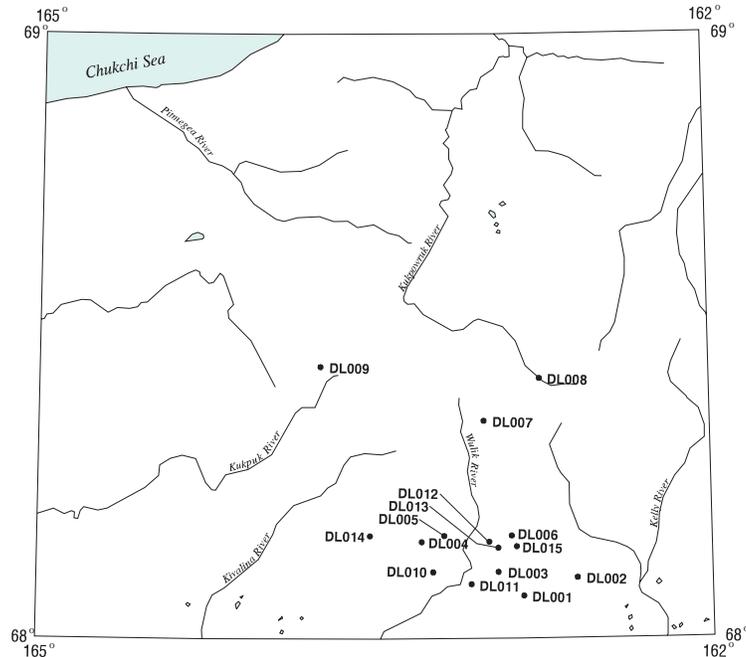


De Long Mountains quadrangle

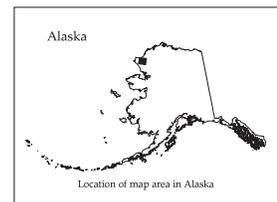
Descriptions of the mineral occurrences shown on the accompanying figure follow. See U.S. Geological Survey (1996) for a description of the information content of each field in the records. The data presented here are maintained as part of a statewide database on mines, prospects and mineral occurrences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



*Distribution of mineral occurrences in the De Long Mountains
1:250,000-scale quadrangle, northwestern Alaska*

This and related reports are accessible through the USGS World Wide Web site <http://ardf.wr.usgs.gov>. Comments or information regarding corrections or missing data, or requests for digital retrievals should be directed to: Frederic Wilson, USGS, 4200 University Dr., Anchorage, AK 99508-4667, e-mail fwilson@usgs.gov, telephone (907) 786-7448. This compilation is authored by:

Anita Williams
Anchorage, AK



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.

OPEN-FILE REPORT 00-023

Site name(s): Red Dog; Hilltop; Aqqaluk; Paalaaq

Site type: Mine

ARDF no.: DL001

Latitude: 68.0704

Quadrangle: DL A-2

Longitude: 162.8379

Location description and accuracy:

This record describes the Main Red Dog deposit, and the nearby Hilltop, Aqqaluk, and Paalaaq deposits. The map site is at the open pit of the Main deposit, two miles north-west of Deadlock Mountain in section 20, T. 31 N., R. 18 W., of the Kateel River Meridian. The Hilltop deposit is one mile south of Main deposit in section 29, T. 31 N., R. 18 W., of the Kateel River Meridian. Aqqaluk, 1,500 feet north of the Main deposit, and Paalaaq, just west-northwest of Aqqaluk, are in sections 20, 17, T. 31 N., R. 18 W., of the Kateel River Meridian.

Commodities:

Main: Ag, Pb, Zn

Other: Ba

Ore minerals: Barite, boulangerite, galena, marcasite, polybasite, pyrite, sphalerite, tetrahedrite

Gangue minerals: Quartz

Geologic description:

The DeLong Mountains are characterized by stacked and folded, thrust allochthons. The structurally lower allochthons are composed of Devonian through Cretaceous clastic and chemical sedimentary rocks. The two uppermost allochthons contain Jurassic or older mafic and ultramafic igneous sequences. Minor igneous rocks of basic composition are exposed 0.6 mile northeast of Red Dog (Kulas, 1992).

