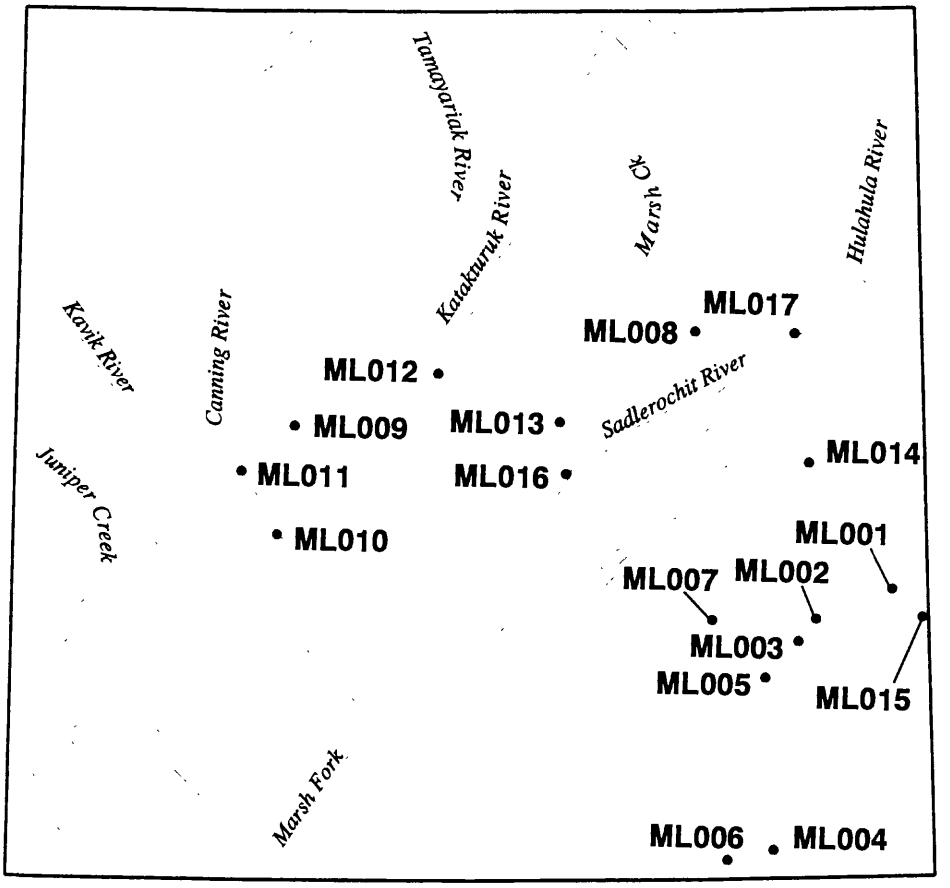
Alaska Resource Data File

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

Mount Michelson quadrangle

This publication is one in the series, the Alaska Resource Data File (ARDF) of the U.S. Geological Survey (USGS). The ARDF is an information file on mines, prospects, and mineral occurrences in Alaska exclusive of sand and gravel, coal, and oil and gas. 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.



Distribution of mineral occurences in the Mount Michelson 1:250,000-scale quadrangle, Alaska

The Mount Michelson quadrangle contains 17 known mineral occurrences. No mineral production is known from the quadrangle exclusive of sand and gravel used in oil and gas exploration west of the Canning River and north of the north flank of the Franklin Mountains.

This report is preliminary and has not been reviewed for conformity with U.S. Geological Survey editorial standards or with the North American Stratigraphic Code. Any use of trade, product, or firm names is for descriptive purposes only and does not imply endorsement by the U.S. Government.

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Most of the mountainous area within the quadrangle is in wilderness status and lies within the Arctic National Wildlife Refuge. Mountainous areas in the quadrangle are the areas most prospective for lode deposits. Of these mountainous areas, those of which pre-Mississippian rocks are exposed or are close to the surface are most prospective for vein mineralization: most of these areas are in wilderness status. Triassic and Cretaceous rock units in which phosphate, uranium, and rare earth elements occurrences are present, crop out outside the wilderness boundaries, but most lie within the wildlife refuge.

