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

GEOLOGIC REPORT 1/10/90

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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.

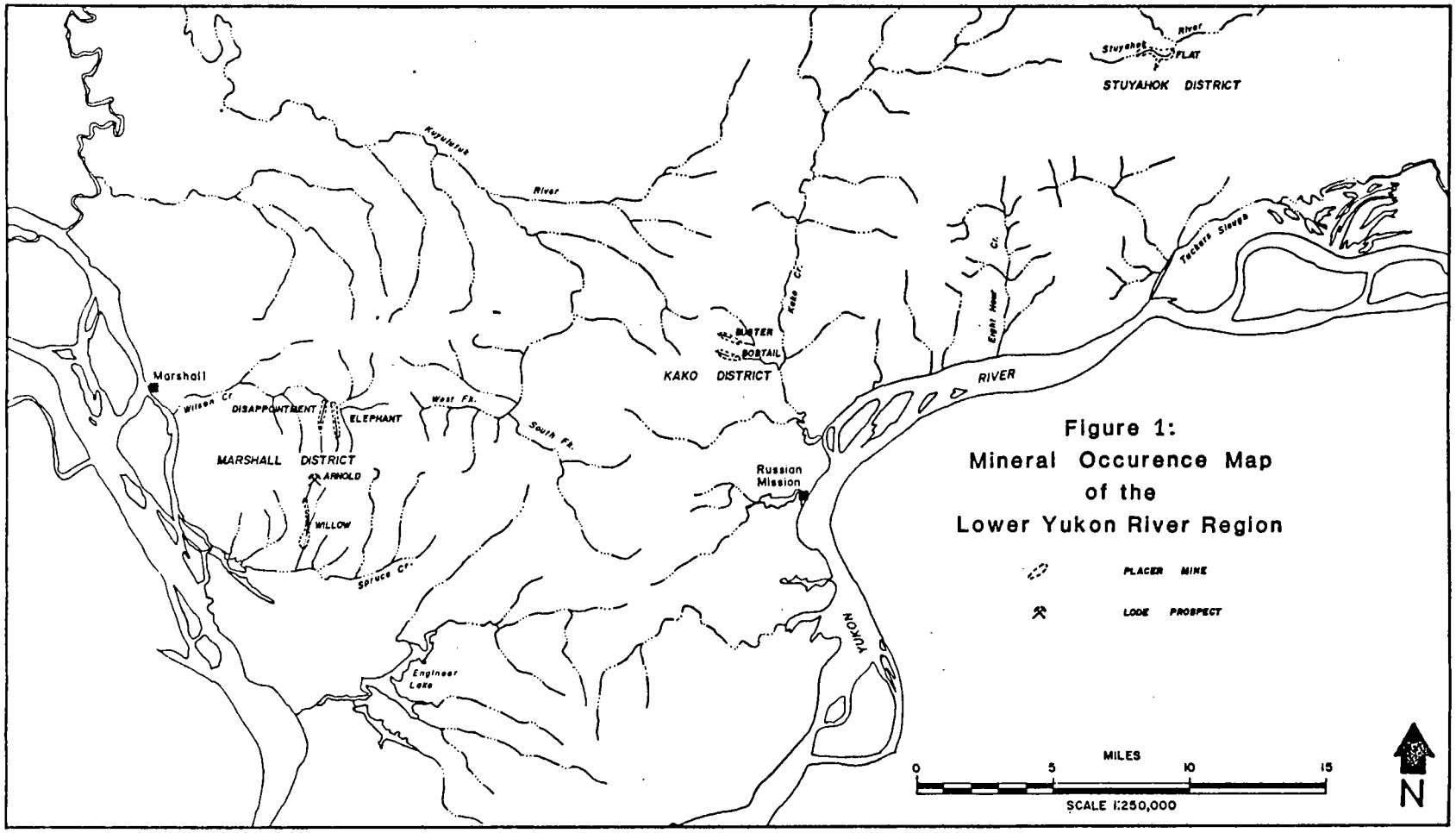
Access

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.


