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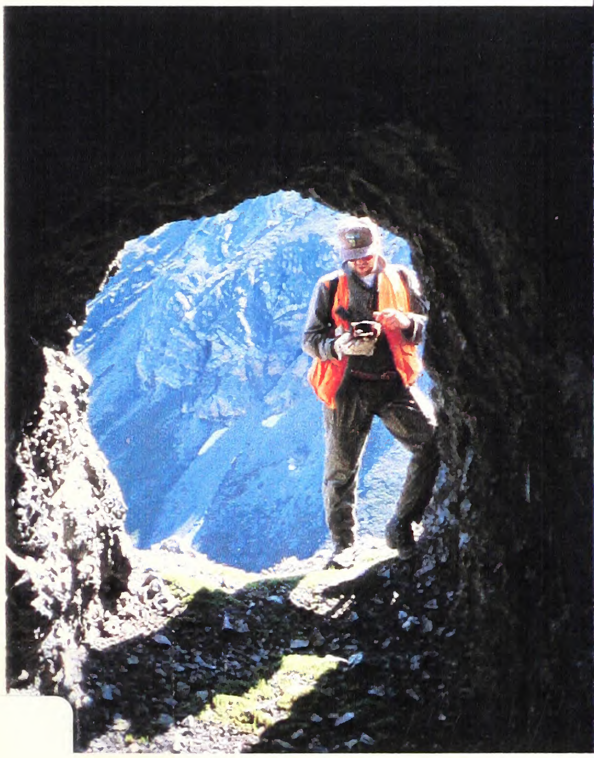
Mineral Assessment of Ahtna, Inc. Selections in the Wrangell-St. Elias National Park and Preserve, Alaska

Final Report

Mark P. Meyer, Darrel A. VandeWeg, and Andrew D. Shepherd



Mission Statement

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Authors

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Cover photos

Left - Darrel VandeWeg collecting GPS location data at the Cave Prospect Adit No. 2 on Copper Creek, a southern tributary of the Kotsina River. Photo by Mark P. Meyer. Upper right - Mark P. Meyer taking field notes at the Warner prospect adit on Rock Creek, a southern tributary of the Kotsina River. Photo by Darrel A. VandeWeg. Lower Right - Andrew Shepherd collecting GPS location data at the Clear Creek Mine lower opencut on Clear Creek, a northern tributary of the Kuskulana River. Photo by Mark P. Meyer.

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Unit of Measure Abbreviations

cu ft	cubic foot
in	inches
ft	feet
mm	millimeter
oz	ounce
ppb	parts per billion
ppm	parts per million
%	percent
sq ft	square foot

Abbreviations Used in the Tables

Minerals

Ag	silver
Au	gold
az	azurite
bor	bornite
cc	chalcocite
cpy	chalcopyrite
cv	covellite
gar	garnet
gn	galena
mag	magnetite
mal	malachite
Mo	molybdenite
nc	native copper
PGM	platinum group metals
po	pyrrhotite
py	pyrite
sl	sphalerite
tet	tetrahedrite

Host rocks

Cgl	conglomerate
CLs	Chitistone Limestone
CVb	Chitina Valley batholith
HCF	Hasen Creek Formation
KPF	Kuskulana Pass Formation
Ls	limestone
mar	marble
MCF	McCarthy Formation
NB	Nabesna Batholith
NGs	Nikolai Greenstone
NLs	Nabesna Limestone
Q	Quaternary
SkG	Skolai Group

Mineral deposit types*

Contact dep.	Contact deposit
Stringer ATO	Stringer argentiferous tetrahedrite deposits
Stringer BB-C	Stringer bornite and bornite-chalcopyrite deposits
Stringer BCO	Stringer bornite-chalcopyrite deposits
Stringer CO	Stringer chalcocite deposits
Stringer P-CO	Stringer pyrite-chalcopyrite deposits

*See the copper deposit types section in the report for detailed descriptions.

MINERAL ASSESSMENT OF AHTNA, INC. SELECTIONS IN THE WRANGELL-ST. ELIAS NATIONAL PARK AND PRESERVE, ALASKA

FINAL REPORT

ABSTRACT

The Bureau of Land Management conducted a mineral assessment of Ahtna, Inc. Regional Native Corporation Alaska Native Claims Settlement Act (ANCSA) selections within the Wrangell-St. Elias National Park and Preserve, Alaska. The assessment was conducted through a Memorandum of Understanding (MOU) between the National Park Service, BLM, and Ahtna, Inc. to provide Ahtna, Inc. with minerals information to assist them in finalizing their land selections within the park.

A literature search and two seasons of field work identified 82 mineral occurrences within a three-mile radius of the Ahtna, Inc. selections. Eleven were historically producing mines, 48 development prospects, 12 exploration prospects, and 11 raw prospects. During the field investigation, 39 occurrences were located and sampled, 8 were visited but not sampled, 11 were not located but the surrounding area sampled, 20 were looked for but not located, and 4 were not looked for.

Investigations in the northern Wrangell Mountains study area disclosed significant hard rock mineral occurrences at the Nabesna, Rambler, and the Royal Development mines inside Ahtna, Inc. selections. The Nabesna and Royal Development mines are patented and privately held. The Caribou Creek Mine and Trail Creek Occurrence placer properties contain gold values of interest, and are also within Ahtna, Inc. selections. The Rambler Mine, Caribou Creek Mine, and the Trail Creek Occurrence are properties favorable for exploration.

Investigations in the southern Wrangell Mountains study area identified 15 properties with significant mineral values inside Ahtna, Inc. selections. Properties favorable for exploration include the Clear Creek, Copper King, Mullen, and Silver Star mines and the Ammann, Barrett Young and Nafsted, Carmalita, Fall Creek Upper, Hidden Treasure, Homestake, Larson, Lime Creek, Newhome, Sunrise, and the Sunset prospects. Three patented properties include the Clear Creek, Copper King, and Mullen mines.

Historically producing mines within the study area include the Caribou Creek, Nabesna, Rambler, and Royal Development Co. mines in the northern Wrangell Mountains study area and the Berg Creek, Clear Creek, Copper King, Hubbard-Elliott, Mullen, Nugget Creek, and the Silver Star mines in the southern Wrangell Mountains study area.

INTRODUCTION

During 1996, a Memorandum of Understanding (MOU) between the National Park Service (NPS), Bureau of Land Management (BLM), and Ahtna, Inc. Regional Native Corporation (Ahtna, Inc.) requested that BLM provide comprehensive minerals information and conduct mineral assessments on Federal lands selected by Ahtna, Inc., based in Glennallen, Alaska. The selections occur within the central to northwestern part of the Wrangell-St. Elias National Park and Preserve, Alaska. BLM has authority to conduct mineral assessment activities under section 1010 of the Alaska National Interest Lands Conservation Act (ANILCA).

This multi-year mineral assessment project was undertaken to identify the number, type, amount, and distribution of mineral deposits located in and within close proximity to Ahtna, Inc. selected lands. Economic prefeasibility analysis was completed on three mineral deposit models; basaltic copper, polymetallic vein, and iron skarn deposits (Coldwell, 2000). The economic analysis is summarized in the Executive Summary (Meyer and others, 2000) and discussed in more detail in a separate BLM open file report (Coldwell, 2000). An initial literature search, in 1996, identified 74 previously identified mines, prospects, and occurrences located within one mile of the selected lands. Of these, 55 occur close enough to be considered important to this mineral assessment (Meyer and Shepherd, 1998). After the second season of field work, the number of mineralized occurrences identified had risen to 82 and the area of influence was extended to three miles (Meyer and VandeWeg, 1999). Of those 82 properties, 11 were historically producing mines, 48 development prospects, 12 exploration prospects, and 11 raw prospects. Lode deposits make up all but eight of the properties, the remainder are placer deposits. Table 1 lists the properties located within Ahtna, Inc. selections whereas Table 2 lists those properties located outside the selections.

During the 1997 field investigation 26 properties were located and sampled (8 in the northern Wrangell Mountains and 18 in the southern Wrangell Mountains), 2 were visited but not sampled, 4 were not located but the surrounding area sampled, 17 were looked for but not located, and 7 were not looked for due to time and weather constraints. In 1998 the field investigation was only conducted in the southern Wrangell Mountains where 45 properties were looked for. Twenty-four properties were located and sampled, 5 were located but not sampled, 4 were not located but the surrounding area sampled, and 8 were looked for but could not be located.

In the northern Wrangell Mountains five properties with anomalous mineral concentrations were identified within Ahtna, Inc. selections. These include the Caribou Creek, Nabesna, Rambler, and Royal Development Co., mines and the Trail Creek occurrence. The Nabesna and Royal Development Co. mines are patented. The NPS has proposed a validity determination on the Rambler Mine (Meyer and Shepherd, 1998).

Twenty-seven properties in the southern Wrangell Mountains were identified with anomalous mineral concentrations. Of these, 15 are located inside Ahtna, Inc. selections: the Clear Creek, Copper King, Mullen, and Silver Star mines and the Ammann Prospect, Barrett Young and Nafsted, Carmalita, Fall Creek Upper, Hidden Treasure, Homestake, Larson, Lime Creek, Newhome, Sunrise, and Sunset prospects. Twelve are located outside the selections: the Berg Creek and Nugget Creek mines and the Bluebird, Cave, Divide Creek, Falls Creek, Forget-Me-Not, Mountain Sheep, Peacock Claim, Roaring Creek, Surprise/Sunshine, and Warner prospects (Meyer and VandeWeg, 1999).

TABLE 1 - Properties located within Ahtna, Inc. selections, Wrangell-St. Elias National Park and Preserve, Alaska.

Northern Wrangell Mountains		
Antler Creek North	Caribou Creek Mine	Royal Development Co. Mine
Bee Jay	Caribou Creek Prospect	Trail Creek
Boyden	Nabesna Mine	Unnamed Occurrence 1
Camp Creek 1	Platinum Creek	Unnamed Occurrence 2
Camp Creek 2	Rambler Mine	
Southern Wrangell Mountains		
Ammann Prospect	Fall Creek Saddle Occurrence	Newhome
Barrett Young and Nafsted	Fall Creek Upper Prospect	O'Hara
Blackburn	Franklin	Porcupine Creek Head
Carmalita	Good Enough	Porcupine Creek Mouth
Chichokna	Hidden Treasure	Silver Star Mine
Chokosna River	Homestake	Squaw Creek
Clear Creek Mine	Kinney-Golden	Strelna Creek
Copper King Mine	Larson	Sunrise
Crawford	Lime Creek	Sunset
Dottie	Mineral Creek	Surprise Creek
Escape	Mullen Mine	

Within the selected areas, there are 11 historically producing mines. The northern Wrangell Mountains include the Caribou Creek, Nabesna, Royal Development Co., and Rambler mines. The southern Wrangell Mountains include the Berg Creek, Clear Creek, Copper King, Hubbard-Elliot, Mullen, Nugget Creek, and Silver Star mines.

LAND STATUS

Land in the study area is situated within the Wrangell-St. Elias National Park and Preserve. The park was established and included into the National Park System in 1980 as part of ANILCA, Title II, Section 201(9). Located within the park are 650,000 acres of Ahtna, Inc. selections, selected under authority of the 1971 Alaska Native Claims Settlement Act (ANCSA), Section 12(c). Other native selections include selections made by the local village corporations under ANCSA authority as well as individual native allotments granted under authority of the Native Allotment Act of 1906. There are also numerous private and State of Alaska inholdings and rights-of-way occurring within the park boundary. For current land status check with the representative with the appropriate agency.

Currently, there are no active, unpatented mining claims within or adjacent to Ahtna, Inc. selections. Eleven properties within the study area have been patented and include the Clear Creek,

TABLE 2 - Properties located outside Ahtna, Inc. selections, Wrangell-St. Elias National Park and Preserve, Alaska.

Northern Wrangell Mountains		
Antler Creek South	Rock Creek Moly	Trail Creek Shear
Corundum	Trail Creek Cirque	Vicki
Fennimore & Rasmussen	Trail Creek Cirque North	
Southern Wrangell Mountains		
Alaska Copper Mines	Forget-Me-Not	Peacock Claim
Amy Creek	Hubbard-Elliott Mine	Roaring Creek
Berg Creek Mine	Kotsina River	Roaring Creek Southeast
Bluebird	London and Cape	Roaring Creek Southwest
Bunker Hill	Lost Cabin	Skyscraper
Calcite	Minneapolis	Skyscraper Peak West
Cave Prospect	Montana Boy	Surprise/Sunshine
Copper Queen	Mountain Sheep	War Eagle
Divide Creek	Nugget Creek Mine	Warner
Falls Creek		

Copper King, Hubbard-Elliott, Mullen, Nabesna, Nugget Creek, and Royal Development Co. mines and the Franklin, Minneapolis, War Eagle, and Warner prospects.

LOCATION AND ACCESS

The Wrangell-St. Elias National Park and Preserve is located in south-central Alaska (Plate 1). This is the largest national park in the United States, encompassing all or parts of the Wrangell and Nutzotin Mountains to the north and the Chugach and St. Elias Mountains to the south. The main park headquarters is located at mile 105.5 on the Old Richardson Highway near Copper Center, Alaska. Satellite ranger stations include the Chitina Ranger Station, the Slana Ranger Station, and the Yakutat Ranger Station.

ANILCA established the park which encompasses 8.33 million acres designated as park and 4.85 million acres designated as preserve, for a total of 13.18 million acres. Wilderness designations within the park, also established by ANILCA, encompass 8.7 million acres. The area studied for this assessment included approximately 124,000 acres on the north side of the Wrangell Mountains and approximately 321,000 acres on the southwestern side, for a total of approximately 445,000 acres. Access to the study area was along the Glenn Highway (Tok Cut-Off) and the Nabesna Road for the northern area and the Edgerton Highway, which is connected to the Richardson Highway, for the southern area. All highways are a part of the Alaska highway system.

Helicopters were used to access the mineralized localities, from either the Devils Mountain Lodge, mile 42 of the Nabesna Road, for the northern area or from the Kenny Lake Mercantile located in Kenny Lake, mile 7.5 of the Edgerton Highway, for the southern area. To minimize impacts within the park, helicopter landing sites were selected to be as close as possible to mineralized localities and sample location sites, or so the maximum number of locations could be visited from each landing site.

ACKNOWLEDGMENTS

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Special thanks goes to Kirk and Jack Stanley, Nabesna Mine owners, and Mike Hanscam, Hubbard-Elliott Mine co-owner, for allowing us to visit their properties at Nabesna and Elliott Creek, respectively.

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GEOLOGY

Two diverse physiographic terrains characterize the study area: the northern Wrangell Mountains and the southern Wrangell Mountains. Paleozoic and Mesozoic rocks in both areas are part of Wrangellia, a tectonostratigraphic terrane that originated far to the south and has been tectonically rafted north to its present position. Plate 2 shows the geology of the Wrangell-St. Elias National Park and Preserve based on Helen Beikman's Geologic Map of Alaska (Beikman, 1980).

Northern Wrangell Mountains

Low-lying, broad glacial valleys and steep mountainous terrain characterize the northern Wrangell Mountains. The Denali Fault, an active dextral fault trending northwest-southeast (Richter and others, 1975b), separates the northern area into a northern half and a southern half. All mineral localities identified in the northern Wrangell Mountains occur south of the Denali Fault.

Tetelna Volcanics: The Tetelna Volcanics are the oldest rocks exposed south of the Denali Fault. They represent the last part of an Upper Paleozoic (Pennsylvanian-Permian) volcanic arc that was built directly on ancient oceanic crust. They consists of interbedded volcaniclastic rocks and massive porphyritic andesite flows. The volcaniclastic rocks range from locally graded, thin-bedded, mudstone and sandstone to massive conglomerate (Richter, 1976).

Mankomen Group: The Lower Permian Mankomen Group unconformably overlies the Tetelna Volcanics. The group is a marine sedimentary rock sequence that has been subdivided into the Slana Spur Formation and the overlying Eagle Creek Formation, and is equivalent to parts of the Skolai Group in the southern

Wrangell Mountains (Richter, 1976). The Eagle Creek Formation rocks are dark-gray to gray-green argillite with interbedded light gray to brown calcareous siltstone and grit. The siltstone beds grade into silty limestone (Lowe and others, 1982). The Slana Spur Formation consists of thin- to thick-bedded, light-gray to gray limestone (Richter, 1976).

Nikolai Greenstone: Disconformably overlying the Mankomen Group is the Middle and/or Upper Triassic Nikolai Greenstone. The greenstone consists of dark-green, course-grained, amygdaloidal basalt flows. In the northern Wrangell Mountains the flows are locally separated by thin beds of reddish-brown subaerial volcaniclastic rocks. There has been extensive thermal metamorphism and alteration to the greenstones (Lowe and others, 1982; Richter, 1976).

Triassic (Nabesna) limestone: Disconformably overlying the Nikolai Greenstone is an unnamed Upper Triassic limestone (locally named the Nabesna Limestone). This limestone consists of distinctive lower and upper units. The lower unit is a gray to dark-gray, fine-grained, massive-bedded limestone ranging in thickness from 60 to 800 feet. It contains interbedded lenses and nodules of gray to black chert. The upper unit is composed of dark-gray, fine-grained, thin-bedded limestone ranging up to 500 ft. thick. Limestone beds range in thickness from approximately ¼ to 6 in. and are interbedded with thin beds of cherty argillite and calcareous shale. The lower limestone may correlate with the Chitistone Limestone in the southern Wrangell Mountains (Richter, 1976). Recrystallization and dolomitization have occurred locally in the lower unit. The upper unit may correlate with the lower member of the McCarthy Formation in the southern Wrangell Mountains (Richter, 1976).

Nutzotin Mountain Sequence: Disconformably overlying the Triassic (Nabesna) limestone is a unit informally referred to as the Nutzotin Mountain Sequence. This is a widespread, thick sequence of shallow and deep intertongued marine sedimentary rocks deposited during the Upper Jurassic to Lower Cretaceous. It is composed primarily of dark-gray argillite, gray siltstone, and graded beds of argillite-siltstone-graywacke approximately 9,800 ft. thick (Richter, 1976).

Chisana Formation: The Nutzotin Mountain Sequence locally grades into the Lower Cretaceous Chisana Formation. This is a thick unit of marine and subaerial dark gray-green volcanic flows, massive volcanic breccias, and interbedded volcaniclastic rocks up to 9,800 ft. thick (Lowe and others, 1982; Richter, 1976). The flows are mainly andesites and basaltic andesites with interbedded lenses of marine sedimentary rocks. The lower part of the unit includes beds of volcanic sandstone and siltstone (Richter, 1976).

Continental sedimentary rocks: An angular unconformity separates the Chisana Formation from an unnamed continental sedimentary rock unit of Upper(?) Cretaceous age. This unit is made up of well-consolidated drab-brown, buff, and greenish-gray conglomerate, course- to fine-grained sandstone, siltstone, and lenses of dark-gray shale. The rocks locally contain volcanic ash, carbonaceous debris, and fragments of petrified wood. This unit is relatively flat lying and ranges up to 290 ft. in thickness (Richter, 1976).

Unnamed Tertiary deposits: An angular unconformity separates the unnamed continental sedimentary rocks from an unnamed unit of Tertiary deposits. These deposits consist of weakly consolidated and poorly sorted fluvioglacial deposits, volcanic boulder deposits, and several small tillite deposits (Richter, 1976).

Wrangell Lava: Unconformably overlying all older rocks in the northern area are widespread Upper Tertiary and Quaternary Wrangell Lava deposits from the Wrangell volcanoes (Richter, written commun., 1998). Wrangell Lava is made up of several different types of volcanic rocks. They are mainly flows, breccias, and tuffs with subordinate shallow intrusive rocks and volcaniclastic deposits. The flows are primarily andesite, but can range from dacite to olivine basalt. Textures range from glass to course porphyry (Wayland, 1943).

Porphyry dikes and sills: Intruding into the older rock units are a series of Upper Cretaceous or Lower Tertiary hornblende-feldspar and feldspar porphyry dikes and sills. Composition of the dikes and sills range from andesite to rhyodacite. Generally, alteration occurs in the smaller dikes and sills, while the larger irregular bodies are unaltered. These porphyries may represent hypabyssal equivalents to the older parts of the Wrangell Lava (Richter, 1976).

Diorite complex: The Tetelna Volcanics have been intruded by an unnamed diorite complex during the Upper Triassic to Middle Jurassic. The complex is a diverse group of plutonic rocks and includes medium- to high-grade metamorphic rocks related to the emplacement of the complex. It includes diorite, gneiss, and schist. The metamorphic rocks are Upper Triassic in age while the plutonic rocks are Middle Jurassic in age. The contact between the plutonic and metamorphic rock is both structural and gradational. The complex is also in fault contact with the Nutzotin Mountain sequence and Nikolai Greenstone (Richter, 1976).

Plutonic rocks: A Middle Cretaceous intrusive event is represented by at least eight plutons south of the Denali Fault. These plutons intrude most of the previously described units. Compositions vary, but for the most part they are medium-grained granodiorite and quartz monzonite. Two plutons of interest in the study area include the Nabesna and Devils Mountain plutons. The Nabesna Pluton consists chiefly of hornblende-biotite granodiorite and locally quartz diorite, diorite, and trondhjemite. Large zones have been altered by propylitic and argillic alteration. The Devils Mountain Pluton is primarily a hornblende diorite and quartz diorite which has undergone propylitic alteration (Richter, 1976).

Quaternary deposits: Surficial glacial deposits are present throughout the northern and southern Wrangell Mountains. Active glaciation occurs in the higher elevations. Mount Wrangell, a large shield volcano, periodically exhibits phreatic activity at its summit. Mud volcanoes in the Copper River Basin, near the west flank of Mount Drum, erupt warm saline mud charged with carbon dioxide (Richter, written commun., 1998).

Southern Wrangell Mountains

The southern Wrangell Mountains are characterized by the low-lying, broad Chitina River Valley, which separates the steep mountainous terrain of the Wrangell Mountains from that of the Chugach Mountains. The Border Ranges Fault transects the Chugach Mountains and forms the southern boundary of the study area. Rocks similar to those occurring in the northern Wrangell Mountains are found in this area. The oldest rocks belong to a Late Paleozoic volcanic arc, the Skolai Arc, which apparently developed on ancient oceanic crust. The arc is overlain by thick sequences of Late Paleozoic and Early Mesozoic sedimentary rocks with both the arc and younger rocks being intruded by Mesozoic and Cenozoic plutons and dikes. Upper Tertiary Wrangell Lava unconformably overlies all older rocks. Early Mesozoic greenstones and limestones locally host significant mineral deposits in the Wrangell Mountains and throughout much of the study area.

Skolai Group: Numerous rock units have been recognized in the southern Wrangell Mountains. The oldest is the Skolai Group, which has been subdivided into the Station Creek and the Hasen Creek formations.

Station Creek Formation: The Pennsylvanian and Lower Permian Station Creek Formation is composed of a submarine volcaniclastic member and a volcanic flow member. The submarine volcaniclastic member ranges from thin-bedded to massive, with an upward gradation from coarse volcanic breccia through volcanic graywacke to volcanilutite that can be up to 2,600 ft. thick. The volcanic flow member is composed of andesites, basalts, and minor intercalated volcaniclastic rocks up to 4,000 ft. in maximum thickness. Locally, the flows are pillowed, brecciated, and weakly metamorphosed occasionally to albitite. This formation is in fault contact with either a thick complex of interlayered gneiss and gabbro or a layered gabbro of Pennsylvanian age (MacKevett, 1978).

Hasen Creek Formation: The Lower Permian Hasen Creek Formation conformably overlies the Station Creek Formation. This formation is composed of diverse thin-bedded sedimentary rocks that have been weakly metamorphosed and range up to 2,000 ft. thick. It includes argillite, graywacke, shale, chert, limestone, and minor conglomerate. The unit has been cut by Triassic gabbro and occasionally Jurassic or Tertiary intrusive rocks. Limestone in the upper part of the formation is thin- to thick-bedded and highly fossiliferous. The limestone is of such thickness, up to 800 ft., that it can be mapped as a separate unit (MacKevett, 1978).

Nikolai Greenstone: Unconformably overlying the Skolai Group is the Middle and/or Upper Triassic Nikolai Greenstone. The greenstone is composed of dark-green, coarse-grained, amygdaloidal basalt flows which have undergone extensive chemical alteration. The basalt flows range from 6,500 to 7,000 ft. in thickness with the Nikolai Greenstone and the Skolai Group totaling 13,500 to 14,500 ft. in combined thickness (Moffit and Mertie, 1923). The greenstone is commonly cut by dikes and sills of the Jurassic Chitina Valley batholith and Tertiary plutons (MacKevett, 1978).

Chitistone and Nizina limestones: The Upper Triassic Chitistone and Nizina limestones lie disconformably over the Nikolai Greenstone. The Chitistone Limestone is up to 2,000 ft. thick and grades upward into the Nizina Limestone. The lower Chitistone Limestone is massive, showing little to no evidence of stratification. It creates excellent cliff faces while the upper Nizina Limestone is dark, thin-bedded, and grades seamlessly into the overlying McCarthy Formation. The lower part contains abundant dolomite, algal-mat chips, and intratidal to supratidal features while the upper part contains diverse limestones including lime mudstone, wackestone, packstone, grainstone, and minor chert nodules. The Nizina Limestone, up to 1,500 ft. thick, consists of diverse limestones containing chert as nodules, lenses, and coalescing masses in its lower section and noncarbonate detritus is found in its upper section. The Nizina was formed in deeper water than the Chitistone. Both sections are known to emit fetid odors when freshly broken (MacKevett, 1978). Jurassic (Chitina Valley batholith) and Tertiary plutons cut and intrude both limestones (Moffit and Mertie, 1923). The Chitistone and Nizina limestones are probably related to the Triassic (Nabesna) limestone in the northern Wrangell Mountains (MacKevett, 1978). Where the Chitistone and Nizina limestones are adjacent to the Chitina Valley batholith, the limestones have been metamorphosed to marble. Here it is typically fine- to medium-grained, calcite-rich, locally dolomitic, with occasional crude schistosity or banding (MacKevett, 1978).

McCarthy Formation: The Upper Triassic and Lower Jurassic McCarthy Formation consists of a lower and upper limestone member. This formation is a 3,000 ft. thick section of shale and thin-bedded, yellowish-gray to brown, weathered limestone. The upper member is composed of 2,000 ft. of impure limestone, impure chert, and shale, which is gradational into the lower member. The lower member is more widespread and is composed of 1,000 ft. of thin-bedded impure limestones, calcareous carbonaceous shale, and impure chert overlying the Nizina Limestone. The upper member is confined to the vicinity of McCarthy Creek, east of the study area. In some areas the transition zone between the two members is missing, elsewhere, it reaches thicknesses of several hundred feet. This formation shows more pronounced deformation and folding than other rock units in the southern Wrangell Mountains due to its relative weakness. The formation has been cut and intruded by the Jurassic Chitina Valley batholith and Tertiary dikes (Moffit and Mertie, 1923; MacKevett, 1978).

Kotsina Conglomerate: The Middle to Upper Jurassic Kotsina Conglomerate unconformably overlies the lower member of the McCarthy Formation. Waterworn pebbles and cobbles enclosed in a shaly or arkosic matrix make up the conglomerate. Clasts are derived from Chitistone Limestone, Nikolai Greenstone, the Skolai Group, and also include granodiorite, dike rock, chert, and quartz. This greenish-gray to brown conglomerate forms rugged topographic features and can reach thicknesses of 1,000 feet (Moffit and Mertie, 1923; MacKevett and others, 1978b).

Berg Creek Formation and Kuskulana Pass Formation: Lower Cretaceous sedimentary rocks of the Berg Creek Formation overlie older rocks with a marked angular unconformity. A 1,500 ft. thick sequence is made up of sandstone, shale, abundant impure bioclastic limestone, and conglomerates cut by Tertiary plutons (MacKevett, 1978). These rocks are subdivided into the Berg Creek and Kuskulana Pass formations (MacKevett and others, 1978b). The Berg Creek Formation unconformably overlies Triassic rocks, nonconformably overlies the Jurassic Chitina Valley batholith, and grades upward into the Kuskulana Pass Formation. The Berg Creek Formation shows excellent outcrops, is massive- to medium-bedded, though occasionally cross-bedded, and is up to 800 ft. thick. It consists of light gray to yellowish-brown bioclastic sandy limestone and a basal, 100 ft. thick, greenish-gray to buff colored pebble conglomerate (MacKevett and others, 1978). The 1,000 ft. thick Kuskulana Pass Formation forms smooth to moderate slopes and underlies the Kennecott Formation. It consists of dark greenish to medium gray thin-bedded, fine-grained sandstone, siltstone, and shale that weathers to brown (MacKevett and others, 1978b).

Igneous rocks: The majority of the aforementioned rock units particularly the Skolai Group have been intruded by a variety of igneous rocks. The intrusive rocks include pyroxene diorite, gabbro, granodiorite, quartz diorite, quartz diorite porphyry, and/or quartz latite of the Jurassic Chitina Valley batholith or Tertiary plutons. Dikes and sills are common in portions of the limestones (McCarthy Formation), but not in the Chitistone and Nizina limestones or the Kotsina Conglomerate (Moffit and Mertie, 1923). Folding and faulting have occurred in all these rock units with the most intense activity occurring below the Kotsina Conglomerate. Thrust faulting is the most common form of displacement in the southern Wrangell Mountains study area (Moffit and Mertie, 1923; MacKevett, 1978). Metamorphism has occurred within the Skolai Group and Nikolai Greenstone producing foliation (Moffit and Mertie, 1923).

MINERAL RESOURCES

Mineral resources in the study area include bismuth, copper, corundum, gold, iron, lead, molybdenum, silver, and zinc. Platinum group metals are identified in the northern Wrangell Mountains and uranium in the southern Wrangell Mountains. Copper, the most abundant resource in the area, is found in basaltic copper, carbonate hosted gold-silver, copper skarn, iron skarn, polymetallic vein, and porphyry copper-molybdenum deposits. Gold and silver are found as byproducts of the basaltic copper, copper skarn, iron skarn, and porphyry copper-molybdenum deposits, as well as occurring in carbonate hosted gold-silver and polymetallic vein deposits. Gold is also found in placer deposits. Molybdenum occurs in small quantities as a byproduct of the porphyry copper-molybdenum deposits (MacKevett and others, 1977). Mining claims were staked for uranium in the Kotsina River drainage during the mid 1950's, but no occurrence has been substantiated.

COPPER DEPOSITS

Between 1912 and 1919, Fred H. Moffit and J. B. Mertie, Jr., with the USGS, described, in detail, the different types of copper deposits located in the southern Wrangell Mountains. They identified this area as the Kotsina-Kuskulana district (Moffit and Mertie, 1923). Copper mineralization in the Chitina Valley stretches from the Kotsina and Kuskulana rivers eastward beyond the Kennecott Mine into the Nizina River vicinity. The authors have attempted to apply the detailed descriptions of Moffit and Mertie to the copper deposits in the northern Wrangell Mountains.

Two types of copper deposits were identified by Moffit and Mertie; stringer lode deposits and contact deposits. Stinger lodes, the more common of the two, are hosted in shear zones or in fractures. Contact deposits, on the other hand, consist of disseminated and localized bodies of mineralized rock at or near the contact with granodiorite plutons. The Nikolai Greenstone is the most common host rock for both deposit types, but the upper Skolai Group and the lower Chitistone Limestone also contain copper mineralization (Moffit and Mertie, 1923).

Copper minerals associated with stringer lode deposits include native copper, chalcocite, bornite, chalcopyrite, cuprite, covellite, malachite, azurite, and occasionally chalcanthite. Other minerals may include silver-bearing tetrahedrite (possible freibergite), native silver, gold, bismuth, native barite, galena, and pyrite. Minerals associated with contact deposits include disseminated pyrite and chalcopyrite. Contact-metamorphic minerals including garnet, magnetite, pyroxene, and hornblende may be present in small amounts. The source of the copper is generally believed to be either the Nikolai Greenstone and/or magmatic solutions discharged from underlying granodiorite plutons (Moffit and Mertie, 1923).

Stringer Lodes

Moffit and Mertie (1923) identified five types of stringer lodes based on distinct mineralogy and copper content found in the Kotsina-Kuskulana copper belt. They are: argentiferous tetrahedrite deposits, chalcocite deposits, bornite and bornite-chalcocite deposits, bornite-chalcopyrite deposits, and pyrite-chalcopyrite deposits.

Argentiferous Tetrahedrite Deposits

This type of deposit occurs at only one locality, the Silver Star Mine in the upper Kotsina River drainage. Sulfide minerals include tetrahedrite, chalcopyrite, galena, and minor bismuthinite (?) which are considered here to be hypogene minerals. Argentiferous tetrahedrite deposits are silver-bearing, ranging from 0.08 to 2.4% silver, with quartz and other gangue material present. If the deposit is gangue free, the silver content can range from 3 to 30%, and is known as freibergite. Azurite and malachite are secondary minerals associated with the deposit and are considered to be supergene minerals. Gangue minerals include quartz and barite (Moffit and Mertie, 1923).

Argentiferous tetrahedrite occurs as stringers crosscutting the gangue, with chalcopyrite cutting the tetrahedrite. Microscopic bismuthinite has been known to occasionally crosscut the tetrahedrite. Barite intrudes into the stringers and is then surrounded by quartz and tetrahedrite. Locally tetrahedrite has replaced the quartz (Moffit and Mertie, 1923).

Chalcocite Deposits

Chalcocite deposits are generally missing from the Kotsina-Kuskulana district. This deposit type occurs mainly to the east and makes up the Kennecott Corporation and Mother Lode Coalition mines along the Kennicott River and McCarthy Creek drainages. Sulfide minerals include chalcocite and occasional covellite (Moffit and Mertie, 1923). Moffit and Maddren (1909) originally believed the chalcocite was deposited in the Chitistone Limestone as primary mineralization and not as an alteration product of earlier copper mineralization. In a later study by Bateman and McLaughlin (1920), they regard the deposits to be mostly replacement hypogene mineralization, with the chalcocite replacing bornite (Moffit and Mertie, 1923). The Kennecott type copper deposits are discussed, in more detail in a later section of this report.

The Skyscraper prospects, located on Roaring Creek in the Kotsina River drainage, are the closest to being this type of deposit found in the study area. The prospects are typically composed of crushed greenstone, epidote, chalcocite, and specular hematite, which cuts the greenstone. Hematite is the most abundant mineral with chalcocite being nearly as plentiful. There is a small amount of covellite associated with the chalcocite. Chalcocite and native copper have been located at the Snowshoe claim and as float at the Skyscraper claim of the Skyscraper prospect. Gangue materials include epidote and specular hematite (Moffit and Mertie, 1923).

Bornite and Bornite-Chalcocite Deposits

Bornite is the most common copper mineral in the Kotsina-Kuskulana district. However, none of the deposits are exclusively bornite as they usually grade into bornite-chalcocite. Generally, they are considered bornite deposits where the chalcocite is the secondary mineral. Chalcocite can occur as either primary, intergrown with the bornite, or as secondary supergene, replacing the bornite. Bluish gray chalcocite most commonly occurs as stringers and patches in the bornite, but has been noted as a granular mass of equal amounts of bornite, chalcocite, and quartz, just outside the study area. Pyrite is present in small amounts, with the surface being oxidized and covered with malachite. It was most likely deposited during a later stage of mineralization. Gangue materials include quartz and calcite (Moffit and Mertie, 1923).

Bornite and bornite-chalcocite deposits include the Falls Creek and Divide Creek prospects in the Canyon Creek drainage; the Copper King and Hubbard-Elliott mines on Elliott Creek; the Lost Cabin and Montana Boy prospects in the Kotsina River drainage; the Hidden Treasure, Homestake, Mineral Creek, Newhome, Sunrise, and Sunset prospects in the Kluvesna River drainage; and the Nugget Creek Mine in the Kuskulana River drainage.

Bornite-Chalcopyrite Deposits

In this type of deposit, bornite is the primary mineral with chalcopyrite being the secondary mineral and chalcocite is absent. Questions arise as to whether there have been two phases of the same stage of hypogene mineralization. One hypothesis has them as unrelated phases, with the chalcopyrite replacing the bornite during a later stage, or have both the bornite and chalcopyrite replaced earlier minerals? Chalcopyrite is present along contacts between bornite and gangue, in addition to gash veinlets. Locally, discontinuous gashes crosscut bornite. Pyrite is not present in every bornite-chalcopyrite deposit in the Kotsina-Kuskulana district. Where it is present, the pyrite is not in contact with the bornite-chalcopyrite, thus concluding that pyrite likely crystalized first. Gangue materials include quartz, epidote, calcite, and jasper (Moffit and Mertie, 1923).

Localities of bornite-chalcopyrite deposits include the Chichokna prospect in the Chetaslina River drainage; the Fall Creek Saddle Occurrence and Fall Creek Upper Prospect on the Kluvesna River; the Mullen Mine and the Bluebird, Bunker Hill, Cave, Forget-Me-Not, Lime Creek, Mountain Sheep, Peacock Claim, Roaring Creek, Roaring Creek Southeast, Roaring Creek Southwest, Skyscraper Peak West, Surprise/Sunshine, and the Warner prospects in the Kotsina River drainage; the Minneapolis and Squaw Creek prospects on the Kuskulana River; and the Strelna Creek prospect in the Strelna Creek drainage.

Pyrite-Chalcopyrite Deposits

Pyrite-chalcopyrite deposits are the lowest grade copper deposits that occur in the Kotsina-Kuskulana district. They only form small deposits. Their economic viability is doubtful as copper producers, but they may contain significant quantities of gold and silver. Chalcopyrite can occur in greater or lesser amounts than the pyrite. High temperature minerals including garnet, magnetite, hornblende, and pyroxene are missing from these deposits. Moffit and Mertie consider these deposits as low temperature deposits. The deposits are genetically related to the intrusive bodies of granodiorite that were the source for the contact deposits. It is presumed that chalcopyrite was formed during a later stage of mineralization than pyrite, but that they were deposited during the same period of mineralization (Moffit and Mertie, 1923).

Pyrite-chalcopyrite deposits in the southern Wrangell Mountains include the Chokosna River and Kinney-Golden prospects in the Chokosna River drainage; the Alaska Copper Mines, Ammann, Amy Creek, Kotsina River, and the Larson prospects in the Kotsina River drainage; the Franklin prospect in the Kluvesna River drainage; the Barrett Young and Nafsted prospect in the Kuskulana River drainage; and the Surprise Creek prospect in the Nerelna Creek drainage.

Several properties located in the northern Wrangell Mountains appear to fit into the pyrite-chalcopyrite stringer lode deposit type. These include the Antler Creek North and Antler Creek South prospects on Alder Creek; the Camp Creek I and Camp Creek II prospects on Camp Creek; the Trail Creek, Trail Creek Cirque, Trail Creek Cirque North, and Trail Creek Shear prospects on Trail Creek; the Unnamed Occurrence 1 on Jack Creek; and the Unnamed Occurrence 2 on Notat Creek.

Contact Deposits

Low grade copper deposits that are genetically distinct from the stringer lodes constitute the contact deposits. They typically occur at or near the borders of large intrusive bodies, mainly granodiorites, and consist of disseminated sulfides and occasional bodies of solid minerals replacing the country rock. The intrusive bodies include the Chitina Valley batholith and Tertiary and Cretaceous plutons, dikes, and sills. Sulfide minerals are exclusively pyrite and chalcopyrite. Other contact-metamorphic minerals, which locally occur in large amounts, include garnet, magnetite, pyroxene, and hornblende. Chalcopyrite occurs in small amounts between, and partially surrounding, well-defined crystals of pyrite. Locally, calcite and magnetite gangue materials cut the pyrite (Moffit and Mertie, 1923).

Contact deposits range from contact metamorphic to disseminated contact lodes depending on the degree of metamorphism the country rock has undergone. Contact deposits were subject to higher temperatures and pressures during deposition than the stringer lodes. Where the Nikolai Greenstone was the source of copper for the stringer lodes, the formation of contact deposits was through ascending heated meteoric waters in association with granodiorite intrusives. It is highly probable that both contact metamorphic and disseminated contact lodes were deposited at the same time as stringer lodes, though, at different locations (Moffit and Mertie, 1923).

Examples of contact deposits in direct association with granodiorite intrusives have been located in the Kuskulana River drainage in the southern Wrangell Mountains. These include the Berg Creek and Clear Creek mines and the Calcite, Copper Queen, London and Cape, Porcupine Creek, and War Eagle properties.

Several properties located in the northern Wrangell Mountains appear to fit into the contact deposit type. These include the Caribou Creek prospect on Caribou Creek; the Fennimore and Rasmussen prospect on Rock Creek; and the Nabesna, Rambler, and Royal Development Co. mines at White Mountain.

Kennecott Type Deposits

Kennecott Copper Corporation and Mother Lode Coalition mines (Kennecott) contained the richest copper deposits in the Wrangell Mountains (MacKevett and others, 1997). The total tonnage of ore milled at Kennecott was 4,626,000 tons averaging 13% copper. Total production of 591,535 tons of copper and nine million ounces of silver were produced between 1910 and 1938 from the Jumbo, Bonanza, Erie, and Mother Lode ore bodies (Douglass, 1964). Even though the ore has been exhausted, Kennecott is still regarded as one of the highest grade copper deposits in the world. For this reason, as well as its location relative to the study area, the Kennecott deposit is described in this report.

The Kennecott deposits consist primarily of massive chalcocite with minor covellite along with traces of bornite, chalcopyrite, sphalerite, and galena (Bateman and McLaughlin, 1920; Moffit and Mertie, 1923; Bateman, 1950). Chalcocite commonly occurs as relatively pure lenses and masses. Noticeably absent are quartz, pyrite, and other gangue minerals (Bateman, 1950). Units controlling the deposition of ore are the Nikolai Greenstone and the overlying Chitistone Limestone. At this locality the Chitistone Limestone is made up of a lower and upper unit. The lower unit is composed of thin-bedded gray argillaceous limestone and the upper unit is a massive, light gray magnesium-rich dolomite. Fissures and brecciated zones begin along the greenstone/limestone contact and continue upward into the limestone (Birch, 1925).

Warm, meteoric waters moving through the greenstone, removed copper and transported it along fissures in the limestone (Jensen and Bateman, 1981; MacKevett and others, 1997). As the water traveled through the limestone, no reaction occurred until the upper dolomite unit was reached (Douglas, 1964). Chalcocite was immediately precipitated into the dolomitic wall rock (Jensen and Bateman, 1981) along the fissures and brecciated zones (MacKevett and others, 1997). Mineralization advanced outward from the fissures with a distinct contact between the massive ore and the dolomite (Bateman, 1950). Since the ores are confined mainly to the dolomite, the magnesium may have been a controlling factor in deposition (Bateman, 1950). In a different study, Park and MacDiarmid (1975) described the method of deposition as telethermal. Here, the fluids are thought to be hydrothermal instead of meteoric. These fluids are thought to have migrated for such a great distance from the source that most of their heat and potential for chemical reaction with the surrounding rocks have been exhausted (Park and MacDiarmid, 1975). This might explain the lack of bleaching of the surrounding country rocks.

Four different types of copper deposits were mined at Kennecott. They include: 1) wide, steeply dipping, replacement veins striking normal to bedding, starting in the limestone and pinching out 250 to 600 ft. into the dolomite; 2) flat or tabular bedding replacement ore, which is localized by fissures and restricted to certain beds; 3) glacier ore, which consists of fragments of the Bonanza Lode deposited on a lateral moraine of a small glacier; and 4) slide ore, which consists of fragments of ore deposited in talus slopes (Bateman, 1950).

Gold Deposits

Lode gold has only been found in sufficient quantities to warrant exploration at a few locations in the Wrangell Mountains. Generally it was given consideration only as a byproduct of copper mineralization. Properties where gold was considered valuable or as the primary mineral include the Chichokna prospect on the Chichokna River; the Copper King Mine on Elliott Creek; the Berg Creek Mine in the Kuskulana River drainage; and the Nabesna, Rambler, and Royal Development Co. mines at White Mountain.

The Berg Creek Mine was originally located as a copper prospect in 1907. In 1916, the No. 4 Tunnel intersected a sulfide vein containing gold and silver. Silver predominates over gold by as much as two to four times. The mineralization is located near a contact of intrusive rocks ranging from fine-grained diorite to porphyritic granite toward the north and Chitistone Limestone toward the south. The vein is located in a well-defined fissure cutting the diorite. Gold and silver values are higher within the oxidized parts of the vein. Associated minerals include hematite, pyrite, chalcopyrite, and the presence of tellurium. Gangue materials include quartz and calcite (Moffit and Mertie, 1923).

Placer gold has been found in river gravels in the following drainages within the study area; the Caribou Creek Mine on Caribou Creek, the Vicki prospect on Rock Creek, and the Trail Creek prospect on Trail Creek in the northern Wrangell Mountains and the Escape prospect on the Chokosna River, the Kotsina River prospect on the Kotsina River, and the Carmalita prospect on the Lakina River in the southern Wrangell Mountains.

Nabesna Type Deposits

The Nabesna Mine deposit has been classified as a gold-rich copper skarn. Several distinct parts have been identified in this deposit including a garnet skarn, a garnet-pyroxene skarn, a pyroxene skarn, an idocrase-garnet skarn, and a magnetite-serpentine skarn. Thus, the skarn, along with its sulfide and magnetite ore, form a very complex association (Newberry and others, 1997).

The deposit formed by the intrusion of a Cretaceous quartz diorite pluton into massive, nearly horizontal Triassic (Nabesna) limestone resulting in alteration, especially along the contact (Moffit, 1936). Minerals associated with the intrusion and the subsequent alteration of the limestone are characteristic of contact metamorphism. These include andradite, apatite, epidote, limonite, magnetite, serpentine, and spinel. Ore minerals include pyrite, chalcopyrite, galena, sphalerite, and gold. Calcite is the most common gangue mineral while quartz occurs mainly in the upper part of some veins (Moffit, 1954).

Three types of ore deposits occur within the skarn: 1) auriferous pyrite-calcite veins containing chalcopyrite, sphalerite, and galena in ore shoots, with calcite and quartz as gangue minerals; 2) bodies of massive magnetite with pyrite and some gold; and 3) veins and masses of pyrrhotite containing disseminated pyrite, chalcopyrite, and gold (Richter, 1997). Ore bodies are formed predominantly in limestones east of the intrusion, near its contact surface. These bodies are essentially veins formed by the replacement of limestone along pre-existing fractures and cracks. It has been reported that mineralization also occurs in the quartz diorite intrusion (Koschmann and Bergendahl, 1968). Other deposits containing mineralization similar to the Nabesna type gold deposits are the Royal Development Co. and Rambler mines located at White Mountain.

MOLYBDENUM AND CORUNDUM DEPOSITS

Molybdenum and corundum have been located in the northern Wrangell Mountains at two locations along Rock Creek. These two prospects are the Rock Creek Moly and the Corundum prospect to the east. Bedrock in the Rock Creek vicinity consists of a large meta-igneous complex (Richter, 1970), which is mainly a Triassic(?) hornblende diorite gneiss and a variety of non-foliated diorites (Richter and Schmoll, 1973). A large Triassic(?) peraluminous syenite monzonite gneiss, which is part of the complex, is exposed intermittently for about eight miles along an approximate northwest-southeast line. This syenite-monzonite gneiss is the host rock for the pegmatite syenite dikes that the corundum and molybdenite occur. The pegmatites probably represent a late stage of igneous activity in the complex. Gneiss in the region indicates high grade metamorphism, however locally, hornblende-biotite-plagioclase in the diorite indicates medium grade (greenschist facies) metamorphism (Richter, 1970).

The Rock Creek Moly prospect has two distinct rock types, a pink syenite gneiss and a dark quartz diorite gneiss (Moffit, 1954). The gneiss is cut by a pegmatite dike which ranges in thickness from a few inches up to 2 feet (Berg and Cobb, 1967). The molybdenite occurs in the shattered part of the dike as flakes, blebs, and veinlets (Moffit, 1941). In the more shattered parts of the pegmatite, the molybdenite blebs can be up to 1½ inches in diameter (Smith, 1942b).

At the Corundum prospect, the corundum occurs in thin pegmatite dikes that cut the syenite-monzonite gneiss. The corundum is found in three or more dikes as groups of gray crystals, generally associated with small books of light-gray to very pale lavender muscovite. The corundum may be a result of the late stages of regional metamorphism. The corundum crystals, which were described as being gray and pink asteriated (Pratt, 1901), are badly misshapen, fractured, and contain inclusions. They can be as much as 3 in. long and 1 in. wide (Richter, 1970).

MINERAL DEPOSIT MODELS

Mineral deposit characteristics were first compiled by R.L. Erickson with the USGS in 1982 (Erickson, 1982). Current mineral deposit models were created as a result of work that began in 1983 between USGS and Columbian geologists during the Cooperative Mineral Resource Assessment of Columbia (Cox and Singer, 1986). The models describe essential characteristics of groups of similar deposits along with accompanying grade-tonnage models where they have been developed. In 1986, Dennis Cox and Donald Singer listed the current models in their "Mineral Deposit Models" Bulletin 1693.

Deposit models identified in the Wrangell Mountains include basaltic copper, carbonate hosted gold-silver, copper skarn, iron skarn, granitoid host gold, pebble conglomerate, pegmatite, polymetallic vein, and porphyry copper-molybdenum. Tables 3, 4, and 5 list the deposit model and the mineral deposit types for each property covered in this report. The basaltic copper, copper skarn, iron skarn, and polymetallic vein models are the only models discussed in this report as they represent the most likely types to be mined. Cox and Singer's mineral deposit models were used in the economic prefeasibility study completed by Jim Coldwell (2000).

Basaltic Copper (23)

Basaltic copper deposits describe a diverse group of copper minerals deposited in the upper parts of thick basalt sequences and overlying carbonate rocks. The copper-rich (100-200 ppm) basalts contain sequences of flows, breccias, and tuffs overlain by mixed limestone and shale deposits. The ore bodies may form large pipes or lenses replacing the limestone along breccia zones and fractures. These form within 150 ft. of the basalt/limestone contact. Copper minerals consist mainly of chalcocite with minor amounts of native copper, bornite, and chalcopyrite as well as alteration minerals including malachite, azurite, chlorite, actinolite, epidote, and albite (Cox and Singer, 1986; Nokleberg and others, 1987).

Copper Skarn (18b)

Copper skarns are described as chalcopyrite in talc-silicate, contact metasomatic rocks. They form mainly where igneous rocks, ranging from tonalite to monzogranite, intrude carbonate rocks. Irregular or tabular ore bodies form in the carbonate rocks near the igneous contact and in xenoliths within the igneous stock. Other types of igneous rocks near the deposit are commonly barren. Ore minerals include chalcopyrite and pyrite, and possible gold, silver, hematite, magnetite, bornite, and pyrrhotite. Alteration minerals in the igneous rocks may include epidote, pyroxene, actinolite, chlorite, and garnet (Cox and Singer, 1986).

Iron Skarn (18d)

Iron skarn deposits are described as magnetite in talc-silicate, contact metasomatic rocks. They form mainly as replacement of carbonaceous rocks along the intrusive contact with diorite, granodiorite, granite, or coeval volcanic rocks. Some deposits have also formed in gabbro-rich host rocks near felsic intrusions. Ores form in the fracture zones at or near the contact between the igneous intrusion and carbonate rocks. The ore mineral is primarily magnetite but can include chalcopyrite, pyrite, and pyrrhotite (Cox and Singer, 1986).

Polymetallic Vein (22c)

Polymetallic vein deposits consist of quartz-carbonate veins with gold, silver, and associated base metal sulfides. These veins are related to hypabyssal igneous intrusions in sedimentary and metamorphic rocks. The igneous rocks range in composition from calcalkaline to alkaline, diorite to granodiorite, monzonite to monzogranite, and andesite to rhyolite. The intrusions are small dike swarms and sills within

TABLE 3 - Selected properties within the McCarthy quadrangle, Wrangell-St. Elias National Park and Preserve, Alaska.

Property name	Commodity	Minerals* reported (*identified*)	Host rock*	Mineral* deposit type	Mine type	Deposit model	Study status	Ahtna, Inc. selection
Amy Creek - Tunnel 6	Cu, Ag	Py (*py, cpy*)	NGs, HCF	Stringer P-CO	Dev. prospect	Fe skarn (18d)**	Located/sampled	No
- Tunnel 7		Py (*py, cpy*)			Dev. prospect		Located/sampled	
- Tunnel 8		Py (*py, cpy*)			Dev. prospect		Located/sampled	
Barrett Young & Nafsted	Cu	Cpy, mal (*cpy, py*)	NGs, CVb	Stringer P-CO	Dev. prospect	Basaltic Cu (23)**	Located/sampled	Yes
Berg Creek Mine - Tunnel 1	Au, Ag, Cu	Cpy, py, mag	CLs, CVb	Contact deposit	Dev. prospect	Cu skarn (18b)**	Not located	No
- Tunnel 2		Cpy, py			Dev. prospect		Not located	
- Tunnel 3		Cpy, py			Dev. prospect		Not located	
- Tunnel 4		Py, cpy, Ag, Au			Past producer		Not located	
- Tunnel 5		Py, cpy, Ag, Au (*cpy*)			Past producer		Area sampled	
Blackburn - Lower adit	Cu, Au	Py, cpy	NGs, CVb	Contact deposit	Dev. prospect	Basaltic Cu (23)**	Not located	Yes
- Middle adit		Py, cpy			Dev. prospect		Not located	
- Upper adit		Py, cpy			Dev. prospect		Not located	
Calcite	Cu	Py, cpy (*py, cpy*)	CLs, CVb	Contact deposit	Dev. prospect	Fe skarn (18d)**	Located/sampled	No
Carmalita	Au	Au (*Au*)	Q gravels	Placer	Exp. prospect	Placer	Area sampled	Yes
Chokosna River	Cu	Not reported	SkG, NGs	Stringer P-CO	Exp. prospect	Unknown	Not located	Yes
Clear Creek Mine - Tunnel 1	Cu, Ag, Au	Py, cpy (*cpy, bor, py*)	NGs, CVb	Contact deposit	Past producer	Basaltic Cu (23)**	Located/sampled	Yes
- Tunnel 2		Py, cpy (*cpy, mal*)			Past producer		Located/sampled	
- Tunnel 3		Py, cpy			Past producer		Located	
- Tunnel 4		Not reported			Dev. prospect		Located	
- Opencut		Not reported (*cpy*)			Dev. prospect		Located/sampled	
- Opencut		Not reported (*py, cpy*)			Dev. prospect		Located/sampled	
Copper Queen	Cu, Fe	Py, cpy, mag (*py, cpy*)	CLs, CVb	Contact deposit	Dev. prospect	Cu skarn (18b)**	Located/sampled	No

*See list of abbreviations at the beginning of the report. **After Cox and Singer (1986).

TABLE 3 - Selected properties within the McCarthy quadrangle, Wrangell-St. Elias National Park and Preserve, Alaska -- Continued.

Property name	Commodity	Minerals* reported (*identified*)	Host rock*	Mineral* deposit type	Mine type	Deposit model	Study status	Ahtna, Inc. selection
Escape	Au	Au	Q gravels	Placer	Exp. prospect	Placer	Not located	Yes
Fall Creek Saddle Occurrence	Cu	(*Bor, mal*)	NGs	Stringer BCO	Raw prospect	Unknown	Located/sampled	Yes
Fall Creek Upper Prospect	Cu	(*Bor, cpy, py, mal, az*)	NGs	Stringer BCO	Dev. prospect	Basaltic Cu (23)**	Located/sampled	Yes
Franklin	Cu	(*Cpy, py, mal*)	NGs, HCF	Stringer P-CO	Dev. prospect	Basaltic Cu (23)**	Area sampled	Yes
Good Enough	Cu, Ag	Cc, nc, mal, az	NGs, HCF	Stringer CO	Dev. prospect	Basaltic Cu (23)**	Not located	Yes
Hidden Treasure	Cu, Au, Ag	Bor, cc, nc (*bor, mal*)	NGs, HCF	Stringer BB-C	Dev. prospect	Basaltic Cu (23)**	Located/sampled	Yes
Homestake - Adit	Cu, Au, Ag	Cc, nc (*bor, cpy, nc*)	NGs	Stringer BB-C	Dev. prospect	Basaltic Cu (23)**	Located/sampled	Yes
- Opencut		Cc (*py*)			Dev. prospect		Located/sampled	
Kinney-Golden	Cu	Cpy (*py*)	MCF	Stringer P-CO	Dev. prospect	Basaltic Cu (23)**	Area sampled	Yes
Kotsina River	Cu, Ag	Py	NGs, HCF	Stringer P-CO	Dev. prospect	Basaltic Cu (23)**	Not located	No
Larson - East	Cu	Mal (*py*)	NGs	Stringer P-CO	Dev. prospect	Basaltic Cu (23)**	Located/sampled	Yes
- West		Mal (*cpy, py, mal*)			Dev. prospect		Located/sampled	
Lime Creek	Cu	Bor, cpy (*bor, cc, cpy*)	NGs, CLs	Stringer BCO	Dev. prospect	Basaltic Cu (23)**	Located/sampled	Yes
London and Cape	Cu, Mo, Ag	Py, cpy (*py, cpy, bor*)	CVb, KPF	Contact deposit	Dev. prospect	Por CuMo (21a)**	Located/sampled	No
Lost Cabin - Upper	Cu, Ag	Cc, bor, cpy (*py*)	CLs, NGs	Stringer BB-C	Dev. prospect	Basaltic Cu (23)**	Located/sampled	No
- West		Cc, bor, cpy			Dev. prospect		Not located	
Mineral Creek	Cu, Au, Ag	Cpy, cc, py (*cpy, py*)	HCF, CVb	Stringer BB-C	Dev. prospect	Basaltic Cu (23)**	Area sampled	Yes
Minneapolis	Cu	(*Bor, mal, az*)	HCF, NGs	Stringer BCO	Dev. prospect	Basaltic Cu (23)**	Area sampled	No
Newhome - Adit	Cu, Au, Ag	Bor, cpy (*bor, mal*)	NGs	Stringer BB-C	Dev. prospect	Basaltic Cu (23)**	Located/sampled	Yes
- Opencut No. 1		Bor, cpy (*bor, cpy*)			Dev. prospect		Located/sampled	
- Opencut No. 2		Bor, cpy			Dev. prospect		Located	
- Opencut No. 3		Bor, cpy (*bor, cpy*)			Dev. prospect		Located/sampled	

*See list of abbreviations at the beginning of the report. **After Cox and Singer (1986).

TABLE 3 - Selected properties within the McCarthy quadrangle, Wrangell-St. Elias National Park and Preserve, Alaska -- Continued.

