LODE GOLD OCCURRENCES NEAR THE KAKO AND STUYAHOK PLACER MINES, SOUTHWESTERN ALASKA

GEOLOGIC REPORT 1/10/90

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KAKO AND STUYAHOK GEOLOGIC REPORT

Summary

The Kako and Stuyahok placer mines in southwestern Alaska have a geologic setting conducive to the discovery of a deep level epithermal rhyolite hosted or associated gold system. The Kako and Stuyahok occurrences are related to rhyolite dikes and stocks which intrude the sediments and volcanics topographically above and directly beneath the placer deposits. While no mineable areas of ore grade mineralization have yet been discovered, these placer mines both have large areas of bedrock which are anomalous in gold, silver, arsenic, and mercury. There are indications of structural control on the location and geometry of the occurrences found to date.

The gangue minerals, angularity and shape of the gold, and the volume of cinnabar, arsenopyrite and stibnite in the placer concentrates are all consistent with placer deposits derived from an epithermal lode environment. Significant placer gold resources remain in the Kako and Stuyahok camps.

The areas are within 6 and 20 miles of the Yukon river respectively. Stuyahok is roughly 15 miles northeast of Kako. Good winter haul roads are already in existence. Access to this area rivals most areas of Alaska.

KAKO

At Kako large areas of the ridge above the placer deposits have been shown to be anomalous in gold and arsenic. A 1000 feet by 2000 feet soil and rock chip grid produced an anomaly which is open on two sides with values ranging from 200 to 500 ppb gold and 100 to 2000 ppm arsenic. The anomalous values are related to the contacts of rhyolite stocks and dikes which intrude a chert unit. A rhyolite breccia zone 40 feet wide and at least 1000 feet long traversing the grid has values up to 900 ppb gold. In addition to the anomalous areas on the ridges above the placer camps, anomalous gold, silver, arsenic and mercury values are associated with poorly exposed rhyolite dikes and sills in the valleys, near and under the placer deposits.

STUYAHOK

At Stuyahok rock and stream sediment samples have defined a large area anomalous in gold, silver, arsenic and mercury. Areas of quartz eye rhyolite porphyry and altered Gemuk group volcanics have rock values ranging up to 1 ppm gold and stream sediment samples ranging up to 10 ppm gold.

It is likely that additional mineralized areas will be discovered in

the Kako and Stuyahok placer camps. As a result of very basic work, a lode occurrence has been found within nearly every creek or gulch which hosts a placer deposit. Reconnaissance level sampling has defined large areas of anomalous gold, mercury, antimony and arsenic which suggest large gold systems. The strong arsenic halos which surround gold mineralization at both Kako and Stuyahok are readily detectable. The active placer operations in the two camps will provide support for lode exploration and hopefully in the course of operations will uncover occurrences buried in the valleys.

Location and Access

Location

The Kako and Stuyahok areas are located in western Alaska just north of Yukon River, see Figure 1. The prospects are within 6 and 20 miles of the river respectively and are located close to the villages of Marshall, Russian Mission, and Holy Cross. These placer mines form the heart of the Marshall Mining District.

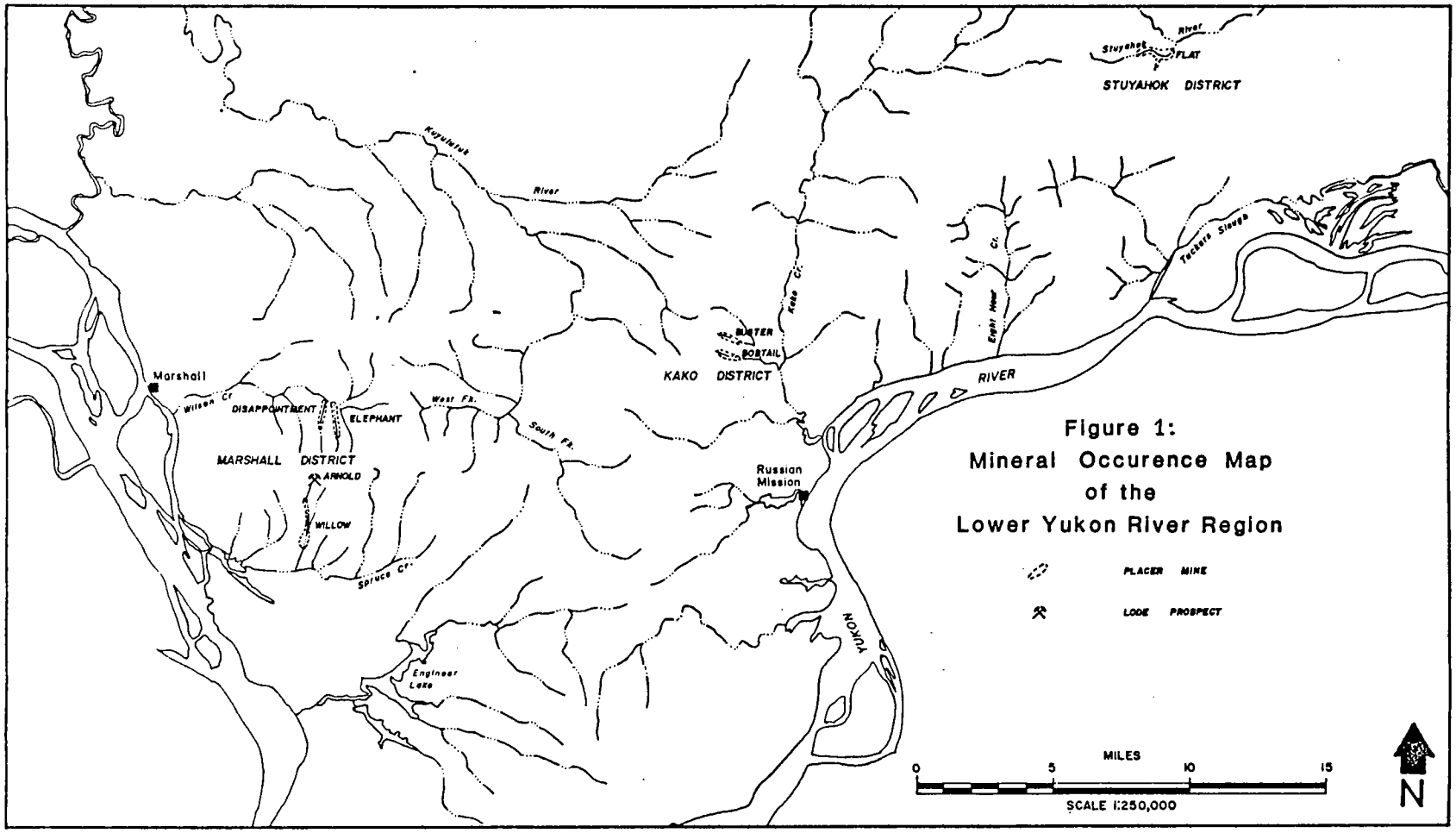
Access

Access to the Kako property is gained by ocean-going barge up the lower Yukon River and by 4 miles of winter haul road from the landing just above the town of Russian Mission. The road has recently been upgraded to handle summer use. Air access is facilitated by any of several well maintained and not so well maintained airports in the area, including a Hercules size strip (greater than 4,500 feet) at the town of Marshall and 3000 foot long airstrips at Russian Mission and Holy Cross which are serviced by at least twice daily commuter flights. A well maintained 2000 foot strip is located on the Kako property.

Access to the Stuyahok Property is similar to that of Kako, although the winter road is roughly 30 miles long. The airstrip at the placer mine is a casually maintained 1500 feet in length. Both Kako and Stuyahok are served from the regional aviation centers located at St Marys (60 miles from Kako), Aniak (80 miles from Kako), and Bethel (80 miles from Kako). All three are served at least twice daily by jet service from Anchorage.

Land

Calista Corporation is one of twelve regional native corporations established by the Alaska Land Claims Settlement Act. Calista will, when the land selection process is complete, have over seven million acres of subsurface estate. Currently Calista Corporation owns 300 square miles of land holdings in the lower Yukon mineral belt, including many prospects and access corridors.


Stuyahok River
FLAT
STUYAHOK DISTRICT
Kuyuhuk River
Kako Cr.
Eight Mile Cr.
Tuckers Slough
BUSTER
BOBTAIL
KAKO DISTRICT
RIVER
Marshall
Wilson Cr.
DISAPPOINTMENT
ELEPHANT
West Fk.
South Fk.
MARSHALL DISTRICT
ARNOLD
WILLOW
Spruce Cr.
Russian Mission
YUKON
Engineer Lake
Figure 1:
Mineral Occurence Map
of the
Lower Yukon River Region
PLACER MINE
LODE PROSPECT
MILES
0
5
10
15
SCALE 1:250,000
N

Calista's land selections were based on village needs and on extensive exploration conducted by Resource Associates of Alaska (RAA) during 1973-1975. Calista still has land selection rights to additional lands and much of the surrounding federal lands are closed to mineral entry pending additional or amended selections. The net result is that the major portion of the mineral potential in Southwestern Alaska is either directly or indirectly controlled by Calista Corporation.

Regional Geology

Terranes

The Lower Yukon area is comprised of two tectonic terranes which were described by Cady, 1955, and Hoare and Coonrad, 1959, these include:

1) A Paleozoic to middle Mesozoic continental margin rift and associated geosynclinal deposits (the Nyac and Gemuk Groups). The Gemuk Group as defined by Hoare and Coonrad, 1959 is comprised of mafic lava flows, breccia, tuffs, and agglomerate, minor felsic flows and tuffs interbedded with siliceous siltstone, chert, graywacke. The Lower Yukon Greenstone Belt is an informal name given to this sequence which covers about 1000 square miles of the Lower Yukon. Most of the Kako and Stuyahok drainage is considered to be Gemuk Group.

And 2) a marine successor basin (the Kuskokwim Group), which followed a major Cretaceous orogeny, that was filled with flysch by the early Tertiary. The Kuskokwim Group in the Lower Yukon is composed mostly of graywacke with minor shale. Only a small part of the Stuyahok drainage is thought to be Kuskokwim group, see Figure 2 and attached map - Geologic and Geochemical Map of the Marshall Area.

Igneous Rocks

Large volumes of upper Tertiary bimodal magma intrude both tectonic terrains. The emplacement was structurally controlled by large displacement right lateral fault systems. The principle igneous rocks are monzonitic stocks, hypabyssal and extrusive albite rhyolites, and biotite basalts. Late Pliocene flood basalts are found south and west of Kako and Stuyahok.

Whole rock analyses from Cady, 1955, Bundtzen, 1987, and unpublished Calista data are consistent with a classification of co-magmatic alkali-calcic, metaluminous volcano-plutonic complexes and related but typically distinct peraluminous rhyolite sills. The volcano-plutonic complexes in southwestern Alaska are part of an extensive belt of reduced (ferrous/ferric ratio) magma as defined by