Kuyuluruk River
Marshall
Wilson Cr
DISAPPOINTMENT
ELEPHANT
West Fk.
South Fk.
MARSHALL DISTRICT
ARNOLD
WILLOW
Spruce Cr.
Engineer Lake
KAKO DISTRICT
BUSTER
BOBTAIL
Kako Cr.
Russian Mission
YUKON
RIVER
Eight Mile Cr.
Tacketa Slough
Stuyahok River
FLAT
STUYAHOK DISTRICT
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

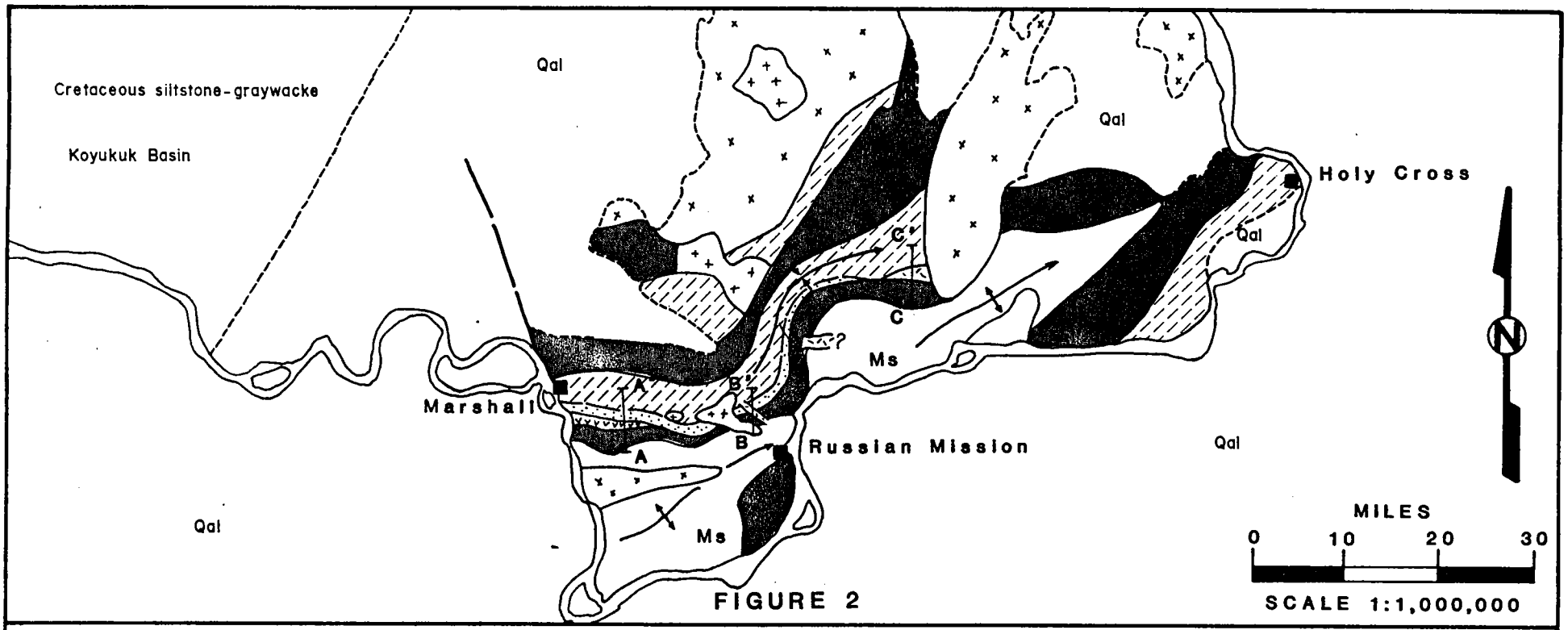


FIGURE 2

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.