Property name	Commodity	Minerals* reported (*identified*)	Host rock*	Mineral* deposit type	Mine type	Deposit model	Study status	Ahtna, Inc. selection
Nugget Creek Mine - Upper	Cu, Au, Ag	Bor, cpy, nc (*bor*)	NGs	Stringer BB-C	Past producer	Basaltic Cu (23)**	Located/sampled	No
O'Hara	Pb, Zn, Fe	Gn, py, po, sl	SkG, mar	Contact deposit	Dev. prospect	Polymet. vein (22c)**	Located	Yes
Porcupine Creek Head	Cu, Au	Cpy, mal	NGs, CVb	Contact deposit	Dev. prospect	Basaltic Cu (23)**	Not located	Yes
Porcupine Creek Mouth	Cu, Au	Py, cpy, mal (*cpy, py*)	NGs, CVb	Contact deposit	Dev. prospect	Basaltic Cu (23)**	Area sampled	Yes
Roaring Creek - Adit	Cu	Bor cpy, nc (*bor, nc*)	NGs, HCF	Stringer BCO	Dev. prospect	Basaltic Cu (23)**	Located/sampled	No
- Opencut		Bor, cpy, nc (*bor, nc*)			Dev. prospect		Located/sampled	
Roaring Creek Southeast	Cu	Bor, cpy, py, nc	NGs, HCF	Stringer BCO	Dev. prospect	Basaltic Cu (23)**	Located	No
Roaring Creek Southwest	Cu	None reported	HCF, NGs	Stringer BCO	Dev. prospect	Basaltic Cu (23)**	Located	No
Silver Star Mine - East	Ag, Cu, Bi	Tet, gn (*bor, cpy*)	HCF, NGs	Stringer ATO	Past producer	Polymet. vein (22c)**	Located/sampled	Yes
- West		Tet, gn (*bor, cpy*)			Past producer		Located/sampled	
Skyscraper	Cu	Cc, nc	NGs, CLs	Stringer CO	Dev. prospect	Basaltic Cu (23)**	Located	No
Skyscraper Peak West	Cu	Bor, cc, cpy, nc	NGs, CLs	Stringer BCO	Dev. prospect	Basaltic Cu (23)**	Located/sampled	No
Squaw Creek	Cu, Ag	Bor	NGs, CLs	Stringer BCO	Dev. prospect	Unknown	Located	Yes
Strelna Creek	Cu	Bor, cpy, nc, py	NGs, CLs	Stringer BCO	Exp. prospect	Basaltic Cu (23)**	Not located	Yes
Sunrise	Cu, Au, Ag	Bor, nc (*bor, cc*)	NGs	Stringer BB-C	Dev. prospect	Basaltic Cu (23)**	Located/sampled	Yes
Sunset - Adit	Cu, Au, Ag	Mal, az (*bor, nc, mal*)	NGs	Stringer BB-C	Dev. prospect	Basaltic Cu (23)**	Located/sampled	Yes
- Opencut		Mal, az (*cpy, py, mal*)			Dev. prospect		Located/sampled	
Surprise/Sunshine - Adit	Cu	Bor, cpy, py, cc	NGs, CVb	Stringer BCO	Dev. prospect	Basaltic Cu (23)**	Located	No
- Opencut No. 1		Bor, cpy (*bor, cc, cpy*)			Dev. prospect		Located/sampled	
- Opencut No. 2		Bor, cpy (*bor, cc, cpy*)			Dev. prospect		Located/sampled	
War Eagle	Cu, Fe	Py, po, cpy (*cpy, py*)	CLs, CVb	Contact deposit	Dev. prospect	Cu skarn (18b)**	Located/sampled	No
Warner	Cu, Ag	Bor, cpy (*bor, mal*)	NGs, CLs	Stringer BCO	Dev. prospect	Basaltic Cu (23)**	Located/sampled	No

*See list of abbreviations at the beginning of the report. **After Cox and Singer (1986).

TABLE 4 - Selected properties within the Nabesna quadrangle, Wrangell-St. Elias National Park and Preserve, Alaska.

Property name	Commodity	Minerals* reported (*identified*)	Host rock*	Mineral* deposit type	Mine type	Deposit model	Study status	Ahtna, Inc. selection
Antler Creek North	Cu	Cpy, py, bor	Diorite	Stringer P-CO	Dev. prospect	Unknown	Not located	Yes
Antler Creek South	Cu	Py, cpy	Diorite	Stringer P-CO	Raw prospect	Unknown	Not located	No
Bee Jay	Cu, Ag, Au	Not reported	NGs, Ls	Unknown	Raw prospect	Unknown	Not located	Yes
Boyden	Au	Au	Q gravels	Placer	Exp. prospect	Placer	Not located	Yes
Camp Creek 1	Cu	Cc (*py, cpy*)	Basalt, Ls	Stringer P-CO	Exp. prospect	Basaltic Cu (23)**	Area sampled	Yes
Camp Creek 2	Cu	Cc (*py, cpy*)	Basalt, Ls	Stringer P-CO	Raw prospect	Basaltic Cu (23)**	Area sampled	Yes
Caribou Creek Mine	Au	Au	Q gravels	Placer	Past producer	Placer	Located/sampled	Yes
Caribou Creek - Adit No.1	Au, Pb, Zn	Py, gn, sl (*py, cpy*)	Volcanics	Contact deposit	Dev. prospect	Unknown	Located/sampled	Yes
- Adit No.2		Py, gn			Dev. prospect		Located	
Corundum	Corundum	Corundum	Gniess	Contact deposit	Exp. prospect	Pegmatite	Not located	No
Fennimore & Rasmussen	Cu	Not reported	Volcanics	Contact deposit	Raw prospect	Basaltic Cu (23)**	Not located	No
Nabesna Mine	Au, Ag, Cu	Po, py, Au, cpy, mag	NLs, NB	Contact deposit	Past producer	Fe skarn (18d)**	Visited	Yes
Platinum Creek	PGM	PGM	Q gravels	Placer	Raw prospect	Placer	Not located	Yes
Rambler Mine - Upper	Au, Cu, Ag	Po, py, cpy (*po, cpy*)	NLs, NB	Contact deposit	Past producer	Fe skarn (18d)**	Located/sampled	Yes
Rock Creek Moly	Mo	Mo (*mo, cpy, py*)	Diorite	Contact deposit	Dev. prospect	Polymet. vein (22c)**	Located/sampled	No
Royal Development Co.	Au, Cu	Py, Au, cpy	Ns	Contact deposit	Past producer	Fe skarn (18d)**	Visited	Yes
Trail Creek	Au	Au (*Au*)	Q gravels	Placer	Raw prospect	Placer	Area sampled	Yes
Trail Creek Cirque	Cu, Pb, Ag	(*Py*)	NGs, Ls	Stringer P-CO	Raw prospect	Polymet. vein (22c)**	Area sampled	No
Trail Creek Cirque North	Cu, Pb, Ag	Gn, sl, tet	Ls, diorite	Stringer P-CO	Exp. prospect	Polymet. vein (22c)**	Not located	No
Trail Creek Shear	Cu	(*Py*)	Argillite	Stringer P-CO	Raw prospect	Basaltic Cu (23)**	Located/sampled	No
Unnamed occurrence 1	Cu	Po, gar, cpy	Volcanics	Stringer P-CO	Raw prospect	Unknown	Not located	Yes
Unnamed occurrence 2	Au	Py, gn, sl	Volcanics	Stringer P-CO	Dev. prospect	Carbhost Au-Ag	Not located	Yes
Vicki	Au	Au	Q gravels	Placer	Exp. prospect	Placer	Not located	No

*See list of abbreviations at the beginning of the report. **After Cox and Singer (1986).

TABLE 5 - Selected properties within the Valdez quadrangle, Wrangell-St. Elias National Park and Preserve, Alaska.

Property name	Commodity	Minerals* reported (*identified*)	Host rock*	Mineral* deposit type	Mine type	Deposit model	Study status	Ahtna, Inc. selection
Alaska Copper Mines	Cu	Not reported	MCF, CVb	Stringer P-CO	Exp. prospect	Unknown	Not located	No
Ammann - Lower	Cu, Ag	Mal, az (*py, cpy*)	CLs, MCF	Stringer P-CO	Dev. prospect	Basaltic Cu (23)**	Located/sampled	Yes
- Upper		Bor, cc, cpy, cv			Dev. prospect		Located	
Bluebird	Cu, Ag, Au	Bor, cpy (*cpy, mal*)	CLs, NGs	Stringer BCO	Dev. prospect	Basaltic Cu (23)**	Located/sampled	No
Bunker Hill	Cu	Bor, py, cpy	CLs, NGs	Stringer BCO	Dev. prospect	Basaltic Cu (23)**	Not located	No
Cave Prospect - Adit No. 1	Cu, Ag	Bor, cpy (*mal, az*)	CLs, NGs	Stringer BCO	Dev. prospect	Basaltic Cu (23)**	Located/sampled	No
- Adit No. 2		Bor, cpy (*mal, az*)			Dev. prospect		Located/sampled	
- Adit No. 3		Bor, cpy			Dev. prospect		Located	
Chichokna	Au	Not reported (*py*)	SkG, CVb	Stringer BCO	Exp. prospect	Polymet. vein (22c)**	Area sampled	Yes
Copper King Mine	Au, Cu	Bor, cc, cpy (*bor, cc*)	NGs, CLs	Stringer BB-C	Past producer	Basaltic Cu (23)**	Located/sampled	Yes
Crawford	Uranium	Uranium	Cgl	Pebble congl.	Raw prospect	Pebble congl. (29a)**	Not located	Yes
Divide - Opencut No. 1	Cu	Bor, cv, cpy (*cpy*)	SkG, Ls	Stringer BB-C	Dev. prospect	Basaltic Cu (23)**	Located/sampled	Yes
- Opencut No. 2		Bor, cv, cpy (*py*)			Dev. prospect		Located/sampled	
- Opencut No. 3		Bor, cv, cpy (*cpy, py*)			Dev. prospect		Located/sampled	
- Opencut No. 4		Bor, cv, cpy			Dev. prospect		Located	
Dottie	Au	Au	Q gravels	Placer	Exp. prospect	Placer	Not located	Yes
Falls Creek - No. 1 Adit	Cu	Bor, cpy (*bor, cpy*)	SkG, Ls	Stringer BB-C	Dev. prospect	Basaltic Cu (23)**	Located/sampled	No
- No. 2 Adit		Bor, cpy			Dev. prospect		Located	
- No. 3 Adit		Bor, cpy			Dev. prospect		Located	
Forget-Me-Not	Cu	Bor, cpy (*cc, bor*)	NGs, CLs	Stringer BCO	Dev. prospect	Basaltic Cu (23)**	Located/sampled	No
Hubbard-Elliott Mine	Cu, Ag, Au	Bor, cpy, cc	NGs, CLs	Stringer BB-C	Past producer	Basaltic Cu (23)**	Located	No
Montana Boy	Cu	Bor, cpy, Au	NGs, CLs	Stringer BB-C	Dev. prospect	Basaltic Cu (23)**	Located/sampled	No

*See list of abbreviations at the beginning of the report. **After Cox and Singer (1986).

TABLE 5 - Selected properties within the Valdez quadrangle, Wrangell-St. Elias National Park and Preserve, Alaska -- Continued.

Property name	Commodity	Minerals* reported (*identified*)	Host rock*	Mineral* deposit type	Mine type	Deposit model	Study status	Ahtna, Inc. selection
Mountain Sheep	Cu, Ag	Bor, cpy (*bor, cpy*)	NGs, CLs	Stringer BCO	Dev. prospect	Basaltic Cu (23)**	Located/sampled	No
Mullen Mine - No.1	Cu, Ag, Au	Bor, cpy (*cpy*)	CLs, MCF	Stringer BCO	Past producer	Basaltic Cu (23)**	Located/sampled	Yes
- No. 2		Bor, cpy			Past producer		Located	
- No. 3		Bor, cpy			Dev. prospect		Located/sampled	
- No. 4		Bor, cpy			Dev. prospect		Located	
- Opencut		Bor, cpy (*cpy*)			Dev. prospect		Located/sampled	
Peacock Claim	Cu, Ag	Bor, cpy, py (*cpy*)	CLs, NGs	Stringer BCO	Dev. prospect	Basaltic Cu (23)**	Located/sampled	No
Surprise Creek	Cu	Cpy, py, cc, bor	SkG, Ls	Stringer P-CO	Dev. prospect	Basaltic Cu (23)**	Not located	Yes

*See list of abbreviations at the beginning of the report. **After Cox and Singer (1986).

the sedimentary and metamorphic rocks. Ores form in areas of high permeability such as intrusive contacts, fault intersections, and breccia pipes that are within the thermal aureoles of the dike swarms. Replacement ore bodies may form where these structures intersect carbonate rocks. Ore minerals include native gold, silver, electrum, sphalerite, chalcopyrite, galena, arsenopyrite, and tetrahedrite. The veins can also contain dolomite, ankerite, siderite, rhodochrosite, barite, fluorite, and chalcedony (Cox and Singer, 1986; Nokleberg and others, 1987).

HISTORY

Native copper from the southern Wrangell Mountains has been utilized by the indigenous residents of the lower Copper River for centuries. It was not only fashioned into hunting tools and ornamentation, but also used as trading material with other Alaskan native groups. Having this copper resource gave the Ahtna natives prestige and power. It enhanced their position as traders between the natives to the south and those to the north. Most of the native copper was likely recovered from stream gravels, but evidence suggests that some may also have been mined from several outcrops throughout the valley (Bleakley, 1997).

During the late eighteenth to mid-nineteenth centuries, the Russians spent little effort in exploring the Copper River region for its mineral wealth. Dmitri Tarkhanov explored only a small part of the Copper River in 1796, but he did not travel as far north as the Chitina River. Even after the United States purchased Alaska from Russia in 1867, it wasn't until the early 1880's that the Americans really began exploring Alaska. Even then, the first mineral prospecting did not occur until 1884 when John Bremner explored the lower Copper River (Bleakley, 1997).

Serious exploration activity in the Wrangell Mountains began as a result of the influx of prospectors and miners during the 1898 Klondike "Gold Rush." The Wrangell Mountains are located along an alternate western route of the "Gold Rush Trail" between Port Valdez and the Yukon Territory. Numerous prospectors, weary from the adventure over the Tazlina Glacier, scoured the valleys and ridge tops of the Wrangell Mountains looking for their elusive "Mother Lode." Others only stopped to check out the mineralization en route to the greater riches awaiting them at Dawson and beyond. A few successful prospectors began mining their deposits for gold, copper, and silver, with the Nabesna and Kennecott mines being the most notable successes. Less notable, but important discoveries were made by Charles Hubbard and Henry Elliott on Elliott Creek, Ole Berg on Berg Creek, the Great Northern Development Co. on Clear Creek, the Alaska Consolidated Copper Co. on Nugget Creek, and the prospects located on Copper Creek.

Most mining activity in the region had ceased by the mid to late 1930's either due to the ore being exhausted or from low mineral prices. During World War II, mining activities in the United States that were deemed unnecessary for the war effort were closed down by executive order. A second flurry of mineral exploration occurred in the mid to late 1950's, but no significant development or mining occurred during this period. Part of the reason was that the wages offered to the miners was less than what the government was paying construction workers throughout the state (verbal communication with Kirk Stanley). Though no mining has occurred at the Nabesna Mine since 1946 (verbal communication with Kirk Stanley), exploration and development activity have continued on the Nabesna, Royal Development Co., and Rambler mines as well as at several other localities in the region during recent years. Extensive exploration activity in the southern

Wrangell Mountains occurred during the 1970's and 1980's. However, none of the exploration results have been published.

A detailed historical account of the copper and gold mining as well as exploration activities in the Wrangell Mountains, not associated with the Kennecott Mine, is currently being written by Geoffrey Bleakley, park Historian for the Wrangell-St. Elias National Park and Preserve.

PREVIOUS STUDIES

The Wrangell Mountains were first explored for their mineral potential by the U.S. War Department in 1885. Lt. Henry T. Allen reached the headwaters of the Chitina and Nizina Rivers looking for the source of Chief Nikolai's copper (Allen, 1887). In 1891, Charles W. Hayes was the first USGS geologist to explore and discover many of the copper deposits in the area (Hayes, 1892). Rohn (1900) conducted the first true geologic and mapping exploration program of the area for the War Department in 1899. The USGS began earnestly conducting studies and reporting on the geology and mining activities of the Wrangell Mountains beginning in 1898 (Capps, 1915). Detailed Alaska Mineral Resource Assessment Program (AMRAP) studies, headed by MacKevett, Richter, and Winkler of the USGS, have been conducted on the Nabesna, McCarthy, and Valdez quadrangles. These studies include the publication of geochemistry data, mineral resource data, and geologic maps. See the bibliography section for a listing of those reports. The U.S. Bureau of Mines (USBM) conducted a two-year reconnaissance mineral assessment of the southern Wrangell-St. Elias area in 1977 and 1978 (U.S. Bureau of Mines, 1978). Only three of the occurrences visited by the USBM are located within Ahtna, Inc. selected lands. The analytical records have not been located for the samples collected during that study.

PRESENT STUDY

The BLM started a multi-year mineral assessment of Ahtna, Inc. selections in 1996 and conducted two seasons of field work. An initial literature search identified 74 mineral occurrences located within one mile of the Ahtna, Inc. selections. Fifty-five properties were considered important enough to be investigated (Meyer and Shepherd, 1998). After the second season of field work, 82 mineral occurrences located within one to three miles of the Ahtna, Inc. selections were considered important enough to be included in this mineral assessment (Meyer and VandeWeg, 1999). Twenty-two of the occurrences are located on the north side of the Wrangell Mountains. The other 60 are located on the south side of the Wrangell Mountains. Eleven of the mineralized occurrences were identified as historically producing mines, 46 as development prospects, 13 as exploration prospects, and 12 as raw prospects.

Field work consisted of locating as many of the workings as possible "on-the-ground." When workings were located, site location and elevation data were collected using Trimble Pathfinder Pro-XL Global Positioning System (GPS) equipment[1]. Wherever mineralized rock was encountered representative rock samples were collected from the site to determine the character of the deposit and GPS location data was obtained. If an open adit was located, a cursory examination was conducted of the workings. This consisted of determining the length and direction of any drifts or crosscuts found. Any unusual or additional findings, such as the location and amount of dynamite or associated

[1]Mention of a specific brand name or manufacturer is for information purposes only and does not imply endorsement by the Bureau of Land Management.

structures, were also noted. Streams with identified placer occurrences were also sampled.

When the 1997 and 1998 field work was completed, the information gathered "on-the-ground" was combined with information collected from the literature search and previous studies. A more comprehensive understanding was developed to determine the historical relationships of miners, exploration companies, and specific properties. Property summary sheets were created for each occurrence (Appendix B, Property Summaries). This level of detail had not been done prior to this study to verify any of the "on-the-ground" workings with those historically reported in the literature.

1997 Field Work

Field work during 1997 was performed during two separate periods. Work in the northern Wrangell Mountains area was conducted from June 15 through 28 based out of the End of the Road Bed & Breakfast, Devils Mountain Lodge, Alaska. Work in the southern Wrangell Mountains area was based out of Kenny Lake Mercantile, Kenny Lake, Alaska from July 20 through August 1. Site investigations were completed on 26 of the identified mineral occurrences (8 in the northern area and 18 in the southern area). A total of 37 adits were located and 70 samples collected and analyzed (Appendix A). Four samples contained over 16% copper (the Bluebird prospect 50.15%, the Mullen Mine opencut 34.46 and 36.64%, and the Cave prospect 16.15%), 11 samples contained between 1.2 and 13.4% copper, 3 samples contained between 316.2 and 1,677.1 ppm silver, 2 samples contained over 2,000 ppm antimony, 7 samples contained over 10% iron, 3 samples contained between 1,208 and 3,956 ppm zinc, and 1 sample contained 1,960 ppm lead.

In the northern Wrangell Mountains area, five adits were examined and sampled on three properties and two placer occurrences were sampled. Seven occurrences were not located and four were not looked for due to time constraints. The properties identified in the northern Wrangell Mountains are shown on Plate 3. A total of 31 samples were collected from the Camp, Caribou, Rock, and Trail Creek drainages as well as the White Mountain area. During the 1997 field season no significant mineral properties within Ahtna, Inc. selected lands other than the Caribou Creek, Nabesna, Rambler, and Royal Development Co. mines and the Trail Creek prospect were identified. Numerous shear zones were encountered, but the mineral values and the extent of mineralization did not warrant further exploration. The Nabesna and Royal Development Co. mines are patented and a validity determination is proposed on the Rambler Mine by the NPS (Meyer and Shepherd, 1998).

In the southern Wrangell Mountains 32 adits on 18 properties were located and sampled. Sixteen occurrences were looked for, but not located and 3 occurrences were not looked for. The properties identified in the southern Wrangell Mountains are shown on Plate 4. A total of 39 samples were collected from the Chichokna, Chokosna, Kotsina, and Kuskulana Rivers and the Falls Creek area. Eleven properties were found to contain elevated copper along with high levels of silver, gold, iron, and/or zinc. These properties are the Clear Creek, Copper King, Mullen, and Silver Star mines and the Ammann, Bluebird, Cave, Fall Creek, Hidden Treasure, and Peacock Claim prospects. Four other properties contain lower but still elevated commodity values. These are the Amy Creek, Copper Queen, Larson, and War Eagle prospects. Native copper was found at the Homestake prospect, whereas, massive chalcopyrite, bornite, and/or chalcocite were found at the other properties in the southern study area (Meyer and Shepherd, 1998).

1998 Field Work

Field work during 1998 was conducted only in the southern Wrangell Mountains area from June 7 through 27 and was based out of Kenny Lake, Alaska. Site investigations were completed on 29 properties and a total of 26 adits and 24 opencuts were located and 40 samples collected and analyzed (Appendix A). Three samples contained over 20.49% copper (Lime Creek 23.99%, Roaring Creek 23.02%, and the Surprise/Sunshine prospect opencut 20.49%), 3 samples contained between 9.56 and 14.48% copper, and 10 samples contained between 1.32 and 3.46% copper. Five samples contained between 10.6 and 61.5 ppm silver, 11 samples contained between 3.1 and 8.9 ppm silver, and 12 samples contained between 0.2 and 2.0 ppm silver. Two samples contained between 2,411 and 2,938 ppb gold, 2 samples contained between 227 and 608 ppb gold, and 21 samples contained between 6 and 98 ppb gold as listed in Appendix A.

During the field season four properties were revisited but not sampled. Twelve reported occurrences were looked for but not located; the surrounding area was sampled on four of them. Eighteen properties were found to contain elevated commodity values of copper along with anomalous levels of silver and/or gold. These include the Nugget Creek Mine and the Barrett Young and Nafsted, Divide Creek, Homestake, Fall Creek Saddle Occurrence, Fall Creek Upper, Forget-Me-Not, Larson, Lime Creek, Mineral Creek, Minneapolis, Mountain Sheep, Newhome, Roaring Creek, Sunrise, Sunset, Surprise/Sunshine, and Warner prospects as shown on Plate 4. Native copper was found at the Homestake, Roaring Creek, and Sunset prospects. Bornite, chalcocite, chalcopyrite, malachite, azurite, and/or pyrite were found, in various concentrations, at all of these properties.

SAMPLING

Sampling employed both hard rock and placer techniques. Hard rock sampling included collecting a representative select, grab, or chip sample of the host rock for analysis, and a hand specimen for later study. Select samples were collected of highly mineralized rock, grab samples were collected of random mineral or rock fragments, and chip samples were a collection of either random or representative minerals or rock chips taken across or along mineralized outcrops. Sample sizes ranged from 3 to 10 pounds depending upon the quality and quantity of mineralization encountered. Placer sampling consisted of running 1/10 of a cubic yard of gravel through a portable sluice box, then panning down the concentrates to an approximate ½ pound sample size. Only those mines, prospects, or occurrences containing visible mineralization had at least one sample collected at the site, depending upon the extent of the mineralization.

All samples were sent to ITS Intertek Testing Services Bondar-Clegg[1], North Vancouver, B.C., Canada, analytical laboratory for preparation and analysis using 34-element inductively coupled argon plasma spectroscopy (ICP) technique. Any element over its ICP detection limit was analyzed by either atomic absorption spectroscopy (AA) or fire assay (FA) techniques. Placer sample concentrates were also submitted for lab analysis.

SITE INVESTIGATIONS

Site investigations were completed on 46 of the identified mineral occurrences (5 in the northern area and 41 in the southern area). A total of 57 adits and 26 opencuts were located (Table 6). A total of 110 samples were collected and analyzed during the study (Appendix A). Seven samples contained over 15% copper (the Bluebird prospect

TABLE 6 - Adit and opencut locations visited in the Wrangell-St. Elias National Park and Preserve.

Property name	Latitude	Longitude	Elev. (ft.)	Bearing	Sample no(s).	Accessibility
Amman Prospect - Lower Adit	N61° 40' 33.607"	W144° 04' 02.997"	3,860	N.28°E.	10041	Caved
- Upper Adit	N61° 40' 32.198"	W144° 04' 04.876"	3,940	N.68°E.	Not sampled	Open
Amy Creek - Tunnel 6	N61° 42' 25.017"	W143° 50' 50.725"	3,810	N.10°E.	10048	Caved
- Tunnel 7	N61° 42' 22.275"	W143° 50' 35.386"	3,875	N.28°E.	10049	Caved
- Tunnel 8	N61° 42' 11.105"	W143° 50' 38.788"	4,170	N.85°E.	10050	Flooded
Berg Creek - Tunnel 5	N61° 33' 06.337"	W143° 47' 26.360"	2,865	N/A	10059, 10060	Caved
Bluebird - Opencut	N61° 39' 46.706"	W144° 02' 01.952"	5,055	N/A	10044	N/A
Calcite - Adit	N61° 32' 48.777"	W143° 43' 13.397"	4,930	N.78°E.	10068	Open
Caribou Creek Prospect - Adit No. 1	N62° 37' 28.137"	W143° 26' 59.860"	4,860	N.78°W.	10006 - 10008	Caved
- Adit No. 2	N62° 37' 26.995"	W143° 27' 02.084"	4,890	N.13°W.	Not sampled	Caved
Cave Prospect - Adit No. 1	N61° 40' 18.381"	W144° 04' 02.402"	4,110	N.35°W.	10043	Flooded at 34 ft.
- Adit No. 2	N61° 40' 20.403"	W144° 04' 14.415"	4,350	S.78°W.	10107	Open
- Opencut	N61° 40' 25.177"	W144° 04' 15.303"	4,400	N/A	Not sampled	N/A
Clear Creek Mine - Tunnel 1	N61° 37' 24.608"	W143° 50' 24.448"	5,010	N.35°E.	10054	Partially sloughed
- Tunnel 2	N61° 37' 50.057"	W143° 50' 50.595"	5,585	N.33°E.	10056, 10057	Caved
- Tunnel 3	N61° 37' 41.604"	W143° 50' 57.967"	5,140	N.30°E.	Not sampled	Iced in at 20 ft.
- Tunnel 4	N61° 36' 58.588"	W143° 50' 22.623"	4,300	N.90°E.	Not sampled	Caved
- Lower Opencut	N61° 37' 38.869"	W143° 50' 58.226"	5,095	N/A	10058	N/A
- Upper Opencut	N61° 37' 24.518"	W143° 50' 19.761"	5,125	N.31°W.	10055	N/A
Copper King Mine - Adit	N61° 38' 12.130"	W144° 02' 03.251"	4,700	N.32°E.	10063	Iced in
- Opencut No. 1	N61° 38' 20.769"	W144° 02' 09.226"	4,610	N/A	Not sampled	N/A
- Opencut No. 2	N61° 38' 20.988"	W144° 02' 06.649"	4,635	N/A	Not sampled	N/A
- Opencut No. 3	N61° 38' 21.053"	W144° 02' 06.360"	4,640	N/A	Not sampled	N/A
- Opencut No. 4	N61° 38' 21.123"	W144° 02' 05.825"	4,640	N/A	Not sampled	N/A
Copper Queen - Adit	N61° 33' 31.285"	W143° 45' 27.753"	3,340	N/A	10062	Caved
Divide Creek - Opencut No. 1	N61° 21' 50.641"	W144° 16' 37.169"	4,550	N/A	10102	N/A
- Opencut No. 2	N61° 21' 51.578"	W144° 16' 39.437"	4,560	N/A	10103	N/A
- Opencut No. 3	N61° 21' 49.081"	W144° 16' 40.560"	4,600	N/A	10104	N/A
- Opencut No. 4	N61° 21' 49.760"	W144° 16' 39.524"	4,575	N/A	Not sampled	N/A
Fall Creek Upper Prospect	N61° 47' 48.858"	W143° 56' 24.106"	5,270	N/A	10087	Open
Falls Creek - No. 1 Adit	N61° 21' 13.668"	W144° 15' 38.732"	4,780	N.40°E.	10064	Open, one X-cut
- No. 2 Adit	N61° 21' 16.925"	W144° 16' 14.674"	4,620	S.03°W.	Not sampled	Open
- No. 3 Adit	N61° 21' 30.147"	W144° 15' 40.455"	4,710	N.40°W.	Not sampled	Open
Forget-Me-Not - Opencut	N61° 39' 44.654"	W144° 02' 09.822"	4,750	N.65°W.	10105	N/A
Hidden Treasure - Adit	N61° 48' 00" *	W143° 53' 04" *	5,620	N/A	10052	Not located

* GPS coordinates could not be differentially corrected. N/A Not applicable.

TABLE 6 - Adit and opencut locations visited in the Wrangell-St. Elias National Park and Preserve--Continued.

Property name	Latitude	Longitude	Elev. (Ft.)	Bearing	Sample no(s).	Accessibility
Homestake - Adit	N61° 47' 31.899"	W143° 56' 03.964"	4,640	N.45°W.	10038	Open, two X-cuts
- Opencut	N61° 47' 27.734"	W143° 56' 12.206"	4,690	N/A	10085	N/A
Hubbard and Elliot - Lower Adit	N61° 39' 00.241"	W144° 06' 04.936"	3,955	N.20°W.	Not sampled	Sloughed at 20 ft.
- Upper Adit	N61° 39' 00.946"	W144° 06' 06.639"	4,020	N.15°W.	Not sampled	Open, one X-cut
Larson - East Adit	N61° 42' 08.461"*	W143° 51' 46.415"*	5,000	N.65°W.	10051	Open
- West Adit	N61° 42' 09.139"	W143° 52' 40.865"	4,900	S.60°W.	10096	Sloughed at portal
- West Opencut	N61° 42' 10.070"	W143° 52' 43.908"	4,950	N/A	10097	N/A
Lime Creek - Adit	N61° 41' 33.004"	W143° 55' 56.244"	3,890	N.17°W.	10071	Open
London and Cape - Adit	N61° 34' 01.141"	W143° 43' 06.130"	4,505	S.65°E.	10077	Caved
Lost Cabin Upper - Adit	N61° 44' 01.510"*	W143° 59' 46.135"*	4,010	N.73°W.	10072, 10073	Open
Montana Boy - Lower Opencut	N61° 39' 45.979"*	W144° 01' 56.875"*	5,230	N/A	10074	N/A
- Upper Opencut	N61° 39' 46.620"*	W144° 01' 53.811"*	5,380	N/A	Not sampled	N/A
Mountain Sheep - Adit	N61° 40' 02.716"	W144° 03' 14.675"	4,760	N.55°W.	10106	Caved at 10 ft.
Mullen Mine - No. 1 Adit	N61° 40' 34.613"	W144° 03' 53.492"	3,700	N.48°E.	10040	Open, many X-cuts
- No. 2 Adit	N61° 40' 32.601"	W144° 03' 52.244"	3,580	N.28°W.	Not sampled	Caved
- No. 3 Adit	N61° 40' 35.035"	W144° 03' 53.335"	3,670	N.08°E.	Not sampled	Open
- No. 4 Adit	N61° 40' 35.547"	W144° 03' 53.421"	3,690	N.08°E.	Not sampled	Open
- Opencut	N61° 40' 30" *	W144° 03' 57" *	3,850	N/A	10039, 10039A	N/A
Newhome - Adit	N61° 47' 28.403"	W143° 55' 58.126"	4,430	N.10°E.	10037	Open
- Opencut No. 1	N61° 47' 25.124"	W143° 55' 59.268"	4,490	N/A	10100	N/A
- Opencut No. 2	N61° 47' 27.785"	W143° 56' 01.676"	4,540	N/A	Not sampled	N/A
- Opencut No. 3	N61° 47' 28.187"	W143° 56' 01.093"	4,520	N/A	10101	N/A
Nugget Creek - Lower Adit	N61° 38' 34.011"	W143° 43' 05.271"	3,500	N/A	Not sampled	Caved
- Upper Adit	N61° 38' 35.481"	W143° 43' 04.668"	3,670	S.88°W.	10079	Caved
Peacock Claim -Adit	N61° 40' 14.790"	W144° 03' 39.530"	4,120	N.58°W.	10042	Open
Rambler Mine - Adit No. 1	N62° 23' 03.577"	W143° 00' 29.438"	3,640	N/A	10027	Open
- Adit No. 2	N62° 23' 07.028"	W143° 00' 19.522"	3,400	N/A	Not sampled	Iced in
Roaring Creek - Adit No. 1	N61° 41' 17.805"	W143° 50' 31.185"	5,290	S.36°E.	10089	Caved
- Upper Opencut	N61° 41' 17.893"	W143° 50' 33.355"	5,450	N/A	10090	N/A
Rock Creek Moly - Adit	N62° 35' 54.617"	W143° 21' 20.739"	5,170	N.13°W.	10016 - 10018	Sloughed at entrance
Silver Star Mine - Lower Adit	N61° 44' 17.936"	W143° 54' 09.497"	4,875	N/A	10038	Sloughed
- Upper Adit	N61° 44' 18.825"	W143° 54' 06.899"	4,915	N.75°W.	10085	Open
Skyscraper Peak West - Adit	N61° 41' 26.417"	W143° 48' 06.340"	4,790	N.58°W.	10091	Open
Sunrise - Opencut No. 1	N61° 47' 34.610"*	W143° 56' 10.733"*	4,270	N/A	Not sampled	N/A
- Opencut No. 2	N61° 47' 34.191"	W143° 55' 57.940"	4,090	N/A	10086	N/A

* GPS coordinates could not be differentially corrected. N/A Not applicable.

TABLE 6 - Adit and opencut locations visited in the Wrangell-St. Elias National Park and Preserve--Continued.

Property name	Latitude	Longitude	Elev. (Ft.)	Bearing	Sample no(s).	Accessibility
Sunset - Adit	N61° 47' 39.490"	W143° 55' 40.296"	4,140	S.38°W.	10098	Caved
- Opencut	N61° 47' 41.203"	W143° 55' 40.887"	4,170	N/A	10099	N/A
Surprise/Sunshine - Adit	N61° 45' 06.224"	W143° 48' 23.982"	5,550	S.42°W.	Not sampled	Open
- Opencut No. 1	N61° 45' 07.382"	W143° 48' 24.057"	5,640	N/A	10093, 10093A	N/A
- Opencut No. 2	N61° 45' 06.662"	W143° 48' 26.486"	5,630	N/A	10094	N/A
War Eagle - Adit	N61° 33' 32.068"	W143° 44' 36.985"	3,550	N.12°W.	10061	Caved
Warner - Adit	N61° 42' 31.731"	W143° 57' 40.373"	2,320	S.72°E.	10070	Open

* GPS coordinates could not be differentially corrected. N/A Not applicable.

at 50.2%, the Mullen Mine at 34.46 and 36.64%, the Lime Creek prospect at 24%, the Roaring Creek prospect at 24.03%, the Surprise/Sunshine prospect at 20.5%, and the Cave prospect at 17.0%), 24 samples contained between 1 and 14% copper, 6 samples contained between 103 and 1,677 ppm silver (the Silver Star Mine at 618.4 ppm and 1,677 ppm, the Berg Creek Mine at 316.2 ppm, the Mullen Mine at 109.7 ppm, the Bluebird prospect at 104 ppm, and the Rambler Mine at 103.6 ppm), 3 samples contained between 8 and 49 ppm gold (the Berg Creek Mine at 17.75 and 48.48 ppm and the Rambler Mine at 8.68 ppm), 2 samples contained over 2,000 ppm antimony (the Silver Star Mine), 7 samples contained over 10% iron (the Clear Creek and Mullen mines and the Carmalita and War Eagle prospects), 3 samples contained between 1,208 and 3,956 ppm zinc (the Rambler Mine at 3,956 ppm, the Silver Star Mine at 3,060 ppm, and the Clear Creek Mine at 1,208 ppm), and 1 sample contained 1,960 ppm lead (the Rambler Mine).

Northern Wrangell Mountains

During the investigation of the northern Wrangell Mountains five adits were located and sampled on the Rambler Mine and the Caribou Creek and Rock Creek Moly prospects and two placer occurrences, the Caribou Creek and Trail Creek prospects, were sampled. Areas investigated in the northern Wrangell Mountains include the Alder, Camp, Caribou, Rock, and Trail Creek drainages as well as the White Mountain area and are shown on Plate 3 and listed in Table 4.

Bedrock in the northern Wrangell Mountains is extremely incompetent and highly fractured making the discovery of any workings difficult. Tailings and mine waste dumps in this area are small and tend to blend into the natural surroundings (scree slopes). Vegetative regrowth of disturbed areas was not a contributing factor for locating mine workings in the higher elevations and too thick in the lower elevations to aid in locating workings. There is little, if any, leftover mine or camp equipment at any of the workings in the northern area other than that located at the Nabesna, Royal Development Co., and Rambler mines. One cairn in Caribou Creek was spotted, on an over flight, and used as a reference point while several aluminum claim posts on Rock Creek helped in locating the open adit. Noting a rusted 20 gallon drum in a ravine assisted in locating the actual workings.

Six areas have seen the greatest amount of mineral activity in this part of the study area. They are: Antler Creek, Camp Creek, Caribou Creek, Rock Creek, Trail Creek, and the White Mountain area as shown on Plate 3. The major producing operations in the northern area include the Nabesna, Royal Development Co. (Roehm, 1936a), and Rambler mines. The Nabesna and Royal Development Co. mines are patented and the current owner requested that no samples be taken from the properties.

Camp Creek

Camp Creek No. 1 and Camp Creek No. 2 occurrences: Neither occurrence was located because of extremely unstable slope conditions. A highly iron-oxide stained pyritic boulder, containing minor chalcopyrite, was found on a medial moraine along the west side of the valley. Bedrock in the valley consists of highly sheared, fractured, and faulted amygdaloidal basalt in contact with Triassic (Nabesna) limestone. A select sample of the float (map no. 19, sample AAWSE 10028) contained 107 ppm copper, 0.3 ppm silver, and 1,209 ppm bismuth.

Caribou Creek

Caribou Creek Mine: The mine was a hydraulic placer operation that utilized a 3-in.-diameter hose and a 12-in.-wide sluicebox ("Long Tom") of unknown length. A wing dam, with wooden gates, was built to control water flow in the creek and create a head for the hydraulic nozzle. The area worked covered approximately 1 to 1½ miles of the creek and is marked by boulder piles on both sides of the creek. The workings are located between a lower cabin which is still used by hikers, and an old tent site at the 4,450 ft. elevation. Stream float consists of basalt, rhyolite, and aplitic dike boulders up to 16 inches in diameter. One placer sample (map no. 9, sample AAWSE 10014) collected below an eastern gully consisting of sloughed material contained two small angular gold flakes approximately ½ mm in diameter. Analytical results of the concentrates contained 2,951 ppb gold, 0.6 ppm silver, and 31 ppm copper. A second sample (map no. 9, sample AAWSE 10015) was collected below the workings from a gravel bar on the east side of the creek and contained six small flakes of gold up to ½ mm in diameter. Analytical results of the concentrates revealed 5,227 ppb gold, 0.4 ppm silver, and 33 ppm copper. No quartz was noted in the concentrates from either sample location.

Caribou Creek prospect: Two caved adits are located upstream from the Caribou Creek Mine on the west side of the creek. The adits are driven into Permian volcanic and volcaniclastic bedrock containing rhyolitic and hornblendite dikes. Adit No. 1 appears to have been driven N. 78° W. following a rhyolitic dike containing disseminated pyrite. A zone of horndblendite is located above the portal. A select sample (map. no. 6, sample no. AAWSE 10006) collected of rhyolitic dike material with disseminated pyrite from the waste dump contained 2 ppm copper. A select sample (map no. 6, sample no. AAWSE 10007) collected from a 2-ft.-wide iron-oxide stained vein located on the upper right of the portal contained disseminated pyrite. The sample contained 316 ppm copper and 0.3 ppm silver. A grab sample (map no. 6, sample no. AAWSE 10008) collected of pyrite float above the adit contained 137 ppm copper. Adit No. 2 is located 150 ft. downstream from Adit No. 1. This adit appears to have been driven N. 13° W., with no visible copper mineralization noted in the waste dump or immediate vicinity. No samples were collected due to the lack of mineralization.

Rock Creek

Rock Creek Moly prospect: The adit, driven by Kennecott Copper Corp. on a molybdenum prospect, was located. It is open and driven N. 13° W. for approximately 150 ft. into a diorite gniess complex which has been cut by alkali dikes. A select sample (map no. 13, sample AAWSE

10016) collected from iron-oxide stained pegmatite dike on the adit floor contained pyrite and epidote. The sample contained 3 ppm molybdenum and 27 ppm copper. A select sample (map no. 13, sample AAWSE 10017) collected of quartz diorite gniess with epidote and pyrite from the waste dump contained 4 ppm molybdenum, 13 ppb gold, and 81 ppm copper. Also from the waste dump, a select sample (map no. 13, sample AAWSE 10018) collected of pink syenite gniess containing biotite and pyrite contained 3 ppm molybdenum and 13 ppm copper.

Trail Creek

Trail Creek Cirque: The Trail Creek Cirque prospect is reported to be in a cirque on the east side of Trail Creek. Sampling was conducted in the area, however the prospect was not located. Bedrock in the area consists of folded and faulted Nikolai Greenstone overlain by massive and thin-bedded Triassic limestones intruded by augite-hornblende diorite and plagioclase porphyry (Richter and Schmoll, 1973). A massive pyrite boulder, 12 inches in diameter, was located on the south side of the cirque along a medial moraine. The source of the boulder was not located but appears to have come from the south side of the mountain above its resting place. The area is too steep and dangerous to climb to locate its source. A select sample (map no. 4, sample no. AAWSE 10021) collected from the boulder contained 1,037 ppm copper, 0.9 ppm silver, and 17 ppb gold. At the 5,360 ft. elevation, a 3- ft.-wide shear zone was located in an outcrop west of the boulder. The outcrop is made up of a 10- to 12-ft.-thick bed of shale overlain by a 30-ft.-thick bed of horndblendite. A random chip sample (map no. 4, sample no. AAWSE 10020) collected from the shale contained 42 ppm copper.

Trail Creek Shear prospect: An extensive shear-zone on a northeastern tributary of Trail Creek was located and sampled. Bedrock consists of highly sheared and weathered argillite intruded by hornblende-plagioclase porphyry sills and dikes. This zone is cut by a stream which follows a fault line and extends for approximately ¼ mile. Two samples, a grab and a select sample, (map no. 2, sample nos. AAWSE 10010-10011) were collected from two 12-in.-wide dikes containing disseminated pyrite. The samples contained 123 and 40 ppm copper, respectively. A select sample (map no. 2, sample no. AAWSE 10012) collected from a 1- to 2-in.-wide shear zone contained 21 ppm copper, 0.5 ppm silver, and 80 ppb gold. A select sample (map no. 2, sample no. AAWSE 10013) was taken of the argillite between samples AAWSE 10010 and AAWSE 10012 contained 135 ppm copper and 14 ppb gold.

Trail Creek placer prospect: A placer operation on Trail Creek was looked for on the ground and from the air, but not located. No signs of prospecting were noted in the drainage. Stream float consists of basalt diabase, greenstone, and limestone. Three placer samples were collected with very minor gold recovery in the samples. Two samples were collected in the main drainage above and below the northeast tributary and one sample was collected in the northeastern tributary below the Trail Creek shear. The first sample (map no. 8, sample no. AAWSE 10029) contained four to five fine gold specks ranging from ½ to 1 mm in size. Analysis of the concentrates revealed 4,321 ppb gold and 69 ppm copper. The second sample (map no. 1, sample no. AAWSE 10030) contained two small gold specks. Analysis of the concentrates revealed 1,144 ppb gold and 68 ppm copper. The third sample (map no. 3, sample no. AAWSE 10031) was taken from Trail Creek. A fair amount of clay was encountered in this sample but very little black sands were present. Two gold specks were recovered from the sample. Analysis of the concentrates revealed 3,122 ppb gold, 0.3 ppm silver, and 73 ppm copper.

Jack/Caribou Creek: There is an extensive east-west trending, shear-zone extending from beyond Jack Creek through Caribou Creek. This shear zone follows a major fault zone, shows intensive iron-staining, and ranges up to 140 ft. in width. Minerals consist of disseminated pyrite and minor chalcopyrite. Five samples (map nos. 10-12, 14, samples AAWSE 10001-10005) collected from one of the stain zones contained only 3 to 58 ppm copper, 217 to 1,054 ppm manganese, and up to 11 ppb gold. Numerous shear zones of a similar nature occur throughout the northern Wrangell Mountains. No shear zones encountered in the study area contain high enough quality or quantity of mineralization to warrant further exploration.

White Mountain

Rambler Mine: The upper and lower adits were located. Improvements include four buildings (assay lab, office, bunkhouse, and storage shed), an ore bunker, a metal-lined ore shoot with a cabled ore car between the adits, and a generator. The No. 1 Adit (upper adit) is open but iced-in 20 ft. from its portal. A chip sample (map no. 18, sample no. AAWSE 10027) collected across a 3-ft.-wide shear zone, 45 ft. above the adit, contains pyrrhotite and chalcopyrite. The sample contained 3,301 ppm copper, 103.3 ppm silver, 8.68 ppm gold, 3,956 ppm zinc, 1,960 ppm lead, and 1,238 ppm bismuth. The No. 2 Adit is open for 10 ft. from the portal, then is iced-in. No samples were collected. No visible copper mineralization was noted in the adit or in the waste dump.

Southern Wrangell Mountains

Investigations were completed on 41 of the identified mineral properties in the southern Wrangell Mountains. Those properties are listed in Tables 3 and 5. On those properties, a total of 52 adits and 26 opencuts were located with 68 samples collected and analyzed (Plates 4 & 6, Appendix A). Seven occurrences were looked for and not located but the areas were sampled. Thirteen occurrences were not located.

More mineral related activity was conducted in this region than the north, so there were more workings to locate. Two old mill buildings were located, the Nugget Mine Millsite and the Berg Creek Mine (North Midas) Millsite. The mill equipment from the Nugget Mill was moved to the Berg Mill, and both buildings are deteriorating rapidly.

The greatest amount of mineral activity in this part of the study area occurred in two major drainage basins, the Kotsina River drainage, which includes the Kluvesna River, and the Kuskulana River drainage to the west. Other areas of mineral activity include Elliott Creek (a southern tributary of the Kotsina River) and Canyon Creek (a tributary of the Copper River) south of Chitina. Occurrences in the Kluvesna and Kotsina River drainages were discovered and worked during the early 1900's, concurrent with the Kennecott Mine operation. Major producing operations in the southern Wrangell Mountains study area include the Berg Creek Mine on Berg Creek, the Clear Creek Mine on Clear Creek, the Mullen Mine on Copper Creek, the Copper King and Hubbard-Elliott mines on Elliott Creek, the Silver Star Mine on the Kotsina River, and the Nugget Creek Mine on Nugget Creek.

Kluvesna River Prospects

The Kluvesna River drainage includes the Fall Creek and Mineral Creek tributaries. Prospects located in the Fall Creek drainage include the Fall Creek Saddle Occurrence, Fall Creek Upper Prospect, Good Enough, Hidden Treasure, Homestake, Newhome, Sunset, and the Sunrise prospects as shown on Plate 4. The prospects located in the Kluvesna River drainage include the Franklin, Lost Cabin, and Mineral Creek prospects. The Good Enough property was looked for but no workings were located.

Fall Creek

Fall Creek Saddle Occurrence: The prospect consists of a 2-ft.-wide shear zone along the contact of faulted, sheared, and iron-oxide stained basalt and the Nikolai Greenstone. The malachite and iron-oxide stained shear zone strikes N. 10° W. and dips vertically. Disseminated bornite and malachite occur within quartz and epidote veining. A select sample (map no. 22, sample AAWSE 10088) collected of the disseminated bornite and malachite in the shear zone contained 3,769 ppm copper, 0.6 ppm silver, and 25 ppb gold.

Fall Creek Upper Prospect: Workings consist of an opencut along a highly iron-oxide stained 3-ft.-wide shear zone within the Nikolai Greenstone. The opencut is 10 ft. wide by 25 ft. deep and 20 ft. high at the face. Bornite, chalcopyrite, and malachite occur in epidote and quartz veins within the shear zone. The mineralized zone covers an area of approximately 30 sq. ft. along the length of the opencut. A select sample (map no. 23, sample AAWSE 10087) collected from the shear zone contained 1.94% copper, 6.4 ppm silver, and 6 ppb gold.

Hidden Treasure: The Hidden Treasure consists of two opencuts in what appears to be medial moraines near the head of a cirque at the head of the valley. The reported adit could not be located as the slopes in the cirque are talus covered with very little exposed bedrock. The smaller upper opencut is 5 ft. wide by 10 ft. long and 2 ft. deep. The larger lower opencut, 5 ft. wide by 20 ft. long and 5 ft. deep, consists of malachite- and azurite-stained vesicular Nikolai Greenstone containing bornite. A select sample (map no. 27, sample AAWSE 10052) collected of mineralized greenstone from the waste dump contained 3.3% copper and 3.0 ppm silver. No visible mineralization was found in the upper opencut.

Homestake prospect: An adit is driven N. 45° W. for 83 ft. into mineralized vesicular Nikolai Greenstone tuff containing native copper, bornite, chalcopyrite, stephanite, malachite, and azurite. This mineralized tuff covers an area approximately 50 ft. high by 100 ft. wide. A 3-ft.-wide shear zone to the south of the adit contains native copper and is traceable for at least 15 feet. A select sample (map no. 25, sample AAWSE 10038) collected of the mineralized greenstone contained 2.9% copper and 8.5 ppm silver. A pile of mineralized greenstone is visible on the slope below the adit. An opencut is located in a gully approximately 100 ft. above the adit. Bedrock in the opencut consists of iron-oxide stained Nikolai Greenstone with pyrite and chalcopyrite mineralized quartz veins. A grab sample (map no. 25, sample AAWSE 10085) collected of the mineralized quartz veins contained 215 ppm copper and 8 ppb gold.

Newhome prospect: One adit and three opencuts are located on the property. The adit, driven N. 10° E. for 35 ft., into Nikolai Greenstone which contains malachite- and azurite-stained quartz and bornite. Twenty feet from the portal, a 6-in.-wide shear zone with ⅛-in.-wide quartz veins was encountered. A select sample (map no. 25, sample AAWSE 10037) collected from the waste dump contained 5,354 ppm copper and 7.4 ppm silver. Opencut No. 1, is located furthest from the adit to the southwest. The opencut, 15 ft. wide by 20 ft. long and 15 ft. deep at the face, is cut along a 2-ft.-wide shear zone with associated quartz and epidote veining. Bornite, chalcocite, and malachite occur in the shear, where the bornite surrounds the chalcocite. A select sample (map no. 24, sample no. AAWSE 10100) collected of mineralized quartz from the waste dump contained 2.49%

copper, 11.6 ppm silver, and 6 ppb gold. Opencut No. 2, located toward the northwest, contained no visible sulfide mineralization. Opencut No. 3 is located directly above the adit. The opencut is cut along a 1-ft.-wide mineralized shear zone with associated quartz veining which may be the same shear the adit is driven along. Bornite, chalcopyrite, and malachite minerals are deposited in the shear. A select sample (map no. 24, sample AAWSE 10101) collected of mineralized rock from a stockpile contained 2.61% copper, 5.6 ppm silver, and 20 ppb gold.

Sunrise prospect: One adit is reportedly (Moffit and Maddren, 1909) located below the Homestake adit. A possible opencut is located at the creek level, but no mineralization was noted at this location. No samples were collected. Further downstream, Opencut No. 2 is located on the north side of the creek. Bedrock consists of Nikolai Greenstone which has been crosscut by less than 1-in.-thick quartz veins. Disseminated bornite, chalcocite, and malachite are associated with the quartz. A select sample (map no.25, sample no. AAWSE 10086) collected of a quartz vein contained 2.77% copper, 8.9 ppm silver, and 10 ppb gold.

Sunset prospect: The prospect is located in the tributary north of the creek containing the Sunrise prospect. Workings consist of a caved adit and an opencut. The adit appears to be driven S. 38° W. along a 2-ft.-wide shear zone containing native copper, bornite, and malachite with associated quartz and calcite veining. A representative chip sample (map no. 26, sample no. AAWSE 10098) collected from the shear zone above the portal contained 9.56% copper, 32.4 ppm silver, and 6 ppb gold. The opencut is located 50 ft. upstream from the adit. It is dug along a 2-ft.-wide shear zone trending N. 40° W., that contains disseminated chalcopyrite, pyrite, and malachite with associated quartz. The opencut is 15 ft. long by 7 ft. wide and 5 ft. deep. A grab sample (map no. 26, sample AAWSE 10099) collected from the shear zone contained 5,732 ppm copper and 3.2 ppm silver.

Kluvesna River

Franklin prospect: The Kluvesna River drainage was investigated but the patented Franklin prospect was not located. An outcrop at the base of a waterfall consisted of highly fractured iron-oxide stained Nikolai Greenstone with calcite and quartz veins containing disseminated pyrite, minor chalcocite, and malachite. The same minerals are disseminated throughout the greenstone. Calcite crystals have formed within vugs along fracture planes. A random chip sample (map no. 28, sample no. AAWSE 10076) collected of the mineralized rock contained 186 ppm copper.

Lost Cabin prospect: Two adits were located, however the lower adit was inaccessible. The upper adit is driven N. 17° E. for 30 ft. along a 3-ft.-wide shear zone into bedded Chitistone Limestone. The limestone is in contact with the Nikolai Greenstone. A select sample (map no. 32, sample no. AAWSE 10072) collected from the limestone wall rock contained 224 ppm copper, 0.2 ppm silver, and 6 ppb gold. A select sample (map no. 32, sample no. AAWSE 10073) collected from a pyrite-bearing shear zone contained 253 ppm copper and 0.2 ppm silver.

Mineral Creek prospect: Mineral Creek was investigated but none of the reported workings (Moffit and Mertie, 1923) were located; it appears that the adits have been closed by surface sloughing. Rocks in the entire Mineral Creek drainage have been highly sheared and faulted, which has created extremely unstable slopes. Bedrock consists of iron-oxide stained Skolai Group cherts, tuffs, and lava flows, which have been intruded by diorite. A 1- to 2-ft.-wide shear zone in the diorite contains veinlets and disseminated chalcopyrite and pyrite with quartz gangue. A representative chip sample (map no. 30, sample no. AAWSE 10075) collected across a 2-ft.-wide shear zone contained 1,583 ppm copper, 0.3 ppm silver, and 18 ppb gold.

Kotsina River Prospects

Tributaries of the Kotsina River drainage include Amy Creek, Copper Creek, Roaring Creek, Rock Creek, and Surprise Creek. Mines located in the drainage include the Mullen and Silver Star mines as shown on Plate 4. Properties include the Alaska Copper Mines, Ammann, Amy Creek, Bluebird, Bunker Hill, Cave, Crawford, Dottie, Forget-Me-Not, Kotsina River, Larson, Lime Creek, Montana Boy, Mountain Sheep, Peacock, Roaring Creek, Roaring Creek Southeast, Roaring Creek Southwest, Skyscraper, Skyscraper Peak West, Surprise/Sunshine, and the Warner prospects. The Alaska Copper Mines, Bunker Hill, Crawford, Dottie, Kotsina River, Roaring Creek Southeast, Roaring Creek Southwest, and Skyscraper prospects were looked for but not located.

Amy Creek

Amy Creek prospect: Three adits associated with this prospect are located along both sides of the Amy Creek valley. The main adit, Tunnel 6, is caved at the portal and appears to have been driven N. 10° E. into highly sheared and iron-stained Nikolai Greenstone. Minerals consist of disseminated pyrite and minor chalcopyrite. A select sample (map no. 44, sample AAWSE 10048) collected of mineralized greenstone from the waste dump contained 183 ppm copper and a trace of silver. Across the valley, Tunnel 7 is also caved at the portal and appears to have been driven N. 28° E. into sheared and iron-stained Nikolai Greenstone. Minerals consist of both disseminated and veinlets of pyrite and chalcopyrite. A select sample (map no. 44, sample AAWSE 10049) collected of mineralized greenstone from the waste dump contained 244 ppm copper and 0.3 ppm silver. Tunnel 8 is located further up the valley. This adit is open and has been driven N. 85° E. for at least 50 ft. into sheared and iron-stained Nikolai Greenstone. Minerals consist of both disseminated and veinlets of pyrite and chalcopyrite. A select sample (map no. 45, sample AAWSE 10050) collected of the mineralized greenstone from the waste dump contained 211 ppm copper and a trace of silver.

Copper Creek

Mullen Mine: The Mullen Mine, which has been patented, was visited and the underground workings were examined. The map of the Mullen No. 1 adit published by Van Alstine and Black (1946) shows an accurate depiction of the underground workings. These workings have been mapped and sampled recently by an unknown party, as sample location tags were found at probable sample sites. Workings at the Mullen Mine include the Mullen Nos. 1 - 4 adits and an opencut. The Mullen No. 1 adit, driven N. 48° E. along a 2-ft.-wide shear zone within the Chitistone Limestone contains bornite, chalcocite, chalcopyrite, and quartz. Dynamite was located just inside the portal. An inclined shaft is located north of the adit near the portal. Two collapsed buildings are located in front of the portal. A random chip sample (map no. 34, sample AAWSE 10040) collected from the 2-ft.-wide shear zone contained 12.2% copper, 23.6 ppm silver, and 286.1 ppm cadmium. No visible mineralization was noted at the Nos. 2, 3, or 4 adits. An opencut above the No. 2 Adit, cut into the malachite- and azurite-stained Chitistone Limestone face, contains massive chalcopyrite. A random chip sample (map no. 34, sample AAWSE 10039) taken across the 4-ft.-wide face contained 34.46% copper and 40.5

ppm silver. A select sample (map no. 34, sample AAWSE 10039A) collected of high grade ore from the opencut contained 36.64% copper and 109.7 ppm silver.

Ammann prospect: There are two adits located on this prospect. The upper adit is open and has been driven S. 52° E. for 19 ft. into the Chitistone Limestone following 2-in.-wide calcite veins. No visible mineralization was noted in the adit, veins, or surrounding area. No samples were collected. The lower adit is caved and appears to have been driven N. 28° E. Bedrock consists of malachite- and azurite-stained Chitistone Limestone with ¾-in.-wide calcite veins containing chalcopyrite and pyrite. A grab sample (map no. 34, sample AAWSE 10041) collected of the calcite vein from the waste dump contained 1.2% copper, 6.4 ppm silver, and 8 ppb gold.

Bluebird prospect: Workings consist of an opencut or caved adit along a highly sheared malachite- and azurite-stained zone in the Nikolai Greenstone underlying Chitistone Limestone. A select sample (map no. 38, sample AAWSE 10044) collected of high grade massive chalcocite ore from the waste dump contained 50.15% copper and 103.6 ppm silver. The shear zone crops out below the workings and contains chalcopyrite. A random chip sample (map no.38, sample AAWSE 10045) collected from the outcrop contained 6.4% copper and 10.3 ppm silver. This shear zone is a continuation of the same shear zone located at the Forget-Me-Not prospect.

Cave Prospect: Three adits and one opencut are located at this prospect. Adit No. 1 is driven N. 35° W. into the Nikolai Greenstone for 34 ft., where it has sloughed. The adit appears to have been driven for an extra 30 to 50 ft. beyond that. At 10 ft. from the portal the workings cut a 2-in.-wide malachite- and azurite-stained quartz vein containing chalcopyrite. A random chip sample (map no. 35, sample AAWSE 10043) collected of the quartz vein contained 16.95% copper and 30.6 ppm silver. Adit No. 2 is driven S. 78° W., for 15 ft. along a 1-ft.-wide shear zone in the Chitistone Limestone. The shear zone is malachite- and azurite-stained with small quartz veins containing disseminated bornite. A select sample (map no. 35, sample no. AAWSE 10107) collected of the stained limestone contained 817 ppm copper. Adit No. 3 is located to the south, driven into a sheared limestone face. The adit was not examined; as access to the adit is not possible without ropes. A small opencut is dug into the limestone above Adit No. 2. No visible sulfide mineralization was noted.