Updates to the file are based mainly on improved knowledge of the stratigraphic framework of the Mount Michelson quadrangle. Much of this information has come from work on the geologic framework of the quadrangle in support of oil and gas assessment of the Arctic coastal plain within the quadrangle.

This and related reports are accessible through the USGS World Wide Web site http://www-mrs-ak.wr.usgs.gov/ardf. Comments or information regarding corrections or missing data, or requests for digital retrievals should be directed to the author(s) of this compilation:

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Site: Leffingwell Glacier

Type: Occurrence

ARDF no. ML001

Latitude: 69.33334 **Quadrangle:** ML B-1

Longitude: 144.1167

Location description and accuracy:
Locality 25 of Brosge' and Reiser (1976) and locality 9 of Grybeck (1977). Accurate to within 1,220 meters (4,000 ft).

Commodities:
Main: Mo **Other:**

Ore minerals: Molybdenite

Gangue minerals:

Geologic description:
Scattered molybdenite crystals and small aggregates of molybdenite that are less than 1.25 centimeters (.5 in.) across are present at two localities in fresh granite of the Okpilak batholith.

Alteration:

Workings/Exploration:
None

Age:
Probably Early Devonian

Deposit model:
Lode; disseminated Mo

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

Production: No **Status:** Inactive

Production notes:

Reserves:

Additional comments:

References:
Cobb and others, 1981, p. A19; Brosge' and Reiser, 1976; Grybeck, 1977, p. 39; Sable, 1977, p. 69

Primary reference: Sable, 1977

Reporter: Powers, M.T. (Huber, D.F.); Schmidt, J.M.; Kelley, J.S.

Reporter afflilation: USGS

Last report date: 9/15/96

Site: Esetuk Glacier

Type: Occurrence

ARDF no. ML002

Latitude: 69.3 **Quadrangle:** ML B-1

Longitude: 144.3667

Location description and accuracy:
Locality 30 of Brosge' and Reiser(1976) and locality 8 of Grybeck (1977). Accurate to within 2,220 meters (4,000 ft).

Commodities:
Main: Cu, Pb, Zn **Other:** Sn, W

Ore minerals: Azurite, galena, malachite, sphalerite

Gangue minerals: Axinite, fluorite, tourmaline

Geologic description:
Galena, sphalerite, malachite, azurite, axinite, and quartz-tourmaline-fluorite veins are present in skarn. Fluorite is present in schist in contact zone on west side of the Okpilak batholith.

Alteration:

Workings/Exploration:
As much as 300 ppm Sn and 1,500 ppm W was reported, but no tin or tungsten minerals were reported.

Age:
Early Devonian(?)

Deposit model:
Lode; skarn

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

Production: No **Status:** Inactive

Production notes:

Reserves:

Additional comments:

References:
Cobb and others, 1981, p. A18; Brosge' and Reiser, 1976; Grybeck, 1977, p. 39

Primary reference: Brosge' and Reiser, 1976

Reporter: Powers, M.T. (Huber, D.F.); Schmidt, J.M.; Kelley, J.S.

Reporter afflilation: USGS

Last report date: 9/15/96

Site: Kolotuk Creek

ARDF no ML003

Latitude: 69.275 **Quadrangle:** ML B-1

Longitude: 144.425

Location description and accuracy:
Accurate to within 2,220 meters (4,000 ft).

Commodites:

Main: Cu **Other:**

Ore minerals: Azurite, malachite

Gangue minerals:

Geologic description:
Azurite and malachite stains on limestone in thermally altered zone at contact of granite with host rock. Brosge' observed no sulfides (personal obseration, 1976) at the site. Heavy minerals separated from a panned- concentrated sample of stream sediments at 69.283°N, 144.417°W contained yttocerite(?), fluorite, and 0.030 eU.