The Red Dog deposit complex comprises multiple, superimposed thrust fault slices of stratabound, massive sulfides and barren mudstones. It occurs in black, siliceous shale and chert of the Mississippian to Pennsylvanian Kuna Formation. The Kivalina unit, an interbedded calcarenite and calcareous shale, is the footwall of the deposit. Mineralization is syngenetic with respect to sediment deposition. Silicification occurs within and peripheral to the main mass of sulfides. A barite facies is concentrated toward the top and periphery of the deposit. Major sulfides in decreasing order of abundance are sphalerite, pyrite, marcasite, and galena. Rare disseminated chalcopyrite and pyrrhotite occur in sphalerite. The ore textures are massive, fragmental, chaotic, and veined; they rarely

show typical sedimentary layering. The upper portion of the ore body is oxidized. The deposit is weakly enriched upward in lead relative to zinc.

The Main deposit is composed of two major mineralized thrust fault slices and one lesser mineralized fault slice. It extends 1,600 meters in a northwest direction and varies in width from 150 to 975 meters. High-grade portions of the deposit are 135 meters thick. The base of the Main deposit is a tectonic melange zone which separates it from the Cretaceous Okpikruak Formation.

The Hilltop occurrence is a flat-lying klippe of the same ore body as the Main deposit (Moore and others, 1986). The mineralized zone is 490 meters long by 245 meters wide and the exhalite package is less than 100 meters thick. The mineral assemblage is similar to that at the Main deposit except that copper sulfides occur at Hilltop. Significant amounts of chalcopyrite, covellite, and bornite occur locally. The deposit contains 0.3% Cu, along with gold values of about 1 gram per ton. The presence of copper and gold may indicate that this deposit formed near a vent (Kulas, 1992).

The Aqqaluk deposit was discovered during a drilling program in 1995. The ore is similar to that at the Main deposit. Sphalerite and galena occur in silica rock, barite and shale. Sulfides are disseminated, semi-massive to massive, and rarely laminated. Late crosscutting sulfide veins and stringers occur in the host shale and occasionally in the exhalites (Phelps, 1998).

The Paalaaq deposit is the newest and deepest exploration target in the Red Dog complex. Exploration drilling during the summer of 1999 will be targeted on this occurrence (Phelps, 1998).

Alteration:

Silicification of host mudstone.

Age of mineralization:

Mississippian to Permian.

Deposit model:

Sedimentary exhalative Zn-Pb (Cox and Singer, 1986; model 31a).

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

31a

Production Status: Yes, Large

Site Status: Active

Workings/exploration:

The first reported visit to the Red Dog area was in 1968 by the U.S. Geological Survey. In 1975, the U.S. Bureau of Mines conducted a mineral examination of the Red Dog site. Active exploration of the site and adjacent area began in 1975 and the first claims were staked in 1978. In 1980, Cominco Alaska drilled 9 holes that totaled 915 meters, to determine the size of the deposit. Geologic mapping at a scale of 1:12000 was done in the region from 1977 to 1984. The Red Dog deposit was mapped at a scale of 1:2400 in 1982

and 83. One hundred core holes were drilled from 1981 to 1984 for a total of 9800 meters. This provided a 30-meter drill spacing for the first five years of production. It also provided information for metallurgical testing.

Geophysical methods used at Red Dog include CS-ATM, Input, Induced Polarization, and Gravity (Young, 1989).

An open pit mine and associated facilities were designed and constructed; the first ore was processed by the mill in late 1989. Mining is by open pit with a stripping ratio of 1:1. Exploration in the Red Dog area is ongoing with core drilling programs and geophysical surveys.

Production notes:

The mine currently (1999) processes 2.5 million metric tons per year of ore which produces 100,000 metric tons of lead and 650,000 metric tons of zinc concentrate per year. In 1999, after the expansion program, the mine is projected to produce 175,000 metric tons of lead and 975 metric tons of zinc concentrate from 3.2 million metric tons of ore (Phelps, 1998). The ore mining rate in 1997 was 3.1 million metric tons and the stripping ratio in 1999 is less than 1:1.