Forget-Me-Not prospect: Workings consist of a small opencut in sheared and iron-oxide stained Nikolai Greenstone. A 3-ft.-wide shear zone trending N. 65° W. with a steep southern dip extends up-slope 20 to 30 ft. and across slope 40 feet. Malachite-stained quartz and calcite make up part of the shear zone. Chalcocite, bornite, chalcopyrite, pyrite, and malachite occur in the shear zone. A select sample (map no. 38, sample no. AAWSE 10105) collected from the shear zone contained 1.89% copper and 3.2 ppm silver. This shear zone appears to be a continuation of the mineralized shear zone that occurs at the Bluebird and Montana Boy prospects 200 yards to the east.

Montana Boy prospect: Workings consist of two opencuts. The lower opencut is located in iron-oxide stained Chitistone Limestone with small calcite veining. The opencut is 3 ft. wide by 15 ft. long and 2 ft. deep. No visible sulfide mineralization was noted in the opencut. A grab sample (map no. 38, sample no. AAWSE 10074) collected of iron-oxide stained limestone contained 44 ppm copper. The upper opencut is 3 ft. wide by 4 ft. long and 3 ft. deep and is cut into the limestone. No visible sulfide mineralization was noted in the opencut.

Mountain Sheep prospect: Workings include one adit driven N. 55° W., for 20 ft., into the Nikolai Greenstone, following a 3-ft.-wide shear zone. The adit is caved 10 ft. from the portal. Bornite, chalcopyrite, malachite, and azurite occur within the shear zone. A select sample (map no. 37, sample no. AAWSE 10106) collected from the sheared rock on the floor of the adit contained 3.0% copper and 3.1 ppm silver.

Peacock Claim prospect: The prospect contains one adit driven N. 58° W. and caved 34 ft. from the portal. The adit extends for another 30 to 50 feet. Rock mucked from the adit was used to build rock walls outside the portal to create an area for a tent and blacksmith shop. No mineralization was noted in the adit as the face was not reachable nor was any mineralization noted in the waste dump. Chips of chalcopyrite were emplaced in the retaining wall to the north of the portal. A grab sample (map no. 36, sample AAWSE 10042) collected of the chips in the rock retaining wall contained 3.1% copper and 4.8 ppm silver.

Roaring Creek

Roaring Creek prospect: The workings consist of a caved adit and an upper opencut. The Adit No. 1 (Camp 3 Tunnel) appeared to have been driven S. 24° W. into highly iron-oxide stained and fractured Nikolai Greenstone. Native copper, chalcocite, bornite, malachite, and azurite occur in the associated quartz and calcite veins. A high grade select sample (map no. 46, sample no. AAWSE 10089) from the opencut contained 23.02% copper, 3.6 ppm silver, and 43 ppb gold. The upper opencut is cut into the same bedrock as the adit. Native copper, chalcocite, bornite, malachite, and azurite occur in associated quartz and calcite veins. A high grade select sample (map no. 46, sample no. AAWSE 10090) collected from the opencut contained 14.48% copper, 23.4 ppm silver, and 23 ppb gold.

Skyscraper Peak West prospect: Workings consist of an adit driven into Nikolai Greenstone and brecciated, amygdaloidal basalts with ⅛-in.-wide quartz and epidote veinlets. The adit is driven N. 4° E. for 40 ft. and is caved 20 ft. from the portal. A 6-in.-wide shear zone cuts perpendicular to the adit at the portal. No visible sulfide mineralization was noted at or near the adit. A grab sample (map no. 47, sample no. AAWSE 10091) collected of material that fell from the roof of the adit contained 196 ppm copper.

Rock Creek

Lime Creek prospect: The prospect consists of an adit driven N. 17° W. for 15 ft. into sheared Nikolai Greenstone. The adit cuts a 10- to 15-ft.-wide shear zone containing rose quartz and calcite. Massive bornite, chalcocite, chalcopyrite, malachite, and azurite occur in the shear zone. A representative chip sample (map no. 41, sample no. AAWSE 10071) collected of the high grade rock from the shear zone contained 23.99% copper, 4.8 ppm silver, and 608 ppb gold.

Warner prospect: An adit has been driven S. 72° E. for 30 ft. into iron-oxide stained Nikolai Greenstone. The adit is driven along a 2-ft.-wide shear zone containing disseminated bornite along with quartz and calcite veins. A select sample (map no. 33, sample no. AAWSE 10070) collected from the shear zone contained 3.46% copper, 3.8 ppm silver, and 16 ppb gold.

Kotsina River

Larson prospect: The Larson East and Larson West adits are located on the south side of the Kotsina River. The Larson East adit is driven N. 65° W. for 90 ft. in iron-oxide stained Nikolai Greenstone that contains disseminated pyrite. A select sample (map no. 43, sample AAWSE 10051) collected from the waste dump contained

188 ppm copper and a trace of silver. The Larson West workings consist of an adit and an opencut. The adit, partially sloughed at the portal, is driven S. 60° W., for 25 ft. in Nikolai Greenstone with epidote veins. No visible sulfide mineralization was noted in the adit or in the waste dump. No samples were collected. The adit was most likely driven to intercept mineralized shear zones that trend north-south above the adit. A 7-in.-wide quartz vein is located above the adit. The quartz vein trends north-south with a 45° west dip and contains chalcopyrite, pyrite, and malachite. A select sample of the quartz vein (map no. 42, sample no. AAWSE 10096) contained 6,714 ppm copper and 1.3 ppm silver. An opencut, located north of the adit, was cut along an iron-oxide stained shear zone containing chalcopyrite, pyrite, malachite, and a 7-in.-wide quartz vein. This shear zone may be the same one the adit was driven to intersect. A grab sample (map no. 42, sample no. AAWSE 10097) collected from the shear zone contained 4,952 ppm copper, 2 ppm silver, and 6 ppb gold.

Surprise/Sunshine prospect: Workings consist of one adit and two opencuts. The adit is driven N. 42° E., for 135 ft., into Nikolai Greenstone. Numerous quartz veins, up to 4 in. wide, and a shear zone were noted in the adit. A 1-ft.-wide shear zone was crossed 50 ft. from the portal. No sulfide mineralization was noted in the adit or the waste dump. Above the adit are two opencuts, with Opencut No. 1 being located directly above the adit and Opencut No. 2 approximately 60 ft. to the west. Opencut No. 1 is 4 ft. wide by 20 ft. long and 20 ft. deep, dug N. 50° W. across a 2-ft.-wide quartz vein. The vein trends N. 60° W. and dips steeply southwest. The vein has a dark reddish tint and is malachite and azurite stained. Bornite, chalcocite, chalcopyrite, malachite, and azurite occur as pods and are also disseminated throughout the quartz. A select sample (map no. 29, sample no. AAWSE 10093) collected from the quartz vein contained 1.32% copper, 0.7 ppm silver, and 227 ppb gold. A select sample (map no. 29, sample AAWSE 10093-A) collected of high grade rock from the waste dump contained 20.49% copper, 6.6 ppm silver, and 2,938 ppb gold. Opencut No. 2 cuts a 4- to 5-ft.-wide white quartz vein trending N. 70° E. with a vertical dip. The opencut is 12 ft. wide by 15 ft. deep and 10 ft. high at the face. This quartz vein contains more iron-oxide staining than the red quartz vein. Bornite, chalcocite, malachite, and azurite occur in the quartz vein. A select sample (map no. 29, sample no. AAWSE 10094) collected from the quartz vein contained 6,797 ppm copper, 2.1 ppm silver, and 66 ppb gold.

Silver Star Mine: The mine is located on Finnestad Creek, a northern tributary of the Kotsina River, and was the last operating mine in the area, closing in the late 1980's. The property contains two adits, numerous opencuts, and surface stripping. The upper adit is driven N. 75° W. for 50 ft. through sheared iron-stained Nikolai Greenstone, along a 6-in.-wide shear zone. Minerals consist of bornite, chalcopyrite, chalcocite, arsenopyrite, malachite, and azurite. A select sample (map no. 31, sample AAWSE 10035) collected of mineralized material from the waste dump contained 2.6% copper, 1,677.1 ppm silver, over 2,000 ppm antimony, 3,060 ppm zinc, 158 ppm lead, and 177 ppb gold. The lower adit is caved at the portal but with a little work could be reopened. Minerals consist of bornite and chalcopyrite in a quartz and calcite matrix. A select sample (map no. 31, sample AAWSE 10036) collected outside the portal contained 513 ppm copper and 31.2 ppm silver. A stockpile, next to an opencut west of the adits, includes material made up of quartz and calcite veinlets containing blebs of bornite, chalcopyrite, chalcocite, arsenopyrite, and galena. A select sample (map no. 31, sample AAWSE 10034) collected from the stockpile contained 5,811 ppm copper, 618.4 ppm silver, over 2,000 ppm antimony, 989 ppm zinc, and 404 ppm lead.

Kuskulana River Prospects

Tributaries within the Kuskulana River drainage include the Berg, Clear, MacDougall, Nugget, Porcupine, Squaw, and Trail creeks. Mines located within the drainage include the Berg Creek, Clear Creek, and Nugget Creek mines as shown on Plate 4. Properties include the Barrett Young and Nafsted, Blackburn, Calcite, Copper Queen, London and Cape, Minneapolis, Porcupine Creek Head, Porcupine Creek Mouth, Squaw Creek, Trail Creek, and War Eagle prospects. The Blackburn, Porcupine Creek Head, and Porcupine Creek Mouth prospects were looked for but not located.

Berg Creek

Berg Creek Mine: Ole Berg operated the mine which includes five tunnels. Tunnel No. 5, the "Working Level," was located because it is where the upper terminus of the aerial tramway is situated. The adit is caved and the exact location of the portal was not located because of the thick vegetative overgrowth. Bedrock in the area consists of Nikolai Greenstone and Chitistone Limestone. Minerals consist of massive and disseminated chalcopyrite, malachite, azurite, and pyrite in quartz. Two select samples (map no. 59, sample nos. AAWSE 10059-10060) collected of mineralized material next to the tramway station contained 4,515 and 2,872 ppm copper, 67.8 and 316.2 ppm silver, and 17.75 and 48.48 ppm gold, respectively.

Clear Creek

Clear Creek Mine: This patented property workings included four adits and two opencuts. Tunnel No. 1 was driven N. 35° E. into Nikolai Greenstone and contains two crosscuts. Minerals occur in sheared iron-stained quartz veinlets and consist of chalcopyrite, minor bornite, and pyrite. A select sample (map no. 53, sample AAWSE 10054) collected from the waste dump contained 155 ppm copper, 1.6 ppm silver, and 285 ppb gold. An opencut above the portal exposes a 2-ft.-wide shear zone, trending N. 31° W., within the Nikolai Greenstone bedrock. Minerals consist of disseminations and 1-in.-thick veins of chalcopyrite. A select sample (map no. 53, sample AAWSE 10055) collected from the shear zone contained 4,978 ppm copper, 4.6 ppm silver, 9,828 ppb gold, and over 10% iron. Tunnel No. 2 adit was caved, but appears to have been driven N 33° E. into a 20-ft.-wide shear zone in highly sheared and faulted Nikolai Greenstone. Minerals consist of massive and disseminated chalcopyrite, malachite, and azurite. A select sample (map no. 51, sample AAWSE 10056) collected of massive chalcopyrite from the waste dump contained 8.8% copper, 66.3 ppm silver, 8,000 ppb gold, over 10% iron, and 1,208 ppm zinc. A select sample (map no. 51, sample AAWSE 10057) collected of disseminated chalcopyrite and malachite contained 2.9% copper, 9.4 ppm silver, 665 ppb gold, and 1,329 ppm manganese. Tunnel No. 3, driven N. 30° E., is iced in at 20 ft. from the portal. The adit appears to have been driven as a haulage tunnel. No visible mineralization was noted in the waste dump. An opencut, 15 ft. wide by 15 ft. long and 6 ft. deep, located down stream from Tunnel No. 3, was cut to expose a 2-in.-wide iron-oxide stained vein containing disseminated pyrite and chalcopyrite. A select sample (map no. 52, sample AAWSE 10058) collected from the vein contained 210 ppm copper, 162 ppb gold, 952 ppm zinc, and over 10% iron. Tunnel No. 4 is located further downstream. The adit is caved, though appears to have been driven N. 30° E. No visible mineralization was noted in the waste dump. No exposed bedrock was noted at this location.

MacDougall Creek

Calcite prospect: The prospect adit is driven N. 78° E., but is caved 53 ft. from the portal. Bedrock consists of sheared Chitistone Limestone with epidote along shear planes containing disseminated chalcopyrite and pyrite. A select sample (map no. 60, sample no. AAWSE 10068) collected of mineralized limestone from the waste dump contained 32 ppm copper and 0.4 ppm silver.

Copper Queen prospect: Workings on the prospect consist of a caved adit driven into sheared and iron-stained Nikolai Greenstone that contains disseminated pyrite and chalcopyrite. A select sample (map no. 53, sample AAWSE 10055) collected of greenstone from the waste dump contained 3,891 ppm copper, 5.0 ppm silver, and 542 ppb gold.

War Eagle prospect: This patented property contains a caved adit which appears to have been driven N. 12° W. into Chitistone Limestone and associated Chitina Valley pluton. Chalcopyrite, minor bornite, disseminated pyrite, and malachite occur in a 8- to 12-in.-wide dike. A sample (map no. 57, sample AAWSE 10061) collected of limestone from the waste dump contained 876 ppm copper, 0.8 ppm silver, 42 ppb gold, and over 10% iron.

Nugget Creek

Minneapolis prospect: The patented prospect was not located, but the area was sampled. Bedrock consists of highly sheared and altered Nikolai Greenstone with quartz and epidote veins up to 5 in. thick. Disseminated bornite, malachite, and azurite occur in the greenstone. A select sample (map no. 49, sample no. AAWSE 10078) collected of the greenstone contained 1,336 ppm copper, 0.2 ppm silver, and 18 ppb gold.

Nugget Creek Mine: Two adits were located at this patented property. The Upper Adit was located and a high grade sample was collected from the waste dump. The adit is driven N. 32° W., for 20 ft., following an iron-oxide stained 2-ft.-wide shear zone in Nikolai Greenstone, which has also been trenched in front of the portal. Bornite, malachite, and azurite occur in the shear zone. A select sample (map no. 48, sample no. AAWSE 10079) of the high grade rock contained 10.65% copper, 61.5 ppm silver, and 16 ppb gold.

Porcupine Creek

Barrett Young and Nafsted prospect: The prospect is reported to be at the head of Porcupine Creek. No workings were located but a shear zone with apparent opencuts was discovered. A highly iron-oxide and malachite stained 20-ft.-wide shear zone trends north-south dipping steeply to the south cutting Nikolai Greenstone. Chalcopyrite, pyrite, malachite, and azurite occur along with quartz and epidote. A select sample (map no. 50, sample no. AAWSE 10082) collected from the shear zone contained 7,939 ppm copper, 0.7 ppm silver, and 50 ppb gold.

Blackburn prospect: Bedrock in the Blackburn area consists of iron-oxide stained and sheared Nikolai Greenstone cut by dioritic dikes with quartz and epidote veining. Pyrite and minor chalcopyrite were noted in the diorite. Grab samples collected in the Blackburn area (map no. 54, sample nos. AAWSE 10080-10081) contained 504 and 440 ppm copper and 12 and 0.4 ppm silver, respectively. The first sample collected was diorite and the second was greenstone float.

Squaw Creek

Squaw Creek prospect: On the west side of the mouth of Squaw Creek is what appears to be an adit located at the base of a vertical face of

Chitistone Limestone. The property was noted from the air but not located on the ground. The adit is partially obscured by alder bushes, and is in an extremely difficult location to access due to the steepness of the bluff above and below the adit. Ropes would be required to access this site. The closest landing zone is a dried up pond located to the southwest within the dense spruce forest. No historical information is known about this location.

Trail Creek

London and Cape prospect: A caved adit appears to have been driven S. 65° E. into Chitina Valley batholith diorite containing mica and quartz veins. Pyrite, chalcopyrite, bornite, and malachite occur as disseminations in the bedrock and as veinlets along fracture planes. A grab sample (map no. 56, sample, no. AAWSE 10077) collected of the diorite and quartz at the mouth of the portal contained 105 ppm copper. No other mineralization was noted in the area.

Elliott Creek Prospects

The Hubbard-Elliott Copper Co. had extensive workings along the entire Elliott Creek including the Copper King Mine at the head of the valley and the Hubbard-Elliott Mine in the central part of the valley (Plate 4). Both the Hubbard-Elliot and Copper King mines have been patented and are owned by the same group.

Copper King Mine: Workings consist of an ice and snow-covered adit located near an upper camp on the Mineral King lode claim. All camp buildings have collapsed with the exception of one cabin. The adit appears to have been driven N. 32° E. into Nikolai Greenstone. Massive chalcocite, bornite, chalcopyrite, malachite, and azurite are associated with quartz. A select sample (map no. 39, sample AAWSE 10063) collected of quartz from the waste dump contained 13.4% copper, 17.2 ppm silver, 16 ppb gold, and 1,105 ppm manganese.

Hubbard-Elliott Mine: The mine includes two adits on Rainbow Creek that were visited with one of the property's co-owners, Mr. Mike Hanscam, Anchorage, Alaska, and Danny Rosenkrans and Geoffrey Bleakley of the NPS. GPS location data was obtained, but no samples were collected.

Canyon Creek Prospects

The Canyon Creek drainage includes the workings of the Divide Creek and Falls Creek prospects as shown on Plate 4.

Divide Creek prospect: The prospect has four opencuts all located within 300 ft. of each other. Bedrock in the area consists of Skolai Group greenstone cut by iron-oxide stained shear zones containing quartz and epidote veining. Opencut No. 1 is 8 ft. wide by 12 ft. deep and 5 ft. high at the face. Chalcopyrite, malachite, and azurite occur in quartz veins in the shear. A select sample (map no. 64, sample no. AAWSE 10102) collected of a mineralized quartz vein contained 3.43% copper, 7.9 ppm silver, and 73 ppb gold. Opencut No. 2 is 5 ft. wide by 3 ft. long and 5 ft. high at the face. Disseminated and veinlets of pyrite and minor disseminated bornite occur within quartz veins and the bedrock. A select sample (map no. 64, sample no. AAWSE 10103) collected of a quartz vein contained 242 ppm copper, 0.4 ppm silver, and 23 ppb gold. Opencut No. 3 is T-shaped with the longest dimension being 15 ft. Chalcopyrite, pyrite, malachite, and azurite occur within the shear zone as well as disseminated within the bedrock. A select sample (map no. 64, sample no. AAWSE 10104) collected of a quartz vein contained 1.99% copper, 10.6 ppm silver, and 98 ppb gold. Opencut No. 4 is the smallest opencut. No visible sulfide mineralization was noted in the opencut.

Falls Creek prospect: Workings on this prospect include three adits. Adit No. 1 is driven 149 ft. into highly sheared and fractured Skolai Group greenstone with quartz and epidote veins. The adit was driven N. 40° E. for 29 ft. and then N. 88° E. for 120 feet. A crosscut driven to the north for 15 ft. is located 65 ft. from the portal. A 3-ft.-wide shear zone at the portal extends for at least 100 ft. to the north. Chalcopyrite, bornite, malachite, and azurite occur in the shear zone. A select sample (map no. 65, sample AAWSE 10064) collected of material from the Adit No. 1 waste dump contained 6.2% copper, 6.2 ppm silver, and 329 ppb gold. Adit No. 2 is located southwest of Adit No. 1. The adit is driven S. 3° W. for 100 ft. along a shear zone into highly sheared and fractured Skolai Group greenstone with quartz and epidote veins. The adit must have been driven to intersect mineralized shear zones in the area. No visible sulfide mineralization was noted in the adit, the waste dump, or the surrounding bedrock. No samples were collected. Adit No. 3 is located across the valley and is driven N. 40° W. for 10 ft. into limestone. No visible mineralization was noted in the adit or waste dump. Mineralized boulders, scattered along the valley floor, were derived from a shear zone north of Adit No. 1. These boulders may be derived from the same shear zone Adit No. 1 is driven on. Disseminated pyrite, chalcopyrite, malachite, and azurite occur with quartz in the boulder. A representative chip sample (map no. 65, sample no. AAWSE 10065) collected of mineralized quartz from one of the boulders contained 1,733 ppm copper, 0.5 ppm silver, and 22 ppb gold.

Other Prospects

Other prospects in the southern Wrangell Mountains area include the Chokosna River, Escape, and Kinney-Golden prospects located on the Chokosna River. The Carmalita prospect is located on the Lakina River (Plate 4). The Chokosna, Escape, and Kinney-Golden prospects were looked for but not located.

Kinney-Golden prospect: Bedrock in the area consists of a slight iron-oxide stained, buff colored chloritic diorite. The staining occurs along fractures as well as on the surface of the diorite. The diorite is overlain by alternating layers of basalt, limestone, and bedded shale of the Skolai Group. The bedded shales range from ⅛ to 5 in. thick. Round plagioclase phenocrysts, up to ¼ inch in diameter, were noted within the basalt beds. Disseminated pyrite occurs within the basalts and bedded shales, while the thicker shale beds contain up to ¼ in. pyrite blebs. A select sample (map no. 61, sample no. AAWSE 10083) collected of the pyritic basalt with plagioclase contained 61 ppm copper. A select sample (map no. 61, sample no. AAWSE 10084) collected of the thicker pyritic bedded shale contained 46 ppm copper and 0.2 ppm silver.

Carmalita prospect: A placer sample was collected on the lower reaches of the Lakina River in the approximate location of the Carmalita prospect. A 1/10 cubic yard of material was processed through a mini sluicebox. Stream float consists of basalt, diorite, granite, and quartz cobbles up to 8 inches in diameter. The sample contained two very fine specks (approximately 0.1 mm) of gold along with a minor amount of black sands. Lab analysis revealed the sample concentrates (map no. 63, sample no. AAWSE 10095) to contain 2,411 ppb gold and 55 ppm copper.

SUMMARY

This summary is based on the historical literature search performed, field work completed, and samples collected for analysis regarding this mineral assessment study.

Northern Wrangell Mountains

Investigations in the northern Wrangell Mountains disclosed no significant "hard rock" mineral properties other than the Nabesna, Royal Development Co., and Rambler mines. Two placer prospects, containing anomalous gold values were identified, these include the Caribou Creek Mine and the Trail Creek placer occurrence (Table 7). The Nabesna and Royal Development Co. mines are patented and a validity determination of the Rambler Mine has been proposed by the NPS.

Fourteen prospects are located within Ahtna, Inc. selections and are listed in Table 1. Three of those properties contain elevated mineral values and are favorable for exploration. They include the Caribou Creek and Rambler mines and the Trail Creek prospect as listed in Table 7 and shown on Plate 7. Seven properties are located outside the Ahtna, Inc. selections and are listed in Table 2.

Both the Clear Creek and Nabesna mines were historical producers. No values were reported for the Clear Creek Mine. The Nabesna Mine, along with the Rambler and Royal Development Co mines, had a total gross production of $1,869,396 between 1931 and 1946 (Wayland, 1943).

The Nabesna and Rambler mines are the only mines in the northern study area that have published reserves. These two mines have a combined reported reserve of 0.3 to 1.1 million metric tons of 0.2 oz. per ton gold, 1.8 oz. per ton silver, 1.5% copper, 0.05% zinc, and 0.002% molybdenum (Newberry and Others, 1997).

Southern Wrangell Mountains

The southern Wrangell Mountains have numerous properties that contain high mineral values located within or close proximity to Ahtna, Inc. selected lands. Results from the samples collected during the field work identified 26 properties containing high values of copper, as well as anomalous values of silver and/or gold. Fifteen properties favorable for exploration are located inside the selections and include the Clear Creek, Copper King, Mullen, and Silver Star mines and the Ammann, Barrett Young and Nafsted, Carmalita, Fall Creek Upper, Hidden Treasure, Homestake, Larson, Lime Creek, Newhome, Sunrise, and the Sunset prospects (Table 7, Plate 8). Those containing elevated levels of copper, silver, and gold located outside the selections include the Berg Creek and Nugget Creek mines and the Bluebird, Cave Prospect, Divide Creek, Falls Creek, Forget-Me-Not, Mountain Sheep, Peacock Claim, Roaring Creek, Surprise/Sunshine, and the Warner prospects (Table 8). Native copper was found at the Homestake, Roaring Creek, and Sunset prospects whereas, bornite, chalcocite, chalcopyrite, malachite, azurite, and/or pyrite minerals were found, in various concentrations, at all of these properties.

Eight properties in the southern area have been patented including the Clear Creek, Copper King, Hubbard-Elliott, and Mullen mines and the Franklin, Minneapolis, War Eagle, and Warner prospects.

Thirty-two prospects are located within Ahtna, Inc. selections as listed in Table 1. Twenty-nine properties are located outside the boundary and are unavailable for selection as listed in Table 2.

Seven properties located in the southern study area have been historical producers. These were the Berg Creek, Clear Creek, Copper King, Hubbard-Elliott, Mullen, Nugget Creek, and Silver Star mines. No values were reported for the Berg Creek, Clear Creek, Copper King, Hubbard-Elliot, and Mullen mines. The Nugget Creek Mine had reported production of 160 tons of ore but no values reported (Moffit, 1921). The Silver Star

TABLE 7 - Highest analytical results of selected properties within Ahtna, Inc. selections in the Wrangell-St. Elias National Park and Preserve.

Name	Copper (%)*	Silver (ppm)	Gold (ppb)*	Lead (ppm)	Zinc (ppm)	Sample nos.
Northern Wrangell Mountains						
Caribou Creek Mine**	33	0.4	5,227	21	84	10014-15
Rambler Mine	3,301 ppm	103.3	8.68 ppm	1,960	3,956	10027
Trail Creek**	73	0.3	4,321	29	108	10029-31
Southern Wrangell Mountains						
Clear Creek Mine	8.8	66.3	9,828	30	1,208	10054-58
Copper King Mine	13.4	17.2	45	19	30	10063
Mullen Mine	36.6	109.7	45	19	45	10039-40
Silver Star Mine	2.6	1,677.1	177	404	3,060	10034-36
Ammann	1.2	6.4	8	4	13	10041
Barrett Young and Nafsted	7,939 ppm	0.7	50	5	106	10082
Carmalita**	55	<0.2	2,411	<2	113	10095
Fall Creek Upper	1.94	6.4	6	8	72	10087
Hidden Treasure	3.3	3	12	<2	73	10052
Homestake	2.9	8.5	6	<2	71	10038, 85
Larson West	6,714 ppm	2	6	4	68	10096-97
Lime Creek	24.03	4.8	608	12	58	10071
Newhome	2.61	11.6	20	32	110	10100-01
Sunrise	2.77	8.9	10	9	86	10086
Sunset	9.56	32.4	6	34	206	10098-99

* Unless otherwise noted. ** Placer concentrate samples.

Mine had reported production of 30,000 oz. of silver (Bundtzen and Others, 1985).

Three properties in the southern study area have published resource figures. These include the Mullen Mine and the Bluebird and War Eagle prospects. The Mullen Mine has published resource estimates for two veins. Vein No. 1 contains 1,263 tons of indicated ore with 1.55% copper and Vein No. 2 contains 59 tons of indicated ore with 5.82% copper and 0.28 oz. per ton silver (Van Alstine and Black, 1946). The Bluebird prospect has a published resource estimate of 1 ton of ore containing 50.15% copper and 103.6 ppm silver (Meyer and Shepherd, 1998). The War Eagle prospect contains a published

TABLE 8 - Highest analytical results of selected properties outside Ahtna, Inc. selection in the Wrangell-St. Elias National Park and Preserve.

Name	Copper (%)*	Silver (ppm)	Gold (ppb)*	Lead (ppm)	Zinc (ppm)	Sample nos.
Southern Wrangell Mountains						
Berg Creek Mine	4,514 ppm	316.2	48.48 ppm	12	26	10059-60
Nugget Creek Mine	10.65	61.5	16	117	337	10079
Bluebird	50.2	103.6	32	37	47	10044-45
Cave Prospect	17.0	30.6	533	22	41	10043
Divide Creek	3.43	10.6	98	32	110	10102-04
Falls Creek	6.2	6.2	329	4	29	10064-65
Forget-Me-Not	1.89	3.2	<5	87	60	10105
Mountain Sheep	3	3.1	<5	131	68	10106
Peacock Claim	3.1	4.8	77	2	59	10042
Roaring Creek	23.53	23.4	43	50	334	10089-90
Surprise/Sunshine	20.5	6.6	2,938	11	81	10093-94
Warner	3.46	3.8	16	13	180	10070

* Unless otherwise noted.

resource estimate of less than 10,000 tons of ore containing 62.07% iron, and 1,000 ppm copper (Berg and Cobb, 1967; Richter, 1998).

The USBM, during their 1977 field investigation of the southern Wrangell Mountains, made a rough estimation of the resources at the Skyscraper prospect. They estimated in their field notes that there is a resource of 2 million tons of ore with 2% copper at the property (Meyer and VandeWeg, 1999).

RECOMMENDATIONS

More detailed exploration needs to be conducted on numerous properties located within the study area. The next stage of exploration techniques need to be incorporated into the investigation of those properties listed in Tables 7 and 8 to further delineate the extent and grade of mineralization. Exploration techniques that are beyond the scope of this study that should be considered include; airborne magnetic and electromagnetic surveys, ground penetrating radar surveys, induced polarization and magnetic ground geophysical surveys, detailed surface geologic mapping, soil grid sampling, trenching, and exploratory drilling programs and any other techniques not listed that would assist in the investigations.

No estimation of tonnages or grades were completed on most of the properties visited during this study. Only one property, the Bluebird prospect, had a resource estimate completed on a stock pile identified during the study. A detailed economic analysis has been completed for the study area based on Cox and Singer's mineral deposit model types typical of the area and a summary of that report is discussed in the Executive Summary (Meyer and others, 2000). The detailed economic prefeasibility analysis is published as a separate BLM open file report (Coldwell, 2000).

Many of the properties were inaccessible because of their adits being caved or the shear zones and quartz veins buried beneath talus. Very few, if any, of the properties had mineralization exposed at the surface beyond those areas historically worked or prospected. This made it difficult to obtain enough information on the mineralization and geology of a particular prospect to determine tonnage and grade figures for that prospect.

More detailed work, as described earlier, needs to be completed on those properties favorable to exploration listed in Tables 7 and 8 and shown on Plate 7. This will allow for a better understanding of the subsurface geology and extent of geologic trends as well as the mineralization contained in those trends. Most samples collected for this report were collected from either exposed mineralized shear zones and quartz veins or from either waste dumps or tailings piles located adjacent to opencuts and portals.

Northern Wrangell Mountains

The Rambler Mine, Caribou Creek Mine, and Trail Creek occurrence (Plate 7) should be sampled in more detail to determine the extent and value of mineralization at these locations. Numerous iron-stained shear zones were encountered throughout much of the northern study area, but the mineral values and the extent of mineralization in these shear zones do not warrant further exploration activity at this time.

Southern Wrangell Mountains

More detailed investigations should be conducted to further delineate the extent of mineralization on those properties favorable for exploration located within Ahtna, Inc. selections in the southern study area as shown on Plate 7. The properties, listed in Table 7, have shown high mineral values: up to 36.6% copper, silver values up to 1,677.1 ppm, gold values up to 9,828 ppb, zinc values up to 3,956 ppm, and lead values up to 1,960 ppm. All of those properties occur in areas with little outcrop and are covered with either talus or vegetation, making the mineralization difficult to follow. These properties include the Clear Creek, Copper King, Mullen, and Silver Star mines and the Ammann, Barrett Young and Nafsted, Fall Creek Upper, Hidden Treasure, Homestake, Larson, Lime Creek, Newhome, Sunrise, and the Sunset prospects. More detailed information is needed on the O'Hara prospect to identify it's mineral potential.

It is recommended that Ahtna, Inc. consider any or all of the properties listed above and in (Table 7 and Plate 7) during their selection process. Ahtna, Inc. should also consider the availability of the following patented properties; the Copper King and Hubbard-Elliott mines on Elliott Creek, the Mullen Mine on Copper Creek, the Nugget Creek Mine on Nugget Creek, and the Warner prospect on Rock Creek.

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APPENDIX A - ANALYTICAL RESULTS
WRANGELL-ST. ELIAS NATIONAL PARK AND PRESERVE

APPENDIX A - ANALYTICAL RESULTS WRANGELL-ST. ELIAS NATIONAL PARK AND PRESERVE.

Map	Sample		Location							Au	AuGrav	Ag	Cu
no.	AAWSE	Property name	Latitude	Longitude	QUAD	SEC	TWP	RNG	Elev. (ft)	ppb	ppm	ppm	ppm
1	10030	Trail Creek	N 62° 37' 52.411"	W 143° 16' 17.473"	Nab. C-5	24	10N	11E	4,535	1144		0.2	68
2	10010	Trail Creek Shear	N 62° 37' 22.454"	W 143° 14' 22.832"	Nab. C-5	30	10N	12E	4,670	<5		<0.2	123
2	10011	Trail Creek Shear	N 62° 37' 22.885"	W 143° 14' 20.517"	Nab. C-5	30	10N	12E	4,670	<5		<0.2	40
2	10012	Trail Creek Shear	N 62° 37' 22.885"	W 143° 14' 20.517"	Nab. C-5	30	10N	12E	4,670	80		0.5	21
2	10013	Trail Creek Shear	N 62° 37' 22.885"	W 143° 14' 20.517"	Nab. C-5	30	10N	12E	4,670	13		<0.2	135
3	10031	Trail Creek	N 62° 37' 09.618"	W 143° 14' 59.138"	Nab. C-5	25	10N	11E	4,470	3122		0.3	73
4	10020	Trail Creek Cirque	N 62° 37' 02.809"	W 143° 13' 41.690"	Nab. C-5	30	10N	12E	5,345	<5		<0.2	42
4	10021	Trail Creek Cirque	N 62° 37' 04.857"	W 143° 13' 32.991"	Nab. C-5	30	10N	12E	5,880	17		0.9	1037
5	10019	Trail Creek West Tributary	N 62° 37' 07.654"	W 143° 16' 16.327"	Nab. C-5	25	10N	11E	4,565	<5		<0.2	32
6	10006	Caribou Creek Prospect Adit No. 1	N 62° 37' 28.137"	W 143° 26' 59.860"	Nab. C-5	30	10N	10E	4,860	<5		<0.2	2
6	10007	Caribou Creek Prospect Adit No. 1	N 62° 37' 26.324"	W 143° 27' 09.111"	Nab. C-5	35	10N	10E	4,860	<5		0.4	316
6	10008	Caribou Creek Prospect Adit No. 1	N 62° 37' 26.995"	W 143° 27' 02.084"	Nab. C-5	30	10N	10E	4,860	<5		<0.2	137
7	10009	Trail Creek	N 62° 36' 29.282"	W 143° 14' 07.689"	Nab. C-5	30	10N	12E	5,880	33		0.2	332
8	10029	Trail Creek	N 62° 36' 31.269"	W 143° 15' 53.990"	Nab. C-5	25	10N	11E	4,185	4321		<0.2	69
9	10014	Caribou Creek Mine	N 62° 37' 03.139"	W 143° 27' 27.293"	Nab. C-5	28	10N	10E	4,205	2951		0.9	21
9	10015	Caribou Creek Mine	N 62° 37' 01.375"	W 143° 27' 33.123"	Nab. C-5	25	10N	10E	4,155	5227		0.4	33
10	10004	Caribou Creek East Tributary	N 62° 37' 16"*	W 143° 31' 25"*	Nab. C-5	27	10N	10E	4,220	<5		<0.2	44
10	10005	Caribou Creek East Tributary	N 62° 37' 14.832"	W 143° 31' 17.614"	Nab. C-5	27	10N	10E	4,060	2		<0.2	3
11	10003	Caribou Creek West Tributary	N 62° 36' 44.890"	W 143° 28' 37.536"	Nab. C-5	35	10N	10E	4,565	<5		<0.2	28
12	10002	Caribou Creek Middle Tributary	N 62° 36' 29.393"	W 143° 27' 52.504"	Nab. C-5	36	10N	10E	4,645	<5		<0.2	37
13	10016	Rock Creek Moly Adit	N 62° 35' 54.617"	W 143° 21' 20.739"	Nab. C-5	30	10N	11E	5,140	<5		<0.2	27
13	10017	Rock Creek Moly Tailings	N 62° 35' 54.617"	W 143° 21' 20.739"	Nab. C-5	30	10N	11E	5,140	13		<0.2	31
13	10018	Rock Creek Moly Tailings	N 62° 35' 54.617"	W 143° 21' 20.739"	Nab. C-5	30	10N	11E	5,140	<5		<0.2	13
14	10001	Caribou Creek East Tributary	N 62° 36' 10.820"	W 143° 26' 20.712"	Nab. C-5	36	10N	10E	4,535	<5		<0.2	69
15	10025	Alder Creek	N 62° 26' 37.053"	W 142° 14' 23.272"	Nab. B-3	27	8N	17E	5,880	<5		<0.2	149
16	10022	Alder Creek	N 62° 26' 40.629"	W 142° 16' 27.287"	Nab. B-3	28	8N	17E	4,550	<5		<0.2	133
16	10023	Alder Creek	N 62° 26' 42.164"	W 142° 16' 31.926"	Nab. B-3	28	8N	17E	4,605	<5		0.4	883
16	10024	Alder Creek	N 62° 26' 43.968"	W 142° 16' 34.856"	Nab. B-3	28	8N	17E	4,610	<5		0.2	360

* GPS coordinates could not be corrected for this location.   Mc. = McCarthy; Nab. = Nabesna; Val. Valdez.

APPENDIX A - ANALYTICAL RESULTS WRANGELL-ST. ELIAS NATIONAL PARK AND PRESERVE--Continued.

Map	Sample	Cu	Co	Pb	Zn	Mn	Ni	Co	Co	Bi	As	Sn	Fe	Mn	Fe	Ba	Co	V	Sn	W	La
no.	AAWSE	pct	pct	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	pct	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
1	10030			<2	93	2	43	17	0.3	<5	10	<5	4.49	795	<10	112	45	106	<20	<20	18
2	10010			<2	33	8	8	18	<0.2	<5	8	<5	5.64	1177	<10	<1	61	32	<20	<20	23
2	10011			6	41	<1	8	15	<0.2	<5	61	<5	5.53	1453	<10	55	22	<1	<20	<20	6
2	10012			2	25	<1	13	3	1.2	<5	394	<5	4.97	3457	<10	183	8	3	<20	<20	<1
2	10013			55	102	<1	50	33	<0.2	<5	14	<5	6.56	1180	<10	367	52	159	<20	<20	16
3	10031			22	102	3	41	22	0.4	<5	25	<5	5.58	348	<10	99	55	129	<20	<20	16
4	10020			3	45	1	14	5	0.2	<5	<5	<5	2.14	151	<10	50	67	18	<10	<20	7
4	10021			1	25	7	28	71	<0.2	<5	<5	<5	>10.00	388	14	1	53	33	<20	<20	6
5	10019			5	58	1	13	18	<0.2	<5	<5	<5	4.49	1079	<10	246	47	15	<20	<20	16
6	10006			3	50	<1	3	7	0.4	<5	<5	<5	0.64	641	<10	378	61	3	<20	<20	17
6	10007			<2	55	1	5	22	<0.2	<5	<5	<5	7.84	681	<10	28	44	116	<20	<20	<1
6	10008			<2	37	<1	8	18	<0.2	<5	<5	<5	4.17	367	<10	25	55	15	<10	<20	<1
7	10009			<2	33	3	41	22	0.4	<5	8	<5	4.49	1395	<10	18	39	50	<20	<20	<1
8	10029			7	183	2	33	18	0.2	<5	22	<5	4.84	748	<10	139	57	129	<20	<20	16
9	10014			7	67	5	48	18	<0.2	<5	<5	<5	6.91	525	11	<1	67	299	<20	<20	16
9	10015			22	63	3	50	22	<0.2	<5	<5	<5	8.72	562	55	41	128	411	<20	<20	16
10	10004			<2	30	<1	13	22	<0.2	<5	<5	<5	3.34	217	<10	99	61	99	<20	<20	2
10	10005			5	61	<1	13	18	<0.2	<5	<5	<5	3.32	224	<10	63	61	50	<20	<20	23
11	10003			18	30	<1	5	18	<0.2	<5	8	<5	5.57	562	<10	48	43	18	<20	<20	3
12	10002			99	15	<1	5	22	<0.2	<5	<5	<5	5.57	963	<10	41	37	58	<20	<20	2
13	10016			<2	15	3	61	28	<0.2	<5	<5	<5	4.17	675	<10	28	124	116	<20	<20	<1
13	10017			<2	85	4	20	22	<0.2	<5	6	<5	6.03	1180	<10	61	74	133	<20	<20	24
13	10018			3	15	3	3	5	<0.2	<5	<5	<5	2.14	485	<10	15	52	23	<20	<20	33
14	10001			3	58	<1	3	18	<0.2	<5	15	<5	5.89	1054	<10	<1	27	99	<20	<20	<1
15	10025			<2	30	<1	3	18	<0.2	<5	<5	<5	2.87	470	<10	33	37	15	<20	<20	16
16	10022			<2	41	5	28	18	<0.2	<5	<5	<5	3.60	348	<10	106	63	15	<20	<20	2
16	10023			3	37	1	18	18	<0.2	<5	<5	<5	4.59	129	<10	45	55	50	<10	<20	7
16	10024			<1	51	<1	5	43	<0.2	<5	<5	<5	9.87	650	<10	60	29	410	<20	<20	<1

APPENDIX A - ANALYTICAL RESULTS WRANGELL-ST. ELIAS NATIONAL PARK AND PRESERVE--Continued.

Map	Sample	Al	Mg	Ca	Na	K	Sr	Y	Ga	Li	Na	Sc	Ta	Ti	Zr
no.	AAWSE	pct	pct	Pct	pct	pct	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
1	10030	2.02	1.89	1.46	0.06	0.12	89	5	5	29	<1	7	<10	0.13	10
2	10010	2.14	1.81	5.41	0.34	0.07	147	11	5	22	4	<5	<10	<0.01	9
2	10011	1.95	1.54	0.68	0.05	0.41	236	9	4	76	3	<5	<10	<0.01	2
2	10012	0.20	3.23	>10.00	0.31	0.08	396	8	<2	9	5	<5	<10	<0.01	9
2	10013	4.39	2.54	0.68	0.18	1.39	55	22	5	30	3	17	<10	0.02	4
3	10031	1.95	1.59	2.66	0.03	0.11	117	13	3	13	<1	9	<10	0.08	11
4	10020	1.75	0.03	0.07	0.08	0.13	17	7	2	14	<1	<5	<10	<0.01	2
4	10021	0.74	0.07	0.08	0.02	0.07	5	7	2	3	2	<5	<10	<0.01	7
5	10019	2.07	0.39	4.62	0.08	0.08	311	7	4	33	3	6	<10	<0.01	9
6	10006	1.63	0.08	1.56	0.39	0.32	30	8	<2	<1	<1	<5	<10	<0.01	22
6	10007	3.92	1.24	1.18	0.08	0.08	42	8	<1	5	4	9	<10	0.16	2
6	10008	3.22	1.22	1.31	0.39	0.18	87	7	<1	9	3	5	<10	0.16	2
7	10009	1.76	5.07	>10.00	0.01	0.07	202	9	<1	21	6	13	<10	<0.01	2
8	10029	1.73	1.74	2.70	0.03	0.08	104	8	3	13	<1	7	<10	0.14	9
9	10014	0.89	1.09	0.54	0.03	0.08	42	4	<2	4	<1	<5	<10	0.26	6
9	10015	0.89	1.09	0.49	0.03	0.02	42	4	<2	3	<1	<5	<10	0.33	6
10	10004	3.92	0.74	2.50	0.39	0.46	134	8	<2	9	4	7	<10	0.11	9
10	10005	1.22	0.61	0.80	0.39	0.14	139	8	<2	4	3	<5	<10	0.11	11
11	10003	1.78	0.89	2.58	0.07	0.08	65	8	<2	5	3	8	<10	0.13	9
12	10002	1.75	0.39	0.80	0.39	0.11	13	3	<1	2	2	<5	<10	0.08	5
13	10016	2.75	0.98	3.49	0.39	0.29	48	7	<1	3	4	16	<10	0.11	9
13	10017	2.92	2.18	3.42	0.34	0.55	105	8	<2	13	4	13	<10	0.12	5
13	10018	0.53	0.08	0.67	0.39	0.08	81	8	<1	3	2	<5	<10	0.08	9
14	10001	3.49	0.39	1.27	0.24	0.16	72	7	<1	9	3	8	<10	0.13	9
15	10025	1.03	0.39	1.41	0.18	0.16	124	9	<2	9	2	<5	<10	0.13	2
16	10022	1.03	0.87	1.57	0.03	0.22	76	9	<2	9	3	9	<10	0.16	7
16	10023	1.01	0.05	1.05	0.39	0.16	81	8	<2	4	2	<5	<10	0.11	9
16	10024	3.03	2.75	3.22	0.52	0.37	183	7	<2	7	7	26	<10	0.36	12

APPENDIX A - ANALYTICAL RESULTS WRANGELL-ST. ELIAS NATIONAL PARK AND PRESERVE--Continued.

Map	Sample		Location							Au	AuGrav	Ag	Cu
no.	AAWSE	Property name	Latitude	Longitude	QUAD	SEC	TWP	RNG	Elev. (ft.)	ppb	ppm	ppm	ppm
17	10026	Alder Creek	N 62° 26' 43.534"	W 142° 17' 21.071"	Nab. B-3	29	8N	17E	5,920	<5		<0.2	50
18	10027	Rambler Mine	N 62° 23' 03.079"	W 143° 00' 30.411"	Nab. B-5	10	7N	13E	3,685	>10000	8.68	103.3	3301
19	10028	Camp Creek - Moraine	N 62° 20' 47.037"	W 142° 43' 50.910"	Nab. B-4	36	7N	14E	5,820	<5		0.3	107
20	10033	Chichokna River	N 61° 55' 51.885"	W 144° 30' 18.515"	Val. D-2	28	2N	5E	4,700	<5		0.2	95
21	10032	Chichokna River	N 61° 55' 03.733"	W 144° 30' 44.850"	Val. D-2	33	2N	5E	4,155	<5		<0.2	25
22	10088	Fall Creek Saddle Occurrence	N 61° 48' 26"*	W 143° 56' 30"*	Mc. D-8	4	1S	8E	6,050	25		0.6	3769
23	10087	Fall Creek Upper Prospect	N 61° 47' 48.967"	W 143° 56' 23.400"	Mc. D-8	10	1S	8E	5,270	6		0.3	>10000
24	10100	Newhome Opencut No. 1	N 61° 47' 25.172"	W 143° 55' 59.268"	Mc. D-8	10	1S	8E	4,790	6		11.6	>10000
24	10101	Newhome Opencut No. 3	N 61° 47' 28.183"	W 143° 56' 01.129"	Mc. D-8	10	1S	8E	4,520	10		6.6	>10000
25	10037	Newhome Adit No. 1	N 61° 47' 29.965"	W 143° 55' 50.555"	Mc. B-8	10	1S	8E	4,440	6		7.4	5354
25	10038	Homestake Adit	N 61° 47' 31.899"	W 143° 56' 03.964"	Mc. B-8	10	1S	8E	4,480	6		0.6	>10000
25	10085	Homestake Upper Opencut	N 61° 47' 27.734"	W 143° 56' 12.206"	Mc. D-8	10	1S	8E	4,090	6		<0.2	215
25	10086	Sunrise Opencut No. 2	N 61° 47' 34.191"	W 143° 55' 57.940"	Mc. D-8	10	1S	8E	4,090	10		0.6	>10000
26	10098	Sunset Adit	N 61° 47' 39.471"	W 143° 55' 40.449"	Mc. B-8	10	1S	8E	4,090	6		32.4	>10000
26	10099	Sunset Opencut	N 61° 47' 41.229"	W 143° 55' 41.015"	Mc. B-8	10	1S	8E	4,090	<5		3.2	5732
27	10052	Hidden Treasure Mound	N 61° 48' 00.115"	W 143° 53' 04.397"	Mc. D-8	12	1S	8E	5,620	10		3.0	>10000
28	10076	Franklin	N 61° 46' 12.304"*	W 143° 53' 05.481"*	Mc. D-8	24	1S	8E	4,090	<5		<0.2	186
29	10093	Surprise/Sunshine Opencut No. 1	N 61° 45' 07.382"	W 143° 48' 24.057"	Mc. D-8	29	1S	8E	5,640	227		0.3	>10000
29	10093A	Surprise/Sunshine Opencut No. 1	N 61° 45' 07.382"	W 143° 48' 24.057"	Mc. D-8	29	1S	8E	5,640	2938		6.6	>10000
29	10094	Surprise/Sunshine Opencut No. 2	N 61° 45' 06.646"	W 143° 48' 26.493"	Mc. D-8	29	1S	9E	5,640	10		0.2	6797
30	10075	Mineral Creek	N 61° 44' 55.193"	W 143° 53' 39.312"	Mc. C-8	29	2S	8E	4,155	10		0.3	1583
31	10034	Silver Star Mine	N 61° 44' 18.003"	W 143° 54' 13.259"	Mc. C-8	36	1S	8E	4,155	20		618.4	5811
31	10035	Silver Star Mine	N 61° 44' 18.825"	W 143° 54' 06.899"	Mc. C-8	36	1S	8E	4,915	177		1677.1	>10000
31	10036	Silver Star Mine	N 61° 44' 17.936"	W 143° 54' 09.497"	Mc. C-8	36	1S	8E	4,875	<5		31.2	513
32	10072	Lost Cabin Upper Adit	N 61° 44' 01.510"*	W 143° 59' 46.135"*	Mc. C-8	3	2S	8E	4,090	6		0.2	224
32	10073	Lost Cabin Upper Adit	N 61° 44' 01.510"*	W 143° 59' 46.135"*	Mc. C-8	3	2S	8E	4,010	<5		0.2	253
33	10069	Rock Creek	N 61° 42' 30.549"	W 143° 57' 39.265"	Mc. C-8	9	2S	8E	2,330	<5		<0.2	70
33	10070	Warner	N 61° 42' 31.701"	W 143° 57' 40.356"	Mc. C-8	9	2S	8E	2,330	16		3.8	>10000

* GPS coordinates could not be corrected for this location. Mc. = McCarthy; Nab. = Nabesna; Val. Valdez.

APPENDIX A - ANALYTICAL RESULTS WRANGELL-ST. ELIAS NATIONAL PARK AND PRESERVE--Continued.

Map	Sample	Cu	Cd	Pb	Zn	Mo	Ni	Co	Cd	Bi	As	Sb	Fe	Mn	Te	Ba	Ce	V	Sn	W	La
no.	AAWSE	pct	pct	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	pct	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
17	10026			<1	48	<1	23	26	<0.2	<5	<5	<5	5.71	638	<10	50	91	193	<20	<20	2
18	10027			1960	3956	<1	8	90	33.1	1238	73	<5	>10	100	<10	<1	22	3	<20	<20	<1
19	10028			<2	201	<1	35	40	<0.2	<5	<5	<5	7.74	1209	<10	5	35	255	<20	<20	8
20	10033			2	36	2	8	2	<0.2	<5	<5	<5	2.36	354	<10	150	32	90	<20	<20	8
21	10032			<2	37	8	8	5	<0.2	<5	11	8	3.22	587	<10	33	39	90	<20	<20	12
22	10088			<2	57	1	50	16	<0.2	<5	22	<5	3.80	459	<10	5	23	123	<20	<20	8
23	10087	1.94		9	71	<1	22	16	15.5	<5	<5	<5	1.79	250	<10	<1	90	72	<20	<20	8
24	10100	2.49		16	110	9	33	18	22	<5	<5	<5	2.30	313	<10	90	92	22	<20	<20	8
24	10101	2.61		35	86	8	37	20	<0.2	<5	<5	<5	2.55	366	<10	16	73	79	<20	<20	5
25	10037			<2	58	2	46	17	0.6	<5	8	22	4.66	547	<10	354	127	139	<20	<20	8
25	10038	2.9		<1	71	2	62	22	<0.2	<5	33	<5	5.82	748	<10	477	141	194	<20	<20	8
25	10085			<2	71	<1	50	33	<0.2	<5	<5	<5	5.75	772	<10	3	<1	177	<20	<20	6
25	10086	2.77		9	86	<1	33	90	0.4	<5	<5	<5	1.79	108	<10	2	90	74	<20	<10	3
26	10098	9.56		30	206	2	22	2	<0.2	<5	21	<5	1.08	100	<10	1	50	35	<20	<20	1
26	10099			9	50	<1	35	16	<0.2	<5	8	<5	3.21	287	<10	<1	90	103	<20	<20	4
27	10052	3.3		<2	73	2	46	23	9.3	<5	<5	<5	4.85	731	<10	21	108	115	<20	<20	2
28	10076			<1	45	<1	22	23	<0.2	<5	<5	<5	3.55	444	<10	256	25	36	<20	<20	4
29	10093	1.32		11	22	2	28	22	<0.2	<5	12	<5	1.73	130	<10	8	149	41	<20	<20	1
29	10093A	20.27	20.49	<2	71	<1	7	16	<0.2	<5	<5	<5	0.53	16	<10	1	9	12	<20	<20	<1
29	10094			9	51	3	25	23	0.6	<5	<5	<5	1.13	141	<10	2	223	28	<20	<20	<1
30	10075			<2	37	26	11	57	<0.2	<5	<5	<5	7.97	362	<10	17	11	107	<20	<20	6
31	10034			404	989	5	8	10	44.7	<5	467	>2000	1.08	804	<10	130	130	9	<20	<20	2
31	10035	2.6		158	3060	2	8	35	149.1	29	1829	>2000	1.23	933	<10	90	50	16	<20	<20	8
31	10036			35	11	16	8	3	3.6	<5	30	158	0.81	329	<10	682	75	5	<10	<20	<1
32	10072			<2	7	<1	<1	<1	<0.2	<5	7	<5	0.09	98	<10	3	11	8	<20	<20	13
32	10073			<2	7	<1	<1	<1	<0.2	<5	11	<5	0.09	98	<10	3	4	2	<20	<20	16
33	10069			43	70	<1	<1	5	<0.2	<5	697	10	1.54	28	<10	43	41	7	<20	<20	<1
33	10070	3.46		13	180	<1	33	27	1.6	<5	<5	<5	5.65	722	<10	5	31	172	<20	<20	6

APPENDIX A - ANALYTICAL RESULTS WRANGELL-ST. ELIAS NATIONAL PARK AND PRESERVE--Continued.

Map	Sample	Al	Mg	Ca	Na	K	Sr	Y	Ga	Li	Nb	Sc	Ta	Ti	Zr
no.	AAWSE	pct	pct	Pct	pct	pct	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
17	10026	2.84	2.23	3.08	0.34	0.24	254	7	<2	13	5	13	<10	0.21	9
18	10027	0.05	0.18	0.09	<0.01	<0.01	4	<1	<2	<1	<1	<5	<10	<0.01	15
19	10028	1.79	0.18	9.26	0.03	0.03	20	20	<2	11	8	20	<10	0.73	60
20	10033	1.27	0.84	0.82	0.19	0.07	16	6	<2	3	2	2	<10	0.07	8
21	10032	0.92	0.21	1.38	0.18	0.07	41	8	<2	3	2	<5	<10	0.18	8
22	10088	2.14	1.66	0.33	<0.01	<0.01	41	8	8	5	<1	11	<10	0.45	15
23	10087	1.14	0.91	1.38	<0.01	<0.01	13	5	4	2	7	5	<10	0.38	20
24	10100	1.71	0.07	0.08	<0.01	0.08	41	5	5	3	2	<5	<10	0.38	21
24	10101	1.85	1.16	0.19	<0.01	0.03	13	8	5	3	2	5	<10	0.38	20
25	10037	3.26	1.58	0.08	<0.01	0.03	16	8	<2	3	8	12	<10	0.08	23
25	10038	5.03	0.25	7.46	<0.01	<0.01	16	13	4	3	41	23	<10	0.32	15
25	10085	2.34	0.21	3.92	0.18	0.07	53	12	8	7	12	11	<10	0.08	15
25	10086	1.63	0.82	0.07	<0.01	<0.01	16	5	8	7	8	<5	<10	0.57	27
26	10098	1.42	0.07	1.73	<0.01	<0.01	8	3	4	<1	8	<5	<10	0.18	5
26	10099	1.79	1.07	0.18	<0.01	<0.01	8	5	8	2	4	8	<10	0.33	15
27	10052	2.56	2.17	2.74	0.21	0.03	13	8	<2	8	8	8	<10	0.40	14
28	10076	1.98	0.07	1.38	0.04	0.08	41	11	4	11	8	<5	<10	0.07	8
29	10093	0.75	0.21	1.13	0.07	0.07	16	3	<2	<1	4	<5	<10	0.08	2
29	10093A	1.85	0.03	0.07	<0.01	<0.01	8	<1	<2	<1	<1	<5	<10	<0.01	<1
29	10094	1.79	0.07	0.54	<0.01	0.02	4	7	<2	8	2	<5	<10	<0.01	8
30	10075	2.24	0.77	1.75	0.18	0.18	84	7	4	5	7	8	<10	0.25	8
31	10034	0.22	0.04	7.83	<0.01	0.07	335	3	<2	<1	8	<5	<10	<0.01	<1
31	10035	0.37	0.21	>10.00	<0.01	0.08	47	3	<2	2	5	<5	<10	<0.01	<1
31	10036	0.08	<0.01	3.11	<0.01	0.03	1321	<1	<2	<1	41	<5	<10	<0.01	<1
32	10072	0.08	0.18	>10.00	<0.01	0.07	898	11	<2	<1	<1	<5	<10	<0.01	<1
32	10073	0.08	0.18	>10.00	<0.01	0.03	1059	11	<2	<1	<1	<5	<10	<0.01	<1
33	10069	0.77	0.02	1.69	<0.01	0.19	27	2	<2	4	<2	<5	<10	<0.01	2
33	10070	2.25	2.16	4.12	0.02	0.08	21	12	9	13	14	12	<10	0.31	16

APPENDIX A - ANALYTICAL RESULTS WRANGELL-ST. ELIAS NATIONAL PARK AND PRESERVE--Continued.

