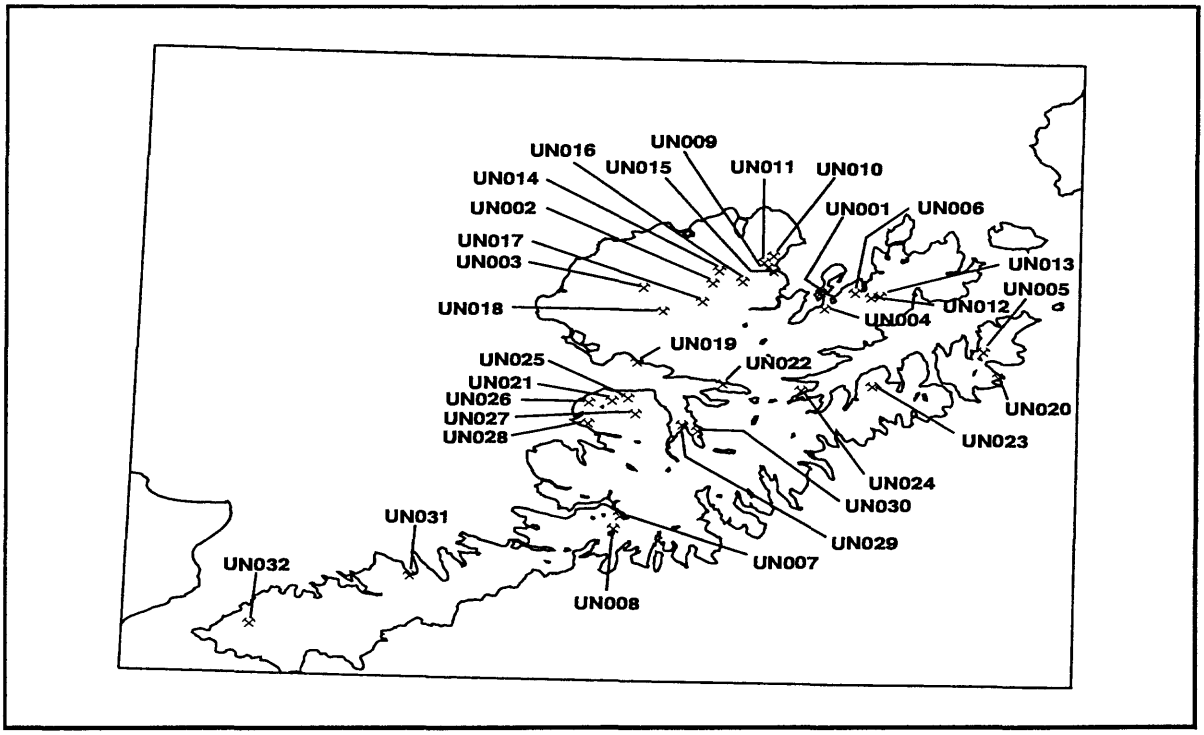
Alaska Resource Data File

U.S. Department of the Interior — U.S. Geological Survey

Unalaska quadrangle

Description of the mineral occurrences shown on the accompanying figure follow. See U.S. Geological Survey (1996) for description of the information content of each field in the records. The data presented here is maintained as part of a statewide database on mines, prospects and mineral occurrences throughout Alaska.



Distribution of mineral occurrences in the Unalaska 1:250,000-scale quadrangle, Aleutian Islands, Alaska

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OPEN-FILE REPORT 96-270

Site: Amaknak Island

Type: Occurrence

ARDF no. UN001

Latitude: 53.885 **Quadrangle:** UN D-2

Longitude: 166.5483

Location description and accuracy:
Locality is 1.6 km south of Dutch Harbor airport on Amaknak Island and corresponds to locality 1 of Cobb (1972, MF-446); it is accurate to about 400 m. It also is anomaly no. 27 of Christie (1974).

At least one of these quartz veins was gold-bearing on the basis of a report in Drewes and others (1961).

Commodities:
Main: Au **Other:**

Ore minerals: Gold, pyrite

Gangue minerals: Quartz

Geologic description:
Christie (1974) reported a color anomaly caused by the oxidation of disseminated pyrite in volcanic breccia of the Unalaska Formation (see Drewes and others, 1961) cut by small swarms of feldspar porphyry andesite and hornblende-biotite porphyry basalt (lamprophyre) dikes. Dikes are oriented 010° dipping 80° E. The dikes are weakly mineralized, however small vuggy quartz veins occur adjacent to some dikes. At least one of these quartz veins was gold-bearing on the basis of a report in Drewes and others (1961). Fracturing in the area varies from moderate to intense.

Alteration:
Rocks are regionally propylitically altered or metamorphosed to low-grade. Area of locality is highly iron-stained. Christie (1974) reported the alteration assemblage of epidote-chlorite-kaolinite-pyrite accompanied by moderate to intense leaching.

Workings/Exploration:
Brief reconnaissance mapping and sampling reported by Christie (1974); however, in 1992 the entire ridge was being quarried for riprap and fill and being removed for commercial port development (F.H. Wilson, unpublished data, 1992).

Age:
Miocene or younger

Deposit model:
Epithermal gold vein

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992)
25

Production: No **Status:** Inactive

Production notes:

Reserves:

Additional comments:
This and other undescribed occurrences were apparently reported to Drewes and others (1961) by some one named Eakle on the basis of local reports.

References:
Berg and Cobb, 1967; Cobb, 1972, MF-446; Drewes and others, 1961; Christie, 1974

Primary reference: Christie, 1974

Reporter: L.P. Niles; S.W. Bie; Damon Bickerstaff, F.H. Wilson

Reporter affiliation: USGS

Last report date: 5/04/94

Site: Makushin River Placer

Type: Occurrence

ARDF no. UN002

Latitude: 53.8967 **Quadrangle:** UN

Longitude: 166.7792

Location description and accuracy:
Locality is about 9 km east of Broad Bay landing strip on the Makushin River and corresponds to locality 4 of Cobb (1972, MF-446). Accurate within about 300 m.

A few minute grains of gold panned from 2 tributaries on north side of Makushin River.

Commodities:
Main: Au **Other:**

Ore minerals: Gold

Gangue minerals:

Geologic description:
A few minute grains of gold were panned from 2 tributaries on north side of Makushin River. Above these streams is a conspicuous gossan of altered and pyritized rocks of the Unalaska Formation (see Drewes and others, 1961).

Alteration:

Workings/Exploration:

Age:
Quaternary

Deposit model:
Placer gold-PGE

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
39a

Production: No **Status:** Inactive

Production notes:

Reserves:

Additional comments:
Stream gradient about 75 m/km.

References:
Cobb, 1972, MF-446; 1980; Drewes and others, 1961

Primary reference: Drewes and others, 1961

Reporter: L.P. Niles, D.F. Huber, F.H. Wilson

Reporter affiliation: USGS

Last report date: 3/18/96

Site: Makushin Volcano Sulfur

Type: Prospect

ARDF no. UN003

Latitude: 53.8875 **Quadrangle:** UN D-3

Longitude: 166.9267

Location description and accuracy:
Location is in crater at summit of Makushin Volcano (Maddren, 1919a, p. 285, fig. 3). Coordinates were derived from Drewes and others (1961, plate 75) and are thought to be accurate within about a 1.6 km radius.

The richest sulfur deposits are within 0.7 m of surface, but some are present up to 5 m deep.

Commodities:
Main: S **Other:**

Ore minerals: Sulfur

Gangue minerals:

Geologic description:
Twenty to thirty acres of bare ground in summit crater icecap of Makushin Volcano contain several active fumaroles and vents. Decomposed basalt is altered to a gray-creamy white mantle more than 5 m thick. The richest sulfur deposits are within 2 feet (0.7 m) of surface, but some are present up to 16 feet (5 m) deep. Sulfur is most conspicuous along cracks and crevices, and as incrustations around fumarole vents. Probably not more than 5 acres of the area contain high grade deposits of sulfur (Maddren, 1919).

Alteration:
Hydrothermal alteration of basalt(?).

Workings/Exploration:
Some drilling up to 16 feet (5 m) deep during sampling by USGS (Maddren, 1919).

Age:

Deposit model:
fumarolic sulfur, hydrothermal, volcanogenic

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production: Yes; small **Status:** Inactive

Production notes:
According to Veniaminov (1840), there was some production of sulphur during Russian occupation.

Reserves:
Only about 5 acres contain high-grade ore; estimated at 1,800 tons per acre within 2 feet (0.7 m) of surface. Lower grade material and or deeper may yield as much as 4,900 tons of sulfur per acre to a 16 foot (5 m) depth (Maddren, 1919).

Additional comments:
Extensive evaluation and drilling by State of Alaska for geothermal evaluation conducted in 1970's and 1980's (Motyka, 1983; Motyka and others, 1983; 1988; Nye and others, 1984; Queen, 1989; Reeder, 1982, AOF 163; Reeder, 1982 in Watson; Republic Geothermal, Inc., 1983; 1984; 1985). Some Russian sulphur production prior to 1840.

References:
Veniaminov, 1840, p. 84; Brooks, 1911; 1916; 1919; Maddren, 1919, B692-E; Bain, 1946; Snyder, 1959; Drewes and others, 1961; Cobb, 1980; Motyka, 1983; Motyka and others, 1983; 1988; Nye and others, 1984; Queen, 1989; Reeder, 1982, AOF 163; Reeder, 1982 in Watson; Republic Geothermal, Inc., 1983; 1984; 1985

Primary reference: Maddren, 1919

Reporter: L.P. Niles; S.W. Bie

Reporter affiliation: USGS

Last report date: 1/07/92

Site: Pyramid Peak, Ruby Mine

Type: Mine

ARDF no. UN004

Latitude: 53.8583 **Quadrangle:** UN D-2

Longitude: 166.54

Location description and accuracy:
Location is on northwest slope of Pyramid Peak, near Obernoi Point; 2 km southwest of Unalaska Village at elevation of about 500 feet (150 m), it corresponds to locality 2 of Cobb (1972, MF-446). Latitude and longitude are accurate to within about 200 m.

Colorless to tan quartz vein contains very fine-grained visible gold (< 1 mm) and trace pyrite.