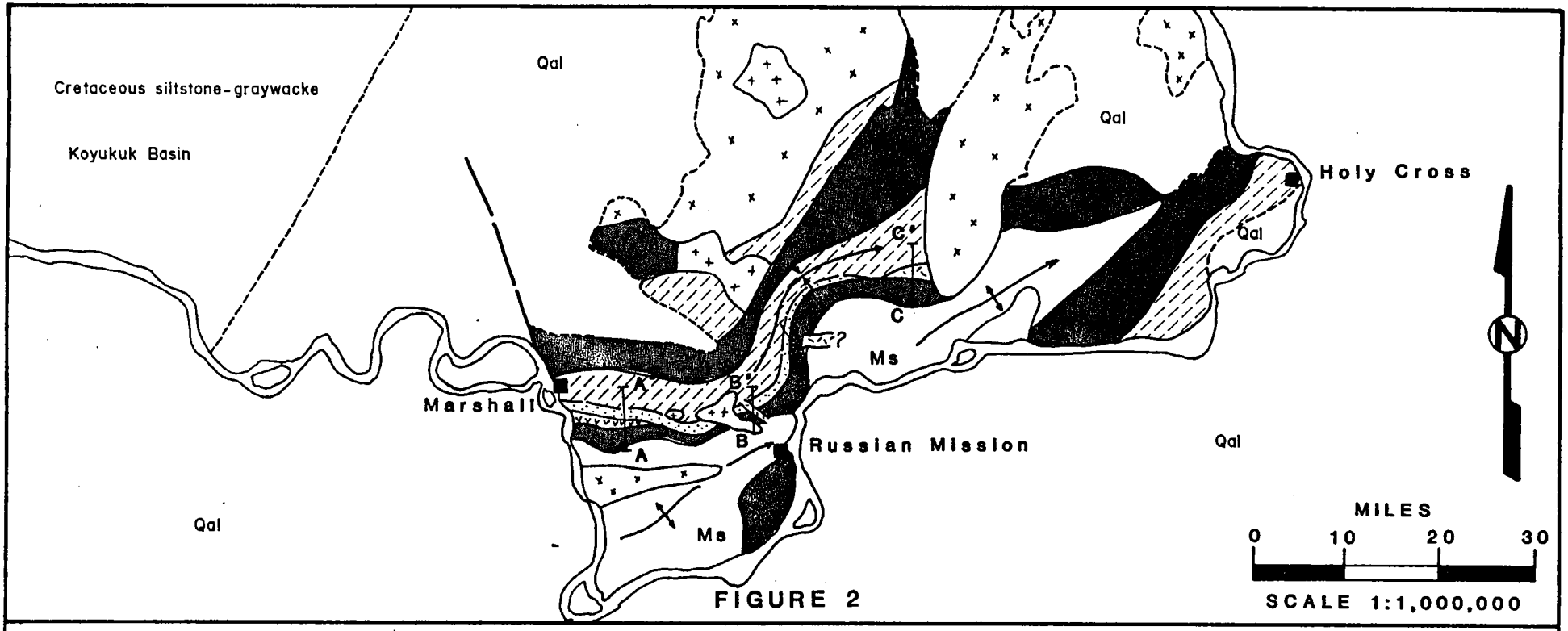


FIGURE 2

GEOLOGICAL MAP OF LOWER YUKON GOLD BELT

EXPLANATION

- Qal — Alluvium
- Tertiary
  - Undifferentiated Subaerial Volcanics
  - Quartz-Feldspar Porphyry
  - Granite
- Jurassic
  - Siltstone-Graywacke
  - Chert
  - Felsic Volcanics
  - Mafic Volcanics
- Permo-Triassic
  - Ms — Chert-Chert Conglomerate-Tuffaceous Shale-Tuff

CROSS-SECTION LOCATION

- A'–A: Marshall
- B'–B: Kako
- C'–C: Stuyahok

Keith, 1988.

The monzonitic stocks are quite variable in composition and frequently have silica-poor intrusive phases interrelated with quartz-rich phases. Whole rock analyses exhibit a variability from alkaline to calc-alkaline monzonitic stocks with an average sub alkaline composition. The derivation and intrusive sequence may be crudely similar to that proposed for Lower Cretaceous and Early Tertiary igneous rocks of the western United States (Bundtzen, 1987).

Tectonic and Structural Setting

Major Faults

In southwestern Alaska the large displacement right lateral fault systems like the Iditarod, Aniak, Holokuk, Holitna, and Farewell, localize Tertiary plutonism. The many fault splays and extensional zones (simoids) between splays and the major faults also controlled the emplacement of igneous rocks. The Kako and Stuyahok areas are influenced by the large displacement Chirosky Fault to the west and the Aniak-Thompson Fault to the east (Hoare and Coonrad, 1959), see Figure 3. In the area between the fault systems (Kako and Stuyahok) an extensional tectonic environment was created during the Tertiary and Early Quaternary. The rhyolites of interest were emplaced into this setting.

The area also straddles the Nunivak Arch or Geanticline, a Mesozoic? feature variously interpreted as an orogenic welt or a collision related suture (Box, 1985; Patton, 1973), see Figure 3. In any case, the Paleozoic and Mesozoic rocks adjacent to the arch are characterized by imbricate thrust sheets, isoclinal folds, and sharp, local metamorphic gradients related to deformation or thrust sheet juxtaposition.

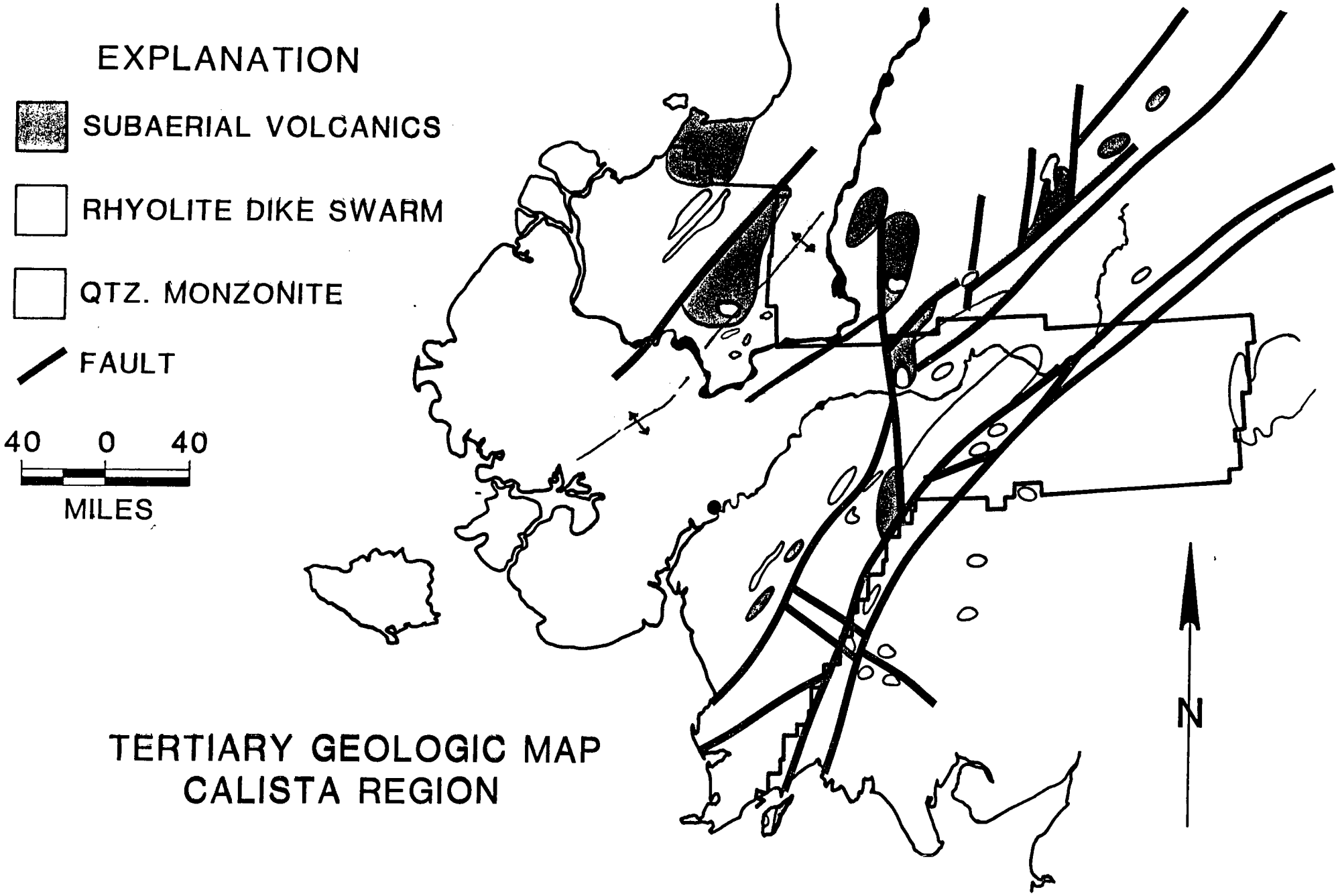
Regional Mineralization

Placer Occurrences

Coarse gold placers occur where Tertiary rhyolite or Tertiary-Cretaceous intermediate composition intrusives cut across the sequence described above, see Figure 2. Fine gold placer deposits are reported in many drainages and are not dependent on the occurrence of Cretaceous or Tertiary intrusives.

Lode Occurrences

Lode gold, mercury, and antimony occurrences are spatially associated with the Tertiary igneous rocks. Throughout southwestern Alaska, the alkali olivine quartz monzonite stocks and the peraluminous rhyolites host a variety of gold occurrences which



TERTIARY GEOLOGIC MAP
CALISTA REGION

Figure 3

seem to be controlled by emplacement depth, erosional level, and lateral zonation.

The occurrences examined to date generally fall into the following categories: 1. gold-arsenopyrite-scheelite veins and stockworks in monzonites; 2. tourmaline-silver-tin-minor gold greisens in monzonites; 3. low value vein and disseminated gold halos in the hornfels surrounding the stock or dike; 4. gold-stibnite-arsenopyrite-cinnabar veins and micro-stockworks in monzonites, rhyolites and graywacke; and 5. disseminated gold-arsenopyrite-stibnite-cinnabar mineralization in graywacke and rhyolite.

Kako History

Placer gold was discovered at Buster and Bobtail Creek in 1920 by prospectors from the Willow Creek/Marshall area (Cobb, 1973). The gold bearing gravels were mined by hand methods including shaft and adit construction in frozen ground. In the Thirties the Yukon Mining Company used gin poles and scrapers and later a dragline to mine Buster and Bobtail Creeks, Figure 4. By World War 2 the operation was in decline. A rough estimate of 25,000 ounces of gold were produced prior to the 1940's.

In 1974 and 1975 geologists, working for Resource Associates of Alaska (RAA) which was under contract to Calista Corporation to evaluate the mineral potential of the Calista Region, camped at Kako and documented a gold, silver and arsenic anomaly associated with a rhyolite breccia. A large scale rock and soil grid was sampled late in the season of 1974. The results indicated an extensive area of anomalous rhyolite.

RAA's interpretation of the data was that Kako was very promising for both "Nevada style hydrothermal-fracture systems" and "volcanogenic massive sulfide or exhalite" deposits. Many of the soil and stream sediments samples taken by RAA focused on base metal mineralization, often gold and low temperature metals were not tested.

Four Federal placer claims on Buster Creek were kept active and were exempted from the selections made by Calista and the village of Russian Mission following the passage of the Alaska Native Claims Settlement Act. In the early 1980's Dave Penz acquired those four claims on Buster Creek and has built a modern family placer mine featuring a sluice and jigs, a D-8, a one yard hoe, a loader, and other miscellaneous equipment. Penz has produced somewhere around one thousand ounces. Penz received patent on the four claims this in July, 1989.