Map no.	Sample AAWSE	Property name	Location Latitude	Longitude	QUAD	SEC	TWP	RNG	Elev. (ft.)	Au ppb	AuGrav ppm	Ag ppm	Cu ppm
34	10039	Mullen Mine Opencut	N 61° 40' 30"*	W 144° 03' 57"*	Val. C-1	24	2S	7E	3,850	38		40.5	>10000
34	10039A	Mullen Mine Opencut	N 61° 40' 30"*	W 144° 03' 57"*	Val. C-1	24	2S	7E	3,850	45		109.7	>10000
34	10040	Mullen Mine Adit No. 1	N 61° 40' 34.371"	W 144° 03' 53.492"	Val. C-1	24	2S	7E	3,755	<5		23.6	>10000
34	10041	Ammann Prospect Lower Adit	N 61° 40' 33.607"	W 144° 04' 02.402"	Val. C-1	24	2S	7E	4,880	6		0.3	>10000
35	10043	Cave Prospect Adit No. 1	N 61° 40' 18.381"	W 144° 04' 02.402"	Val. C-1	25	2S	7E	4,135	533		30.6	>10000
35	10107	Cave Prospect Adit No. 2	N 61° 40' 20.403"	W 144° 04' 14.415"	Val. C-1	25	2S	7E	4,880	<5		<0.2	817
36	10042	Peacock Claim Adit	N 61° 40' 14.790"	W 144° 03' 39.530"	Val. C-1	25	2S	7E	4,140	77		4.8	>10000
37	10106	Mountain Sheep	N 61° 40' 02.683"	W 144° 03' 14.612"	Val. C-1	15	2S	7E	4,760	<5		3.1	>10000
38	10044	Bluebird Opencut	N 61° 39' 48.261"	W 144° 01' 54.261"	Val. C-1	30	2S	7E	5,050	<5		103.6	>10000
38	10045	Bluebird Outcrop	N 61° 39' 48.261"	W 144° 01' 54.261"	Val. C-1	30	2S	8E	5,050	32		10.3	>10000
38	10074	Montana Boy	N 61° 39' 45.979"*	W 144° 01' 56.875"*	Val. C-1	3	2S	8E	5,230	<5		<0.2	44
38	10105	Forget-Me-Not	N 61° 39' 44.654"	W 144° 02' 09.822"	Val. C-1	30	2S	8E	4,950	<5		3.2	>10000
39	10063	Copper King Mine Adit No. 1	N 61° 38' 12.130"	W 144° 02' 03.251"	Val. C-1	6	3S	8E	4,705	16		17.2	>10000
40	10046	Rock Creek	N 61° 41' 36.659"	W 143° 56' 47.032"	Mc. C-8	15	2S	8E	3,045	<5		0.7	1468
40	10046A	Rock Creek	N 61° 41' 36.659"	W 143° 56' 47.032"	Mc. C-8	15	2S	8E	3,045	<5		<0.2	259
40	10047	Rock Creek	N 61° 41' 36.113"	W 143° 56' 47.832"	Mc. C-8	15	2S	8E	3,030	<5		<0.2	213
41	10071	Lime Creek	N 61° 41' 33.004"	W 143° 55' 56.244"	Mc. C-8	15	2S	8E	3,890	608		4.8	>10000
42	10096	Larson West Adit	N 61° 42' 09.170"	W 143° 52' 40.931"	Mc. C-8	12	2S	8E	4,950	<5		0.3	6714
42	10097	Larson West Opencut	N 61° 42' 10.063"	W 143° 52' 43.918"	Mc. C-8	12	2S	8E	4,950	6		2.0	4952
43	10051	Larson East	N 61° 42' 08.461"	W 143° 51' 46.415"	Mc. C-8	17	2S	8E	4,880	<5		<0.2	196
44	10048	Amy Creek Tunnel 6	N 61° 42' 25.017"	W 143° 50' 50.725"	Mc. C-8	7	2S	8E	3,810	<5		<0.2	183
44	10049	Amy Creek Tunnel 7	N 61° 42' 22.775"	W 143° 50' 35.386"	Mc. C-8	7	2S	8E	3,875	<5		0.3	244
45	10050	Amy Creek Tunnel 8	N 61° 42' 11.105"	W 143° 50' 38.788"	Mc. C-8	7	2S	8E	4,170	<5		<0.2	211
46	10089	Roaring Creek Adit No. 1	N 61° 41' 18.113"	W 143° 50' 31.087"	Mc. C-8	18	2S	9E	5,290	43		3.6	>10000
46	10090	Roaring Creek Upper Opencut	N 61° 41' 17.893"	W 143° 50' 33.355"	Mc. C-8	18	2S	8E	5,360	23		23.4	>10000
47	10091	Skyscraper Peak West	N 61° 41' 25.393"	W 143° 48' 06.158"	Mc. C-8	17	2S	8E	4,790	<5		<0.2	196
47	10092	Skyscraper Peak	N 61° 41' 21.448"	W 143° 48' 04.306"	Mc. C-8	17	2S	9E	4,740	<5		<0.2	579

* GPS coordinates could not be corrected for this location. Mc. = McCarthy; Nab. = Nabesna; Val. Valdez.

APPENDIX A - ANALYTICAL RESULTS WRANGELL-ST. ELIAS NATIONAL PARK AND PRESERVE--Continued.

Map	Sample	Cu	Cu	Pb	Zn	Mo	Ni	Co	Cr	Bi	As	Sb	Fe	Mn	Te	Ba	Cr	V	Sn	W	La
no.	AAWSE	pct	pct	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	pct	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
34	10039	34.5		13	45	93	<1	3	168.1	<5	1635	40	>10.00	48	<10	40	7	7	<20	132	<1
34	10039A	36.6		11	78	11	<1	<1	40.5	10	143	<5	>10.00	9	10	2	8	47	24	74	40
34	10040	12.2		9	10	11	<1	2	286.1	<5	429	11	1.83	175	<10	15	10	9	<20	<20	<1
34	10041	1.2		9	10	1	2	<1	16.6	<5	47	<5	0.27	184	<10	11	8	9	<20	<20	4
35	10043	17.0		22	41	2	27	17	1.1	<5	<5	<5	9.07	391	<10	2	<1	158	<20	27	4
35	10107			9	8	<1	8	<1	17.6	<5	268	<5	0.10	176	<10	11	10	3	<20	<20	<1
36	10042	3.1		2	10	2	10	13	2.8	<5	<1	<5	5.03	519	<10	11	35	129	<20	<10	3
37	10106	3.00		131	18	<1	58	55	<0.2	<5	<1	<5	8.20	689	<10	8	47	250	<20	<20	4
38	10044	50.2		37	78	11	9	9	6.8	<5	17	<5	7.46	175	58	8	8	74	<20	106	14
38	10045	6.4		9	47	2	29	9	4.9	<5	8	<5	9.23	166	<10	11	10	129	<20	<20	2
38	10074			<1	8	<1	<1	<1	<0.2	<5	8	<5	0.17	901	<10	3	<1	8	<20	<20	13
38	10105	1.89		87	10	<1	58	32	0.3	<5	10	<5	5.03	597	<10	9	70	144	<20	<20	3
39	10063	13.4		11	36	1	29	29	0.7	<5	<5	<5	4.62	1105	<10	9	67	117	<20	22	3
40	10046			9	58	<1	7	9	<0.2	<5	674	13	1.05	117	<10	53	10	10	<20	<20	<1
40	10046A			9	27	<1	9	1	<0.2	<5	231	6	0.51	7	<10	44	32	8	<20	<20	<1
40	10047			9	36	<1	3	<1	<0.2	<5	936	29	0.32	7	<10	36	56	7	<20	<20	<1
41	10071	24.03	23.99	13	58	<1	<1	<1	0.7	<5	<5	<5	0.47	137	<10	<1	2	8	<20	<20	<1
42	10096			9	10	<1	29	17	<0.2	<5	6	<5	1.65	305	<10	1	112	11	<20	<10	3
42	10097			2	18	1	74	13	<0.2	<5	17	<5	1.83	387	<10	19	10	31	<20	<20	3
43	10051			2	10	1	53	22	<0.2	<5	<5	<5	5.03	792	<10	9	122	144	<20	<20	3
44	10048			<2	56	2	36	13	<0.2	<5	8	<5	5.76	529	<10	131	115	129	<20	<20	4
44	10049			21	11	2	58	13	4.9	<5	8	<5	4.63	357	<10	21	11	78	<20	<20	2
45	10050			2	74	2	36	13	0.3	<5	<5	<5	5.37	723	<10	32	10	123	<20	<20	3
46	10089	23.53	23.02	<2	44	<1	3	2	<0.2	<5	36	<5	0.24	58	<10	<1	3	7	<20	<20	<1
46	10090	14.48		53	334	<1	32	29	<0.2	<5	271	<5	2.76	529	<10	1	<1	78	<20	<20	3
47	10091			9	84	<1	47	32	<0.2	<5	<5	<5	7.24	726	<10	15	36	242	<20	<10	12
47	10092			2	18	2	11	2	<0.2	<5	<5	<5	1.09	144	<10	<1	90	52	<20	<20	1

APPENDIX A - ANALYTICAL RESULTS WRANGELL-ST. ELIAS NATIONAL PARK AND PRESERVE--Continued.

Map	Sample	Al	Mg	Ga	Na	K	Sc	Y	Ga	Li	Nb	Sc	Ta	Ti	Zr
no.	AAWSE	pct	pct	Pct	pct	pct	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
34	10039	0.07	0.69	2.43	<0.01	<0.01	22	<1	33	<1	37	<5	32	<0.01	2
34	10039A	0.08	0.02	0.84	<0.01	<0.01	6	<1	12	<1	1	<5	<10	<0.01	<1
34	10040	0.07	6.03	>10.00	<0.01	0.02	74	<1	<2	<1	23	<5	12	<0.01	<1
34	10041	0.12	0.34	>10.00	<0.01	<0.01	234	1	<2	1	4	<5	<10	<0.01	<1
35	10043	1.82	1.37	3.36	0.02	0.07	12	17	<2	17	23	11	18	0.03	27
35	10107	0.04	3.09	>10.00	<0.01	0.01	<1	<1	4	<1	1	<5	<10	<0.01	<1
36	10042	3.39	1.66	3.36	0.04	0.03	15	11	<2	4	9	<5	<10	0.37	15
37	10106	2.84	3.28	2.14	0.05	0.04	29	17	<2	16	3	12	<10	0.69	54
38	10044	0.40	0.17	0.10	0.10	<0.01	3	1	2	1	3	<5	<10	0.09	8
38	10045	2.64	0.41	4.62	0.03	<0.01	12	9	4	1	11	5	<10	0.34	24
38	10074	0.03	3.16	>10.00	<0.01	<0.01	309	<1	<2	<1	<1	<5	<10	<0.01	<1
38	10105	3.62	0.02	3.16	4.95	<0.01	11	12	1	9	1	9	<10	0.01	26
39	10063	2.96	1.82	4.95	0.01	4.95	16	16	<2	12	26	16	17	0.48	24
40	10046	0.98	0.34	0.87	<0.01	0.26	42	9	<2	9	6	<5	<10	<0.01	2
40	10046A	0.08	0.02	0.10	<0.01	0.20	17	1	<2	9	<1	<5	<10	<0.01	2
40	10047	1.04	0.02	0.12	<0.01	0.21	13	<1	<1	9	<1	<5	<10	<0.01	2
41	10071	0.08	0.34	0.28	<0.01	<0.01	6	<1	<1	<1	<1	<5	<10	0.04	<1
42	10096	1.34	0.01	4.95	<0.01	<0.01	172	3	3	2	3	<5	<10	3.16	8
42	10097	1.47	1.21	1.57	<0.01	0.12	37	4	4	4	6	<5	<10	0.24	14
43	10051	2.64	2.38	3.16	0.04	0.01	49	9	<2	9	6	<5	<10	0.48	11
44	10048	2.41	1.84	1.32	0.07	4.95	17	9	<2	9	3	9	<10	0.01	8
44	10049	1.48	0.89	2.73	0.07	<0.01	12	4	<2	4	3	<5	<10	0.44	11
45	10050	2.21	1.84	3.36	0.05	0.10	26	11	<2	9	3	<5	<10	0.40	11
46	10089	0.17	0.17	0.10	<0.01	<0.01	4	<1	<2	<1	<1	<5	<10	0.03	<1
46	10090	2.05	1.57	2.20	<0.01	0.01	49	9	4	4	16	5	<10	0.34	15
47	10091	3.45	2.44	2.26	0.12	0.03	43	13	12	12	17	12	<10	0.49	39
47	10092	1.13	0.30	2.36	<0.01	<0.01	170	4	4	<1	4	<5	<10	0.16	11

APPENDIX A - ANALYTICAL RESULTS WRANGELL-ST. ELIAS NATIONAL PARK AND PRESERVE--Continued.

Map	Sample		Location							Au	AuGrav	Ag	Cu
no.	AAWSE	Property name	Latitude	Longitude	QUAD	SEC	TWP	RNG	Elev. (ft.)	ppb	ppm	ppm	ppm
48	10079	Nugget Creek Upper Adit	N 61° 38' 34.651"	W 143° 43' 05.293"	Mc. C-8	2	3S	9E	3,660	16		61.5	>10000
49	10078	Minneapolis	N 61° 38' 35.239"	W 143 45' 06.494"	Mc. C-8	4	3S	9E	4,470	98		0.8	1336
50	10082	Barrett Young & Nafsted	N 61° 38' 10.313"	W 143° 50' 50.201"	Mc. C-8	9	3S	9E	5,960	50		0.4	7939
51	10056	Clear Creek Mine Adit No. 2	N 61° 37' 50.057"	W 143° 50' 50.595"	Mc. C-8	9	3S	9E	5,585	8000		66.3	>10000
51	10057	Clear Creek Mine Adit No. 2	N 61° 37' 50.057"	W 143° 50' 50.595"	Mc. C-8	9	3S	9E	5,585	665		0.8	>10000
52	10058	Clear Creek Mine Lower Opencut	N 61° 37' 38.869"	W 143° 50' 58.226"	Mc. C-8	7	3S	9E	5,585	162		<0.2	210
53	10054	Clear Creek Mine Adit No. 1	N 61° 37' 24.608"	W 143° 50' 24.448"	Mc. C-8	9	3S	9E	5,585	285		1.6	155
53	10055	Clear Creek Mine Upper Opencut	N 61° 37' 24.518"	W 143° 50' 19.761"	Mc. C-8	4	3S	9E	5,125	9828		0.8	4978
54	10080	Blackburn	N 61° 37' 21.462"	W 143° 47' 13.307"	Mc. C-8	7	3S	9E	3,490	12		<0.2	504
54	10081	Blackburn	N 61° 37' 20.794"	W 143° 47' 25.293"	Mc. C-8	9	3S	9E	3,750	<5		0.4	440
55	10053	Porcupine Creek Opencut	N 61° 37' 03.542"	W 143° 47' 20.245"	Mc. C-8	9	3S	9E	4,600	25		<0.2	1757
56	10077	London and Cape	N 61° 34' 01.525"	W 143° 43' 06.402"	Mc. C-8	35	3S	9E	4,510	<5		<0.2	105
57	10061	War Eagle Adit No. 1	N 61° 33' 32.068"	W 143° 44' 36.985"	Mc. C-8	34	3S	9E	3,570	12		0.8	876
58	10062	Copper Queen Adit	N 61° 33' 31.285"	W 143° 45' 27.753"	Mc. C-8	34	3S	9E	3,325	542		0.8	3891
59	10059	Berg Creek Mine Adit No. 5	N 61° 33' 09.332"	W 143° 47' 19.801"	Mc. C-8	4	3S	9E	2,825	>10000	17.75	67.8	4514
59	10060	Berg Creek Mine Adit No. 5	N 61° 33' 09.332"	W 143° 47' 19.801"	Mc. C-8	4	3S	9E	2,825	>10000	48.48	316.2	2872
60	10068	Calcite	N 61° 32' 48.777"	W 143° 43' 13.397"	Mc. C-8	2	3S	9E	4,930	<5		0.4	32
61	10083	Kinney-Golden area	N 61° 30' 46.422"	W 143° 37' 43.421"	Mc. C-7	2	4S	10E	3,750	<5		<0.2	61
61	10084	Kinney-Golden area	N 61° 30' 44.818"	W 143° 37' 44.722"	Mc. C-8	2	3S	10E	4,470	<5		0.8	46
62	10066	Gilahina Tributary	N 61° 28' 47.622"	W 143° 36' 12.588"	Mc. B-7	33	3S	10E	4,470	<5		<0.2	161
62	10067	Gilahina Tributary	N 61° 28' 47.416"	W 143° 36' 11.820"	Mc. B-7	33	4S	10E	4,480	30		<0.2	211
63	10095	Carmalita	N 61° 20' 44.761"	W 143° 33' 49.245"	Mc. B-8	14	6S	10E	900	2411		<0.2	55
64	10102	Divide Creek Opencut No. 1	N 61° 21' 50.641"	W 144° 16' 37.169"	Val. B-1	11	6S	9E	4,550	73		7.9	>10000
64	10103	Divide Creek Opencut No. 2	N 61° 21' 51.578"	W 144° 16' 39.437"	Val. B-1	11	6S	9E	4,560	23		0.8	242
64	10104	Divide Creek Opencut No. 3	N 61° 21' 49.081"	W 144° 16' 40.560"	Val. B-1	11	6S	9E	4,600	98		10.6	>10000
65	10064	Falls Creek Adit No. 1	N 61° 21' 13.668"	W 144° 15' 38.732"	Val. B-1	13	6S	9E	4,695	329		0.8	>10000
65	10065	Falls Creek Quartz Boulder	N 61° 21' 16.294"	W 144° 15' 32.238"	Val. B-1	13	6S	6E	4,560	22		0.5	1733

* GPS coordinates could not be corrected for this location. Mc. = McCarthy; Nab. = Nabesna; Val. Valdez.

APPENDIX A - ANALYTICAL RESULTS WRANGELL-ST. ELIAS NATIONAL PARK AND PRESERVE--Continued.

Map	Sample	Cu	Ce	Pb	Zn	Mo	Ni	Co	Co	Bi	As	Sb	Te	Mn	Te	Ba	Ce	V	Sn	W	La
no.	AAWSE	pct	pct	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	pct	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
48	10079	10.65		117	337	35	28	9	277.1	<5	<5	<5	3.47	305	<10	18	11	79	<20	<20	4
49	10078			<2	16	<1	23	16	<0.2	<5	<5	<5	2.09	259	<10	<1	58	77	<20	<20	3
50	10082			5	101	<1	35	33	0.3	<5	125	<5	5.77	1389	<10	14	54	112	<20	<20	4
51	10056	8.8		36	1208	5	347	262	6.7	16	15	<5	>10.00	115	<10	<1	38	12	<20	21	<1
51	10057	2.9		5	<1	1	61	37	0.3	<5	<5	<5	8.82	1329	<10	<1	103	113	<20	<20	3
52	10058			4	952	1	14	40	<0.2	<5	5	<5	>10.00	232	<10	23	98	146	<20	<20	2
53	10054			16	48	107	37	45	<0.2	<5	<5	<5	5.54	161	<10	7	113	50	<20	<20	3
53	10055			25	37	6	22	45	<0.2	35	87	<5	>10.00	110	17	7	141	65	<20	<20	<1
54	10080			3	16	2	1	11	0.5	<5	<5	<5	2.35	259	<10	96	37	16	<20	<20	21
54	10081			<2	26	<1	47	23	1.6	<5	<5	<5	3.60	357	<10	4	98	107	<20	<20	5
55	10053			3	26	4	<5	55	<0.2	<5	<5	<5	9.81	289	<10	[illegible]	98	170	<20	<20	3
56	10077			<2	77	2	1	4	<0.2	<5	<5	<5	2.01	275	<10	36	98	67	<20	<20	2
57	10061			5	36	1	16	21	<0.2	<5	<5	<5	>10	392	<10	1	11	173	<20	<20	<1
58	10062			4	42	4	5	11	<0.2	<5	<5	<5	6.50	649	<10	1	98	12	<20	<20	<1
59	10059			6	26	16	6	1	0.3	<5	<5	14	2.57	169	47	6	146	23	<20	<20	1
59	10060			11	16	77	7	2	<0.2	11	[illegible]	<5	8.01	164	103	4	161	6	<20	<20	<1
60	10068			<2	16	1	5	6	<0.2	<5	<5	<5	5.16	710	<10	2	33	16	<20	<20	9
61	10083			4	50	<1	4	6	<0.2	<5	<5	<5	3.28	924	<10	988	45	113	<20	<20	11
61	10084			<2	11	1	16	1	0.3	<5	<5	<5	2.47	<20	<10	116	26	16	<20	<20	24
62	10066			16	98	<1	5	4	<0.2	<5	<5	<5	2.35	1144	<10	227	98	41	<20	<20	6
62	10067			11	142	4	4	4	<0.2	<5	<5	<5	8.70	152	<10	77	98	16	<20	<20	3
63	10095			<2	113	1	48	16	<0.2	<5	<5	<5	>10.00	382	<10	79	144	626	<20	<20	13
64	10102	3.43		12	101	1	38	22	0.3	<5	<5	<5	5.36	413	<10	1	37	135	<20	<20	3
64	10103			<2	47	<1	44	27	<0.2	<5	37	<5	5.75	484	<10	<1	130	135	<20	<20	4
64	10104	1.99		16	16	2	4	14	0.3	<5	5	<5	2.48	109	<10	2	76	77	<20	<20	2
65	10064	6.2		4	26	1	26	6	5.4	<5	<5	<5	6.50	252	<10	1	11	36	<20	<20	2
65	10065			4	16	1	19	5	0.2	<5	<5	<5	1.44	209	<10	1	191	44	<20	<20	1

APPENDIX A - ANALYTICAL RESULTS WRANGELL-ST. ELIAS NATIONAL PARK AND PRESERVE--Continued.

Map	Sample	Al	Mg	Ca	Na	K	Sr	Y	Ga	Li	Nb	Sc	Ta	Ti	Zr
no.	AAWSE	pct	pct	Pct	pct	pct	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
48	10079	1.92	3.09	5.30	<0.01	<0.01	81	5	6	18	18	6	<10	<0.01	<1
49	10078	1.28	0.78	3.75	<0.01	<0.01	90	4	3	5	5	5	<10	0.36	16
50	10082	1.55	0.30	1.25	0.15	0.14	10	<1	1	4	2	11	<10	0.23	7
51	10066	0.25	0.19	0.35	<0.01	<0.01	4	<2	<2	<2	1	<5	10	0.05	5
51	10057	3.05	2.65	4.54	<0.01	0.02	123	4	3	5	8	2	<10	0.07	8
52	10057	2.41	1.81	0.91	0.12	0.75	400	5	<2	12	<1	10	<10	0.21	8
53	10053	1.50	0.02	4.93	<0.01	0.17	90	3	<2	6	2	4	<10	0.08	7
53	10055	0.92	0.59	0.15	0.04	0.11	6	6	<2	5	<1	6	<10	0.09	5
54	10066	1.22	0.02	0.60	0.19	0.13	223	2	5	1	5	<5	<10	0.07	7
54	10066	2.21	1.07	2.29	0.12	<0.01	131	3	5	5	8	5	<10	0.36	13
55	10053	1.84	0.01	0.97	0.12	0.12	19	2	<2	5	<1	4	<10	0.45	7
56	10077	1.44	0.30	1.31	0.01	0.17	155	5	4	5	5	<5	<10	0.11	7
57	10066	0.49	1.07	1.66	0.02	0.17	25	<1	<2	3	<1	<5	<10	0.08	6
58	10062	0.48	0.12	2.90	<0.01	<0.01	4	2	<2	<1	<1	<5	<10	0.07	7
59	10059	0.57	0.30	0.60	<0.01	0.09	10	1	<2	2	<1	<5	<10	<0.01	2
59	10060	0.22	0.01	1.31	<0.01	0.09	4	<1	<2	<1	<1	<5	<10	<0.01	4
60	10066	2.21	1.11	0.60	<0.01	<0.01	287	5	7	2	5	<5	<10	0.07	7
61	10053	2.02	1.85	1.59	0.22	0.12	131	4	7	10	3	10	<10	0.08	7
61	10066	1.62	0.63	>10.00	0.02	0.17	786	10	5	8	2	11	<10	<0.01	<1
62	10066	1.84	0.01	0.87	0.01	0.12	90	4	<2	11	2	<5	<10	0.08	7
62	10067	1.62	0.61	3.83	0.01	0.12	5	4	7	5	<1	10	<10	<0.01	5
63	10095	0.56	0.02	3.83	0.02	0.02	156	[illegible]	4	2	42	<5	<10	0.21	4
64	10067	1.62	1.25	3.83	0.02	<0.01	188	[illegible]	[illegible]	2	10	5	<10	0.08	22
64	10053	1.71	0.01	1.31	0.09	<0.01	90	10	5	6	10	<5	<10	0.08	27
64	10053	0.96	0.01	2.90	<0.01	<0.01	131	2	<2	<1	2	<5	<10	0.08	16
65	10064	1.36	0.61	1.78	0.04	<0.01	131	5	<2	4	10	<5	<10	0.51	16
65	10065	0.63	0.59	1.29	0.04	<0.01	6	3	<2	2	<1	5	<10	0.13	1

Appendix B - Property Summary Sheets

ALASKA COPPER MINES

Plate no. 4

Ownership and Location:

Alternate name(s):
Sport Nos. 2-3
Company name(s):
Mineral survey(s):

Commodity: Copper
Deposit type: Stringer P-CO
Deposit model: Unknown

Location: Reported at approximately the 2,150 ft. elevation on the west side of the mouth of Pass Creek, a southern tributary of the Kotsina River.

Township: 002 S.
Quadrangle: Valdez C-1
Mining district: Chistochina
Alaska Kardex: KX 86-153
ARDF no.: Unknown
MAS no.: 0020860128

Range: 008 E.
Section: 07
Meridian: Copper River
Mineral status: Exploration prospect

Ahtna, Inc. selection: Not located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:
1958 - Two claims staked by Scott Simenstad (KX 86-153).

Historical operating data:
None reported.

Geologic setting:
Bedrock in the area consists of Jurassic and Triassic McCarthy Formation limestone and shale overlain by Triassic Chitistone Limestone and associated with the Jurassic Chitina Valley batholith (Winkler and others, 1981).

Recent investigations:

USGS/USBM/BLM work:
BLM
Looked for but not located during 1997 and 1998.
Estimated location:
Latitude N 61° 42' 37"; Longitude W 144° 02' 22"; Elevation 2,150 ft.

References:

Bibliography:

Winkler, G.R., Silberman, M.L., Grantz, A., Miller, R.J., and MacKevett, E.M., Jr., 1981, Geologic map and summary geochronology of the Valdez quadrangle, southern Alaska: U.S. Geological Survey Open-File Report 80-892-A.

Meyer, M.P., and Shepherd, A.D., 1998, Mineral assessment of Ahtna, Inc. selections in the Wrangell-St. Elias National Park and Preserve, Alaska. 1997 preliminary report: U.S. Bureau of Land Management Open File Report 71, p. 15, 39.

Meyer, M.P., and VandeWeg, D.A., 1999, Mineral assessment of Ahtna, Inc. selections in the Wrangell-St. Elias National Park and Preserve, Alaska. 1998 preliminary report: U.S. Bureau of Land Management Open File Report 73, p. 6, 15, 17, 35-36.

AMMANN PROSPECT

Plate no. 4

Ownership and Location:

Alternate name(s):
Company name(s):
Mineral survey(s):

Commodity: Copper, silver
Deposit type: Stringer P-CO
Deposit model: Basaltic Cu

Location: Located between the 3,860 ft. and the 3,940 ft. elevation, west of the Mullen Prospect, between Copper Creek and a western tributary. Copper Creek is a southern tributary of the Kotsina River.

Township: 002 S.
Quadrangle: Valdez C-1
Mining district: Chistochina
Alaska Kardex: None
ARDF no.: Unknown
MAS no.: 0020860194

Range: 007 E. ***Section:*** 24
Meridian: Copper River
Mineral status: Development prospect

Ahtna, Inc. selection: Located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:

Claims staked by Adolph Ammann (Date unknown).
Underground work done after 1914 (Van Alstine and Black, 1946).

Historical operating data:

Upper adit - driven S. 5° E. for 25 ft. (Van Alstine and Black, 1946).
Lower adit (main adit) - driven S. 32° W. for 473 ft. then S. 17° E. for 11 ft. (Van Alstine and Black, 1946).

Geologic setting:

Ammann Prospect Upper

Bedrock consists of Triassic Chitistone Limestone overlain by the Jurassic and Triassic McCarthy Formation limestone and shale and the Jurassic Kotsina Conglomerate. Tertiary hypabyssal rocks cut the limestones (Winkler and others, 1981). No copper mineralization was noted in the adit. The adit appears to be driven to undercut a discontinuous mineralized zone outcropping 25 ft. above the portal. A 2- to 6-in.-thick mineralized breccia zone, striking east and dipping 45° west, contains quartz, pyrite, bornite, chalcopyrite, chalcocite, covellite, malachite, and azurite (Van Alstine and Black, 1946).

Ammann Prospect Lower (Main Adit)

Bedrock consists of Triassic Chitistone Limestone on the nose of a small anticline. The limestone strikes N. 75° E. and dips 75° north at the portal, but at the face it strikes N. 28°

E. and dips 65° west. The limestone is cut by discontinuous, irregular, less than ¼-in.-thick veinlets of malachite, azurite, and calcite (Van Alstine and Black, 1946).

Recent investigations:

USGS/USBM/BLM work:

BLM

Located two adits (one caved) and sampled one during 1997.

Upper Adit

Adit open, driven N. 68° E. for 19 ft. into the Chitistone Limestone. The limestone face at the end of the adit contains up to 2-in.-wide calcite veins.

No samples were collected. No visible copper mineralization was noted in the adit or the waste dump.

Latitude N 61° 40' 32.198; Longitude W 144° 04' 04.876"; Elevation 3,940 ft.

Lower Adit (Main Adit)

Adit caved at the portal, appears to have been driven N. 28° E. into the Chitistone Limestone. The surrounding bedrock is not exposed due to local vegetation. Limestone float containing up to ¾-in.-wide calcite veins with chalcopyrite, pyrite, minor bornite, malachite, and azurite was noted in the waste dump.

A grab sample (**AAWSE 10041**, map no. 34) collected of mineralization from the waste dump contained 1.2% copper, 6.4 ppm silver, and 8 ppb gold.

Latitude N 61° 40' 33.607"; Longitude W 144° 04' 02.997"; Elevation 3,860 ft.

References:

Bibliography:

Moffit, F.H., and Mertie, J.B., Jr., 1923, The Kotsina-Kuskulana district, Alaska: U.S. Geological Survey Bulletin 745, p. 101.

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AMY CREEK

Plate no. 4

Ownership and Location:

Alternate name(s):
Ames [sic] Creek
Company name(s):
Great Northern Development Co.
Mineral survey(s):

Commodity: Copper, silver
Deposit type: Stringer P-CO
Deposit model: Fe skarn (18d?)

Location: Three adits located on Amy Creek. Tunnel 6 is located at the 3,810 ft. elevation on the west side of the creek. Tunnel 7 is located at the 3,875 ft. elevation on the east side of the creek across from Tunnel 6. Tunnel 8 is located at the 4,170 ft. elevation on the east side of Amy Creek ¼ mile south of Tunnel 7. Amy Creek is a southern tributary of the Kotsina River between Rock Creek and Roaring Creek.

Township: 002 S.
Quadrangle: McCarthy C-8
Mining district: Chistochina
Alaska Kardex: KX 87-042
ARDF no.: MC040
MAS no.: 0020870058

Range: 009 E. ***Section:*** 07
Meridian: Copper River
Mineral status: Development prospect

Ahtna, Inc. selection: Not located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:
1906 - Claims staked (KX 87-042).
- Prospecting started (Moffit and Mertie, 1923).
1907 - Prospecting work done (Moffit and Maddren, 1908).
1908 - Development work on the tunnels continued (Moffit, 1909).

Historical operating data:
1907 - Three tunnels reported (Moffit and Maddren, 1908).
Tunnel 6 - 50 ft. long driven southwest.
Tunnel 7 - 70 ft. long driven N. 30° E.
Tunnel 8 - 30 ft. long.
1977 - Two caved adits located (USBM field notes).

Geologic setting:
Bedrock in the valley consists of Permian Hasen Creek Formation sedimentary rocks, locally intruded by Triassic gabbro (Richter, 1998), and overlain by the Triassic Nikolai Greenstone (MacKevett and others, 1978). Rocks have been folded, faulted, and locally mineralized with pyrite and its oxidation products. The shear zones have become schistose in character where they have identical bedding and

flow planes as the country rock (Moffit and Mertie, 1923).

Recent investigations:

USGS/USBM/BLM work:

USBM

The site was visited in 1977. Two caved adits were located. No copper mineralization was noted (USBM field notes).

BLM

Located three adits (two caved) and collected samples during 1997.

Tunnel 6

Adit caved at the portal, appears to have been driven N. 10° E. Bedrock made up of highly sheared and iron-oxide stained Nikolai Greenstone. Disseminated pyrite and minor chalcopyrite occur in the quartz filled shear zones.

A select sample (**AAWSE 10048**, map no. 44) collected from the waste dump contained 183 ppm copper and less than 0.2 ppm silver.

Latitude N 61° 42' 25.017"; Longitude W 143° 50' 50.725"; Elevation 3,810 ft.

Tunnel 7

Adit caved at the portal, appears to have been driven N. 28° E. Bedrock made up of highly sheared and iron-oxide stained Nikolai Greenstone. Disseminated and veinlets of pyrite and minor chalcopyrite are associated with quartz and minor calcite.

A select sample (**AAWSE 10049**, map no. 44) collected from the waste dump contained 244 ppm copper and 0.3 ppm silver.

Latitude N 61° 42' 22.275"; Longitude W 143° 50' 35.386"; Elevation 3,875 ft.

Tunnel 8

Adit open, but partially sloughed at the portal and filled with water. Adit driven N. 85° E. for an unknown length, but driven at least 50 ft. where it has collapsed. Bedrock made up of highly sheared and iron-oxide stained Nikolai Greenstone. Disseminated and veinlets of pyrite occur in the quartz and calcite filled shear zones.

A select sample (**AAWSE 10050**, map no. 45) collected from the waste dump contained 211 ppm copper and less than 0.2 ppm silver.

Latitude N 61° 42' 11.105"; Longitude W 143° 50' 38.788"; Elevation 4,170 ft.

References:

Bibliography:

Moffit, F.H., and Maddren, A.G., 1908, The mineral resources of the Kotsina and Chitina valleys, Copper River region, *in* Brooks, A.H., and others, Mineral resources of Alaska, report on progress of investigations in 1907: U.S. Geological Survey Bulletin 345, p. 137-138.

Moffit, F.H., and Maddren, A.G., 1909, Mineral resources of the Kotsina-Chitina region, Alaska: U.S. Geological Survey Bulletin 374, p. 55.

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Cobb, E.H., and MacKevett, E.M., Jr., 1980, Summaries of data on and lists of references to metallic and selected mineral deposits in the McCarthy quadrangle, Alaska: U.S. Geological Survey Open-File Report 80-885, p. 5.

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Meyer, M.P., and VandeWeg, D.A., 1999, Mineral assessment of Ahtna, Inc. selections in the Wrangell-St. Elias National Park and Preserve, Alaska. 1998 preliminary report: U.S. Bureau of Land Management Open File Report 73, p. 9.

ANTLER CREEK NORTH

Plate no. 3

Ownership and Location:

Alternate name(s):
Unnamed occurrence
Company name(s):
Mineral survey(s):

Commodity: Copper
Deposit type: Stringer P-CO
Deposit model: Unknown

Location: Reported at approximately the 6,750 ft. elevation on the west side of a northern tributary of Antler Creek, a tributary of Stuver Creek.

Township: 008 N.
Quadrangle: Nabesna B-3
Mining district: Tok
Alaska Kardex: None
ARDF no.: NB042
MAS no.: 0020780135

Range: 017 E. ***Section:*** 32
Meridian: Copper River
Mineral status: Raw prospect

Ahtna, Inc. selection: Located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:
None reported.

Historical operating data:
Surface workings reported (Richter, 1997).

Geologic setting:
Bedrock in the area consists of Cretaceous Antler Creek hornblende syenodiorite pluton with quartz veins containing minor chalcopyrite, pyrite, and bornite (Richter, 1975; Richter, 1997).

Recent investigations:

USGS/USBM/BLM work:
BLM
Looked for but not located during 1997.
Estimated location:
Latitude N 62° 25' 36"; Longitude W 142° 18' 48"; Elevation 6,750 ft.

References:

Bibliography:

Richter, D.H., 1975, Reconnaissance geologic map of the Nabesna B-3 quadrangle, Alaska: U.S. Geological Survey Miscellaneous Investigations Series Map I-904.

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ANTLER CREEK SOUTH

Plate no. 3

Ownership and Location:

Alternate name(s):
Unnamed occurrence
Company name(s):
Mineral survey(s):

Commodity: Copper
Deposit type: Stringer P-CO
Deposit model: Unknown

Location: Reported at approximately the 5,750 ft. elevation on the west side of a northern tributary of Antler Creek, a tributary of Stuver Creek.

Township: 007 N.
Quadrangle: Nabesna B-3
Mining district: Tok
Alaska Kardex: None
ARDF no.: NB043
MAS no.: 0020780136

Range: 017 E. ***Section:*** 05
Meridian: Copper River
Mineral status: Raw prospect

Ahtna, Inc. selection: Not located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:
None reported.

Historical operating data:
None reported.

Geologic setting:
Bedrock in the area consists of Cretaceous Antler Creek hornblende syenodiorite pluton containing segregations of pyrite and chalcopyrite in the border zone (Richter, 1975; Richter, 1997).

Recent investigations:

USGS/USBM/BLM work:
BLM
Looked for but not located during 1997.
Estimated location:
Latitude N 62° 25' 00"; Longitude W 142° 18' 05"; Elevation 5,750 ft.

References:

Bibliography:

Richter, D.H., 1975, Reconnaissance geologic map of the Nabesna B-3 quadrangle, Alaska: U.S. Geological Survey Miscellaneous Investigations Series Map I-904.

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BARRETT YOUNG & NAFSTED

Plate no. 4

Ownership and Location:

Alternate name(s):
Porcupine Creek
Company name(s):
Mineral survey(s):

Commodity: Copper
Deposit type: Stringer P-CO
Deposit model: Basaltic Cu

Location: Reported at the 6,040 ft. elevation in the northwestern headwaters of Porcupine Creek, a northern tributary of the Kuskulana River.

Township: 003 S.
Quadrangle: McCarthy C-8
Mining district: Chistochina
Alaska Kardex: KX 87-037
ARDF no.: None
MAS no.: 0020870147

Range: 009 E. ***Section:*** 06
Meridian: Copper River
Mineral status: Exploration prospect

Ahtna, Inc. selection: Located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:
1900 - Three claims staked by Barrett, Young, & Nafsted (Moffit and Mertie, 1923).

Historical operating data:
Two tunnels reported (Moffit and Mertie, 1923).

Geologic setting:
Bedrock consists of the sheared and iron-oxide stained Triassic Nikolai Greenstone containing northeast trending zones of faults and fractures associated with the Jurassic Chitina Valley batholith (MacKevett and others, 1978). Veinlets of malachite and chalcopyrite cut the greenstone (Moffit and Mertie, 1923).

Recent investigations:

USGS/USBM/BLM work:
BLM
Located and sampled during 1998.

Located a 20-ft.-wide highly iron-oxide and malachite stained shear zone which strikes northeast-southwest and dips steeply south in the Nikolai Greenstone. The outcrop is highly weathered and had a small cave starting to form. Chalcopyrite, pyrite, malachite, and azurite occur along with quartz and epidote.

A select sample (**AAWSE 10082**, map no. 50) collected from the shear zone contained 7,939 ppm copper, 0.7 ppm silver, and 50 ppb gold.
Latitude N 61° 38' 10.313"; Longitude W 143° 50' 50.201"; Elevation 6,040 ft.

References:

Bibliography:

Moffit, F.H., 1915, Mineral deposits of the Kotsina-Kuskulana district, with notes on mining in Chitina valley, *in* Brooks, A.H., and others, Mineral resources of Alaska, report on progress of investigations in 1914: U.S. Geological Survey Bulletin 622, p. 158.

Moffit, F.H., and Mertie, J.B., Jr., 1923, The Kotsina-Kuskulana district, Alaska: U.S. Geological Survey Bulletin 745, p. 128.

Heiner, L.E., Wolff, E.N., and Grybeck, D., 1971, Copper mineral occurrences in the Wrangell Mt. - Prince William Sound area, Alaska: Mineral Industry Research Laboratory Report 27, p. 75.

MacKevett, E.M., Jr., 1978, Geologic map of the McCarthy quadrangle, Alaska: U.S. Geological Survey Miscellaneous Geological Investigations Map I-1032.

MacKevett, E.M., Jr., Smith, J.G., Jones, D.L., and Winkler, G.R., 1978, Geologic map of the McCarthy C-8 quadrangle, Alaska: U.S. Geological Survey Geologic Quadrangle Map GQ-1418, no. 20.

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BEE JAY

Plate no. 3

Ownership and Location:

Alternate name(s):
Bee Jay 1-8
Soda Creek
Company name(s):
Mineral survey(s):

Commodity: Copper, silver, gold, lead
Deposit type: Unknown
Deposit model: Unknown

Location: Reported at approximately the 3,450 ft. elevation on the east side of the mouth of Soda Creek, a tributary of Platinum Creek.

Township: 009 N.
Quadrangle: Nabesna C-4
Mining district: Chisana
Alaska Kardex: KX 78-066
ARDF no.: None
MAS no.: 0020780078

Range: 013 E. ***Section:*** 34
Meridian: Copper River
Mineral status: Raw prospect

Ahtna, Inc. selection: Located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:
1964 - Eight claims staked by Bernard Locke and John Joslen (KX 78-066).

Historical operating data:
None reported.

Geologic setting:
Bedrock in the area consists of faulted Triassic Nikolai Greenstone underlying massive Triassic limestone (Richter and others, 1976).

Recent investigations:

USGS/USBM/BLM work:
BLM
Not looked for during 1997.
Estimated location:
Latitude N 62° 31' 00"; Longitude W 142° 57' 00"; Elevation 3,450 ft.

References:

Bibliography:

Richter, D.H., 1976, Geologic map of the Nabesna quadrangle, Alaska: U.S. Geological Survey Miscellaneous Investigations Series Map I-932.

Richter, D.H., Matson, N.A., Jr., and Schmoll, H.R., 1976, Geologic map of the Nabesna C-4 quadrangle, Alaska: U.S. Geological Survey Geologic Quadrangle Map GQ-1303.

Meyer, M.P., and Shepherd, A.D., 1998, Mineral assessment of Ahtna, Inc. selections in the Wrangell-St. Elias National Park and Preserve, Alaska. 1997 preliminary report: U.S. Bureau of Land Management Open File Report 71, p. 13, 45.

BERG CREEK MINE

Plate no. 4

Ownership and Location:

Alternate name(s):
Camp Bird Lode
Century Lode
Dupont Lode
Engineer Syndicate
Golconda
Gold Eagle
Hercules Lode
May Day Lode
Midas Burdick
Midas Gold Mine
Minnehaha Lode
Morning Lode
North Midas Mine
North Midas 1-4
Ole Berg Property
Sunrise No. 1-3 Lode
North Midas Millsite
Triple M Millsite

Company name(s):
Kelley Development Co.
North Midas Copper Co.

Mineral survey(s):
M.S. 1558 A&B

Commodity: Gold, silver, copper, iron
Deposit type: Contact deposit
Deposit model: Cu Skarn (18b)

Location: Located between the 2,850 and 3,000 ft. elevations on the west side of Berg Creek, a southern tributary of the Kuskulana River. The mill is located at the 2,835 ft. elevation near the junction of Berg and MacDougall Creeks.

Township: 004 S.
Quadrangle: McCarthy C-8
Mining district: Chistochina
Alaska Kardex: KX 87-014
KX 87-133
ARDF no.: MC005
MAS no.: 0020870073

Range: 009 E. ***Section:*** 04
Meridian: Copper River
Mineral status: Past producer

Ahtna, Inc. selection: Not located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:

1907 - Olé Berg discovered the mineralization (Moffit and Mertie, 1923). Eighteen lode and four placer claims along with one power claim were staked.

1913 - Development work done (Brooks, 1914).

1914 - Only assessment work done (Moffit, 1915).

1915 - Development work done (Brooks, 1916).

1916 - Development work done on Tunnel No. 4, driven 80 ft. (Moffit, 1918).

1918 - Mill and cyanide plant completed and put into operation (Martin, 1919a).
- A carload of ore produced and shipped. Tunnel No. 5 developed (Martin, 1919a).

1919 - Tram line (3.5 cu. ft. bucket capacity) construction started, development and mining done (Brooks, 1921).
- The mill was run only for a short period of time due to high water on Berg Creek (Moffit and Mertie, 1923).

1920 - Underground work done. The mill was not operated (Brooks, 1922).

1921 - Claims staked by Gordon Burdick, W.D. Rich, and J.F. Crane (KX 87-014).

1922 - Development work done (Brooks and Capps, 1924).
- Cyanide plant replaced by a flotation plant with gold and silver-bearing pyrite concentrated to a shipping product. Concentrates were hauled by tractor 12 miles to Strelna and shipped on the Copper River & Northwestern Railway (Brooks and Capps, 1924).
- A diesel engine was installed as the source of auxiliary power (Brooks and Capps, 1924).

1923 - Productive mining accomplished (Brooks, 1925).

1925 - Two men doing assessment work of surface stripping (Shepard, 1926a).

1943 - Adits No. 1, 2, 3 were caved at the portals, No. 4 was ice blocked at 60 ft., No. 5 was ice blocked at 150 ft. (Van Alstine and Black, 1946).

1965 - Claims staked by Robert C. and Vera Moore (KX 87-133).

Production:

1918 - A carload of ore produced and shipped during the winter (Martin, 1919b).

1919 - A few ounces of gold and silver produced (Moffit and Mertie, 1923).

Historical operating data:

1916 - Four crosscuts driven to intersect ore (Smith, 1917b).
- Four tunnels, three started prior to 1916, with a combined length of 1,150 ft., Tunnel No. 4 was 80 ft. long (Moffit, 1918).

1918 - Tunnel No. 5, (highest tunnel) known as the "working tunnel," was driven 570 ft. (Martin, 1919b).
- Ore was originally mined from Tunnel No. 4. Tunnel No. 5 cuts the vein 570 ft. from the portal and 120 ft. vertically, below No. 4 (Martin, 1919b).
- Mill and cyanide plant (Martin, 1919b).

The 25 ton per day mill included Blake and Wheeling crushers, a Denver ball mill, a Dorr thickener, mechanical agitators, and an Oliver filter. The cyanide plant used an all-slime process with precipitation by zinc shavings (Martin, 1919b).

- Power plant with a 8 to 14 in. diameter pipeline, 2,200 ft. long, with a 200 ft. head, and a 60 hp. Castle wheel (Martin, 1919b).
- A Roebling tram, 4,600 ft. long, with a 1,000 ft. drop, 500 pound automatic loading and discharge buckets, and a capacity of 5 tons per hour (Martin, 1919b).

1919 - Over 1,600 ft. of levels and adits driven. Two levels 100 ft. apart and a short intermediate level driven from the upper level. Ore drawn off from the lower level (Brooks, 1921).

Tunnel No. 1

Located at the 3,000 ft. elevation, 1,200 ft. above Berg Creek. Driven 480 ft. S. 5° E. Minerals include magnetite, pyrite, and chalcopyrite (Moffit and Mertie, 1923).

Tunnel No. 2

Located 500 ft. southwest of Tunnel No. 1 at the 3,250 ft. elevation. Driven 140 ft. in a southerly direction with a short crosscut 100 ft. from the portal. A shallow winze was sunk in the eastern crosscut (Moffit and Mertie, 1923). Minerals include pyrite and chalcopyrite.

Tunnel No. 3

Located 1,000 ft. southwest of Tunnel No. 2 at the 3,175 to 3,200 ft. elevation. Driven nearly 500 ft. to the south-southeast. Minerals include pyrite and chalcopyrite (Moffit and Mertie, 1923).

Tunnel No. 4

Located 450 ft. south-southwest from Tunnel No. 5 at the 2,900 ft. elevation. Driven following the vein which strikes N. 70° E. and dips 45° south. (Moffit and Mertie, 1923).

Tunnel No. 5

Located at the 2,800 ft. elevation. Driven following the vein which strikes N. 70° E. and dips 45° south. (Moffit and Mertie, 1923).

Geologic setting:

Bedrock consists of extremely altered and much faulted Triassic Chitistone Limestone and Triassic Nikolai Greenstone intruded by light-colored Jurassic granodiorite pluton (Chitina Valley batholith). These rocks are overlain by the Cretaceous Berg Creek Formation conglomerates and the lower member of the McCarthy Formation limestone and shale (MacKevett and others, 1978). Magnetite, pyrite, gold, and chalcopyrite were deposited along a fault plane (Moffit, 1921). Tunnel No. 4 yielded high values of gold giving the notion to mine for gold verses copper (Moffit, 1918). A vein, 1½ to 6 ft. wide, averaging 2 or 3 ft. wide, made up of quartz and chalcopyrite with copper carbonate staining, strikes N. 70° E. (Moffit, 1921) and dips 45 to 55° southeast. (Martin, 1919b). Richter (1998) reports the main workings consist of gold-bearing quartz veins and magnetite and epidote skarn containing pyrite and chalcopyrite. The upper workings consist of disseminated and small masses of magnetite, pyrite, and chalcopyrite in quartz and skarn bodies.

Recent investigations:

USGS/USBM/BLM work:

BLM

Located the Millsite and "Working Tunnel" Tunnel No. 5 level during 1997. Vegetation at the site is very thick making location of the portal extremely difficult.

Revisited site during 1998.

Tunnel No. 4

Adit reportedly open. Located in the gully to the west of Tunnel No. 5. This adit was not visited due to time constraints.

No samples collected.

Estimated location:

Latitude N 61° 32' 59"; Longitude W 143° 47' 40"; Elevation 2,950 ft.

Tunnel No. 5 - "Working Tunnel" level

Upper terminus of aerial tramway. The actual portal was not located due to the density of the alder regrowth covering the workings. Material collected from the ore bunker beneath the upper tramway station consisted of massive and disseminated chalcopyrite along with malachite and azurite associated with quartz.

Sample location:

Latitude N 61° 33' 09.332"; Longitude W 143° 47' 19.801"; Elevation 2,825 ft.

A select sample (**AAWSE 10059**, map no. 59) collected from the waste dump contained 4,514 ppm copper, 67.8 ppm silver, and 17.75 ppm gold.

A select sample (**AAWSE 10060**, map no. 59) collected from the ore bunker contained 2,872 ppm copper, 316.2 ppm silver, and 48.48 ppm gold.

Adit location:

Latitude N 61° 33' 06.337"; Longitude W 143° 47' 26.360"; Elevation 2,865 ft.

Millsite

The mill building is mostly collapsed and still contains much of its milling equipment and engines. The mill is also the lower terminus of the aerial tramway, which has collapsed, leaving the cables strewn along its route to the upper station. There is one cabin that still has its roof, while all other buildings have either collapsed or are in the process of collapsing.

Latitude N 61° 33' 09.488"; Longitude W 143° 47' 19.200"; Elevation 2,835 ft.

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BLACKBURN

Plate no. 4

Ownership and Location:

Alternate name(s):
Blackburn Group
Blackburn 1-3
Company name(s):
Alaska United Exploration Co.
Mineral survey(s):

Commodity: Copper, gold
Deposit type: Contact deposit
Deposit model: Basaltic Cu

Location: Reported at approximately the 3,650 ft. elevation on the west side of Porcupine Creek, a northern tributary of the Kuskulana River.

Township: 003 S.
Quadrangle: McCarthy C-8
Mining district: Chistochina
Alaska Kardex: None
ARDF no.: MC027
MAS no.: 0020870064

Range: 009 E. ***Section:*** 09
Meridian: Copper River
Mineral status: Development prospect

Ahtna, Inc. selection: Located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:
1923 - Three tunnels driven (Moffit, 1918).

Historical operating data:
Blackburn group (Moffit and Mertie, 1923);
Highest adit is 75 ft. long.
Middle adit is caved.
Lowest adit is 125 ft. long with two short branches.

Geologic setting:
Bedrock consists of fine-grained Triassic Nikolai Greenstone which is cut by diorite apophyses of the Jurassic Chitina Valley batholith, where both are shattered. A vertical fault strikes N. 25° E. Pyrite, chalcopyrite, possible gold, and associated copper and iron-oxide staining occurs along the apophyses (Moffit and Mertie, 1923; MacKevett and others, 1978; Richter, 1998).

Recent investigations:

USGS/USBM/BLM work:
BLM
Looked for but not located in 1997.

Looked for but no workings located in 1998. Samples collected in the area.

Bedrock in the area consists of iron-oxide stained and sheared Nikolai Greenstone and diorite with quartz and epidote veining. The diorite contains disseminated chalcopyrite and pyrite. The greenstone contains chalcopyrite, pyrite, and malachite.

A grab sample (**AAWSE 10080**, map no. 54) collected from a diorite boulder contained 504 ppm copper and 12 ppb gold.

Latitude N 61° 37' 21.462"; Longitude W 143° 47' 13.307"; Elevation 4,550 ft.

A grab sample (**AAWSE 10081**, map no. 54) collected of the greenstone float contained 440 ppm copper and 0.4 ppm silver.

Latitude N 61° 37' 20.794"; Longitude W 143° 47' 25.293"; Elevation 3,800 ft.

Estimated location:

Latitude N 61° 37' 17"; Longitude W 143° 47' 03"; Elevation 3,650 ft.

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BLUEBIRD

Plate no. 4

Ownership and Location:

Alternate name(s):
Company name(s):
Mineral survey(s):

Commodity: Copper, silver, gold
Deposit type: Stringer BCO
Deposit model: Basaltic Cu

Location: Located at the 5,050 ft. elevation on the east side of the Middle Fork Copper Creek, a southern tributary of the Kotsina River.

Township: 002 S.
Quadrangle: Valdez C-1
Mining district: Chistochina
Alaska Kardex: None
ARDF no.: Unknown
MAS no.: 0020860139

Range: 008 E. *Section:* 30
Meridian: Copper River
Mineral status: Development prospect

Ahtna, Inc. selection: Not located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:
1922 - Prospecting done (Moffit and Mertie, 1923).

Historical operating data:
One opencut reported (Moffit and Mertie, 1923).

Geologic setting:
Bedrock consists of Triassic Chitistone Limestone overlying Triassic Nikolai Greenstone (Winkler and others, 1981) which are cut by N. 45 to 65° W. trending vertical dipping shear zones. Local malachite staining reported (Van Alstine and Black, 1946). Bornite and subordinate chalcopyrite deposited in small irregular veins intrude into the limestone and greenstone (Moffit and Mertie, 1923).

Recent investigations:

USGS/USBM/BLM work:
BLM
Located and sampled the workings during 1997.
Opencut
An opencut, or possible caved adit, cut into extensively sheared and stained Nikolai Greenstone. The shear zone covers an area 20 ft. wide by 60 ft. long. Minerals consisted of massive chalcocite, chalcopyrite, malachite, and azurite. Gangue includes biotite. A stockpile contains at least 1 ton of high grade material.

A select sample (**AAWSE 10044**, map no. 38) collected of the high grade material from the stockpile contained 50.15% copper and 103.6 ppm silver.
Latitude N 61° 39' 46.706"; Longitude W 144° 02' 01.952"; Elevation 5,055 ft.

Outcrop

An outcrop of Nikolai Greenstone below the workings is a continuation of the shear zone noted at the above-mentioned opencut. Minerals at this location consist of chalcopyrite, malachite, and azurite with associated quartz.

A random chip sample (**AAWSE 10045**, map no. 38) taken from the outcrop contained 6.4% copper, 10.3 ppm silver, and 32 ppb gold.
Latitude N 61° 39' 48.261"; Longitude W 144° 01' 54.261"; Elevation 5,020 ft.

Resources:

BLM

At least 1 ton of high grade material stockpiled below the opencut containing 50.15% copper and 103.6 ppm silver (Meyer and Shepherd, 1998).

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BOYDEN

Plate no. 3

Ownership and Location:

Alternate name(s):
Kensky Disc.
Company name(s):
Mineral survey(s):

Commodity: Gold
Deposit type: Placer
Deposit model: Placer

Location: Reported at approximately the 4,000 ft. elevation along the north side of Skookum Creek, west of Devils Mountain Lodge.

Township: 007 N.
Quadrangle: Nabesna B-5
Mining district: Chisana
Alaska Kardex: KX 78-054
ARDF no.: None
MAS no.: 0020780101

Range: 013 E. *Section:* 09
Meridian: Copper River
Mineral status: Exploration prospect

Ahtna, Inc. selection: Located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:
1958 - One placer claim staked by Henry Boyden (KX 78-054).

Historical operating data:
None reported.

Geologic setting:
Bedrock in the area consists of faulted Triassic Nikolai Greenstone underlying massive Triassic limestone (Lowe and others, 1982).

Recent investigations:

USGS/USBM/BLM work:
BLM
Looked for but not located in 1997.
Estimated location:
Latitude N 62° 23' 56"; Longitude W 143° 00' 49"; Elevation 4,000 ft.

References:

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BUNKER HILL

Plate no. 4

Ownership and Location:

Alternate name(s):
Bunker Hill Group
Company name(s):
Mineral survey(s):

Commodity: Copper
Deposit type: Stringer BCO
Deposit model: Basaltic Cu

Location: Reported at approximately the 5,500 ft. elevation on the west side of the East Fork Copper Creek, a southern tributary of the Kotsina River.

Township: 002 S.
Quadrangle: Valdez C-1
Mining district: Chistochina
Alaska Kardex: None
ARDF no.: Unknown
MAS no.: 0020860195

Range: 008 E. ***Section:*** 29
Meridian: Copper River
Mineral status: Development prospect

Ahtna, Inc. selection: Not located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:
1922 - Prospecting done (Moffit and Mertie, 1923).

Historical operating data:
A 15 ft. adit driven S. 10° E. and an opencut trending S. 30° E. reported (Moffit and Mertie, 1923; Van Alstine and Black, 1946).

Geologic setting:
Adit driven into Triassic Chitistone Limestone. Triassic Nikolai Greenstone (Winkler and others, 1981) underlies the limestone and locally has also been thrust over the limestone. The limestone is fractured and contains veinlets of quartz, calcite, epidote, malachite, and azurite up to 1 in. thick. Copper minerals in the vein include bornite, chalcopyrite, malachite, and azurite. The greenstone is shattered and mineralized with bornite, pyrite, and chalcopyrite. Malachite and azurite occur as secondary oxidation products (Moffit and Mertie, 1923; Van Alstine and Black, 1946).

Recent investigations:

USGS/USBM/BLM work:
BLM
Looked for but not located in 1998.
Estimated location:
Latitude N 61° 40' 03"; Longitude W 144° 00' 32"; Elevation 5,500 ft.

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CALCITE

Plate no. 4

Ownership and Location:

Alternate name(s):
Agnus MacDougall
Big Foot Creek
MacDougall Creek
Company name(s):
Chitina-Kuskulana Copper Co.
Mineral survey(s):

Commodity: Copper, silver
Deposit type: Contact deposit
Deposit model: Fe skarn

Location: Located at the 4,930 ft. elevation of the southeastern headwaters of MacDougall Creek (also named Bigfoot Creek), a southern tributary of the Kuskulana River.

Township: 004 S.
Quadrangle: McCarthy C-8
Mining district: Chistochina
Alaska Kardex: KX 87-046b
ARDF no.: MC014
MAS no.: 0020870077

Range: 009 E. *Section:* 02
Meridian: Copper River
Mineral status: Development prospect

Ahtna, Inc. selection: Not located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:
1900 - Staked at the same time as the War Eagle claims (KX 87-046b).
1919 - Development work done on a 600-ft.-long adit (Moffit, 1921).

Historical operating data:
1919 - A 600-ft.-long adit driven (Moffit, 1921).
- Reported mine equipment includes hand steel, a 6-hp. gasoline engine, blower, 600 ft. of air tubing for ventilation of the face (Moffit, 1921).

Geologic setting:
Most of MacDougall Creek is made up of a Jurassic granodiorite pluton (Chitina Valley batholith) intruded into Triassic Chitistone Limestone and marble which has been cut by a brecciated fault zone and overlain by the Cretaceous Berg Creek Formation conglomerates (MacKevett and others, 1978). Abundant serpentine minerals and sparsely disseminated pyrite, chalcopyrite, malachite, and azurite occurs within the brecciated fault (Richter, 1998).
An adit is driven along the contact of a diorite mass on the north, and silicified limestone on the south. The area is disturbed by faulting, with the underlying limestone and shale being thrust in a northerly direction over the younger sediments. The fault strikes N. 75° W. and dips 25° north to 30° south and most likely played a part in the mineralization deposition (Moffit, 1921; Moffit and Mertie, 1923).

White altered Triassic Chitistone Limestone in and surrounding the adit is highly fractured and sheared along the fracture planes which contain iron-stained gouge and laminated mineralization. Copper staining is abundant. Minerals included chalcopyrite, copper-bearing pyrite, and pyrite (Moffit, 1921).

Recent investigations:

USGS/USBM/BLM work:

BLM

Located and sampled during 1997.

Adit open, driven N. 78° E. for 53 ft. where it has caved. At 29 ft. from the portal, sloughing has occurred burying the tramrails and electric cables. Bedrock consists of Chitistone Limestone and epidote. The epidote occurs along the shear planes. Minerals consist of disseminated chalcopyrite and pyrite with biotite gangue.