Commodities:
Main: Au, Cu, Ag **Other:** Pb, Zn

Ore minerals: Gold, chalcopyrite, pyrite

Gangue minerals: Limonite, quartz

Geologic description:
According to Collier (1905) and Simpson (1986), this historic mine was developed on quartz veins localized on vertical joint sets in andesitic volcaniclastic rocks of the Unalaska Formation. An adit approximately 300 feet (60 m) deep followed the veins and joints in the andesitic rocks. The main vein varies in width from 6 feet (2 m) at widest part to 1 foot (0.3 m) at ends of tunnels and crosscuts. This colorless to tan quartz vein contains very fine-grained visible gold (< 1 mm) and trace pyrite and chalcopyrite. The tan color is thought to be due to very fine-grained oxidized pyrite (Simpson, 1986). Underground, the quartz breccia/vein zone varies from 40 feet (12 m) wide to as much as 80 (24 m) feet on the east. Quartz is similar to that on surface and also contains open spaces having crystals to 1/4" (6 mm) long. Samples collected by Simpson (1986) underground from a small stockpile near a winze contained visible galena, chalcopyrite and sphalerite. From this, he concluded that sulfide concentration apparently increases with depth. Numerous dikes cut tuffs and flows of the country rock. Above the adit the bedrock is well exposed, below it "*** exposures are non-existent due to thick vegetation ***(Simpson, 1986)."

Alteration:
Regional propylitic alteration; wall rocks show little or no alteration.

Workings/Exploration:
According to Collier (1905) the main tunnel runs east about 20 feet (7 m), then south approximately 150 feet (45 m) crosscutting joints and the main ore body, which are developed by short drifts. Tunnel then turns east and follows a little-mineralized joint for several hundred feet (> 60 m). A cable tramway had connected the mine with 3-stamp mill, both of which were in ruins by 1904. Collier (1905) reports assay of 0.02 oz/ton gold (about 0.7 ppm), and a trace of silver from the face of a drift on the main ore body. Kennecott-Alaska channel samples across vein ranged between 0.1 and 0.9 ppm gold (Simpson, 1986). Undescribed samples collected underground by Kennecott-Alaska (Simpson, 1986) contained up to 1.15 ppm gold, 9.4 ppm silver, 3,000 ppm copper, 8,070 ppm lead, and 4,200 ppm zinc.

Age:
Late Tertiary or younger

Deposit model:
Epithermal gold vein

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
25

Production: Yes, small **Status:** Inactive

Production notes:

Construction of a mill and extensive underground workings suggest some production. However, Simpson (1986) expressed opinion that no ore was probably ever shipped.

Reserves:

Additional comments:

The mill was apparently constructed on the basis of very high assays, which were not realized at the time of milling (Collier, 1905). The mill was apparently moved from the Apollo Mine (PM006) on Unga Island (Norton, 1907). Other undescribed occurrences are nearby according to Simpson (1986).

References:

Becker, 1898; Collier, 1905; Norton, 1907; Jaggar, 1908; Atwood, 1909; 1911; Wedow and others, 1952; Drewes and others, 1961; Berg and Cobb, 1967; Cobb, 1972, MF-446; Simpson, 1986

Primary reference: Simpson, 1986

Reporter: L.P. Niles; S.W. Bie; F.H. Wilson

Reporter affiliation: USGS

Last report date: 5/6/96

Site: Sedanka Island; Biorka

Type: Prospect

ARDF no. UN005

Latitude: 53.7917 **Quadrangle:** UN D-1

Longitude: 166.20

Location description and accuracy:
Locality is 4 km south of Biorka Village, 0.9 km east of Udamat Bay on Sedanka Island. The locality corresponds to locality 3 of Cobb (1972, MF-446), it is accurate within about 300 m. It is also equivalent in part to anomaly no. 15 of Christie (1974).

Average analysis of 29 samples along narrow mineralized zone was 6.8 percent Zn. Average of 19 samples was 9.1 percent Zn, 0.24 percent Pb, 0.45 percent Cu, 0.04 oz/ton Au,

Commodities:
Main: Au, Ag, Cu, Zn **Other:** Cd, Pb

Ore minerals: Sphalerite, chalcopyrite, argentiferous galena, gold

Gangue minerals: Quartz, ankerite, pyrite

Geologic description:
Quartz and ankerite in nearly vertical veins in N 60°W striking fractures in diorite that forms hanging wall of fault that strikes N 80°E and dips 55°S. Richest mineralization near fault; fine-grained greenstone of footwall is barren. Veins contain sphalerite, abundant pyrite, a small amount of chalcopyrite and argentiferous(?) galena, and a small amount of gold. Pyrite is also disseminated throughout diorite. Deposit along fault has been exposed for 70 m along strike, with mineralization zone a maximum of 18 m high and averaging more than 13 meters. Ore shoot extends at least 14 m beyond sampled zone, with fault traceable for at least 900 m west, and possibly 3.2 km east of mineralized zone, but no mineralization has been detected outside of the sampled area. Ores deposited at temperature below 138° C (Drewes and others, 1961, p. 658).

Alteration:
Christie (1974) reports pervasive development of chlorite and minor sericite and quartz veinlets near diorite.

Workings/Exploration:
A 70 by 12 m area of tundra overburden was stripped by hydraulic methods and explosives, and 29 channel samples collected along strike of deposit for 75 m during USBM investigations in 1945 (Webber and others, 1946). Average analysis of 29 samples along narrow mineralized zone was 6.8 percent Zn. Average of 19 samples was 9.1 percent Zn, 0.24 percent Pb, 0.45 percent Cu, 0.04 oz/ton Au, 1.4 oz/ton Ag. Benefication tests showed that concentrates contained 0.3 percent Cd. Sampling in 1979 by Resource Associates of Alaska (Butherus, 1979) yielded gold values ranging from 200 ppb to 12 ppm (0.348 oz/t). Christie (1974) did not visit the "zinc" occurrence, however reconnaissance mapping in the area and limited sampling resulted in samples yielding up to 205 ppm copper, 1,000 ppm zinc, 3.1 ppm silver, and 0.34 ppm gold.

Age:

Deposit model:
Polymetallic vein

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
22c

Production: No **Status:** Inactive

Production notes:

Reserves:

Additional comments:

References:

Bain, 1946; Webber and others, 1946, RI-3967; Twenhofel, 1953; Drewes and others, 1961; Berg and Cobb, 1967; Cobb, 1972, MF-446; Butherus, 1979; Randolph, 1991

Primary reference: Webber and others, 1946

Reporter: L.P. Niles; S.W. Bie; F.H. Wilson

Reporter affiliation: USGS

Last report date: 3/18/96

Site: Mount Coxcomb

Type: Prospect

ARDF no. UN006

Latitude: 53.88462 **Quadrangle:** UN C-2

Longitude: 166.47595

Location description and accuracy:
Mineralized area on the northwest side of Mount Coxcomb extends for approximately 2 km along coast of Iliuliuk Bay, immediately southwest of Summer Bay and extends into Summer Bay valley on its west side. Equivalent to anomaly no. 17 of Christie (1974).

Veins fill open space fractures, 3 inches to 3 feet (0.7 to 1 m) wide, 10 to 20 feet (3 to 6 m) long, spaced a few to tens of

Commodities:
Main: Au **Other:** Ag

Ore minerals: Pyrite, chalcopyrite?

Gangue minerals: Quartz, sericite, chlorite

Geologic description:
Alteration and mineralization occurs in rocks of the Unalaska Formation (see Drewes and others, 1961), composed of volcanic breccia, volcaniclastic sedimentary rocks, debris flows, and rare lava flows. The dominant lithology within the altered zone is regionally propylitized andesitic tuff and flows (Randolph, 1991). A number of hypabyssal dioritic stocks, possibly cupolas related to the Captain's Bay pluton, intrude the prospect areas. Emplacement of the stocks generated peripheral hydrothermal systems, which filled structures and fractures with cockscomb quartz, presumably related to stock emplacement (Randolph, 1991). Randolph (1991) reports two styles of mineralization at Mt. Coxcomb. Most common is a wide-spaced quartz vein system characterized by scattered emplacement of non-brecciated comb quartz over a large area. Veins fill open space fractures, 3 inches to 3 feet (0.7 to 1 m) wide, 10 to 20 feet (3 to 6 m) long, spaced a few to tens of feet apart. Veining is spatially related to hypabyssal stocks and faulting. Ore grade gold is restricted to the quartz veining. The veins occasionally yield pyrite or arsenopyrite, but have low silver, mercury, and base metal values. The second style of mineralization is in large-scale vein systems that are composite emplacement of brecciated cockscomb quartz along major structural breaks. The structures are typically 10 to 40 feet (3 to 12 m) thick and more than 1,000 feet (300 m) long. These display no wall rock alteration, except for silicification within the anastomosing zones. Gold values can reach or grade, silver, mercury and arsenic are only weakly anomalous and the veins are sulfide-free.

Alteration:
Regional propylitic alteration overprinted by silicic and sericitic alteration is common, as is the introduction of pyrite throughout the altered volcanic breccia. Area is highly iron-stained, apparently derived from weathering of pyrite.

Workings/Exploration:
Battle Mountain Exploration Co. (BMEC) established three sampling grids over part of area. The C1 and C3 grids were located on wide-spaced vein systems are described above although a zone large-scale vein system also crosses the C1 grid. The C1 grid produced gold-in-soil values to 776 ppb and first-pass gold in rock values of 0.36 oz/t (12 ppm) and greater than 50 ppm arsenic; mineralization appeared to be restricted to wide-spaced cockscomb quartz veins and not to pervasively silicified or "crackle-brecciated" tuffs. A geophysical survey of the grid indicated a major north dipping mineralizing structure, localized on a mapped fault, runs through the grid. Channel sampling along the trend outlined at least 322 feet (100 m) of 0.06 oz/t gold. The C2 grid produced no significant gold values. The C3 grid, located approximately 1 km north of the C1 grid, yielded significantly higher gold-in-soil than C1 at 3,500 ppb and significantly lower arsenic than C1 grid.