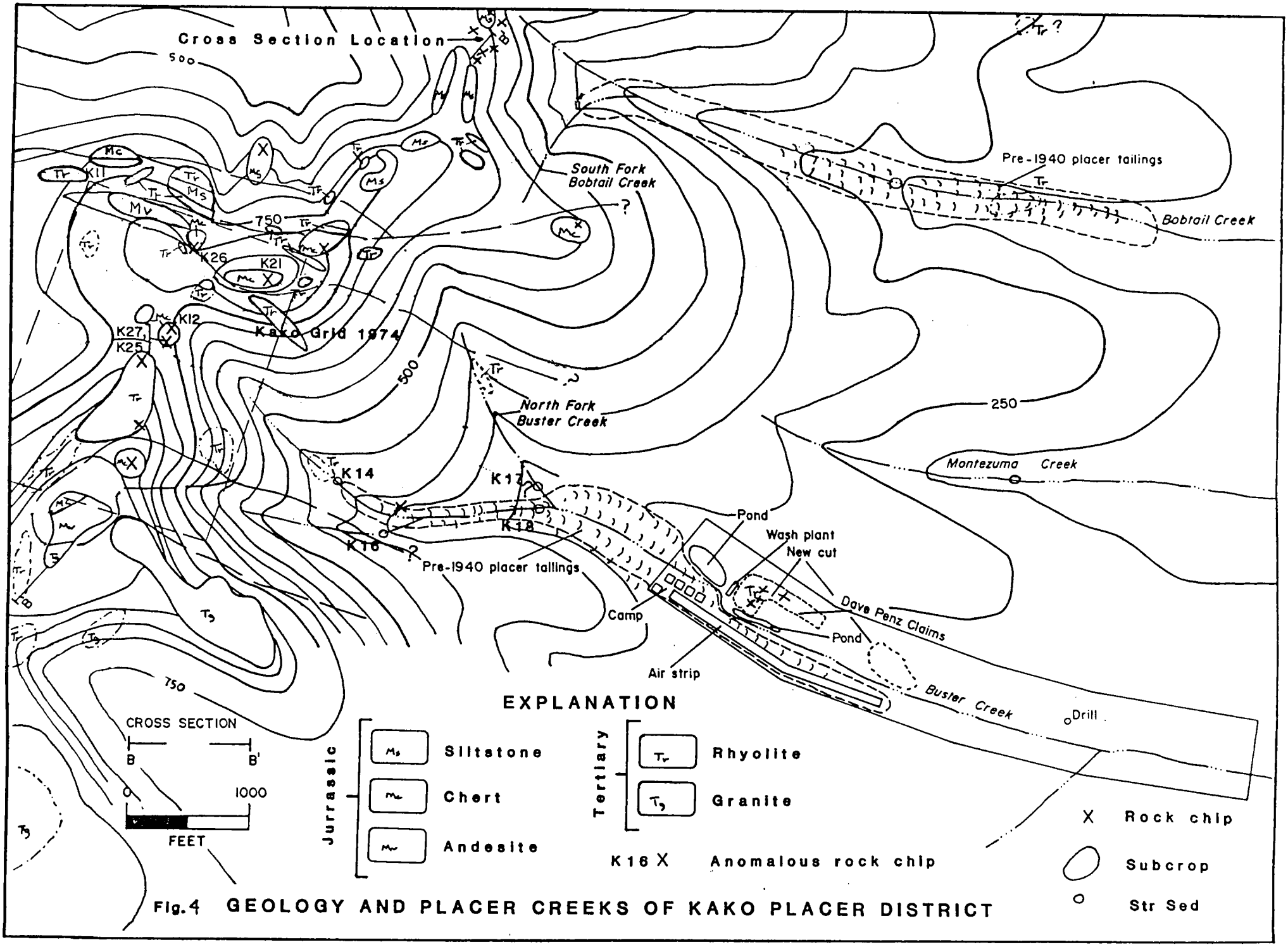


Fig. 4 GEOLOGY AND PLACER CREEKS OF KAKO PLACER DISTRICT

Calista conducted reconnaissance mapping and sampling of the area during a few weeks of the 1985, 1986, 1987 and 1988 field seasons. In 1989 Calista collected over 400 soil and rock chip samples from grids covering areas surrounding the placer deposits. The soil sampling increased the area of anomalous rhyolite and identified several bodies of rhyolite which extend or occur in the placer valleys.

In addition Calista re-assayed 265 selected pulps from RAA's 1974 soil grid program. The pulps were re-analyzed by Bondar-Clegg which used reliable assay methods with lower detection limits than that used by RAA's in house laboratory in 1974. These results defined several new anomalies.

Kako Geology

Lithologic Units

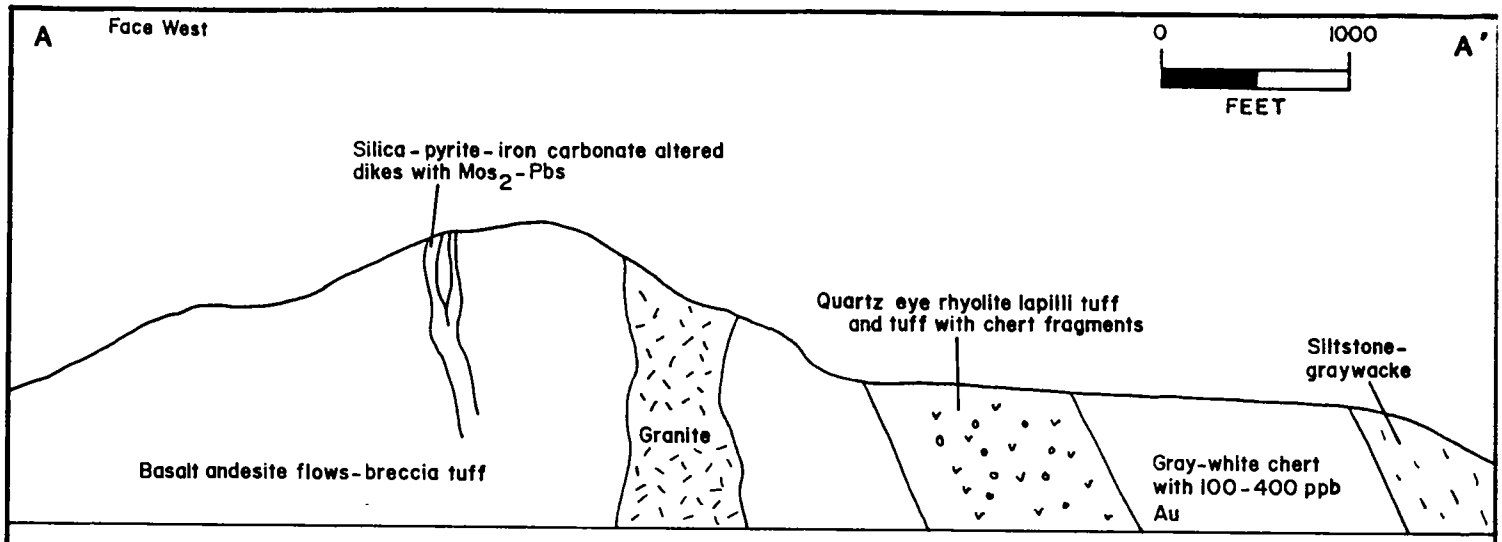
The rocks within the placer drainage are, from south to north, quartz monzonite, rhyolite, chert, and siltstone. Each is in contact with an enclosing andesite flow, agglomerate and tuff complex, Figure 4, Figure 5 and map labeled Geology of Kako Prospect.

Sediments

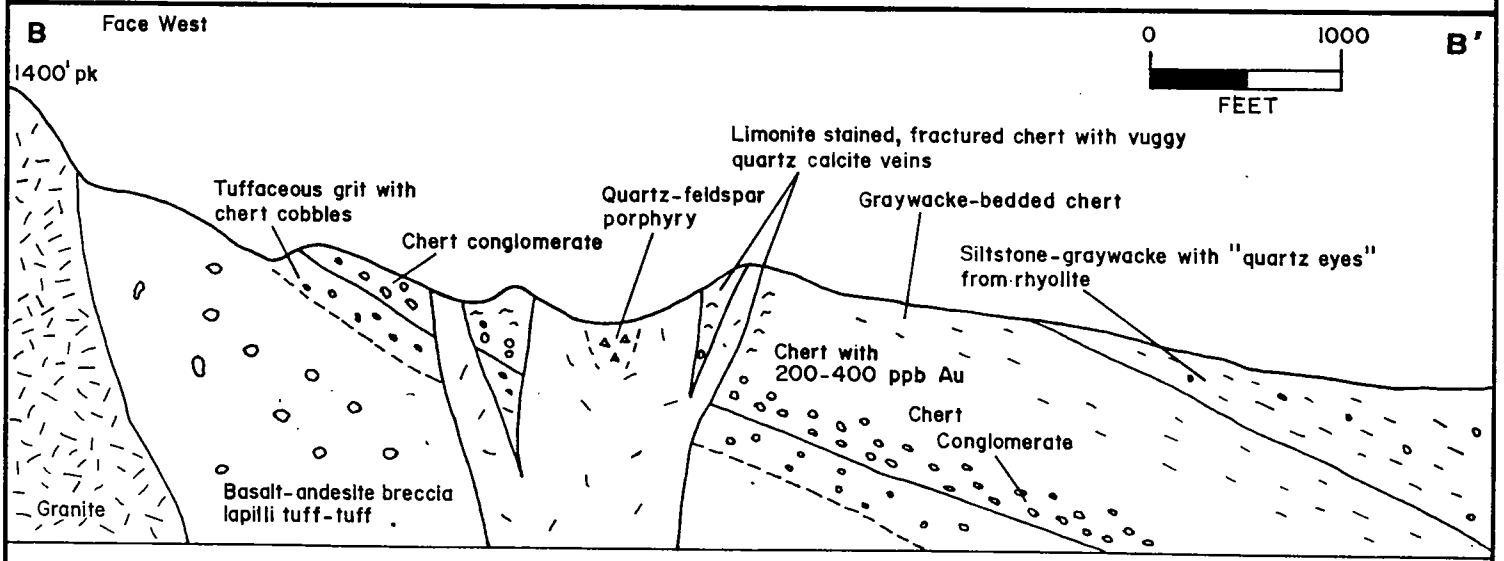
The Gemuk group sediments exposed on ridges above the Kako placer mine on Buster Creek include cherts, recrystallized limestone, silicified limestone, siliceous siltstones, siliceous shales, and jasper. Directly above the placer creeks the principal sediment is chert.

Cherts in the grid area vary widely. The outcrops at the top of the ridge are white to pale gray, siliceous, and appear amorphous. Most of the cherts seen in rubblecrop are dark gray to greenish color and have a tuffaceous character. At the saddle at the northern end of the grid, the cherts become sedimentary in character, dominated by cherty siltstone with minor cherty agglomerates and gritstones. Some black chert fragments and gray chert with black healed fractures occur as float along lines 500North to 600North. The chert is often fractured and pervasively iron-stained.

The "chert" is variable in appearance and has been mapped in a variety of ways by different geologists. Commonly, the chert appears to be composed entirely of crypto-crystalline or amorphous silica. To the north of the Buster Creek saddle the "chert" is a intermittently siliceous siltstone. My observations are mostly consistent with a marine to shallow marine origin for the chert. At the head of the South Fork of Bobtail Creek, the "chert" shows granular textures and some relic casts of pebbles and clasts



SCHEMATIC CROSS SECTION OF MARSHALL PLACER DISTRICT



SCHEMATIC CROSS SECTION OF KAKO PLACER DISTRICT

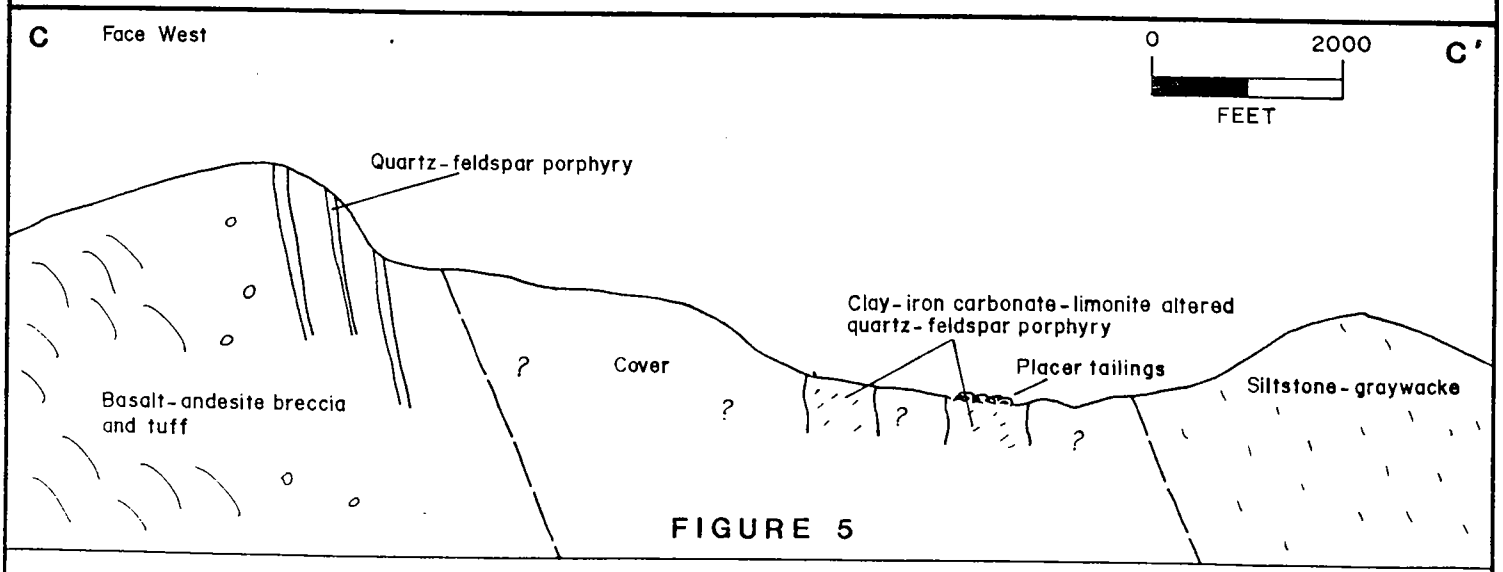


FIGURE 5

SCHEMATIC CROSS SECTION OF STUYAHOK PLACER DISTRICT

See geologic map of Lower Yukon gold belt for section location and explanation of rock types.

suggesting a partially recrystallized quartzite. However, this texture could also result from the re-silicification of a brecciated fine grained marine chert.

