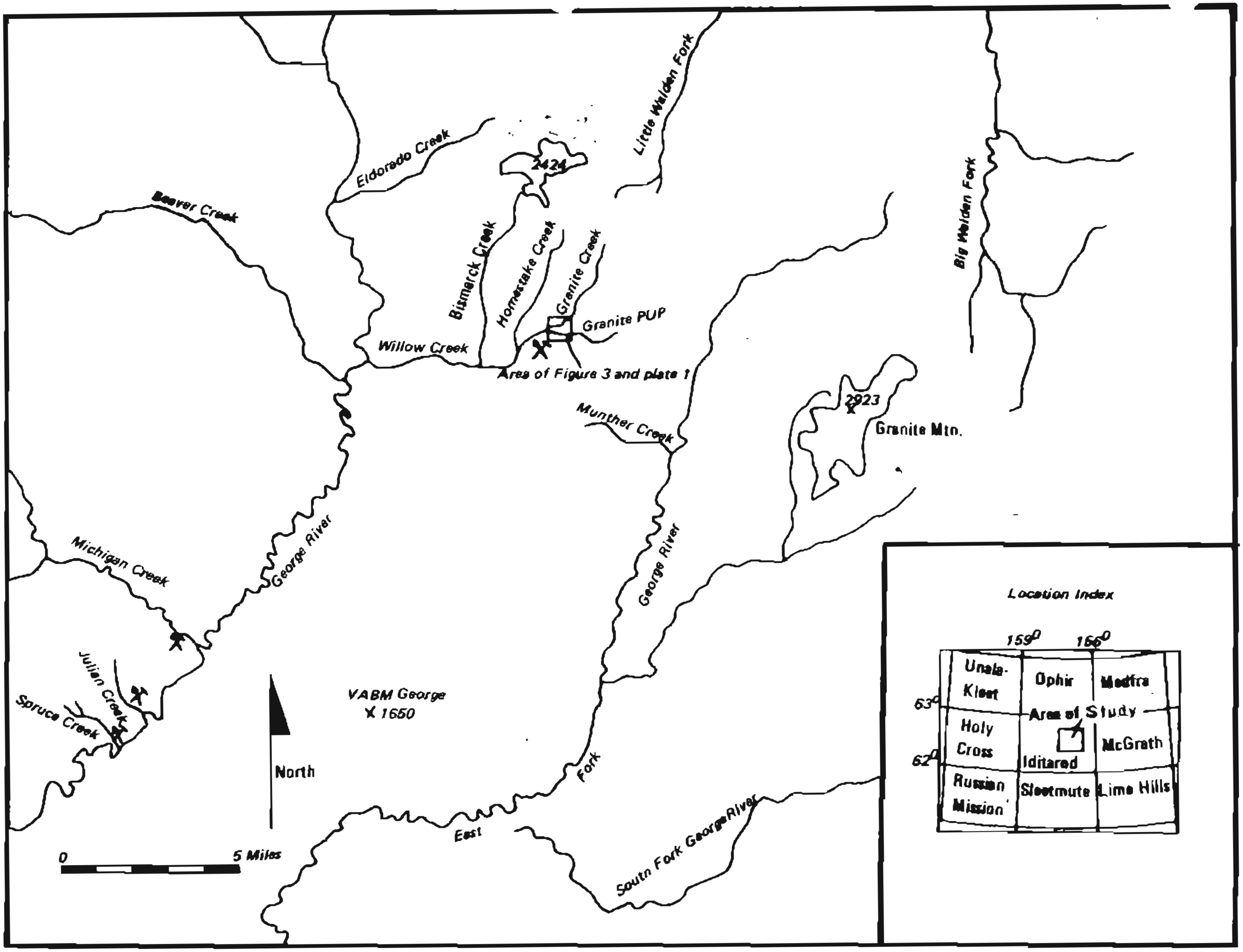


Figure 1. Location map of central Iditarod Quadrangle showing Wyrick placer camp, Granite Creek drainage.

of the Kuskokwim Group, that ranges in age from late Early to Late Cretaceous (Cady and others, 1955; Bundtzen and Laird, 1980). Graded beds, rip up clasts, and other sedimentary features suggest deposition by turbidity currents.