Sampling of quartz veins produced gold and silver values as high as 2.932 oz/t (102 ppm) and 14.3 ppm, respectively. A geophysical survey outlined a NNW-trending anomaly within the north central portion of the C3 grid. Rock sampling along this anomaly averaged 0.75 oz/t (26 ppm) gold and defined an open-ended trend measuring roughly 100 by 200 feet (30 by 60 m). BMEC reported that gold has been panned in the vicinity of Mt. Coxcomb since before 1900 and BMEC mapping crews found several prospect pits and tunnels in the area.

Age:
Late Tertiary or younger

Deposit model:
Epithermal gold vein; disseminated gold

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
25

Production: Undet. **Status:** Inactive

Production notes:

Reserves:

Additional comments:
At north end of altered zone, along Summer Bay road, the ruins of what may have been a tramway come down a steep gully. During W.W.II, Mount Coxcomb was the site of a major shore battery and the tramway may be related to that installation rather than any workings.

References:
Drewes and other, 1961; Christie, 1974; Randolph, 1991; F.H. Wilson and E.A. Bailey, unpublished data, 1992.

Primary reference: Randolph, 1991

Reporter: F.H. Wilson

Reporter affiliation: USGS

Last report date: 5/6/96

Site: Pumicestone Bay

Type: Prospect

ARDF no. UN007

Latitude: 53.5195 **Quadrangle:** UN B-3

Longitude: 166.9579

Location description and accuracy:
South of the head of Pumicestone Bay, on south side of river entering bay from the southwest. Anomaly 41 of Christie (1974).

The quartz stockwork contained gold to 272 ppb and slightly anomalous lead and barium.

Commodities:
Main: Au, Ag **Other:** Pb, Ba, Zn

Ore minerals: Chalcopyrite, sphalerite, galena, pyrite

Gangue minerals: Magnetite, specularite, epidote, chlorite

Geologic description:
Christie (1974) reported a single 3,000 ft (900 m) by 1,500 ft (450 m) color anomaly whereas later evaluations by Randolph and Ellis (1989) and Randolph (199) described three color anomalies aligned along a steep valley wall. Country rock is the Unalaska Formation (see Drewes and others, 1961), near a sheared contact with the Shaler batholith. Granodiorite of the pluton occurs below the color anomalies at elevations below about 600 feet (200 m). Prospect lies at contact with metamorphosed impure sandstone, breccia, and quartz pebble conglomerate. Stockwork veining and silicification is locally developed within an exposed volume of 600 by 160 feet, having a 75 foot thickness (180 x 50 x 20 m). Semi-parallel northeast-trending shear zones cut off the quartz stockwork and silicification to the northwest. Quartz veining occurs parallel and/or marginal to these shear zones. Largest of these quartz veins are about 1 foot (30 cm) wide, gossanous, and contains up to 20 percent pyrite (Randolph, 1991) and rare chalcopyrite, sphalerite and or galena (Christie, 1974; Randolph, 1991). Randolph's (1991) interpretation was that there were two episodes of veining, where the sulfide-bearing shear-hosted veins cut the earlier quartz stockwork.

Alteration:
Rocks are regionally propylitically altered and also hornfelsed as a result of proximity to the Shaler batholith (Simpson, 1986). Highest gold grades are associated with zones of "pyrite-silica" alteration in "spotted andesite" (Simpson, 1986).

Workings/Exploration:
Battle Mountain Exploration Co. (BMEC) established a sampling grid over one exposure of hornfelsed volcaniclastic and or graywacke that has been strongly stockworked and silicified. Quartz stringer densities were as high as 2 per inch (2.54 cm) and only rarely contain visible sulfides. The quartz stockwork contained gold to 272 ppb and slightly anomalous lead and barium. Quartz veins hosted in the northeast-trending shear zones contain up to 275 ppb gold, 31.5 ppm silver, 0.24 percent lead, 0.14 percent zinc, elevated barium and insignificant mercury and arsenic (Randolph, 1991).

Age:
Miocene or younger

Deposit model:
Polymetallic vein, epithermal gold vein

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
22c, 25

Production: No **Status:** Inactive

Production notes:

Reserves:

Additional comments:
Randolph (1991) gave the prospect a poor potential for economic gold mineralization due to remoteness, ruggedness of the environment, and the lack of evidence for economic mineralization.

References:
Christie, 1974; Simpson, 1986; Randolph and Ellis, 1989; Randolph, 1991

Primary reference: Randolph, 1991

Reporter: F.H. Wilson

Reporter affiliation: USGS

Last report date: 5/6/96

Site: Reinken, Bornite Lake

Type: Prospect

ARDF no. UN008

Latitude: 53.49878 **Quadrangle:** UN A-3

Longitude: 166.97040

Location description and accuracy:
Three km south of the head of Pumicestone Bay in a lake basin; the lake is locally called Bornite Lake.

Reported 18th or 19th century mining by Russians.

Commodities:
Main: Cu, Au(?), Ag **Other:** Hg

Ore minerals: Pyrite

Gangue minerals: Quartz

Geologic description:
Quartz veins up to 60 cm wide cut a silicified roche moutonnee immediately north of lake. Roche moutonnee is pervasively silicified and 500 feet wide by 1,500 feet long (150 x 450 m). Up to 30 percent pyrite occurs in veins and silicified rock. Country rock shown in Drewes and others (1961) as Unalaska Formation, about 2 km from mapped southern margin of Shaler batholith (granodiorite).

Alteration:
Pervasive silicification of country rocks.

Workings/Exploration:
Reported 18th or 19th century mining by Russians. No evidence remains of Russian activity; prospect possibly staked by John and Leon Reinken in 1929. Kennecott-Alaska (Simpson, 1986) collected 23 rock samples; Battle Mountain Exploration Co. (Randolph, 1991) collected pan concentrates and an additional 9 rock samples. None of BMEC rock samples were anomalous in gold; one contained 4.8 ppm silver, 9,085 ppm copper, and 410 ppb mercury. However, pan concentrates contained up to 240 ppb gold and 920 ppm copper.

Age:
Miocene or younger

Deposit model:
Polymetallic vein, epithermal gold vein

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
22c, 25

Production: No **Status:** Inactive

Production notes:

Reserves:

Additional comments:
Reportedly mined during Russian period (Simpson, 1986; erroneously reported as the 1600's), Randolph (1991) gave the prospect a poor potential for economic gold mineralization due to remoteness, ruggedness of the environment, and the lack of evidence for economic mineralization.

References:
Drewes and others, 1961; Simpson, 1986; Randolph, 1991

Primary reference: Randolph, 1991

Reporter: F.H. Wilson

Reporter affiliation: USGS

Site: Makushin Valley

Type: Prospect

ARDF no. UN009

Latitude: 53.92384 **Quadrangle:** UN C-2

Longitude: 166.66332

Location description and accuracy:
North side of Makushin River Valley, about 5,000 feet (1.5 km) inland from coast at Broad Bay. Prospect extends over a distance of about 1 km along and below ridge.

Gold grades derived from chip samples across the Makushin Vein system range up to 0.48 oz/t (16 ppm) and 3.12 oz/t (107 ppm) silver, although Simpson (1986) reported 0.1 to 1 ppm gold is

Commodities:
Main: Au, Ag **Other:** As, Hg

Ore minerals: Gold, pyrite

Gangue minerals: Quartz, chlorite, epidote

Geologic description:
Propylitically altered porphyritic andesite and andesitic volcaniclastic rocks of the Unalaska Formation (see Drewes and others, 1961) contain quartz veins ranging from 1 inch (3 cm) to 2 feet (60 cm) in thickness, The veins are erratic (in distribution?) and discontinuous and trend N 50-60° W (Simpson, 1986). Quartz veins are exposed on the ridge and in the "Makushin Vein" at 1,500' (450 m) elevation in steep slopes on the north side of the valley. These veins consist of milky white quartz, trace pyrite and anomalous gold and silver. The lower elevation "Makushin Vein" ranges between 4 and 7 feet (1.2 to 2.1 m) thick and is traceable for 1,200 feet (360 m). It trends N 70° W and dips steeply to the southwest. The Makushin Vein is composed of quartz that varies from gray to white and except for one observed 3 inch (8 cm) wide sulfide and visible gold-bearing zone, is sulfide free. The sulfide-bearing zone is located in approximately the center of the vein and contains very fine-grained sulfides and gold (0.1 mm) in a matrix of chlorite and epidote (Simpson, 1986). Later work by Battle Mountain Exploration Co. (Randolph, 1991) found the Makushin Vein bifurcates into two main structural trends running E-W and NW-SE. East-west trending veins are composed of massive, milky quartz that has been brecciated and then healed by multiple void-filling bands of cockscomb quartz. Northwest-southeast trending "veins" generally have dense zones of quartz "crackle-breccia." Other nearby veins were examined by BMEC and typically were moderately anomalous in gold.

Alteration:
Wall rocks are propylitically altered volcaniclastic rocks that show no wall-rock alteration as a result of veining. Propylitic alteration is thought to predate mineralization and is probably not associated with quartz veining and gold mineralization.

Workings/Exploration:
Extensive sampling and mapping by Kennecott-Alaska in 1985 (Simpson, 1986) and BMEC in 1990 (Randolph, 1991). Veins along the ridge contained anomalous gold and silver but too widely spaced and discontinuous to be of interest (Simpson, 1986). Gold grades derived from chip samples across the Makushin Vein system range up to 0.48 oz/t (16 ppm) and 3.12 oz/t (107 ppm) silver, although Simpson (1986) reported 0.1 to 1 ppm gold is more typical. The zone having visible sulfides and gold yielded one sample of 8.575 oz/t gold (294 ppm) and 85.87 oz/t (2,944 ppm) silver (Simpson, 1986). Fluid inclusion studies suggest a formation temperature of 230 to 250°C; however, the system apparently did not undergo boiling (Randolph, 1991). BMEC sampling indicated NW-SE trend yields gold values consistently below 500 ppb while E-W trend ranged from 570 ppb to 3.34 opt (115 ppm). Arsenic and mercury values are high, whereas base metal values are low.

Age:
Late Tertiary or younger

Deposit model:
Epithermal gold vein

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
25

Production: No **Status:** Inactive

Production notes:

Reserves:
Based on a body 450 by 60 by 2m, reserves of 110,000 tons suggested by Simpson (1986). No grade given.