Fox, 1940, suggested that a large volume of this 'chert' was a silicified limestone. Some chert outcrops do weather in a distinctly fluted manner similar to carbonates. Fox also suggests that the conglomerate and breccia textures textures observed were a result of complete silicification of fine grained arenaceous sediments and recrystallized quartzite. RAA mapped these same rocks as a "siliceous tuff".

Rhyolites

The andesites and cherts have been intruded by a body of late Cretaceous to early Tertiary porphyritic albite rhyolite. The rhyolite is characterized by quartz eyes, clay-altered feldspar phenocrysts, and siliceous bands. Breccia, hypabyssal, and possibly siliceous dome, and proximal tuff textures are common in the rubblecrop. In addition to the areas exposed above the placer deposit, float and tailings found in the valley suggest that a large body of silica-rich rhyolite occurs immediately below the placer gravels.

The rhyolite that forms rubblecrop on the 901' ridge is sparsely porphyritic with 5% clear quartz eyes, rare to absent feldspar phenocrysts and minor relict sulfide grains, chiefly oxidized pyrite, in a white to buff aphanitic groundmass. Pebble clasts, and angular chert fragments are seen in some of the rhyolite. Alteration is light to moderate on the ridge and the argillic alteration and intense limonite alteration seen in the Buster Creek Saddle is not evident. Mafic grains are sparse and are generally altered to oxides but angular casts remain and groundmass staining is uncommon. Fragments from rubblecrop at the east end of line 300North displays siliceous banding and platy fracture.

It should be noted that although I believe the rhyolite is a Tertiary intrusion other geologists (RAA) have felt that this could be a marine bimodal volcanic sequence that is capable of hosting either Kuroko base metal or exhalite type gold mineralization.

The rhyolite alteration assemblage is characterized by clay, sericite and minor silica and iron carbonate. Limonite after sulfides and possibly after carbonate is common. Locally the alteration and silicification are so intense that the original composition and texture can not be identified.

Structure
The area has been extensively faulted by northeast and east-west trending faults. Sheared and brecciated rocks in rubble, the lack of continuous beds, and air photo identification of numerous lineaments all suggest unresolved structural complexities. The east-west fault which localizes the mineralized breccia above Buster Creek seems to be fairly high angle. Several areas appear to be intensely fractured on air photos. These areas surround the dome-like high points which occur along the ridge, Figure 4 and map labeled Geology of Kako Prospect.

Kako Placer

Buster Creek Gravels
The composition of the gravels is completely consistent with local derivation and short distances of transport. The Buster Creek placer was developed in the upper portion of a alluvial fan. Evidence of water table reduction/oxidation fronts is quite common but no relationship between stained gravels and the quality of pay has been established. The pay gravels are mostly rhyolite with minor chert and andesite. Our best estimate based on the extent of tailings is that 5 to 7 thousand ounces were won from Buster Creek.

Heavy Minerals
As can be expected from the surrounding country rocks there is only a small volume of "black sands" concentrated from the Kako placer. Placer concentrates from Buster Creek consist primarily of fine sized gold, cinnabar, garnet, and arsenopyrite. . Minor amounts of scheelite, cassiterite, stibnite, ilmenite and magnetite are also reported. The minor volume of "black sands" and the composition of the concentrates is consistent with derivation from a epithermal gold system. Black sand concentrations increase in gravels derived from the Gemuk Group andesites.

Penz, who now uses a large jig system, confirms that a significant amount of the gold he recovers comes from nuggets on the one hand and minus 20 mesh on the other hand. This broad size distribution is typical for placers which are located close to their source.

The gold won from the Kako Placer is rough and coarse and rarely looks well traveled. Fine lace like structures thought to be box works or crystal casts are frequently observed on the nuggets. A small portion of the placer gold is found still attached to gangue minerals, typically quartz and sericite altered rhyolite. Rare pieces of gold attached to arsenopyrite have been reported. The gangue

minerals, angularity and shape of the gold, and the volume of cinnabar and stibnite in the placer concentrate are also consistent with a placer derived from an epithermal lode environment.

The fineness of the gold from the Kako placer is reported to be 818 (Smith, 1941). This low fineness is consistent with placer deposits near a lode source. Penz and past placer producers have reported the best yields from areas of rhyolite bedrock.

Bobtail Creek

The float in the upper section of the creek is composed chiefly of siliceous siltstone and chert. Rhyolite is a minor component of the float. No placer tailings were found above the 220' elevation where two tributary streams join Bobtail Creek from the north and south at the eastern edge of section 17. The valley floor is flat and willow choked at this elevation. Dragline overburden piles begin at the point where these tributaries enter the stream and continue downstream 2000 to 2500 feet where they encounter the upper end of a large beaver dam. Tailings between the dragline piles consist of 80-90% siltstone and shales, commonly iron-stained, with larger cobbles of chert and cherty tuffs. Crystal poor white rhyolite and andesitic volcanics are minor components of the tailings. No quartz was seen in the tailings. An estimated 2 to 4 thousand ounces was won from Bobtail Creek.

Placer Potential

Penz who is mining on Buster Creek has reserves on his claims sufficient for several years of operation. Additional placer reserves owned by Calista Corporation are known to exist on Buster and Bobtail Creek. Joesting, 1940, evaluated Buster Creek with a churn drill. He estimated that the average value for the remaining pay zones in Buster Creek was $ 8.00 per yard (@ 400.00/oz) with $4.00 cutoff grade. Joesting estimated that a minimum of 7 to 8 thousands ounces remained in Buster Creek, mostly on the lower portion of the creek (owned by Calista).

Significant geologic indicated placer reserves are thought to exist below and alongside the old tailings on Bobtail Creek and on adjacent Montezuma Creek. The upper portions of the Kuyukutuk River, north over the ridge from Buster and Bobtail Creeks, have also been reported to have favorable drill holes (Penz, 1989)

LODE TARGETS

The Kako Grid

In 1989, 265 pulps retained from RAA's 1974 soil grid program across Buster Saddle at Kako were re-analyzed by methods with greater

technical sophistication and lower detection levels than the original analyses done in 1974. The results defined two anomalous, open-ended zones within the grid area.

The soil sampling program conducted in 1989 by Calista was designed to expand the anomalous areas defined by RAA. A 6500 foot baseline oriented 45 degrees northeast was sampled at 50 foot intervals along Base Hill ridge west of the Kako placer mine. This line crossed contacts between all the lithologies present on the ridge. Two perpendicular lines trending northwest/southeast were also sampled to trace the extent of the anomalous rhyolites on either side of the Buster Saddle. The Calista soil sampling expanded the two anomalous zones discovered by RAA.

Table 1, found at the end of this report is a list of anomalous samples from the Kako Prospect. Figure 4 and the geochemical overlays accompanying the map Geology of the Kako Prospect show the locations of anomalous samples.

Rhyolite-Chert Contacts

The first anomalous area is a zone at the northern end of the grid near hill 901 with values ranging from 0.1 to 0.3 ppm gold and 2 to 3 ppm silver. Several anomalous samples cluster along rhyolite and chert or andesite contacts particularly where these contacts appear to intersect fault strikes.

In 1989 a 500' by 800' soil grid was sampled over this anomalous area. A horizon in the rocks mapped variously as chert, quartzite and siliceous tuff carries anomalous gold ranging from 110 to 260 ppb gold. A stream sediment sample taken from a small stream draining this chert yielded 360 ppb gold, Figure 4.

Half of the anomalous samples were in areas of rhyolite float, the other half were taken in soils with chert or cherty tuff float. A distinctive outcrop of fractured, bleached and highly limonite-stained chert is located at the top of hill 901. All samples from this area averaged 0.1 ppm gold. This outcrop is probably a cap or roof pendant on the rhyolite that is exposed as rubble north, south, and east of the chert. One thin section from a sample nearby the gold anomalies was determined to be a recrystallized sedimentary chert.

Buster Creek Breccia

The second zone is an area of limonite - quartz - rhyolite breccia, which is exposed in the saddle at the head of the South Fork of Buster Creek. The rock is vuggy, silicified, and has pervasive limonite staining. The rhyolite is pervasively altered by sericite and

clay.

This zone, which appears to be coincident and parallel with the trace of Buster Creek, carries gold values to 0.9 ppm, silver values up to 9.6 ppm, and arsenic levels greater than 2000 ppm. 32 of the re-analyzed samples were found to have gold values of .1 ppm or greater. This zone of brecciation is 30 feet wide and is traceable for 300 feet. The zone is lost in the brush below the saddle.

Because of the poor nature of the outcrop, it is difficult to determine grades across any width. However, soil and rock chip samples averaged together suggest that this zone **averages** 300 ppb gold, a little less than 2 ppm silver, and 500 ppm arsenic, see Table 1. Trenching in this area and further exploration along strike, particularly downstream toward the placer deposits is planned for the future.

A strong stream sediment anomaly has been identified below this occurrence. These samples which were taken above the placer tailings in the three streams which drain the east side of the Kako Grid area run 480, 200, 360, and 520 ppb gold, Figure 4 and Figure 5. This is one of the strongest stream sediment anomalies we have recorded in southwestern Alaska. Given the extent of the anomalies, the possibility of discovering higher grade mineralization in this area seems good.

Other Occurrences

In addition to the rhyolite breccia and the auriferous (?) chert reports of mineralized rhyolite dikes within the placer cuts and the occurrence of placer gold to the north in Bobtail Creek and to the west in the Kuyukutuk River suggest that other areas should be investigated.

Trace Element Geochemistry

Silver values are elevated on the steep southern slope of the 901' ridge. Values average between 1 and 2 ppm silver in a 400' by 800' area with rhyolite rubblecrop. Gold values are not correlative and are not anomalous in this area, however, arsenic and silver values show close correspondence. Silver anomalies are also present on the 901' soil grid. One highly anomalous sample had .542 ppm gold, 17.9 ppm silver, and 2000 ppm arsenic. Silver values in the 1-2 ppm range extend to line 700North.

Nearly the entire drainage is anomalous in arsenic. Arsenic is anomalous over the entire Buster Saddle and increases wherever rhyolite is found. The average arsenic level is about 200 ppm.

Arsenic values in brecciated or altered rhyolite commonly range from 500 to more than 2000 ppm. These levels are also present on the hill 901' chert with values of 667, 1384, and 2000 ppm over a one 100 foot interval. Gold and silver values often increase as arsenic increases. Sharp isolated jumps in arsenic content in areas of deep soil cover probably reflect small dikes or veins.

Lead, mercury, and antimony correlate with the occurrence of rhyolite porphyry. Mercury and antimony do not correlate with the presence or absence of gold. Despite the presence of cinnabar in the placer concentrates at Kako, the hardrock samples have weak values of mercury and antimony compared to the samples from the Stuyahok rhyolite.

Stuyahok History

Gold was discovered at Stuyahok in 1918 (Cobb, 1973). Little of the history of the operation is known. The mine ceased operation in the 1940's and the equipment was moved to Ruby. Total production in the area probably exceeds 20,000 ounces (Cobb, 1973).

In 1974 and 1975 geologists working for Resource Associates of Alaska (RAA) found anomalous gold, arsenic and mercury. Like Kako, many of the soil and stream sediments samples taken by RAA focused on base metal mineralization. Often no assays for gold or low temperature metals were run. RAA's assessment of the area was similar to the appraisal of the Kako property.

Calista selected the Stuyahok area in 1977 and leased the placer mine to the Chase Brothers in 1986. The five brothers and their father, who worked on the property in the early 1940's, have produced about 100 ounces. Calista terminated the lease in 1989 and the property is currently available for lease.

Calista accomplished some small scale mapping and sampling in 1985 and 1988. In 1989 careful sampling of the placer tailings resulted in the discovery of an area of gold bearing bedrock.

Stuyahok Geology

Lithologic Units

The ridge above the placer is is underlain by coarse, angular andesite marine tuffs, flows, agglomerate and breccia. Felsic and siliceous tuff is occasionally interbedded with the andesite. On the north and east portions of the ridge, talus and rubble indicates that a quartz-feldspar porphyritic rhyolite with a very siliceous matrix intrudes the andesites, see Figure 5 and attached map Stuyahok Prospect Geology/Geochemistry.

Rhyolite porphyry float increases toward the placer tailings. The valley floor is probably is composed of more rhyolite than the flanks of the ridge. To the northeast Cretaceous graywacke may be in contact with the rhyolites.