Two distinctive igneous rock types intrude the Kuskokwim Group in the study area 1) a fine grained, equigranular, tourmaline rich, augite-biotite monzonite radiometrically dated by biotite separates, as 71.1±2.2 m.y., and 2) a series of peraluminous quartz rhyolite sills and/or dikes that strike N. 70-85 E. across the mine area (fig. 2). The rhyolite shows extensive sericite alteration. The monzonite intrusion has created a hornfels aureole in the adjacent clastic sedimentary rocks that extend 300 to 1,000 ft away from the intrusive contact zone. Apparently no thermal aureoles are associated with the 2 mi wide rhyolite dike swarm.

Air photo analysis shows a series of high level strath terraces in valleys of the prospect area. An older terrace level occurs about 50-75 vertical ft above the modern stream valley. This older strath terrace serves as the planar surface upon which both mine airstrips rest. However, no fluvial gravels were recognized anywhere on this surface. A more youthful terrace 5-20 ft above present stream levels of Granite Pup and Granite Creeks locally includes thin channel gravels 6 in. to 2 ft thick on bedrock.

## MINING HISTORY

No published information concerning mine production is known and all data has been obtained directly from Anthony (Tony) Gadardi of Anchorage, Alaska and L.E. Wyrick, the present mine operator. The Iditarod-George district has four streams---Julian, Spruce, Michigan, and Granite Creeks---that have collectively contributed a total production of about 25,000 oz/gold (Bundtzen and others, 1985). Additionally, placer gold has been panned on Bismarck, Homestake, Eldorado, and Munther Creeks, and Waldren Fork of Takotna River (fig. 1). According to Gadardi (personal commun., 1985), William Duffy and others of Flat ventured into the Granite Creek drainage sometime around World War I and discovered a rich, but narrow, confined paystreak at the present mine site. Although the ground averages only 6 to 8 ft of overburden, underground drift mining was the principal mining method employed. By 1925, Duffy and others drift mined along the paystreak a distance of at least 1,200 ft as indicated by timbers excavated in the last two years. The present opencut follows the old drift mine workings. Every 300 ft, air holes feeding the drifts have been encountered by the recent mine operator. More underground production occurred through the early 1930s but apparently ceased by 1935. Unpublished mint returns through that time indicate production of 156 oz of gold and 21 oz of silver---probably conservative figures. Subsequent activity is unknown until 1979, when Jack Hayden of Flat used a suction dredge to excavate a small 15' x 20' pit midway along the pay zone.

L.E. Wyrick, using a local crew of three employees, began modern mechanized mining operations on Granite Creek and Granite Pup in 1984 and continued through 1985 using a standard bulldozer-sluicing system, and recycling technology to meet current settleable solid and turbidity standards (pl. 1).