Additional comments:

References:
Drewes and others, 1961; Simpson, 1986; Randolph, 1991

Primary reference: Randolph, 1991

Reporter: F.H. Wilson

Reporter affiliation: USGS

Last report date: 5/6/96

Site: Mak North

Type: Prospect

ARDF no. UN010

Latitude: 53.94240 **Quadrangle:** UN C-2

Longitude: 166.65183

Location description and accuracy:
Located approximately 2,500 m north of Makushin River on northernmost ridge between Broad and Wide Bays. Occurrence extends for at least 9,000 feet (2,800 m) in an east-west direction. Latitude and longitude is of central point of vein system.

The Mak North vein system is intermittently exposed over a lateral distance of at least 9,000 feet (2,800 m) and a vertical distance of 1,000 feet (300 m).

Commodities:
Main: Au, Ag **Other:** As, Hg

Ore minerals: Gold, pyrite

Gangue minerals: Quartz

Geologic description:
Very similar to Makushin Valley (UN009) vein; in particular the east-west trending part of the Makushin Valley vein system. Quartz veins occur in propylitically altered porphyritic andesite and andesitic volcaniclastic rocks of the Unalaska Formation (see Drewes and others, 1961). The Mak North vein system is intermittently exposed over a lateral distance of at least 9,000 feet (2,800 m) and a vertical distance of 1,000 feet (300 m). The veins are composed of massive, milky quartz that has been brecciated and then healed by multiple void-filling bands of cockscomb quartz. The Mak North vein system has a reported range in thickness from 2 to 20 feet (0.7 to 7 m).

Alteration:
Regional propylitic alteration; no apparent wall-rock alteration around vein.

Workings/Exploration:
The main or "discovery" zone of the vein system was originally located from the air and was channel sampled using a line spacing of roughly 15 m. This sampling outlined a strike length of about 60 m having gold values averaging 0.024 oz/t (0.82 ppm), and having a highest value of 0.034 oz/t (1.17 ppm) over 7.5 m. Other sampling of the vein yielded gold values as high as 690 ppb. The veins have identical Au/Ag/Hg/As and base metal signatures as the east-west veins in the Makushin Valley (UN009) occurrence (Randolph, 1991).

Age:
Late Tertiary or younger

Deposit model:
Epithermal gold vein

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
25

Production: No **Status:** Inactive

Production notes:

Reserves:

Additional comments:
See also UN009, UN011

References:
Drewes and others, 1961; Randolph, 1991

Primary reference: Randolph, 1991

Reporter: F.H. Wilson

Reporter affiliation: USGS

Last report date: 12/18/92

Site: Mid Vein

Type: Occurrence

ARDF no. UN011

Latitude: 53.93158 **Quadrangle:** UN C-3

Longitude: 166.67194

Location description and accuracy:
Located approximately 1.2 km north of Makushin River between the Mak North and Makushin Valley prospects, about 2.5 km inland of Broad Bay and 1.25 km NW of the Makushin Valley prospect.

Commodities:
Main: Au **Other:** As

Ore minerals: Gold

Gangue minerals:

Geologic description:
Very similar to Makushin Valley (UN009) vein; in particular the east-west trending part of the Makushin Valley vein system. Quartz veins occur in propylitically altered porphyritic andesite and andesitic volcaniclastic rocks of the Unalaska Formation (see Drewes and others, 1961). Discontinuously exposed for at least 900 m on strike, having a width of 5 to 7.5 m.

Alteration:
Regional propylitic alteration; no apparent wall-rock alteration around vein.

Workings/Exploration:
Twelve channel samples collected along discontinuous outcrop. Six samples yielded gold values between 100 and 650 ppb. The 2 highest samples yielded 1,062 ppb (over 6 m) and 1,748 ppb (over 2 m) gold.

Age:
Late Tertiary or younger

Deposit model:
Epithermal gold vein

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
25

Production: No **Status:** Inactive

Production notes:

Reserves:

Additional comments:

References:
Drewes and others, 1961; Randolph, 1991

Primary reference: Randolph, 1991

Reporter: F.H. Wilson

Reporter affiliation: USGS

Last report date: 12/18/92

Site: Misty Mountain

Type: Occurrence

ARDF no. UN012

Latitude: 53.87762 Quadrangle: UN C-2

Longitude: 166.44176

Location description and accuracy:
Locality is southeast of Summer Bay lake and is accurate.

"The veining appears to be controlled by several shear zones that developed in response to large-scale faulting (Randolph, 1991)."

Commodities:
Main: Au Other: Hg

Ore minerals: Gold

Gangue minerals: Quartz, arsenopyrite(?)

Geologic description:
This occurrence is primarily a very high (more than 40 colors per pan) gold pan concentrate anomaly. Country rocks are strongly propylitically altered andesitic tuffs and flows capped by unaltered basaltic volcanic rocks. The andesitic rocks host a wide-spaced cockscomb quartz vein system containing rare arsenopyrite. "The veining appears to be controlled by several shear zones that developed in response to large-scale faulting (Randolph, 1991)." Battle Mountain Exploration Co. considered the source of the pan concentrate anomaly indeterminate as their fieldwork was unable to delineate a source. A ridge to the north of the occurrence hosts several wide-spaced quartz vein systems; however, sampling did not locate highly anomalous areas.

Alteration:
Regional propylitic alteration; no apparent wall-rock alteration around vein.

Workings/Exploration:
Pan concentrate, rock, and soil sampling by BMEC. Rock sampling was of andesitic rocks cut by quartz veins in the stream basin. Highest gold from these rocks was 168 ppb, pan concentrate from the basin yielded 170 ppb Au and 930 ppb Hg.

Age:
Late Tertiary or younger

Deposit model:
Epithermal gold vein

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
25

Production: No **Status:** Inactive

Production notes:

Reserves:

Additional comments:

References:
Randolph, 1991

Primary reference: Randolph, 1991

Reporter: F.H. Wilson

Reporter affiliation: USGS

Last report date: 12/18/92

Site: Royal Dutch

Type: Occurrence

ARDF no. UN013

Latitude: 53.88003 **Quadrangle:** UN C-2

Longitude: 166.42279

Location description and accuracy:
Near head of westernmost stream draining into Humpy Cove of Summer Bay, approximately 2.8 km inland.

Rock (vein) samples had gold values to 6.58 oz/t (225 ppm) gold, 0.1 oz/t (3.4 ppm) silver, and 6,167 ppm arsenic.

Commodities:
Main: Au **Other:**

Ore minerals: Gold

Gangue minerals: Arsenopyrite, epidote

Geologic description:
Randolph (1991) reports this occurrence is very similar to Misty Mountain (UN012). "The prospect appears to be located within a transition zone between 2 regional rock packages. The lower package includes andesitic flows and tuffs and the upper package is a thick sequence of basaltic flows and lahars. *** Unlike Misty Mtn., both rock packages *** exhibit propylitic alteration, quartz veining, and intrusion by dioritic to gabbroic plutons (Randolph, 1991)." A wide-spaced cockscomb quartz/arsenopyrite vein system covers an area approximately 600 by 1,000 feet (180 x 300 m) and the veins have a dominant trend of N 30° W. Veins approach 2 feet (0.7 m) in thickness and vary in density from one vein to tens-of-feet to many veins per foot. In areas of high density veining the country rock is strongly propylitized and contains abundant epidote. Mineralization is restricted to quartz veins.

Alteration:
Regional propylitic alteration; increased(?) wall-rock propylitic alteration in association with veining.

Workings/Exploration:
Pan concentrate, rock, and soil sampling by BMEC (Randolph, 1991). Rock (vein) samples had gold values to 6.58 oz/t (225 ppm) gold, 0.1 oz/t (3.4 ppm) silver, and 6,167 ppm arsenic. Only two rock samples on NW margin of grid had anomalous mercury, but pan concentrates had high mercury. Twenty of 29 rock samples had gold greater than 130 ppb. Nineteen of those 20 contain more 52 ppm As. Of the 8 rocks containing more than 400 ppm As, 5 contained more than 1 ppm Au, suggesting strong correlation between As and Au.

Age:
Late Tertiary or younger

Deposit model:
Epithermal gold vein

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
25

Production: No **Status:** Inactive

Production notes:

Reserves:

Additional comments:

References:
Randolph, 1991

Primary reference: Randolph, 1991

Reporter: F.H. Wilson

Reporter affiliation: USGS
Last report date: 5/7/96

Site: Makushin Valley NC

Type: Occurrence

ARDF no. UN014

Latitude: 53.91667 **Quadrangle:** UN

Longitude: 166.76667

Location description and accuracy:
North central part of Makushin Valley; anomaly no. 5 of Christie (1974).

Commodities:
Main: Au, Ag **Other:**

Ore minerals: Pyrite

Gangue minerals: Magnetite

Geologic description:
Small color anomaly in Unalaska Formation (see Drewes and others, 1961) at contact with porphyritic diorite. Diorite has miarolitic cavities and contains less than 0.5 percent pyrite and abundant magnetite. Christie (1974) reports this as a small system, yet in notes indicates it is a 1 mile (1.6 km) by 0.5 mile (800 m) northeast trending zone.

Alteration:
Diorite shows alteration to epidote and chlorite, probably propylitic alteration. Partial leaching reported but not of what was leached.

Workings/Exploration:
Six samples collected showed very low silver, gold, copper, and molybdenum, probably not much above background.

Age:
Cenozoic

Deposit model:
Copper porphyry(?) or epithermal vein(?)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
17, 25

Production: No **Status:** Inactive

Production notes:

Reserves:

Additional comments:

References:
Drewes and others, 1961; Christie, 1974

Primary reference: Christie, 1974

Reporter: Damon Bickerstaff, F.H. Wilson

Reporter affiliation: USGS

Last report date: 5/03/94

Site: Wide Bay

Type: Occurrence

ARDF no. UN015

Latitude: 53.91667 **Quadrangle:** UN

Longitude: 166.65000

Location description and accuracy:
North corner of Wide Bay, Unalaska Bay, Unalaska Island. Anomaly no. 26 of Christie (1974).