Alteration:

Workings/Exploration:
None

Age:
Possibly Early Devonian

Deposit model:
Possibly Cu skarn

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

Production: No **Status:** Inactive

Production notes:

Reserves:

Additional comments:

References:
Cobb and others, 1981, p. A19; White, M.G., 1952, p. 4,5, and 7; Brosge' and Reiser, 1976

Primary reference: Brosge' and Reiser, 1976

Reporter: Powers, M.T. (Huber, D.F.); Schmidt, J.M.; Kelley, J.S.

Reporter afflilation: USGS

Last report date: 9/13/96

Site: Itkillik Creek

Type: Occurrence

ARDF no. ML004

Latitude: 69.03333 **Quadrangle:** ML A-1

Longitude: 144.5167

Location description and accuracy:
Locality 43 of Brosge' and Reiser (1976) and locality 12 of Grybeck (1977). Accurate to within 2,220 meters (4,000 ft).

Commodities:
Main: Cu **Other:**

Ore minerals: Chalcopyrite

Gangue minerals:

Geologic description:
Chalcopyrite is present in phyllite interbedded with chert and volcanic rocks. Rocks are reported to be in the "Cambrian-Ordovician(?) Neruokpuk(?) Fm.".

Alteration:

Workings/Exploration:
None

Age:

Deposit model:
Cu in shale

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

Production: No **Status:** Inactive

Production notes:

Reserves:

Additional comments:
This occurence is unlikely to be "Neruokpuk" as the term is currently used. Sandstone, not volcanic rock, is the dominant rock type of the "Neruokpuk Schist of Leffingwell (1919)" as mapped and used by Reiser and others (1980) and Lane and others (1995).

References:
Cobb and others, 1981, p. A19; Brosge' and Reiser, 1976; Grybeck, 1977, p.40; Reiser and others, 1980; Lane and others, 1995; Barker, 1978, p.21

Primary reference: Brosge' and Reiser, 1976

Reporter: Powers, M.T. (Huber, D.F.); Schmidt, J.M.; Kelley, J.S.

Reporter afflilation: USGS

Last report date: 9/15/96

Site: Unnamed

Type: Occurrence

ARDF no. ML005

Latitude: 69.23333 **Quadrangle:** ML A-1

Longitude: 144.5333

Location description and accuracy:
Locality 33 of Brosge' and Reiser (1976); downstream of the west flank of the Okpilak batholith. Accurate to within 2,220 meters (4,000 ft).

Commodities:
Main: Au **Other:** Sn

Ore minerals: Gold

Gangue minerals:

Geologic description:
60 ppm Au and more than .1 percent Sn was found in panned concentrate of stream sediments collected downstream from zone of altered schist on west flank of Okpilak batholith.

Alteration:

Workings/Exploration:

Age:
Placer is Recent in age but lode from which the placer was probably derived is Early Devonian(?) in age.

Deposit model:
Placer Au, Sn

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

Production: No **Status:** Inactive

Production notes:

Reserves:

Additional comments:

References:
Cobb and others, 1981, p. A21-22; Brosge' and Reiser, 1976

Primary reference: Brosge' and Reiser, 1976

Reporter: Power, M.T. (Huber, D.F.); Schmidt, J.M.; Kelley, J.S.

Reporter afflilation: USGS

Last report date: 10/15/96

Site: Unnamed

Type: Occurrence

ARDF no. ML006

Latitude: 69.02278 **Quadrangle:** ML A-1

Longitude: 144.6667

Location description and accuracy:
Locality 42 of Brosge' and Reiser (1976) and locality 10 of Grybeck (1977). Accurate to within 2,220 meters (4,000 ft).

Commodities:
Main: Cu **Other:**

Ore minerals: Chalcopyrite

Gangue minerals:

Geologic description:
Chalcopyrite is present in brecciated quartzite of the Kekiktuk Conglomerate of Early Mississippian age.