Reserves:

The Main Red Dog ore body reserves in 1989 were 85 million short tons of ore grading 17.1% zinc, 5.6% lead and 2.2 ounces of silver per ton. The 1998 reserves total 146 million metric tons grading 16.1% zinc, 4.3% lead and 2.6 ounces silver per metric ton. Specifically, the Main deposit contains indicated reserves of 50.6 million metric tons grading 19.5 % Zn, 5.2% Pb and 3 ounces silver per ton. The Aqqaluk has inferred reserves of 72.9 million metric tons grading 13.7% Zn, 3.6% Pb and 2 ounces silver per ton. Hilltop holds probable reserves of 9.6 million tons grading 17.8% Zn, 5.5 % Pb and 3.6 ounces silver per ton. Paalaaq has possible underground resources of 13 million tons grading 15% Zn, 4.3% Pb and 2.8 ounces silver per ton.

Additional comments:

The Red Dog ore body is the world's largest lead-zinc deposit. Red Dog went into production in 1990 at 3,000 metric tons per day. Current (1999) reserves and mining plans give a 50+ year mine life. All of the deposits except Paalaaq can be mined as open pits. Paalaaq will be developed as an underground mine.

References:

Tailleur, 1970; Cobb, 1972 (MF 404); Cobb, 1975 (OFR 75-628); Tailleur and others, 1977 (C 772B); Grybeck, 1977; Bundtzen and Henning, 1978; Degenhart and others, 1978; Grybeck and De Young, 1978; Plahuta, 1978; Grybeck and Nokleberg, 1979; Mayfield and others, 1979 (C 804B); Lange and others, 1985; Moore and others, 1986; Young and Moore, 1987; Schmidt and Zierenberg, 1988 (C 1035); Young, 1989; Kulas, 1992; Phelps, 1998; Cominco Alaska Staff, 1998.

Primary reference: Young, 1989; Kulas, 1992; Phelps, 1998

Reporter(s): Anita Williams (Anchorage, AK)

Last report date: 12/21/99

Site name(s): Husky

Site type: Occurrence

ARDF no.: DL002

Latitude: 68.1

Quadrangle: DL A-1

Longitude: 162.6

Location description and accuracy:

The Husky occurrence, at the center of an old Kennicott claim block, is at an elevation of about 1,400 feet, about 6 miles west of the Kelly River. The map site is at the west-central edge of section 22, T. 31 N., R. 16 W., of the Kateel River Meridian. The location is accurate within 2 miles.

Commodities:

Main: Pb, Zn

Other:

Ore minerals: Galena, sphalerite

Gangue minerals:

Geologic description:

The Husky occurrence consists of galena and sphalerite in veins cutting Mississippian-Permian Endicott Group sandstones (Noatak Formation?). Husky has been interpreted as a sedimentary exhalative Zn-Pb deposit (Werden, 1998).

Alteration:

Age of mineralization:

Mississippian to Permian.

Deposit model:

Sedimentary exhalative Zn-Pb(?) (Cox and Singer, 1986; model 31a).

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

31a(?)

Production Status: None

Site Status: Inactive

Workings/exploration:

Kennecott held claims in 1984.

Production notes:

Reserves:

Additional comments:

References:

Eakins and others, 1983; Werdon, 1998.

Primary reference: Werdon, 1998

Reporter(s): Anita Williams (Anchorage, AK)

Last report date: 12/21/99

Site name(s): Moil Creek**Site type:** Occurrence**ARDF no.:** DL003**Latitude:** 68.11**Quadrangle:** DL A-2**Longitude:** 162.95**Location description and accuracy:**

According to unpublished industry data, the Moil Creek occurrence is at an elevation of about 750 feet, on a short, east-flowing tributary to Ikalukrok Creek (J. Britton, oral communication, 1998). The map site is in section 2, T. 31 N., R. 19 W., of the Kateel River Meridian. The location is accurate to within 0.5 mile.

Commodities:**Main:** Ba**Other:****Ore minerals:** Barite**Gangue minerals:****Geologic description:**

The Moil Creek occurrence consists of bedded barite lenses in dark Triassic(?) shales of the Otuk Formation (D. Moore, oral communication, 1985).

Alteration:**Age of mineralization:**

Triassic?

Deposit model:

Bedded barite (Cox and Singer, 1986; model 31b).