Commodities:
Main: Cu **Other:**

Ore minerals: Chalcopyrite, pyrite

Gangue minerals:

Geologic description:
This is a very small 100 by 200 foot (30 by 60 m) color anomaly localized along andesite dikes that cut volcanic flows and pyroclastic rocks of the Unalaska Formation (see Drewes and others, 1961). The dikes trend 300° (N30°E) and dip steeply south. Chalcopyrite and pyrite are disseminated in narrow envelopes in the wall rocks surrounding the dikes. Oxidation obscures original textures and may have obliterated evidence of primary chalcopyrite. Very minor chalcopyrite remains. Fracturing is moderately developed.

Alteration:
Silicification is the only form of alteration other than oxidation described. Leaching ranges from moderate to intense.

Workings/Exploration:
Brief reconnaissance mapping and collection of one silt sample yielding background results for copper, molybdenum, zinc, silver, and gold.

Age:
Miocene or younger

Deposit model:

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production: No **Status:** Inactive

Production notes:

Reserves:

Additional comments:

References:
Drewes and others, 1961; Christie, 1974

Primary reference: Christie, 1974

Reporter: Damon Bickerstaff, F.H. Wilson

Reporter affiliation: USGS

Last report date: 5/04/94

Site: Makushin Valley SE

Type: Occurrence

ARDF no. UN016

Latitude: 53.90000 **Quadrangle:** UN

Longitude: 166.71667

Location description and accuracy:
Southeast side of Makushin Valley. Anomaly no. 6 of Christie (1974).

Commodities:
Main: Cu **Other:** Ag

Ore minerals: Pyrite

Gangue minerals: Magnetite

Geologic description:
Color anomaly in Unalaska Formation (see Drewes and others, 1961) associated with porphyritic diorite. Diorite is weakly altered, contains miarolitic cavities, less than 0.5 percent pyrite and more than 2 percent magnetite. Fracturing is locally strongly developed and strikes east and northeast. No chalcopyrite seen. Zone containing more than 2 percent pyrite is roughly 600 ft (180 m) by 4,000 ft (1220 m).

Alteration:
Possibly propylitic and argillic alteration. Partial leaching, fractures largely leached.

Workings/Exploration:
Single sample reported, reconnaissance mapping. Sample showed 90 ppm copper and 1.4 ppm silver.

Age:
Cenozoic

Deposit model:
Copper porphyry(?)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
17

Production: No **Status:** Inactive

Production notes:

Reserves:

Additional comments:

References:
Drewes and others, 1961; Christie, 1974

Primary reference: Christie, 1974

Reporter: Damon Bickerstaff, F.H. Wilson

Reporter affiliation: USGS

Last report date: 5/03/94

Site: Makushin River

Type: Occurrence

ARDF no. UN017

Latitude: 53.86667 **Quadrangle:** UN

Longitude: 166.80000

Location description and accuracy:
Headwaters of south fork of Makushin River. Anomaly no. 19 of Christie (1974).

Commodities:
Main: Au, Ag **Other:**

Ore minerals:

Gangue minerals: Pyrite, pyrrhotite.

Geologic description:
A pale yellow-brown to dark red-brown color anomaly 3,000 ft (900 m) in diameter located in volcanic flows and pyroclastic rocks of the Unalaska Formation (see Drewes and others, 1961) is reported by Christie (1974). These volcanic rocks are intruded by numerous small dikes and plugs of diorite containing sparse disseminated pyrite. Post-mineralization andesite and gabbro dikes are present. "Fracture sulfides were important in several areas that are now totally leached. No evidence for copper mineralization was seen there or elsewhere in the system Christie, 1974."

Alteration:
Argillic alteration is characteristic with there being local development of silicification and sericitic alteration. Leaching (of sulfides?) is complete in fractures and only partial where they are disseminated (Christie, 1974).

Workings/Exploration:
Limited reconnaissance mapping and 8 soil(?) samples. Samples contained up to 2.4 ppm silver, one contained 0.44 ppm gold.

Age:
Cenozoic

Deposit model:
Epithermal gold vein(?)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
25

Production: No **Status:** Inactive

Production notes:

Reserves:

Additional comments:

References:
Drewes and others, 1961; Christie, 1974

Primary reference: Christie, 1974

Reporter: Damon Bickerstaff, F.H. Wilson

Reporter affiliation: USGS

Last report date: 5/03/94

Site: Nateekin River

Type: Occurrence

ARDF no. UN018

Latitude: 53.85000 **Quadrangle:** UN

Longitude: 166.88333

Location description and accuracy:
North side of Nateekin River about 5 miles (8 km) upstream from Nateekin Bay. Anomaly no. 18 of Christie (1974).

Commodities:
Main: Au(?), Ag **Other:**

Ore minerals: Pyrite

Gangue minerals:

Geologic description:
A pale yellow-brown to medium red-brown color anomaly 3,000 ft (900 m) in diameter in pyroclastic rocks and volcanic flows (andesite to dacite) of Unalaska Formation (see Drewes and others, 1961). The rocks contain disseminated and locally mineralized fracture concentrated sulfides and are cut by post-mineralization augite andesite dikes. Christie (1974) indicated that there is no evidence that this sulfide system is related to an intrusive body because exposure is sufficiently good to rule out the existence of one. No copper was observed (the goal of Christie's examination efforts).

Alteration:
Propylitic to argillic - local silicification. Leaching is locally complete.

Workings/Exploration:
Limited reconnaissance mapping and 3 soil(?) samples. Samples contained up to 1.8 ppm silver, one contained 0.01 ppm gold and 9 ppm molybdenum.

Age:
Cenozoic

Deposit model:

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production: No **Status:** Inactive

Production notes:

Reserves:

Additional comments:
Localization of sulfides and silicification, the gold and silver anomalies, and the local geologic context suggests epithermal mineralization might warrant consideration.

References:
Drewes and others, 1961; Christie, 1974

Primary reference: Christie, 1974

Reporter: Damon Bickerstaff, F.H. Wilson

Reporter affiliation: USGS

Last report date: 5/7/96

Site: Humpback Bay

Type: Occurrence

ARDF no. UN019

Latitude: 53.76667 **Quadrangle:** UN

Longitude: 166.93333

Location description and accuracy:
Northwest side of Humpback Bay, Makushin Bay. Anomaly no. 9 of Christie (1974).

Commodities:
Main: Cu, Au **Other:**

Ore minerals:

Gangue minerals: Chlorite, pyrite

Geologic description:
This occurrence is a zone of orange to brown iron-staining that covers an irregularly shaped 500 ft (150 m) by 1,000 ft (300 m) area. It consists of finely disseminated pyrite in a variety of host rocks. The host rocks include a coarse-grained feldspar porphyry dacite sill or plug, amygdaloidal andesite flows and pyroclastic rocks, and fine grained feldspar-porphyritic andesite(?). Pyrite occurs in low to moderate amounts in all units; its weathering causes the gossanous oxidation. Fracturing is poorly developed, rock is fairly massive.

Alteration:
Descriptions suggests propylitic and possibly some argillic alteration; chlorite is only phase explicitly mentioned. Moderate leaching of some phase (presumably pyrite?) was reported.

Workings/Exploration:
Five samples were collected, one of which showed 92 ppm copper and one 0.02 ppm gold, otherwise results were unimpressive (Christie, 1974). Presumably, some reconnaissance mapping was conducted.

Age:
Cenozoic

Deposit model:
Copper porphyry?

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
17

Production: No **Status:** Inactive

Production notes:

Reserves:

Additional comments:

References:
Christie, 1974

Primary reference: Christie, 1974

Reporter: Damon Bickerstaff, F.H. Wilson

Reporter affiliation: USGS

Last report date: 5/8/96

Site: Unnamed

Type: Occurrence

ARDF no. UN020

Latitude: 53.75000 Quadrangle: UN

Longitude: 166.16667

Location description and accuracy:
East side of Sedanka Island. Anomaly no. 25 of Christie (1974).

Commodities:
Main: Cu **Other:** Ag

Ore minerals: Chalcopyrite, pyrite

Gangue minerals: Magnetite

Geologic description:
Color anomaly 6,000 ft (1800 m) by 2,000 ft (600 m) occurs in volcanic rocks of the Unalaska Formation (see Drewes and others, 1961). In the east half of area, scattered, intensely altered zones of pyrite-chlorite +/- epidote are separated by zones of more moderate alteration containing minor pyrite and abundant fracture-controlled magnetite and epidote. According to Christie (1974), the only possible intrusive rocks are intensely bleached and contain 3 to 10 percent pyrite. Chalcopyrite is minor and sporadic in occurrence, where present it occurs as fracture fillings and disseminated in both weakly and intensely altered rock. Where chalcopyrite does occur, grade is less than 200 ppm. Fracturing weak to moderately developed.

Alteration:
Propylitic alteration having the assemblages pyrite-chlorite +/- epidote and magnetite-epidote +/- chlorite. Christie (1974) reported leaching is weakly developed. Intensely bleached rocks containing up to 10 percent pyrite are locally present (Possible sericitic alteration?).

Workings/Exploration:
Brief reconnaissance mapping and a few soil/silt samples showed low level anomalies, most significant was 1.3 to 1.4 ppm silver.

Age:
Miocene or younger

Deposit model:
Copper porphyry?

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
17

Production: No **Status:** Inactive

Production notes:

Reserves:

Additional comments:
See UN005, Sedanka, which occurs to the northwest of this occurrence.

References:
Drewes and others, 1961; Christie, 1974

Primary reference: Christie, 1974

Reporter: Damon Bickerstaff, F.H. Wilson

Reporter affiliation: USGS

Last report date: 5/8/96

Site: Unnamed

Type: Occurrence

ARDF no. UN021

Latitude: 53.70333 **Quadrangle:** UN B-3

Longitude: 166.98333

Location description and accuracy:
West side of head of creek flowing north to Makushin Bay, Midway between Tarasof Point and USCGS Point Mist, roughly 2 km inland. Anomaly no. 1 of Christie (1974). Location accurate within 1 km.

Copper anomalies to 2,400 ppm, molybdenum to 10 ppm, and silver to 3.4 ppm from very limited sampling.