Alteration:

Workings/Exploration:

Age:
Post Mississippian; brecciation implies Cretaceous or Early Tertiary age synchronous with thrusting in the Northeastern Brooks Range.

Deposit model:
Cu in sandstone

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

Production: No **Status:** Inactive

Production notes:

Reserves:

Additional comments:

References:
Cobb and others, 1981, p. A21; Brosge' and Reiser, 1976; Grybeck, 1977, p. 40; Barker, 1978, p.21

Primary reference: Brosge' and Reiser, 1976

Reporter: Powers, M.T. (Huber, D.F.); Schmidt, J.M.; Kelley, J.S.

Reporter afflilation: USGS

Last report date: 9/15/96

Site: Katak Creek

Type: Occurrence

ARDF no. ML007

Latitude: 69.3 **Quadrangle:** ML B-2

Longitude: 144.7056

Location description and accuracy:
Locality 4 of Cobb (1972, MF462); outcrop along the Katak Creek about 10 kilometers (6 mi) east-northeast of Mount Chamberlin. Accurate to withir 760 meters (2,500 ft).

Commodities:
Main: Sn **Other:**

Ore minerals: Cassiterite

Gangue minerals: Ilmenite, magnetitie, sphene, tourmaline

Geologic description:
Angular grains 0.1 to 0.8 millimeters across of cassiterite observed in thin section, from samples of the Kekiktuk Conglomerate. Some cassiterite could still be present in contact zones of Romanzov Mountains Granite, or in greisens and pyritic zones in the granite.

Alteration:

Workings/Exploration:

Age:
Placer is Early Mississippian in age and lode from which the placer was likely derived is likely Early Devonian in age.

Deposit model:
Sn placer

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

Production: No **Status:** Inactive

Production notes:

Reserves:

Additional comments:

References:
Cobb, E.H., 1972 (MF-462); Reed, 1968, p. 31, 33-34; Cobb, 1975 (OFR 75-628), p. 66; Cobb and others, 1981, p. A19

Primary reference: Reed, 1968

Reporter: Powers, M.T. (Huber, D.F.); Schmidt, J.M.; Kelley, J.S.

Reporter afflilation: USGS

Last report date: 9/13/96

Site: Itkilyariak Creek

Type: Occurrence

ARDF no. ML008

Latitude: 69.63333 **Quadrangle:** ML C-2

Longitude: 144.75

Location description and accuracy:
Locality 3 of Brosge' and Reiser (1976) and locality 3 of Grybeck (1977). Accurate to within 2,220 meters (4,000 ft).

Commodities:
Main: Cu **Other:**

Ore minerals: Native copper

Gangue minerals:

Geologic description:
Native copper is reported to be present in basalt.

Alteration:

Workings/Exploration:

Age:
Proterozoic(?)

Deposit model:
Basalt-hosted Cu

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992)
23

Production: No **Status:** Inactive

Production notes:

Reserves:

Additional comments:

References:
Cobb and others, 1981, p. A19; Brosge' and Reiser, 1976; Grybeck, 1977, p. 39

Primary reference: Brosge' and Reiser, 1976

Reporter: Powers, M.T. (Huber, D.F.); Schmidt, J.M.; Kelley, J.S.

Reporter afflilation: USGS

Last report date: 9/13/96

Site: Nanook Creek

Type: Occurrence

ARDF no. ML009

Latitude: 69.52500 **Quadrangle:** ML

Longitude: 146.07500

Location description and accuracy:
Localities 6 and 7 of Brosge' and Reiser (1976) and locality 1 of Grybeck (1977). Accurate to within 2,220 meters (4,000 ft).