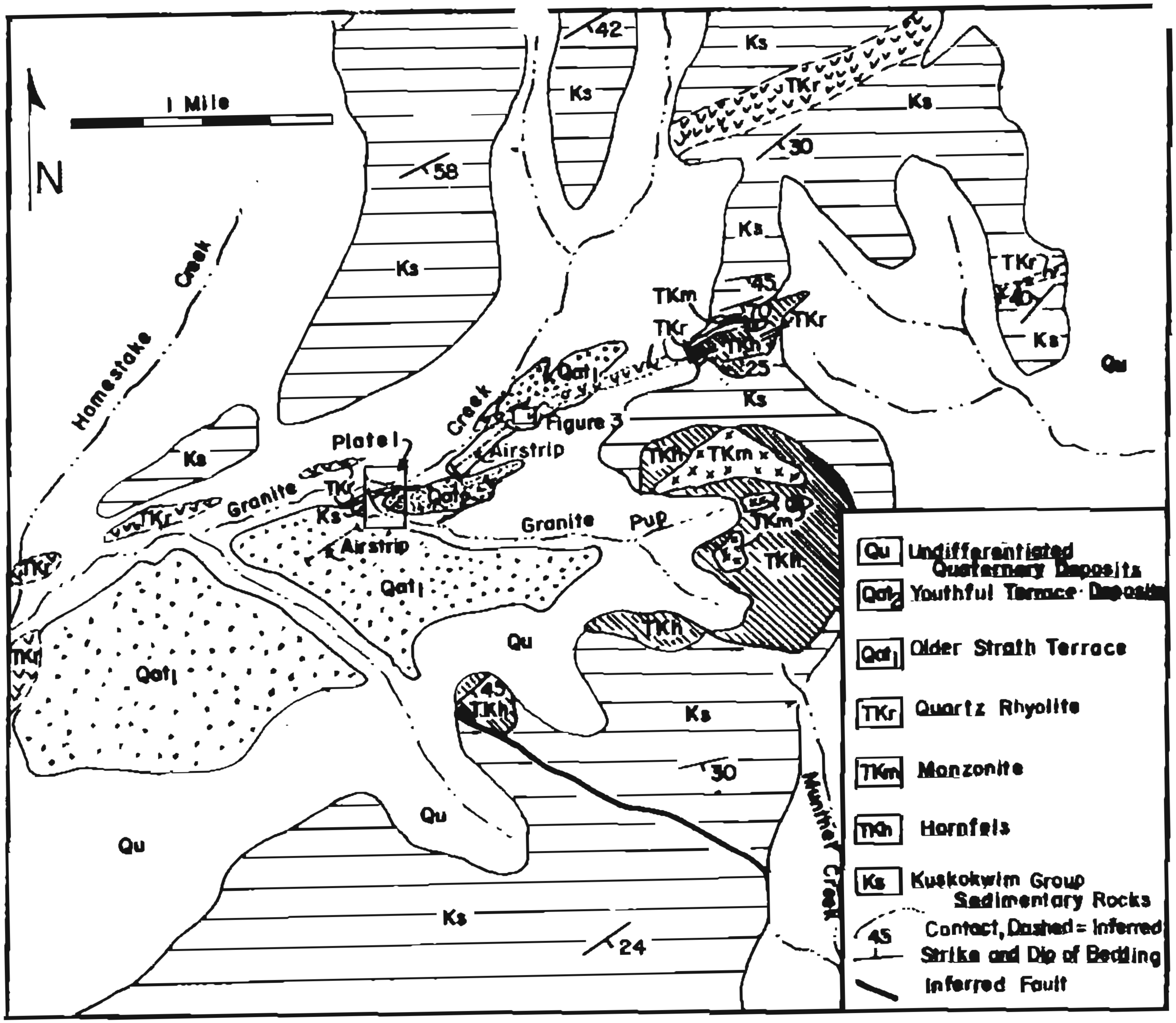


Figure 2. Geologic sketch of Granite Creek area.

To meet these requirements, Mr. Wyrick has constructed a temporary channel of Granite 'Pup' to divert the stream around the active mining operation. 1984-85 mine production remains confidential, but a total production from 1916 to present is estimated at 700 oz gold and 98 oz silver.

## GEOLOGY OF WYRICK LODE DEPOSITS

While digging a bedrock drain and diversionary channels, mine operator L.E. Wyrick located significant stibnite-quartz deposits. Sketch maps of trench and mine cuts and analytical results of sampling from these deposits are presented on plate 1, and in table 1. Further, while exploring some of the area near his newer airstrip east of the placer mine, Wyrick reopened an old trench. A sketch of this trench appears in figure 3 and analytical results of sampling are also given in table 1.

Layered sedimentary rocks consist of shale, sandstone, and pebble conglomerate that are divided into four units on plate 1. The sedimentary units strike N. 65-80 E. and dip steeply to vertically south (stratigraphic 'up' to the south). Contacts between most units appear to be normal. Sandstone units crop out as resistant ribs and reefs in the mine cuts while shale and siltstone form incompetant rubble and slumped portions of the mine cuts. At least three large 20 to 85 ft wide rhyolite dikes intrude the clastic sedimentary section cutting the sedimentary rocks at angles of 45-60° to bedding. The sedimentary rocks show no thermal effects or hydrothermal alteration. However, the dike-sediment contacts are usually marked by shear zones or faults. The rhyolite in the mine and trench cuts appears either as fresh, blocky rubble or as extensive alteration zones of yellow-brown clay gouge up to 14 in. thick.