A select sample (**AAWSE 10068**, map no. 60) collected of material from the waste dump contained 32 ppm copper and 0.4 ppm silver.

Latitude N 61° 32' 48.777"; Longitude W 143° 43' 13.397"; Elevation 4,930 ft.

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Cobb, E.H., and MacKevett, E.M., Jr., 1980, Summaries of data on and lists of references to metallic and selected mineral deposits in the McCarthy quadrangle, Alaska: U.S. Geological Survey Open-File Report 80-885, p. 14.

Meyer, M.P., and Shepherd, A.D., 1998, Mineral assessment of Ahtna, Inc. selections in the Wrangell-St. Elias National Park and Preserve, Alaska. 1997 preliminary report: U.S. Bureau of Land Management Open File Report 71, p. 11, 14-15, 18, 56-57.

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CAMP CREEK 1

Plate no. 3

Ownership and Location:

Alternate name(s):
Company name(s):
Mineral survey(s):

Commodity: Copper
Deposit type: Stringer P-CO
Deposit model: Basaltic Cu

Location: Reported approximately at the 6,100 ft. elevation of the headwaters of Camp Creek, an eastern tributary of the Nabesna River.

Township: 007 N.
Quadrangle: Nabesna B-4
Mining district: Chisana
Alaska Kardex: KX 78-028
ARDF no.: None
MAS no.: 0020780011

Range: 014 E. ***Section:*** 36
Meridian: Copper River
Mineral status: Exploration prospect

Ahtna, Inc. selection: Located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:
1902 - Mineralization reported by Mr. Alfred B. Iles (Mendenhall and Schrader, 1902).
1907 - Staked by D.C. Sargent (KX 78-028).

Historical operating data:
None reported.

Geologic setting:
A 6-in.- to 2-ft.-wide vein reported to occur in Triassic amygdaloidal basalt flows (Richter, 1971; MacKevett and Holloway, 1977) near its contact with Triassic massive limestone (Richter, 1971). Veins consist of either chalcocite or copper glance (splendid luster), with little or no gangue (Mendenhall and Schrader, 1903).

Recent investigations:

USGS/USBM/BLM work:
USGS
A sample collected in 1903, from the vein, was reported to yield 61% copper (Mendenhall and Schrader, 1903).
BLM
Looked for but not located in 1997. A sample was collected from the area.
Unable to find the reported vein or any sign of the workings. The valley walls are extremely

steep and unstable. Bedrock in the area consists mostly of volcanics and cherts containing disseminated pyrite. A massive pyritic boulder containing minor chalcopyrite found in a medial moraine on the west side of the valley was sampled. The boulder is heavily iron-oxide stained and weathered.

A select sample (**AAWSE 10028**, map no. 19) collected from the boulder contained 107 ppm copper and 0.3 ppm silver.

Latitude N 62° 20' 47.370"; Longitude W 142° 43' 50.910"; Elevation 5,820 ft.

Estimated location:

Latitude N 62° 21' 01"; Longitude W 142° 43' 23"; Elevation 6,500 ft.

References:

Bibliography:

Mendenhall, W.C., and Schrader, F.C., 1902, Copper deposits of the Mount Wrangell region, Alaska, *in* Emmons, S.F., and Hayes, C.W., Contributions to economic geology: U.S. Geological Survey Bulletin 213, p. 148.

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Brooks, A.H., 1906, The mining industry in 1906, *in* Brooks, A.H., and others, Report on progress of investigations of mineral resources of Alaska in 1906: U.S. Geological Survey Bulletin 314, p. 28.

Berg, H.C., and Cobb, E.H., 1967, Metalliferous lode deposits of Alaska: U.S. Geological Survey Bulletin 1246, p. 208.

Heiner, L.E., Wolff, E.N., and Grybeck, D., 1971, Copper mineral occurrences in the Wrangell Mt. - Prince William Sound area, Alaska: Mineral Industry Research Laboratory Report 27, p. 81.

Richter, D.H., 1971, Reconnaissance geologic map and section of the Nabesna B-4 quadrangle, Alaska: U.S. Geological Survey Miscellaneous Geologic Investigations Map I-656.

Richter, D.H., and Matson, N.A., Jr., 1972, Metallic mineral resources map of the Nabesna quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-422.

Richter, D.H., 1976, Geologic map of the Nabesna quadrangle, Alaska: U.S. Geological Survey Miscellaneous Investigations Series Map I-932.

MacKevett, E.M., Jr., and Holloway, C.D., 1977, Table describing metalliferous and selected non-metalliferous mineral deposits in eastern southern Alaska: U.S. Geological Survey Open-File Report 77-169A, p. 50.

Meyer, M.P., and Shepherd, A.D., 1998, Mineral assessment of Ahtna, Inc. selections in the Wrangell-St. Elias National Park and Preserve, Alaska. 1997 preliminary report: U.S. Bureau of Land Management Open File Report 71, p. 13, 58-59.

CAMP CREEK 2

Plate no. 3

Ownership and Location:

Alternate name(s):
Company name(s):
Mineral survey(s):

Commodity: Copper
Deposit type: Stringer P-CO
Deposit model: Basaltic Cu

Location: Reported at approximately the 4,200 ft. elevation of Camp Creek, an eastern tributary of the Nabesna River.

Township: 007 N.
Quadrangle: Nabesna B-4
Mining district: Chisana
Alaska Kardex: None
ARDF no.: NB033
MAS no.: 0020780077

Range: 014 E. ***Section:*** 25
Meridian: Copper River
Mineral status: Raw prospect

Ahtna, Inc. selection: Located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:
None reported.

Historical operating data:
None reported.

Geologic setting:
Bedrock in the area consists of Triassic amygdaloidal basalt flows (Richter, 1971; MacKevett and Holloway, 1977) near its contact with the Triassic massive limestone (Richter, 1971). Some of the limestones appear to be favorable for copper mineralization. Only malachite staining on coarsely crystalline limestone has been observed in the moraine gravels. Other rocks in the moraine include a variegated or purple amygdaloidal diabase (Mendenhall and Schrader, 1903).

Recent investigations:

USGS/USBM/BLM work:
BLM
Looked for but not located in 1997. A sample was collected from the area.

Unable to find the reported vein or any sign of the workings. The valley walls are extremely steep and unstable. Bedrock consists mostly of volcanics and cherts containing disseminated pyrite. A massive pyrite boulder containing minor chalcopyrite, found in a medial moraine on the west side of the valley, was sampled. The boulder is heavily iron-oxide stained and weathered.

A select sample (**AAWSE 10028**, map no. 19) collected from the boulder contained 107 ppm copper and 0.3 ppm silver.

Latitude N 62° 20' 47.037"; Longitude W 142° 50' 910"; Elevation 5,820 ft.

Estimated location:

Latitude N 62° 21' 52"; Longitude W 142° 44' 30"; Elevation 4,200 ft.

References:

Bibliography:

Mendenhall, W.C., and Schrader, F.C., 1903, The mineral resources of the Mount Wrangell district, Alaska: U.S. Geological Survey Professional Paper 15, p. 39.

Brooks, A.H., 1906, The mining industry in 1906, *in* Brooks, A.H., and others, Report on progress of investigations of mineral resources of Alaska in 1906: U.S. Geological Survey Bulletin 314, p. 28.

Richter, D.H., and Matson, N.A., Jr., 1969, Geochemical data from the Nabesna B-4 quadrangle, Alaska: U.S. Geological Survey Open-File Report 69-224 (366), 8 p.

Heiner, L.E., Wolff, E.N., and Grybeck, D., 1971, Copper mineral occurrences in the Wrangell Mt. - Prince William Sound area, Alaska: Mineral Industry Research Laboratory Report 27, p. 81.

Richter, D.H., 1971, Reconnaissance geologic map and section of the Nabesna B-4 quadrangle, Alaska: U.S. Geological Survey Miscellaneous Geologic Investigations Map I-656.

Richter, D.H., 1976, Geologic map of the Nabesna quadrangle, Alaska: U.S. Geological Survey Miscellaneous Investigations Series Map I-932.

MacKevett, E.M., Jr., and Holloway, C.D., 1977, Table describing metalliferous and selected non-metalliferous mineral deposits in eastern southern Alaska: U.S. Geological Survey Open-File Report 77-169A, p. 50.

Richter, D.H., 1997, Alaska resource data file - Nabesna quadrangle: U.S. Geological Survey Open-File Report 97-749, p. 45.

Meyer, M.P., and Shepherd, A.D., 1998, Mineral assessment of Ahtna, Inc. selections in the Wrangell-St. Elias National Park and Preserve, Alaska. 1997 preliminary report: U.S. Bureau of Land Management Open File Report 71, p. 13, 60-61.

CARIBOU CREEK MINE

Plate no: 3

Ownership and Location:

Alternate name(s):
Company name(s):
Mineral survey(s):

Commodity: Gold
Deposit type: Placer
Deposit model: Placer

Location: Located at the 4,300 ft. elevation of the middle fork of Caribou Creek, a northern tributary of the Copper River.

Township: 010 N.
Quadrangle: Nabesna C-5
Mining district: Chistochina
Alaska Kardex: None
ARDF no.: None
MAS no.: 0020780132

Range: 010 E. ***Section:*** 25
Meridian: Copper River
Mineral status: Past producer

Ahtna, Inc. selection: Located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:
Unknown.

Historical operating data:
A hydraulic placer operation that used a 3-in.-diameter hose and a 12-in.-wide sluicebox ("Long Tom") of unknown length. A wing dam, with wooden gates, was built to control water flow in the creek and create a head for the hydraulic nozzle. The area worked covered approximately 1 to 1½ miles of the creek. Boulder piles have been placed on both sides of the creek in the areas worked. The workings are located between a cabin, used by hikers, upstream to an old tent site at the 4,450 ft. elevation.

Geologic setting:
Caribou Creek drains Permian volcanic and volcaniclastic rocks along a contact zone of a Permian and Triassic meta-igneous complex of diorites and gniess' (Richter and Schmoll, 1973).

Recent investigations:

USGS/USBM/BLM work:
BLM
Located workings and collected two placer samples in 1997.
A placer sample (**AAWSE 10014**, map no. 9) was collected below an eastern gully and consisted of sloughed material. Stream float consists of basalt, rhyolite, and aplitic dike

material. A 1/10 cubic yard sample was processed through a mini sluicebox. Recovered two small angular gold flakes (lenticular, approximately ½ mm). No quartz was noted in the stream float. Lab analysis showed the sample concentrates contained 2,951 ppb gold, 0.6 ppm silver, and 31 ppm copper.

Sample Location:

Latitude N 62° 37' 03.139"; Longitude W 143° 27' 27.293"; Elevation 4,205 ft.

A placer sample (**AAWSE 10015**, map no. 9) was taken of small gravel to boulders 16 in. in diameter. Stream float in the sampled area consists of basalts and rhyolites. A 1/10 cubic yard sample was processed through a mini sluicebox. Recovered six gold flakes from a speck (0.02 mm) to ½ mm. in size No quartz or garnets were noted in the stream float. Lab analysis showed the sample concentrates contained 5,227 ppb gold, 0.4 ppm silver, and 33 ppm copper.

Sample Location:

Latitude N 62° 37' 01.375"; Longitude W 143° 27' 33.123"; Elevation 4,155 ft.

References:

Bibliography:

Richter, D.H., and Schmoll, H.R., 1973, Geologic map of the Nabesna C-5 quadrangle, Alaska: U.S. Geological Survey Geologic Quadrangle Map GQ-1062.

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Meyer, M.P., and Shepherd, A.D., 1998, Mineral assessment of Ahtna, Inc. selections in the Wrangell-St. Elias National Park and Preserve, Alaska. 1997 preliminary report: U.S. Bureau of Land Management Open File Report 71, p. 1-2, 10, 13, 62-63.

CARIBOU CREEK PROSPECT

Plate no. 3

Ownership and Location:

Alternate name(s):
Unnamed occurrence
Company name(s):
Mineral survey(s):

Commodity: Copper, gold, lead, zinc
Deposit type: Contact deposit
Deposit model: Unknown

Location: Located at the 4,890 and 4,920 ft. elevations on the west side of the middle fork of Caribou Creek, a northern tributary of the Copper River.

Township: 010 N.
Quadrangle: Nabesna C-5
Mining district: Chistochina
Alaska Kardex: None
ARDF no.: NB008
MAS no.: 0020780003

Range: 010 E. *Section:* 25
Meridian: Copper River
Mineral status: Development prospect

Ahtna, Inc. selection: Located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:
1942 - A caved adit located (Moffit, 1954).

Historical operating data:
1950's - A Caved adit driven N. 65° E. to crosscut the vein (Moffit, 1954).

Geologic setting:
Bedrock consists of Permian volcanic and volcaniclastic rocks along a contact zone of a Permian and Triassic meta-igneous complex of diorites and gniess' (Richter and Schmoll, 1973). An 8-ft.-thick trachyte dike striking N. 55° W., dipping 45° northeast, cuts diorite gneiss. Stringers made up of quartz, calcite, pyrite, galena, and sphalerite, from ¼ to 2 in. thick, form a 6- to 12-in.-wide mineralized zone. Another trachyte dike, located across the creek, shows pyritization along the contact (Moffit, 1954).

Recent investigations:

USGS/USBM/BLM work:
BLM
Located and sampled two caved adits in 1997.
Adit No. 1
Adit caved at the portal, appears to have been driven N. 78° W. The workings appear to be following a rhyolitic dike containing disseminated pyrite. A zone of

horndblendite is located above the portal.

A select sample (**AAWSE 10006**, map no. 6) collected of the rhyolite and disseminated pyrite from the waste dump contained 2 ppm copper.

Latitude N 62° 37' 28.137"; Longitude W 143° 26' 59.860"; Elevation 4,860 ft.

A select sample (**AAWSE 10007**, map no. 6) collected from a 2-ft.-wide iron-oxide stained vein located on the upper right of the portal contains disseminated pyrite. The sample contained 316 ppm copper and 0.3 ppm silver.

Latitude N 62° 37' 26.324"; Longitude W 143° 27' 09.111"; Elevation 4,860 ft.

A grab sample (**AAWSE 10008**, map no. 6) collected of pyrite float above the adit contained 137 ppm copper.

Latitude N 62° 37' 26.995"; Longitude W 143° 27' 02.084"; Elevation 4,860 ft.

Adit No. 2

Adit caved at the portal, located 150 ft. downstream from Adit No. 1. The adit appears to have been driven N. 13° W. No visible copper mineralization was noted in the waste dump or the workings.

No samples were collected. No visible copper mineralization was noted.

Latitude N 62° 37' 26.292"; Longitude W 143° 27' 15.991"; Elevation 4,890 ft.

References:

Bibliography:

Moffit, F.H., 1954, Geology of the eastern part of the Alaska range and adjacent area: U.S. Geological Survey Bulletin 989-D, p. 203.

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Meyer, M.P., and Shepherd, A.D., 1998, Mineral assessment of Ahtna, Inc. selections in the Wrangell-St. Elias National Park and Preserve, Alaska. 1997 preliminary report: U.S. Bureau of Land Management Open File Report 71, p. 10-11, 13, 64-65.

CARMALITA

Plate no. 4

Ownership and Location:

Alternate name(s):
Company name(s):
Mineral survey(s):

Commodity: Gold
Deposit type: Placer
Deposit model: Placer

Location: Reported at approximately the 2,100 ft. elevation of Crystal Creek just upstream of the Lakina River, a northern tributary of the Chitina River.

Township: 006 S.
Quadrangle: McCarthy B-7
Mining district: Chistochina
Alaska Kardex: KX 87-188
ARDF no.: None
MAS no.: 0020870138

Range: 010 E. *Section:* 13
Meridian: Copper River
Mineral status: Exploration prospect

Ahtna, Inc. selection: Located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:
1975 - One claim staked by David Kesinger (KX 87-188).

Historical operating data:
None reported.

Geologic setting:
The Lakita River headwaters drain thick sequences of Permian gabbro and gniess', marble of the metamorphosed Permian Skolai Group, Permian and Pennsylvanian Station Creek Formation, Jurassic and Triassic McCarthy Formation limestone and shale, and Cretaceous sedimentary rocks (MacKevett, 1978).

Recent investigations:

USGS/USBM/BLM work:
BLM
A placer sample was collected from the Lakina River during 1998.
A placer sample (**AAWSE 10095**, map no. 63) was collected from the lower reach of the Lakina River. A 1/10 cubic yard sample was processed through a mini sluicebox. Stream float consists of basalt, diorite, granite, and quartz. Cobbles range up to 8 in. in diameter. Collected the sample from the lower edge of a gravel bar. A very minor amount of black sands was collected in the sample. Recovered two very fine specks (approximately 0.1 mm)

of gold. Lab analysis showed the sample concentrates contained 2,411 ppb gold and 55 ppm copper.

Latitude N 61° 20' 44.760"; Longitude W 143° 33' 49.245"; Elevation 880 ft.

Estimated location:

Latitude N 61° 21' 01"; Longitude W 143° 31' 44"; Elevation 2,100 ft.

References:

Bibliography:

MacKevett, E.M., Jr., 1978, Geologic map of the McCarthy quadrangle, Alaska: U.S. Geological Survey Miscellaneous Geological Investigations Map I-1032.

Meyer, M.P., and Shepherd, A.D., 1998, Mineral assessment of Ahtna, Inc. selections in the Wrangell-St. Elias National Park and Preserve, Alaska. 1997 preliminary report: U.S. Bureau of Land Management Open File Report 71, p. 14, 66.

Meyer, M.P., and VandeWeg, D.A., 1999, Mineral assessment of Ahtna, Inc. selections in the Wrangell-St. Elias National Park and Preserve, Alaska. 1998 preliminary report: U.S. Bureau of Land Management Open File Report 73, p. 6, 14, 19, 31-33, 49-50.

CAVE PROSPECT

Plate no. 4

Ownership and Location:

Alternate name(s):

Company name(s):
Adolph Ammann

Mineral survey(s):

Commodity: Copper, silver
Deposit type: Stringer BCO
Deposit model: Basaltic Cu

Location: Located between the 4,110 and 4,450 ft. elevations, southwest of the Mullen Prospect, on the west side of Copper Creek, a southern tributary of the Kotsina River.

Township: 002 S.
Quadrangle: Valdez C-1
Mining district: Chistochina
Alaska Kardex: KX 86-64 (Partial)
KX 86-148 (Partial)
ARDF no.: Unknown
MAS no.: 0020860192

Range: 007 E. *Section:* 25
Meridian: Copper River
Mineral status: Development prospect

Ahtna, Inc. selection: Not located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:
1907 - Staked by Scott Simenstad and E.W. Hundley (KX 86-064).
1916 - Staked by Robert Jenkins (KX 86-148).
1944 - A 223-ft.-long adit (Van Alstine and Black, 1946).

Historical operating data:
A 223-ft.-long adit trending S. 88° W. reported (Van Alstine and Black, 1946).

Geologic setting:
Bedrock consists of Triassic Nikolai Greenstone overlain by Triassic Chitistone Limestone (Winkler and others, 1981) which strikes N. 40° W. and dips 25° southwest. A mineralized 2- to 12-in.-thick shear zone contains sheared greenstone, quartz, malachite, bornite, and minor chalcopyrite. The shear zone strikes N. 14° W. and dips 7° west. (Van Alstine and Black, 1946).

Recent investigations:

USGS/USBM/BLM work:
BLM
Located and sampled Adit No. 1 during 1997.
Located Adit No. 2 and No. 3, but sampled only Adit No. 2 during 1998.
Adit No. 1
Adit open, driven N. 35° W., into the Chitistone Limestone for 34 ft. where it was then partially flooded. The adit is driven for another 30 to 50 ft., but was

inaccessible due to the flooding. A shear zone located on the north rib of the adit, 10 ft. in from the portal, contains chalcopyrite, malachite, and azurite bearing quartz.

A grab sample (**AAWSE 10043**, map no. 35) collected from the 2- to 12-in.-wide quartz shear zone contained 16.95% copper, 30.6 ppm silver, and 533 ppb gold.

Latitude N 61° 40' 18.381"; Longitude W 144° 04' 02.402"; Elevation 4,110 ft.

Adit No. 2

Adit open, driven S. 78° W. following a shear zone for 15 feet. Driven in malachite and azurite stained Chitistone Limestone with minor disseminated bornite(?).

A select sample (**AAWSE 10107**, map no. 35) collected from the stained limestone at the face of the adit contained 817 ppm copper.

Latitude N 61° 40' 20.403"; Longitude W 144° 04' 14.415"; Elevation 4,350 ft.

Adit No. 3

Adit open, driven into the Chitistone Limestone forming a vertical cliff. The adit is in a location that can only be reached with the use of ropes.

No samples were collected. The adit was not visited due to accessability reasons.

Estimated location:

Latitude N 61° 40' 11"; Longitude W 144° 04' 01"; Elevation 4,450 ft.

Opencut

A small opencut is located on top of the ridge above Adit No. 2. Workings cut into the Chitistone Limestone. The opencut appears to have been cut to try and locate any mineralized trends above the Cave Prospect and Mullen Mine.

No samples were collected. No visible copper mineralization was noted.

Latitude N 61° 40' 25.177"; Longitude W 144° 04' 15.303"; Elevation 4,400 ft.

References:

Bibliography:

Moffit, F.H., and Mertie, J.B., Jr., 1923, The Kotsina-Kuskulana district, Alaska: U.S. Geological Survey Bulletin 745, p. 102-103.

Van Alstine, R.E., and Black, R.F., 1946, Copper deposits of the Kotsina-Kuskulana district, Alaska: U.S. Geological Survey Bulletin 947-G, p. 129-130.

Heiner, L.E., Wolff, E.N., and Grybeck, D., 1971, Copper mineral occurrences in the Wrangell Mt. - Prince William Sound area, Alaska: Mineral Industry Research Laboratory Report 27, p. 103.

Winkler, G.R., Silberman, M.L., Grantz, A., Miller, R.J., and MacKevett, E.M., Jr., 1981, Geologic map and summary geochronology of the Valdez quadrangle, southern Alaska: U.S. Geological Survey Open-File Report 80-892-A.

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Meyer, M.P., and VandeWeg, D.A., 1999, Mineral assessment of Ahtna, Inc. selections in the Wrangell-St. Elias National Park and Preserve, Alaska. 1998 preliminary report: U.S. Bureau of Land Management Open File Report 73, p. 6, 9, 11, 15, 28-30, 51-52.

CHICHOKNA

Plate no. 4

Ownership and Location:

Alternate name(s):
Chichokna 1-15
Company name(s):
Alaska Yukon Minerals
Mineral survey(s):

Commodity: Gold
Deposit type: Stringer BCO
Deposit model: Polymetallic vein

Location: Reported at approximately the 2,890 ft. elevation along the Chichokna River, a tributary of the Chetaslina River.

Township: 002 N.
Quadrangle: Valdez D-2
Mining district: Chistochina
Alaska Kardex: KX 86-160
ARDF no.: Unknown
MAS no.: 0020860087

Range: 005 E. ***Section:*** 33
Meridian: Copper River
Mineral status: Exploration prospect

Ahtna, Inc. selection: Located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:
1968 - Fifteen claims staked by John J. Brennan (KX 78-160).

Historical operating data:
None reported.

Geologic setting:
Bedrock in the area consists of the metamorphosed Permian Skolai Group which has been intruded by the Jurassic Chitina Valley batholith (Winkler and others, 1981).

Recent investigations:

USGS/USBM/BLM work:
BLM
Looked for but not located in 1997.

A prominent iron-oxide stain zone within a steep narrow canyon was observed along the Chichokna River. The area was not investigated due to time constraints and accessibility. This may be the actual location of the claims.

Two samples were collected from the ridge west of the river where the original location was thought to be.

A select sample (**AAWSE 10032**, map no. 21) collected of slightly weathered biotite gniess

with minor pyrite and associated quartz contained 25 ppm copper.
Latitude N 61° 55' 03.733"; Longitude W 144° 30' 44.850"; Elevation 4,155 ft.

A select sample (**AAWSE 10033**, map no. 20) collected of iron-oxide stained greenstone with pyrite and associated quartz contained 95 ppm copper and 0.2 ppm silver.
Latitude N 61° 55' 51.885"; Longitude W 144° 30' 18.515"; Elevation 4,700 ft.

Estimated location:
Latitude N 61° 54' 25"; Longitude W 144° 30' 07"; Elevation 2,890 ft.

References:

Bibliography:

Winkler, G.R., Silberman, M.L., Grantz, A., Miller, R.J., and MacKevett, E.M., Jr., 1981, Geologic map and summary geochronology of the Valdez quadrangle, southern Alaska: U.S. Geological Survey Open-File Report 80-892-A.

Meyer, M.P., and Shepherd, A.D., 1998, Mineral assessment of Ahtna, Inc. selections in the Wrangell-St. Elias National Park and Preserve, Alaska. 1997 preliminary report: U.S. Bureau of Land Management Open File Report 71, p. 15, 69.

CHOKOSNA RIVER

Plate no. 4

Ownership and Location:

Alternate name(s):
Broken Leg Group
Mineral King Group
Company name(s):
Mt. Wrangell Copper Co.
Mineral survey(s):

Commodity: Copper
Deposit type: Stringer P-CO
Deposit model: Unknown

Location: Reported at approximately the 2,790 ft. elevation on the west side of a tributary of the Gilahina River.

Township: 005 S.
Quadrangle: McCarthy B-8
Mining district: Chistochina
Alaska Kardex: KX 87-107
ARDF no.: None
MAS no.: 0020870144

Range: 010 E. ***Section:*** 09
Meridian: Copper River
Mineral status: Exploration prospect

Ahtna, Inc. selection: Located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:
1919 - Claims staked (KX 87-107).

Historical operating data:
None reported.

Geologic setting:
The Gilahina River headwaters drain thick sequences of Permian gabbro and gniess', marble of the metamorphosed Permian Skolai Group, Permian and Pennsylvanian Station Creek Formation, Permian Hasen Creek Formation sedimentary rocks, Triassic Nikolai Greenstone, Jurassic and Triassic McCarthy Formation limestone and shale, Jurassic Chitina Valley batholith dikes and plutons, and Cretaceous sedimentary rocks (MacKevett, 1978).

Recent investigations:

USGS/USBM/BLM work:
BLM
Looked for but not located during 1997 and 1998.
Estimated location:
Latitude N 61° 26' 58"; Longitude W 143° 38' 02"; Elevation 2,790 ft.

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CLEAR CREEK MINE

Plate no. 4

Ownership and Location:

Alternate name(s):
Copper Mountain
Copper Mountain Group
Great Northern Development Co.
Company name(s):
Great Northern Development Co.
Mineral survey(s):
M.S. 918

Commodity: Copper, silver, molybdenum, gold
Deposit type: Contact deposit
Deposit model: Basaltic Cu

Patent number(s):
541521

Location: Located between the 4,300 and 5,585 ft. elevations on the east side of Clear Creek, a northern tributary of the Kuskulana River.

Township: 003 S.
Quadrangle: McCarthy C-8
Mining district: Chistochina
Alaska Kardex: KX 87-040
KX 87-041
ARDF no.: MC028
MAS no.: 0020870063

Range: 009 E. ***Section:*** 07
Meridian: Copper River
Mineral status: Past producer
Patented

Ahtna, Inc. selection: Located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:

1906 - Fifty-eight claims staked (KX 87-040, KX 87-041).
- Prospecting started (Van Alstine and Black, 1946).

1907 - Claims staked from August 6, 1907 to March 20, 1910. Claims include the Ada, Alice, Alma, Alpha, Anaconda, Anvil, Arcansaw[sic], Berdena, Bertha, Beta, Blane, Borden, Borinite[sic], Buck, Butte, Cairo, California, Chicken, Cleo, Clyde, Colorado, Columbia, Cook-Ko, Copper King, Copper Queen, Ethel, Eureka, Helena, Humboldt, Idaho, Irwin, Jessie, Keno, Kent, Lida, Madison, Maud, May, Monroe, Munro, Nancy, Ophir, Porcupine, Pyrites, Ramshorn, Ray, Ruth, Salem, Shamrock, Solomon, Star, Taft, Teddy, Theo, Togo, Troy, Venetia, and Westover Lodes by the Great Northern Development Co.
- Claims recorded from September 16, 1907 to April 8, 1910.
- Prospecting and development work done (Moffit, 1909).

1908 - Prospecting and development work done (Moffit, 1909).

1910 - Mineral Survey 918 was completed. Claims include those mentioned staked in 1907.

1911 - Development work done (Moffit, 1912b).

1912 - Development work done, an aerial tramway started. 5,000 ft. of tunneling has been

completed and considerable ore was blocked out (Moffit, 1913).
- A snowslide during the winter of 1912-13 destroyed much of the camp and workings including the generating plant as well as taking several lives (Moffit and Mertie, 1923).

1913 - Shipment of ore made (Brooks, 1914).

1914 - Assessment work done, development work suspended pending patent grants (Moffit, 1918).
- Three tunnels driven with a total length of 5,700 ft. and a fourth started (Moffit, 1918).

1915 - Assessment work only was completed (Smith, 1917a).

1916 - Assessment work only was completed (Smith, 1917b).
- Patented August 9, 35 claims (Moffit, 1918).

1922 - Development work done (Moffit, 1924).

1943 - All workings reported caved (Van Alstine and Black, 1946).

Production:

Shipment of ore made during the winter of 1912-13 (Brooks, 1914).

Historical operating data:

In 1910 Mineral Survey 918 reported two main tunnels with branches, crosscuts, underground work and winze, as well as one tunnel, two opencuts, and one shaft.

During 1912, 5,000 ft. of tunneling and considerable ore was blocked (Moffit, 1912b; Moffit, 1913).

Aerial tramway began being built during 1912 to connect to a projected railroad spur (Moffit, 1913).

Three principal tunnels totaling 5,661 ft. and a fourth tunnel 175 ft. long (Moffit and Mertie, 1923).

Tunnel No. 1

Over 2,000 ft. of workings at the 5,000 ft. elevation. Two branches were driven, and each were 1,000 ft. long. Only the east branch was accessible in 1943 (Van Alstine and Black, 1946).

Tunnel No. 2

Located at the 5,500 ft. elevation. Tunnel driven N. 30 to 60° E. following fracture planes, a crosscut with a 2-ft.-thick vein is located at 350 ft. Pyrite and chalcopyrite occur in the vein (Moffit and Mertie, 1923).

Tunnel No. 3

Driven 2,266 ft. at the 5,200 ft. elevation. Chalcopyrite and pyrite occur in a sheeted zone near the granodiorite contact perpendicular to Tunnel No. 2 (Moffit and Mertie, 1923). By 1943 the tunnel was closed by ice 100 ft. beyond the portal (Van Alstine and Black, 1946).

Tunnel No. 4

Driven 175 ft. at the lowest point (4,200 ft. elevation) for use as the main working tunnel during mining (Moffit and Mertie, 1923). Completely caved by 1945 (Van Alstine and Black, 1946).

Geologic setting:

Clear Creek follows the boundary between the Triassic Chitistone Limestone and the underlying Triassic Nikolai Greenstone, which dip steeply west-southwest (Moffit, 1918). The greenstone on the east side of the creek near the headwaters is intruded by a dark mass of mineralized porphyritic igneous rock (Jurassic Chitina Valley batholith) (MacKevett and others, 1978). Ore minerals consist of azurite, bornite, chalcocite, chalcopyrite, covellite, galena, malachite, and molybdenite disseminated through both the intruded and intruding rocks. In places the mineralization fills minute veinlets, parallel to one another, which represent fractures in a shear zone. They also form larger veins, up to 6 ft. wide, along fracture planes, but generally, the ore is a low-grade, disseminated deposit. Gangue minerals include aragonite, calcite, magnetite, pyrite, quartz, and stilbite (Moffit, 1918; Richter, 1998).

Recent investigations:

USGS/USBM/BLM work:

USBM

Site visited in 1977 (USBM field notes).

BLM

Located and sampled in 1997

Tunnel No. 1 - Monroe Lode claim

Adit open, driven N. 35° E., length unknown into the Nikolai Greenstone. The adit has a crosscut to the north approximately 50 ft. from the portal and two crosscuts, both driven about 50 ft., in the shape of a V at the end of the main adit. This adit contains candles strewn all over the floor the entire length of the workings. At the crosscuts there are stacks of candle boxes in both arms. At least 50 cases of candles were counted. Chalcopyrite, minor bornite, and pyrite occur in sheared iron-stained quartz veinlets.

A select sample (**AAWSE 10054**, map no. 53) collected from the waste dump contained 155 ppm copper, 1.6 ppm silver, and 285 ppb gold.

Latitude N 61° 37' 24.608"; Longitude W 143° 50' 24.448"; Elevation 5,010 ft.

Opencut - Upper - Monroe Lode claim

Around the corner, to the southeast, and above Tunnel No. 1, an L-shaped opencut or sloughed-in shaft was located. Bedrock consists of highly iron-oxide stained Nikolai Greenstone with a 2-ft.-wide shear zone trending N. 31° W. for at least 30 feet. Chalcopyrite occurs as disseminations and as veins up to 1 in. thick within the quartz filled shear zone.

A select sample (**AAWSE 10055**, map no. 53) collected from the shear zone in the opencut contained 4,978 ppm copper, over 10% iron, 4.6 ppm silver, and 9,828 ppb gold.

Latitude N 61° 37' 24.518"; Longitude W 143° 50' 19.761"; Elevation 5,125 ft.

Tunnel No. 2 - Copper King Lode claim

Adit caved at portal, appears to have been driven N. 33° E. into a 20-ft.-wide shear zone in the Nikolai Greenstone. Copper minerals occur as either massive chalcopyrite (AAWSE 10056) or as malachite and disseminated chalcopyrite in the greenstone (AAWSE 10057).

A select sample (**AAWSE 10056**, map no. 51) collected of the massive chalcopyrite from the waste dump contained 8.8% copper, 66.3 ppm silver, 8,000 ppb gold, over 10% iron, and 1,208 ppm zinc.

A select sample (**AAWSE 10057**, map no. 51) collected disseminated chalcopyrite, bornite, pyrite, and malachite with associated quartz in the Triassic Nikolai Greenstone contained 2.9% copper, 9.4 ppm silver, 665 ppb gold, and 1,329 ppm

manganese.
Latitude N 61° 37' 50.057"; Longitude W 143° 50' 50.595"; Elevation 5,585 ft.

Tunnel No. 3 - Copper Queen Lode claim

Adit is completely iced in at 20 ft. from the portal and appears to have been driven N. 30° E. into highly sheared Nikolai Greenstone.

No samples were collected. No copper mineralization was noted in the waste dump or the surrounding area.

Latitude N 61° 37' 41.604"; Longitude W 143° 50' 57.967"; Elevation 5,140 ft.

Opencut - Lower - Copper Queen Lode or the Pyrites Lode claim

An opencut, 15 ft. wide by 15 ft. long, 6 ft. deep, cut into the Nikolai Greenstone, exposed a 2-in.-wide iron-oxide stained shear zone containing veinlets and disseminated pyrite, chalcopyrite, and azurite with associated quartz.

A select sample (**AAWSE 10058**, map no. 52) collected from the shear zone contained 210 ppm copper, over 10% iron, 162 ppb gold, 952 ppm zinc, and less than 0.2 ppm silver.

Latitude N 61° 37' 38.869"; Longitude W 143° 50' 58.226"; Elevation 5,095 ft.

Tunnel No. 4 - Alpha or Beta Lode claim

Adit caved at portal, appears to have been driven N. 30° E. into Nikolai Greenstone.

No samples were collected. No copper mineralization was noted in the waste dump or surrounding area.

Latitude N 61° 36' 58.588"; Longitude W 143° 50' 22.623"; Elevation 4,300 ft.

Camp - Copper Queen Lode claim

All buildings are collapsed due to the snowslide.

Latitude N 61° 37' 32"; Longitude W 143° 50' 46"; Elevation 4,910 ft.

Generating plant

All buildings are collapsed. Remnants of an engine were located at the site.

Latitude N 61° 36' 52"; Longitude W 143° 50' 34"; Elevation 4,120 ft.

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Richter, D.H., 1998, Alaska resource data file - McCarthy quadrangle: U.S. Geological Survey Open-File Report 98-227, p. 40-41.

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COPPER KING MINE

Plate no. 4

Ownership and Location:

Alternate name(s):
Hubbard and Elliott
Mineral King
Swazie
Elliott Creek

Commodity: Gold, copper
Deposit type: Stringer BB-C
Deposit model: Basaltic Cu (23)

Company name(s):
Elliott Hubbard Mining Co.
Hubbard-Elliott Copper Mines Development Co. of Alaska
Mineral King Mining Co.

Mineral survey(s):
M.S. 566

Mineral certificate(s):
00000015

Location: Located at the 4,705 ft. elevation near the headwaters of Elliott Creek on the south side of the creek. Elliott Creek is a northern tributary of the Kotsina River.

Township: 003 S.
Quadrangle: Valdez C-1
Mining district: Chistochina
Alaska Kardex: KX 86-050
KX 86-051
ARDF no.: Unknown
MAS no.: 0020860140

Range: 008 E. *Section:* 06
Meridian: Copper River
Mineral status: Past producer
Patented

Ahtna, Inc. selection: Located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:

1899 - Fifty-six claims staked by H.C. Elliott, Charles Hubbard, Bertha Huntley, John Fay, and Helen H. Nickolson (KX 86-050).
- Eighty-four claims staked by H.C. Elliott and Charles Hubbard (KX 86-051).

1900 - Copper King and the Mineral King claims located, August 26, by Charles G. Hubbard, George J. Roberts, P.J. Boardman, Ernest L. Brundett, Henry Prather Elliott, and Antoinette M. Elliott.
- Claims recorded September 27.

1902 - Mineral Survey 566 surveyed, June 26-July 4 for Charles G. Hubbard, George J. Roberts, P.J. Boardman, Ernest L. Brundett, Henry Prather Elliott, and Antoinette M. Elliott. Claims include the Copper King and Mineral King Lodes.

1904 - Patent issued, June 30, 41.322 acres.

Historical operating data:

1902 - Mineral Survey 566 reported a discovery cut and an opencut.

Copper Creek claim - One opencut.

Mineral King claim - Several opencuts and one adit (See below).

Geologic setting:

Most of the lower part of the creek is occupied by Triassic Nikolai Greenstone and overlain by Triassic Chitistone Limestone (Winkler and others, 1981). Outcrops of the limestone are not conspicuous on the south side of the valley, but are on the north side and at the head of the valley form bold high cliffs. Thin-bedded Jurassic and Triassic McCarthy Formation limestone and shale occurs locally within the Chitistone Limestone. The Jurassic Kotsina Conglomerate caps the northern ridge while tuffs and basalts cap the southern ridge. Quartz diorite porphyry dikes of the Chitina Valley batholith occasionally cut the northern rocks. Faulting has occurred in the rocks with fracturing and faulting more pronounced in the greenstones. These fault and fracture zones have been mineralized by copper-bearing solutions. Bornite, chalcopyrite, and/or chalcocite are deposited as either irregular veins, replacement ore, or disseminated in the country rock. Gangue consists of quartz, calcite, and epidote (Moffit and Mertie, 1923).

Copper King claim

Mixture of bornite and chalcocite along a shear zone. Minor amounts of pyrite, malachite, and chalcanthite (blue glass) are located along the shear zone. The shear zone trend's east-northeast, parallel to the limestone bluffs, and dips southward (Moffit and Mertie, 1923).

Mineral King claim

A shear zone, striking N. 35° E., dipping 30° south, showing a number of faults. Vertical joints, striking N. 60° E., and faults that dip 30° southeast, cross the greenstone. A mixture of bornite and chalcocite has replaced the greenstone, particularly along the joint and fracture planes. The mineralized rock ranges up to 6 ft. wide and can be traced for up to 30 ft. (Moffit and Mertie, 1923).

Recent investigations:

USGS/USBM/BLM work:

BLM

Located one adit and collected one sample during 1997.

Visited in 1998 with the mine owner.

Mineral King Lode

Located an adit that is snow covered and iced in at the portal. The adit appears to have been driven N. 32° E. into the Nikolai Greenstone. Massive bornite, malachite, and azurite associated with quartz was noted in the waste dump.

A select sample (**AAWSE 10063**, map no. 39) collected from the waste dump contained 13.4% copper, 17.2 ppm silver, 16 ppb gold, and 1,105 ppm manganese. Latitude N 61° 38' 12.130"; Longitude W 144° 02' 03.251"; Elevation 4,700 ft.

Opencut No. 1

Opencut dug into Nikolai Greenstone. Chalcocite, bornite, chalcopyrite, malachite, and azurite are noted in the outcrops in the opencut.

No samples were collected.

Latitude N 61° 38' 20.769"; Longitude W 144° 02' 09.226"; Elevation 4,610 ft.

Opencut No. 2

Opencut 15 ft. long by 5 ft. wide, and 3 ft. deep. No bedrock was encountered.

No samples were collected.

Latitude N 61° 38' 20.988"; Longitude W 144° 02' 06.649"; Elevation 4,635 ft.

Opencut No. 3

Opencut 15 ft. long by 5 ft. wide, and 3 ft. deep. No bedrock was encountered.

No samples were collected.

Latitude N 61° 38' 21.053"; Longitude W 144° 02' 06.360"; Elevation 4,640 ft.

Opencut No. 4

Opencut 15 ft. long by 5 ft. wide, and 3 ft. deep. No bedrock was encountered.

No samples were collected.

Latitude N 61° 38' 21.123"; Longitude W 144° 02' 05.825"; Elevation 4,640 ft.

Camp

All buildings, but one, are collapsed at the camp in the valley. Remains of a collapsed building with an engine are located just below adit.

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COPPER QUEEN

Plate no. 4

Ownership and Location:

Alternate name(s):
Rarus Group
Company name(s):
Alaska Consolidated Copper Co.
Mt. Wrangell Copper Co.
Mineral survey(s):

Commodity: Copper, iron
Deposit type: Contact deposit
Deposit model: Cu skarn (18b)

Location: Located at the 3,325 ft. elevation west of Berg Creek and east of MacDougall Creek, southern tributaries of the Kuskulana River.

Township: 003 S.
Quadrangle: McCarthy C-8
Mining district: Chistochina
Alaska Kardex: KX 87-044
ARDF no.: MC026
MAS no.: 0020870070

Range: 009 E. ***Section:*** 34
Meridian: Copper River
Mineral status: Development prospect

Ahtna, Inc. selection: Not located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:
19?? - Claims staked by the Alaska Consolidated Copper Co. (Moffit, 1918).
1912 - Exploration work done (Moffit, 1913).
1914 - Exploration work done (Moffit, 1918).
1915 - Claims dropped by the Alaska Consolidated Copper Co. (Moffit, 1918).
1916 - Claims restaked (Moffit, 1918) by the Wrangell Copper Co. (Moffit, 1921; KX 87-044).

Historical operating data:
1914 - Over 400-ft.-long tunnel driven (Moffit, 1915).
1916 - A 433-ft.-long tunnel with a 50 ft. crosscut (Moffit, 1918 and Richter, 1998) trends S. 15°E. (Moffit and Mertie, 1923).

Geologic setting:
Bedrock in the area consists of faulted, silicified, and garnetized Triassic Chitistone Limestone and marble adjacent to a Jurassic granodiorite pluton (Chitina Valley batholith) and overlain by the Cretaceous Berg Creek Formation conglomerates (MacKevett and others, 1978). Mineralization consists of magnetite, pyrrhotite, pyrite, and chalcopyrite in veinlets and irregular bodies (Richter, 1998).

Recent investigations:

USGS/USBM/BLM work:

USBM

Site visit in 1977 (USBM field notes).

BLM

Located and sampled during 1997.

Adit caved at the portal. Bedrock consists of highly iron-oxide stained and sheared basalt containing pyrite and disseminated chalcopyrite with associated quartz.

A select sample (**AAWSE 10062**, map no. 58) collected from the waste dump contained 3,891 ppm copper, 5.0 ppm silver, and 542 ppb gold.

Latitude N 61° 33' 31.285"; Longitude W 143° 45' 27.753"; Elevation 3,340 ft.

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Newberry, R.J., 1995, An update on skarn deposits of Alaska: Alaska Division of Geological and Geophysical Surveys Public-Data File 95-20, p. 6.

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CORUNDUM

Plate no. 3

Ownership and Location:

Alternate name(s):
Corundum # I
Rock Creek Corundum
Company name(s):
Mineral survey(s):

Commodity: Corundum
Deposit type: Contact deposit
Deposit model: Pegmatite

Location: Reported at approximately the 5,300 to 5,500 ft. elevation on the west side of Little Jack Creek, east of Rock Creek, northern tributaries of the Copper River.

Township: 010 N.
Quadrangle: Nabesna C-5
Mining district: Chistochina
Alaska Kardex: KX 78-073
ARDF no.: NB010
MAS no.: 0020780083

Range: 011 E. ***Section:*** 34
Meridian: Copper River
Mineral status: Exploration prospect

Ahtna, Inc. selection: Not located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:
1964 - First reported by Ray Gatz (Richter, 1970).
1968 - One claim staked by R.J. McGrane (KX 78-073).

Historical operating data:
None reported.

Geologic setting:
Crystals of gray corundum occur sporadically in discontinuous alkali pegmatite dikes, less than 3 ft. wide, cutting a peraluminous syenite-monzonite gneiss which is part of a meta-igneous complex consisting of a Permian and Triassic diorite and a diorite gneiss complex containing amphibole, gabbro, and cataclasite. The corundum has been recognized in three dikes and is associated with muscovite (Richter, 1970 and 1979; Richter and Schmoll, 1973).

Recent investigations:

USGS/USBM/BLM work:
USGS
Brief visit in 1967 and 1968.
Detailed examination in 1969 of the property by Donald Richter (Richter, 1970).

BLM
Looked for but not located in 1997.
Estimated location:
Latitude N 62° 35' 55"; Longitude W 143° 20' 00"; Elevation 5,400 ft.

References:

Bibliography:

Richter, D.H., 1970, A corundum occurrence in the eastern Alaska Range, Alaska: U.S. Geological Survey Professional Paper 700-C, p. C98-C102.

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CRAWFORD

Plate no. 4

Ownership and Location:

Alternate name(s):
Bet[ween]. Copper
Crawfords Nos. 1-3
Shale Creek
Company name(s):
Mineral survey(s):

Commodity: Uranium
Deposit type: Pebble conglomerate
Deposit model: Qtz pebble conglomerate (29a?)

Location: Reported at approximately the 5,000 ft. elevation on the north side of Sheep Mtn., east of Sheep Creek, a southern tributary of the Kotsina River.

Township: 002 S.
Quadrangle: Valdez C-1
Mining district: Chistochina
Alaska Kardex: KX 86-028
KX 86-029
KX 86-030
KX 86-031
ARDF no.: Unknown
MAS no.: 0020860125

Range: 007 E. ***Section:*** 14
Meridian: Copper River
Mineral status: Raw prospect

Ahtna, Inc. selection: Located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:
1955 - Fourteen claims staked by C.C. Cechowski (KX 86-028).
- Six claims staked by Roland Wainer (KX 86-029).
- Three claims staked by Ben Crawford (KX 86-030).
- Three claims staked by Richard Kennard (KX 86-031).

Historical operating data:
None reported.

Geologic setting:
Bedrock in the area consists of the Jurassic Kotsina conglomerate (Winkler and others, 1981).

Recent investigations:

USGS/USBM/BLM work:
BLM
Looked for but not located during 1997 and 1998.

No visible signs of workings were noted in 1998. Bedrock of the area consists of pebble conglomerate with aplitic, biotitic, and epidote dikes generally trending southeast - northwest. Pebbles include basalt, quartz, epidote, and calcite with a graywacke matrix.

Scintillation counter readings of the conglomerate showed no readings above background levels.

Estimated location:

Latitude N 61° 41' 28"; Longitude W 144° 05' 41"; Elevation 4,400 ft.

References:

Bibliography:

Winkler, G.R., Silberman, M.L., Grantz, A., Miller, R.J., and MacKevett, E.M., Jr., 1981, Geologic map and summary geochronology of the Valdez quadrangle, southern Alaska: U.S. Geological Survey Open-File Report 80-892-A.

Meyer, M.P., and Shepherd, A.D., 1998, Mineral assessment of Ahtna, Inc. selections in the Wrangell-St. Elias National Park and Preserve, Alaska. 1997 preliminary report: U.S. Bureau of Land Management Open File Report 71, p. 15, 84.

Meyer, M.P., and VandeWeg, D.A., 1999, Mineral assessment of Ahtna, Inc. selections in the Wrangell-St. Elias National Park and Preserve, Alaska. 1998 preliminary report: U.S. Bureau of Land Management Open File Report 73, p. 15, 58-59.

DIVIDE CREEK

Plate no. 4

Ownership and Location:

Alternate name(s):
Canyon Creek
Company name(s):
Mineral survey(s):

Commodity: Copper
Deposit type: Stringer BB-C
Deposit model: Basaltic Cu

Location: Located between the 4,700 and 4,820 ft. elevation on the south side of Divide Creek, a northern tributary of Canyon Creek. Canyon Creek is an eastern tributary of the Copper River.

Township: 006 S.
Range: 006 E. *Section:* 11
Quadrangle: Valdez B-1
Meridian: Copper River
Mining district: Nizina
Mineral status: Development prospect
Alaska Kardex: KX 86-135
ARDF no.: Unknown
MAS no.: 0020860196

Ahtna, Inc. selection: Not located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:
1900 - Lode claims staked (KX 86-135).

Historical operating data:
Small opencut reported (Moffit, 1912a).

Geologic setting:
Bedrock consists of fractured Permian Skolai Group (Winkler and others, 1981) volcanics associated with altered (metamorphosed) Permian sedimentary beds which include slate, schist, and highly siliceous thin-bedded limestone. Ore minerals include disseminated bornite, covellite, and chalcopyrite in the greenstone (Moffit, 1914).

Recent investigations:

USGS/USBM/BLM work:
BLM
Looked for, as part of Falls Creek, but not located during 1997 (Meyer and Shepherd, 1998).
Located four opencuts and sampled three during 1998.
Opencut No. 1
Bedrock consists of Skolai Group greenstone cut by shear zones containing up to 1-in.-wide quartz and epidote veins. The opencut is 8 ft. wide by 12 ft. deep and 5

ft. high at the face. Chalcopyrite, malachite, and azurite occur within quartz and epidote veins. A sample was collected of the high grade mineralization.

A select sample (**AAWSE 10102**, map no. 64) collected from the quartz vein in the open cut contained 3.43% copper, 7.9 ppm silver, and 73 ppb gold.

Latitude N 61° 21' 50.641"; Longitude W 144° 16' 37.169"; Elevation 4,550 ft.

Opencut No. 2

Bedrock consists of highly iron-oxide stained Skolai Group greenstone cut by 1-in.-wide quartz veins. The opencut is 5 ft. wide by 3 ft. long and 5 ft. high at the face. Disseminated and veinlets of pyrite and bornite occur within the quartz and bedrock.

A select sample (**AAWSE 10103**, map no. 64) collected of the quartz vein contained 242 ppm copper, 0.4 ppm silver, and 23 ppb gold.

Latitude N 61° 21' 51.578"; Longitude W 144° 16'39.437"; Elevation 4,560 ft.

Opencut No. 3

Bedrock consists of highly iron-oxide stained Skolai Group greenstone cut by shear zones containing 1-in.-wide quartz veins. The opencut is T-shaped with the longest dimension 15 ft. long. Chalcopyrite, pyrite, malachite, and azurite occur within the shear zone and as disseminations within the bedrock.

A select sample (**AAWSE 10104**, map no. 64) collected of the quartz vein contained 1.99% copper, 10.6 ppm silver, and 98 ppb gold.

Latitude N 61°21'49.081"; Longitude W 144°16'40.560"; Elevation 4,600 ft.

Opencut No. 4

Bedrock consists of Skolai Group greenstone.

No samples were collected. No visible copper mineralization was noted in the opencut.

Latitude N 61°21'49.760"; Longitude W 144°16'39.524"; Elevation 4,575 ft.

References:

Bibliography:

Moffit, F.H., 1912a, The Taral and Bremner River districts, *in* Brooks, A.H., and others, Mineral resources of Alaska, report on progress of investigations in 1911: U.S. Geological Survey Bulletin 520, p. 103.

Moffit, F.H., 1914, Geology of the Hanagita-Bremner region, Alaska: U.S. Geological Survey Bulletin 576, p. 52.

Berg, H.C., and Cobb, E.H., 1967, Metalliferous lode deposits of Alaska: U.S. Geological Survey Bulletin 1246, p. 63.

Heiner, L.E., Wolff, E.N., and Grybeck, D., 1971, Copper mineral occurrences in the Wrangell Mt. - Prince William Sound area, Alaska: Mineral Industry Research Laboratory Report 27, p. 103.

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DOTTIE

Plate no. 4

Ownership and Location:

Alternate name(s):
Dottie and Danny
Hjalmer Nos. 1-2
Johnson Nos. 1-4
Left Limit Kotsina River
Right Limit Copper Creek
Company name(s):
Mineral survey(s):

Commodity: Gold
Deposit type: Placer
Deposit model: Placer

Location: Reported at approximately the 2,100 ft. elevation of the northern braid of the Kotsina River near the mouth of Copper Creek.

Township: 002 S.
Quadrangle: Valdez C-1
Mining district: Chistochina
Alaska Kardex: KX 86-032
KX 86-033
KX 86-034
KX 86-035
KX 86-036
ARDF no.: Unknown
MAS no.: 0020860127

Range: 007 E. *Section:* 12
Meridian: Copper River
Mineral status: Exploration prospect

Ahtna, Inc. selection: Located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:
1955 - Two claims staked by Mark Kennard (KX 86-032).
- Two claims staked by Vern Johnson (KX 86-033).
- Two claims staked by Pauline Johnson (KX 86-034).
- Two claims staked by Roland Wainer (KX 86-035).
- Two claims staked by C.C. Cechowski (KX 86-036).

Historical operating data:
None reported.

Geologic setting:
The Kotsina River headwaters drain the Permian Hasen Creek Formation sedimentary rocks, the Triassic Nikolai Greenstone, the Triassic Chitistone Limestone, and the Jurassic and Triassic McCarthy Formation limestone and shale which have been cut or intruded by the Jurassic Chitina

Valley batholith and Tertiary hypabyssal rocks (Winkler and others, 1981).

Recent investigations:

USGS/USBM/BLM work:

BLM

Not looked for during 1997.

Looked for but not located during 1998.

Estimated location:

Latitude N 61° 42' 53"; Longitude W 144° 03' 31"; Elevation 2,100 ft.

References:

Bibliography:

Winkler, G.R., Silberman, M.L., Grantz, A., Miller, R.J., and MacKevett, E.M., Jr., 1981, Geologic map and summary geochronology of the Valdez quadrangle, southern Alaska: U.S. Geological Survey Open-File Report 80-892-A.

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ESCAPE

Plate no. 4

Ownership and Location:

Alternate name(s):
Escape 1-3
Company name(s):
Mineral survey(s):

Commodity: Gold
Deposit type: Placer
Deposit model: Placer

Location: Reported at approximately the 1,480 ft. elevation of the Chokosna River upstream from the community of Chokosna.

Township: 005 S.
Quadrangle: McCarthy B-8
Mining district: Chistochina
Alaska Kardex: KX 87-158
ARDF no.: None
MAS no.: 0020870078

Range: 009 E. *Section:* 10
Meridian: Copper River
Mineral status: Exploration prospect

Ahtna, Inc. selection: Located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:
1971 - Three claims staked by Don Shepard (KX 87-158).

Historical operating data:
None reported.

Geologic setting:
The Chokosna River headwaters drain thick sequences of Permian gabbro and gniess', marble of the metamorphosed Permian Skolai Group, Permian and Pennsylvanian Station Creek Formation, Permian Hasen Creek Formation sedimentary rocks, Triassic Chitistone Limestone, Triassic Nikolai Greenstone, Jurassic and Triassic McCarthy Formation limestone and shale, Jurassic Chitina Valley batholith dikes and plutons, and Cretaceous sedimentary rocks (MacKevett, 1978).

Recent investigations:

USGS/USBM/BLM work:
BLM
Not looked for during 1997.
Looked for but not located during 1998.
In flying over the Chokosna River no landing zones were noted along the river banks. The brush is too thick. Also encountered numerous homesteads along the lower course of the river, so sampling without disturbing owners is not feasible.

Estimated location:
Latitude N 61° 27' 22"; Longitude W 143° 41' 45"; Elevation 1,480 ft.

References:

Bibliography:

MacKevett, E.M., Jr., 1978, Geologic map of the McCarthy quadrangle, Alaska: U.S. Geological Survey Miscellaneous Geological Investigations Map I-1032.

Meyer, M.P., and Shepherd, A.D., 1998, Mineral assessment of Ahtna, Inc. selections in the Wrangell-St. Elias National Park and Preserve, Alaska. 1997 preliminary report: U.S. Bureau of Land Management Open File Report 71, p. 14, 87.

Meyer, M.P., and VandeWeg, D.A., 1999, Mineral assessment of Ahtna, Inc. selections in the Wrangell-St. Elias National Park and Preserve, Alaska. 1998 preliminary report: U.S. Bureau of Land Management Open File Report 73, p. 14, 19, 65-66.

FALL CREEK SADDLE OCCURRENCE

Plate no. 4

Ownership and Location:

Alternate name(s):
Fall Creek
Kluvesna Creek
Long Glacier
Trail Creek
Company name(s):
Mineral survey(s):

Commodity: Copper
Deposit type: Stringer BCO
Deposit model: Unknown

Location: Located at the 6,000 ft. elevation on the saddle between Trail Creek, a western tributary of Fall Creek, and Long Glacier, northwestern tributaries of the Kotsina River.

Township: 001 S.
Quadrangle: McCarthy D-8
Mining district: Chistochina
Alaska Kardex: None
ARDF no.: None
MAS no.: 0020870148

Range: 008 E. ***Section:*** 04
Meridian: Copper River
Mineral status: Raw prospect

Ahtna, Inc. selection: Located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:
Unknown.

Historical operating data:
None reported.

Geologic setting:
Bedrock consists of faulted, sheared, and iron-oxide stained Triassic Nikolai Greenstone (MacKevett, 1978).

Recent investigations:

USGS/USBM/BLM work:
BLM
Located and sampled during 1998.

Mineralization occurs within a 2-ft.-wide shear zone along the contact between the Nikolai Greenstone and an iron-oxide stained basalt. The malachite and iron-oxide stained shear zone strikes N. 10° W. with a near vertical dip. Disseminated bornite and malachite occur within the quartz and epidote veining.

A select sample (**AAWSE 10088**, map no. 22) collected from the shear zone contained 3,769 ppm copper, 0.6 ppm silver, and 25 ppb gold.
Latitude N 61° 48' 23"; Longitude W 143° 58' 08"; Elevation 6,050 ft.

References:

Bibliography:

MacKevett, E.M., Jr., 1978, Geologic map of the McCarthy quadrangle, Alaska: U.S. Geological Survey Miscellaneous Geological Investigations Map I-1032.

Meyer, M.P., and VandeWeg, D.A., 1999, Mineral assessment of Ahtna, Inc. selections in the Wrangell-St. Elias National Park and Preserve, Alaska. 1998 preliminary report: U.S. Bureau of Land Management Open File Report 73, p. 1-2, 6, 13-14, 20-21, 28-30, 67-68.

FALL CREEK UPPER PROSPECT

Plate no. 4

Ownership and Location:

Alternate name(s):
Fall Creek
Kluvesna Creek
Trail Creek
Company name(s):
Mineral survey(s):

Commodity: Copper
Deposit type: Stringer BCO
Deposit model: Basaltic Cu

Location: Located at the 5,300 ft. elevation on the north side of Trail Creek, a western tributary of Fall Creek, a northwestern tributary of the Kotsina River.

Township: 001 S.
Quadrangle: McCarthy D-8
Mining district: Chistochina
Alaska Kardex: None
ARDF no.: None
MAS no.: 0020870149

Range: 008 E. ***Section:*** 10
Meridian: Copper River
Mineral status: Development prospect

Ahtna, Inc. selection: Located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:
Unknown.