Commodities:
Main: Cu **Other:**

Ore minerals: Azurite, malachite, native copper

Gangue minerals:

Geologic description:
Native copper, malachite, and azurite stains are present at two localities in basalt that is locally amygdalordal. Azurite and malachite is also present in breccia zone in Devonian or older dolomite overlying the basalt. These dolomites are likely part of the Katakturuk Dolomite which depositionally overlies the basalt in which the copper is present. The Katakturuk Dolomite is considered Proterozic in age and hence the basalt is also likely Proterozoic in age.

Alteration:

Workings/Exploration:

Age:
Proterozoic(?)

Deposit model:
Basalt-hosted Cu

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992)
23

Production: No **Status:** Inactive

Production notes:

Reserves:

Additional comments:

References:
Cobb and others, 1981, p. A20; Brosge' and Reiser, 1976; Grybeck, 1977, p. 39

Primary reference: Brosge' and Reiser, 1976

Reporter: Powers, M.T. (Huber, D.F.); Schmidt J.M.; Kelley, J.S.

Reporter afflilation: USGS

Last report date: 9/13/96

Site: Shublik Island

Type: Occurrence

ARDF no. ML010

Latitude: 69.4 **Quadrangle:** ML B-4

Longitude: 146.1306

Location description and accuracy:
Locality 2 of Cobb (1972, MF 462) and locality 13 of Brosge' and Reiser, (1976). Accurate to within 915 meters (3,000 ft).

Commodities:
Main: U **Other:**

Ore minerals:

Gangue minerals:

Geologic description:
Sample of black limestone from the Shublik Formation of Triassic age contained .001% U.

Alteration:

Workings/Exploration:
None

Age:
Triassic(?)

Deposit model:
Limestone hosted uranium

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

Production: No **Status:** Inactive

Production notes:

Reserves:

Additional comments:

References:
Cobb, 1972 ,MF-462; Patton and Matzko, 1959, p. 12 and 14; Cobb and others, 1981, p. A20; Brosge' and Reiser, 1976

Primary reference: Patton and Matzko, 1959

Reporter: Powers, M.T. (Huber, D.F.); Schmidt J.M.; Kelley, J.S.

Reporter afflilation: USGS

Last report date: 9/13/96

Site: Canning River

Type: Occurrence

ARDF no. ML011

Latitude: 69.47222 **Quadrangle:** ML B-4

Longitude: 146.25

Location description and accuracy:
Locality 21 of Brosge' and Reiser (1976) and locality 1 of Cobb (1972, MF-462). Accurate to within 915 meters (3,000 ft).

Commodities:
Main: P; U **Other:**

Ore minerals: Apatite

Gangue minerals:

Geologic description:
Sample collected 50 meters (165 ft) above base of the Shublik Formation contained 14.7 percent P and 0.001 percent U. Bluish-black shale and limestone similar to that collected is present throughout the 80 meter (265 ft) -thick section of Shublik Formation that crops out at this location.

Alteration:

Workings/Exploration:
P up to 14.7 percent

Age:
Triassic

Deposit model:
Upwelling type phosphate

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992)
34c

Production: No **Status:** Inactive

Production notes:

Reserves:

Additional comments:

References:
Cobb, 1972, MF-462; Patton and Matzko, 1959, p. 12 and 14; Cobb and others, 1981, p. 22; Brosge' and Reiser, 1976

Primary reference: Patton and Matzko, 1959

Reporter: Powers, M.T. (Huber, D.F.); Schmidt J.M.; Kelley, J.S.

Reporter afflilation: USGS

Last report date: 9/13/96

Site: Katakturuk River

Type: Occurrence

ARDF no. ML012

Latitude: 69.58611 **Quadrangle:** ML C-3

Longitude: 145.6

Location description and accuracy:
Locality 3 of Cobb (1972, MF-462) and locality 7 of Grybeck (1977); 575 meter (1,890 ft) hill at the confluence of two forks of the Katakturuk River in the headwaters of the Katakturuk River near the south flank of the Sadlerochit Mountains. Accurate to within 455 meters (1,500 ft).