Five distinctive gash veins of quartz, with stibnite, and its oxidation products kermesite and stibiconite are found in shear zones and along rhyolite-shale contact zones. In the stream diversionary channel next to the Wyrick camp facilities, most gash veins range from 1 to 12 in. wide. However the most impressive mineralization occurs in an 18 ft wide shear zone in the main Wyrick mine cut (plate 1). Within this zone, masses and pods of 50 to 60 percent stibnite up to 20 in. wide were observed as well as linear 'streak -zones' 6 to 8 in. wide containing 15 to 30 percent stibnite.

In both the gash veins and main shear zone occurrences, the stibnite commonly consists of radiating crystals and blades 1 to 3 in. long and 0.1 to 0.4 in. wide. Uncommonly, the stibnite in the main Wyrick mine cut shows mechanical distortion by shear action and consists of smooth, slickensided, fine grained anhedral grains and masses. Country rock gangue mineralogy consists of sheared, clay-rich rhyolite and dark gray shale.

A detailed chip-channel geochemical sampling effort was conducted by the authors to ascertain the 1) average antimony grade, 2) the tenor of gold and silver of the stibnite deposits, and 3) metallurgical characteristics of the mineralized zones. Most samples averaged 15 lbs in weight and represent the material in the intervals described in table 1 and shown on plate 1. Stibnite gash veins in the diversionary channel range in grade from 0.55 percent to 30.9 percent antimony and average 14.5 percent antimony (N=7).

Table 1. Analytical results of samples from the Wyrick placer/lode deposits, Granite Creek area, Iditarod B-2 Quadrangle, Alaska.