Commodities:
Main: Cu, Ag **Other:**

Ore minerals: Chalcopyrite, pyrite

Gangue minerals: Magnetite

Geologic description:
Occurrence is a 1,000 by 5,000 foot (300 by 1,500 m) color anomaly in granodiorite or diorite that intrudes rocks of the Unalaska Formation (see Drewes and others, 1961). A small but well-mineralized breccia-pipe is located nearby, possibly within the area of the color anomaly. The color anomaly is oriented N 30°E and is defines a zone containing more than 2 percent pyrite. Christie (1974) reports that areas showing 200-500 ppm copper are confined to zones having quartz veinlets which occur almost exclusively in the dike-like granodiorite to diorite porphyry. The color anomaly is covered to the northeast. Gold potential was not considered during the Quintana reconnaissance evaluation conducted by Christie.

Alteration:
Alteration of the porphyry consists of chloritized mafic minerals, chalky feldspar, and minor disseminated pyrite. In zones outward from the contact with the porphyry the Unalaska Formation displays pervasive sericitic alteration and contains minor quartz veinlets and pyrite. Peripheral to this the rocks contain sericite and pyrite in fractures which grades to pervasive developed chlorite (propylitic alteration) and pyrite limited to fractures; and finally to pervasive epidote and disseminated pyrite. Christie (1974) reports partial leaching, complete in breccia, however the leached phase is not identified.

Workings/Exploration:
Brief reconnaissance mapping and rock, stream, and soil sampling was reported by Christie (1974). Copper anomalies to 2,400 ppm, molybdenum to 10 ppm, and silver to 3.4 ppm from very limited sampling.

Age:
Miocene or younger

Deposit model:
Copper porphyry, epithermal gold vein(?)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
17, 25

Production: No **Status:** Inactive

Production notes:

Reserves:

Additional comments:
According to Christie (1974), the mineralized zone goes under cover to the northeast of the exposure and in his interpretation, if their silt sample W-7 and soil sample W-25 had been strongly anomalous, (which they weren't) a soil survey should have been done. Otherwise, he thought the apparent grade and size for a copper porphyry system were of academic interest only. Goal

was a copper porphyry system, hence sampling may not have been appropriate to evaluate gold potential.

References:
Drewes and others, 1961; Christie, 1974

Primary reference: Christie, 1974

Reporter: Damon Bickerstaff, F.H. Wilson

Reporter affiliation: USGS

Last report date: 5/13/96

Site: Portage Bay

Type: Occurrence

ARDF no. UN022

Latitude: 53.73333 **Quadrangle:** UN

Longitude: 166.75000

Location description and accuracy:
Centered in valley northeast of Cannery Point in the Portage Bay - Makushin Bay area. Anomaly no. 12 of Christie (1974).

Commodities:
Main: Au? **Other:**

Ore minerals:

Gangue minerals: Pyrite

Geologic description:
Very large, 5,000 ft (1,500 m) by more than 5,000 ft (1,500 m), intense yellow-brown to red-brown color anomaly elongated parallel to valley, roughly northeast. Pyrite is disseminated through amygdaloidal andesite flows, minor pyroclastic rocks, and porphyritic andesite. No intrusive rocks were found within the color anomaly. Christie (1974) interpreted the alteration as solfataric in nature. Fracturing is mainly post-mineralization.

Alteration:
Argillic and local silicification reported. Minor leaching.

Workings/Exploration:
Reconnaissance mapping only, no sampling.

Age:
Cenozoic

Deposit model:

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production: No **Status:** Inactive

Production notes:

Reserves:

Additional comments:

References:
Christie, 1974

Primary reference: Christie, 1974

Reporter: Damon Bickerstaff, F.H. Wilson

Reporter affiliation: USGS

Last report date: 5/03/94

Site: Beaver Inlet, Amugul Bay, Tanaskan Bay

Type: Occurrence

ARDF no. UN023

Latitude: 53.73333 **Quadrangle:** UN

Longitude: 166.43333

Location description and accuracy:
South side of Beaver Inlet centered on lands between Amugul and Tanaskan Bays. Anomaly no. 13 of Christie (1974).

Commodities:
Main: Cu, Au, Ag **Other:** Zn

Ore minerals: Chalcopyrite

Gangue minerals: Epidote, pyrite

Geologic description:
Deep red-brown to yellow-brown color anomaly 8,000 ft (2,400 m) by 3,000 ft (900 m) in size which is elongate in an east-west direction. The color anomaly occurs in a diorite to gabbro stock intruding amygdaloidal porphyritic andesite flows. Leucocratic feldspar porphyry monzonite(?) dikes are syn-mineralization, however Christie (1974) did not report which unit(s) these dikes intrude. The stock contains disseminated pyrite and trace chalcopyrite. The intruded volcanic rocks are propylitically altered and carry up to 3 to 5 percent fracture localized and disseminated pyrite. In some areas, high density fracturing is present. Locally abundant ferricrete caps the occurrence.

Alteration:
Alteration is propylitic on the basis of disseminated and fracture controlled epidote. Fractured zones are totally leached.

Workings/Exploration:
Five soil samples were collected by Christie (1974) in the course of brief reconnaissance mapping. Samples yielded up to 270 ppm copper, 198 ppm zinc, 1.6 ppm silver, and 0.04 ppm gold.

Age:
Cenozoic

Deposit model:
Copper porphyry

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
17

Production: No **Status:** Inactive

Production notes:

Reserves:

Additional comments:

References:
Christie, 1974

Primary reference: Christie, 1974

Reporter: Damon Bickerstaff, F.H. Wilson

Reporter affiliation: USGS

Last report date: 5/03/94

Site: Beaver Inlet, Erskine Bay, Kisselem Bay

Type: Occurrence

ARDF no. UN024

Latitude: 53.72500 **Quadrangle:** UN

Longitude: 166.58333

Location description and accuracy:
Point of land separating Erskine Bay and Kisselem Bay, Beaver Inlet. Anomaly no. 11 of Christie (1974).

Commodities:
Main: Cu, Ag, Au **Other:** Zn

Ore minerals: Pyrite

Gangue minerals: Chlorite

Geologic description:
Orange, brown, and purple color anomaly, 300 ft (90 m) by 1500 ft (450 m) confined to feldspar porphyry andesite. Anomaly is oriented along ridge crest, essentially east-west. Color is due to weathering of very finely disseminated pyrite. Narrow N-S trending shear zones are especially leached and fractured; their original sulfide content was indeterminate due to the extensive leaching and alteration in the shear zones. Some zones, especially the one at extreme east end of point of land, may represent zones of bleaching and alteration due to solfataric activity. Fracturing ranges from poor to intense. Other associated rocks include amygdaloidal andesite and minor coarse-grained diorite. No visible sulfides were seen in the dioritic intrusive.

Alteration:
Chlorite is only alteration phase mentioned and may indicate propylitic alteration. However, bleaching (leaching) may indicate other types of alteration. Alteration ranges from moderate to very intense.

Workings/Exploration:
Eighteen soil samples were collected in the course of reconnaissance mapping, samples contained up to 123 ppm copper, 102 ppm zinc, 1.7 ppm silver, and 0.02 ppm gold.

Age:
Cenozoic

Deposit model:
Copper porphyry, epithermal gold vein

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
17, 25

Production: No **Status:** Inactive

Production notes:

Reserves:

Additional comments:

References:
Christie, 1974

Primary reference: Christie, 1974

Reporter: Damon Bickerstaff, F.H. Wilson

Reporter affiliation: USGS

Last report date: 5/03/94

Site: Unnamed

Type: Occurrence

ARDF no. UN025

Latitude: 53.70833 **Quadrangle:** UN B-3

Longitude: 166.95000

Location description and accuracy:
Just east of the mouth of creek flowing north to Makushin Bay, Midway between Tarasof Point and USCGS Point Mist. Anomaly no. 3 of Christie (1974).

Commodities:
Main: Cu, Au **Other:**

Ore minerals: Chalcopyrite

Gangue minerals: Pyrite

Geologic description:
Small color anomaly in Unalaska Formation (see Drewes and others, 1961) at granodiorite or diorite intrusive contact. Color anomaly is a zone containing more than 2 percent sulfides (pyrite?) 500 feet (150 m) by 3,000 feet (900 m) in size and elongate to the northwest. A breccia pipe which outcrops on the shore of Makushin Bay is outside of the iron-stained color anomaly area, but contains some chalcopyrite, and has a prominent green stain.

Alteration:
Chlorite suggests propylitic alteration. Partial leaching was noted by Christie (1974).

Workings/Exploration:
Brief reconnaissance mapping and three soil samples collected. Soil samples showed moderate copper and gold anomalies, containing up to 122 ppm Cu and 0.02 ppm Au.

Age:

Deposit model:
Copper porphyry, epithermal gold vein(?)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
17, 25

Production: No **Status:** Inactive

Production notes:

Reserves:

Additional comments:

References:
Drewes and others, 1961; Christie, 1974

Primary reference: Christie, 1974

Reporter: Damon Bickerstaff

Reporter affiliation: USGS

Last report date: 4/14/94

Site: Unnamed

Type: Occurrence

ARDF no. UN026

Latitude: 53.70000 **Quadrangle:** UN B-4

Longitude: 167.03333

Location description and accuracy:
Near Cape Starichkof, Makushin Bay. Anomaly no. 2 of Christie (1974). Location accurate within approximately 1.5 km.

Occurrence contains 3 percent disseminated sulfides, largely pyrite(?) over an area 300 feet (90 m) by 2

Commodities:
Main: Mo, Au, Ag **Other:**

Ore minerals: Pyrite

Gangue minerals: Chlorite, epidote

Geologic description:
Tabular color anomaly centered on andesite (or altered diorite?) dikes cutting the Unalaska Formation (see Drewes and others, 1961). Occurrence contains 3 percent disseminated sulfides, largely pyrite(?) over an area 300 feet (90 m) by 2 miles (3.2 km). No chalcopyrite was seen.

Alteration:
Rocks show zoned propylitic alteration from epidote on periphery to chlorite in interior. Argillic alteration occurs in innermost zones. Zoned (epidote to chlorite) propylitic alteration and possible argillic alteration in core. Partial leaching was noted.

Workings/Exploration:
Brief reconnaissance mapping and 1 soil sample reported in Christie (1974). Soil sample (W-6) showed 13 ppm Mo, 3.4 ppm Ag, and 0.02 ppm Au.