Historical operating data:
None reported.

Geologic setting:
Bedrock consists of faulted, sheared, and highly iron-oxide stained Triassic Nikolai Greenstone containing quartz (MacKevett, 1978).

Recent investigations:

USGS/USBM/BLM work:
BLM
Located and sampled during 1998.
Opencut
An opencut driven along a highly iron-oxide stained 3-ft.-wide shear zone within the Nikolai Greenstone. The opencut is 10 ft. wide by 25 ft. deep and 20 ft. high at the face. Bornite, chalcopyrite, pyrite, and malachite within quartz and epidote veining. The mineralized zone covers an area of approximately 30 sq. ft. along the length of

the opencut.

A select sample (**AAWSE 10087**, map no. 23) collected from the shear zone contained 1.94% copper, 6.4 ppm silver, and 6 ppb gold.

Latitude N 61° 47' 48.858"; Longitude W 143° 56' 24.106"; Elevation 5,270 ft.

References:

Bibliography:

MacKevett, E.M., Jr., 1978, Geologic map of the McCarthy quadrangle, Alaska: U.S. Geological Survey Miscellaneous Geological Investigations Map I-1032.

Meyer, M.P., and VandeWeg, D.A., 1999, Mineral assessment of Ahtna, Inc. selections in the Wrangell-St. Elias National Park and Preserve, Alaska. 1998 preliminary report: U.S. Bureau of Land Management Open File Report 73, p. 1-2, 6, 11, 13-14, 20-21, 28-30, 69-70.

FALLS CREEK

Plate no. 4

Ownership and Location:

Alternate name(s):
Canyon Creek
Company name(s):
Mineral survey(s):

Commodity: Copper
Deposit type: Stringer BB-C
Deposit model: Basaltic Cu

Location: Located at the 4,695 ft. elevation on the south side of Falls Creek cirque. Falls Creek is a northern tributary of Canyon Creek. Canyon Creek is an eastern tributary of the Copper River.

Township: 006 S.
Range: 006 E.
Section: 13
Quadrangle: Valdez B-1
Meridian: Copper River
Mining district: Nizina
Mineral status: Development prospect
Alaska Kardex: KX 86-137
ARDF no.: None
MAS no.: 0020860105

Ahtna, Inc. selection: Not located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:
1911 - One opencut and two tunnels driven on the south side of Falls Creek (Moffit, 1914).
1956 - Neil Finnisand and son blazed a trail to the area (Jasper, 1956).

Historical operating data:
Two tunnels, 105 ft. and 150 ft. long, one opencut reported (Moffit, 1914).

Geologic setting:
Bedrock consists of fractured Permian Skolai Group greenstone (Winkler and others, 1981) associated with metamorphosed Permian sedimentary beds that include slate, schist, and highly siliceous thin-bedded limestone. Ore minerals include disseminated bornite, covellite, and chalcopyrite in the greenstone (Moffit, 1914).

Recent investigations:

USGS/USBM/BLM work:
BLM
Located two adits and sampled one during 1997.
Located the No. 2 Adit during 1998.
No. 1 Adit
Adit open, 149 ft. long, into the Skolai Group greenstone. The adit is driven N. 40° E. for 29 ft. then N. 88° E. for 120 ft. A crosscut driven to the north 15 ft. is located

65 ft. from the portal. A shear zone at the portal extends at least 100 ft. at a 45° angle to the left. Bornite, chalcopyrite, malachite, and azurite occur within the shear zone.

A select sample (**AAWSE 10064**, map no. 65) collected from the waste dump contained 6.2% copper, 6.2 ppm silver, and 329 ppb gold.

Latitude N 61° 21' 13.668"; Longitude W 144° 15' 38.732"; Elevation 4,780 ft.

No. 2 Adit

Adit open, driven along a shear zone S. 3° W. for 100 ft. Bedrock consists of highly sheared and fractured Skolai Group greenstone with quartz and epidote veining. The adit did not encounter any visible copper mineralization.

No samples collected. No visible copper mineralization was noted in the adit or waste dump.

Latitude N 61° 21' 16.925"; Longitude W 144° 16' 14.674"; Elevation 4,620 ft.

No. 3 Adit

Adit open, driven N. 40° W. for 10 ft. This adit is located on the north side of the valley. The adit is driven into limestone and greenschist. The adit did not encounter any visible copper mineralization.

No samples were collected. No copper mineralization was noted in the waste dump or surrounding area.

Latitude N 61° 21' 30.147"; Longitude W 144° 15' 40.455"; Elevation 4,710 ft.

Opencut

Opencut cut approximately 15 ft. long by 3 ft. wide and 3 ft. deep into glacial tills. The opencut did not expose any visible bedrock or copper mineralization.

No samples were collected. No visible copper mineralization was noted.

Latitude N 61° 21' 22.103"; Longitude W 144° 16' 11.878"; Elevation 4,360 ft.

Mineralized boulder

A mineralized boulder located northeast from Adit No. 1 is deposited in the cirque. This boulder, along with at least four others, is derived from a shear zone located to the north of the No. 1 Adit. Disseminated chalcopyrite, pyrite, malachite, and azurite along with iron-stained quartz, chlorite, and calcite made up the boulder.

A representative chip sample (**AAWSE 10065**, map no. 65) collected from the boulder contained 1,733 ppm copper, 0.5 ppm silver, and 22 ppb gold.

Latitude N 61° 21' 16"; Longitude W 144° 15' 32"; Elevation 4,560 ft.

Camp

All the camp buildings in the lower part of the cirque are collapsed.

References:

Bibliography:

Moffit, F.H., 1912a, The Taral and Bremner River districts, *in* Brooks, A.H., and others, Mineral resources of Alaska, report on progress of investigations in 1911: U.S. Geological Survey Bulletin 520, p. 102-103.

Moffit, F.H., 1914, Geology of the Hanagita-Bremner region, Alaska: U.S. Geological Survey Bulletin 576, p. 52.

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FENNIMORE & RASMUSSEN

Plate no. 3

Ownership and Location:

Alternate name(s):
Skyline
Company name(s):
Mineral survey(s):

Commodity: Copper
Deposit type: Contact deposit
Deposit model: Unknown

Location: Reported at approximately the 4,200 ft. elevation on the east side of Rock Creek, a northern tributary to Caribou Creek. Caribou Creek is a northern tributary of the Copper River.

Township: 009 N.
Quadrangle: Nabesna C-5
Mining district: Chistochina
Alaska Kardex: KX 78-071
ARDF no.: None
MAS no.: 0020780111

Range: 011 E. ***Section:*** 04
Meridian: Copper River
Mineral status: Raw prospect

Ahtna, Inc. selection: Not located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:
1968 - One claim staked by Fennimore and Rasmussen (KX 78-071).

Historical operating data:
None reported.

Geologic setting:
Bedrock in the area consists of Permian volcanic and volcaniclastic rocks along a contact zone of a Permian and Triassic meta-igneous diorite and gniess complex (Richter and Schmoll, 1973).

Recent investigations:

USGS/USBM/BLM work:
BLM
Looked for but not located in 1997.
Estimated location:
Latitude N 62° 35' 24"; Longitude W 143° 21' 42"; Elevation 4,200 ft.

References:

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FORGET-ME-NOT

Plate no. 4

Ownership and Location:

Alternate name(s):
Forget-me-not claim
Company name(s):
Mineral survey(s):

Commodity: Copper
Deposit type: Stringer BCO
Deposit model: Basaltic Cu

Location: Located at the 4,680 ft. elevation on the west side of the Middle Fork Copper Creek, a southern tributary of the Kotsina River.

Township: 002 S.
Quadrangle: Valdez C-1
Mining district: Chistochina
Alaska Kardex: None
ARDF no.: Unknown
MAS no.: 0020860197

Range: 008 E. ***Section:*** 30
Meridian: Copper River
Mineral status: Development prospect

Ahtna, Inc. selection: Not located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:
1922 - Prospecting done (Moffit and Mertie, 1923).

Historical operating data:
One small opencut reported (Moffit and Mertie, 1923).

Geologic setting:
Irregular fracture zone within Triassic Nikolai Greenstone near the contact with the Triassic Chitistone Limestone (Winkler and others, 1981). Chalcopyrite and minor bornite are disseminated in the greenstone, with malachite coating the fractures (Moffit and Mertie, 1923; Van Alstine and Black, 1946).

Recent investigations:

USGS/USBM/BLM work:
BLM
Located and sampled during 1998.

Workings consist of a small opencut in sheared and iron-oxide stained Nikolai Greenstone. The shear zone is 3 ft. wide, strikes N. 65° W. and dips steeply south. The shear zone extends for 20 to 30 ft. up slope as well as 40 ft. across slope. This shear zone appears to be a continuation of the shear zone that occurs at the Bluebird and Montana Boy occurrences further up the ridge. The Bluebird prospect is visible from Forget-Me-Not prospect. The shear zone contains quartz and calcite veins and is malachite stained. Chalcocite, bornite, chalcopyrite, pyrite, and malachite along with quartz and calcite occur within the shear zone. A possible opencut occurs to the south (southern extension) at the 4,680 ft. elevation, containing malachite staining. This mineralization is in a location that is too dangerous to attempt to sample.

A select sample (**AAWSE 10105**, map no. 38) collected across the 3-ft.-wide shear zone contained 1.89% copper and 3.2 ppm silver.

Latitude N 61° 39' 44.654"; Longitude W 144° 02' 09.822"; Elevation 4,750 ft.

References:

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Van Alstine, R.E., and Black, R.F., 1946, Copper deposits of the Kotsina-Kuskulana district, Alaska: U.S. Geological Survey Bulletin 947-G, p. 130-131.

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FRANKLIN

Plate no. 4

Ownership and Location:

Alternate name(s):
Franklin Lode
Franklin No. 2-3 Lode

Company name(s):
Galena Bay Mining Co.

Mineral survey(s):
M.S. 908

Commodity: Copper
Deposit type: Stringer P-CO
Deposit model: Basaltic Cu

Patent number(s):
545933

Location: Located at the 2,800 ft. elevation on the southeast side of the Kluvesna River between Mineral Creek and the Kluvesna River. The Kluvesna River is a northern tributary of the Kotsina River.

Township: 001 S.
Quadrangle: McCarthy D-8
Mining district: Chistochina
Alaska Kardex: None
ARDF no.: None
MAS no.: 0020870150

Range: 008 E. ***Section:*** 24
Meridian: Copper River
Mineral status: Development prospect
Patented

Ahtna, Inc. selection: Located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:
1911 - Claims staked June 1 by the Galena Bay Mining Co. Claims were surveyed for Mineral Survey 908 on October 16-17 by Lynn W. Storm.
1916 - Claims patented September 16.

Historical operating data:
1911 - Two tunnels and two opencuts reported (M.S. 908).

Geologic setting:
Bedrock of the area consists of fractured Triassic Nikolai Greenstone overlying the Lower Permian Hasen Creek Formation sedimentary rocks (MacKevett and others, 1978).

Recent investigations:

USGS/USBM/BLM work:
BLM
Area located and sampled in 1998.

None of the reported adits were located. Bedrock consists of an outcrop of iron-oxide stained, highly fractured Nikolai Greenstone which contains malachite staining along the fracture surfaces. Calcite crystals have formed within vugs along the fracture planes. Interbedded calcite and quartz are associated within the fractures. Disseminated pyrite, chalcocite, and malachite occur within the quartz as well as the greenstone. The malachite staining is impossible to sample due to extreme steepness and hardness of rock face.

A random chip sample (**AAWSE 10076**, map no. 28) collected from the base of the outcrop contained 186 ppm copper.

Latitude N 61°46'12.304"; Longitude W 143°53'05.481"; Elevation 2,800 ft.

References:

Bibliography:

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GOOD ENOUGH

Plate no. 4

Ownership and Location:

Alternate name(s):
Good Enough Group
Company name(s):
Kotsina Mining Co.
Mineral survey(s):

Commodity: Copper, silver
Deposit type: Stringer CO
Deposit model: Basaltic Cu (23)

Location: Reported at approximately the 3,950 ft. elevation on the southeast side of Scotty Peak, along the east side of an unnamed tributary of the Kluvesna River.

Township: 001 S.
Quadrangle: McCarthy D-8
Mining district: Chistochina
Alaska Kardex: KX 87-032
ARDF no.: MC053
MAS no.: 0020870046

Range: 008 E. ***Section:*** 22
Meridian: Copper River
Mineral status: Development prospect

Ahtna, Inc. selection: Located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:
1907 - Staked by Adolph Ammann and Jack Nafsted (KX 87-032).

Historical operating data:
Two tunnels;

The older and longer tunnel, located on the northeast side of a deep gulch, is driven 70 ft. in a northwesterly direction trough fractured greenstones. Workings include one crosscut. Workings reported caved by 1923 (Moffit and Mertie, 1923).

The newer and shorter tunnel started on the south side of the gulch (Moffit and Mertie, 1923).

Geologic setting:
Located along the boundary of the Triassic Nikolai Greenstone and underlying Permian Hasen Creek Formation sedimentary rocks that are in close association to the Jurassic Chitina Valley batholith and Tertiary hypabyssal rocks (MacKevett, 1978). Bedrock made up of faulted and fractured, fine-grained basalt and tuff with native copper and chalcocite associated with quartz and calcite veins. Cuprite, malachite, and azurite are also present in small quantities. Minerals form amygdules and replace the greenstone (Moffit and Mertie, 1923).

Recent investigations:

USGS/USBM/BLM work:

BLM

Looked for but not located during 1997 and 1998.

Bedrock consists of Nikolai Greenstone forming a set of waterfalls. Just to the right, below the falls, is a disturbed area along the bank. This could possibly be the location of the workings. Noticed a coffee can lid in the stream bed just below this location. No visible copper minerals were noted in the bank or in the creek float.

Estimated location:

Latitude N 61° 46' 17"; Longitude W 143° 55' 59"; Elevation 3,950 ft.

References:

Bibliography:

Moffit, F.H., and Maddren, A.G., 1908, The mineral resources of the Kotsina and Chitina valleys, Copper River region, *in* Brooks, A.H., and others, Mineral resources of Alaska, report on progress of investigations in 1907: U.S. Geological Survey Bulletin 345, p. 143.

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HIDDEN TREASURE

Plate no. 4

Ownership and Location:

Alternate name(s):
Fall Creek
Company name(s):
Mineral survey(s):

Commodity: Copper, gold, silver
Deposit type: Stringer BB-C
Deposit model: Basaltic Cu (23)

Location: Reported at approximately the 5,300 ft. elevation on the east side of Fall Creek, a northern tributary of Kluvesna River.

Township: 001 S.
Quadrangle: McCarthy D-8
Mining district: Chistochina
Alaska Kardex: KX 87-032
ARDF no.: MC055
MAS no.: 0020870045

Range: 008 E. *Section:* 12
Meridian: Copper River
Mineral status: Development prospect

Ahtna, Inc. selection: Located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:
1907 - Staked by Adolph Ammann and Jack Nafsted (KX 87-032).

Historical operating data:
Several opencuts and a tunnel reported (Moffit and Mertie, 1923).

Geologic setting:
Small fracture veins filled with quartz and calcite along a north-south fault within amygdaloidal Triassic Nikolai Greenstone and underlying Permian Hasen Creek Formation sedimentary rocks. The Jurassic Chitina Valley batholith and Tertiary hypabyssal rocks are also located within the area (MacKevett, 1978). Bornite and chalcocite occur at the south end of the claim, chalcocite and native copper occur at the north end of the claim, and in between, chalcocite and native copper occur in the quartz veins. The tunnel sits on the south end (Moffit and Mertie, 1923).

Recent investigations:

USGS/USBM/BLM work:
BLM
Looked for during 1997. The adit was not located but two opencuts in the cirque were located and one sampled.
Revisited the area during 1998. No workings were noted. Several cairns were noted on the ridge line southwest of the 6,050 ft. arete. Collected location GPS data for three of the cairns.

Lower opencut

Opencut 5 ft. wide by 20 ft. long and 5 ft. deep. Bedrock consists of vesicular Nikolai Greenstone containing bornite, malachite, and azurite with associated quartz. A select sample (**AAWSE 10052**, map no. 27) collected from the waste dump contained 3.3% copper, 3.0 ppm silver, and 12 ppb gold.

Latitude N 61° 48' 00"; Longitude W 143° 53' 04"; Elevation 5,620 ft.

Upper opencut

Opencut 5 ft. wide by 10 ft. long and 2 ft. deep cut into the Nikolai Greenstone. No samples were collected. No visible copper mineralization was noted.

Cairn locations:

Cairn no. 1

Latitude N 61° 47' 52.853"; Longitude W 143° 53' 19.455"; Elevation 6,060 ft.

Cairn no. 2

Latitude N 61° 47' 47.095"; Longitude W 143° 53' 18.839"; Elevation 5,910 ft.

Cairn no. 3

Latitude N 61° 47' 56.374"; Longitude W 143° 52' 51.364"; Elevation 5,860 ft.

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HOMESTAKE

Plate no. 4

Ownership and Location:

Alternate name(s):
Fall Creek
Kluvesna Creek
Trail Creek
Company name(s):
Adolph Ammann
Mineral survey(s):

Commodity: Copper, gold, silver
Deposit type: Stringer BB-C
Deposit model: Basaltic Cu (23)

Location: Located at the 4,480 ft. elevation on the south side of the mouth of Trail Creek, a western tributary of Fall Creek, a northwestern tributary of the Kluvesna River.

Township: 001 S.
Quadrangle: McCarthy D-8
Mining district: Chistochina
Alaska Kardex: KX 87-032 (Partial)
ARDF no.: MC054
MAS no.: 0020870015

Range: 008 E. *Section:* 10
Meridian: Copper River
Mineral status: Development prospect

Ahtna, Inc. selection: Located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:
1907 - Staked by Adolph Ammann and Jack Nafsted (KX 87-32).
- Prospecting and development work done (Moffit and Maddren, 1908; Moffit and Maddren, 1909).

Historical operating data:
One short tunnel reported (Moffit and Mertie, 1923).

Geologic setting:
Bedrock consists of a vertical fault in Triassic Nikolai Greenstone stained with malachite. Native copper exposed 25 ft. above the tunnel mouth. Greenstones also contain chalcocite, bornite, and a black, carbonaceous, copper-bearing (stephanite) substance (Moffit and Mertie, 1923; MacKevett, 1978).

Recent investigations:

USGS/USBM/BLM work:
BLM
Located and sampled during 1997.

Area reexamined and sampled in 1998.

Homestake Adit

Adit open, driven S. 75°E., for 83 ft. Two crosscuts are located, one at 40 ft. from the portal is driven west for 15 ft., and one at 55 ft. from the portal is driven east for 30 ft. Bedrock consists of the Nikolai Greenstone containing native copper along a 2-ft.-wide shear zone to the left of the portal. Native copper, bornite, chalcopyrite, malachite, and stephanite(?) occur within the shear zone. The adit is driven into a zone of mineralized basaltic tuff covering an area 50 ft. high and 100 ft. wide.

A select sample (**AAWSE 10038**, map no. 25) collected from the waste dump contained 2.9% copper, 8.5 ppm silver, and 6 ppb gold.

Latitude N 61° 47' 31.899"; Longitude W 143° 56' 03.964"; Elevation 4,640 ft.

Upper opencut

Bedrock consists of iron-oxide stained Nikolai Greenstone. The opencut is located in a gully directly above the adit. Pyrite and chalcopyrite occur within quartz veining.

A grab sample (**AAWSE 10085**, map no. 25) collected of the pyrite contained 215 ppm copper and 8 ppb gold.

Latitude N 61° 47' 27.734"; Longitude W 143° 56' 12.206"; Elevation 4,690 ft.

References:

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HUBBARD-ELLIOTT MINE

Plate no. 4

Ownership and Location:

Alternate name(s):
Elliott Creek
Rainbow Creek

Commodity: Copper, gold, silver
Deposit type: Stringer BB-C
Deposit model: Basaltic Cu

Company name(s):
Hubbard-Elliot Copper Co.
Hubbard-Elliot Copper Mines Development Co. of Alaska

Mineral survey(s):
M.S. 565 through 566
M.S. 630 through 632
(M.S. 632 included in M.S. 658)
M.S. 658 through 659
M.S. 660A&B through 662A&B
M.S. 663
M.S. 664 (Not filed)
M.S. 665A&B

Mineral certificate(s):
00000014
00000065 through 00000066
00000075 through 00000078
00000080 through 00000081

Location: Located along the entire length of the Elliott Creek valley, with the lower camp at Rainbow Creek. Elliott Creek is a northern tributary of the Kotsina River.

Township: 002 S.
Range: 007 E. *Section:* 34
Quadrangle: Valdez C-1
Meridian: Copper River
Mining district: Chistochina
Mineral status: Past producer
Patented
Alaska Kardex: KX 86-050
KX 86-051
ARDF no.: Unknown
MAS no.: 0020860123

Ahtna, Inc. selection: Not located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:

1899 - Fifty-six claims staked by H.C. Elliott, Charles Hubbard, Bertha Huntley, John Fay, and Helen H. Nickolson (KX 86-050).
- Eighty-four claims staked by H.C. Elliott and Charles Hubbard (KX 86-051).

1900 - Copper King, Goodyear, Henry Prather, Lizzie G, Louise, Mineral King, Nancy Hanks and Rainbow claims located, August 26, by Charles G. Hubbard, George J. Roberts, P.J. Boardman, Ernest Brundett, Henry P. Elliott, and Antoinette Elliott.
- Claims recorded September 27.

1901 - Prospects reported (Schrader and Spencer, 1901).

- Elizabeth Lode located, July 16, by the Hubbard-Elliott Copper Mines Development Co. of Alaska.
- Albert Johnston and Guthrie Lodes located, July 17, by the Hubbard-Elliott Copper Mines Development Co. of Alaska.
- Claims recorded October 11.

1902 - Workings reported (Mendenhall and Schrader, 1902).
- Mineral Survey 566 surveyed, June 26-July 4 for Charles G. Hubbard, George J. Roberts, P.J. Boardman, Ernest Brundett, Henry P. Elliott, and Antoinette Elliott. Claims include the Copper King and Mineral King Lodes.
- Mineral Survey 565 surveyed, July 5-19, for Charles G. Hubbard, George J. Roberts, P.J. Boardman, Ernest Brundett, Henry P. Elliott, and Antoinette Elliott. Claims include the Goodyear, Henry Prather, Lizzie G, Louise, Nancy Hanks, and Rainbow Lodes.

1904 - Mineral Survey 630 surveyed, August 3-12, for the Hubbard-Elliott Copper Mines Development Co. of Alaska. Claims include the Albert Johnston and Guthrie Lodes.
- Mineral Survey 631 surveyed, August 5-6, for the Hubbard-Elliott Copper Mines Development Co. of Alaska. Claim included the Elizabeth Lode.
- Babe, California, Castle, Cave, Chance, Cliff, Copper Queen, Curtis, El Capitan, Flanders, Fortuna, Frisco, Glendive, Gloriana, Kotsina, Katherine, Lawton, Leland, Lime-Gulch, Marie Antoinette, Marmot, Ophir, Ralph J., Red Jacket, Regina, Retriever, Samolean, Senator, Sweepstakes, Unalita, Van-Dyck, and the Wrangell Lodes along with the Castle, Cliff, El Capitan, and Lawton Millsites located, August 10, for the Hubbard-Elliott Copper Mines Development Co. of Alaska.
- Claims recorded September 14.
- Mineral Survey 565 Patented June 30.

1905 - Mineral Survey 658 surveyed, August 19-22, for the Hubbard-Elliott Copper Mines Development Co. of Alaska. Claims include the California, Copper Queen, Fortuna, Frisco, Gloriana, Katherine, Kotsina, Regina, and Van-Dyck Lodes.
- Mineral Survey 659 surveyed, August 27-28, for the Hubbard-Elliott Copper Mines Development Co. of Alaska. Claims include the Flanders, Marmot, and Samolean Lodes.
- Mineral Survey 660 A and B surveyed, August 28-30, for the Hubbard-Elliott Copper Mines Development Co. of Alaska. Claims include the Babe, Castle, Glendive, Retriever, Sweepstakes, and Wrangell Lodes and the Castle Millsite.
- Mineral Survey 661 A and B surveyed, August 23-25, for the Hubbard-Elliott Copper Mines Development Co. of Alaska. Claims include the Cave, Chance, Cliff, and Lime-Gulch Lodes and the Cliff Millsite.
- Mineral Survey 662 A and B surveyed, August 26, for the Hubbard-Elliott Copper Mines Development Co. of Alaska. Claims include the Lawton and Leland Lodes and the Lawton Millsite.
- Mineral Survey 663 surveyed, August 31, for the Hubbard-Elliott Copper Mines Development Co. of Alaska. Claim includes the Ralph J. Lode.
- Mineral Survey 665 A and B surveyed, September 1-4, for the Hubbard-Elliott Copper Mines Development Co. of Alaska. Claims include the Curtis, El Capitan, Marie Antoinette, Ophir, Red Jacket, Senator, and the Unalita Lodes and the El Capitan Millsite.

1906 - Development work done (Brooks, 1906).
- Mineral Surveys 630 and 631 Patented August 10.

1907 - Mineral Surveys 659 and 663 Patented March 27.
- Mineral Surveys 658 and 660A Patented April 23.
- Mineral Survey 665A Patented May 4.
1908 - Development work done (Moffit and Maddren, 1908).
1909 - Development work done (Moffit and Maddren, 1909).
1910 - Development work done (Moffit, 1910).
1911 - Mr. Elliott killed by snow slide (Moffit and Mertie, 1923).
1912 - Development work done (Moffit, 1913).
1913 - Development work done (Brooks, 1914).
1914 - Development work done (Brooks, 1915; Moffit, 1915).
1915 - Development work done (Brooks, 1916; Smith, 1917a).
1916 - Development work done (Smith, 1917b; Moffit, 1918).
1922 - Development work done (Brooks and Capps, 1924).

Historical operating data:

Albert Johnson claim

Two adits and one opencut reported. The upper adit is 48 ft. long. The lower adit is 1,076 ft. long, with several crosscuts (Moffit and Maddren, 1909; Moffit, 1913; Moffit and Mertie, 1923).

Chance claim

One opencut reported (Moffit and Maddren, 1909).

Cliff claim

Two opencuts reported (Moffit and Maddren, 1909).

Copper Queen claim

One opencut reported (Moffit and Maddren, 1909).

Curtis claim

One adit 12 ft. long reported (Moffit and Mertie, 1923).

Elizabeth claim

One adit, 250 ft. long, with several crosscuts and two opencuts reported (Moffit and Maddren, 1909; Moffit and Mertie, 1923).

Goodyear claim

One adit, 300 ft. long, with several crosscuts and one opencut reported (Mendenhall and Schrader, 1902; Moffit and Mertie, 1923).

Guthrie claim

One adit reported, length unknown (Moffit and Maddren, 1909).

Harry Prather claim

One opencut reported (Moffit and Maddren, 1909).

Leland and Lawton claim

Several opencuts reported (Moffit and Maddren, 1909).

Lizzie G. claim

One opencut reported (Moffit and Maddren, 1909).

Louise claim

One opencut reported (Mendenhall and Schrader, 1902).

Marie Antoinette claim

Two opencuts reported (Moffit and Maddren, 1909).

Mary Ellen claim

One adit reported, length unknown (Moffit, 1915).

Marmot claim

One opencut reported (Moffit and Maddren, 1909).

Swazie claim

One opencut reported(Moffit and Mertie, 1923).

Geologic setting:

Most of the lower part of the Elliott Creek is occupied by Triassic Nikolai Greenstone and overlain by the Triassic Chitistone Limestone (Winkler and others, 1981). Outcrops of the limestone are not conspicuous on the south side of the valley, but on the north side and at the head of the valley form bold, high cliffs. Thin-bedded Triassic limestone and shale occur locally within the Chitistone Limestone. The Jurassic Kotsina Conglomerate caps the northern ridge while tuffs and basalts cap the southern ridge. Quartz diorite porphyry dikes occasionally cut the northern rocks. Faulting has occurred in the rocks with fracturing and faulting more pronounced in the greenstones. These fault and fracture zones have been mineralized by copper-bearing solutions. Bornite, chalcopyrite, and/or chalcocite are deposited as either irregular veins, replacement ore, or are disseminated in the country rock. Gangue consists of quartz, calcite, and epidote (Moffit and Mertie, 1923).

Albert Johnson claim

Faulted greenstone intruded by diorite porphyry dikes. An upper adit is driven along a shear zone. Sulfide-bearing minerals occur as veins and replacement deposits which includes bornite and chalcopyrite with associated quartz, epidote, and calcite gangue. Lower adit driven N. 25° E. to intersect a shear zone 300 ft. from the portal. The shear zone contains bornite and chalcopyrite along the fracture planes and associated calcite. Crosscuts are driven following two sets of shear zones. One shear zone trends S. 20° E., and the other trends N. 20 to 30° W. At 850 ft., native copper is encountered in the fractured greenstone (Moffit and Mertie, 1923).

Chance claim

Limestone capping the greenstone. Bornite occurs within the greenstone (Moffit and Mertie, 1923).

Cliff claim

Faulted and sheared iron-oxide stained greenstone. Faults trend east-west, dipping 45° north. Copper sulfide minerals are exposed along joint planes (Moffit and Mertie, 1923).

Copper Queen claim

Greenstone with intersecting veins of pyrite and/or chalcopyrite reported (Moffit and Mertie, 1923).

Curtis claim

Sheared greenstone mineralized with pyrite and highly stained with iron hydroxide. Two shear zones that strike N. 15° W. with dips of 30° west and 80° northeast. Gold and silver reported from the shear zones (Moffit and Mertie, 1923).

Elizabeth claim

Faulted and broken greenstone. Faults strike N. 50° W., N. 50° E., and N. 20° E. with near vertical dips. Bornite and chalcopyrite occur in quartz veins following the fractures (Moffit and Mertie, 1923).

Goodyear claim

Greenstone with veins containing pyrite, chalcopyrite, and bornite with associated calcite and quartz (Moffit and Mertie, 1923).

Guthrie claim

Shattered greenstone cut by veins containing bornite and chalcopyrite with associated quartz, calcite, and epidote. Near the portal a 1-in.-thick mineralized vein strikes N. 50° W. (Moffit and Mertie, 1923).

Henry Prather claim

North-south fault dipping 60° west is intersected by two parallel faults striking N. 40° E. and dipping 25 to 30° west. One fault contains a 5 ft. wide by 30 ft. long lenticular mass of weathered greenstone. Chalcopyrite and bornite occur in veins of calcite, from 8 to 12 in. thick, cut by small faults (Moffit and Mertie, 1923).

Lawton claim

Faulted greenstone in contact with the Kotsina Conglomerate and a large porphyritic dike that separates them. A fault between the greenstone and the 30- to 35-ft.-wide dike strikes N. 30° W. and dips 50 to 60° south. Pyrite and chalcopyrite associated with the dike (Moffit and Mertie, 1923).

Leland claim

Faulted greenstone in contact with the Kotsina Conglomerate and a large porphyritic dike that separates them. Pyrite and chalcopyrite associated with the dike (Moffit and Mertie, 1923).

Lizzie G. claim

Sheared and plicated greenstone filled with quartz and calcite. Chalcopyrite occurs in 2- in.-wide quartz veins, with bornite and chalcopyrite in calcite-greenstone veins (Moffit and Mertie, 1923).

Louise claim

Faulted and jointed greenstone. Fault strikes N. 20° W. and dips 45 to 50° west. Bornite and chalcopyrite occur in calcite and quartz veins up to 2 in. thick. Veins are exposed for 30 ft. horizontally (Moffit and Mertie, 1923).

Marie Antoinette claim

Shattered and faulted iron-oxide stained greenstone. Copper sulphide minerals occur in calcite veins following joint or slip planes. Largest vein strikes N. 30° W. (Moffit and Mertie, 1923).

Marmot claim

Broken and faulted greenstone. Fault strikes N. 60° W. and dips vertically. Pyrite and malachite occur in calcite veins (Moffit and Mertie, 1923).

Swazie claim

Shattered iron-oxide stained greenstone in contact with limestone along a north-south fault. Limestone contains pyrite, chalcopyrite, bornite, malachite, azurite, and gold (Moffit and Mertie, 1923).

Recent investigations:

USGS/USBM/BLM work:

BLM

Located two adits on Rainbow Creek during 1998.

Upper Adit

Adit open, driven N. 15° E. for 30 ft. along a mineralized shear zone. At the end of the adit a shaft is located to the left. At approximately 20 ft. from the portal, two crosscuts were made. The left crosscut is driven N. 78° W. for 20 ft., while the right crosscut is driven N. 30° W. for 40 ft.

No samples collected.

Latitude N 61° 39' 00.946"; Longitude W 144° 06' 06.639"; Elevation 4,020 ft.

Lower Adit

Adit open, driven N. 20° W. along a mineralized shear zone. The adit is sloughed at 20 ft. from the portal.

No samples collected.

Latitude N 61° 39' 00.241"; Longitude W 144° 06' 04.936"; Elevation 3,955 ft.

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KINNEY-GOLDEN

Plate no. 4

Ownership and Location:

Alternate name(s):
Golden Creek
Kinney Golden 1-7
Company name(s):
Mineral survey(s):

Commodity: Copper
Deposit type: Stringer P-CO
Deposit model: Basaltic Cu

Location: Reported at approximately the 4,200 ft. elevation between two tributaries of the Chokosna River, south of Kuskulana Pass.

Township: 004 S.
Quadrangle: McCarthy C-8
Mining district: Chistochina
Alaska Kardex: KX 87-053
ARDF no.: MC013
MAS no.: 0020870074

Range: 010 E. ***Section:*** 20
Meridian: Copper River
Mineral status: Development prospect

Ahtna, Inc. selection: Located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:
1900 - Seven claims staked (KX 87-053).
1916 - Development work done (Moffit, 1918).

Historical operating data:
1916 - One tunnel, driven 200 ft. at the 4,200 ft. elevation and several opencuts reported (Moffit, 1918).

Geologic setting:
Located at the contact between interbedded Tertiary hypabyssal rocks, Jurassic-Triassic McCarthy Formation limestone and shale, and the Triassic Nikolai Greenstone. Two parallel faults striking east and dipping south, 500 ft. apart, brought the shale into contact with the Nikolai Greenstone and the lower member of the McCarthy Formation. Chalcopyrite occurs along the greenstone-limestone contact and subsidiary faults (Moffit, 1918; MacKevett and others, 1978; Richter, 1998).
No ore body was discovered at this location (Berg and Cobb, 1967).

Recent investigations:

USGS/USBM/BLM work:
BLM
Looked for but not located during 1997 and 1998.

Two samples collected from the area during 1998.

Bedrock consists of a slight iron-oxide stained buff colored diorite with epidote. The staining occurs along the fractures as well as on the surface of the diorite. The diorite is overlain by alternating layers of basalts, limestones, and bedded shales of the Skolai Group. The bedded shales range from ⅛ to 5 in. thick. Also, noted round plagioclase inclusions up to ¼ in. in diameter occurring in the basalts. Disseminated pyrite occurs within the basalts and the bedded shales, with the shales containing up to ¼ in. blebs in the thicker beds.

A select sample (**AAWSE 10083**, map no. 61) collected of pyritic basalt with plagioclase from an outcrop contained 61 ppm copper.

Latitude N 61° 30' 46.422"; Longitude W 143° 37' 43.421"; Elevation 3,920 ft.

A select sample (**AAWSE 10084**, map no. 61) collected of the pyritic bedded shale contained 46 ppm copper and 0.2 ppm silver.

Latitude N 61° 30' 44.497"; Longitude W 143° 37' 44.722"; Elevation 4,050 ft.

Estimated location:

Latitude N 61° 30' 33"; Longitude W 144° 38' 00"; Elevation 4,200 ft.

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KOTSINA RIVER

Plate no. 4

Ownership and Location:

Alternate name(s):
Hartman
T. Larson
Company name(s):
Great Northern Development Co.
Captain Hartman and Associates
Mineral survey(s):

Commodity: Copper, silver
Deposit type: Stringer P-CO
Deposit model: Basaltic Cu

Location: Reported at approximately the 2,700 ft. elevation on the south side of the Kotsina River between Rock Creek and Roaring Creek. Approximately ½ mile west of the Great Northern Development Co. office located on Roaring Creek.

Township: 002 S.
Quadrangle: McCarthy C-8
Mining district: Chistochina
Alaska Kardex: KX87-034
KX 87-035
ARDF no.: MC045
MAS no.: 0020870054

Range: 009 E. ***Section:*** 06
Meridian: Copper River
Mineral status: Development prospect

Ahtna, Inc. selection: Not located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:

1907 - Claims staked by the Great Northern Development Co. and by Captain Hartman and Associates (KX 87- 034; KX 87-35).
- Prospecting and development work done, five short tunnels started (Moffit and Maddren, 1908).

1908 - Prospecting and development work done, the tunnels were extended (Moffit, 1909).
1909 - Prospecting and development work done (Moffit, 1910).
1914 - Development work and assessment work completed (Moffit, 1915).
1922 - Great Northern Development Co. has given up the claims (Moffit and Mertie, 1923).

Historical operating data:

Five short tunnels, none driven more than 20 ft. long, completed by 1907 (Moffit and Maddren, 1908).

Geologic setting:

Bedrock consists of Triassic Nikolai Greenstone overlying the Permian Hasen Creek Formation sedimentary rocks that have been intruded by Tertiary hypabyssal rocks (MacKevett and others, 1978). At the first adit, a 10-ft.-thick porphyritic gabbro and felsic feeder dike cuts the fine-grained greenstones. The dike strikes N. 30° W., dips 80° west, and is bounded by fault planes. Mineralization consists of copper-bearing pyrite. The second adit contains a 4- to 6-in.-thick quartz vein containing a little copper-bearing pyrite. This vein strikes N. 50° W. and cuts the greenstone. The other three adits contain pyrite in the greenstone with an oxidized brown stain (Moffit and Maddren, 1908; Richter, 1998).

Recent investigations:

USGS/USBM/BLM work:

BLM

Looked for but not located during 1997.

Estimated location:

Latitude N 61° 43' 02"; Longitude W 143° 51' 29"; Elevation 2,700 ft.

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LARSON

Plate no. 4

Ownership and Location:

Alternate name(s):
Larson Claim
Larson East
Larson West
Company name(s):
Mineral survey(s):

Commodity: Copper
Deposit type: Stringer P-CO
Deposit type: Basaltic Cu

Location: Located at the 4,900 and 5,000 ft. elevations in the cirque west of Amy Creek. Amy Creek is a southern tributary of the Kotsina River between Rock Creek and Roaring Creek.

Township: 002 S.
Quadrangle: McCarthy C-8
Mining district: Chistochina
Alaska Kardex: KX 87-039
ARDF no.: None
MAS no.: 0020870056

Range: 008 E. *Section:* 12
Meridian: Copper River
Mineral status: Development prospect

Ahtna, Inc. selection: Located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:
1900 - Claims staked by Thomas Larson (KX 87-039).
1922 - Development work done (Moffit and Mertie, 1923).

Historical operating data:
Two tunnels reported (Moffit and Mertie, 1923).

Geologic setting:
Amygdaloidal Triassic Nikolai Greenstone (MacKevett and others, 1978) filled with quartz amygdules cut by veins and lenses of the same material. A fracture zone and the surrounding rock are stained with malachite. The zone has been traced for several hundred feet (Moffit and Mertie, 1923).

Recent investigations:

USGS/USBM/BLM work:
BLM
Located and sampled two adits and one opencut during 1997 and 1998.
Larson East Adit
Adit located on the east side of the cirque. Driven N. 65° W. for 35 ft., then continued eastward for another 55 ft. A wheelbarrow containing one case and one stick of dynamite are located in the middle of the adit 55 ft. from the portal. Bedrock

consists of Nikolai Greenstone, slightly iron-stained, containing disseminated pyrite. Latitude N 61° 42' 08.461"; Longitude W 143° 51' 46.415"; Elevation 5,000 ft.

A select sample (**AAWSE 10051**, map no. 43) collected from the waste dump contained 188 ppm copper and less than 0.2 ppm silver.

Larson West Adit

Adit open, though sloughed at portal, driven S. 60° W. for 25 ft. into the Nikolai Greenstone with epidote veining. No visible copper minerals were noted in the adit or in the waste dump. Adit most likely driven to intercept the mineralized shear zones trending north-south above the adit.

No samples were collected. No visible copper mineralization was noted in the adit of the waste dump.

Latitude N 61° 42' 09.139"; Longitude W 143° 52' 40.865"; Elevation 4,900 ft.

Vein above adit

A select sample (**AAWSE 10096**, map no. 42) collected from a north-south trending 7-in.-wide quartz vein located above the west adit. The vein dips 45° west. Chalcopyrite, pyrite, malachite, and minor disseminated native copper occur in the quartz. The sample contained 6,714 ppm copper and 1.3 ppm silver.

Latitude N 61° 42' 09.192"; Longitude W 143° 52' 43.516"; Elevation 4,950 ft.

Larson West Opencut

Located an opencut 30 ft. north of the adit. The opencut is cut along the 7-in.-wide quartz vein which shows iron-oxide staining. Chalcopyrite, pyrite, malachite, and minor disseminated native copper occur in the quartz vein.

A grab sample (**AAWSE 10097**, map no. 42) collected of the mineralization quartz vein contained 4,952 ppm copper, 2 ppm silver, and 6 ppb gold.

Latitude N 61° 42' 10.063"; Longitude W 143° 52' 43.918"; Elevation 4,950 ft.

Opencut location:

Latitude N 61° 42' 10.070"; Longitude W 143° 52' 43.908"; Elevation 4,950 ft.

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LIME CREEK

Plate no. 4

Ownership and Location:

Alternate name(s):
Bird Larsen
G & B
United Verde
Company name(s):
Mineral survey(s):

Commodity: Copper
Deposit type: Stringer BCO
Deposit model: Basaltic Cu (23)

Location: Located at the 3,890 ft. elevation on the north side of Lime Creek, a tributary of Rock Creek and the Kotsina River.

Township: 002 S.
Quadrangle: McCarthy C-8
Mining district: Chistochina
Alaska Kardex: KX 87-033
KX 87-156
ARDF no.: MC043
MAS no.: 0020870080

Range: 008 E. ***Section:*** 15
Meridian: Copper River
Mineral status: Development prospect

Ahtna, Inc. selection: Located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:
1900 - Two claims staked by Dick Gilleneau, Joe Bell, and A.L. Barrett (KX 87-033).
1902 - Development work done (Mendenhall and Schrader, 1903).
1907 - Development work done (Moffit and Maddren, 1908).
1914 - Development work done (Moffit, 1915).
1971 - Claims staked by Joseph Taylor (KX 87-156).

Historical operating data:
Two tunnels and two opencuts reported (Moffit and Maddren, 1908).
Lower adit, length unknown.
Upper adit, 20 ft. long.

Geologic setting:
Small faults cut the Triassic Nikolai Greenstone near the contact with the overlying Triassic Chitistone Limestone (MacKevett and others, 1978). The faults contain bornite and chalcopyrite accompanied by quartz, calcite, and epidote (Moffit, 1915; Richter, 1998)). The bornite occurs as lenses and irregular 1 in. lumps in the greenstone as well as fracture fillings and small lenticular veins (Moffit and Maddren, 1908).

Recent investigations:

USGS/USBM/BLM work:

BLM

Located and sampled one adit during 1998.

Adit

Adit open, driven N. 17° W. for 15 ft. Bedrock consists of sheared Nikolai Greenstone. A 10- to 15-ft.-wide iron-oxide stained shear zone is located at the portal. Massive bornite, chalcocite, chalcopyrite, malachite, and azurite occur in the shear zone. Gangue materials include rose quartz and calcite.

A representative chip sample (**AAWSE 10071**, map no. 41) collected of the high grade ore from the shear zone at the portal contained 23.99% copper, 4.8 ppm silver, and 608 ppb gold.

Latitude N 61° 41' 33.004"; Longitude W 143° 55' 56.244"; Elevation 3,890 ft.

Base Camp

Located the base camp site. Flat area for the tent site and lots of old food tins strewn down the ravine.

Latitude N 61° 41' 31.104"; Longitude W 143° 56' 05.525"; Elevation 3,610 ft.

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LONDON AND CAPE

Plate no. 4

Ownership and Location:

Alternate name(s):
Trail Creek
Company name(s):
London and Cape Co.
Mineral survey(s):

Commodity: Copper, molybdenum, silver
Deposit type: Contact deposit
Deposit model: Porphyry Cu-Mo (21a)

Location: Located at the 4,510 ft. elevation along the ridge on the west side of Trail Creek, a southern tributary of the Kuskulana River.

Township: 003 S.
Quadrangle: McCarthy C-8
Mining district: Chistochina
Alaska Kardex: KX 87-048
ARDF no.: MC002
MAS no.: 0020870090

Range: 009 E. ***Section:*** 35
Meridian: Copper River
Mineral status: Development prospect

Ahtna, Inc. selection: Not located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:
1909 - Reportedly 14 claims were patented by the London and Cape Co. (Moffit and Mertie, 1923).
1912 - Work had ceased on the property (Moffit and Mertie, 1923).
1919 - Supposedly 14 claims staked by Theovak Wagenen -(KX 87-48). These claims are confused with the War Eagle claims.

Historical operating data:
A 245-ft.-long adit driven in an unknown direction reported (Moffit and Mertie, 1923).

Geologic setting:
Bedrock of the area is made up of Jurassic granodiorite and quartz diorite (Chitina Valley batholith) intruding the Cretaceous Kuskulana Pass Formation sedimentary rocks and Berg Creek Formation conglomerates (MacKevett and others, 1978; Richter, 1998).

The area of the adit is composed of granodiorite and quartz diorite which has been fractured and weathered into angular fragments. The fracturing created an environment favorable for circulation of mineralized solutions, that deposited iron and copper sulfides. Minerals include pyrite, chalcopyrite, and copper staining. The workings are driven to intersect an ore body beneath the ridge, but were not driven far enough. Minerals occur as veinlets or disseminated in the country rock. No copper mineralization was encountered (Moffit and Mertie, 1923; Richter, 1998).

Recent investigations:

USGS/USBM/BLM work:

BLM

Located and sampled during 1998.

Adit caved at portal, appears to have been driven S. 65° E. Bedrock consists of diorite with mica and quartz gangue which contains pyrite, chalcopyrite, and malachite. Mineralization occurs mainly as disseminations in the country rock but also as veinlets along the fractures.

A grab sample (**AAWSE 10077**, map no. 56) collected of mineralized material contained 105 ppm copper.

Latitude N 61° 34' 01.525"; Longitude W 143° 43' 07.402"; Elevation 4,510 ft.

Adit location:

Latitude N 61° 34' 01.141"; Longitude W 143° 43' 06.130"; Elevation 4,505 ft.

These claims and those of the War Eagle prospect have been confused as to which ones have been patented and included in Mineral Survey 874. All the patented claims and Mineral Survey 874 are part of the War Eagle prospect and not the London and Cape prospect.

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LOST CABIN

Plate no. 4

Ownership and Location:

Alternate name(s):
Lost Cabin Extension
Lost Cabin Group
Company name(s):
Mineral survey(s):

Commodity: Copper, silver
Deposit type: Stringer BB-C
Deposit model: Basaltic Cu (23)

Location: Located between the 3,650 and 4,200 ft. elevation south of Scotty Peak, north of The Peninsula. The Peninsula is at the junction of the Kluvesna and Kotsina Rivers.

Township: 001 S.
Quadrangle: McCarthy C-8
Mining district: Chistochina
Alaska Kardex: KX 87-32
ARDF no.: MC050
MAS no.: 0020870047

Range: 008 E. ***Section:*** 32
Meridian: Copper River
Mineral status: Development prospect

Ahtna, Inc. selection: Not located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:
1907 - Six claims staked by Adolph Ammann and Jack Nafsted (KX 87-32).

Historical operating data:
Four tunnels and several opencuts reported (Moffit and Mertie, 1923).

Geologic setting:
Located along the contact of the Triassic Chitistone Limestone and the Triassic Nikolai Greenstone (MacKevett and others, 1978). Mineralization occurs for several hundred feet, or less, below the contact, but also occurs near the contact. Mineralization does not occur within the limestone. Copper mineralization consists of chalcocite, bornite, and chalcopyrite, with the bornite and chalcocite disseminated in the greenstone. Bornite occurs at the lower end, but as you go upward the mineralization changes to chalcocite and then to chalcopyrite. Chalcopyrite stained with iron-oxides (Moffit and Mertie, 1923).

Recent investigations:

USGS/USBM/BLM work:
BLM
Located two adits and sampled one during 1998.

Upper Adit

Adit open, driven N. 17° E. for 30 ft. Bedrock consists of thin- to massive-bedded Chitistone Limestone which has been folded, faulted, and tipped vertically. The limestone in this area is interbedded with the Nikolai Greenstone. The adit is driven to follow a 3-ft.-wide shear zone trending N. 5° W., dipping 55° east, with calcite, quartz, and epidote veining. Pyrite occurs along the shear zone.

A select sample (**AAWSE 10072**, map no. 32) collected of the limestone wall rock contained 224 ppm copper, 0.2 ppm silver, and 6 ppb gold.

A select sample (**AAWSE 10073**, map no. 32) collected from the shear zone contained 253 ppm copper and 0.2 ppm silver.

Latitude N 61° 44' 01.510"; Longitude W 143° 59' 46.135"; Elevation 4,010 ft.

West Adit

This adit is located on the east side of the first major ravine to the west of the upper adit. An attempt was made to reach this adit from the upper adit but we were cut off by a cliff. The adit was not reached due to terrane and time constraints.

Estimated location:

Latitude N 61° 43' 56"; Longitude W 144° 00' 10"; Elevation 3,150 ft.

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MINERAL CREEK

Plate no. 4

Ownership and Location:

Alternate name(s):
Granite Mountain
Valdez Claim
Valdez Group Nos. 1-6
Valdez No. 1
Company name(s):
Mineral survey(s):

Commodity: Copper, gold, silver
Deposit type: Stringer BB-C
Deposit model: Basaltic Cu

Location: Reported at approximately between the 3,600 ft. and 7,100 ft. elevation of Mineral Creek on the west side of Granite Peak. Mineral Creek is a southeastern tributary of the Kluvesna River.

Township: 001 S.
Quadrangle: McCarthy D-8
Mining district: Chistochina
Alaska Kardex: KX 87-036
KX 87-156
ARDF no.: MC052
MAS no.: 0020870048

Range: 008 E. ***Section:*** 26
Meridian: Copper River
Mineral status: Development prospect

Ahtna, Inc. selection: Located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:
1923 - Six claims staked by A.L. Barrett, Ed Young, and Jake Nafsted (Moffit and Mertie, 1923: KX 87-036).
1971 - Fifty-five claims in the area by Joseph Taylor (KX 87-156).

Historical operating data:
Half a dozen tunnels were started, with the most recent one on the Valdez Group claims (Moffit and Mertie, 1923).

Principal Tunnel

Driven S. 25° W. for 50 ft., then continued with two branches. One branch heads south for an unknown length and the other branch is driven S. 70° W. for 50 ft. The main adit follows a bedding or flow plane containing pyrite and chalcopyrite in crushed quartz and country rock (Moffit and Mertie, 1923).

Valdez No. 1 Tunnel

Located 350 ft. higher than the Principal Tunnel. Unknown length. Adit contains pyrite in calcite and quartz (Moffit and Mertie, 1923).

Short Tunnel

Located 200 ft. higher on the northeast side of the creek. Adit contains a mineralized quartz vein (Moffit and Mertie, 1923).

Two short tunnels

Located opposite the Valdez Group claims and are 75 ft. apart vertically. Unknown mineralization (Moffit and Mertie, 1923).

Short Tunnel

Located 4,600 ft. above the Kluvesna River. Adit contains a 18-in.-wide vein in a fault within the Nikolai Greenstone. Assay reported $60.00 per ton gold (Moffit and Mertie, 1923).

Geologic setting:

Bedrock consists of cherts and tuffs of the Permian Hasen Creek Formation interbedded with lava flows striking almost north and dipping 45° east. The cherts and tuffs are intruded by Jurassic granodiorite (Chitina Valley batholith) and more basic, dark-colored fine-grained dioritic rocks (Tertiary hypabyssal rocks) which contain disseminated pyrite. The bedrock is cut by numerous faults containing quartz veins and associated pyrite, chalcopyrite, and minor chalcocite (Moffit and Mertie, 1923; MacKevett, 1978).

Assays from a 4-ft.-thick vein in the Principal Tunnel contained $9.75 in gold (approximately ½ oz. per ton) and 3 oz. silver per ton. One 18-in.-thick quartz vein in the highest adit assayed $60 per ton gold (approximately 3 oz. per ton) in 1923 (Moffit and Mertie, 1923).

Recent investigations:

USGS/USBM/BLM work:

BLM

Looked for but not located during 1998. A sample was collected from the area.

The head of the drainage was examined but no evidence of any of the workings was noted. Snow filled the creek bed below the 4,100 ft. elevation. Thus, no exploration was conducted below this elevation. Bedrock in the creek bed consists of diorite overlying basalts. The basalts contained 1- to 2-ft.-wide shear zones containing quartz and calcite veins. The surface is highly iron-oxide stained. Veinlets and disseminated chalcopyrite and pyrite occur within the shear zones.

A representative chip sample (**AAWSE 10075**, map no.30) collected across the shear zone contained 1,583 ppm copper, 0.3 ppm silver, and 18 ppb gold.

Latitude N 61° 44' 55.193"; Longitude W 143° 53' 39.312"; Elevation 4,110 ft.

Estimated location:

Latitude N 61° 45' 10"; Longitude W 143° 54' 10"; Elevation 4,000 ft.

References:

Bibliography:

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MINNEAPOLIS

Plate no. 4

Ownership and Location:

Alternate name(s):
Minneapolis Lode
Company name(s):
Galena Bay Mining Co.
Mineral survey(s):
M.S. 906

Commodity: Copper
Deposit type: Stringer BCO
Deposit model: Basaltic Cu

Patent number(s):
552285

Location: Reported at approximately the 4,750 ft. elevation on the west side of Nugget Creek, a northern tributary of the Kuskulana River.

Township: 002 S.
Quadrangle: McCarthy C-8
Mining district: Chistochina
Alaska Kardex: None
ARDF no.: None
MAS no.: 0020870151

Range: 009 E. ***Section:*** 34
Meridian: Copper River
Mineral status: Development prospect
Patented

Ahtna, Inc. selection: Not located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:
1911 - One claim staked June 1, by the Galena Bay Mining Co. (M.S. 906).
- Claim surveyed October 22, by Lynn W. Storm (M.S. 906).
1916 - Patent issued, October 30.

Historical operating data:
1911 - One adit and two opencuts reported (M.S. 906).

Geologic setting:
Bedrock consists of Permian Hasen Creek Formation sedimentary rocks and associated Tertiary hypabyssal rocks thrust over Triassic Nikolai Greenstone (MacKevett and others, 1978).

Recent investigations:

USGS/USBM/BLM work:
BLM
Looked for but not located during 1998. One sample collected in the area.
Bedrock consists of highly sheared and altered Hasen Creek Formation sedimentary rocks and the Nikolai Greenstone with quartz, epidote, and chlorite veins up to 5 in. thick. Mineralized area covers approximately 900 sq. ft. Disseminated bornite, malachite, and

azurite occur in the greenstone.

A select sample (**AAWSE 10078**, map no. 49) collected from the greenstone contained 1,336 ppm copper, 0.2 ppm silver, and 18 ppb gold.

Latitude N 61° 38' 35.239"; Longitude W 143° 45' 06.493"; Elevation 4,350 ft.

Estimated location:

Latitude N 61° 38' 42"; Longitude W 143° 45' 14"; Elevation 4,750 ft.

References:

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MONTANA BOY

Plate no. 4

Ownership and Location:

Alternate name(s):
Mountain Boy
Company name(s):
Mineral survey(s):

Commodity: Copper
Deposit type: Stringer BB-C
Deposit model: Basaltic Cu

Location: Located at the 5,250 ft. elevation on the ridge between the Middle Fork and the East Fork Copper Creek, southern tributaries of the Kotsina River.

Township: 002 S.
Quadrangle: Valdez C-1
Mining district: Chistochina
Alaska Kardex: None
ARDF no.: Unknown
MAS no.: 0020860198

Range: 008 E. *Section:* 30
Meridian: Copper River
Mineral status: Development prospect

Ahtna, Inc. selection: Not located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:
1922 - Prospecting done (Moffit and Mertie, 1923).

Historical operating data:
Two opencuts and a 10 ft. long, south trending adit reported (Moffit and Mertie, 1923; Van Alstine and Black, 1946).

Geologic setting:
Bedrock consists of Triassic Chitistone Limestone overlying Triassic Nikolai Greenstone (Winkler and others, 1981) which have been cut by a N. 48° W. vertical zone of fractures with copper mineralization. Bornite, the major mineral, with chalcopyrite is found near the limestone-greenstone contact. Reported free gold panned from this claim (Moffit and Mertie, 1923; Van Alstine and Black, 1946).

Recent investigations:

USGS/USBM/BLM work:
BLM
Located and sampled during 1998.
Lower opencut
Bedrock consists of iron-oxide stained Chitistone Limestone which contains small veins of calcite and quartz. The opencut is 3 ft. wide by 15 ft. long and 2 ft. deep.

No visible copper mineralization was noted at the workings.

A grab sample (**AAWSE 10074**, map no. 38) taken of the iron-oxide stained limestone contained 44 ppm copper.

Latitude N 61° 39' 45.979"; Longitude W 144° 01' 56.875"; Elevation 5,230 ft.

Upper opencut.

Bedrock consists of iron-oxide stained Chitistone Limestone which contains small veins of calcite. The opencut is 3 ft. wide by 3 ft. deep and 4 ft. long.

No samples were collected. No visible copper mineralization was noted at the workings or the waste dump.

Latitude N 61° 39' 46.620"; Longitude W 144° 01' 53.811"; Elevation 5,380 ft.

References:

Bibliography:

Moffit, F.H., and Mertie, J.B., Jr., 1923, The Kotsina-Kuskulana district, Alaska: U.S. Geological Survey Bulletin 745, p. 103.

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MOUNTAIN SHEEP

Plate no. 4

Ownership and Location:

Alternate name(s):
Company name(s):
Mineral survey(s):

Commodity: Copper, silver
Deposit type: Stringer BCO
Deposit model: Basaltic Cu

Location: Located at the 4,650 ft. elevation on the west side of the Middle Fork Copper Creek, a southern tributary of the Kotsina River.

Township: 002 S.
Quadrangle: Valdez C-1
Mining district: Chistochina
Alaska Kardex: None
ARDF no.: Unknown
MAS no.: 0020860199

Range: 007 E. *Section:* 25
Meridian: Copper River
Mineral status: Development prospect

Ahtna, Inc. selection: Not located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:
1922 - Prospecting done (Moffit and Mertie, 1923).

Historical operating data:
One opencut and a 20-ft.-long adit trending N. 65° W. reported (Moffit and Mertie, 1923; Van Alstine and Black, 1946).

Geologic setting:
The adit is driven into the Triassic Nikolai Greenstone below the Triassic Chitistone Limestone (Winkler and others, 1981). The greenstone is locally shattered and contains disseminated pyrite, bornite, and minor chalcopyrite. Several shear zones, up to 1 in. thick, contain 1% bornite by volume. Limonite, malachite, and azurite stain the greenstones near the adit (Moffit and Mertie, 1923; Van Alstine and Black, 1946).

Recent investigations:

USGS/USBM/BLM work:
BLM
Located and sampled during 1998.

Adit open, driven onto the Nikolai Greenstone. The adit follows a 3-ft.-wide shear zone trending N. 55° W., dipping 60° east, for 20 ft. Sloughing has occurred at 10 ft. from the portal. Chalcopyrite, bornite, malachite, and azurite occur along the shear zone.