| Field number | Cu (ppm) | Pb (ppm) | Zn (ppm) | Au (oz/t) | Ag (oz/t) | Hg (ppm) | Sb (ppm) | Sn (ppm) | B (ppm) | Zr (ppm) | Ba (ppm) | As (ppm) | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 85BT157a[1] | ND | ND | ND | ND | 0.10 | ND | 109,000 | -- | -- | -- | -- | ND | Grab sample with stibnite, 6"chip |
| 85BT157b[2] | 7 | 20 | 105 | ND | ND | 0.52 | 40 | 3 | 300 | 70 | 1,500 | 20 | 25 ft. chip-channel sample |
| 85BT159[1] | 8 | 18 | 100 | ND | 0.01 | ND | 10 | -- | -- | -- | -- | ND | 10' chip-channel sample in rhyolite |
| 85BT160[1] | 7 | 19 | 100 | ND | ND | ND | 20 | -- | -- | -- | -- | ND | 10'chip-channel sample in rhyolite |
| 85BT161a[1] | 14 | 18 | ND | 0.01 | ND | ND | 5,510 | -- | -- | -- | -- | ND | 5' channel with stibnite |
| 85BT161b[1] | 10 | 1 | ND | 0.02 | 0.25 | ND | 121,000 | -- | -- | -- | -- | ND | 5' channel with stibnite |
| 85BT162[1] | 6 | 10 | ND | ND | ND | ND | 120 | -- | -- | -- | -- | 10 | 8' chip-channel in rhyolite |
| 85BT163[1] | 11 | 1 | ND | ND | 0.19 | ND | 110,800 | -- | -- | -- | -- | ND | Grab sample, 12" stibnite gash vein |
| 85BT112a[1] | ND | ND | ND | 0.04 | 0.08 | ND | 270,000 | -- | -- | -- | -- | ND | Channel sample, 12" stibnite vein |
| 85BT112b[1] | ND | ND | ND | 0.01 | 0.22 | ND | 309,000 | -- | -- | -- | -- | ND | Channel sample, 8" stibnite vein |
| 85BT112c[2] | 20 | 20 | 10 | 0.02 | 0.06 | 0.18 | >10,000 | ND | 20 | 15 | 300 | ND | Grab sample, stibnite vein |
| 85BT112d[2] | 10 | 100 | ND | ND | 0.03 | 0.20 | >10,000 | ND | 200 | 50 | 1,500 | 40 | Grab sample, stibnite vein |
| 85BT164[1] | 19 | 8 | ND | 0.01 | ND | ND | 370 | -- | -- | -- | -- | 70 | 6' chip-channel in rhyolite |
| 85BT165[1] | 6 | 13 | ND | ND | ND | ND | 60 | -- | -- | -- | -- | ND | 8' chip-channel in rhyolite |
| 85BT166[1] | ND | ND | 100 | ND | 0.01 | ND | 440 | -- | -- | -- | -- | 10 | 2' chip-channel in rhyolite |
| 85BT167a[1] | 22 | 4 | ND | 0.01 | 0.08 | ND | 28,500 | -- | -- | -- | -- | ND | 4' channel, stibnite bearing shear zone |
| 85BT167b[1] | 21 | 8 | ND | 0.02 | 0.12 | ND | 20,100 | -- | -- | -- | -- | 60 | 6' channel, stibnite bearing shear zone |
| 85BT167c[1] | 45 | 35 | 100 | 0.01 | 0.02 | ND | 1,470 | -- | -- | -- | -- | ND | 8' channel, stibnite bearing shear zone |
| 85BT168a[1] | 28 | 12 | 100 | 0.01 | 0.03 | ND | 310 | -- | -- | -- | -- | 80 | 6' channel, Sb shear zone |
| 85BT168b[2] | 15 | ND | 85 | 0.03 | 0.06 | 2.38 | >10,000 | 2 | 200 | 70 | 1,000 | 180 | 4' channel, Sb shear zone |
| 85BT169[2] | 5 | 20 | 70 | ND | ND | 0.33 | 6 | 2 | 300 | 150 | 700 | 10 | 35' chip sample and rhyolite slate |