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

31b

Production Status: None**Site Status:** Inactive

Workings/exploration:

Production notes:

Reserves:

Additional comments:

References:

This description.

Primary reference: This description

Reporter(s): Anita Williams (Anchorage, AK)

Last report date: 12/21/99

Site name(s): SOB

Site type: Occurrence

ARDF no.: DL004

Latitude: 68.16

Quadrangle: DL A-3

Longitude: 163.29

Location description and accuracy:

The SOB occurrence is at an elevation of about 3,000 feet in section 20, T. 32 N., R. 20 W., of the Kateel River Meridian. Location is accurate within one mile.

Commodities:

Main: Ba

Other:

Ore minerals: Barite

Gangue minerals:

Geologic description:

The SOB occurrence consists of barite cobbles in an 11 by 24 meter zone on a hillside, surrounded by argillite of the Mississippian to Permian Siksikpuk Formation. The occurrence has been interpreted as a bedded barite deposit. A nearby drainage has blocks of ferricrete breccia (Cobb and others, 1981).

Alteration:

Age of mineralization:

Mississippian to Permian.

Deposit model:

Bedded barite (Cox and Singer, 1986; model 31b).

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

31b

Production Status: None

Site Status: Inactive

Workings/exploration:

Production notes:

Reserves:

Additional comments:

References:

Cobb and others, 1981.

Primary reference: Cobb and others, 1981

Reporter(s): Anita Williams (Anchorage, AK)

Last report date: 12/21/99

Site name(s): Lik; SU

Site type: Prospect

ARDF no.: DL005

Latitude: 68.17

Quadrangle: DL A-2

Longitude: 163.19

Location description and accuracy:

The Lik prospect is at an elevation of about 1,000 feet in the headwaters of east-flowing tributaries to Wulik River. The map site is at the boundary of sections 14 and 15, T. 32 N., R. 20 W., of the Kateel River Meridian. The property is also referred to as the SU prospect.

Commodities:

Main: Ag, Pb, Zn

Other: Ba, Cd

Ore minerals: Boulangerite, bournonite, galena, marcasite, pyrite, sphalerite

Gangue minerals: Calcite, sparry dolomite

Geologic description:

The Lik prospect is a black, carbonaceous shale- and chert-hosted, volcanogenic exhalative, massive, Pb-Zn-Ag sulfide deposit. The deposit strikes northeast and dips about 30 degrees west. The sulfide horizons are thinly bedded, stratiform and confined to carbonaceous shale and chert. The ore consists of fine- to very fine-grained, sulfides in thin bands or massive lenses which occur discontinuously along strike for over a kilometer. The dominant sulfides are pyrite, marcasite, sphalerite and minor galena. Pyrite accounts for about 50% of the sulfides. Barite is also reported. In silver-rich zones, boulangerite and bournonite appear as exsolution blebs in galena.

There are three types of sulfide mineralization in the Lik deposit. The most common type consists of thinly-banded, fine-grained sulfides in black shales that occur in the lowest portion of the section. The second type consists of lenses of massive sulfide, quartz, and barite higher in the section. The third type consists of vein and breccia sulfide deposits stratigraphically below the massive sulfide lenses.

The Lik deposit is hosted by a sequence of black shales, black cherts, calcareous black shales and occasional calcareous sandstones. The sequence grades upward from the foot-wall of the deposit through the mineralized zone into an oxidized zone without any apparent depositional hiatus. The hanging-wall of the deposit consists of Permian-Triassic, thick-bedded, gray-green cherts and siliceous mudstones. The Permian-Triassic strata ei-

ther grade downward into black shales or rest directly on the massive sulfides. The Permian-Triassic rocks are overlain by the severely-sheared sole of an overriding, Upper Cretaceous thrust sheet. Complex folding and disrupted bedding are commonly found in the banded sulfides. The deposit is divided into two parts, North Lik and South Lik, which are offset from each other by a fault.

A drill hole in the North Lik deposit had a 174.5 foot intercept of ore containing 8.9% Zn, 3.5% Pb, and 2.3 ounces silver per ton (J. Britton, oral communication, 1998).

Alteration:

Host rocks are intensely silicified close to the sulfides.