A select sample (**AAWSE 10106**, map no. 37) collected from ore along the floor of the adit contained 3.0% copper and 3.1 ppm silver.

Sample location:

Latitude N 61° 40' 02.683"; Longitude W 144° 03' 14.612"; Elevation 4,760 ft.

Adit location:

Latitude N 61° 40' 02.716"; Longitude W 144° 03' 14.675"; Elevation 4,760 ft.

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MULLEN MINE

Plate no. 4

Ownership and Location:

Alternate name(s):
Angle Lode
Copper Creek
Hoffman Prospect
Mullen Group
Mullen Lode
Sport Lode
Copper Mountain Millsite

Company name(s):
Alaska Copper Mining Co. Inc.
Alaska Hurlock Syndicate
Alaska Pioneer Copper Co.
Copper Creek Copper Mining Co.
Copper River Exploration
Coronado Copper and Zinc Co.
Galena Bay Mining Co.
Golden Bay Mining Co.

Commodity: Copper, gold, silver
Deposit type: Stringer BCO
Deposit model: Basaltic Cu

Mineral survey(s):
M.S. 904

Patent number(s):
806021

Location: The Mullen No. 1 Adit is located at the 3,755 ft. elevation on the west side of Copper Creek, a southern tributary of the Kotsina River.

Township: 002 S.
Quadrangle: Valdez C-1
Mining district: Chistochina
Alaska Kardex: KX 86-064
KX 86-140
KX 86-141
KX 86-148
KX 86-165
KX 86-172
ARDF no.: Unknown
MAS no.: 0020860126

Range: 007 E. *Section:* 24
Meridian: Copper River
Mineral status: Past producer
Patented

Ahtna, Inc. selection: Located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:

1900 - A 15-ft.-long opencut with a shallow shaft at its end (Schrader and Spencer, 1901).
- A ton of material was mined and two select samples contained 30% copper, with one sample having over 2 oz. gold and one having 1/10 oz. silver (Schrader and Spencer, 1901).
- Hoffman Prospect staked (KX 86-141).

1907 - Fifteen claims staked by Scott Simenstad and E.W. Hundley (KX 86-064).

1911 - Mineral Survey 904 surveyed, October 11-12, for the Galena Bay Mining Co. Claims include the Angle, Mullen, and Sport Lodes.
- Mineral Survey 907 surveyed October 14-15, for the Galena Bay Mining Co. Claims include the Crag and Glance Lodes.

1916 - Six claims staked by Robert Jenkins (KX 86-148).

1917 - Three opencuts: northern cut 20 ft. long, 10 ft. deep; middle cut; southern cut, length's unknown (Moffit and Maddren, 1908).

1921 - Patented May 12, 56.057 acres.

1926 - Development work done (Smith, 1927).
- Eight claims staked by A.K. Crawford and Adolph Ammann (KX 86-140).

1927 - Development work was completed by several men hired by George H. Hurlock (Smith, 1930a).

1928 - Some work done (Smith, 1930b).

1929 - Inactive (Smith, 1930c).

1930 - Inactive (Smith, 1931).

1936 - Mining done (Smith, 1938).

1944 - Workings include an opencut, two adits with drifts, crosscuts, and inclined shafts.
- Workings include 800 ft. of underground workings, unknown length of the inclined shafts, and possible flooding. No. 2 Adit is caved (Van Alstine and Black, 1946).

1969 - Thirty-nine claims staked by John Hewitt and Scott Simenstad (KX 86-165).

1971 - Sixty-two claims staked by Joseph F. Taylor and Warren T. Taylor (KX 86-172).

Production:

One ton of material mined (Schrader and Spencer, 1901).

Historical operating data:

By 1911 the Angle, Mullen, and Sport Lodes Mineral Survey 904 reports seven opencuts, three tunnels, and one shaft.

Workings include four opencuts, a shallow shaft, two adits with 800 ft. of workings which include drifts, crosscuts, and an inclined shaft.

As of 1944 the Lower Camp included a sawmill, engine house, stable, blacksmith shop, garage, bunkhouse, bath house, warehouse, office, mess hall, assay office, and three store houses.

Upper Camp included three bunk houses, mess hall, and a bath house.

Mullen No. 1 Adit has a compressor house and a tool shop (Van Alstine and Black, 1946).

Van Alstine with the USGS published a map of the underground workings of the No. 1 Adit and the No. 2 Adit in 1946 (Van Alstine and Black, 1946).

Geologic setting:

Three poorly defined north-south mineralized zones, 1 to 3 ft. thick, within altered Triassic Chitistone Limestone overlain by Jurassic and Triassic McCarthy Formation limestone and shale and underlain by Triassic Nikolai Greenstone (Winkler and others, 1981). Ore minerals include chalcopyrite and bornite with malachite and iron-oxide staining (Schrader and Spencer, 1901).

In the underground workings the Chitistone Limestone is exposed through most of them with the Nikolai Greenstone exposed near the end of several crosscuts. Small bodies of diorite are located along the contacts as well as intruding into them. The diorite is a lighter colored, highly altered, medium-grained granitoid rock. Faults are abundant and conspicuous near the diorite bodies. A ½- to 4-in.-wide calcite and copper-rich vein follows a N. 10° W. slickenside fault zone in the No. 1 Adit (Van Alstine and Black, 1946).

Recent investigations:

USGS/USBM/BLM work:

USGS

Two select samples contained 30% copper with one sample having over 2 oz. silver and the other having 1/10 oz. gold (Schrader and Spencer, 1901).

BLM

Located and sampled several adits and one opencut during 1997 and 1998.

Mullen No. 1 Adit

Adit open, driven N. 48° E. along a shear zone in the Nikolai Greenstone containing disseminated chalcopyrite, bornite, chalcocite, malachite, and azurite with associated quartz. The first crosscut contains dynamite, also remnants of a winze is visible at the right side of the portal. The map of the workings published by Van Alstine and Black (1946) shows a correct depiction of the underground workings. Two collapsed buildings are located directly outside the portal.

A select sample (**AAWSE 10040**, map no. 34) collected across the 3-ft.-wide quartz shear zone at the portal contained 12.2% copper, 23.6 ppm silver, and 286.1 ppm cadmium.

Latitude N 61° 40' 34.613"; Longitude W 144° 03' 53.492"; Elevation 3,700 ft.

Mullen No. 2 Adit

Adit caved at the portal. This adit appears to have been the haulage tunnel as there are rails connecting this adit with the No. 1 Adit and associated buildings. This adit is driven 100 to 150 ft. below the opencut, and it is most likely driven to undercut this mineralized zone.

No samples were collected. No copper mineralization was noted in the waste dump.

Latitude N 61° 40' 32.601"; Longitude W 144° 03' 52.244"; Elevation 3,580 ft.

Mullen No. 3 Adit

Adit open, driven N. 8° E. for 10 ft. just below and north of the No. 1 Adit. Most likely driven to undercut the shear zone in the No. 1 Adit. Thirty feet above this adit is a wooden platform, possibly to assist in starting another adit. Malachite stained rocks were noted above this location.

No samples were collected. No copper mineralization was noted in the adit or on the waste dump.

Latitude N 61° 40' 35.035"; Longitude W 144° 03' 53.335"; Elevation 3,670 ft.

Mullen No. 4 Adit

Adit open, driven N. 8° E. for 27 ft. where it intersects a 12-in.-wide shear zone containing ½-in.-wide quartz veins. No visible copper mineralization was noted in the shear. This adit has the remains of a wooden door frame and the door lying close by. Was this adit used as a root cellar?

No samples were collected. No copper mineralization was noted in the adit or on the waste dump.

Latitude N 61° 40' 35.547"; Longitude W 144° 03' 53.421"; Elevation 3,690 ft.

Mullen Opencut

Opencut cut westward into the face of the limestone outcrop 100 to 150 ft. above the Mullen No. 2 Adit. The opencut is 15 ft. wide by 20 ft. tall and 20 ft. deep. Massive chalcopyrite, malachite, and azurite occur in an iron-stained shear zone.

A random chip sample (**AAWSE 10039**, map no. 34) collected across the 4-ft.-wide face contained 34.46% copper, 40.5 ppm silver, and 38 ppb gold. A select sample (**AAWSE 10039-A**, map no. 34) collected of high grade material contained 36.64% copper, 109.7 ppm silver, and 45 ppb gold.

Latitude N 61° 40' 30"; Longitude W 144° 03' 57"; Elevation 3,850 ft.

Resources:

USGS

1946 (Van Alstine and Black, 1946)

Vein no. 1 - Contains 1,263 tons of indicated ore with 1.55% copper.

Vein no. 2 - Contains 59 tons of indicated ore with 5.82% copper, trace gold, and 0.28 oz. per ton silver.

References:

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NABESNA MINE

Plate no. 3

Ownership and Location:

Alternate name(s):
Carl Whitham Mine
Alidade #1
Bear Vein
Moon Shine Lode
No. 49 Vein
Nugget Vein
Sunshine Lode
White Mountain Lode Nos. 10-11, and 13-15
White Mountain Nos. 1-6,
White Mountain Quartz Nos. 7-9
Nabesna Mill
"El-Se-Ba" (Native for "The White Mountain")

Commodity: Gold, silver, copper, lead, zinc
Deposit type: Contact deposit
Deposit model: Fe skarn (18d)

Company name(s):
Nabesna Mining Corp.
Ptarmigan Mining Co.
Royal Development Co.

Owner:
Kirk Stanley
P.O. Box 200956
Anchorage, AK 99520

Mineral survey(s):
M.S. 1591

Patent number(s):
1079922

Location: Located between the 4,200 and 4,850 ft. elevation on the north side of Camp Creek, on the east side of White Mountain, northwest of the Nabesna Millsite. Located northeast of the Royal Development Co. site.

Township: 007 N.
Quadrangle: Nabesna B-5
Mining district: Chisana
Alaska Kardex: KX 78-026
KX 78-027
KX 78-059
ARDF no.: NB016
MAS no.: 0020780010

Range: 013 E. *Section:* 21
Meridian: Copper River
Mineral status: Past producer
Patented

Ahtna, Inc. selection: Located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:

1903 - Twenty-eight claims were staked by Yvonne Alford, A.J. Field, Paul Paulson, Carl Whitham, and Wayne Dolt (KX 78-026).

Pre 1924 - Work in the area was done on the Royal Development Co. occurrence.

1924 - Royal Development Co. claims relocated by Carl F. Whitham (Wayland, 1943).

1925 - The Bear Vein was discovered 1,000 ft. northeast of the Golden Eagle (Wayland, 1943).

1926 - 1928 - Development work included a 50 ft. opencut, 30 ft. shaft, exposure of the 100 ft. Level portal vein (Wayland, 1943).

1929 - Nabesna Mining Corp. formed; Mr. Carl F. Whitham was the President and General Manager (Wayland, 1943).
- Tram built to the millsite at the base of the cliff (Wayland, 1943).

1930 - A 2,000 ft. tram line built, 150 ft. tunnel driven on the Bear Vein (AK Miner 1/3/39).

1931 - Small mill in operation and permanent camp under construction (Wayland, 1943).
- Work began on the 250 ft. Level (Wayland, 1943).

1932 - Mineral Survey 1591 surveyed, July 20 - August 8. Claims include White Mountain Nos. 1-6, White Mountain Quartz Nos. 7-9, White Mountain Lode Nos. 10-11, 13-15, Moon Shine Lode, and Sunshine Lode.

1933 - Work began on the 650 ft. Level (Smith, 1942c). The Tower Knob Level was driven 900 ft. (Moffit, 1936).

1934 - Over 2,900 ft. of underground development work completed, a larger crusher installed, new tram constructed to the 650 ft. Level, 35 men employed (Smith, 1936).
- Mill capacity increased from 30 to 60 tons per day (Roehm, 1936a.
- 9,955 tons of ore was mined, trammed, and milled (Roehm, 1936a.
- Average ore value during the third quarter was $33.69 per ton (Moffit, 1936a).

1935 - Mill treating 60 tons per day of ore and operating season on a year-round basis (Wayland, 1943).
- Recovery increased 50 to 90%, costs reduced to make $15.00 ore profitable (Wayland, 1943).
- Six new flotation cells were put into operation and a cyanide plant built (Smith, 1937).
- Present mill has a capacity of 120 tons per day (Moffit, 1937).
- 16,443 tons of ore mined, trammed, and milled (Roehm, 1936a).
- Patent issued on December 9.

1936 - All stoping done between the 250 ft. and 450 ft. levels (Wayland, 1943).
- Underground workings include 3,203 ft. of drifts, stopes, and raises and the extraction of 11,653 tons of ore (Smith, 1938).
- Development work completed on the 350, 450, 550, and 650 ft. levels with 40 men (Roehm, 1936b).
- Leaching system in the cyanide plant was replaced into a continuous-process agitation unit (Smith, 1938).

1937 - No. 49 Vein discovered (Wayland, 1943).
- Reported production included mining 8,800 tons of ore and treating an additional 7,300 tons of tailings. Over 2,000 ft. of underground openings were driven (Smith, 1939a).

1938 - 2,589 ft. of underground workings driven, 12,225 tons of ore and 5,801 tons of tailings were treated, with an average value of $42.65 for the ore and $14.69 for the tails.
- Mill recovery was 91.57%, with 595 tons of concentrates with 517 tons shipped to the smelter (Smith, 1939b).

1939 - Most of the known veins worked out (Wayland, 1943).
- 5,000 tons of ore mined and milled, 1,630 ft. of underground workings driven (Smith, 1941).

1940 - Mining and milling continued at a reduced rate. Operations were discontinued by September 11 (Smith, 1942c).
- Gross production was $1,869,396 which includes some silver and copper recovered at the Tacoma smelter (Wayland, 1943).
- Thirty-four placer claims were staked by the Nabesna Mining Co. (KX 78-027).

1946 - First shipment of ore since closed for war, 4 tons valued at $1,000 per ton, September 15. Fourteen to 16 men working since June 1 (AK Miner 10/11/46).
- Closed October 15, treated 540 tons of Golden Eagle (Rambler Mine) ore.

1960 - One claim staked by Lenhart Grothe (KX 78-059).

19?? - Property purchased by Kirk Stanley.

Production:

1931 - Concentrate production valued at $460,759.00 (AK Miner 1/3/39).

1934 - 9,955 tons of ore milled with an average value of $32.86 per ton (Roehm, 1936a).
- A total of 329.982 tons of concentrates was produced and shipped (Roehm, 1936a).

1935 - 16,443 tons of ore milled with average value of $19.52 per ton (Roehm, 1936a).
- A total of 415 tons of concentrates was produced and shipped (Roehm, 1936a).
- Gross production value of bullion and concentrate was $257,492.95 (Roehm, 1936a).

1936 - 4th quarter report (Roehm, 1936a).
- 2,393 tons of ore milled with average value of $22.10.
- 1,670.23 tons of tailings treated with average value of $1.35.
- A total of 49.71 tons of mill concentrates was produced and shipped.
- A total of 673.06 tons of cyanide concentrates were produced and shipped.
- Gross value of mill concentrates and bullion was $36,975.57.
- Gross production value of cyanide concentrates and gold precipitate was $20,825.14.
- Total gross production value was $57,800.71.

1937 - 3rd and 4th quarter reports (Roehm, 1936a).
- 3,961 tons of ore milled with average value of $19.46.
- 5,232 tons of tailings treated with average value of $16.02.
- A total of 250.84 tons of mill concentrates was produced and shipped.
- A total of 3,922.96 tons of cyanide concentrates were produced and shipped.
- Gross production value of mill concentrates was $88,857.98.
- Gross production value of tailings was $83,816.64.
- Gross production value of cyanide concentrates and bullion was $69,671.99.
- Total gross production value was $242,346.61.

1938 - 1st, 3rd, and 4th quarter reports (Roehm, 1936a).
- 9,161 tons of ore milled with average value of $43.42.
- 5,801.1 tons of tailings treated with average value of $14.69.
- A total of 283.29 tons of mill concentrate was produced and shipped.

- A total of 1,460.15 tons of cyanide concentrates were produced and shipped.
- Gross production value of mill concentrates was $322,531.68.
- Gross production value of tailings was $48,227.34.
- Gross production value of cyanide concentrates and bullion was $20,843.84.
- Total gross production value was $391,602.86.
- Total gross value of production to October 1, 1938 is $1,568,723.00 (AK Miner 1/3/39)

1939 - 1st and 2nd quarter reports (Roehm, 1936a).
- 5,029 tons of ore milled with average value of $18.28.
- 729.6 tons of tailings treated with average value of $12.59.
- A total of 135.74 tons of mill concentrates was produced and shipped.
- A total of 21.78 tons tailings' concentrates produced and shipped.
- Gross production value of mill concentrates was $81,888.93.
- Gross production value of tailings concentrate was $5,515.58.
- Total gross production value was $87,404.51.

1940 - 2nd and 3rd quarter reports (Roehm, 1936a).
- 1,994.7 tons of ore milled with average value of $15.48.
- 2,102.4 tons of tailings treated with average value of $6.33.
- A total of 53.97 tons of mill concentrates was produced and shipped.
- A total of 33.41 tons of tailings concentrates produced and shipped.
- Gross production value of mill concentrates was $26,837.62.
- Gross production value of tailings concentrate was $13,310.73.
- Total gross production value was $40,148.35.

1946 - Mine reopened for 3 months (AK Miner ?/1946).
- Treated 540 tons Golden Eagle ore valued at $15.42 per ton.
- Produced 9.19 tons of concentrates.
- 172.478 oz. gold and 126.475 oz. silver valued at $6,151.08.
- Reported production included mining 8,800 tons of ore and treating an additional 7,300 tons of tailings (Smith, 1939a).
- Gross production was $1,869,396.00 which includes some silver and copper recovered at the Tacoma smelter (Wayland, 1943).

Historical operating data:

1932 - Mineral Survey 1591 surveyed in two common improvement tunnels, one opencut, and one glory hole. Total value estimated at $34,800.00.

1934 - Improvements include: a mill addition, a mine office building, three staff quarters buildings, a concentrate storage shed, a garage and heating plant building, a warm-storage building for perishable supplies, a 9 x 16 in. Tellsmith-Wheeling jaw crusher, a Marcy grinding unit, a Dorr classifier, a Garner-Denver air compressor at the 650 ft. Level portal, a pump for winter pumping, and a heating-plant boiler with a radiation capacity of 5,000 ft. (Moffit, 1936), a 120 hp. diesel engine, two trams, one to the 250 ft. Level and one to the 650 ft. Level (Moffit, 1937).

Workings: (Roehm, 1936a)

650 ft. Level Portal - Lower Tunnel - Working Level (Connected to lower tram)

Over 1,500 ft. of drifts, a 349 ft., 58° incline connected to the 250 ft. Level, a 251 ft. crosscut, and a 20-ton ore bunker.

650 ft. Level North

At least 500 ft. of drifts.

550 ft. Level

Over 50 ft. of drifts.

No. 49 Stope raised to the 450 ft. Level.

No. 53 Stope raised to the 450 ft. Level.

450 ft. Level

Over 510 ft. of drifts and a 160 ft. stope raise.

350 ft. Level - Swede Gulch Portal

At least 700 ft. of drifts and a 124 ft. stope raise.

250 ft. Level Portal (Connected to upper tram)

Connects to the Nugget Portal - 250 ft. Level of the Royal Development Co. Mine.

Over 243 ft. of drifts and 1,596 ft. of stope raises.

Nugget Crosscut - 639 ft. open to surface.

100 ft. Level Portal - Old Level

At the 4,200 ft. elevation. Unknown length.

Glory Hole Discovery

Nugget Vein Tunnel

Over 143 ft. of drifts.

Mill

An 80-ton ore bunker. A Marcy grinding unit and a Dorr classifier.

Mine camp

Assay office, bunk house, garage and heating plant, mess hall, mine office, owners house, post office, and storage buildings.

Geologic setting:

The Triassic massive (Nabesna?) limestone exposed on the east side of White Mountain is made up of a lower massive limestone and an upper thin-bedded limestone. Up to 1,000 ft. of massive, bluish-gray limestone is overlain by over 500 ft. of thin-bedded, bluish-gray impure limestone overlain by Jurassic quartz diorite dikes and intrusives, overlain by Jurassic garnet tactite, and overlain by Cenezoic lava flows (Moffit, 1933). Limestone is faulted and intruded by a large irregular Cretaceous quartz diorite (Nabesna Batholith) stock associated with numerous satellite quartz diorite dikes and minor quartz monzonite (Richter, 1997).

The ore body is formed along a contact surface between the diorite and massive limestone which trends northeastward and a near vertical westward dip (Moffit, 1933). The ore deposit occurs as three types: 1) the principal ore, gold-bearing pyrite-calcite veins carrying chalcopyrite, sphalerite, and galena in ore shoots; 2) bodies of massive magnetite with pyrite, calcite, and some gold; and 3) veins and bodies of pyrrhotite with disseminated pyrite, chalcopyrite, and gold (Koschmann and Bergendahl, 1968; Richter, 1997). Newberry (1997) refers to the Nabesna deposit as a gold-rich copper skarn. At this locality, the complexity of the deposit is noted in the association between the garnet skarn, the garnet-pyroxene skarn, the pyroxene skarn, the idocrase-garnet skarn, and the magnetite-serpentine skarn with the sulfide and magnetite ore bodies (Newberry, 1997).

Metallic minerals recovered from the mill tables include gold, lead sulphate, pyrite, small amounts of chalcopyrite, and magnetite (Moffit, 1933).

Reserves:

Published reserves of 0.3 to 1.1 million metric tons at 0.2 oz. per ton gold, 1.8 oz. per ton silver, 1.5% copper, 0.05% zinc, and 0.002% molybdenum (Newberry and others, 1997).

Recent investigations:

USGS/USBM/BLM work:

BLM

A tour of the mill and assay buildings, the Nabesna townsite, and an overview of the mineralization of the mine was given by Kirk and Jack Stanley. John Devenport, an Ahtna, Inc. representative, was also present for the tour.

No samples were collected as per Kirk Stanley's request.

650 ft. Level

Estimated location:

Latitude N 62° 22' 25"; Longitude W 143° 01' 09"; Elevation 3,680 ft.

250 ft. Level

Estimated location:

Latitude N 62° 22' 29"; Longitude W 143° 01' 09"; Elevation 4,080 ft.

100 ft. Level

Estimated location:

Latitude N 62° 22' 33"; Longitude W 143° 01' 10"; Elevation 4,240 ft.

Swede Gulch

Estimated location:

Latitude N 62° 22' 39"; Longitude W 143° 00' 57"; Elevation 3,960 ft.

Millsite

Estimated location:

Latitude N 62° 22' 20"; Longitude W 143° 00' 38"; Elevation 3,100 ft.

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NEWHOME

Plate no. 4

Ownership and Location:

Alternate name(s):
Fall Creek
Kluvesna Creek
Trail Creek
Company name(s):
Adolph Ammann
Mineral survey(s):

Commodity: Copper, gold, silver
Deposit type: Stringer BB-C
Deposit model: Basaltic Cu

Location: Located at the 4,440 ft. elevation on the south side of Trail Creek, a western tributary of Fall Creek, a northwestern tributary of the Kotsina River.

Township: 001 S.
Quadrangle: McCarthy D-8
Mining district: Chistochina
Alaska Kardex: KX 87-032 (Partial)
ARDF no.: MC054
MAS no.: 0020870152

Range: 008 E. ***Section:*** 10
Meridian: Copper River
Mineral status: Development prospect

Ahtna, Inc. selection: Located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:
1907 - Staked by Adolph Ammann and Jack Nafsted (KX 87-32).
- Prospecting and development work done (Moffit and Maddren, 1908; Moffit and Maddren, 1909).

Historical operating data:
One short tunnel and several opencuts reported (Moffit and Mertie, 1923).

Geologic setting:
Bedrock consists of Triassic Nikolai Greenstone fractured and veined with quartz containing bornite and chalcopyrite (Moffit and Mertie, 1923; MacKevett, 1978).

Recent investigations:

USGS/USBM/BLM work:
BLM
Located and sampled during 1997.
Area reexamined and three opencuts sampled in 1998.

Newhome Adit

Adit open, driven N. 10° E. for 35 ft. in Nikolai Greenstone. At 28 ft. from the portal the adit cut across a 6-in.-wide shear zone with quartz veins ⅛ in. thick. Minor quartz veins at the face but no visible mineralization noted. Bornite, chalcopyrite, malachite, and azurite associated with the quartz as noted in the sample.

A select sample (**AAWSE 10037**, map no. 25) collected from the waste dump contained 5,354 ppm copper, 7.4 ppm silver, and 8 ppb gold.

Sample location:

Latitude N 61° 47' 29.965"; Longitude W 143° 55' 50.555"; Elevation 4,440 ft.

Adit location:

Latitude N 61° 47' 28.403"; Longitude W 143° 55' 58.126"; Elevation 4,430 ft.

Opencut No. 1

Bedrock consists of iron-oxide stained Nikolai Greenstone. The opencut, 15 ft. wide by 20 ft. long and 15 ft. deep at the face, is cut along a 2-ft.-wide mineralized shear zone with associated quartz and epidote veining. Bornite, chalcocite, and malachite occur with the quartz along the shear zone. The bornite surrounds the chalcocite.

A select sample (**AAWSE 10100**, map no. 24) collected from the waste dump contained 2.49% copper, 11.6 ppm silver, and 6 ppb gold.

Sample location:

Latitude N 61° 47' 25.172"; Longitude W 143° 55' 59.268"; Elevation 4,490 ft.

Opencut location:

Latitude N 61° 47' 25.124"; Longitude W 143° 55' 59.268"; Elevation 4,490 ft.

Opencut No. 2

Bedrock consists of iron-oxide stained Nikolai Greenstone.

No samples were collected. No visible copper mineralization was noted.

Latitude N 61° 47' 27.785"; Longitude W 143° 56' 01.676"; Elevation 4,540 ft.

Opencut No. 3

Bedrock consists of iron-oxide stained Nikolai Greenstone containing a 1-ft.-wide mineralized shear zone with associated quartz veining. The shear zone, located directly above the adit, appears to be a continuation of the same shear zone the adit is driven into. Bornite, chalcocite, and malachite occur with the quartz along the shear zone. The bornite surrounds the chalcocite.

A select sample (**AAWSE 10101**, map no. 24) collected from the ore dump located on the north side of the opencut contained 2.61% copper, 5.6 ppm silver, and 20 ppb gold.

Sample location:

Latitude N 61° 47' 28.183"; Longitude W 143° 56' 01.129"; Elevation 4,520 ft.

Opencut location:

Latitude N 61° 47' 28.186"; Longitude W 143° 56' 01.093"; Elevation 4,520 ft.

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NUGGET CREEK MINE

Plate no. 4

Ownership and Location:

Alternate name(s):
Lucky Boy Tunnel
Nugget Gulch
One Girl Claim
Valdez Tunnel

Company name(s):
Alaska Consolidated Copper Co.
Alaska Copper Corp.

Mineral survey(s):
M.S. 891
M.S. 892
M.S. 893, Sections A, B, C, D

Commodity: Copper, gold, silver
Deposit type: Stringer BB-C
Deposit model: Basaltic Cu

Patent number(s):
487252 through 487253

Location: Located between the 3,500 and 3,700 ft. elevation on the east side of Nugget Greek, a northern tributary of the Kuskulana River, northwest of the Kuskulana Glacier toe.

Township: 003 S.
Quadrangle: McCarthy C-8
Mining district: Chistochina
Alaska Kardex: KX 87-045
ARDF no.: MC001
MAS no.: 0020870065

Range: 009 E.
Section: 02
Meridian: Copper River
Mineral status: Past producer
Patented

Ahtna, Inc. selection: Not located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:

1900 - Thirty-six claims staked by James McCarthy, O.H. Thorgaard, and Jerry and Joan Coppes (KX87-045).

1902 - Ballard, Black Hawk, Comstock, Copper Queen, Copper Queen No. 2, Copper Queen No.3, Copper Queen No. 4, Excelsior, Excelsior No.2, Gray Hound, Illinois, Jennie, Lucky Boy, Lucky Girl, Lucky Girl No. 2, Newport, One Girl, Owl, Queen Ann, Redding, Salem, Seattle, Tom Thumb, Tom Thumb No. 2, Valdez, Wilkes Barre, Wisconsin, York, York No. 2, and York No. 3 Lodes located June 9, 1902 to August 23, 1907, by the Alaska Consolidated Copper Co.
- Claims recorded July 25, 1902 to September 4, 1907.

1905 - Blue Bell, Buffalo, Pennsylvania, and White Horse Lodes located June 15-22.

1907 - The Valdez claim tunnel and "Mud Tunnel" were driven (Moffit and Maddren, 1908).
- German Town Lode located, July 15, by Alaska Consolidated Copper Co.

- Claim recorded September 4.

1908 - Two new tunnels were driven (Moffit, 1909).

1909 - Mineral Survey 893 surveyed, July 10-31, for the Alaska Consolidated Copper Co. Claims include those listed as located in 1902.
- Mineral Survey 892 surveyed, July 31 - August 4, for the Alaska Consolidated Copper Co.
- Mineral Survey 891 surveyed, August 4-6, for the Alaska Consolidated Copper Co. Claim includes the German Town Lode.
- Development work continued (Moffit, 1910).

1912 - Development work continued. Ore from the Valdez claim was stockpiled in either dumps or sacks (Moffit, 1913).

1913 - Development work continued (Brooks, 1914).

1914 - Development work continued (Brooks, 1915).

1914 - Development work continued by the Alaska Copper Corp. (Brooks, 1916).

1915 - Development work continued (Smith, 1917b).
- Patented August 19.

1916 - Development work continued. Ore reported shipped (Moffit, 1918).

1917 - A road to Strelna was started (Brooks, 1921).

1918 - Development work continued. Ore reported shipped (Martin, 1919b).

1919 - Mining operation ceased, all equipment moved out (Brooks, 1921).

1943 - All workings caved (Van Alstine and Black, 1946).

Production:

Total production between 1916 and 1918 was 160 tons of concentrates and hand-sorted ore. Prior to 1916, two car loads of high-grade hand sorted ore shipped (Moffit, 1921; Moffit and Mertie, 1923).

Historical operating data:

1907 - Mineral Survey 893 reported 4 shafts, 9 tunnels, and 35 opencuts.

1909 - Mineral Survey 891 reported one tunnel.

Valdez claim

Valdez Tunnel

A 30 ft. adit, numerous opencuts, and a 30 ft. deep shaft (Moffit and Maddren, 1908). By 1912 the shaft was 163 ft. deep and 900 ft. of tunneling driven (Moffit, 1913). By 1914 the shaft was 170 ft. deep and 1,500 ft. of tunneling driven (Moffit, 1915).

The northwest adit (Moffit, 1909).

The southwest adit - driven 100 ft. (Moffit, 1909).

Lucky Boy Tunnel

By 1916 the main level (160 ft. level) includes drifts at the 35, 50, and 105 ft. levels. A 60 ft. crosscut in the shaft driven (Moffit, 1918).

One Girl claim

The "Mud Tunnel" has been driven 100 ft. S. 75° W. and several opencuts (Moffit and Maddren, 1908).

1916 - Power plant and compressor were installed (Smith, 1917b).

1918 - A concentration plant with jaw crushers, jigs, along with "Wilfley" and Card tables were installed (Martin, 1919b).

Geologic setting:

Bedrock consists of amygdaloidal Triassic Nikolai Greenstone (MacKevett and others, 1978).

Valdez claim

Nikolai Greenstone cut by a fault and a set of perpendicular faults trending N. 65° E. where the ore is deposited. The fault set can be traced for several hundred feet. A 2-ft.-wide calcite vein contains bornite and minor chalcopyrite. A 2- to 3-in.-wide fault containing blue and yellow clay also contains small crystals of chalcopyrite (Moffit and Maddren, 1908).

One Girl claim

Driven in amygdaloidal Nikolai Greenstone. No ore was encountered in the workings (Moffit and Maddren, 1908).

A 2- to 3-ton native copper nugget, 7 ft. long by 2 ft. 3 in. wide and 12 in. thick, was discovered in the creek bed. This is how the name Nugget Creek was derived (Moffit and Maddren, 1908). This nugget is located at the University of Fairbanks Museum, Fairbanks, Alaska.

Recent investigations:

USGS/USBM/BLM work:

USBM

Site visit in 1977 (USBM field notes).

BLM

Located the lower adit during 1997.

Located and sampled the upper adit during 1998.

Lower Adit

Adit caved. Millsite location.

No samples were collected.

Latitude N 61° 38' 34.011"; Longitude W 143° 43' 05.271"; Elevation 3,500 ft.

Upper Adit

Adit open, partially sloughed at portal. Driven N. 32° W. for 20 ft. into the Nikolai Greenstone. Iron-oxide stained 2-ft.-wide shear zone in front of portal is cut by a trench. Bornite, malachite, and azurite occur in the shear zone with associated quartz.

A select sample (**AAWSE 10079**, map no. 48) collected of high grade ore material from the waste dump contained 10.65% copper, 61.5 ppm silver, and 16 ppb gold.

Sample location:

Latitude N 61° 38' 34.651"; Longitude W 143° 43' 05.293"; Elevation 3,660 ft.

Adit location:

Latitude N 61° 38' 35.481"; Longitude W 143° 43' 04.668"; Elevation 3,670 ft.

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O'HARA

Plate no. 4

Ownership and Location:

Alternate name(s):
Bloom Creek 1-10
Francis No. 1
Golden Boy No. 1
Hufico Group
Hunt 1-13
Nelson Mtn.
O'Hara-Farmun Prospect
Patricia No. 1
Queenie No. 1-2
Company name(s):
Mineral survey(s):

Commodity: Lead, zinc, iron
Deposit type: Contact deposit
Deposit model: Polymetallic vein

Location: Reported at approximately the 3,800 ft. elevation on the north side of Nelson Mtn. on a southern tributary of the Chitina River.

Township: 006 S.
Quadrangle: McCarthy B-8
Mining district: Nizina
Alaska Kardex: KX 87-016
KX 87-146
ARDF no.: MC075
MAS no.: 0020870079

Range: 009 E. ***Section:*** 20
Meridian: Copper River
Mineral status: Development prospect

Ahtna, Inc. selection: Located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:
1924 - Six tons of supplies sledded up to the prospect in the winter (Shepard, 1925).
- Two cabins built (Shepard, 1925).
1925 - Claims staked by Farmun and O'Hara (KX 87-016).
1985 - Ten claims staked by Howard Hunt and William Fike (KX 87-146).

Historical operating data:
1924 - A 20-ft.-long opencut reported (Shepard, 1925).
1940 - Three adits have been driven reported (Berg and Cobb, 1967).

Geologic setting:
Bedrock consists of Permian (MacKevett and Holloway, 1977) marble containing sparse veins, up to 8 in. thick, of galena, sphalerite, pyrite, marcasite, and pyrrhotite overlying the Permian and

Pennsylvanian metamorphosed Skolai Group (MacKevett, 1978). The marble also contains thin layers of mica schist and minor disseminated tourmaline, pyrite, pyrrhotite, and sphalerite (Berg and Cobb, 1967).

Ore body is 12 ft. wide, striking N. 80° E. and dipping 35° west, containing 10 to 15% lead, some zinc, and a little iron. The lead occurs in bands of solid mineral and is disseminated throughout the limestone gangue. The ore body shows a distinct hanging wall and a gradual lessening of impregnation in the foot wall. A small greenstone (andesite) dike intersects the ore body near the surface, dipping flatly to the east (Shepard, 1925).

Recent investigations:

USGS/USBM/BLM work:

BLM

Looked for but not accessible due to weather during 1997.

Estimated location:

Latitude N 61° 20' 07"; Longitude W 143° 49' 58"; Elevation 3,800 ft.

References:

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PEACOCK CLAIM

Plate no. 4

Ownership and Location:

Alternate name(s):
Company name(s):
Adolph Ammann
Mineral survey(s):

Commodity: Copper, silver
Deposit type: Stringer BCO
Deposit model: Basaltic Cu

Location: Located at the 4,140 ft. elevation, southeast of the Mullen Prospect, on the east side of Copper Creek, a southern tributary of the Kotsina River.

Township: 002 S.
Quadrangle: Valdez C-1
Mining district: Chistochina
Alaska Kardex: None
ARDF no.: Unknown
MAS no.: 0020860193

Range: 007 E. ***Section:*** 25
Meridian: Copper River
Mineral status: Development prospect

Ahtna, Inc. selection: Not located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:
Claim staked by Adolph Ammann (Date unknown).

Historical operating data:
None reported.

Geologic setting:
Bedrock consists of Triassic Nikolai Greenstone overlain by Triassic Chitistone Limestone (Winkler and others, 1981) which strikes N. 40° W. and dips 25° southwest. Mineralized veinlets up to 1 in. thick containing pyrite, bornite, and minor chalcopyrite with surface malachite and azurite staining are noted in the area (Van Alstine and Black, 1967).

Recent investigations:

USGS/USBM/BLM work:
BLM
Located and sampled during 1997.

Adit open, driven N. 58° W. into the Nikolai Greenstone. The adit was sloughed-in at 34 ft. from the portal, were it pancaked out. The adit extends for another 30 to 50 ft. Rocks from the workings were used to build retaining walls outside the adit. No visible copper mineralization was noted in the adit or on the waste dump.

A grab sample (**AAWSE 10042**, map no. 36) collected of chalcopyrite, malachite, and

azurite that had been integrated, or placed, into the rock retaining wall outside the portal. The sample contained 3.1% copper, 4.8 ppm silver, and 77 ppb gold.
Latitude N 61° 40' 14.790"; Longitude W 144° 03' 39.530"; Elevation 4,120 ft.

References:

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PLATINUM CREEK

Plate no. 3

Ownership and Location:

Alternate name(s):
Company name(s):
Mineral survey(s):

Commodity: Platinum Group Metals
Deposit type: Placer
Deposit model: Placer

Location: Reported approximately 2 miles from the mouth of Platinum Creek, north of Gillam Lake.

Township: 008 N.
Quadrangle: Nabesna B-4
Mining district: Chisana
Alaska Kardex: None
ARDF no.: None
MAS no.: 0020780129

Range: 014 E. ***Section:*** 27
Meridian: Copper River
Mineral status: Raw prospect

Ahtna, Inc. selection: Located within Ahtna, Inc. selected lands.

Development and Location:

History and production:
None reported.

Historical operating data:
None reported.

Geologic setting:
Platinum Creek drains Permian volcanic and volcaniclastic rocks that are in fault contact with Permian and Triassic amygdaloidal basalts (Richter, 1971).

Recent investigations:

USGS/USBM/BLM work:
BLM
Not looked for in 1997.
Estimated location:
Latitude N 62° 27' 07"; Longitude W 142° 47' 42"; Elevation 2,450 ft.

References:

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PORCUPINE CREEK HEAD

Plate no. 4

Ownership and Location:

Alternate name(s):
Company name(s):
Mineral survey(s):

Commodity: Copper, gold
Deposit type: Contact deposit
Deposit model: Basaltic Cu

Location: Located at approximately the 3,940 ft. elevation at the headwaters along the west side of Porcupine Creek, a northern tributary of the Kuskulana River.

Township: 003 S.
Quadrangle: McCarthy C-8
Mining district: Chistochina
Alaska Kardex: KX 87-037
ARDF no.: None
MAS no.: 0020870041

Range: 009 E. *Section:* 05
Meridian: Copper River
Mineral status: Development prospect

Ahtna, Inc. selection: Located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:
1916 - Four claims staked by A.L. Barrett, Ed Young, and Jake Nafsted (KX 87-037).
1923 - Two tunnels driven, one just recently started (Moffit and Mertie, 1923).

Historical operating data:
Two short tunnels reported (Moffit and Mertie, 1923).

Geologic setting:
Bedrock consists of Triassic Nikolai Greenstone sheared with minute veinlets of malachite and minor chalcopyrite associated with the Jurassic Chitina Valley batholith (Moffit and Mertie, 1923; MacKevett and others, 1978).

Recent investigations:

USGS/USBM/BLM work:
BLM
Looked for but not located during 1997 and 1998.
Estimated location:
Latitude N 61° 38' 02"; Longitude W 143° 48' 57"; Elevation 3,940 ft.

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PORCUPINE CREEK MOUTH

Plate no. 4

Ownership and Location:

Alternate name(s):
Company name(s):
Mineral survey(s):

Commodity: Copper, gold
Deposit type: Contact deposit
Deposit model: Basaltic Cu

Location: Located at approximately the 3,780 ft. elevation near the mouth along the west side of Porcupine Creek, a northern tributary of the Kuskulana River.

Township: 003 S.
Quadrangle: McCarthy C-8
Mining district: Chistochina
Alaska Kardex: None
ARDF no.: None
MAS no.: 0020870050

Range: 009 E. *Section:* 09
Meridian: Copper River
Mineral status: Development prospect

Ahtna, Inc. selection: Located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:
1923 - Two tunnels driven (Moffit and Mertie, 1923).

Historical operating data:
Two tunnels, one caved and one driven 125 ft. with two short branches reported (Moffit and Mertie, 1923)

Geologic setting:
Bedrock consists of shattered Triassic Nikolai Greenstone stained with iron-oxide and cut by diorite dikes of the Jurassic Chitina Valley batholith (MacKevett and others, 1978). Outcrops show stringers of cavernous quartz containing pyrite and stained with iron-oxide and malachite, possibly derived from the chalcopyrite associated with the pyrite (Moffit and Mertie, 1923).

Recent investigations:

USGS/USBM/BLM work:
BLM
Looked for but not located in 1997.
Reported workings not located. Approximately 1,500 ft. above the reported location, an opencut was located and sampled. This may have been part of this property.
Estimated location:
Latitude N 61° 37' 00"; Longitude W 143° 46' 33"; Elevation 3,780 ft.

Opencut

Bedrock consists of Nikolai Greenstone. The opencut, 10 ft. long by 4 ft. wide and 3 ft. deep, driven N. 67° W., is located on the ridge southwest of the reported Porcupine Creek Mouth workings. The main ore vein is highly iron-oxide stained and contains sheared greenstone and quartz with blebs (up to 2 mm) of chalcopyrite and disseminated pyrite.

A select sample (**AAWSE 10053**, map no. 55) collected from a pile of mineralized material contained 1,757 ppm copper and 25 ppb gold.

Latitude N 61° 37' 03.542'; Longitude W 143° 47' 20.245"; Elevation 4,580 ft.

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RAMBLER MINE

Plate no. 3

Ownership and Location:

Alternate name(s):
Golden Eagle Group
Cliff Vein
Company name(s):
Nabesna Mining Corp.
Kirk Stanley
Mineral survey(s):

Commodity: Gold, copper, silver
Deposit type: Contact deposit
Deposit model: Fe Skarn (18d)

Location: Located at the 3,400 and 3,640 ft. elevations on the west-northwest side of White Mountain, approximately ½ mile north of the Nabesna Mine.

Township: 007 N.
Quadrangle: Nabesna B-5
Mining district: Chisana
Alaska Kardex: KX 78-003
ARDF no.: NB017
MAS no.: 0020780036

Range: 013 E. *Section:* 16
Meridian: Copper River
Mineral status: Past producer

Ahtna, Inc. selection: Located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:
19?? - Cliff vein located by Carl Whitham, development work done.
1946 - Development and mining being done by 14 men (Thomas, 1946).
1953 - One hundred eleven claims staked by Kirk Stanley, Howard Grey, Kenneth Hallback, and Howard McWilliams (KX 78-003).

Historical operating data:
Average value of the ore, as reported by Mr. Whitham, was $32 gold per ton (average of 14 samples was 0.91 oz. per ton). The highest assay was $85 per ton (2.42 oz. per ton gold) at $32.00 per fine ounce gold (Wayland, 1943). The mill had the capacity of running 20 tons of ore per day (Thomas, 1946).

Geologic setting:
The ore body is a gold-rich pyrrhotite-salite body in dolomite near a quartz-sericite-altered porphyry dike. Its spacial proximity to the Nabesna skarn allows for a genetic relationship. Due to the complex nature of the plutonic events in the area, the deposits may be of separate origins. Gold occurs independently of arsenic. (Newberry and others, 1997).
Massive gold-bearing pyrrhotite and pyrite in an ore body 52 ft. long by 19 ft. wide and 34 ft. high

trends northeastward. Coarsely crystalline pyrrhotite up to 2 in. in diameter, occurs along with pyrite, chalcopyrite, and marcasite. Wall rock is crystalline limestone with associated andesitic dikes with a few iron-stained vugular quartz crystals. The pyrrhotite alters to marcasite along limonite-stained fractures (Richter, 1997).

Possible sphalerite crystals were noted in the dike rock found in the waste dump (Meyer and Shepherd, 1998).

Reserves:

Published reserves include 0.02 to 0.3 million metric tons at 1 oz. per ton gold, 1 oz. per ton silver, 0.3% copper, 0.02% zinc, 0.05% arsenic, and 0.05% bismuth (Newberry and others, 1997).

Recent investigations:

USGS/USBM/BLM work:

BLM

Located two adits and collected one sample during 1997.

Workings include four buildings (assay, office, bunkhouse, and storage shed), an ore bunker, a metal-lined ore chute with a cabled ore car between the levels, generator, and numerous drill steel.

No. 1 Adit

Adit iced-in 20 ft. from portal. A chip sample (**AAWSE 10027**, map no. 18) collected across a 3-ft.-wide shear zone, above the adit at the 3,685 ft. elevation, contains pyrrhotite and chalcopyrite. A sample collected to get an idea of the mineral values at this location. The sample contained 3,301 ppm copper, 103.3 ppm silver, and 8.68 ppm gold.

Sample location:

Latitude N 62° 23' 03.079"; Longitude W 143° 00' 30.411"; Elevation 3,685 ft.

Adit location:

Latitude N 62° 23' 03.577"; Longitude W 143° 00' 29.438"; Elevation 3,640 ft.

No. 2 Adit

Adit open, unknown length. Adit changes direction 10 ft. from the portal and is iced-in.

No samples were collected. No visible copper mineralization was noted in the adit or in the waste dump.

Latitude N 62° 23' 07.028"; Longitude W 143° 00' 19.522"; Elevation 3,400 ft.

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ROARING CREEK

Plate no. 4

Ownership and Location:

Alternate name(s):
Astor Lode
Austin Lode
Camp 3
Emma Lode
Frisco Lode
Ideal Lode
Laurence Lode
Minnie Lode
Native Copper Lode
Prescott Lode
Reco Lode
Red Jacket Lode
Sunset Lode
Toledo Lode

Company name(s):
California-Alaska Mining and Development Co.

Mineral survey(s):
M.S. 952

Commodity: Copper
Deposit type: Stringer BCO
Deposit model: Basaltic Cu

Location: Located between the 5,250 and 5,450 ft. elevation on the west side of Roaring Creek, a southern tributary of the Kotsina River.

Township: 002 S.
Quadrangle: McCarthy C-8
Mining district: Chistochina
Alaska Kardex: KX 87-032
ARDF no.: MC037
MAS no.: 0020870061

Range: 009 E. ***Section:*** 18
Meridian: Copper River
Mineral status: Development prospect

Ahtna, Inc. selection: Not located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:
1907 - Claims staked by Adolph Ammann and Jack Nafsted (KX 87-032).
1914 - Prospecting and development work completed (Moffit, 1915).

Historical operating data:
Above Camp 3, the Camp 3 Tunnel was driven 50 ft. by the California-Alaska Mining and

Development Co. (Moffit and Maddren, 1908; Moffit and Maddren, 1909; Moffit and Mertie, 1923).

Geologic setting:

Bedrock consists of Triassic Nikolai Greenstone interbedded with Permian Hasen Creek Formation slaty beds and hard, fine-grained, cherty-looking beds intermingled with amygdaloidal flows (MacKevett and others, 1978). Workings driven into a gray and black mottled slate near a fault plane striking N. 20° W. Pyrite, chalcopyrite, bornite, native copper, and azurite occur in the calcite-quartz veins (Moffit and Maddren, 1908; Moffit and Maddren, 1909; Richter, 1998).

A 500- to 600-pound native copper nugget was found in slide rock in the gulch north of the Camp 3 Tunnel (Moffit and Maddren, 1908; Moffit and Maddren, 1909).

Recent investigations:

USGS/USBM/BLM work:

USBM

Site visit during 1977 (USBM field notes).

BLM

Located and sampled during 1998.

Camp 3 Tunnel - Adit No. 1

Adit caved, appears to have been driven S. 24° W. for an unknown length. Bedrock consists of highly iron-oxide stained and fractured Nikolai Greenstone. Native copper, chalcocite, bornite, malachite, and azurite occur in associated quartz and calcite veins.

A select sample (**AAWSE 10089**, map no. 46) collected of high grade mineralization from float to the right of the adit contained 23.02% copper, 3.6 ppm silver, and 43 ppb gold.

Sample location:

Latitude N 61° 41' 18.113"; Longitude W 143° 50' 31.087"; Elevation 5,290 ft.

Adit location:

Latitude N 61° 41' 17.805"; Longitude W 143° 50' 31.185"; Elevation 5,290 ft.

Upper opencut

Bedrock consists of highly iron-oxide stained and fractured Nikolai Greenstone. Native copper, chalcocite, bornite, malachite, and azurite occur in associated quartz and calcite veins.

A select sample (**AAWSE 10090**, map no. 46) collected of high grade mineralization from the opencut contained 14.48% copper, 23.4 ppm silver, and 23 ppb gold.

Latitude N 61° 41' 17.893"; Longitude W 143° 50' 33.355"; Elevation 5,450 ft.

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ROARING CREEK SOUTHEAST

Plate no. 4

Ownership and Location:

Alternate name(s):
Company name(s):
Mineral survey(s):

Commodity: Copper
Deposit type: Stringer BCO
Deposit model: Basaltic Cu

Location: Located at approximately the 4,750 ft. elevation on the east side near the head of Roaring Creek, a southern tributary of the Kotsina River.

Township: 002 S.
Quadrangle: McCarthy C-8
Mining district: Chistochina
Alaska Kardex: KX 87-032
ARDF no.: None
MAS no.: 0020870153

Range: 009 E. *Section:* 20
Meridian: Copper River
Mineral status: Development prospect

Ahtna, Inc. selection: Not located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:
1907 - Claims staked by Adolph Ammann and Jack Nafsted (KX 87-032).
1914 - Prospecting and development work completed (Moffit, 1915).

Historical operating data:
One tunnel reported (Moffit and Maddren, 1908; Moffit and Maddren, 1909).

Geologic setting:
Bedrock consists of the Triassic Nikolai Greenstone with native copper and the Permian Hasen Creek Formation sedimentary rocks (Moffit and Maddren, 1908; Moffit and Maddren, 1909; MacKevett and others, 1978). Pyrite, chalcopyrite, and bornite occur in small quantities (Moffit and Mertie, 1923).

Recent investigations:

USGS/USBM/BLM work:
BLM
Located from the air but not sampled during 1998.

Adit caved, located to the east of the toe of the glacier about 40 ft. above the lateral moraine. Due to time constraints and adverse conditions we were not able to collect GPS data and sample this location on the ground.

Estimated location:
Latitude N 61° 40' 32"; Longitude W 143° 49' 19"; Elevation 4,750 ft.

References:

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ROARING CREEK SOUTHWEST

Plate no. 4

Ownership and Location:

Alternate name(s):
Company name(s):
Great Northern Development Co.
Mineral survey(s):

Commodity: Copper
Deposit type: Stringer BCO
Deposit model: Basaltic Cu

Location: Located at the 4,600 ft. elevation on the west side of Roaring Creek just south of the western tributary. Roaring Creek is a southern tributary of the Kotsina River.

Township: 002 S.
Quadrangle: McCarthy C-8
Mining district: Chistochina
Alaska Kardex: KX 87-032 (Partial)
ARDF no.: None
MAS no.: 0020870154

Range: 009 E. *Section:* 20
Meridian: Copper River
Mineral status: Development prospect

Ahtna, Inc. selection: Not located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:
1907 - Claims staked by Adolph Ammann and Jack Nafsted (KX 87-032).
1914 - Prospecting and development work completed (Moffit, 1915).

Historical operating data:
One tunnel reported (Moffit and Maddren, 1908; Moffit and Maddren, 1909).

Geologic setting:
Bedrock consists of gray and black mottled shales of the Permian Hasen Creek Formation, near a fault plane separating the shales from the Triassic Nikolai Greenstone (MacKevett and others, 1978). The slate cleavage strikes N. 20° W. with a near vertical dip. The adit has been driven perpendicular to the cleavage strike. The rocks are iron-oxide stained, but contain no copper minerals (Moffit and Maddren, 1908; Moffit and Maddren, 1909).

Recent investigations:

USGS/USBM/BLM work:
BLM
Located from the air but not sampled during 1998.
Adit caved, driven into a Nikolai Greenstone cliff south of the western tributary. Due to time constraints we were not able to locate and sample this location on the ground.

Estimated location:
Latitude N 61° 40' 55"; Longitude W 143° 49' 57"; Elevation 4,600 ft.

References:

Bibliography:

Moffit, F.H., and Maddren, A.G., 1908, The mineral resources of the Kotsina and Chitina valleys, Copper River region, *in* Brooks, A.H., and others, Mineral resources of Alaska, report on progress of investigations in 1907: U.S. Geological Survey Bulletin 345, p. 139.

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ROCK CREEK MOLY

Plate no. 3

Ownership and Location:

Alternate name(s):
Todd Claims
Discovery Group
Rock Creek Moly 1-7
Bessie M Disc
Bessie M 1-6 E. Disc
Bessie 1 West
Company name(s):
Mineral survey(s):

Commodity: Molybdenum
Deposit type: Contact deposit
Deposit model: Polymetallic vein

Location: Located at the 5,170 ft. elevation in the ravine on the west side of Rock Creek at its headwaters. Rock Creek is a northern tributary of the Copper River.

Township: 010 N.
Quadrangle: Nabesna C-5
Mining district: Chistochina
Alaska Kardex: KX 78-011
ARDF no.: NB009
MAS no.: 0020780004

Range: 011 E. *Section:* 33
Meridian: Copper River
Mineral status: Development prospect

Ahtna, Inc. selection: Not located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:

1936 - Seven claims staked by L. DeWitt, David Vietti, Vern Horn, George Todd, and Carol Aldredge (KX 78-011).
- Six claims staked by George Todd, William Frame, Lawrence DeWitt, and Ben Horn (Smith, 1939a).

1937 - Development work included a camp, trail, and two opencuts (Smith, 1939a).
- Contract let in September to Kennecott Copper Corp. to drive a 150 ft. tunnel (Smith, 1939a). Tunnel started in winter of 1937 (Moffit, 1941).

1938- Tunnel driven by Ed Barrett under contract with the Kennecott Copper Co. and testing done. Results were disappointing and the work was discontinued (Smith, 1938; Smith, 1939b). Tunnel completed in summer (Moffit, 1941).

1956 - Dave Vietti and A. Carlquist visited their property (Jasper, 1956).

Historical operating data:
Two opencuts and a 170 ft. adit driven N. 13° W. reported (Moffit, 1954). A pegmatite dike was intersected at 165 ft. from the portal (Smith, 1938).

Geologic setting:

Bedrock consists of gniess rocks of the Jurassic-Triassic diorite complex cut by an alkali pegmatite dike, up to 2 ft. wide, containing molybdenite up to 1½ in. in diameter. The dike strikes N. 20° W., dipping 60° southwest, and is traceable for 70 feet. Molybdenite occurs as plates, lumps, and tiny veinlets and is irregularly distributed in the pegmatite (Moffit, 1954).

Recent investigations:

USGS/USBM/BLM work:

BLM

Located and sampled during 1997.

Adit open, partially sloughed, driven N. 13° W. for approximately 150 ft. into diorite.

A select sample (**AAWSE 10016**, map no. 13) collected of iron-stained basalt taken from the floor of the adit. The sample contained molybdenum and pyrite with biotite. The sample contained 3 ppm molybdenum and 27 ppm copper.

A select sample (**AAWSE 10017**, map. no. 13) was collected of a quartz diorite gniess with chalcopyrite and pyrite with chlorite and quartz from the waste dump. The sample contained 4 ppm molybdenum, 13 ppb gold, and 81 ppm copper.

A select sample (**AAWSE 10018**, map no. 13) was collected of a pink syenite gneiss containing pyrite with biotite and quartz from the waste dump. The sample contained 3 ppm molybdenum and 13 ppm copper.

Latitude N 62 35' 54.617"; Longitude W 143° 21' 20.739"; Elevation 5,170 ft.

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ROYAL DEVELOPMENT CO.

Plate no. 3

Ownership and Location:

Alternate name(s):
Glacier
Jacksina Creek
Monte Cristo
Nugget Block
Nugget Portal
Ramshorn Group
Stonehead Group

Commodity: Gold, copper
Deposit type: Contact deposit
Deposit model: Fe Skarn (18d)

Company name(s):
Nabesna Mining Corp.
Ptarmigan Co.
Royal Development Co.
Webb Co.

Owner:
Kirk Stanley
P.O. Box 200956
Anchorage, AK 99520

Mineral survey(s):
M.S. 1591

Patent number(s):
1079922

Location: Located between the 3,680 and 4,060 ft. elevations on the north side of Camp Creek on the south side of White Mountain, southwest of the Nabesna Mine.

Township: 007 N.
Quadrangle: Nabesna B-5
Mining district: Chisana
Alaska Kardex: KX 78-003
ARDF no.: NB015
MAS no.: 0020780009

Range: 013 E. *Section:* 20
Meridian: Copper River
Mineral status: Past producer
Patented

Ahtna, Inc. selection: Located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:
1889 - Prospectors panned colors of gold from the White Mountain cliffs (Wayland, 1943).
1903 - 1905 - A.J. Field and Paul Paulson located 28 claims (Wayland, 1943).
1906 - Royal Development Co. formed (Wayland, 1943).
1906 - Managers James Casey and J.L. Hanson brought in a 3-stamp mill (Wayland, 1943).
1907 - Mill operated, 60 tons of ore crushed, $30.00 per ton gold (Capps, 1915).

- Recovered $12.00 per ton free gold (Capps, 1915).

1907 - 1914 - Royal Development Co. continued assessment work (Wayland, 1943).
- Drove two tunnels totaling 130 ft. (Wayland, 1943).

1915 - Claims lapsed.
1924 - Claims relocated by Carl F. Whitham (Wayland, 1943).
1925 - Development and mining were concentrated at the Bear Vein (Nabesna Mine).
1935 - Patented as part of the Nabesna Mine on December 9.
1940 - Prospecting by the Nabesna Mining Corp. was reported to be promising (Smith, 1942c).
1941 - A 450 ft. tunnel was driven but stopped 150 ft. short of the ore zone (Moffit, 1944).
1980's - An extensive diamond drilling program conducted (Richter, 1997).

Historical operating data:

1906 - A 3-stamp mill reported (Wayland, 1943).
1941 - A 450 ft. tunnel reported (Moffit, 1944).

Three adits, the lowest adit at the 3,680 ft. elevation, the middle adit at the 3,950 ft. elevation, and the upper adit, the 250 ft. Level, at the 4,060 ft. elevation. The old millsite located below the adits at the 3,760 ft. elevation (Wayland, 1943). Underground workings totaled 130 ft. in length (Richter, 1997).

Geologic setting:

A gossan derived from the oxidation of a pyritized sheared Cretaceous diorite and the oxidation of the adjoining pyritized contact-metamorphosed Triassic (Nabesna?) limestone. Deposit trends N. 45° E., ranging from 4 to 15 ft. wide. Ore consists of iron-oxide stained cellular quartz carrying free gold (Moffit, 1909). Ore minerals include native gold, pyrite, chalcopyrite, cerussite, and anglesite. Gangue minerals include quartz, magnetite, and garnet (Richter, 1997).

Recent investigations:

USGS/USBM/BLM work:

BLM

A tour of the mill and assay buildings, the Nabesna townsite, and an overview of the mineralization of the mine were given by Kirk and Jack Stanley. John Devenport, an Ahtna, Inc. representative, was also present for the tour.