| 85BT275[2] | 20 | 10 | ND | 0.02 | 0.32 | 3.00 | >10,000 | 10 | 100 | 50 | 200 | ND | 2 inch stibnite vein in shale |
| 85BT276[2] | 7 | ND | 20 | ND | ND | 0.10 | 120 | ND | 10 | 50 | 150 | ND | 10' chip-channel rhyolite |
| 85BT278[2] | ND | ND | ND | ND | ND | ND | ND | ND | ND | 15 | 150 | ND | 10' chip-channel, sandstone |
| 85BT279a[2] | 7 | 15 | 95 | ND | ND | 0.22 | 38 | ND | 1,000 | 200 | 700 | 20 | 30' chip-channel, rhyolite |
| 85BT279b[2] | 5 | 10 | 75 | ND | 0.01 | 0.30 | 24 | ND | 1,000 | 100 | 500 | 10 | 25' chip-channel, rhyolite |
| 85BT279c[2] | ND | 10 | 50 | ND | ND | 0.20 | 18 | ND | 1,000 | 70 | 700 | ND | 30' chip-channel, rhyolite |
| 85BT279d[2] | 20 | 10 | 60 | ND | 0.03 | 0.24 | 22 | 30 | 500 | 50 | 500 | 10 | 35' chip-channel, rhyolite |
| 85BT279e[2] | 7 | ND | 20 | ND | ND | 0.12 | 4 | ND | ND | 50 | 200 | ND | 8' chip sample in sandstone |
| 85BT279f[2] | 50 | ND | 75 | ND | ND | 0.24 | 2 | ND | 500 | 150 | 500 | ND | 2" gash vein calcite and sulfides |
| 85BT280[2] | 10 | ND | 15 | ND | 0.06 | 0.44 | >10,000 | ND | 500 | 50 | 500 | 150 | grab sample, high grade |
| 85BT277a[2] | 30 | ND | 110 | ND | ND | 0.18 | 44 | ND | 1,000 | 200 | 1,000 | 20 | 10' chip sample, sandstone |
| 85BT277b[2] | 20 | ND | 85 | ND | ND | 0.26 | 24 | ND | 700 | 100 | 700 | 10 | 10' chip sample, sandstone |
| 85BT277c[2] | ND | 10 | 75 | ND | ND | 0.54 | 2 | ND | 1,000 | 50 | 700 | ND | 10' chip sample, rhyolite |
| 85BT277d[2] | ND | 10 | 70 | ND | ND | 0.56 | 2 | ND | 1,000 | 50 | 1,000 | ND | 10' chip sample, rhyolite |
| 85BT277e[2] | 7 | 10 | 100 | ND | ND | 0.50 | 10 | ND | 1,000 | 50 | 1,000 | ND | 10' chip sample, rhyolite |
| 85BT277f[2] | 7 | ND | 50 | ND | 0.02 | 0.22 | 20 | ND | 300 | 150 | 1,000 | 10 | 10' chip sample, pyritic sandstone |
| 85BT277g[2] | 20 | ND | 60 | ND | 0.02 | 0.22 | 10 | ND | 300 | 100 | 700 | 30 | 10' chip sample, pyritic sandstone |
| 85BT277h[2] | 20 | ND | 75 | ND | 0.02 | 0.26 | 10 | ND | 500 | 100 | 1,000 | 40 | 10' chip sample, pyritic calc sandstone |
| 85BT277i[2] | 20 | ND | 95 | ND | ND | 0.28 | 48 | ND | 500 | 200 | 700 | 10 | 10' chip sample, calc sandstone |
| 85BT277j[2] | 20 | ND | 55 | ND | ND | 0.22 | 10 | ND | 300 | 150 | 700 | 20 | 10' chip sample, calc sandstone |
| 85BT277k[2] | ND | 50 | 100 | ND | ND | 0.38 | 2 | ND | 1,000 | 100 | 1,000 | ND | Rhyolite grab with sulfide blebs |
| 85BT277l[2] | 20 | ND | 50 | ND | ND | 0.22 | 8 | ND | 300 | 150 | 1,000 | 20 | Lithic sandstone grab sample |