Age:
Miocene or younger

Deposit model:

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production: No **Status:** Inactive

Production notes:

Reserves:

Additional comments:

References:
Drewes and others, 1961; Christie, 1974

Primary reference: Christie, 1974

Reporter: Damon Bickerstaff, F.H. Wilson

Reporter affiliation: USGS

Last report date: 4/14/94

Site: Tarasof Point

Type: Occurrence

ARDF no. UN027

Latitude: 53.68333 **Quadrangle:** UN

Longitude: 166.93333

Location description and accuracy:
West side of Anderson Bay, 2 miles (3.2 km) southwest of Tarasof Point. Anomaly no. 20 of Christie (1974). Anderson Bay is the south arm of Makushin Bay.

(Soil) Samples showed up to 260 ppm copper, 28 ppm molybdenum, 2.6 ppm silver, and 0.24 ppm gold.

Commodities:
Main: Mo, Cu, Ag, Au **Other:**

Ore minerals: Pyrite

Gangue minerals: Epidote, chlorite, limonite

Geologic description:
The occurrence is defined by multiple color anomalies surrounding breccia pipes emplaced through a pendant(?) of volcanic rocks of the Unalaska Formation (see Drewes and others, 1961) between exposures of diorite plutons. The color anomalies occur in two 1,000 ft (300 m) by 3,000 ft (915 m) areas. Late mineral quartz-feldspar porphyry and crowded feldspar porphyry dikes cut the breccia pipes. The breccia pipes may have originally contained up to 15 to 20 percent sulfides, which are now totally leached. Copper may have been present, as traces of chalcopyrite occur in the adjacent diorite plutons. Alteration and the amount of pyrite appear to decrease abruptly away from areas of breccia. According to Christie (1974), fracturing is very important (in localizing alteration?). Within the breccia pipes there is intense silicification and peripheral to this, secondary chlorite and epidote are developed. The occurrence is capped by highly altered rocks distinguished by the development of limonite.

Alteration:
The core of the occurrence shows intense silicification and on the periphery, the development of chlorite and epidote indicate propylitic alteration. Leaching is complete in the area of interest.

Workings/Exploration:
Reconnaissance mapping and multiple soil samples were used to evaluate the color anomaly. Samples showed up to 260 ppm copper, 28 ppm molybdenum, 2.6 ppm silver, and 0.24 ppm gold.

Age:
Cenozoic

Deposit model:
Copper porphyry, epithermal gold vein

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
17, 25

Production: No **Status:** Inactive

Production notes:

Reserves:

Additional comments:
The mode of occurrence suggests an epithermal gold vein model should be considered as a possible model for this system.

References:
Drewes and others, 1961; Christie, 1974

Primary reference: Christie, 1974

Reporter: Damon Bickerstaff, F.H. Wilson

Reporter affiliation: USGS

Last report date: 5/04/94

Site: Unnamed

Type: Occurrence

ARDF no. UN028

Latitude: 53.66667 **Quadrangle:** UN

Longitude: 167.03333

Location description and accuracy:
One mile (1.6 km) east of Kof Point. Anomaly no. 4 of Christie (1974).

Commodities:
Main: Cu **Other:**

Ore minerals: Chalcopyrite, pyrite

Gangue minerals:

Geologic description:
Color anomaly in Unalaska Formation (see Drewes and others, 1961) near contact with diorite(?). Anomaly is a zone containing 2 percent sulfides, 500 feet (150m) by 2000 feet (600 m) in size, elongate to the northwest. Sulfides are dominantly pyrite with traces of chalcopyrite. There appeared to be no structural control on stronger alteration and mineralization.

Alteration:
Propylitic and quartz sericitic(?) alteration. Partial leaching.

Workings/Exploration:
None, brief examination

Age:

Deposit model:

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):

Production: No **Status:** Inactive

Production notes:

Reserves:

Additional comments:

References:
Drewes and others, 1961; Christie, 1974

Primary reference: Christie, 1974

Reporter: Damon Bickerstaff, F.H. Wilson

Reporter affiliation: USGS

Last report date: 5/02/94

Site: Naginak Cove

Type: Occurrence

ARDF no. UN029

Latitude: 53.67 **Quadrangle:** UN

Longitude: 166.83

Location description and accuracy:
West and northwest side of Naginak Cove, off Anderson Bay on Unalaska Island. Anomalies no. 23 and 24 of Christie (1974).

Commodities:
Main: Cu, Mo, Ag, Au **Other:** Zn

Ore minerals: Chalcopyrite, pyrite

Gangue minerals: Chlorite

Geologic description:
This site corresponds to two color anomalies as reported by Christie (1974) The first color anomaly is 4,000 ft (1,200 m) by 2,000 ft (600 m) in size and located on a gossan occurring along the contact between granodiorite of the Shaler batholith and hornfelsed volcanic rocks of the Unalaska Formation (see Drewes and others, 1961). Christie (1974) reported that alaskite and granodiorite (including some aplite) dikes associated with the Shaler batholith are common, five or six 10 ft to 30 ft (3 to 9 m) wide dikes of which were mapped within this anomaly area. A stockwork of intense pyrite veining occurs in the vicinity of dikes as do some quartz veins having sericite-pyrite envelopes. A feldspar porphyry dike(?) is reported as showing weak propylitic alteration. The only copper (mineral) seen was in a single piece of float in a creek having chalcopyrite as fracture filling and pyrite-chalcopyrite and disseminations in adjacent wall rock.
In a second area to the south of the above color anomaly, a triangular color anomaly 3,000 ft north-south (900 m) by 1,500 ft (450 m) east-west shows a clear relationship between a sulfide system and a quartz-eye porphyry dike. The color anomaly is cut off on the east by the sea where it is widest and most intense. The dike is divided into a number of narrow stringers in the west and widens to the east where it may grade into a feldspar (+/- quartz-eyes) porphyry. Alteration is most intense and sulfides are most common where the dike is widest on east. Pyrite occurs as veins having envelopes of quartz sericite alteration within the dike and immediately adjacent wall rock. Chalcopyrite, pyrite, and chlorite occur in veins and disseminations within a zone less than 50 ft (15 m) from the dike contact. Christie (1974) mentions a mineralized zone is 200 ft by 800 ft (61 m by 244 m) in maximum size and that most of the rock in this mineralized zone contains no chalcopyrite. It is not clear what the relationship of this mineralized zone is to other parts of the described color anomaly.
Fracturing is moderately intense in both areas of color anomaly.

Alteration:
Quartz-sericite-pyrite and weak propylitic (pyrite-chlorite +/- epidote) alteration around quartz veins. Leaching is slight to moderate.

Workings/Exploration:
Reconnaissance geologic mapping and limited soil sampling. Two samples reported by Christie (1974) had 7 and 16 ppm molybdenum, 146 and 175 ppm copper, 84 and 290 ppm zinc, 1.8 and 2.1 ppm silver, and 0.03 and 0.05 ppm gold. In the southern part of the area, samples had concentrations ranging up to 16 ppm molybdenum, 510 ppm copper, 680 ppm zinc, 2.0 ppm silver, and 0.03 ppm gold.

Age:
Miocene or younger

Deposit model:
Copper porphyry, epithermal gold vein

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
17, 25

Production: No **Status:** Inactive

Production notes:

Reserves:

Additional comments:
The analytical data from very limited sampling indicate further of evaluation of this area for epithermal gold veins is probably warranted.

References:
Drewes and others, 1961; Christie, 1974

Primary reference: Christie, 1974

Reporter: Damon Bickerstaff, F.H. Wilson

Reporter affiliation: USGS

Last report date: 5/20/96

Site: Anderson Bay

Type: Occurrence

ARDF no. UN030

Latitude: 53.65833 **Quadrangle:** UN

Longitude: 166.80000

Location description and accuracy:
At 2,000 ft contour east of Undamak Cove, Anderson Bay. Anomaly no. 10 of Christie (1974).

Samples yielded up to 64 ppm molybdenum, 215 ppm copper, 1.6 ppm silver, and 0.05 ppm gold.

Commodities:
Main: Cu, Mo, Au, Ag **Other:**

Ore minerals: Pyrite

Gangue minerals:

Geologic description:
Country rock consists of amygdaloidal basic volcanic flows and pyroclastic rocks, often highly ferruginous. Christie (1974) mentioned, but did not describe a nearby intrusive body. Strongly developed, but very local and irregularly distributed gossan bodies are present due to high amounts of disseminated pyrite in rock. Fracturing is poorly to moderately developed, no orientation was reported. Work focused on two zones, 75 ft (23 m) by 100 ft (30 m) in size that contain up to 5 percent disseminated pyrite.

Alteration:
Only gossan and ferruginous alteration mentioned along with moderate leaching.

Workings/Exploration:
Forty-two silt and soil samples collected during reconnaissance mapping. Samples yielded up to 64 ppm molybdenum, 215 ppm copper, 1.6 ppm silver, and 0.05 ppm gold.

Age:
Cenozoic

Deposit model:
Copper porphyry, porphyry copper-molybdenum, epithermal gold vein

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
17, 21a, 25

Production: No **Status:** Inactive

Production notes:

Reserves:

Additional comments:

References:
Christie, 1974

Primary reference: Christie, 1974

Reporter: Damon Bickerstaff, F.H. Wilson

Reporter affiliation: USGS

Last report date: 5/03/94

Site: Mt. Aspid

Type: Occurrence

ARDF no. UN031

Latitude: 53.41667 **Quadrangle:** UN A-5

Longitude: 167.40000

Location description and accuracy:
East of Chernofski in cirque on Mt. Aspid. Anomaly no. 47 of Christie (1974).

Commodities:
Main: Cu, Mo, Au **Other:**

Ore minerals: Chalcopyrite, pyrite

Gangue minerals:

Geologic description:
A 3,000 ft by 3,000 ft (900 m by 900 m) color anomaly is developed hornfelsed volcanic rocks intruded by a quartz-eye porphyry and hornblende quartz diorite. Mineralization is apparently related to the quartz-eye porphyry (+/- plagioclase phenocrysts) and consists of pyrite and trace amounts of chalcopyrite. Fracture-controlled sulfides are generally weakly developed and related to local silicification and/or fracture-controlled sericite. Minor quartz veining is also present. Christie (1974) reported a covered area of about 600 ft by 1,000 ft (180 m by 305 m), presumably within the color anomaly area, suggesting a target might lie underneath. However, he also stated that fringing outcrops around this covered area were not well mineralized. Fracturing is generally weak.