Alteration

Alteration of the rhyolite is characterized by intense argillic and sericite alteration, sulfide leaching (casts of pyrite and arsenopyrite remnants), and the formation of limonite on fractures. In many areas of the tailings the alteration and weathering has completely changed the rhyolite to clay, sericite, and limonite. Quartz eyes are all that is left of the original constituents. This alteration is similar to that found at Kako, Donlin, Julian, and Granite Creeks; all of which are gold placers derived from silica-rich, highly altered rhyolites.

Stuyahok Placer

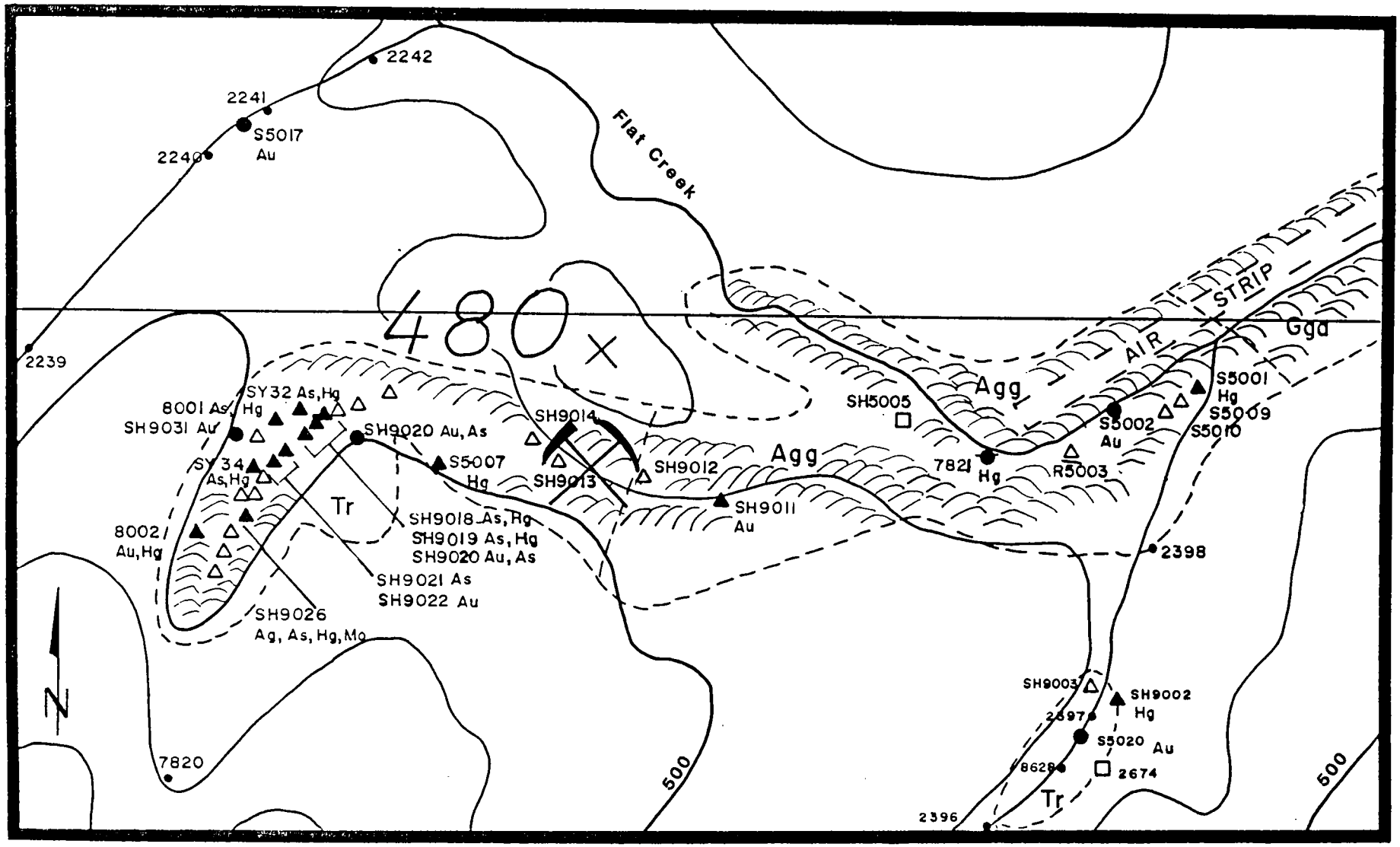
Gravels, Heavy Minerals

Like Kako, the composition of the gravels is completely consistent with local derivation and short distances of transport. Unlike the Kako placer, the Stuyahok placer is characterized by shallow overburden. Placer concentrates from Stuyahok consist primarily of fine sized gold, cinnabar, arsenopyrite, stibnite and magnetite. The composition of the concentrates is consistent with derivation from a epithermal gold system.

The gold is very similar in size distribution, shape, and roughness to Kako and other near-source placers. The fineness of the gold is 787 (Smith, 1937). Smith states that based on the other characteristics of the Stuyahok placer, the source or original composition of the lode gold was obviously different from the source for Willow Creek (mesothermal veins) and may be more silver rich than Kako. Geologically indicated placer reserves along side the old tailings in the Rhyolite Creek area and the virgin ground in Last Chance Creek should contain several thousand ounces. Figures 6 and 7 show the extent of Stuyahok placer tailings and reserves.

LODE TARGETS

Calista samples from an area of bedrock within the mined out placer channel yielded high values of 1.0 and 0.5 ppm gold, over 1000 ppm arsenic, 21.8 ppm silver, and greater than 5 ppm mercury. This area is underlain by a quartz eye rhyolite porphyry. The rhyolite is clay and sericite altered. Calista plans to trench and soil sample this area in the 1990 season.



SCALE 1": 500'

Figure 6 STUYAHOK PROSPECT

2391 • Stream Sediment Sample Location

2194 □ Soil Sample Location, RAA

SH9001 △ Rock Chip Sample Location

Mine Tailings

● Au Stream Sediment Anomaly

■ As Soil Anomaly

▲ Au,Hg Rock Chip Anomaly

Tr — Tertiary? porphyritic to aphanitic rhyolite intrusive, usually sericite and clay altered.

Ggd — Mesozoic to Paleozoic marine volcanic rocks including andesite flows, breccias, and agglomerates

Agg — Undifferentiated Gemuk Group rocks with pronounced clay, sericitic, and carbonate alteration found adjacent to intrusive rhyolite bodies.

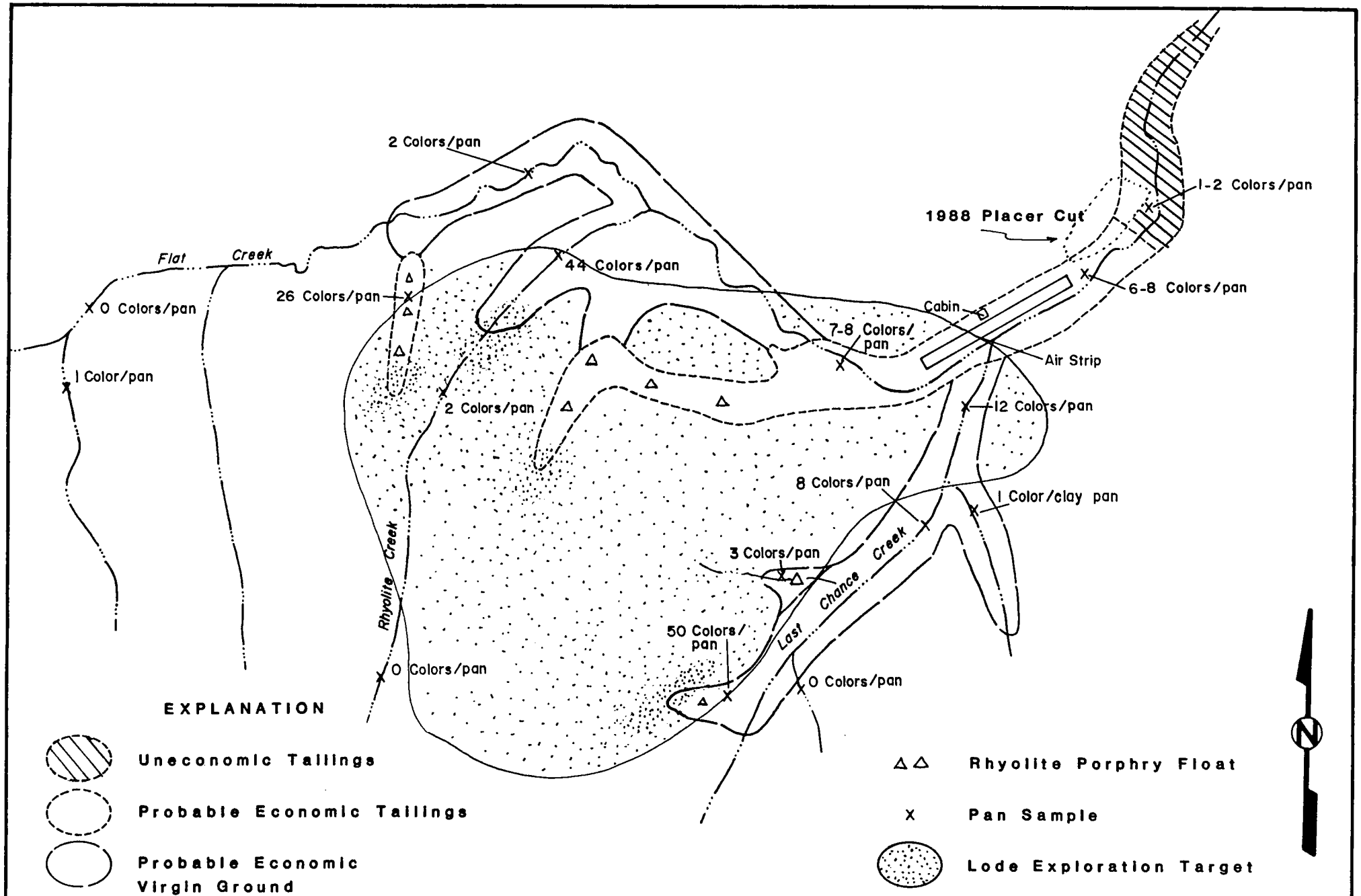


FIGURE 7

Sketch Map of Stuyahok Gold Placer Reserves

Extremely good stream sediment samples taken in and just above the tailings from areas draining rhyolite bedrock yielded 10, 2.4 and .72 ppm gold. Results from stream sediment surveys in and around this and other placer districts demonstrate that sediment samples rarely can predict or confirm buried, distantly transported, coarse size placer deposits. It seems that stream sediment samples are most sensitive to fine gold particles being actively eroded. See attached map and Table 2, at the end of this report which is a list of anomalous samples from Stuyahok. Figure 6 and the attached map, Stuyahok Prospect Geology/Geochemistry, shows the locations of anomalous samples.

In addition to the rhyolite tailings area, an anomaly at the head of the drainage near the ridge crest, on the north flank of peak 1890 was discovered by RAA. Here minor patchy, andesite hosted galena-sphalerite-phrrohotite-pyrite-chalcopyrite mineralization is found on fractures and in discontinuous narrow stringers. Two soil samples located below these mineralized fractures were anomalous in barite and lead. RAA felt that Stuyahok provided an area of potential for volcanogenic massive sulfide mineralization. Subsequent cursory inspection of this area has not yielded any other evidence for massive sulfide mineralization.

In conclusion, grab samples of rhyolite from the tailings, rock samples from bedrock within the tailings, and and stream sediment samples from areas draining the valley rhyolite body are anomalous in arsenic, mercury and stibnite. These results coupled with the alteration assemblage observed suggest that a large area directly surrounding the tailings is favorable for the occurrence of an epithermal to mesothermal lode gold deposit.

CONCLUSIONS

The conclusions listed below outline the potential of the Kako and Stuyahok areas:

*The strong geochemical anomaly, the low temperature sulfide mineral assemblage, and the alteration assemblage are consistent with deeper level epithermal lode deposits.

* The chances of expanding the size of the known occurrences and locating additional zones of gold mineralization in the Kako and Stuyahok areas are very good. The very limited work which has been done to date has identified two strong gold systems.

* The nature of the older Gemuk group volcanic section is poorly

understood. Although it is possible that this is a favorable VMS environment, no polymetallic volcanogenic massive sulfide occurrences of any size have yet been discovered.

* The access to this portion of southwestern Alaska is very good by Alaskan, Canadian and Third World standards.

* The availability of fixed-wing transport, on site heavy equipment, and camp facilities at these placer camps provides for extremely cost effective exploration.