Age of mineralization:

Potassium-argon dating indicates that the mineralization is Late Mississippian in age.

Deposit model:

Sedimentary exhalative Zn-Pb (Cox and Singer, 1986; model 31a).

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

31a

Production Status: None**Site Status:** Active**Workings/exploration:**

Discovered in 1977, the deposit was explored by more than 125 drill holes in the early 1990's.

Production notes:**Reserves:**

The Lik deposit contains reserves of 25 million tons of ore grading 12% combined Pb-Zn and 1.5 ounces silver per ton (Sterne and others, 1984).

Additional comments:

Substantial additional drilling is needed to determine the combined total tonnage of the North Lik and South Lik deposits. Preliminary estimates by GCO indicate that the Lik deposit could be North America's second largest zinc deposit after Red Dog (ARDF number DL001). The sulfides are extremely fine-grained. Cominco Alaska acquired Echo Bay's interest in Lik in early 1999.

References:

Bundtzen and Henning, 1978; Grybeck and Nokleberg, 1979; Cobb and others, 1981; Forest, 1983; Eakins and others, 1983; Sterne and others, 1984.

Primary reference: Sterne and others, 1984

Reporter(s): Anita Williams (Anchorage, AK)

Last report date: 12/21/99

Site name(s): Suds; Hot Dog**Site type:** Prospect**ARDF no.:** DL006**Latitude:** 68.17**Quadrangle:** DL A-2**Longitude:** 162.89**Location description and accuracy:**

The Suds prospect is at an elevation of about 1,000 feet on the east bank of Ikalukrok Creek in section 18, T. 32 N., R. 18 W., of the Kanteel River Meridian. The property is also known as the Hot Dog prospect.

Commodities:**Main:** Pb, Zn**Other:****Ore minerals:** Galena, sphalerite**Gangue minerals:****Geologic description:**

The Suds prospect consists of a gossan that contains sphalerite and galena (I.F. Ellersieck, written communication, 1979). The deposit is in the Mississippian Lisburne Formation of black shale and chert, and the geologic setting is similar to that at the Red Dog and Lik deposits (ARDF numbers DL001 and DL005).

Cominco drilled the property in 1999 and announced significant lead-zinc mineralization at depth in three drill holes. The first intersection is 53 feet of 30% Zn and 6% Pb at a depth of 2,227 feet. The second intersection is 20 feet of 15% Zn and 5% Pb at a depth of 2,182 feet. The remaining intersection is 160 feet of 18% Zn and 5% Pb at a depth of 2,299 feet. The mineral deposit is flat-lying and open to the north, west, and south. (Business News Alaska Staff, 1999).

Alteration:

Iron-oxide alteration (gossan).

Age of mineralization:

Mississippian.

Deposit model:

Sedimentary exhalative Zn-Pb (Cox and Singer, 1986; model 31a).

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

31a

Production Status: None**Site Status:** Active**Workings/exploration:**

Cominco drilled the property in 1999 and announced significant lead-zinc mineralization in three drill holes. The mineralized intercepts were at depths between 2,182 feet and 2,459 feet.

Production notes:**Reserves:****Additional comments:**

The Suds prospect is on state land held by Cominco American. The site is about six miles north of the Red Dog mine.

References:

Cobb and others, 1981; Business News Alaska Staff, 1999.

Primary reference: Business News Alaska Staff, 1999**Reporter(s):** Anita Williams (Anchorage, AK)**Last report date:** 12/21/99

Site name(s): Wulik Knot**Site type:** Occurrence**ARDF no.:** DL007**Latitude:** 68.36**Quadrangle:** DL B-2**Longitude:** 163.01**Location description and accuracy:**

This occurrence is at an elevation of about 1,650 feet, approximately 4 miles northwest of Sheep Mountain. The map site is in section 11, T. 34 N., R. 19 W ., of the Kateel River Meridian.

Commodities:**Main:** Cu**Other:****Ore minerals:** Azurite, malachite**Gangue minerals:****Geologic description:**

The Wulik Knot occurrence consists of malachite and azurite that coat fractures in a small outcrop of gray chert surrounded by maroon shale of Mesozoic age (C.F. Mayfield, written communication, 1979).

