Public-data File 86-15

PROSPECT EXAMINATION OF GOLD-TUNGSTEN PLACER DEPOSIT AT ALDER CREEK, VINASALE MOUNTAIN AREA, WESTERN ALASKA

By

T.K. Bundtzen

Alaska Division of
Geological and Geophysical Surveys

March 1986

THIS REPORT HAS NOT BEEN REVIEWED FOR TECHNICAL CONTENT (EXCEPT AS NOTED IN TEXT) OR FOR CONFORMITY TO THE EDITORIAL STANDARDS OF DGGS.

794 University Avenue, Basement
Fairbanks, Alaska 99709

CONTENTS

FIGURES

TABLES

PROSPECT EXAMINATION OF A GOLD-TUNGSTEN PLACER DEPOSIT AT ALDER CREEK VINASALE MOUNTAIN AREA, WESTERN ALASKA

By

T.K. Bundtzen

INTRODUCTION

During late September of 1982 the author examined the heavy mineral placers of Alder Gulch, a two-mile-long perennial stream draining the south side of an isolated massif known as Vinasale Mountain, about 17 air-miles south of McGrath, Alaska (fig. 1). The author was assisted by J.T. Kline (DGGS) and Peter Snow, mine operator in Alder Gulch. Portions of this study have been supplemented by geologic studies on Vinasale Mountain by the author and G.M. Laird (DGGS) during July of 1977.

The study area lies on the eastern edge of the Kuskokwim Mountains, a maturely dissected upland of accordant rounded ridges and broad sediment filled lowlands. Vinasale Mountain is a conspicuous circular shaped hill comprising about 5 mi^2 that rises to 1,683 ft above sea level, about 1,400 ft above the main Kuskokwim valley. No roads exist in the area and access is restricted to a short 2 1/2-mi-long tractor trail from the mine site to the Kuskokwim River, a major navigable artery. The prospect is about 35 mi downstream from McGrath. The author is not aware of any fixed wing airstrips nearby, but float planes can land on one of the numerous oxbow-lakes in the area or the Kuskokwim River itself. Vinasale Mountain is largely below timberline and is heavily vegetated with stands of over mature spruce, birch, willow, and thick alder patches. Bedrock rubble and outcrop control is conspicuous above 1,200 ft in elevation, along the Kuskokwim River, and in steep zones along the mountain slopes.

HISTORY OF THE PROSPECT

Published data on the Alder Gulch placer deposit is very scant and much of the following has been supplemented by information supplied by mine operator Peter Snow. The placer deposits were discovered by Charles Schuttler in 1922 or 1923 while he was prospecting the various streams radially draining Vinasale Mountain (figs. 1 and 2). According to Cobb (1973) and Smith (1934), hand mining in Alder Gulch between 1929 and 1933 yielded 65 oz of placer gold from a small cut 13,600 ft^2 in area. Cobb (1973) reported that considerable scheelite, magnetite, stibnite, and bismuth were found in the heavy mineral concentrates. Unpublished United States mint returns indicate a production of 103 oz of gold for a period ending 1935. Activity apparently ceased in the mid-1930s and did not resume until 1981, when Peter Snow of McGrath began exploration and development work. During a pilot plant test in 1982, material from a 3,000 ft^2 cut yielded 4-5 oz of gold, including a 1/2 oz gold-quartz nugget. In 1983, additional work below the cut shown in figure 3 also yielded a modest amount of gold. Snow's equipment consisted of a small Allis Chalmers tractor and a hungarian riffle equipped sluice box 12-in. wide and about 12-ft long using a 3 percent grade. The author estimates that no more than 80 yd^3 were processed through the sluice during the 1982 work.