RECOMMENDATIONS

The recommendations offered below summarize some of the directions Calista wold like to follow with a joint venture partner or an exploration lease holder:

** An expansion of the cost effective trenching work should be a top priority of future work. All identified anomalies should be trenched.

** Soil sampling has proved to quite effective in this area and extensive soil and stream sediment surveys should be undertaken.

** An emphasis on determining the nature and significance of the the residual placer occurrences should continue.

** As areas covered with unconsolidated material are tested, the possible auriferous gravels should be evaluated. A program which attempts to integrate the distribution and character of the placer occurrences with a lode occurrence evaluation and exploration effort will be more effective than a hard rock program which excludes placer data.

Calista Corporation considers the Kako and Stuyahok areas to be an excellent targets for a major lode gold discovery. We stand ready to deliver and discuss any of the abundant technical data we have acquired. We are committed to offering exploration leases at reasonable terms. Please direct any questions to Mike Neimeyer, Vice President for Land and Natural Resources or myself.

KAKO ANOMALOUS SAMPLES 1974, 1975,1985,1988,1989

Sample #	Au ppb	Ag ppm	As ppm	Cu ppm	Hg ppb	Mo ppm	Pb ppm	Sb ppm	Tl ppm	Zn ppm	Rock Type	Location
S8059*	15	0.3	122	46	60	<1	10	19	N/A	86		Kako Grid
R8066*	36	0.6	**241**	20	30	2	**120**	8	N/A	23	Rhyolite	Kako Grid
D8067*	11	0.7	**164**	26	45	≤1	45	15	N/A	67		Kako Grid
D8080*	**190**	1.2	**541**	40	40	<1	66	20	N/A	66		Kako Grid
R8081*	**126**	**4.5**	**759**	153	120	3	64	41	N/A	**409**	Chert and rhyolite tuff	Kako Grid
D8082*	**167**	2.5	**808**	44	310	2	**166**	23	N/A	132		Kako Grid
D8086*	8	0.6	**331**	43	80	1	22	25	N/A	391		Kako Grid
R8087*	<5	<0.2	**298**	35	15	<1	7	26	N/A	154	Rhyolite breccia	Kako Grid
D8089*	14	1.2	**337**	50	50	<1	24	17	N/A	**763**		Kako Grid
R8090*	<5	0.8	**641**	72	30	1	28	15	N/A	**690**	Rhyolite tuff	Kako Grid
D8251*	93	0.8	**321**	55	65	1	38	25	N/A	136		Kako Grid
D8252*	25	1	**196**	44	65	1	64	17	N/A	113		Kako Grid
D8253*	**318**	2.4	**535**	53	40	<1	73	19	N/A	135		Kako Grid
R8257*	<5	0.3	**224**	46	**235**	4	12	19	N/A	57	Silicified tuff	Kako Grid
D8258*	33	0.8	**276**	24	25	<1	42	20	N/A	74		Kako Grid
D8260*	50	0.6	**278**	31	50	2	80	16	N/A	80		Kako Grid
D8262*	**127**	2.7	**384**	21	50	2	**256**	16	N/A	93		Kako Grid
D8264*	IS	2.7	**365**	35	80	2	**214**	17	N/A	90		Kako Grid
R8270*	47	1.8	**329**	65	30	5	**191**	21	N/A	189	Rhyolite tuff	Kako Grid
D8275*	16	1	**174**	20	65	1	65	13	N/A	54		Kako Grid
D8280*	**125**	**3.3**	**658**	48	100	2	**431**	27	N/A	175		Kako Grid
D8282*	85	2.2	**550**	33	65	2	**296**	19	N/A	205		Kako Grid
D8283*	19	0.4	**228**	23	45	1	51	17	N/A	75		Kako Grid
D8285*	<5	0.2	131	20	30	1	12	13	N/A	60		Kako Grid
D8289*	37	0.7	**260**	28	50	1	16	15	N/A	50		Kako Grid
D8290*	21	0.6	**231**	33	75	<1	30	19	N/A	91		Kako Grid
D8291*	**321**	1	**264**	29	60	1	51	22	N/A	84		Kako Grid
D8295*	14	1.8	**253**	22	110	2	**123**	15	N/A	51		Kako Grid
R8306*	6	0.5	**186**	130	20	1	15	18	N/A	52	Rhyolite tuff	Kako Grid
D8320*	**148**	1.2	**294**	67	25	1	72	9	N/A	58		Kako Grid
D8322*	48	<0.2	**571**	55	50	2	23	31	N/A	64		Kako Grid
D8324*	53	0.2	**236**	64	45	1	17	24	N/A	68		Kako Grid
R8326*	**262**	<0.2	**166**	184	20	2	11	46	N/A	33	Rhyolite tuff	Kako Grid
D8333*	**321**	<0.2	**215**	96	60	2	<2	25	N/A	42		Kako Grid
R8334*	**229**	0.3	**222**	123	15	4	4	53	N/A	46	Rhyolite tuff	Kako Grid
R8337*	**209**	<0.2	143	173	15	3	<2	29	N/A	27	Rhyolite tuff	Kako Grid

Sample #	Au ppb	Ag ppm	As ppm	Cu ppm	Hg ppb	Mo ppm	Pb ppm	Sb ppm	Tl ppm	Zn ppm	Rock Type	Location
R8338*	**173**	0.3	**245**	**424**	20	4	4	50	N/A	29	Rhyolite tuff	Kako Grid
D8342*	**136**	1.2	**1088**	160	55	4	17	30	N/A	112		Kako Grid
R8343*	9	0.4	**915**	**162**	20	5	15	25	N/A	132	Rhyolite tuff	Kako Grid
R8344*	**287**	1.2	**1915**	**562**	40	**10**	14	70	N/A	211	Rhyolite tuff	Kako Grid
D8345*	IS	1	**223**	80	45	2	21	20	N/A	63		Kako Grid
D8346*	70	2.5	**353**	92	60	3	17	18	N/A	44		Kako Grid
D8347*	86	1.4	**1206**	**273**	160	5	61	53	N/A	94		Kako Grid
D8348*	61	1.2	**479**	161	80	3	22	22	N/A	101		Kako Grid
R8349*	38	2.2	**1819**	**449**	80	8	34	58	N/A	140	Rhyolite tuff	Kako Grid
D8350*	**169**	**3.1**	**427**	58	65	2	24	19	N/A	42		Kako Grid
D8401*	**268**	2.9	**559**	84	65	3	32	19	N/A	38		Kako Grid
D8402*	45	2.7	**744**	54	45	3	35	13	N/A	26		Kako Grid
D8403*	31	1.5	**574**	34	30	2	30	18	N/A	23		Kako Grid
D8404*	51	0.6	**336**	42	25	3	18	19	N/A	23		Kako Grid
D8405*	42	2.5	**428**	36	85	3	23	16	N/A	24		Kako Grid
D8407*	**145**	0.8	**440**	48	35	2	47	23	N/A	83		Kako Grid
D8408*	**232**	1	**636**	86	60	2	95	24	N/A	101		Kako Grid
D8409*	**180**	1.9	**467**	71	125	3	22	17	N/A	37		Kako Grid
D8410*	**794**	**4.7**	**560**	71	40	3	28	23	N/A	50		Kako Grid
D8411*	8	0.5	**205**	24	45	2	13	18	N/A	46		Kako Grid
D8412*	99	0.5	**169**	17	105	2	12	13	N/A	25		Kako Grid
D8414*	14	0.5	**181**	24	50	3	15	16	N/A	35		Kako Grid
D8415*	9	0.4	**196**	35	70	2	16	15	N/A	45		Kako Grid
D8417*	19	1.2	**298**	48	50	2	17	17	N/A	40		Kako Grid
D8418	**700**	**28.2**	**850**	140	N/A	N/A	38	N/A	N/A	41		Kako Grid
D8419*	**118**	**5.3**	**490**	122	70	3	29	22	N/A	43		Kako Grid
D8420*	**487**	**5.5**	**682**	140	35	5	45	32	N/A	51		Kako Grid
D8421*	53	1.4	**243**	56	65	2	17	17	N/A	41		Kako Grid
D8424*	27	0.9	**499**	34	55	4	21	22	N/A	**429**		Kako Grid
D8425*	30	0.6	**261**	43	40	2	15	15	N/A	50		Kako Grid
D8426*	**120**	0.6	**176**	30	35	2	15	11	N/A	57		Kako Grid
D8428*	IS	0.3	**290**	25	35	2	19	20	N/A	107		Kako Grid
D8429*	51	0.4	**246**	33	25	2	13	18	N/A	80		Kako Grid
D8430*	11	0.2	**441**	36	35	3	12	19	N/A	63		Kako Grid
D8431	**900**	1.9	**240**	20	N/A	N/A	25	N/A	N/A	42		Kako Grid
RERUN*	48	0.7	**306**	20	70	2	17	16		44		
D8432*	15	0.3	**160**	13	50	2	13	12	N/A	37		Kako Grid
R8788*	**139**	0.3	59	15	75	1	8	12	N/A	43	Volcanic breccia	Kako Grid
R8795*	48	0.2	119	16	65	2	9	16	N/A	59	Clay altered rhyolite	Kako Grid
D8797*	42	0.5	**214**	22	35	2	12	18	N/A	60		Kako Grid
R8798*	**158**	0.7	**1467**	23	15	4	14	10	N/A	7	Clay altered rhyoloite	Kako Grid

Sample #	Au ppb	Ag ppm	As ppm	Cu ppm	Hg ppb	Mo ppm	Pb ppm	Sb ppm	Tl ppm	Zn ppm	Rock Type	Location
D8912*	58	1.3	**439**	72	60	1	**132**	46	N/A	158		Kako Grid
R8913*	<5	0.9	**176**	71	30	2	17	41	N/A	101	Silceous breccia	Kako Grid
D8914*	19	0.4	**532**	103	80	2	17	41	N/A	179		Kako Grid
D8916*	75	1.6	**455**	93	95	2	**147**	36	N/A	172		Kako Grid
R8917*	<5	0.3	146	14	25	1	**149**	9	N/A	28	Siliceous rhyolite	Kako Grid
D8918*	50	0.5	**255**	44	115	<1	28	24	N/A	131		Kako Grid
D8922*	13	0.5	**183**	54	80	2	41	32	N/A	144		Kako Grid
D8926*	37	0.7	**446**	43	150	1	39	39	N/A	181		Kako Grid
D8927*	74	0.5	**176**	27	80	<1	29	20	N/A	113		Kako Grid
D8928*	<5	0.4	**248**	33	55	<1	34	27	N/A	135		Kako Grid
D8929*	<5	0.4	**195**	39	65	1	50	29	N/A	113		Kako Grid
D8935*	<5	1.3	**243**	48	70	<1	**182**	26	N/A	70		Kako Grid
R8936*	<5	1.2	**325**	14	30	2	**292**	40	N/A	247	Rhyolite porphyry	Kako Grid
D8949*	**138**	0.4	129	46	45	2	20	26	N/A	73		
D8951*	**450**	0.5	148	91	60	1	18	28	N/A	70		
D8853*	68	1	**765**	113	45	2	40	33	N/A	79		Kako Grid
R8954*	<5	0.6	**151**	40	20	<1	22	7	N/A	36	Rhyolite porphyry	Kako Grid
D8955*	46	1	**189**	74	60	1	35	21	N/A	75		Kako Grid
D8957*	42	1.4	**381**	74	45	2	20	22	N/A	62		Kako Grid
R8958*	<5	1.4	**325**	61	15	3	5	9	N/A	21	Rhyolite porphyry	Kako Grid
D8959*	**134**	2.2	**1138**	131	40	4	29	27	N/A	57		Kako Grid
R8960*	<5	0.9	**589**	73	30	3	14	12	N/A	17	Rhyolite porphyry	Kako Grid
D8961*	**305**	2.1	**640**	128	75	3	26	29	N/A	74		Kako Grid
R8962*	22	0.3	**1441**	196	25	4	17	34	N/A	80	Clay altered rhyolite	Kako Grid
D8963*	30	1.8	**474**	72	25	2	25	20	N/A	55		Kako Grid
R8964*	<5	0.4	**496**	47	15	3	32	15	N/A	16	Rhyolite	Kako Grid
R8965*	<5	0.2	**520**	27	25	2	15	6	N/A	24	Rhyolite porphyry	Kako Grid
D8966*	**176**	1.8	**751**	113	30	2	26	21	N/A	48		Kako Grid
R8970*	<5	0.4	**206**	100	15	3	40	9	N/A	14	Rhyolite porphyry	Kako Grid
R8972*	<5	**4.5**	**>2000**	**322**	15	3	14	17	N/A	45	Rhyolite porphyry	Kako Grid
D8973*	**134**	3	**327**	158	55	2	14	26	N/A	42		Kako Grid
R8974*	<5	**9.6**	**1156**	**208**	20	6	14	31	N/A	43	Rhyolite porphyry	Kako Grid
D8976*	<5	1.2	107	149	35	2	10	19	N/A	31		Kako Grid
R8977*	<5	0.5	**350**	158	15	6	6	35	N/A	13	Rhyolite breccia	Kako Grid
R8979*	20	2.4	**987**	21	20	3	37	10	N/A	59	Rhyolite porphyry	Kako Grid
R8980*	<5	**5.9**	**1009**	24	15	3	28	11	N/A	15	Rhyolite porphyry	Kako Grid
R8982*	<5	1.2	**201**	70	15	3	8	19	N/A	6	Rhyolite porphyry	Kako Grid
D8983*	<5	0.3	**262**	24	40	<1	5	22	N/A	58		Kako Grid
R8988*	<5	<0.2	**212**	20	10	2	6	53	N/A	**750**	Andesite tuff	Kako Grid
R8989*	<5	<0.2	**223**	39	10	1	10	55	N/A	**577**	Andesite tuff	Kako Grid
R8994*	<5	<0.2	**226**	35	20	6	15	8	N/A	4	Rhyolite porphyry	Kako Grid