Alteration:**Age of mineralization:**

Mesozoic?

Deposit model:

Secondary copper minerals on fractures in chert.

Deposit model number (After Cox and Singer, 1986 or Bliss, 1992):**Production Status:** None**Site Status:** Inactive**Workings/exploration:**

Production notes:

Reserves:

Additional comments:

References:

Ellersieck and others, 1980; Cobb and others, 1981.

Primary reference: Cobb and others, 1981

Reporter(s): Anita Williams (Anchorage, AK)

Last report date: 12/21/99

Site name(s): Unnamed (headwaters of the Kukpowruk River)

Site type: Occurrence

ARDF no.: DL008

Latitude: 68.43

Quadrangle: DL B-2

Longitude: 162.76

Location description and accuracy:

This occurrence is at an elevation of about 1,650 feet on the east bank of the upper Kukpowruk River. The map site is in section 6, T. 12 S., R. 46 W., of the Umiat Meridian. Location is accurate to within 1 mile.

Commodities:

Main: Cu

Other:

Ore minerals: Malachite

Gangue minerals:

Geologic description:

This occurrence consists of malachite that coats a 6-inch-wide fracture zone subparallel to bedding in Mesozoic maroon shale (C.F. Mayfield, written communication, 1979). Nearby creek gravels are iron stained.

Alteration:

Oxidation of copper mineral.

Age of mineralization:

Mesozoic?

Deposit model:

Secondary copper mineral coating a fracture.

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

Production Status: None

Site Status: Inactive

Workings/exploration:

Production notes:

Reserves:

Additional comments:

References:

Ellersieck and others, 1980; Cobb and others, 1981.

Primary reference: Cobb and others, 1981

Reporter(s): Anita Williams (Anchorage, AK)

Last report date: 12/21/99

Site name(s): Unnamed (near Mt. Kelly)

Site type: Occurrence

ARDF no.: DL009

Latitude: 68.45

Quadrangle: DL B-3

Longitude: 163.74

Location description and accuracy:

The approximate location of this occurrence is at an elevation of about 1,400 feet on a headwater tributary of Kukpuk River, about 3 miles west-southwest of Mt. Kelly. The map site is in section 25, T.11 S., R. 51 W., of the Umiat Meridian. Early reports refer to this site as Ikuk Creek (see Additional Comments).

Commodities:

Main: Au(?)

Other:

Ore minerals: Gold(?), pyrite

Gangue minerals:

Geologic description:

This occurrence consists of a report in the 1880's of auriferous pyrite, said to carry \$3.50 to \$8.00 in gold per ton (gold at \$20.67/ounce). Iron-sulfide nodules are known from sedimentary formations that extend into area, but no gold is known.

Alteration:

Age of mineralization:

Deposit model:

Gold-bearing pyrite.

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

Production Status: None

Site Status: Inactive

Workings/exploration:

Production notes:**Reserves:****Additional comments:**

This occurrence is based on a quote from Stockton's report from the cruise of the USS Thetis in 1889. It mentions a discovery of gold by a prospector named Kelly on Ikuk Creek. The gold is reported to be in 'sulphurets of iron' (Smith and Mertie, 1930).

References:

Smith, 1913; Smith and Mertie, 1930; Berg and Cobb, 1967; Cobb, 1975 (OFR 75-628); Grybeck, 1977; Cobb and others, 1981.

Primary reference: Cobb and others, 1981

Reporter(s): Anita Williams (Anchorage, AK)

Last report date: 12/21/99

Site name(s): Fritz

Site type: Prospect

ARDF no.: DL010

Latitude: 68.11

Quadrangle: DL A-3

Longitude: 163.24

Location description and accuracy:

The Fritz prospect is at an elevation of about 900 feet in the headwaters of Ferric Creek. The map site is in the SW1/4 section 3, SE 1/4 sec. 4, T. 31 N., R. 20 W., of the Kateel River Meridian. Location is accurate within a radius of one mile.