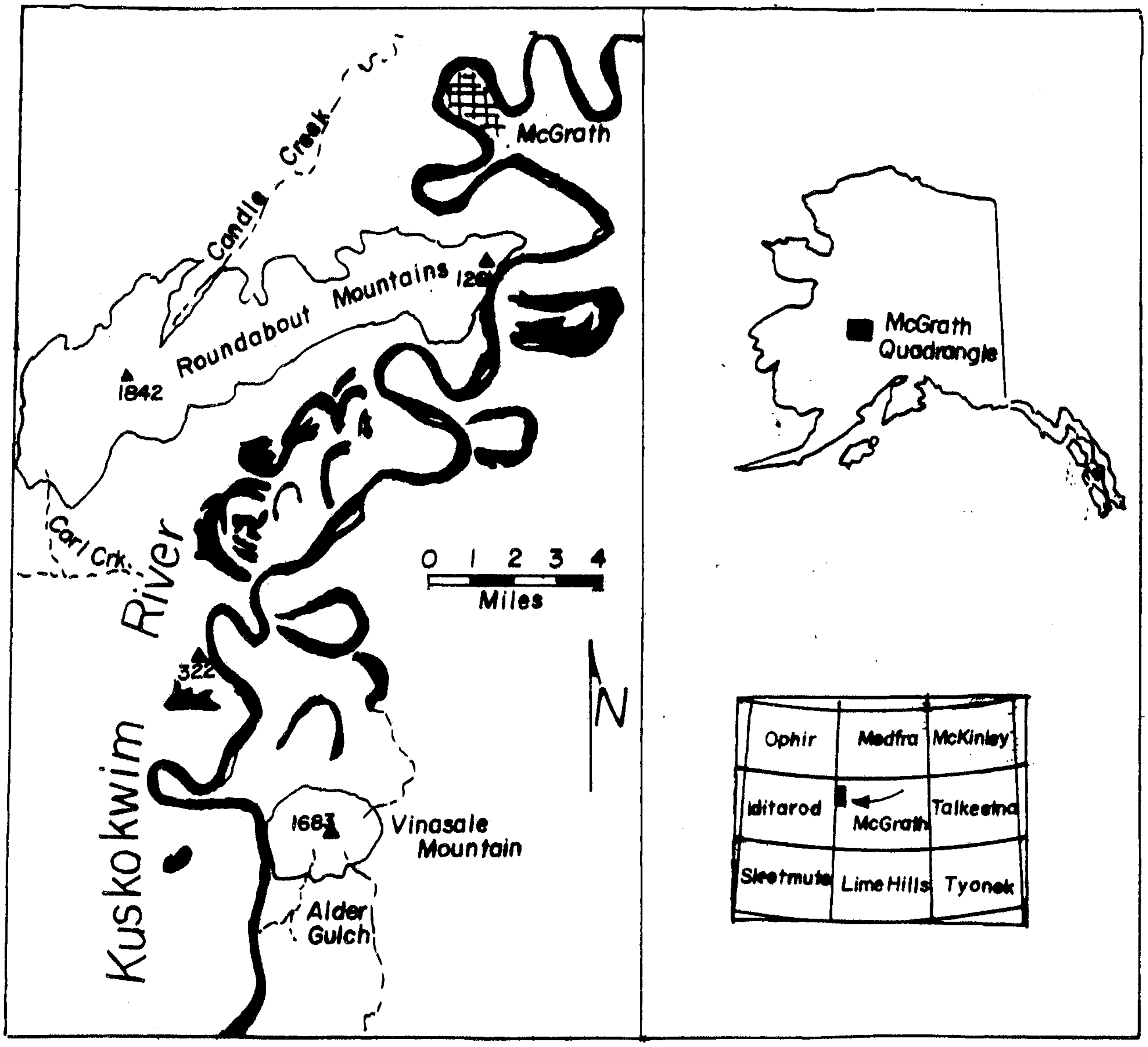

Figure 1. Location of Alder Creek-Vinasale Mountain area, northeast McGrath Quadrangle, Alaska.

GEOLOGY OF VINASALE MOUNTAIN

Vinasale Mountain (fig. 2) is composed of a resistant monzonitic intrusive rimmed by a thermally altered aureole of Kuskokwim Group sedimentary rocks that range in age from late Early to Late Cretaceous (Bundtzen and Laird, 1983a). Exposures along river cut banks consist of sheared, medium- to dark-gray phyllitic siltstone, mudstone, and minor stretched pebble conglomerate. Graded BOUMA intervals, rip up clasts, and flute casts indicate deposition by turbidity currents. Conspicuous shearing in the fine grained sediments is believed to be the result of the effects of the nearby intrusive.