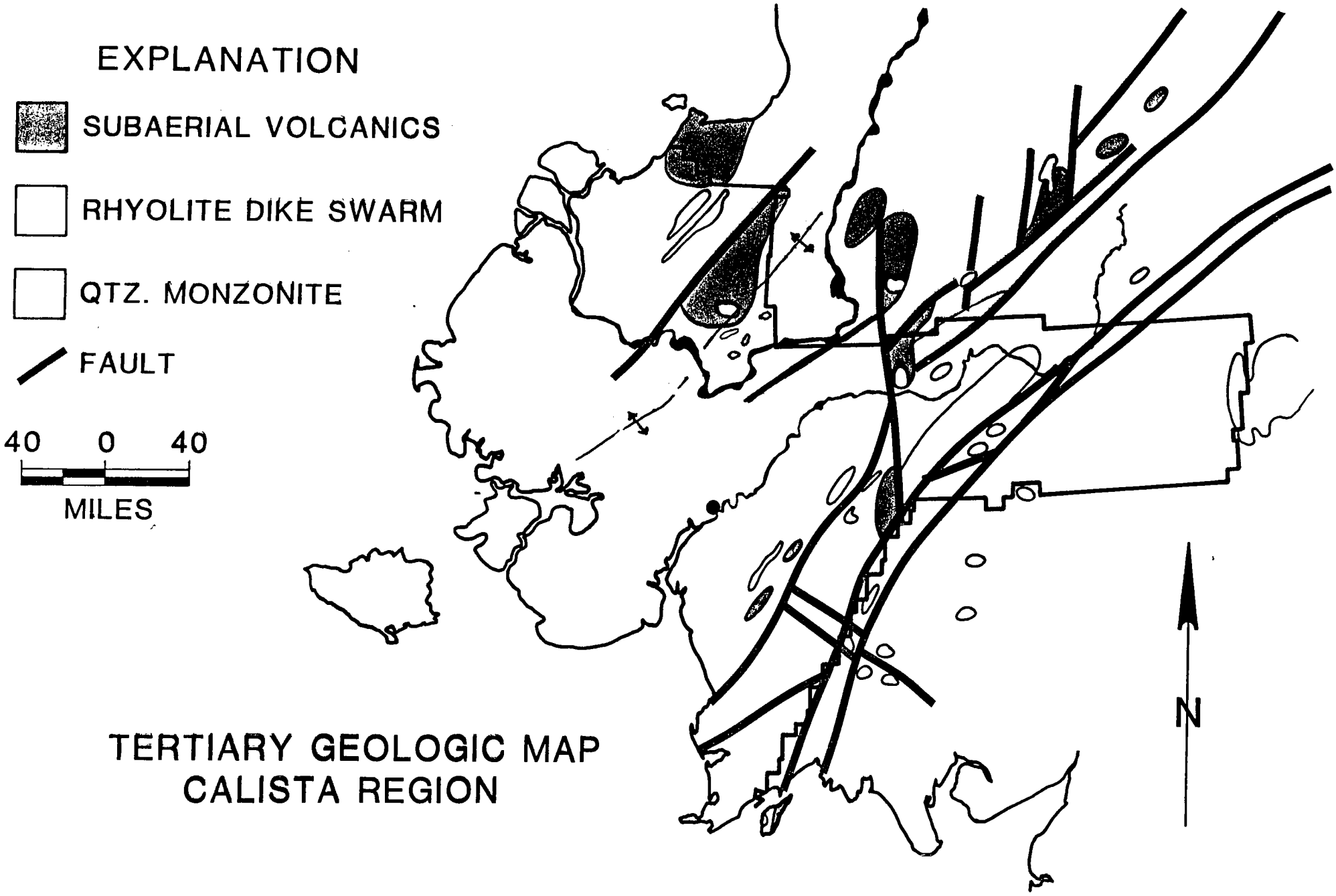
Regional Mineralization

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.