Commodities:
Main: P, U **Other:**

Ore minerals: Phosphate, uranium

Gangue minerals:

Geologic description:
Phosphatic rock is present in the lower 6 meters (20 ft) of a 30 meter (100 ft) - thick succession of black oolitic limestone in the basal part of the Schublik Fm. The phosphate rock is fine-grained and contains uniform oblong phosphatic pellets that average 0.2 long and 0.1 millimeters across. Angular grains of quartz make up 3 percent of rock. One sample contained 35.8 percent P and 0.008 percent U, and has the highest phosphate content of any sample collected from the Shublik Formation.

Alteration:

Workings/Exploration:

Age:
Triassic

Deposit model:
Upwelling type phosphate (Moiser, 1986)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992)
34c

Production: No **Status:** Inactive

Production notes:

Reserves:

Additional comments:

References:
Cobb, 1972, MF-462; Patton and Matzko, 1959, p. 12 and 14; Cobb, 1975, OFR 75-628, p. 67; Grybeck, 1977, p. 39; Mosier, 1986

Primary reference: Patton and Matzko, 1959

Reporter: Powers, M.T. (Huber, D.F.); Schmidt J.M.; Kelley, J.S.

Reporter afflilation: USGS

Last report date: 9/13/96

Site: Fire Creek

Type: Occurrence

ARDF no. ML013

Latitude: 69.53 **Quadrangle:** ML C-3

Longitude: 145.2

Location description and accuracy:
Accurate within 1.6 kilometers (1 mi).

Commodities:
Main: Phosphate **Other:** Rare Earth Elements

Ore minerals:

Gangue minerals:

Geologic description:
Phosphatic rock collected from the Shublik Formation at this location contains as much as 19.17 percent P and several times the average concentrations of rare-earth elements for similar rocks.

Alteration:

Workings/Exploration:
None

Age:
Triassic

Deposit model:
Upwelling type phosphate

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992)
34c

Production: No **Status:** Inactive

Production notes:

Reserves:

Additional comments:

References:
Cobb and others, 1981, p. A18

Primary reference: Cobb and others, 1981

Reporter: Schmidt, J.M.; Kelley, J.S.

Reporter affilation: USGS

Last report date: 9/15/96

Site: Hulahula River

Type: Occurrence

ARDF no. ML014

Latitude: 69.48 **Quadrangle:** ML B-1

Longitude: 144.38

Location description and accuracy:
Locality 5 of Grybeck (1977).

Commodities:
Main: Phosphate **Other:**

Ore minerals:

Gangue minerals:

Geologic description:
Sample of black limestone and phosphate nodules collected from the highest exposure top of the Shublik Formation at this location contained about 15 percent P.

Alteration:

Workings/Exploration:
None

Age:
Triassic

Deposit model:
Upwelling type phosphate

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992)
34c

Production: No **Status:** Inactive

Production notes:

Reserves:

Additional comments:

References:
Cobb and others, 1981, p. A18; Grybeck, 1977, p. 39; Patton and Matzko, 1959

Primary reference: Patton and Matzko, 1959

Reporter: Schmidt, J.M.; Kelley, J.S.

Reporter afflilation: USGS

Last report date: 9/15/96

Site: Okpilak River

Type: Occurrence

ARDF no. ML015

Latitude: 69.3 **Quadrangle:** ML B-1

Longitude: 144.02

Location description and accuracy:
Locality 13 of Grybeck (1977). Accurate to within 1.6 kilometers (1 mi).

Commodities:

Main: Mo, U **Other:** F, Rare Earth Elements(?)

Ore minerals: Molybdenite

Gangue minerals: Fluorite, yttrocerite(?)

Geologic description:
Fluorite, molybdenite, and yttrocerite(?) occur in samples of granite of Okpilak batholith. Representative sample in peripheral zone of granite contains 50 ppm eU. Heavy mineral fractions of concentrates contain 0.034-0.080 percent eU and 0.010-0.033 percent U.