Three separate phases of the Vinasale intrusive have been mapped: 1) a quartz-K-spar porphyry, 2) a medium-grained equigranular biotite augite monzonite, and 3) an equigranular to porphyritic, tourmaline enriched, augite monzonite containing only minor amounts of biotite. In thin section, tourmaline in the latter phase occurs as isolated grains, distinctive rosettes, and localized 'griesen' tourmaline-quartz veins in joints and fractures. The quartz-K-spar porphyry is a silica saturated late phase that contrasts with the older undersaturated monzonite phases. A K-Ar age of 69.0 ± 2.0 m.y. has been obtained from a biotite separate from biotite-augite monzonite in phase 2 above (Bundtzen and Swanson, 1984).

The intrusive has created an extensive hornfelsed aureole in the adjacent sedimentary rocks that extends an average 1,000 ft away from the intrusive contact. The intrusive-hornfels contact along the south side of Vinasale Mountain is believed to be a roughly east-west trending, high angle shear zone. Although no inplace exposures of the fault were observed, a prominent air photo lineament marks the intrusive-hornfels contact for over 1.5 mi. Additionally, rubble crop along the contact zone contains abundant slickensided argillite, tourmaline rich intrusive, and, in the placer cut, hydrothermally altered and sheared intrusive rubble.

Mixed eolian and colluvial deposits comprise much of the lower slopes of Vinasale Mountain as well as most of the lowland areas. Alder Gulch and other small underfit streams that radially drain Vinasale Mountain are infilled with silt fan deposits.

GEOLOGY OF THE ALDER GULCH PROSPECT

The Alder Gulch placers are apparently derived from the eroding mineralized faulted contact between the Vinasale intrusive, and hornfelsed sedimentary rocks, a geologic setting similar to Candle Creek near McGrath (Bundtzen and Laird, 1983b), and the Black Creek-Golden Horn area near Flat (Mertie, 1936).

The 1982 open cut (fig. 3) is essentially on the shear zone between the monzonitic intrusive and the hornfels aureole. In the stripped area, the fault zone is marked by sheared intrusive and abundant quartz-tourmaline vein rubble, some of which contains sulfides. The rubble indicates that the veins average 1-3 in. thick, are often systematically zoned, and consist of euhedrally formed quartz cores successively rimmed by tourmaline and locally