Commodities:

Main: Ag, Pb, Zn

Other: Cd

Ore minerals: Galena, marcasite, pyrite, sphalerite

Gangue minerals:

Geologic description:

This occurrence is a stratiform, black shale- and chert-hosted, synsedimentary, massive sulfide deposit in Mississippian to Permian strata (J. Britton, oral communication, 1998). Fifteen holes were drilled in the early 1980s. The drilling intercepted a complex, mineralized horizon grading less than 5% Zn and Pb over variable thicknesses, generally less than 20 feet. One mineralized intercept of more than 200 feet contained several intervals grading more than 10% combined lead and zinc. Another intercept graded more than 30% combined lead and zinc.

Alteration:

Age of mineralization:

Mississippian to Permian.

Deposit model:

Sedimentary exhalative Zn-Pb (Cox and Singer, 1986; model 31a).

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

31a

Production Status: None

Site Status: Inactive

Workings/exploration:

Fifteen drill holes were completed in the early 1980s.

Production notes:

Reserves:

Additional comments:

References:

This description.

Primary reference: This description

Reporter(s): Anita Williams (Anchorage, AK)

Last report date: 12/21/99

Site name(s): Surprise**Site type:** Prospect**ARDF no.:** DL011**Latitude:** 68.09**Quadrangle:** DL A-2**Longitude:** 163.07**Location description and accuracy:**

The Surprise prospect is at an elevation of about 800 feet on the south side of a tributary to the Wulik River. The map site is in section 17, T. 31 N., R.19 W., of the Kateel River Meridian. Location is accurate within a one mile radius.

Commodities:**Main:** Ag, Pb, Zn**Other:** Barite**Ore minerals:** Barite, galena, sphalerite**Gangue minerals:****Geologic description:**

The Surprise prospect consists of barite and sulfide mineralization in a Mississippian to Permian black shale horizon (J. Britton, oral communication, 1998). Sedimentary exhalative Pb-Zn type mineralization was intersected in 3 drill holes. Grades of approximately 3% combined lead and zinc occurred over intervals ranging from 10 to 24 feet.

Alteration:**Age of mineralization:**

Mississippian to Permian.

Deposit model:

Sedimentary exhalative Zn-Pb (Cox and Singer, 1986; model 31a).

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

31a

Production Status: None**Site Status:** Inactive

Workings/exploration:

Three core holes were drilled on the prospect by GCO.

Production notes:

Reserves:

Additional comments:

References:

This description.

Primary reference: This description

Reporter(s): Anita Williams (Anchorage, AK)

Last report date: 12/21/99

Site name(s): Competition Creek; Rowdy

Site type: Prospect

ARDF no.: DL012

Latitude: 68.16

Quadrangle: DL A-2

Longitude: 162.99

Location description and accuracy:

This prospect is at an elevation of about 900 feet, approximately at the center of section 22, T. 32 N., R. 19 W., of the Kateel River Meridian. This property is also referred to as the Rowdy prospect.

Commodities:

Main: Pb, Zn

Other: Ba

Ore minerals: Barite, galena, marcasite, pyrite, sphalerite

Gangue minerals:

Geologic description:

The Competition Creek prospect is a syngenetic, sedimentary deposit of sulfide disseminations and lenses predominately of pyrite and marcasite, along with some galena and sphalerite. The deposit is in the black shales and cherts of the Kuna Formation (J. Britton, oral communication, 1998). Barite occurs in a shale horizon below the mineralized horizon. In this area, a mafic sill intrudes the Kivalina limestone and shale. The sill is highly propylitized, but appears to have been diorite or gabbro (Moore and others, 1986). The stratigraphic setting at Competition Creek is similar to that at Lik (ARDF number DL005).

Alteration:

Age of mineralization:

Mississippian to Triassic. A potassium argon date indicates that the deposit is Late Mississippian in age.

Deposit model:

Sedimentary exhalative Zn-Pb (Cox and Singer, 1986; model 31a).

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

31a

Production Status: None

Site Status: Inactive

Workings/exploration:

GCO drilled the property in the early 1980's. The ore is much lower grade than at Lik (ARDF number DL005).

Production notes:

Reserves:

Additional comments:

References:

Sterne and others, 1984; Moore and others, 1986.