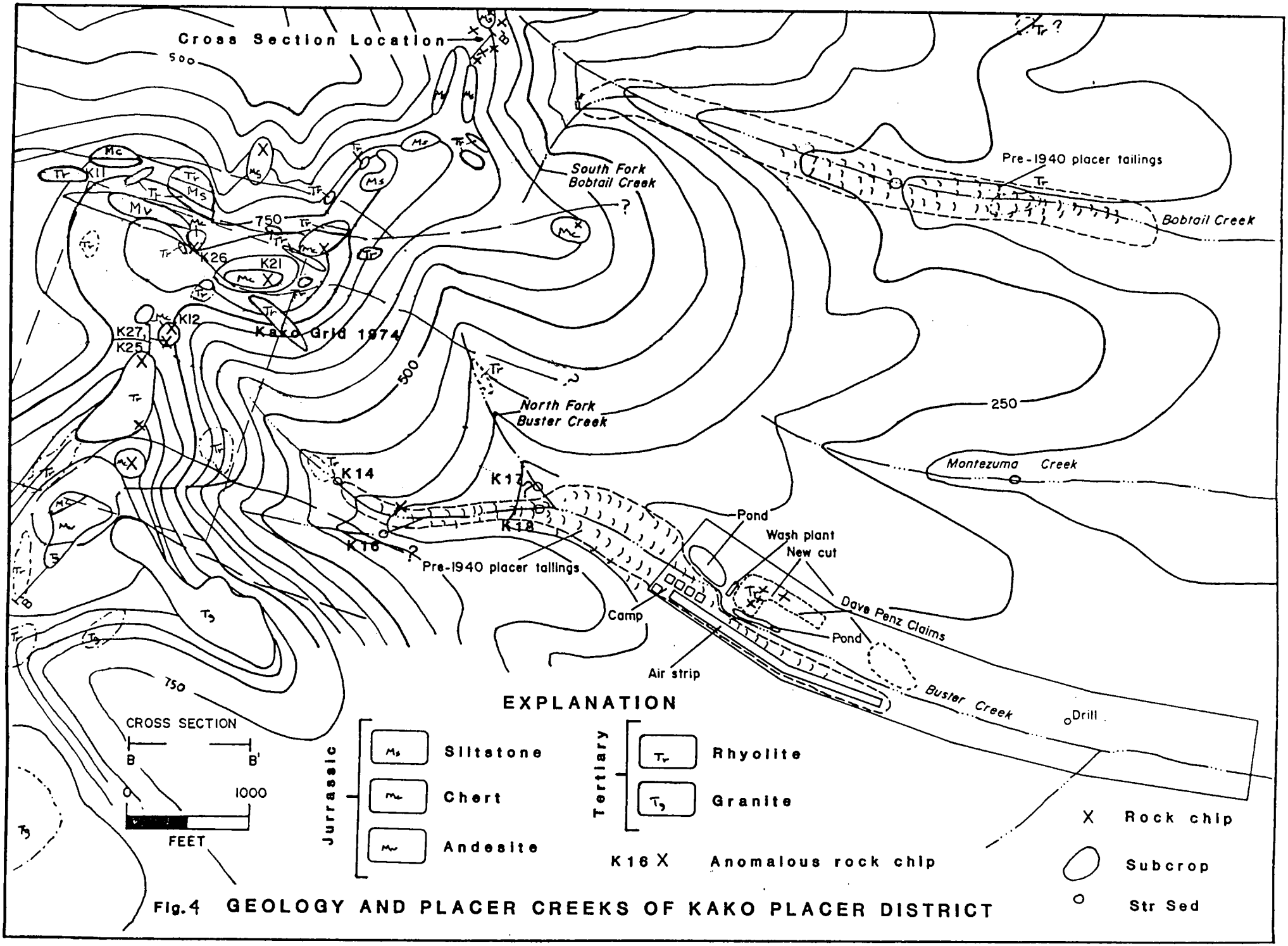


Fig. 4 GEOLOGY AND PLACER CREEKS OF KAKO PLACER DISTRICT