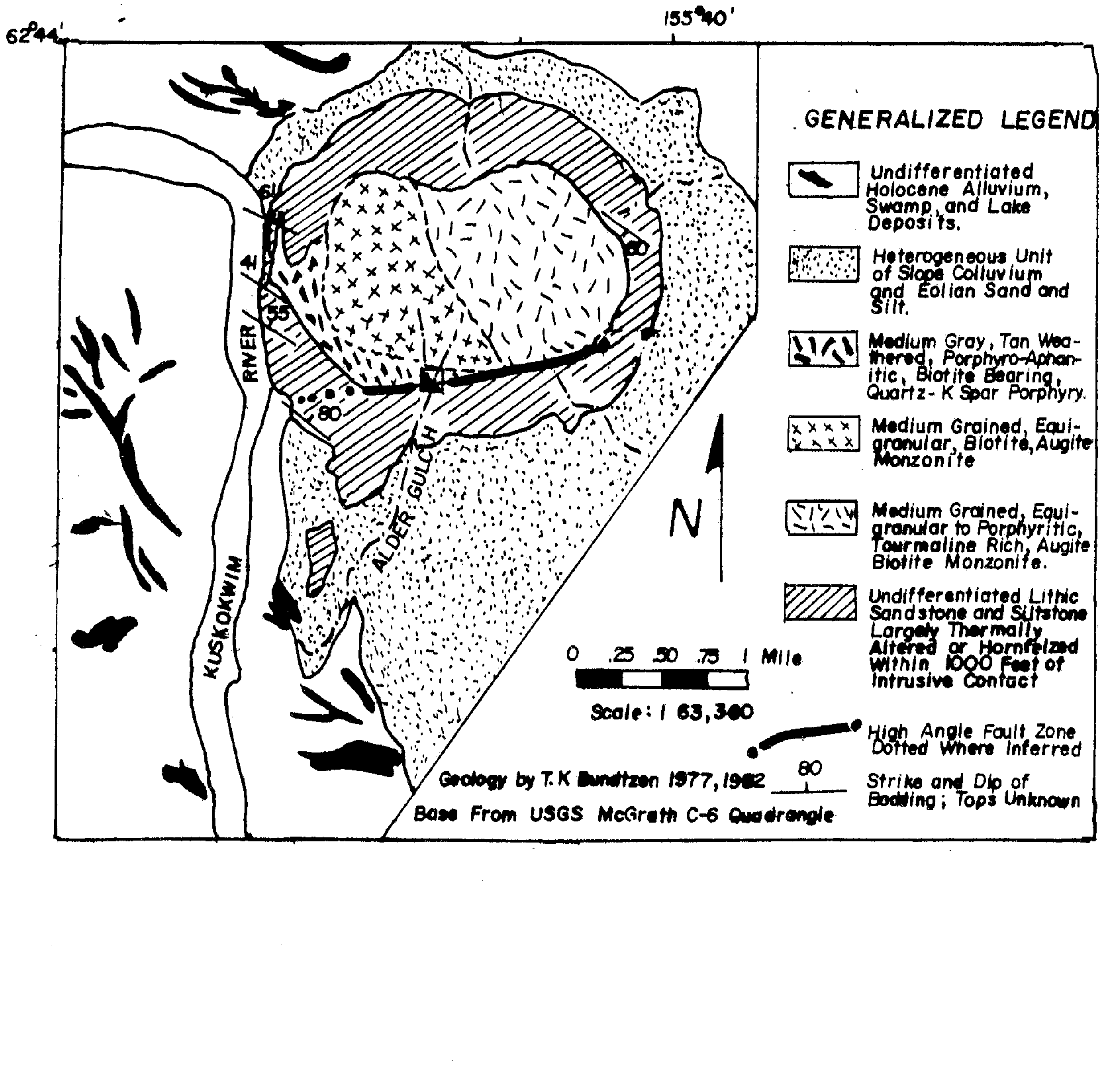

Figure 2. Generalized geologic map of Alder Gulch-Vinasale Mountain area, western Alaska.