Primary reference: Moore and others, 1986

Reporter(s): Anita Williams (Anchorage, AK)

Last report date: 12/21/99

Site name(s): Gull Creek

Site type: Occurrence

ARDF no.: DL013

Latitude: 68.15

Quadrangle: DL A-2

Longitude: 162.95

Location description and accuracy:

This occurrence is at an elevation of about 1,200 feet just north of the center of section 26, T. 32 N., R. 19 W., of the Kateel River Meridian. Location is accurate to within a one mile radius.

Commodities:

Main: Ba

Other:

Ore minerals: Barite

Gangue minerals:

Geologic description:

This occurrence consists of stratiform barite that overlies mid- to upper Paleozoic, black chert (J. Britton, oral communication, 1998).

Alteration:

Age of mineralization:

Mississippian to Permian.

Deposit model:

Sedimentary exhalative Zn-Pb (Cox and Singer, 1986; model 31a).

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

31a

Production Status: None

Site Status: Inactive

Workings/exploration:

Production notes:

Reserves:

Additional comments:

References:

This description.

Primary reference: This description

Reporter(s): Anita Williams (Anchorage, AK)

Last report date: 12/21/99

Site name(s): Sally

Site type: Occurrence

ARDF no.: DL014

Latitude: 68.17

Quadrangle: DL A-3

Longitude: 163.52

Location description and accuracy:

This occurrence is at an elevation of about 1,000 feet, just north of the center of section 17, T. 32 N., R. 21 W., of the Kateel River Meridian. Location is accurate to within a one mile radius.

Commodities:

Main: Pb, Zn

Other:

Ore minerals: Galena, pyrite, sphalerite

Gangue minerals:

Geologic description:

This occurrence is a narrow, massive-pyrite zone which contains galena and sphalerite. It can be traced more than 1,000 feet on the surface. Geochemical values along the zone are erratic (J. Britton, oral communication, 1998).

Alteration:

Age of mineralization:

Mississippian to Permian(?).

Deposit model:

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

Production Status: None

Site Status: Inactive

Workings/exploration:

Production notes:

Reserves:

Additional comments:

References:

This description.

Primary reference: This description

Reporter(s): Anita Williams (Anchorage, AK)

Last report date: 12/21/99

Site name(s): Alvinella; Cub Creek

Site type: Prospect

ARDF no.: DL015

Latitude: 68.152

Quadrangle: DL A-2

Longitude: 162.868

Location description and accuracy:

This prospect is at an elevation of about 1,000 feet in the northwest wall of lower Ikalukruk Creek. The map site is in the NW1/4 of section 30, T. 32 N., R. 18 W., of the Kateel River Meridian. This site also is referred to as the Cub Creek prospect.

Commodities:

Main: Pb, Zn

Other:

Ore minerals: Galena, pyrite, sphalerite

Gangue minerals: Quartz

Geologic description:

The Alvinella prospect is in the southern part of a several-square-mile area which contains five surface showings of lead and zinc mineralization in the black shales of the Mississippian Lisburne Formation. The geologic and structural setting is similar to that at Red Dog (ARDF number DL001). Thrust faults cause repetition of the mineralized shale horizon. The thrust blocks overlie the Cretaceous Wolverine Creek allochthon, which is the structural footwall of the Red Dog sequence. Drilling at the prospect has intercepted zones of low-grade mineralization. The prospect is named for fossilized worm tubes commonly found in the Ikalikrok Member, which consists of silicified, sulfide-bearing shale, carbonate, and non-silicified shales. The tubes are associated with at least minor base-metal sulfides and are thought to indicate sites of hydrothermal discharge (Young, 1989).

Alteration:

Slight silicification.

Age of mineralization:

Mississippian.

Deposit model:

Sedimentary exhalative Zn-Pb (Cox and Singer, 1986; model 31a).

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

31a

Production Status: None

Site Status: Active

Workings/exploration:

The general area has been mapped, sampled, and explored by geophysical surveys. Several core holes, drilled since the early 1980's, have intercepted thin, low-grade mineralization (Scott Jennings, oral communication, 1999).

Production notes:

Reserves:

Additional comments:

The prospect is located on NANA-owned lands.

References:

Young, 1989; Phelps, 1998.

Primary reference: This description

Reporter(s): Anita Williams (Anchorage, AK)

Last report date: 12/21/99

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