Sample #	Au ppb	Ag ppm	As ppm	Cu ppm	Hg ppb	Mo ppm	Pb ppm	Sb ppm	Tl ppm	Zn ppm	Rock Type	Location
D8995*	<5	0.3	**289**	29	70	2	15	22	N/A	61		Kako Grid
D3771*	30	<0.2	64	19	80	2	24	20	N/A	61		21N66W S.18
S3954	-100	0.9	**100**	15	30	1	20	N/A	N/A	56		21N66W S.20
S7934*	12	0.4	**230**	25	75	1	37	19	N/A	177		21N66W S.9
D2886*	**245**	<0.2	52	19	55	1	19	14	N/A	57		
D2887*	<5	0.7	**197**	34	55	2	21	12	N/A	**552**		21N67W S.24
R2940*	11	1.2	**264**	18	40	2	**90**	8	N/A	68	Rhyolite Tuff	21N67W S.13
D3190*	69	1.1	**532**	63	85	3	20	24	N/A	386		
R3193*	<5	0.3	**186**	13	30	2	6	<5	N/A	6	Clay Alt. rhyo tuff	Kako Grid
D3194*	**200**	1.2	**160**	18	25	1	20	N/A	N/A	45		Kako Grid
RERUN	27	0.4	**181**	15	50	1	17	14	N/A	46		
R3195*	<5	<0.2	**167**	30	20	3	7	8	N/A	7	Clay Alt. rhyo tuff	Kako Grid
R3196*	48	**5.6**	**1575**	**377**	50	7	40	38	N/A	19	Clay Alt. rhyo tuff	Kako Grid
D3197*	**385**	**5.1**	**523**	74	60	2	37	17	N/A	38		Kako Grid
R2192*	6	0.4	**354**	70	**410**	6	4	19	N/A	31	Rhyolite porphyry	21N67W S.13
R2193*	<5	0.5	**372**	42	**485**	2	8	19	N/A	16	Altered rhyolite	21N67W S.13
D2376*	<5	0.3	**602**	13	50	2	14	23	N/A	160		21N66W S.18
RK11	50	2.7	**500**	N/A	15	N/A	52	N/A	N/A	176	Chert	21N67W S.24
RK12	**260**	0.2	30	N/A	-5	N/A	5	N/A	N/A	29	Chert	21N67W S.13
SK14	**480**	0.8	**375**	N/A	55	N/A	**100**	N/A	N/A	180		Up. Buster CK.
RK15	-5	1.5	80	N/A	10	N/A	7	N/A	N/A	**710**	Chert breccia	Up. Buster CK.
SK16	**200**	0.2	30	N/A	15	N/A	10	N/A	N/A	84		Up. Buster CK.
SK17	**360**	-0.2	**375**	N/A	35	N/A	22	N/A	N/A	180		Up. Buster CK.
SK18	**520**	0.7	**150**	N/A	30	N/A	43			212		Up. Buster CK.
RK19	-5	0.9	**500**	N/A	20	N/A	7	N/A	N/A	20	Rhyolite	Kako Grid
RK20	15	0.6	**400**	N/A	15	N/A	13	N/A	N/A	76	Rhyolite	Kako Grid
RK21	**110**	**3.2**	**200**	N/A	15	N/A	**280**	N/A	N/A	53	Chert	Kako Grid
SK23	5	-0.2	5	N/A	**240**	N/A	8	N/A	N/A	84		Bobtail Creek
RK24	**100**	2.8	80	N/A	25	N/A	7	N/A	N/A	80	Qz vein in rhyo.	Kako Grid
RK25	**320**	0.4	20	N/A	10	N/A	5	N/A	N/A	55	Rhyolite porphyry	Kako Grid
RK26	70	1.5	**300**	N/A	20	N/A	32	N/A	N/A	288	Chert	Kako Grid
R163242	10	0.7	**185**	37	80	1	47	17	N/A	12	Rhyolite breccia	Lower tailings
R163331	5	0.6	**297**	48	**99900**	1	8	8	N/A	122	Rhyolite breccia	Kako Grid
R163332	65	**7.1**	**2009**	**527**	**1400**	5	42	33	N/A	198	Rhyolite breccia	Kako Grid
RKK25	**130**	2.1	99	5	5	N/A	30	-5	N/A	11	Siliceous rhyolite	Lower tailings
RK8001	87	-5	**1301**	N/A	**>5000**	3	N/A	38	-1	N/A	Rhyolite brccia	Kako Grid
K9001	93	1	**1092**	N/A	10	<1	N/A	33	<1	N/A		
K9002	**120**	**7.1**	**>2000**	N/A	55	3	N/A	47	<1	N/A		
KRM016	**116**	1	**504**	N/A	10	2	N/A	33	1	N/A		
KRM019	53	**4.3**	**390**	N/A	**300**	2	N/A	54	1	N/A		
SG8	25	<0.5	**570**	N/A	70	<1	N/A	13	<1	N/A		

Sample #	Au ppb	Ag ppm	As ppm	Cu ppm	Hg ppb	Mo ppm	Pb ppm	Sb ppm	Tl ppm	Zn ppm	Rock Type	Location
SG23	<5	<0.5	**251**	N/A	5	<1	N/A	11	<1	N/A		
SG27	<5	<0.5	**309**	N/A	40	<1	N/A	12	<1	N/A		
SG28	19	<0.5	**421**	N/A	25	<1	N/A	17	<1	N/A		
SG33	<5	<0.5	**159**	N/A	45	1	N/A	8	<1	N/A		
SG34	7	0.6	**588**	N/A	40	<1	N/A	16	<1	N/A		
SG35	<5	<0.5	**171**	N/A	80	<1	N/A	11	<1	N/A		
SG36	6	<0.5	**326**	N/A	50	<1	N/A	14	<1	N/A		
SG37	19	<0.5	**323**	N/A	65	1	N/A	14	<1	N/A		
SG38	18	0.5	**213**	N/A	50	2	N/A	13	<1	N/A		
SG39	10	<0.5	**213**	N/A	60	1	N/A	3	<1	N/A		
SG40	10	<0.5	**332**	N/A	30	1	N/A	7	<1	N/A		
SG41	**112**	**3.3**	**1101**	N/A	85	1	N/A	21	<1	N/A		89 Soilgrid
SG42	<5	<0.5	**156**	N/A	20	<1	N/A	8	<1	N/A		
SG43	7	0.6	**203**	N/A	45	<1	N/A	8	<1	N/A		
SG46	17	0.8	**253**	N/A	35	<1	N/A	12	<1	N/A		
SG47	38	2.6	**250**	N/A	100	<1	N/A	9	1	N/A		
SG48	64	1.3	**1190**	N/A	25	4	N/A	43	<1	N/A		89 Soilgrid
SG49	54	<0.5	**376**	N/A	20	<1	N/A	13	<1	N/A		
SG50	78	0.8	**524**	N/A	25	3	N/A	20	<1	N/A		
SG51	68	1.1	**573**	N/A	40	2	N/A	40	<1	N/A		
SG52	**219**	1	**451**	N/A	35	2	N/A	21	<1	N/A		89 Soilgrid
SG60	28	1.6	**598**	N/A	65	2	N/A	7	<1	N/A		
SG61	53	2.4	**1102**	N/A	35	2	N/A	12	<1	N/A		89 Soilgrid
SG62	24	1.3	**767**	N/A	10	2	N/A	11	<1	N/A		
SG64	11	1.6	**232**	N/A	155	2	N/A	<5	<1	N/A		
SG65	21	1.1	**387**	N/A	35	2	N/A	10	<1	N/A		
SG66	18	1.3	**376**	N/A	55	3	N/A	6	<1	N/A		
SG70	27	1.1	**225**	N/A	65	4	N/A	5	<1	N/A		
SG72	**542**	**17.9**	**>2000**	N/A	105	5	N/A	**112**	1	N/A		89 Soilgrid
SG73	**267**	**4.5**	**1384**	N/A	85	<1	N/A	42	1	N/A		89 Soilgrid
SG74	52	1.4	**667**	N/A	105	3	N/A	13	1	N/A		
SG75	58	1.3	**481**	N/A	85	<1	N/A	11	<1	N/A		
SG76	46	1.8	**475**	N/A	85	2	N/A	9	<1	N/A		
SG77	47	1.4	**313**	N/A	80	<1	N/A	13	<1	N/A		
SG78	**445**	1.2	**283**	N/A	85	<1	N/A	8	<1	N/A		89 Soilgrid
SG79	41	0.9	**195**	N/A	30	<1	N/A	11	<1	N/A		
SG81	30	0.7	**278**	N/A	70	<1	N/A	6	<1	N/A		
SG82	33	1.7	**256**	N/A	100	<1	N/A	<5	<1	N/A		
SG83	32	2.2	**344**	N/A	75	<1	N/A	15	<1	N/A		
SG84	30	0.8	**185**	N/A	70	<1	N/A	6	<1	N/A		
SG90	23	<0.5	**205**	N/A	110	<1	N/A	11	<1	N/A		

Sample #	Au ppb	Ag ppm	As ppm	Cu ppm	Hg ppb	Mo ppm	Pb ppm	Sb ppm	Tl ppm	Zn ppm	Rock Type	Location
SG100	**117**	<0.5	**410**	N/A	**415**	<1	N/A	28	<1	N/A		89 Soilgrid
SG120	70	2.6	**311**	N/A	40	<1	N/A	8	<1	N/A		
SG122	25	2.4	**281**	N/A	110	<1	N/A	<5	<1	N/A		
SG123	20	1.8	**212**	N/A	65	<1	N/A	<5	<1	N/A		
SG125	16	1.4	**185**	N/A	40	<1	N/A	<5	<1	N/A		
SG126	23	2.3	**362**	N/A	20	<1	N/A	<5	<1	N/A		
SG129	19	1.1	**363**	N/A	10	<1	N/A	<5	<1	N/A		
SG132	11	1	**154**	N/A	70	<1	N/A	<5	<1	N/A		
SG140	7	0.9	**172**	N/A	90	<1	N/A	<5	<1	N/A		
SG188	15	<0.5	**159**	N/A	70	<1	N/A	<5	2	N/A		
SG191	29	0.6	**382**	N/A	40	4	N/A	<5	2	N/A		
SG192	21	0.6	**172**	N/A	30	<1	N/A	<5	2	N/A		
SG193	39	0.6	**271**	N/A	45	2	N/A	7	2	N/A		
SG203	10	<0.5	**160**	N/A	**500**	<1	N/A	26	<1	N/A		
SG205	11	<0.5	**194**	N/A	100	<1	N/A	9	<1	N/A		
SG206	98	1.6	**1148**	N/A	**290**	2	N/A	29	<1	N/A		89 Soilgrid
SG207	29	1.3	**335**	N/A	150	<1	N/A	<5	<1	N/A		
SG215	9	1.9	**186**	N/A	60	<1	N/A	15	<1	N/A		
SG216	42	1	**290**	N/A	70	2	N/A	22	<1	N/A		
SG218	62	1.3	**310**	N/A	50	<1	N/A	12	<1	N/A		
SG220	27	0.6	**213**	N/A	50	<1	N/A	15	<1	N/A		
SG223	9	<0.5	**154**	N/A	60	<1	N/A	14	<1	N/A		
SG225	32	0.6	**236**	N/A	145	<1	N/A	15	<1	N/A		
SG270	25	1	**256**	N/A	35	2	N/A	20	<1	N/A		
SG271	30	1.2	**378**	N/A	30	2	N/A	29	<1	N/A		
SG272	37	1.1	**216**	N/A	35	2	N/A	12	<1	N/A		
SG273	16	1	**170**	N/A	30	2	N/A	11	<1	N/A		
SG279	6	0.8	**153**	N/A	20	2	N/A	13	<1	N/A		
SG282	18	0.9	**179**	N/A	35	2	N/A	16	<1	N/A		
SG283	26	1.1	**176**	N/A	30	2	N/A	16	<1	N/A		
SG284	16	1.1	**176**	N/A	35	2	N/A	13	<1	N/A		
SG285	93	2.1	**639**	N/A	20	2	N/A	27	<1	N/A		89 Soilgrid
SG286	41	1.4	**279**	N/A	30	2	N/A	21	<1	N/A		
SG287	49	1.1	**274**	N/A	35	2	N/A	20	<1	N/A		
SG288	45	1	**355**	N/A	25	2	N/A	22	<1	N/A		
SG289	36	1.4	**318**	N/A	45	2	N/A	38	<1	N/A		
SG290	51	1.3	**781**	N/A	25	2	N/A	29	<1	N/A		89 Soilgrid
SG291	31	0.9	**477**	N/A	20	3	N/A	27	<1	N/A		
SG292	8	0.6	**173**	N/A	20	2	N/A	23	<1	N/A		
SG294	68	1.6	**477**	N/A	25	3	N/A	24	<1	N/A		
SG295	92	1.9	**>2000**	N/A	30	2	N/A	27	<1	N/A		89 Soilgrid