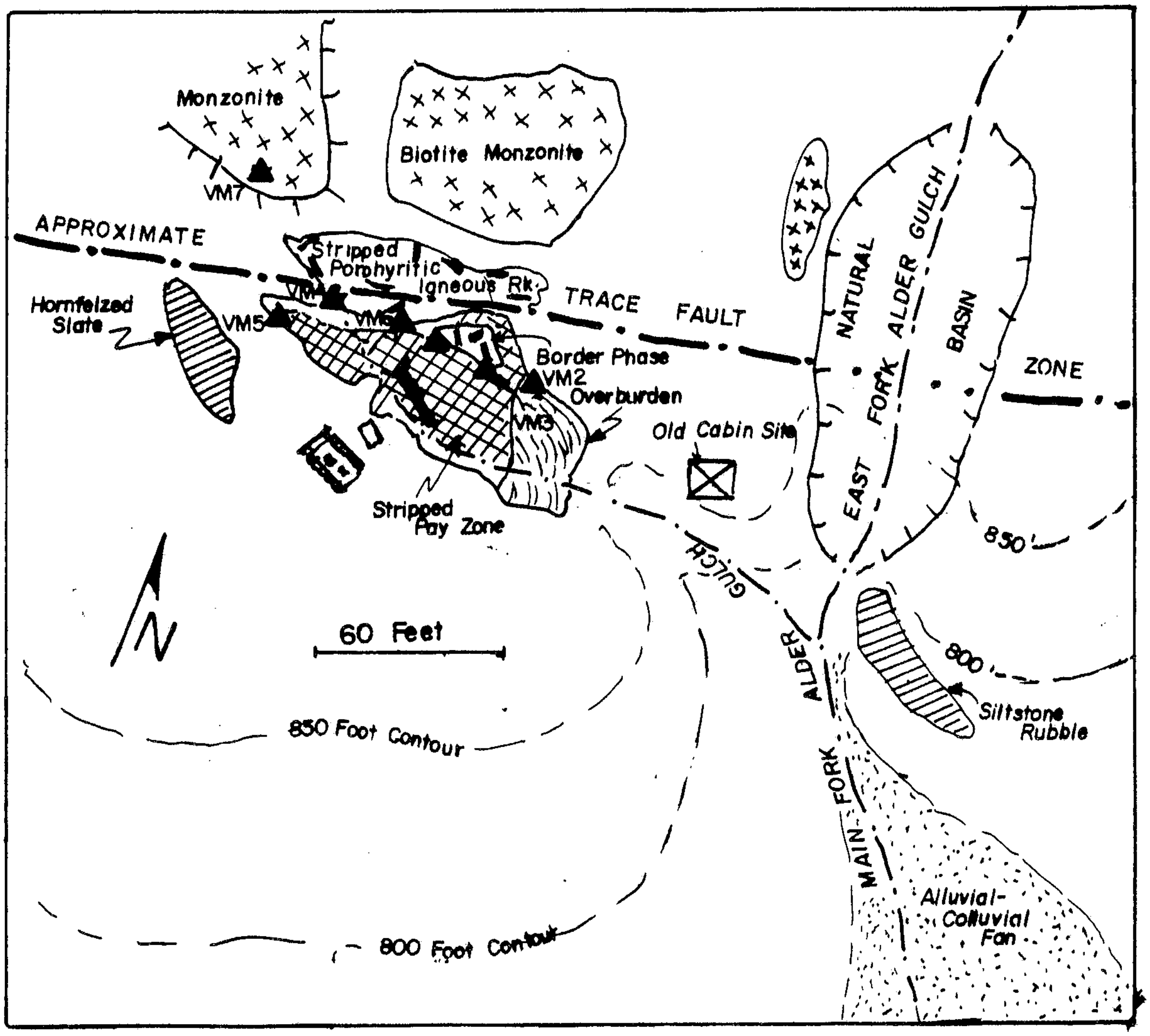

Figure 3. Field sketch of Snow Placer Prospect, Alder Gulch, Vinasale Mountain, McGrath Quadrangle.

axinite. Some chlorite selvege is observed several inches into the monzonite away from vein centers.

Selected samples of vein rubble and gossan from the bedrock cut (fig. 3) were analyzed (table 1). It is emphasized that these samples represent rubble found in the cut and not necessarily in place. However, all samples are believed to be derived from the immediate vicinity. Four of the six samples contain anomalous lead and silver values. One sulfide-bearing sample (VM6) contained 0.29 oz/ton gold, 900 ppm tungsten, 5,112 ppm antimony, and 1,590 ppm lead. A polished section of this material showed jamesonite (a lead-antimony sulfosalt) and possibly bismuthite. It is suggested that this type of mineralization is the source of the placer gold in the deposit. The placer deposit mined in 1982 is probably residual or semi-residual in nature with little or no evidence of fluvial activity. An exposed face of the open cut shows approximately 4 ft of mixed vegetation, A through C soil horizons, underlain by a mixed layer of organic colluvium and tan weathered sandy regolith 2 ft thick. The bottom 2 ft zone is essentially a clay-rich iron cemented regolith that transends into a semicompetent monzonite bedrock surface.

No imbricate pebbles, size grading, stream channeling, or cross bedding was observed although the cut may be offsite from a fluvial channel. Never-the-less, placer gold values are won from this material in sporadic zones. There is no clearly defined pay streak. Panning by the author along the exposed face yielded widely varying values ranging from barren to 35 colors-to-the pan. Values are believed to be concentrated within a few inches of bed-rock, especially in an iron oxide coated clay rich zone; hence, the pay zone is quite thin and could be accidently removed during stripping operations. Large angular boulders of monzonite and, to a lessor extent, hornfels, are common in the 1982 cut and nearby slopes. They vary in size from roughly 12 in. in diameter to over 6 ft and pose serious problems during development of the placer pay zone.