Alteration:
Local quartz sericitic, potassic, and argillic. Leaching is weak.

Workings/Exploration:
Brief reconnaissance mapping and 6 soil or silt samples. Zinc and silver were low, however samples yielded gold as high as 0.04 ppm (detection limit 0.01 ppm) and copper was as high as 330 ppm.

Age:
Miocene or younger

Deposit model:
Copper porphyry, epithermal gold vein

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
17, 25

Production: No **Status:** Inactive

Production notes:

Reserves:

Additional comments:

References:
Christie, 1974

Primary reference: Christie, 1974

Reporter: Damon Bickerstaff, F.H. Wilson

Reporter affiliation: USGS

Last report date: 5/06/94

Site: Boulder Bay

Type: Occurrence

ARDF no. UN032

Latitude: 53.33 **Quadrangle:** UN A-6

Longitude: 167.73

Location description and accuracy:
Northeast side of Umnak Pass between Boulder Bay and Paso Point on Unalaska Island. Anomaly no. 46 of Christie (1974).

Copper, molybdenum, zinc and silver were low, however a few samples showed gold to 0.20 ppm.

Commodities:
Main: Au **Other:**

Ore minerals: Pyrite

Gangue minerals: Chlorite, epidote

Geologic description:
A small 1,500 ft (450 m) long north-south trending color anomaly is developed in hornfelsed sedimentary and pyroclastic volcanic rocks of the Unalaska Formation (see Drewes and others, 1961) cut by north-south trending monzonite and feldspar porphyry dikes. Disseminated and fracture-controlled pyrite occurs in both dike and wall rocks. Minor quartz veining is noted in the description of the occurrence as is weak fracturing.

Alteration:
Propylitic alteration as evidenced by the presence of chlorite and epidote.

Workings/Exploration:
Brief reconnaissance mapping and 4 soil or silt samples. Copper, molybdenum, zinc and silver were low, however a few samples showed gold to 0.20 ppm.

Age:
Miocene or younger

Deposit model:
Epithermal gold vein

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):
25

Production: No **Status:** Inactive

Production notes:

Reserves:

Additional comments:

References:
Drewes and others, 1961; Christie, 1974

Primary reference: Christie, 1974

Reporter: Damon Bickerstaff, F.H. Wilson

Reporter affiliation: USGS

Last report date: 5/06/94

References

Atwood, W.W., 1909, Mineral resources of southwestern Alaska: U.S. Geological Survey Bulletin 379, p. 108-152.

Atwood, W.W., 1911, Geology and mineral resources of parts of the Alaska Peninsula: U.S. Geological Survey Bulletin 467, 137 p.

Bain, H.F., 1946, Alaska's minerals as a basis for industry: U.S. Bureau of Mines Information Circular 7379, 83 p.

Becker, G.F., 1898, Reconnaissance of the gold fields of southern Alaska, with some notes on general geology: U.S. Geological Survey 18th Annual Report, pt. 3, Economic Geology, p. 1-86.

Berg, H.C., and Cobb, E.H., 1967, Metalliferous lode deposits of Alaska: U.S. Geological Survey Bulletin 1246, 254 p.

Brooks, A.H., 1911, The mining industry in 1910: U.S. Geological Survey Bulletin 480, p. 21-42.

Brooks, A.H., 1916, Mineral resources of Alaska, Report on progress of investigations in 1915: U.S. Geological Survey Bulletin 642, 279 p.

Brooks, A.H., 1919, Alaska's mineral supplies: U.S. Geological Survey Bulletin 666P, p. 89-102.

Butherus, D.L., Gressitt, E.E., Pray, Jim, Corner, N.G., Lindberg, P.A., and Fankhauser, R.E., 1979, Exploration and evaluation of the Aleut Native Corporation Lands 1979: Unpublished Resource Associates of Alaska report prepared for Houston Oil and Minerals Corporation and available from The Aleut Corporation, 69 p., 1 appendix.

Christie, J.S., 1974, Aleut-Quintana-Duval 1974 joint venture final report: Unpublished Quintana Minerals Corporation report available from The Aleut Corporation, 24 p., 3 appendices, 2 maps in pocket.

Cobb, E.H., 1972, Metallic mineral resources map of the Unalaska quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies MF-446, 1 sheet, scale 1: 250,000.

Cobb, E.H., 1980, Summaries of data on and lists of references to metallic and selected nonmetallic mineral deposits in fifteen quadrangles in southwestern and west-central Alaska (Atka, Attu, Bristol Bay, Chignik, Cold Bay, Hagemeister Island, Mount Katmai, Naknek, Port Moller, Rat Islands, Saint Lawrence, Stepovak Bay, Ugashik, Unalaska, Unimak): U.S. Geological Survey Open-file Report 80-909, 103 p.

Collier, A.J., 1905, Auriferous quartz veins on Unalaska Island: U.S. Geological Survey Bulletin 259, p. 102-103.

Drewes, Harold, Fraser, G.D., Snyder, G.L., and Barnett, H.F., Jr., 1961, Geology of Unalaska Island and adjacent insular shelf, Aleutian Islands, Alaska: U.S. Geological Survey Bulletin 1028-S, p. 583-676.

Jaggar, T.A., Jr., 1908, Journal of the Technology expedition to the Aleutian Islands, 1907: Technology Review, v. 10, no. 1, p. 1-37.

Maddren, A.G., 1919, Sulphur on Unalaska and Akun islands and near Stepovak Bay: U.S. Geological Survey Bulletin 692-E, p. 283-298.

Motyka, R.J., 1983, High-temperature hydrothermal resources in the Aleutian arc, *in* Alaska Geological Society Symposium on western Alaska geology and resource potential: Anchorage, 1982, Proceedings, Journal of the Alaska Geological Society, v. 3, p. 87-99.

Motyka, R.J., Moorman, M.A., and Poreda, R.J., 1983, Progress report - thermal fluid investigations of the Makushin geothermal area: Alaska Division of Geological and Geophysical Surveys Report of Investigations 83-15, 48 p.

Motyka, R.J., Queen, L.D., Janik, C.J., Sheppard, D.S., Poreda, R.J., and Liss, S.A., 1988, Fluid geochemistry and fluid-mineral equilibria in test wells and thermal-gradient holes at the Makushin geothermal area, Unalaska Island, Alaska: Alaska Division of Geological and Geophysical Surveys Report of Investigations 88-14, 90 p.

Norton, L.M., editor, 1907, Boston Alaskan (published in the interests of Alaska): Boston-Alaskan Society, v. 1, August, 1906-June 1907, 175 p.

Nye, C.J., Queen, L.D., and Motyka, R.J., 1984, Geologic map of the Makushin geothermal area, Unalaska Island, Alaska: Alaska Division of Geological and Geophysical Surveys Report of Investigations 84-3, scale 1:24,000.

Queen, L.D., 1989, Alteration, fluid inclusion, and water-rock equilibrium in the Makushin hydrothermal system, Unalaska Island, Alaska: Fairbanks, University of Alaska M.S. thesis, 128 p.

Randolph, D.B., 1991, Unalaska project 1990 final report, Battle Mountain Exploration Company, Alaska District: unpublished report available from The Aleut Corporation, 62 p., 5 appendices, 15 plates, various scales.

Randolph, D.B., and Ellis, W.T., 1989, Unalaska project 1989 final report, Battle Mountain Exploration Company, Alaska District: unpublished report available from The Aleut Corporation, 41 p., 5 appendices, 11 plates, various scales.

Reeder, J.W., 1982a, Hydrothermal resources of the northern part of Unalaska Island, Alaska: Alaska Division of Geological and Geophysical Surveys Open-File Report AOF-163, 17 p.

Reeder, J.W., 1982b, Hydrothermal resources of the Makushin Volcano region of Unalaska Island, Alaska, *in* Watson, S.T., ed., Conference on Circum-Pacific Energy and Mineral Resources, 3rd, Honolulu, 1982, Transactions, p. 441-450.

Republic Geothermal Inc., 1983, The Unalaska geothermal exploration project, phase 1B: Final report to Alaska Power Authority, 160 p., 16 appendices, 9 plates, scales 1:24,000 and 1:50,000.

Republic Geothermal Inc., 1984, The Unalaska geothermal exploration project, phase II: Final report to Alaska Power Authority, 104 p., 13 appendices.

Republic Geothermal Inc., 1985, The Unalaska geothermal exploration project, phase III: Final report to Alaska Power Authority, 105 p., 11 appendices.

Simpson, D.F., 1986, Aleutian Islands project 1985 final report, Kennecott-Alaska Exploration: unpublished report available from The Aleut Corporation, 54 p.

Snyder, G.L., 1959, Geology of Little Sitkin Island, Alaska: U.S. Geological Survey Bulletin 1028-H, p. 169-210.

Twenhofel, W.S., 1953, Potential Alaskan mineral resources for proposed electrochemical and electrometallurgical industries in the upper Lynn Canal area, Alaska: U.S. Geological Survey Circular 252, 14 p.

U.S. Geological Survey, 1996, Descriptions of the fields used to report brief descriptions of mines, prospects, and mineral occurrences in Alaska and Hawaii: U.S. Geological Survey Open-file Report 96-79, 5 p.

Veniaminov, Ivan, 1840, Notes on the islands of the Unalaska District, translated by Black, L.T., and Geoghegan, R.H., edited with introduction, Pierce, R.A., (1984): Alaska History No. 27, The Elmer E. Rasmuson Library Translation Program, Univ of Alaska, Fairbanks and The Limestone Press, Kingston, Ontario, Canada, 511 p.

Webber, B.S., Moss, J.M., and Rutledge, F.A., 1946, Exploration of Sedanka zinc deposit, Sedanka Island, Alaska: U.S. Bureau of Mines Report of Investigations 3967, 15 p.

Wedow, Helmuth, Jr., White, M.G., and Moxham, R.M., 1952, Interim report on an appraisal of the uranium possibilities of Alaska: U.S. Geological Survey Open-file Report 52-165, 124 p, 5 tables, 8 figures.