Sample #	Au ppb	Ag ppm	As ppm	Cu ppm	Hg ppb	Mo ppm	Pb ppm	Sb ppm	Tl ppm	Zn ppm	Rock Type	Location
SG296	44	1.2	**301**	N/A	40	2	N/A	7	<1	N/A		
SG298	70	2.4	**389**	N/A	40	2	N/A	7	<1	N/A		89 Soilgrid
SG299	46	2.3	**226**	N/A	20	<1	N/A	19	<1	N/A		
SG300	22	1	**446**	N/A	20	2	N/A	22	<1	N/A		
SG301	39	**4.7**	**676**	N/A	20	3	N/A	23	<1	N/A		
SG302	61	2	**490**	N/A	30	2	N/A	22	<1	N/A		
SG303	56	**3.2**	**782**	N/A	35	1	N/A	27	<1	N/A		
SG304	**113**	2.5	**518**	N/A	50	2	N/A	19	<1	N/A		89 Soilgrid
SG305	29	1.4	**347**	N/A	35	2	N/A	21	1	N/A		
SG306	28	1.2	**293**	N/A	20	<1	N/A	24	<1	N/A		
SG307	**137**	1.5	**308**	N/A	35	2	N/A	22	<1	N/A		89 Soilgrid
SG308	36	1.3	**378**	N/A	50	2	N/A	18	<1	N/A		
SG309	23	1	**703**	N/A	25	2	N/A	25	<1	N/A		
SG310	98	1.6	**369**	N/A	40	3	N/A	12	<1	N/A		89 Soilgrid
SG311	23	1.2	**226**	N/A	20	2	N/A	15	<1	N/A		
SG312	25	1.4	**281**	N/A	25	2	N/A	11	<1	N/A		
SG313	**186**	1.9	**349**	N/A	25	1	N/A	17	<1	N/A		89 Soilgrid
SG314	**217**	1.7	**288**	N/A	30	2	N/A	16	<1	N/A		89 Soilgrid
SG315	31	0.8	**214**	N/A	25	2	N/A	13	<1	N/A		
SG316	19	0.8	**171**	N/A	40	<1	N/A	22	<1	N/A		
SG317	31	1.3	**226**	N/A	35	1	N/A	17	<1	N/A		
SG318	32	1.2	**342**	N/A	40	2	N/A	18	<1	N/A		
SG319	18	0.7	**152**	N/A	40	2	N/A	<5	<1	N/A		
SG320	59	0.8	**890**	N/A	20	<1	N/A	<5	<1	N/A		89 Soilgrid
SG321	**133**	1.7	**413**	N/A	20	<1	N/A	<5	<1	N/A		89 Soilgrid
SG322	58	1.9	**343**	N/A	40	2	N/A	<5	<1	N/A		
SG323	39	1.2	**245**	N/A	40	2	N/A	<5	<1	N/A		
SG324	38	1.2	**460**	N/A	40	1	N/A	<5	<1	N/A		
SG325	**159**	1.5	**229**	N/A	50	<1	N/A	16	<1	N/A		89 Soilgrid

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Sample #	Au ppb	Ag ppm	As ppm	Cu ppm	Hg ppb	Mo ppm	Pb ppm	Sb ppm	Tl ppm	Zn ppm	Rock Type	Location
S5002	**10000**	-0.2	20	N/A	105	N/A	18	N/A	N/A	88	STR SED	23N64W S.26
S5005	-5	0.2	**150**	N/A	60	N/A	11	N/A	N/A	**1177**	White rhyolite	23N64W S.34
S5007	-5	0.3	60	N/A	**1950**	N/A	7	N/A	N/A	108	Rhyolite porphyry	23N64W S.26
S5014	10	-0.2	**400**	N/A	70	N/A	52	N/A	N/A	270	STR SED	23N64W S.22
S5015	**85**	1	22	N/A	**270**	N/A	12	N/A	N/A	9	STR SED	23N64W S.28
S5017	**2400**	0.2	27	N/A	50	N/A	40	N/A	N/A	110	PAN CON	23N64W S.23
S5020	**720**	-0.2	30	N/A	50	N/A	15	N/A	N/A	120	PAN CON	23N64W S.26
RSY32	1	-0.2	**265**	7	**9000**	1	8	17	-2	55	Rhyolite with sulfides	23N64W S.26
RSY34	-1	0.4	**760**	28	**9000**	7	40	56	-2	255	Rhyolite breccia	23N64W S.26
S8001	7	-0.5	**876**	N/A	**>5000**	7	N/A	**210**	1	N/A	Clay altered rhyolite	23N64W S.26
S8002	9	-0.5	**679**	N/A	**1550**	5	N/A	47	-1	N/A	Rhyolite breccia	23N64W S.26
7813*	-5	0.9	107	94	**>5000**	2	**495**	40	N/A	440	Silicified graywacke	23N64W S.28
7814*	-5	0.7	148	14	**3500**	2	60	57	N/A	195	SiO2 clay alt dacite	23N64W S.28
7815*	-5	0.3	87	22	**4400**	2	20	27	N/A	184	Ser. clay alt dacite	23N64W S.27
7816*	28	0.4	**364**	22	**2050**	-1	80	18	N/A	131	STR SED	23N64W S.27
7817*	-5	-0.2	31	15	**2400**	-1	20	12	N/A	64	STR SED	23N64W S.27
7818*	-5	-0.2	41	17	**1650**	-1	11	12	N/A	65	STR SED	23N64W S.27
7821*	IS	-0.2	68	25	**2200**	1	21	22	N/A	108	STR SED	23N64W S.26
7825*	-5	-0.2	22	13	**2200**	-1	10	11	N/A	40	STR SED, HCA6	23N67W S.17
7826*	-5	-0.2	39	17	**1700**	1	13	15	N/A	56	STR SED, HCA6	23N67W S.17
7827*	**132**	-0.2	45	16	1300	2	15	13	N/A	45	STR SED, HCA6	23N67W S.17
7830*	IS	-0.2	23	13	**1900**	1	13	14	N/A	56	STR SED	23N64W S.33
7831*	IS	-0.2	20	15	**4300**	2	13	12	N/A	43	STR SED	23N64W S.33
7834*	-5	-0.2	112	81	**4350**	2	16	44	N/A	92	Andesite tuff	23N64W S.28
7836*	-5	0.2	64	45	**>5000**	1	11	23	N/A	41	Siliceous volc. breccia	23N64WS.34
7838	-100	4.5	10	69	N/A	2	**970**	N/A	N/A	620	Rhyolite porphyry	23N64W S.34
7839*	-5	1	**>2000**	72	**>5000**	5	**132**	**210**	N/A	312	STR SED	23N64W S.34
7841*	-5	-0.2	**349**	17	1250	-1	18	**96**	N/A	52	And. agg. qz-carb vns.	23N64W S.34
7842	N/A	N/A	**100**	40	N/A	1	28	N/A	N/A	94	STR SED	23N64W S.34
8858*	6	0.2	64	51	55	2	**357**	15	N/A	156	Gray clay, Loc. lost	23N64W S.34
2196*	-5	0.2	**281**	18	50	-1	19	22	N/A	66	STR SED	23N64W S.33
2197*	-5	0.4	**221**	23	150	1	41	23	N/A	87	STR SED	23N64W S.33
2198*	-5	0.4	**240**	22	80	2	35	25	N/A	85	STR SED	23N64W S.33
2199*	-5	0.3	**247**	23	95	2	37	25	N/A	88	STR SED	23N64W S.33
2200*	-5	0.4	**268**	22	90	2	46	23	N/A	88	STR SED	23N64W S.33
2228*	-5	2.8	**172**	72	145	-1	**2526**	66	N/A	**1321**	Meta andesite	23N64W S.34
2229*	7	0.2	**297**	77	450	2	38	90	N/A	90	Silica carbonate dike	23N64W S.34

Sample #	Au ppb	Ag ppm	As ppm	Cu ppm	Hg ppb	Mo ppm	Pb ppm	Sb ppm	Tl ppm	Zn ppm	Rock Type	Location
2401*	IS	0.2	**348**	26	60	2	48	24	N/A	121	STR SED	23N64W S.34
2402*	-5	0.2	**298**	26	50	1	48	18	N/A	109	STR SED	23N64W S.27
2403*	-5	0.2	**263**	28	80	1	47	19	N/A	109	STR SED	23N64W S.27
2404*	-5	0.5	**334**	27	60	-1	43	18	N/A	152	STR SED	23N64W S.27
2405*	-5	0.3	**264**	24	90	-1	33	17	N/A	135	STR SED	23N64W S.27
2406*	IS	0.3	**325**	21	70	-1	28	14	N/A	119	STR SED	23N64W S.27
SH9001	-5	-0.5	41	N/A	**3150**	-1	N/A	-5	1	N/A	Altered Gemuk Group	23N64W S26
SH9002	8	-0.5	68	N/A	**3900**	-1	N/A	-5	-1	N/A	GG Andesite	23N64W S.26
SH9008	14	**14.6**	12	N/A	120	-1	N/A	-5	1	N/A	GG Andesite, rhyolite?	23N64W S.34
SH9011	**161**	-0.5	-5	N/A	65	-1	N/A	-5	-1	N/A	Clay from Rhyolite	23N64W S.26
SH9018	-5	0.6	**589**	N/A	**2750**	1	N/A	29	1	N/A	Rhyolite, AGG contact	23N64W S.26
SH9019	-5	-0.5	**1197**	N/A	**>5000**	6	N/A	**343**	2	N/A	Rhyolite breccia	23N64W S.26
SH9020	**80**	3.2	**1782**	N/A	750	-1	N/A	-5	1	N/A	STR SED	23N64W S.26
SH9021	-5	-0.5	**379**	N/A	1500	1	N/A	-5	1	N/A	Rhyolite porphyry	23N64W S.26
SH9022	**1002**	-0.5	20	N/A	170	-1	N/A	-5	-1	N/A	Rhyolite, AGG contact	23N64W S.26
SH9026	44	**21.8**	**325**	N/A	**5000**	**59**	N/A	**210**	2	N/A	Rhyolite porphyry	23N64W S.26
SH9029	**567**	0.6	**963**	N/A	170	1	N/A	-5	2	N/A	Rhyolite breccia	23N64W S.26
SH9031	**185**	0.5	36	N/A	170	-1	N/A	-5	1	N/A	STR SED	23N64W S.26
E09618	**471**	N/A	11.8	N/A	45	N/A	N/A	11	N/A	N/A	Same as SH9022	23N64W S.26