Further downstream the '1982 cut' tributary intersects another coming from the east where both form the main Alder Gulch. Just downstream from this point of intersection, the stream gradient changes from 750 ft/mi to about 480 ft/mi indicating a significant hydraulic flexure point. For at least 300 ft below the tributary intersection, the creek has been both mined and explored with exploratory holes (presumably by Schuttler). About 1/2 mi further downstream and midway in the colluvial-alluvial apron (fig. 3), the stream gradient decreases to about 300 ft/mi. In these lower portions of Alder Gulch, the deposit becomes a true alluvial placer with significant downstream migration of heavy minerals from lode sources.

It is presently impossible to determine accurately depth to bedrock on the colluvial-alluvial apron. At a point 100 ft below the tributaries intersection, one prospect hole appears to be eight ft deep; bedrock consists of angular slate and sandstone. Further downstream, the alluvial-colluvial apron probably markedly thickens as evidenced by valley widening and accumulation of swamp deposits. The apron holds the most promise of containing yardages of auriferous detritus necessary for a large mechanized operation, but it would have to be systematically prospected with shallow drilling or backhoe techniques.

Table 1. Selected analyses of rock and pan-concentrate samples, Alder Gulch, McGrath Quadrangle, Alaska, all but gold and silver in ppm.[1]

Field no.	Au oz/ ton	Ag oz/ ton	Cu	Pb	Sb	W	Sn	Bi	Nb	Description of sample
82VM1	.01	.63	43	601	177	-	-	-	-	Quartz-sulfide zone in cut face above sluice
82VM2	.03	.03	36	89	108	-	-	-	-	Quartz-sulfide vein, east end, cut
82VM3	ND	ND	21	15	4	-	-	-	-	Monzonite float
82VM4	.02	.04	22	108	183	-	-	-	-	Monzonite tourmaline griesen
82VM5	.01	ND	-	47	-	-	-	-	-	Quartz-sulfide vein, west end, cut
82VM6	.29	.56	20	1,590	5,112	900	-	16	-	Quartz vein with gossan, from cut face
78VM7	.01	.05	22	-	-	-	-	-	-	Monzonite rubble
82BT200a	-	-	-	-	-	13,700	ND	-	15	1/3 split 80-lb concentrate
82BT200b	-	-	-	-	-	240	10,000	-	15	1/3 split 80-lb concentrate
82BT200c	-	-	-	-	-	10,000	5,000	-	15	1/3 split 80-lb concentrate
82BT200d	638.00	47.00	12	760	4,159	88,100	-	28	700	5-lb concentrate

[1] Analyses of rock samples by M.R. Ashwell and M.K. Polly, DGGS Minerals Laboratory using Atomic Absorption Spectrophotometry. Analyses of pan-concentrate samples by ACME Analytical Laboratories, Vancouver, British Columbia, using an ICP Geochemical Analytical technique.

Based on ground and air photo analysis, Alder Gulch for a distance of 500 ft below the tributary intersection should contain at least 80,000 ft^2 of potential pay surface.

CONCENTRATE RESULTS

A single fire assay by ACME Analytical laboratories, Ltd., of Vancouver, British Columbia, of 3 grams of placer gold from a 1982 panned concentrate yielded a high fineness of 930 with silver the major impurity; this may not be representative of the placer deposit as a whole. This compares with an average fineness of 902 from Candle Creek to the north (Metz and Hawkins, 1981).

A small five-lb concentrate sample collected in 1981 was analyzed by X-ray diffraction techniques for specific mineralogical identification. The results (table 2) show significant amounts of scheelite (calcium tungstate), ilmenorutile (a niobium-tantalum-titanium oxide), and monazite (a cerium rare earth phosphate). Geochemical analyses of a sample split confirmed the presence of tungsten (8.81 percent) and niobium (700 ppm), but tantalum only showed up in trace amounts (table 1). Since niobium and tantalum undergo continuous substitution in ilmenorutile, it is suggested that the ilmenorutile in the sample represents the niobium end member. The sample also assays 2.64 ppm platinum metals, but subsequent sampling and analysis has not confirmed this anomaly.