[1] Analyses by Chemex Labs, Inc., Vancouver, British Columbia, using AAS and fire assay techniques.
[2] Analyzed by by K. Romine, L.S. Laudon, and R.J. Fairfield, U.S. Geological Survey, Denver, Colorado.

Bi, Mo, Nb, W, and Th were looked for but not detected except in 85BT157b (W=4 ppm) and 85BT112b (Bi=2 ppm). Sb values greater than 10,000 not determined in 85BT112a, 112b 168b, 275, and 280. Analyses of Hg, Au, As, Zn, some Sn, and Sb by atomic absorption spectrophotometry, remaining elements by emission spectrography.

ND = not detected

-- = not analyzed

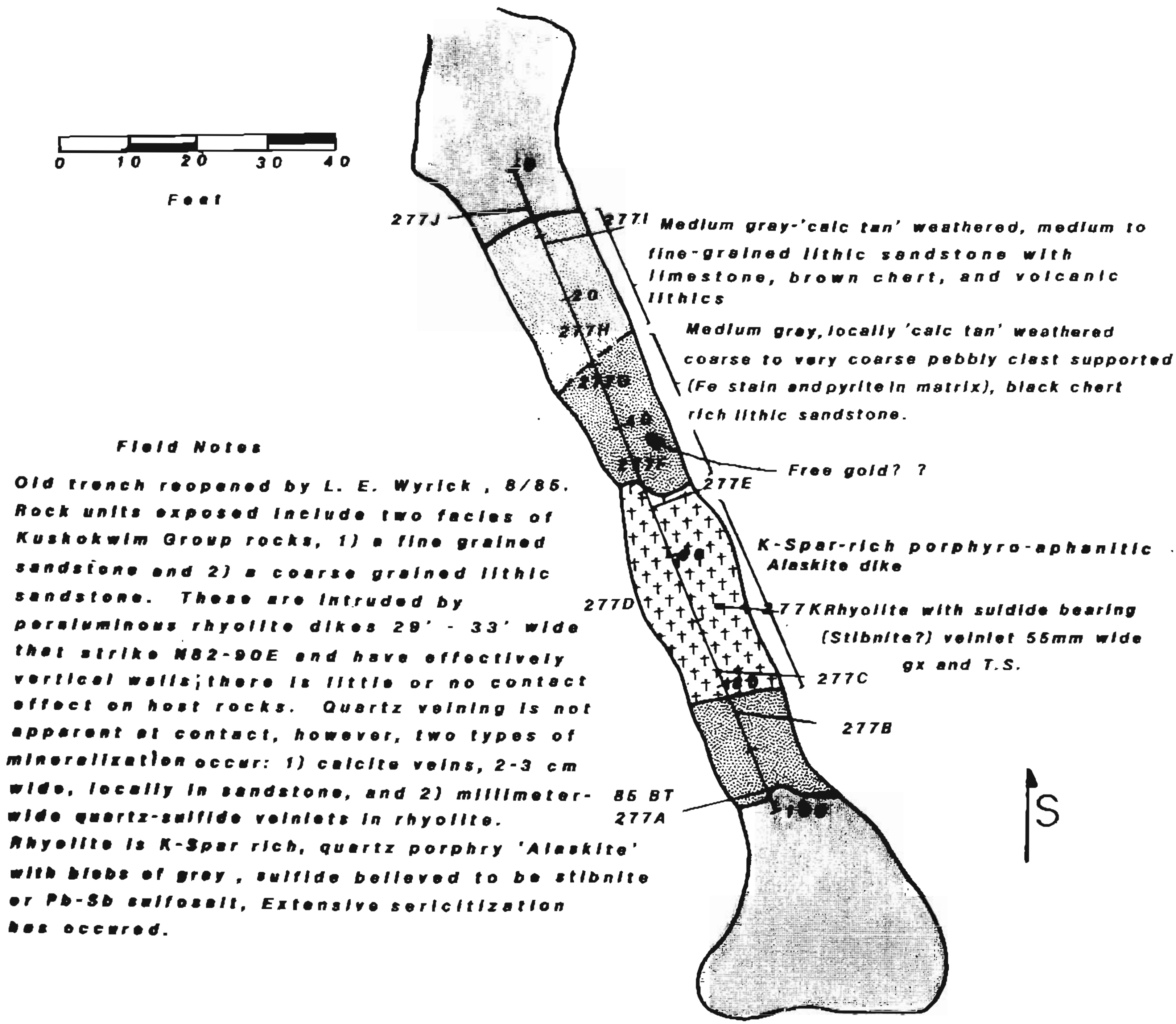


Figure 3. Wyrick airstrip trench, August 25, 1985.

This amounts to a 22 percent average stibnite content ($Sb_2S_3$) of the intervals sampled. The maximum assay (30.9 percent Sb) has a 48 percent total stibnite content. The average gold and silver grades for the sampled material is 0.02 oz/ton and 0.11 oz/ton respectively (N=7).

The shear zone in the main mine cut ranges from 0.04 percent to 2.85 percent antimony and averages 1.6 percent antimony or 2.5 percent total stibnite (N=4) across the 18 ft wide sampled interval. These assays do not take into account the massive stibnite pods and lenses in the shear zone. The average gold and silver assays are 0.014 oz/ton and 0.07 oz/ton respectively.

Analytical results of nine other trace elements are also presented in table 1. The stibnite bearing shear zone and gash veins are deficient in mercury, arsenic, bismuth, barium, tin, and base metals. Specifically, the generally low arsenic (≤10 ppm) and mercury (≤0.2 ppm) values suggest that the stibnite zones contain 'penalty free,' shipping grade material suitable for standard antimony trioxide reduction processes.

Chip-channel samples were collected from 10 to 35 ft wide zones of rhyolite dike and sedimentary country rock at the mine site and at the airstrip trench site (fig. 3). The results show that only background to slightly anomalous gold, silver, and other metals are present in both major rock types.

Estimating stibnite resources in the mine area is difficult, and more surface/subsurface work is recommended. However our preliminary work allows for some estimates. The main 18 ft wide shear zone has been traced for 55 ft for a total areal extent of 990 $ft^2$. Hence the exposed shear zone should contain 2,970 $ft^3$ or 350 tons per vertical yard.[1] If 2.5 percent represents the average stibnite content, then each vertical yard contains about 8½ tons of stibnite.

Estimating the relative size of the smaller gash veins is even more difficult. The mineralized zones pinch and swell and are only well exposed in the 4 to 6 ft wide diversionary channel. If each of the four veins extend for 20 ft laterally, then they collectively contain 18-to-19 tons of mineralized rock with an average 22 percent stibnite content per vertical yard.

## GEOLOGY OF WYRICK PLACER DEPOSITS

The placer deposits currently being exploited on Granite Pup are concentrations of placer gold and other heavy minerals on decomposed bedrock of the modern stream as well as a slightly elevated terrace on the upper right limit of the creek. The paystreak is narrow, ranging from 3-30 ft wide, and had been traced for 1,400 ft by the end of 1985---200 ft further than the channel section that was drift mined.

[1] For the stibnite bearing deposits 8.5 $ft^3$ = 1 short ton.