Alteration:

Workings/Exploration:
None

Age:
Probably Early Devonian

Deposit model:
Disseminated, felsic-hosted

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

Production: No **Status:** Inactive

Production notes:

Reserves:

Additional comments:

References:
Cobb and others, 1981, p. A20; Grybeck, 1977, p. 40

Primary reference:

Reporter: Schmidt, J.M.; Kelley, J.S.

Reporter afflilation: USGS

Last report date: 9/15/96

Site: Sadlerochit River

Type: Occurrence

ARDF no. ML016

Latitude: 69.47 **Quadrangle:** ML B-2

Longitude: 145.18

Location description and accuracy:
Accurate to within 1.6 kilometers (1 mi).

Commodities:
Main: Phosphate **Other:** U

Ore minerals:

Gangue minerals:

Geologic description:
Sample from black siltstone unit of basal Shublik Fm. (Triassic) containing black phosphate nodules contains 18.4 percent P and 0.003 percent eU.

Alteration:

Workings/Exploration:

Age:
Triassic

Deposit model:
Upwelling type phosphate

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992)
34c

Production: No **Status:** Inactive

Production notes:

Reserves:

Additional comments:

References:
Cobb and others, 1981, p. A20; Patton and Matzko, 1959, p. 12-13, 15; Mosier, 1986

Primary reference: Patton and Matzko, 1959

Reporter: Schmidt, J.M.; Kelley, J.S.

Reporter afflilation: USGS

Last report date: 9/15/96

Site: Unnamed

Type: Occurrence

ARDF no. ML017

Latitude: 69.63 **Quadrangle:** ML C-1

Longitude: 144.42

Location description and accuracy:
Locality 4 of Brosge' and Reiser (1976). Accurate to within 1.6 kilometers (1 mi).

Commodities:
Main: Phosphate **Other:** U

Ore minerals:

Gangue minerals:

Geologic description:
Sample from 3 m (10 ft) thick bed, 8 meters (25 ft) above base of Triassic Shublik Formation contains 20 percent P and 0.004 percent eU.

Alteration:

Workings/Exploration:

Age:
Triassic

Deposit model:
Upwelling type phosphate (Mosier, 1986)

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992)
34c

Production: No **Status:** Inactive

Production notes:

Reserves:

Additional comments:

References:
Patton and Matzko, 1959, p. 12 to 13; Cobb and others, 1981, p. A22; Brosge' and Reiser, 1976; Mosier, 1986

Primary reference: Patton and Matzko, 1959

Reporter: Schmidt, J.M.; Kelley, J.S.

Reporter afflilation: USGS

Last report date: 9/15/96

Site: Kolotuk Creek

Type: Occurrence

ARDF no. ML003

Latitude: 69.275 **Quadrangle:** ML B-1

Longitude: 144.425

Location description and accuracy:
Accurate within 2,220 meters (4,000 ft).

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

Ore minerals: Azurite, malachite

Gangue minerals:

Geologic description:
Azurite and malachite stains on limestone in thermally altered zone at contact of granite with host rock. Brosge' observed no sulfides (personal observation, 1976) at site. Heavy minerals separated from a panned- concentrated sample of stream sediments at 69.283° N, 144.417° W, contained yttocerite(?), fluorite, and 0.030 eU.

Alteration:

Workings/Exploration:
None

Age:
Early Devonian(?)

Deposit model:
Cu skarn(?)

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

Production: No **Status:** Inactive

Production notes:

Reserves:

Additional comments:

References:
Cobb and others, 1981, p. A19; White, M.G., 1952, p. 4,5 and 7; Brosge' and Reiser, 1976

Primary reference: Brosge' and Reiser, 1976

Reporter: Powers, M.T. (Huber, D.F.); Schmidt, J.M.; Kelley, J.S.

Reporter afflilation: USGS

Last report date: 9/13/96

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