As a followup, the author collected an 80-lb bulk sample of concentrate from the sluice box in the '1982 cut' in order to determine the economic significance of heavy minerals other than gold. The sample was split into three parts and splits from each were analyzed separately. Geochemical results of all fractions (table 1) show grades average 2.5 percent tungsten and anomalous tin and niobium present in the deposit as well as precious metals. Despite wide fluctuations in the values the data shows that one ton of such concentrate could contain an average 50 lb of tungsten; data on tin and niobium is not adequate for relative grade estimates.

CONCLUSIONS AND RECOMMENDATIONS

The following may assist in the evaluation of the Alder Gulch placer deposits.

1) The Alder Gulch placers consist of an upper residual or semi-residual deposit(s) and a lower alluvial placer. The upper ground probably contains the best overall grades, but values are sporadic and pay is limited in extent. The lower fluvial deposits have the best potential for sustaining a mechanized mining operation but it needs to be systematically prospected.

2) A hydraulic flexure occurs where the two upper tributaries intersect. Downslope heavy mineral migration may have stabilized below this flexure point.

Table 2. Mineralogical identification of pan-concentrates, Alder Gulch, Vinasale Mountain.[1]

Sample HM-3 - Vinasale Mountain

Sample wt: 5.8150

Size	Raw wt.	Cum. wt.	Cum. %	Indiv. %
2	4.3520	4.3520	75.5	75.5
2.5	.8980	5.250	91.02	15.57
2.75	.2585	5.5085	95.51	4.48
3.5	.2570	5.7655	99.96	4.46
3.75	.0022	5.7677	100.	.04
Pan	--	--	--	--

3.5 and 3.75 combined Total: .2592 gm

Run for heavies - 3/18/82

Light f.p. - 1.6080
Lights - .0260 gm

Heavy f.p. - 1.5635
Heavier - .2525

Minerals

1) Magnetite (Fe_3O_4)

2) Ilmenorutile ($Fex/_3$ (Nb,Ta)$2x/_3$ Ti_1-xO_2) iron niobium-tantalum titanium oxide

3) Ilmenite ($FeTiO_2$)

4) Hastingsite $(Ca,Na)_2$ $(Fe^{2+}, Fe^{3+},Mg)_5$ $(Si,Al)_8$ $O_{22}(OH)_2$ calcium iron magnesium aluminum silicate hydroxide

5) Monazite $(Ce,La,Y,Th)PO_4$ cerium rare-earth phosphate

6) Gold (Au)(visual)

7) Scheelite ($CaWO_3$); very abundant

X-ray diffraction analyses by Bruce Cox.

3) Concentrates contain significant amounts of tungsten, tin, and niobium. A wiffly table might be able to further concentrate scheelite from concentrates derived from a larger operation. Tin and niobium values are too poorly understood to determine potential recovery.

4) The pay zone is thin in the residual deposits; care should be exercised during removal of overburden.

5) Large boulders present problems to any operation. An efficient grizzly system is recommended if development proceeds to the production phase.

REFERENCES CITED

Bundtzen, T.K., and Laird, G.M., 1983a, Geologic map of the Iditarod D-1 Quadrangle, Alaska: Alaska Division of Geological and Geophysical Surveys Professional Report 78, 1 pl.

__________ 1983b, Geologic map of the McGrath D-6 Quadrangle, Alaska: Alaska Division of Geological and Geophysical Surveys Professional Report 79, 1 pl.

Bundtzen, T.K., and Swanson, S.E., 1984, Geology and petrology of igneous rocks, Innoko River area, western Alaska: Geological Society of America Abstract with Prog. no. 46990, v. 16, no. 5.

Cobb, E.H., 1973, Placer deposits of Alaska: U.S. Geological Survey Bulletin 1374, p. 51-53.

Metz, P.A., and Hawkins, D.B., 1981, A summary of gold fineness values from Alaska placer deposits: Fairbanks, University of Alaska Minerals Industry Research Laboratory Report 45, 61 p.

Mertie, J.B., Jr., 1936, Mineral deposits of the Ruby-Kuskokwim region, Alaska: U.S. Geological Survey Bulletin 864-C, p. 115-247.

Smith, P.S., 1934, Mineral industry of Alaska in 1933: U.S. Geological Survey Bulletin 864-A, p. 1-94.