Heavy mineral and gold fineness results are summarized in tables 2 and 3. Heavy minerals of economic interest other than gold include stibnite, cassiterite, and garnet. The trace amount of cassiterite is not encouraging, but stibnite's occurrence as a major constituent in both placer and lode deposits suggests potential byproduct recovery of this commodity. The garnets are clear pink varieties of spessartite, probably derived from the rhyolite dikes. The garnets could be semi-precious in quality, but their specific physical characteristics would have to be tested and graded by techniques such as those of the Gemological Institute of America.

Table 2. Mineralogical identification of pan concentrates, Granite Creek drainage, Iditarod-George district, Alaska*.

| | Major (≥15%) | Minor (3-15%) | Trace (<3%) |
|---|---|---|---|
| Granite Creek | garnet (spessartite)<br>amphibole (hastingsite?)<br>ilmenite ($FeTiO_3$)<br>stibnite ($Sb_2S_3$) | zircon<br>pyrite<br>free gold | cassiterite |
| Homestake Creek | garnet (spessartite)<br>pyrite<br>amphibole | chlorite<br>ilmenite | stibnite |

*X-ray diffraction analysis by N.C. Veach, DGGS Minerals Laboratory, Fairbanks, Alaska.

Gold fineness varies from 838 to 871 with silver evidently being the major impurity. Remanant green gold sponge left over from fire assay procedures may indicate that copper is present as a minor impurity in the bullion. At least two distinctive types of gold are present in the samples: 1) dull colored, coarse sized, rounded, low fineness gold with nuggets up to 30 penny weight size, and 2) brighter, brassy, smaller, angular to crystalline 'hard rock' higher fineness gold averaging 0.1 to 1 penny weight in size. No specific sizing of the overall bullion is available at this time.

The authors initially concluded that the rhyolite dikes constituted the main source of the placer gold, as evidenced by 1) rich placer gold concentrations on or below rhyolite dikes on Granite Pup, Homestake Creek and Bismarck Creek (figs. 1 and 2), and 2) the existance of impressive antimony-deposits associated with rhyolite previously described. However, the detailed assay results shown in table 1 indicate only slightly anomalous concentrations of gold and silver in the antimony-quartz deposits. Furthermore, the mine operation continues to encounter rich concentrations of pay above the rhyolite dike swarm to the south and east of the area depicted on plate 1. Hence at least two lode sources must still be considered---1) the rhyolite dike swarm and 2) the small monzonite pluton at the head of Granite Pup about 1 mi east of the present workings. Our present belief is that the monzonite-hornfels contact at the head of the creek is the likely source of the Granite Pup gold. Bundtzen and others (1985) demonstrated that the largest portion of the 2.4 million oz of placer gold mined in the Innoko and

Table 3. Gold fineness results, Granite Creek, Iditarod-George district.

| Sample no. | Sample weight (mg) | Gold fineness | Silver fineness | Undetermined | Remarks |
|---|---|---|---|---|---|
| 84BT44 | 86.78 | 871 | 121 | 8 | Brassy angular wire gold. |
| 84BT42 | 41.20 | 838 | 152 | 19 | Dull, rounded nugget gold; green tinge on fire assay ball. |

Iditarod districts is from monzonite sources; a smaller amount has been derived from rhyolite dike swarms.

## SUGGESTIONS FOR FURTHER WORK

The eastern terrace level and entire valley of Granite Pup to its headward source in monzonite holds the best potential for placer pay. Furthermore the shallow nature of the gravels in the region allow for rapid and inexpensive drilling and exploration. The rhyolite dike swarm both northeast and southwest of the mine site may have shed placer gold down slope and downstream into the Bismarck, Homestake, and Granite Creek drainages (fig. 2).

The Wyrick property is dominantly a placer gold deposit, but the substantial stibnite encountered during placer development could be stockpiled for shipment. Because the stibnite zones are impure, a simple gravity concentrator may need to be employed; massive ore pods could be hand sorted. It would be relatively simple to prove up shallow stibnite reserves by drilling the shear zones along strike. Stibnite ores have been successfully exploited in Alaska's bush during times of high antimony demand. It is possible that significant precious metal values could be encountered at depth or along strike of the known stibnite hardrock deposits.

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