No samples were collected as per Kirk Stanley's request.

Lower adit

Estimated location:
Latitude N 62° 22' 14"; Longitude W 143° 01' 10"; Elevation 3,680 ft.

Middle adit

Estimated location:
Latitude N 62° 22' 16"; Longitude W 143° 01' 17"; Elevation 3,950 ft.

Upper adit - Nugget Portal - 250 ft. Level

Connects to the 250 ft. Level workings of the Nabesna Mine.
Estimated location:
Latitude N 62° 22' 18"; Longitude W 143° 01' 15"; Elevation 4,060 ft.

Millsite

Estimated location:

Latitude N 62° 22' 10"; Longitude W 143° 01' 28"; Elevation 3,760 ft.

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SILVER STAR MINE

Plate no. 4

Ownership and Location:

Alternate name(s):
Granite Mountain
Granite Mountain 1-69
Granite Peak
Louise Lode
Pandora Nos. 1-3
Rock Creek 2¼ mile
Silver Star Group
Silver Star Nos. 1-7, and 9-13
Vesna
Pandora Millsite
Silver Star Millsite

Company name(s):
Barry Brothers
Granite Mountain Mining Co.
Silver Star Mining Co.

Last owner:
Melvin Barry
323 W. Harvard Ave.
Anchorage, Alaska 99501

Mineral survey(s):
M.S. 2324
M.S. 2405

Commodity: Silver, copper, bismuth, antimony, lead, zinc
Deposit type: Stringer ATO
Deposit model: Polymetallic vein

Location: Two adits located at the 4,875 ft. and the 4,915 ft. elevations, west of Granite Peak, on the west side of Finnesand Creek, a northern tributary of the Kotsina River.

Township: 001 S.
Quadrangle: McCarthy C-8
Mining district: Chistochina
Alaska Kardex: KX 87-038
KX 87-132
ARDF no.: MC049
MAS no.: 0020870049

Range: 008 E. ***Section:*** 35
Meridian: Copper River
Mineral status: Past producer

Ahtna, Inc. selection: Located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:

1916 - Neil and Thomas Fennesend claim owners (Moffit and Mertie, 1923).

1963 - Claims staked by Neil Fennesand, Joseph Barry, R. Benson, and Douglas D. Kirk (KX 87-038).

1971 - Sixty-nine claims staked by Neil Fennesand, Warren Taylor, and Joseph Taylor (KX 87-132).

1982 - No production completed (Eakins and others, 1983).

1983 - Silver Star Mining Co. produced 24 tons of high grade silver-gold ore (Bundtzen and others, 1984).

1985 - Production completed (Bundtzen and others, 1985).

1986 - Failed to obtain approval from the NPS to operate (Bundtzen and others, 1987).

1988 - Mine in a standby status pending resolution of a lawsuit with NPS (Green and others, 1989).

1993 - Appeal dismissed/case closed.

Production:

Silver Star Mining Co. produced 24 tons of high grade silver-gold ore (Bundtzen and others, 1984).

Since 1979, 50 to 100 tons of hand-picked silver (tetrahedrite) ore mined (Bundtzen and others, 1982).

Reportedly produced 30,000 oz. silver during past mining seasons (Bundtzen and others, 1985).

Historical operating data:

Lower adit

The lower tunnel is 260 ft. long with two crosscuts. The tunnel was driven N. 20° W. for 170 ft. then branching out into one crosscut going N. 80° W. for 30 ft. and the other going 60 ft. in the general direction of the main entry. Tetrahedrite is the principal mineral (Moffit and Mertie, 1923).

Upper Adit

The upper tunnel driven 20 ft. starting in an opencut. Tunnel driven along a 30-in.-wide fault zone containing silver-bearing tetrahedrite, malachite, azurite, and galena (Moffit and Mertie, 1923).

Opencut

An opencut between the two tunnels following a vertical fault trending N. 10 to 20° W. (Moffit and Mertie, 1923).

Numerous opencuts along the north trending vein system (Moffit and Mertie, 1923).

Geologic setting:

Bedrock consists of the Triassic Nikolai Greenstone and the fine-grained basalts of the Jurassic Hasen Creek Formation to the east (MacKevett and others, 1978). The Jurassic granodiorite pluton (Chitina Valley pluton) that makes up Granite Mountain lies eastward (Moffit and Mertie, 1923). Mineralization associated with quartz occurs along joints and fissures in a shear zone which has been extensively faulted and crushed (Moffit, 1915).

Silver-bearing tetrahedrite, chalcopyrite, galena, sphalerite, and minor bismuthinite(?) occur in the quartz. Azurite and malachite are secondary minerals with the gangue consisting of quartz and barite. Assays of the tetrahedrite ore contain 0.08 to 2.4% silver (Moffit and Mertie, 1923; Richter, 1998).

Recent investigations:

USGS/USBM/BLM work:

USGS

Assays taken of the ore around 1916 reported values ranging from 25 to 700 oz. per ton silver and 1 to 32% copper (Moffit and Mertie, 1923).

BLM

Two adits and a small ore stockpile located and sampled during 1997. This area has had extensive stripping done by the Barry Brothers.

Lower Adit

Adit caved at the portal but appears that, with a little work, could be reopened. This adit is located 450 to 600 ft. west of the upper adit. Bedrock consists of Nikolai Greenstone. Bornite and chalcopyrite located in a quartz and calcite matrix.

A select sample (**AAWSE 10036**, map no. 31) collected outside the portal contained 513 ppm copper and 31.2 ppm silver.

Latitude N 61° 44' 17.936"; Longitude W 143° 54' 09.497"; Elevation 4,875 ft.

Upper Adit

Adit open, driven N. 75° E. for 50 ft. through sheared, iron-oxide stained Nikolai Greenstone. Adit driven along a 6-in.-wide shear zone which does not extend to the end of the adit. Bornite, chalcopyrite, chalcocite, arsenopyrite, malachite, and azurite occur along the shear zone with associated quartz.

A select sample (**AAWSE 10035**, map no. 31) collected from the waste dump contained 2.6% copper, 1,677.1 ppm silver, over 2,000 ppm antimony, 3,060 ppm zinc, 158 ppm lead, and 177 ppb gold.

Latitude N 61° 44' 18.825"; Longitude W 143° 54' 06.899"; Elevation 4,915 ft.

Ore Stockpile

Located an ore stockpile above the lower adit, along an opencut, along the road. Material consists of quartz and calcite containing veinlets and blebs of bornite, chalcopyrite, chalcocite, arsenopyrite, galena, malachite, and azurite.

A select sample (**AAWSE 10034**, map no. 31) collected from the stockpile contained 5,811 ppm copper, 618.4 ppm silver, over 2,000 ppm antimony, 989 ppm zinc, 404 ppm lead, and 20 ppb gold.

Latitude N 61° 44' 18.003"; Longitude W 143° 54' 13.259"; Elevation 4,955 ft.

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SKYSCRAPER

Plate no. 4

Ownership and Location:

Alternate name(s):
Castle
Morning Star
Skyscraper Group
Skyscraper 1-11
Snowshoe
Snowshoe Extension
West Skyscraper
Company name(s):
Kotsina Mining Co.
Mineral survey(s):

Commodity: Copper
Deposit type: Stringer CO
Deposit model: Basaltic Cu

Location: Located between the 5,000 and 5,100 ft. elevation on the west side of Skyscraper Peak, on the east side of Roaring Creek, a southern tributary of the Kotsina River.

Township: 002 S.
Quadrangle: McCarthy C-8
Mining district: Chistochina
Alaska Kardex: KX 87-032
KX 87-156
ARDF no.: MC038
MAS no.: 0020870060

Range: 009 E. *Section:* 17
Meridian: Copper River
Mineral status: Development prospect

Ahtna, Inc. selection: Not located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:
1907 - Six claims staked by Adolph Ammann and Jack Nafsted (KX 87-032).
- Prospecting and development work completed (Moffit and Maddren, 1908).
1914 - Assessment and development work completed (Moffit, 1915).
1923 - Claims lapsed.
1971 - Fifty-five claims staked in the area by Joseph Taylor (KX 87-156).

Historical operating data:
Several opencuts and short tunnels are reported (Moffit and Maddren, 1908), one consisting of a 100-ft.-long adit (Moffit, 1915) located on the Snowshoe claim (Moffit and Mertie, 1923). A second short adit is reportedly located on the West Skyscraper claim (Moffit and Mertie, 1923).

Geologic setting:

A Lenticular mass of chalcocite, 6 in. thick and 3 ft. long, cutting the rough, coarse-grained Triassic Nikolai Greenstone that is capped by Triassic Chitistone Limestone (Moffit and Maddren, 1908; MacKevett and others, 1978). The chalcocite also occurs as patches and lenses within the greenstone (Moffit and Maddren, 1908). Subordinate native copper (probable alteration of chalcocite) has been noted as rough, branching bodies on the Snowshoe Extension, Skyscraper, and Castle claims (Moffit and Mertie, 1923).

Recent investigations:

USGS/USBM/BLM work:

USBM

Site visit during 1977.

Located and sampled the southern N. 85° E. trending, 30-ft.-long adit, analysis results are unavailable (USBM field notes).

BLM

Located two adits and one opencut from the air but unable to sample in 1998.

Adit No. 1

Estimated location:

Latitude N 61° 41' 55"; Longitude W 143° 48' 17"; Elevation 5,000 ft.

Adit No. 2

Estimated location:

Latitude N 61° 42' 06"; Longitude W 143° 48' 08"; Elevation 5,100 ft.

Opencut

Estimated location:

Latitude N 61° 42' 17"; Longitude W 143°48' 05"; Elevation 5,100 ft.

Camp

Estimated location:

Latitude N 61° 42' 12"; Longitude W 143° 48' 25"; Elevation 4,200 ft.

Resources:

USBM

A rough estimate of 2,000,000 tons ore with 2% copper was made in 1977 (USBM field notes).

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SKYSCRAPER PEAK WEST

Plate no. 4

Ownership and Location:

Alternate name(s):
Arctic Chief Lode
Copper King Lode
Gem Lode
Hercules Lode
Mineral King Lode

Company name(s):
California-Alaska Mining and Development Co.

Mineral survey(s):
M.S. 953

Commodity: Copper
Deposit type: Stringer BCO
Deposit model: Basaltic Cu

Location: Located at the 4,700 ft. elevation on the north side of the western tributary of Roaring Creek, a southern tributary of the Kotsina River.

Township: 002 S.
Quadrangle: McCarthy C-8
Mining district: Chistochina
Alaska Kardex: KX 87-156
ARDF no.: None
MAS no.: 0020870155

Range: 009 E. ***Section:*** 17
Meridian: Copper River
Mineral status: Development prospect

Ahtna, Inc. selection: Not located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:
1907 - Claims staked by the California-Alaska Mining and Development Co. (M.S. 953).
1911 - Mineral Survey 953 surveyed July 28-31 by Frederick Butterworth (M.S. 953).
1971 - Fifty-five claims staked in the area (KX 86-156).

Historical operating data:
1911 - Five reported tunnels (M.S. 953).

Geologic setting:
Bedrock consists of Triassic Nikolai Greenstone with thin 1/8-in.-wide quartz veins and epidote overlain by Triassic Chitistone Limestone. Chalcocite, bornite, chalcopyrite, and native copper occur in the area (Moffit and Mertie, 1923; MacKevett and others, 1978).

Recent investigations:

USGS/USBM/BLM work:

BLM

Located and sampled during 1998.

Adit open, driven N. 4° E. for 40 ft. At 20 ft. from the portal, the adit is sloughed. Bedrock consists of Nikolai Greenstone and brecciated, amygdaloidal basalts with thin ⅛-in.-wide quartz, calcite, and epidote veins. A 0- to 6-in.-wide shear zone cuts perpendicular to the adit at the portal. No visible copper mineralization was noted at this location.

A grab sample (**AAWSE 10091**, map no. 47) collected of material that fell from the roof of the adit at 20 ft. contained 196 ppm copper.

Sample location:

Latitude N 61° 41' 25.393"; Longitude W 143° 48' 06.158"; Elevation 4,790 ft.

Adit location:

Latitude N 61° 41' 26.417"; Longitude W 143° 48' 06.340"; Elevation 4,790 ft.

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SQUAW CREEK

Plate no. 4

Ownership and Location:

Alternate name(s):
Company name(s):
Mineral survey(s):

Commodity: Copper, silver
Deposit type: Stringer BCO
Deposit model: Unknown

Location: Located at approximately the 3,400 ft. elevation on the west side of the mouth of Squaw Creek, a northern tributary of the Kuskulana River.

Township: 003 S.
Quadrangle: McCarthy C-8
Mining district: Chistochina
Alaska Kardex: None
ARDF no.: MC030
MAS no.: 0020870158

Range: 008 E. *Section:* 35
Meridian: Copper River
Mineral status: Development prospect

Ahtna, Inc. selection: Located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:
Unknown.

Historical operating data:
None reported.

Geologic setting:
Bedrock consists of Triassic Nikolai Greenstones cut by an altered fault zone containing bornite bearing veins up to 1 in. thick. Area capped by Triassic Chitistone Limestone (MacKevett and others, 1978). A sample collected by the USGS contained >20,000 ppm copper, 200 ppm silver, and 7 ppm molybdenum (MacKevett, 1976).

Recent investigations:

USGS/USBM/BLM work:
BLM
Located from the air but unable to sample during 1998.
Located what appears to be an open adit hidden behind alder bushes at the base of a cliff. The cliff is located on the lower part of the mountain. This adit is extremely difficult to get to. Would most likely need ropes to reach the workings.
Estimated location:
Latitude N 61° 33' 56"; Longitude W 143° 53' 49"; Elevation 3,400 ft.

References:

Bibliography:

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STRELNA CREEK

Plate no. 4

Ownership and Location:

Alternate name(s):
Company name(s):
Mineral survey(s):

Commodity: Copper
Deposit type: Stringer BCO
Deposit model: Basaltic Cu

Location: Located at approximately the 3,650 ft. elevation of Strelna Creek, a northern tributary of the Kuskulana River. Located on the southeast side of the Elliott Creek pass.

Township: 003 S.
Quadrangle: McCarthy C-8
Mining district: Chistochina
Alaska Kardex: KX 87-030
ARDF no.: MC031
MAS no.: 0020870062

Range: 008 E. *Section:* 09
Meridian: Copper River
Mineral status: Exploration prospect

Ahtna, Inc. selection: Located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:
1901 - Claims staked (KX 87-030).

Historical operating data:
Prospecting pit cut along an altered fault zone in the Triassic Nikolai Greenstone (U.S. Bureau of Mines, 1978).

Geologic setting:
Bedrock consists of faulted Triassic Chitistone Limestone and Triassic Nikolai Greenstone (MacKevett and others, 1978) with a 40-ft.-wide mineralized zone occurring along the contact. Bornite, chalcopyrite, and native copper associated with the contact (Schrader and Spencer, 1901). A 6- to 8-ft.-wide fault in the greenstone contained pyrite and shows malachite staining (Moffit and Maddren, 1908).

Recent investigations:

USGS/USBM/BLM work:
BLM
Looked for but not located during 1997.
Estimated location:
Latitude N 61° 37' 14"; Longitude W 143° 58' 54"; Elevation 3,650 ft.

References:

Bibliography:

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SUNRISE

Plate no. 4

Ownership and Location:

Alternate name(s):
Fall Creek
Kluvesna Creek
Trail Creek
Company name(s):
Mineral survey(s):

Commodity: Copper, gold, silver
Deposit type: Stringer BB-C
Deposit model: Basaltic Cu

Location: Located at the 4,310 ft. elevation on the north side of Trail Creek, a western tributary of Fall Creek, a northwestern tributary of the Kotsina River.

Township: 001 S.
Quadrangle: McCarthy D-8
Mining district: Chistochina
Alaska Kardex: KX 87-032 (Partial)
ARDF no.: None
MAS no.: 0020870156

Range: 008 E. ***Section:*** 10
Meridian: Copper River
Mineral status: Development prospect

Ahtna, Inc. selection: Located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:
1907 - Staked by Adolph Ammann and Jack Nafsted (KX 87-32).
- Prospecting and development work done (Moffit and Maddren, 1908; Moffit and Maddren, 1909).

Historical operating data:
One short tunnel reported (Moffit and Maddren, 1908; Moffit and Maddren, 1909; Moffit and Mertie, 1923).

Geologic setting:
A vertical north-south fault in amygdaloidal Triassic Nikolai Greenstone cut by small light-colored, fine-grained, porphyritic Tertiary dikes containing quartz veins along with associated bornite. Native copper is present in outcrop (Moffit and Maddren, 1909; Moffit and Mertie, 1923; MacKevett, 1978).

Recent investigations:

USGS/USBM/BLM work:
BLM
Looked for but not located during 1997.
Looked for and possibly located. Samples collected in the area in 1998.

Opencut No. 1

Directly below the Homestake adit, along the south side of the creek, there appears to be a possible opencut.

No samples were collected. No visible copper mineralization was noted at this location.

Estimated location:

Latitude N 61° 47' 34.610"; Longitude W 143° 56' 10.733"; Elevation 4,270 ft.

Opencut No. 2

Further down the stream on the north side of the creek, an outcrop of malachite stained Nikolai Greenstone was located 40 ft. above the creek level. Area appears to be an opencut. Disseminated bornite, chalcocite, and malachite occur with the quartz.

A select sample (**AAWSE 10086**, map no. 25) collected across a 4 ft. wide section of the outcrop contained 2.77% copper, 8.9 ppm silver, and 10 ppb gold.

Latitude N 61° 47' 34.191"; Longitude W 143° 55' 57.940"; Elevation 4,090 ft.

References:

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SUNSET

Plate no. 4

Ownership and Location:

Alternate name(s):
Fall Creek
Kluvesna Creek
Flim Flam Gulch
Flimflam Gulch
Company name(s):
Adolph Ammann
Mineral survey(s):

Commodity: Copper, gold, silver
Deposit type: Stringer BB-C
Deposit model: Basaltic Cu

Location: Located at the 4,050 ft. elevation on the south and north side of Flim Flam Gulch, a western tributary of Fall Creek, a northwestern tributary of the Kotsina River.

Township: 001 S.
Quadrangle: McCarthy D-8
Mining district: Chistochina
Alaska Kardex: KX 87-032 (Partial)
ARDF no.: None
MAS no.: 0020870157

Range: 008 E. ***Section:*** 10
Meridian: Copper River
Mineral status: Development prospect

Ahtna, Inc. selection: Located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:
1907 - Staked by Adolph Ammann and Jack Nafsted (KX 87-32).
- Prospecting and development work done (Moffit and Maddren, 1908; Moffit and Maddren, 1909).

Historical operating data:
One short tunnel reported (Moffit and Maddren, 1908; Moffit and Maddren, 1909; Moffit and Mertie, 1923).

Geologic setting:
Small fractured veins of quartz and calcite along a north-south fault within crushed amygdaloidal Triassic Nikolai Greenstone. Malachite stains the surface exposures of the greenstone with azurite and malachite are present in fractures. Cuprite is also present as well as a black, carbonaceous, copper-bearing material (stephanite?) between the blocks of greenstone (Moffit and Maddren, 1908; Moffit and Maddren, 1909; Moffit and Mertie, 1923; MacKevett, 1978).

Recent investigations:

USGS/USBM/BLM work:

BLM

Looked for but not located during 1997.

Located and sampled one adit and one opencut in 1998.

Adit

Adit caved, though with some minor digging could be reopened. The adit is located on the south side of the creek at creek level. It appears to have been driven S. 38° W. for an unknown length, along a 2-ft.-wide shear zone. Bedrock consists of sheared Nikolai Greenstone with quartz and calcite veining. Native copper, bornite, and malachite occur in the shear zone. The black carbonaceous material (stephanite?) noted by Moffit and Mertie was found with the copper mineralization.

A select sample (**AAWSE 10098**, map no. 26) collected across the 2-ft.-wide shear zone above the adit contained 9.56% copper, 32.4 ppm silver, and 6 ppb gold.

Sample location:

Latitude N 61° 47' 39.471"; Longitude W 143° 55' 40.449"; Elevation 4,140 ft.

Adit location:

Latitude N 61° 47' 39.490"; Longitude W 143° 55' 40.296"; Elevation 4,140 ft.

Opencut

The opencut is located on the north side of the creek, at creek level, just upstream from the adit. Bedrock consists of sheared Nikolai Greenstone. The 2-ft.-wide shear zone has a strike of S. 40° E., with a vertical dip. The opencut, driven along the shear zone, is 15 ft. long by 7 ft. wide and 5 ft. deep, and is filled with water. Disseminated chalcopyrite, pyrite, and malachite occur along the shear zone with associated quartz.

A grab sample (**AAWSE 10099**, map no. 26) collected from the 2-ft.-wide shear zone contained 5,732 ppm copper and 3.2 ppm silver.

Sample location:

Latitude N 61° 47' 41.229"; Longitude W 143° 55' 41.015"; Elevation 4,160 ft.

Opencut location:

Latitude N 61° 47' 41.203"; Longitude W 143° 55' 40.887"; Elevation 4,170 ft.

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SURPRISE CREEK

Plate no. 4

Ownership and Location:

Alternate name(s):
Nerelna Creek
Company name(s):
Mineral survey(s):

Commodity: Copper
Deposit type: Stringer P-CO
Deposit model: Basaltic Cu

Location: Located at approximately the 3,390 ft. elevation on the east side of Surprise Creek, a southern tributary of Nerelna Creek. Nerelna Creek is a southern tributary of the Chitina River.

Township: 005 S.
Range: 006 E.
Section: 36
Quadrangle: Valdez B-1
Meridian: Copper River
Mining district: Nizina
Mineral status: Development prospect
Alaska Kardex: KX 86-136
ARDF no.: Unknown
MAS no.: 0020860191

Ahtna, Inc. selection: Located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:
1911 - A short tunnel has been driven (Moffit, 1914).

Historical operating data:
One short tunnel reported (Moffit, 1912a).

Geologic setting:
Bedrock consists of a shattered zone of Skolai Group (Winkler and others, 1981) greenstone associated with schist and highly altered siliceous thin-bedded limestone. The fractures in the zone are veined with intergrowths of quartz and epidote. Ore mineralization includes chalcopyrite, pyrite, chrysocolla, chalcocite, and bornite disseminated through the greenstone (Moffit, 1912a).

Recent investigations:

USGS/USBM/BLM work:
BLM
Looked for but not located during 1997.
Estimated location:
Latitude N 61° 23' 50"; Longitude W 144° 14' 47"; Elevation 3,390 ft.

References:

Bibliography:

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Meyer, M.P., and Shepherd, A.D., 1998, Mineral assessment of Ahtna, Inc. selections in the Wrangell-St. Elias National Park and Preserve, Alaska. 1997 preliminary report: U.S. Bureau of Land Management Open File Report 71, p. 15, 147-148.

SURPRISE/SUNSHINE

Plate no. 4

Ownership and Location:

Alternate name(s):
Surprise Creek Group
Company name(s):
Alaska-Kotsina Copper Co.
Mineral survey(s):

Commodity: Copper, silver, gold
Deposit type: Stringer BCO
Deposit model: Basaltic Cu

Location: Located above the 5,500 ft. elevation at the head of a gulch on the north side of the valley between Surprise and Sunshine Creeks. Surprise Creek is a northern tributary of the Kotsina River.

Township: 001 S.
Quadrangle: McCarthy D-8
Mining district: Chistochina
Alaska Kardex: KX 87-043
KX 87-156
ARDF no.: MC048
MAS no.: 0020870051

Range: 009 E. *Section:* 29
Meridian: Copper River
Mineral status: Development prospect

Ahtna, Inc. selection: Not located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:

1900 - Five claims staked by the Alaska-Kotsina Copper Co. The Drake, Grenig, Hubbard, Laddie, and Sheehan claims (KX 87-043).

1907 - Development work carried out by the Alaska-Kotsina Copper Co. Tunnel started on the Hubbard claim. Several opencuts made during the previous years (Moffit, 1910).

1915 - Three claims were renamed; the Hubbard to Joe Dandy, the Laddie to True Blue, and the Sheehan to George M. (Moffit and Mertie, 1923).

Historical operating data:

Several opencuts and a tunnel reported (Moffit, 1915).

Principal Tunnel

A 135-ft.-long adit driven on the Joe Dandy claim in an unknown direction. Workings ended before reaching the copper-bearing fractures (Moffit and Mertie, 1923).

Opencuts

Two opencuts expose the vein on the Joe Dandy claim. The first opencut exposes a 4- to 8-ft.-wide white quartz vein carrying chalcocite, bornite, and pyrite. The second opencut (200 ft. northeast of the first) is along the strike of the fault, and is 40 ft. long and 25 ft. deep. The quartz vein is the same vein exposed in the lower cut. However, it is represented by many smaller lenticular veins with a maximum thickness of 12 in. (Moffit and Mertie, 1923).

Geologic setting:

Surprise Creek roughly follows the contact between the Triassic Nikolai Greenstone and an intrusive Jurassic granodiorite pluton (Chitina Valley batholith). The claims are located along a well-defined fault zone within the greenstone which trends generally northeast, dipping northwest, and traceable for over a mile. The fault zone, ranging in thickness from 2 to over 8 ft., contains several zones of displacement or minor faults. The minor faults contain fissures and joints filled with the copper-bearing minerals and quartz. The quartz appears in veins and lenses ranging from 12 in. to over 8 ft. thick. Chalcocite, bornite, chalcopyrite, and minor pyrite are found as lenses and irregular shaped masses. The quartz and copper were deposited before the movement on the fault stopped, as indicated by crushed vein material and slickenslides on both sides of the veins (Moffit, 1915; MacKevett, 1978).

Tin has been reported in the diorite mass (Moffit and Mertie, 1923). Samples collected in 1902 contained no tin mineralization (Mendenhall, 1905).

Recent investigations:

USGS/USBM/BLM work:

BLM

Located and sampled one adit and two opencuts during 1998.

Adit

Adit open, driven N. 42° E. for approximately 135 ft. into Nikolai Greenstone containing 4-in.-wide quartz veins. At 50 ft. from the portal, the adit crosses a 1-ft.-wide shear zone and is partially sloughed in at this point. At 75 ft. from the portal, an ore car is located with four cases and six sticks of dynamite located just beyond the ore car. No copper mineralization was noted in the adit or on the waste dump.

No samples were collected. No visible copper minerals were noted.

Latitude N 61° 45' 06.224"; Longitude W 143° 48' 23.982"; Elevation 5,550 ft.

Opencut No. 1

Opencut No. 1 is located directly above the adit. Driven in Nikolai Greenstone cutting a dark red, 2-ft.-thick quartz vein. The opencut is 4 ft. wide by 20 ft. long and 20 ft. deep, driven N. 50° W. The quartz vein strikes N. 60° W., dipping steeply southwest. Bornite, chalcocite, chalcopyrite, pyrite, malachite, and azurite occur as pods and disseminations throughout the quartz.

A grab sample (**AAWSE 10093**, map no. 29) collected across the quartz vein contained 1.32% copper, 0.7 ppm silver, and 227 ppb gold.

A select sample (**AAWSE 10093A**, map no. 29) collected of the high-grade minerals contained 20.27% copper, 6.6 ppm silver, and 2,938 ppb gold.

Latitude N 61° 45' 07.382"; Longitude W 143° 48' 24.057"; Elevation 5,640 ft.

Opencut No. 2

Opencut No. 2 is located approximately 60 ft. west of Opencut No. 1. Driven in Nikolai Greenstone cutting a white 4- to 5-ft.-wide, iron-oxide stained, quartz vein striking N. 70° E. with a vertical dip. The opencut is 12 ft. wide by 15 ft. deep and 10 ft. high at the face. The western quartz vein is more iron-oxide stained than the eastern quartz vein. Bornite, chalcocite, malachite, and azurite occur in the quartz vein.

A select sample (**AAWSE 10094**, map no. 29) collected of quartz from the waste dump contained 6,797 ppm copper, 2.1 ppm silver, and 66 ppm gold.

Sample location:
Latitude N 61° 45' 06.646"; Longitude W 143° 48' 26.493"; Elevation 5,630 ft.

Opencut location:
Latitude N 61° 45' 06.662"; Longitude W 143° 48' 26.486"; Elevation 5,630 ft.

References:

Bibliography:

Mendenhall, W.C., 1905, Geology of the central Copper River region, Alaska: U.S. Geological Survey Professional Paper 41, p. 123.

Moffit, F.H., and Maddren, A.G., 1908, The mineral resources of the Kotsina and Chitina valleys, Copper River region, *in* Brooks, A.H., and others, Mineral resources of Alaska, report on progress of investigations in 1907: U.S. Geological Survey Bulletin 345, p. 141-142.

Moffit, F.H., and Maddren, A.G., 1909, Mineral resources of the Kotsina-Chitina region, Alaska: U.S. Geological Survey Bulletin 374, p. 59-60.

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Moffit, F.H., 1915, Mineral deposits of the Kotsina-Kuskulana district, with notes on mining in Chitina valley, *in* Brooks, A.H., and others, Mineral resources of Alaska, report on progress of investigations in 1914: U.S. Geological Survey Bulletin 622, p. 110.

Moffit, F.H., and Mertie, J.B., Jr., 1923, The Kotsina-Kuskulana district, Alaska: U.S. Geological Survey Bulletin 745, p. 89, 108-110.

Berg, H.C., and Cobb, E.H., 1967, Metalliferous lode deposits of Alaska: U.S. Geological Survey Bulletin 1246, p. 44.

MacKevett, E.M., Jr., and Cobb, E.H., 1972, Metallic mineral resources map of the McCarthy quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-395.

MacKevett, E.M., Jr., 1976, Mineral deposits and occurrences in the McCarthy quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-773B, no. 173.

MacKevett, E.M., Jr., and Holloway, C.D., 1977, Table describing metalliferous and selected nonmetalliferous mineral deposits in eastern southern Alaska: U.S. Geological Survey Open-File Report 77-169A, p. 35, no. 109.

MacKevett, E.M., Jr., 1978, Geologic map of the McCarthy quadrangle, Alaska: U.S. Geological Survey Miscellaneous Geological Investigations Map I-1032.

MacKevett, E.M., Jr., Smith, J.G., Jones, D.L., and Winkler, G.R., 1978, Geologic map of the McCarthy C-8 quadrangle, Alaska: U.S. Geological Survey Geologic Quadrangle Map GQ-1418, no. 4.

Cobb, E.H., and MacKevett, E.M., Jr., 1980, Summaries of data on and lists of references to metallic and selected mineral deposits in the McCarthy quadrangle, Alaska: U.S. Geological Survey Open-File Report 80-885, p. 83.

Richter, D.H., 1998, Alaska resource data file - McCarthy quadrangle: U.S. Geological Survey Open-File Report 98-227, p. 64-65.

Meyer, M.P., and VandeWeg, D.A., 1999, Mineral assessment of Ahtna, Inc. selections in the Wrangell-St. Elias National Park and Preserve, Alaska. 1998 preliminary report: U.S. Bureau of Land Management Open File Report 73, p. 1-2, 6, 10, 12, 14, 17, 19, 21, 28-30, 150-152.

TRAIL CREEK

Plate no. 3

Ownership and Location:

Alternate name(s):
Company name(s):
Mineral survey(s):

Commodity: Gold
Deposit type: Placer
Deposit model: Placer

Location: Located at the 4,750 ft. elevation of the northeastern tributary of Trail Creek headwaters, southwestern Noyes Mountain.

Township: 010 N.
Quadrangle: Nabesna C-5
Mining district: Tok
Alaska Kardex: None
ARDF no.: NB011
MAS no.: 0020780052

Range: 012 E. ***Section:*** 30
Meridian: Copper River
Mineral status: Raw prospect

Ahtna, Inc. selection: Located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:

1931 - Located and staked by N.P. Nelson and E.G. LaBell (Moffit, 1941).
- Prospecting carried out during the winter (Moffit, 1941).

Historical operating data:

None reported.

Geologic setting:

Trail Creek headwaters drain the folded and faulted Triassic Nikolai Greenstone overlain by Triassic massive and thin-bedded limestones and Jurassic argillites that are intruded by Tertiary dikes and sills of hornblende-plagioclase porphyry (Richter and Schmoll, 1973). The stream gravels are derived from these rocks. The source of the gold has not been located (Moffit, 1941).

Recent investigations:

USGS/USBM/BLM work:

BLM

Looked for but not located, streams in the drainage sampled during 1997.

No placer workings were identified on the ground during the 1997 field season. The entire creek was examined from the air to look for any signs of placer workings. There has been reported prospecting in the past, but this may have been confused with the workings on Caribou Creek. Three samples were collected in the drainage with very minor gold recovery.

Samples AAWSE 10029 and AAWSE 10030 were collected in the main drainage above and below the northeast tributary, respectively, and sample AAWSE 10031 was collected in the northeast tributary below the Trail Creek shear.

Sample **AAWSE 10029** (map no. 8). A 1/10 cubic yard of material processed through a mini sluicebox. Float consists of basalt diabase, greenstones, and limestones. Four to five fine specks of gold were noted (½ to 1 mm in size) in the concentrates. Lab analysis showed the sample concentrates to contain 4,321 ppb gold and 69 ppm copper.
Latitude N 62° 36' 31.269"; Longitude W 143° 15' 53.990"; Elevation 4,185 ft.

Sample **AAWSE 10030** (map no. 1). A 1/10 cubic yard of material processed through a mini sluicebox. Float consists of basalt diabase with no limestone present. Recovered two small specks of gold. Lab analysis showed the sample concentrates to contain 1,144 ppb gold and 68 ppm copper.
Latitude N 62° 37' 52.411"; Longitude W 143° 16' 17.473"; Elevation 4,535 ft.

Sample **AAWSE 10031** (map no. 3) was taken from Trail Creek. A 1/10 cubic yard of material processed through a mini sluicebox. A fair amount of clay was encountered. Very little black sands and no garnet was present. Recovered two specks of gold. Lab analysis showed the sample concentrates to contain 3,122 ppb gold, 0.3 ppm silver, and 73 ppm copper.
Latitude N 62° 37' 18.058"; Longitude W 143° 14' 45.160"; Elevation 4,470 ft.

References:

Bibliography:

Moffit, F.H., 1941, Geology of the upper Tetling River district, Alaska: U.S. Geological Survey Bulletin 917-B, p. 154-155.

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Richter, D.H., and Schmoll, H.R., 1973, Geologic map of the Nabesna C-5 quadrangle, Alaska: U.S. Geological Survey Geologic Quadrangle Map GQ-1062.

Richter, D.H., 1976, Geologic map of the Nabesna quadrangle, Alaska: U.S. Geological Survey Miscellaneous Investigations Series Map I-932.

Richter, D.H., 1997, Alaska resource data file - Nabesna quadrangle: U.S. Geological Survey Open-File Report 97-749, p. 16.

Meyer, M.P., and Shepherd, A.D., 1998, Mineral assessment of Ahtna, Inc. selections in the Wrangell-St. Elias National Park and Preserve, Alaska. 1997 preliminary report: U.S. Bureau of Land Management Open File Report 71, p. 10, 13, 149-150.

TRAIL CREEK CIRQUE

Plate no. 3

Ownership and Location:

Alternate name(s):
Unnamed occurrence
Company name(s):
Mineral survey(s):

Commodity: Copper, lead, silver
Deposit type: Stringer P-CO
Deposit model: Polymetallic vein

Location: Reported at approximately the 6,000 ft. elevation on the south side of a cirque along the east side of Trail Creek.

Township: 010 N.
Quadrangle: Nabesna C-5
Mining district: Tok
Alaska Kardex: None
ARDF no.: None
MAS no.: 0020780005

Range: 012 E. ***Section:*** 30
Meridian: Copper River
Mineral status: Raw prospect

Ahtna, Inc. selection: Not located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:
None reported.

Historical operating data:
None reported.

Geologic setting:
Bedrock in the area consists of folded and faulted Triassic Nikolai Greenstone overlain by Triassic massive- and thin-bedded limestones intruded by Tertiary or Cretaceous augite-hornblende diorite and plagioclase porphyry (Richter and Schmoll, 1973).

Recent investigations:

USGS/USBM/BLM work:
BLM
Looked for but not located during 1997.

A massive boulder, 12 in. in diameter, of massive pyrite and minor chalcopyrite with associated quartz veins was located on the south side of the cirque along a medial moraine. The source of the boulder was not located but appears to have come from the south side of the mountain above its resting place. The area is too steep and dangerous to climb to find the source.

A select sample (**AAWSE 10021**, map no. 4) collected from the boulder contained 1,037 ppm copper, 0.9 ppm silver, and 17 ppb gold.
Latitude N 62° 37' 04.857"; Longitude W 143° 13' 32.991"; Elevation 5,400 ft.
A 30-ft.-thick shear zone west of the boulder is made up of a 10- to 12-ft.- thick bed of shale overlain by a 30-ft.-thick bed of horndblendite at the 5,360 ft. elevation.
A random chip sample (**AAWSE 10020**, map no. 4) collected from the shale contained 42 ppm copper.
Latitude N 62° 37' 02.809"; Longitude W 143° 13' 41.690"; Elevation 5,345 ft.

References:

Bibliography:

Richter, D.H., and Matson, N.A., Jr., 1972, Metallic mineral resources map of the Nabesna quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-422.

Richter, D.H., and Schmoll, H.R., 1973, Geologic map of the Nabesna C-5 quadrangle, Alaska: U.S. Geological Survey Geologic Quadrangle Map GQ-1062.

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TRAIL CREEK CIRQUE NORTH

Plate no. 3

Ownership and Location:

Alternate name(s):
Unnamed occurrence
Company name(s):
Mineral survey(s):

Commodity: Copper, lead, silver
Deposit type: Stringer P-CO
Deposit model: Polymetallic vein

Location: Located at approximately the 6,000 ft. elevation on the north side of a cirque on the north side of a northeastern tributary of Trail Creek.

Township: 010 N.
Quadrangle: Nabesna C-5
Mining district: Tok
Alaska Kardex: None
ARDF no.: NB012
MAS no.: 0020780134

Range: 012 E. ***Section:*** 30
Meridian: Copper River
Mineral status: Exploration prospect

Ahtna, Inc. selection: Not located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:
None reported.

Historical operating data:
Surface workings reported (Richter, 1997).

Geologic setting:
Bedrock consists of a small Cretaceous - Tertiary diorite porphyry stock intruding thin-bedded Triassic limestone. Galena, sphalerite, and tetrahedrite occur in small quartz carbonate veins along the border zones of the intrusion (Richter, 1997).

Recent investigations:

USGS/USBM/BLM work:
BLM
Looked for but not located during 1997.
Estimated location:
Latitude N 62° 36' 53"; Longitude W 143° 13' 51"; Elevation 6,000 ft.

References:

Bibliography:

Richter, D.H., and Schmoll, H.R., 1973, Geologic map of the Nabesna C-5 quadrangle, Alaska: U.S. Geological Survey Geologic Quadrangle Map GQ-1062, no 2.

Richter, D.H., and Singer, D.A., 1975, Mineral resources map of the Nabesna quadrangle, Alaska: U.S. Geological Survey Geologic Quadrangle Map MF-655K, no 8.

Richter, D.H., 1976, Geologic map of the Nabesna quadrangle, Alaska: U.S. Geological Survey Miscellaneous Investigations Series Map I-932.

Richter, D.H., 1997, Alaska resource data file - Nabesna quadrangle: U.S. Geological Survey Open-File Report 97-749, p. 17.

TRAIL CREEK SHEAR

Plate no. 3

Ownership and Location:

Alternate name(s):
Company name(s):
Mineral survey(s):

Commodity: Copper
Deposit type: Stringer P-CO
Deposit model: Basaltic Cu

Location: Located at the 4,620 ft. elevation along the south side of the cirque in a northeastern tributary of Trail Creek.

Township: 010 N.
Quadrangle: Nabesna C-5
Mining district: Tok
Alaska Kardex: None
ARDF no.: None
MAS no.: 0020780133

Range: 012 E. ***Section:*** 30
Meridian: Copper River
Mineral status: Raw prospect

Ahtna, Inc. selection: Not located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:
None reported.

Historical operating data:
None reported.

Geologic setting:
Bedrock consists of Jurassic argillite intruded by dikes and sill of hornblende-plagioclase porphyry (Richter and Schmoll, 1973).

Recent investigations:

USGS/USBM/BLM work:
BLM
Located and sampled during 1997.

Bedrock consists of highly sheared and weathered argillites intruded by mineralized basaltic dikes and parallel shear zones. This area is cut by the stream and extended for approximately ¼ mile.

A grab sample (**AAWSE 10010**, map no. 2) was collected from a 16-in.-wide mineralized trachyte dike containing disseminated pyrite, chalcopyrite, and minor bornite along with epidote gangue. The sample contained 123 ppm copper and 1,177 ppm manganese. Latitude N 62° 37' 22.454"; Longitude W 143° 14' 22.832"; Elevation 4,670 ft.

A select sample (**AAWSE 10011**, map no. 2) was collected from an iron-oxide stained 12-in.-wide basaltic dike striking N. 38° W. and dipping 73° south. Pyrite and chalcopyrite occur along fracture planes as well as disseminated in quartz and epidote in the dike. The sample contained 40 ppm copper and 1,453 ppm manganese.
Latitude N 62° 37' 22.885"; Longitude W 143° 14' 20.517"; Elevation 4,670 ft.

A select sample (**AAWSE 10012**, map no. 2) was collected from a 1- to 2-in.-wide shear zone containing pyrite and chalcopyrite with quartz veins trending parallel to the dike. The sample contained 21 ppm copper, 0.5 ppm silver, 80 ppb gold, and 3,457 ppm manganese.
Latitude N 62° 37' 22.885"; Longitude W 143° 14' 20.517"; Elevation 4,670 ft.

A select sample (**AAWSE 10013**, map no. 2) was taken of the argillite, between samples AAWSE 10010 and AAWSE 10012, to obtain general background levels. Disseminated and veinlets of pyrite and chalcopyrite occurred along fractures. The sample contained 135 ppm copper, 14 ppb gold, and 1,186 ppm manganese.
Latitude N 62° 37' 22.885"; Longitude W 143° 14' 20.517"; Elevation 4,670 ft.

References:

Bibliography:

Moffit, F.H., 1941, Geology of the upper Tetling River district, Alaska: U.S. Geological Survey Bulletin 917-B, p. 154-155.

Richter, D.H., and Schmoll, H.R., 1973, Geologic map of the Nabesna C-5 quadrangle, Alaska: U.S. Geological Survey Geologic Quadrangle Map GQ-1062.

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UNNAMED OCCURRENCE 1

Plate no. 3

Ownership and Location:

Alternate name(s):
Company name(s):
Mineral survey(s):

Commodity: Copper
Deposit type: Stringer P-CO
Deposit model: Unknown

Location: Reported at approximately the 3,200 ft. elevation along a tributary of Jack Creek, on the south side of Devils Mountain.

Township: 007 N.
Quadrangle: Nabesna B-4
Mining district: Chisana
Alaska Kardex: None
ARDF no.: None
MAS no.: 0020780008

Range: 013 E. ***Section:*** 02
Meridian: Copper River
Mineral status: Raw prospect

Ahtna, Inc. selection: Located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:
None reported.

Historical operating data:
None reported.

Geologic setting:
Bedrock in the area consists of Permian volcanic and volcaniclastic rocks intruded by Cretaceous or Tertiary diorites (Richter, 1971). Boulders, up to 3 ft. by 5 ft. by 3 ft., of massive pyrrhotite and chalcopyrite in a matrix of actinolite and garnet located in local glacial deposits (Richter and Matson, 1969).

Recent investigations:

USGS/USBM/BLM work:
USGS
Stream geochemical survey had four samples containing 70 ppm copper (Richter and Matson, 1969).
BLM
Not looked for in 1997.
Estimated location:
Latitude N 62° 25' 00"; Longitude W 142° 56' 35"; Elevation 3,200 ft.

References:

Bibliography:

Richter, D.H., and Matson, N.A., Jr., 1969, Geochemical data from the Nabesna B-4 quadrangle, Alaska: U.S. Geological Survey Open-File Report 69-224 (366), 8 p.

Richter, D.H., and Matson, N.A., Jr., 1972, Metallic mineral resources map of the Nabesna quadrangle, Alaska: U.S. Geological Survey Miscellaneous Field Studies Map MF-422.

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Meyer, M.P., and Shepherd, A.D., 1998, Mineral assessment of Ahtna, Inc. selections in the Wrangell-St. Elias National Park and Preserve, Alaska. 1997 preliminary report: U.S. Bureau of Land Management Open File Report 71, p. 13, 155.

UNNAMED OCCURRENCE 2

Plate no. 3

Ownership and Location:

Alternate name(s):
Company name(s):
Mineral survey(s):

Commodity: Gold, lead, zinc
Deposit type: Stringer P-CO
Deposit model: Carbonate-host Au-Ag

Location: Reported at approximately the 3,400 ft. elevation of an eastern tributary of Notat Creek.

Township: 010 N.
Quadrangle: Nabesna C-5
Mining district: Chistochina
Alaska Kardex: KX 78-024
ARDF no.: None
MAS no.: 0020780081

Range: 010 E. *Section:* 27
Meridian: Copper River
Mineral status: Development prospect

Ahtna, Inc. selection: Located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:
1938 - One claim staked (KX 78-024).
1942 - A caved adit located (Moffit, 1954).

Historical operating data:
1942 - Adit driven N. 65° E. for unknown length, now caved (Moffit, 1954).

Geologic setting:
Bedrock in the area consists of faulted Permian and Pennsylvanian Tetelna volcanics in contact with a Jurassic and Triassic diorite gniess complex (Richter, 1976). An 8-ft.-thick trachyte dike, striking N. 55° W. and dipping 45° northeast, cuts the diorite gneiss complex. Stringers of quartz, calcite, pyrite, galena, and sphalerite, ¼ to 2 in. thick, form a 6- to 12-in.-wide vein zone (Moffit, 1954). Gold content of veins unknown (Moffit, 1954).

Recent investigations:

USGS/USBM/BLM work:
BLM
Looked for but not located in 1997.
No evidence of workings or mineralization located in the drainage. This property reference may be the property located in the middle fork of Caribou Creek.
Estimated location:
Latitude N 62° 37' 00"; Longitude W 143° 30' 00"; Elevation 3,400 ft.

References:

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VICKI

Plate no. 3

Ownership and Location:

Alternate name(s):
Vicki # I
Vince # I-II
Company name(s):
Mineral survey(s):

Commodity: Gold
Deposit type: Placer
Deposit model: Placer

Location: Reported near the mouth of Rock Creek, a tributary of Caribou Creek.

Township: 009 N.
Quadrangle: Nabesna C-5
Mining district: Chistochina
Alaska Kardex: KX 87-092
ARDF no.: None
MAS no.: 0020780080

Range: 010 E.
Section: 14
Meridian: Copper River
Mineral status: Exploration prospect

Ahtna, Inc. selection: Not located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:
1971 - Three claims staked by Vincent Coan (KX 78-092).

Historical operating data:
None reported.

Geologic setting:
Rock Creek headwaters drain Permian volcanic and volcaniclastic rocks, some of which have been hornfelsed and dioritized, and Permian limestones. These are in contact with a Permian and Triassic diorite gniess complex and all have been intruded by Tertiary dikes and sills of a hornblende-plagioclase porphyry (Richter and Schmoll, 1973).

Recent investigations:

USGS/USBM/BLM work:
BLM
Not looked for in 1997.
Estimated location:
Latitude N 62° 34' 00"; Longitude W 143° 29' 00"; Elevation 3,000 ft.

References:

Bibliography:

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Richter, D.H., 1976, Geologic map of the Nabesna quadrangle, Alaska: U.S. Geological Survey Miscellaneous Investigations Series Map I-932.

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WAR EAGLE

Plate no. 4

Ownership and Location:

Alternate name(s):
Agnus MacDougall
Apex Lode
Boden Lode
Byron Lode
Climax Lode
Crystalight Lode
Dalton Lode
Globe Lode
Gopher Lode
Highball Lode
Hilltop Lode
Humboldt Lode
Phoenix Lode
Tiptop Lode
Transport Lode
Big Foot Creek
MacDougall Creek

Company name(s):
Chitina-Kuskulana Copper Co.
Theo. F. Van Wagen

Mineral survey(s):
M.S. 873 A&B

Commodity: Copper, iron
Deposit type: Contact deposit
Deposit model: Cu skarn (18b)

Patent number(s):
300956

Location: Located at the 3,570 ft. elevation on the west side of MacDougall Creek (also named Bigfoot Creek), a southern tributary of the Kuskulana River.

Township: 003 S.
Quadrangle: McCarthy C-8
Mining district: Chistochina
Alaska Kardex: KX 87-046a
KX 87-048
ARDF no.: MC025
MAS no.: 0020870057

Range: 009 E.
Section: 34
Meridian: Copper River
Mineral status: Development prospect
Patented

Ahtna, Inc. selection: Not located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:

1909 - Twenty-one claims (5 mill sites and 16 lode claims) staked by Agnus MacDougall (KX 87-046).

1912 - Patented November 19, 289.0905 acres.

1919 - Development work done (Van Alstine and Black, 1946).

Historical operating data:

A 104-ft.-long adit driven in a south-southeasterly direction (Van Alstine and Black, 1946).

Geologic setting:

MacDougall Creek is made up of Triassic Chitistone Limestone and marble intruded by small masses of magnetite and diopside adjacent to a Jurassic granodiorite pluton (Chitina Valley batholith) and overlain by the Cretaceous Berg Creek Formation conglomerates and the Kuskulana Pass Formation sedimentary rocks (MacKevett and others, 1978; Richter, 1998).

A tunnel is driven south-southwesterly in the white, silicified Chitistone Limestone which is broken by numerous joints and slips. An 8- to 12-in.-thick mineralized dike contains pyrite and chalcopyrite and is malachite stained (Moffit and Mertie, 1923). Richter (1998) mentions a mineralized zone 24 ft. thick. The copper minerals are contact-metamorphic minerals from the intrusion of the diorite. Magnetite bodies are exposed between the tunnel and base of the conglomerate (Moffit and Mertie, 1923). Pyrite, pyrrhotite, chalcopyrite, epidote, chlorite, calcite, and quartz occur in diopside rock (Berg and Cobb, 1967).

Recent investigations:

USGS/USBM/BLM work:

USGS

An assay of the diopside contained 62.07% iron and up to 1,000 ppm Cu (Berg and Cobb, 1967; Richter, 1998).

BLM

Located and sampled during 1997.

Adit caved, appears to have been driven N. 12° W. for an unknown length. Chalcopyrite, minor bornite, and disseminated pyrite occur in the dike. All the collapsed buildings of the middle camp are located 200 ft. below the adit.

A select sample (**AAWSE 10061**, map no. 57) collected from the waste dump contained over 10% iron, 876 ppm copper, 0.8 ppm silver, and 42 ppb gold.

Latitude N 61° 33' 32.068"; Longitude W 143° 44' 36.985"; Elevation 3,550 ft.

Resources:

USGS

1967 - Less than 10,000 tons of 62.07% iron and 1,000 ppm copper (Berg and Cobb, 1967; Richter, 1998).

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Moffit, F.H., 1915, Mineral deposits of the Kotsina-Kuskulana district, with notes on mining in Chitina valley, *in* Brooks, A.H., and others, Mineral resources of Alaska, report on progress of investigations in 1914: U.S. Geological Survey Bulletin 622, p. 114.

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Newberry, R.J., 1995, An update on skarn deposits of Alaska: Alaska Division of Geological and Geophysical Surveys Public-Data File 95-20, p. 6.

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WARNER

Plate no. 4

Ownership and Location:

Alternate name(s):
Galena-Nikolai Holding
McClellan Lode
Warner Lode
Warner Prospect

Company name(s):
Chittyna Exploration Co.
Nikolai Mining Co.

Owner:
Daryl Reindle
P.O. Box 101048
Anchorage, AK 99510

Mineral survey(s):
M.S. 547

Commodity: Copper, silver
Deposit type: Stringer BCO
Deposit model: Basaltic Cu (23)

Mineral certificate(s):
00000005

Location: Located at the 2,320 ft. elevation on the west side of the lower part of Rock Creek, a southern tributary of the Kotsina River.

Township: 002 S.
Quadrangle: McCarthy C-8
Mining district: Chistochina
Alaska Kardex: KX 87-031
ARDF no.: MC044
MAS no.: 0020870055

Range: 008 E. *Section:* 09
Meridian: Copper River
Mineral status: Development prospect
Patented

Ahtna, Inc. selection: Not located within Ahtna, Inc. selected lands.

Development and Geology:

History and production:
1899 - Warner and McClellan Lodes claims were located on July 9, by the Chittyna Exploration Co., and recorded on September 4 (M.S. 547).
1901 - Mineral Survey 547 surveyed, August 14-18, for the Chittyna Exploration Co. Claims include the McClellan and Warner Lodes (M.S. 547).
1904 - Two claims staked by John H. Huber (KX 87-031).
1907 - Patented (Moffit and Maddren, 1908).
1922 - Development work done (Moffit and Mertie, 1923).

Historical operating data:
In 1901 Mineral Survey 547 reported a discovery shaft, 4 ft. by 6 ft., 12 ft. deep; an opencut, 20 ft. by 50 ft., 60 ft. deep; a tunnel, 4 ft. x 7 ft., 22 ft. long; a crosscut, 12 ft. by 15 ft., 15 ft. deep; and

another crosscut, 5 ft. by 20 ft.

Stripping - a 25 ft. by 40 ft. area (Mendenhall and Schrader, 1903).

A 25 ft. adit driven S. 35° W. (Moffit and Mertie, 1923).

Geologic setting:

Bedrock consists of the Triassic Nikolai Greenstone in contact with the overlying Triassic Chitistone Limestone (MacKevett and others, 1978). A 3- to 3½-ft.-wide crushed quartz-calcite fault zone trending S. 35° W. is stained with malachite and contains small irregular bodies of bornite and chalcopyrite scattered along the fault. The 25-ft.-long adit was driven along the fault zone (Moffit and Mertie, 1923).

Recent investigations:

USGS/USBM/BLM work:

BLM

Located and sampled during 1998.

Adit open, driven S. 72° E. for 30 ft. Driven into iron-oxide stained Nikolai Greenstone along a 2-ft.-wide shear zone. Portal cribbed for first 10 ft. The adit is located 20 ft. above the west side of the creek bed. Disseminated bornite and malachite occurs within the quartz and calcite veins.

Noted two metal bed frames and one gray wooden box left in the adit.

This property was not located properly on the BLM Master Title Plat (MTP).

A select sample (**AAWSE 10070**, map no. 33) collected from the shear zone contained 3.46% copper, 3.8 ppm silver, and 16 ppb gold.

Sample location:

Latitude N 61° 42' 31.701"; Longitude W 143° 57' 40.356"; Elevation 2,320 ft.

Adit location:

Latitude N 61° 42' 31.731"; Longitude W 143° 57' 40.373"; Elevation 2,320 ft.

References:

Bibliography:

Schrader, F.C., and Spencer, A.C., 1901, The geology and mineral resources of a portion of the Copper River district, Alaska: U.S. Geological Survey Special Publication 5, p. 85.

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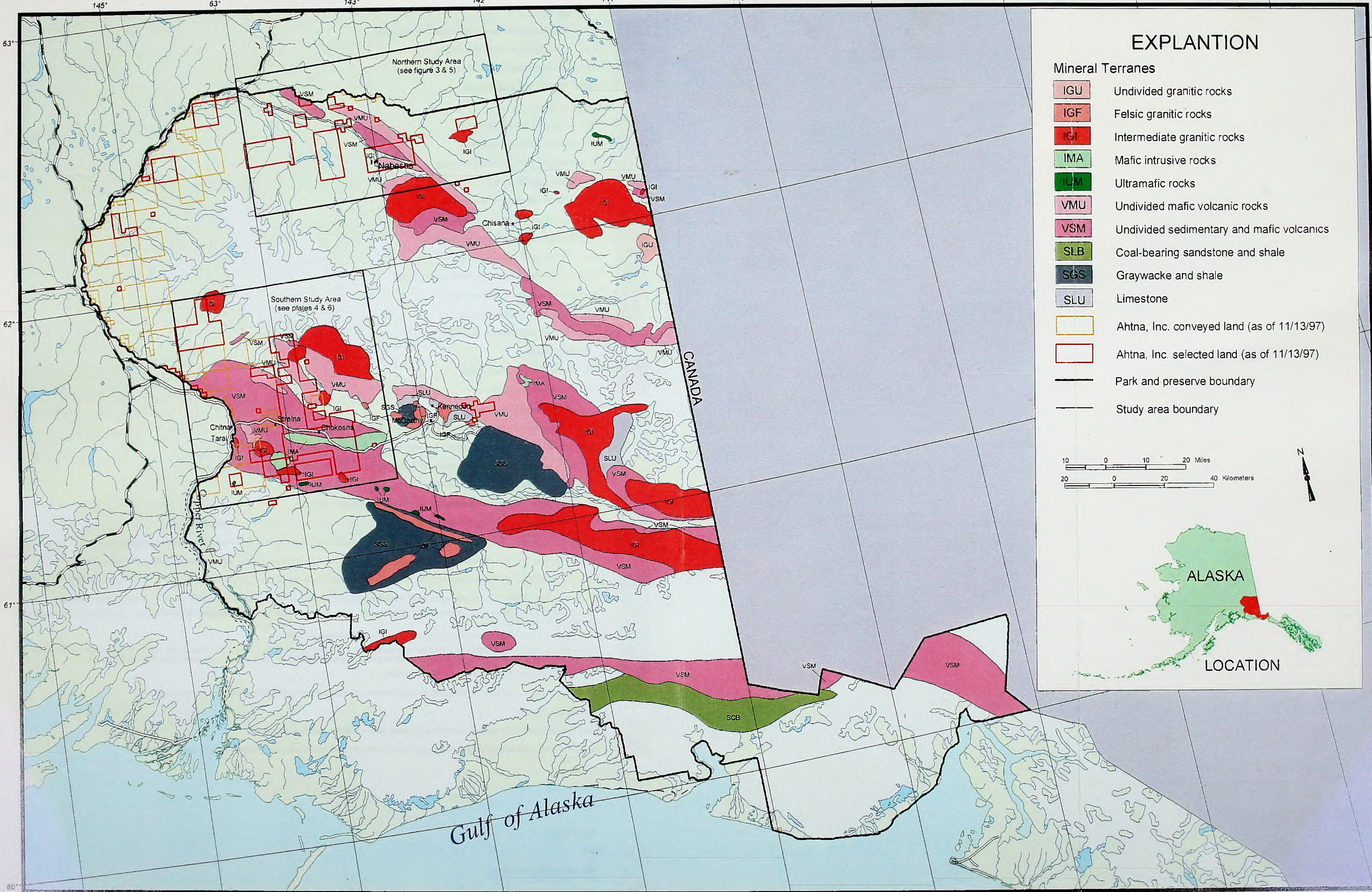


PLATE 1. - Location map of the Wrangell-St. Elias National Park and Preserve showing mineral terranes.

EXPLANATION

Volcanic Rocks

QTvi — Quaternary and/or Tertiary intermediate volcanic rocks.

lTvm — Lower Tertary mafic volcanic volcanic rocks.

KJvm — Cretaceous and Jurassic mafic volcanic rocks.

Trvm — Triassic mafic volcanic rocks.

Intrusive Rocks

Tif — Tertiary felsic intrusive rocks.

Kif — Cretaceous felsic intrusive rocks.

Kii — Cretaceous intermediate intrusive rocks.

Ki — Cretaceous undifferentiated intrusive rocks.

Jii — Jurassic intermediate intrusive rocks.

JTrii — Jurassic and/or Triassic intermediate intrusive rocks.

Pif — Pennsylvanian intermediate intrusive rocks.

Pim — Pennsylvanian mafic intusive rocks.

uPzim — Upper Paleozoic mafic intrusive rocks.

Sii — Silurian intermediate intrusive rocks.

Pzim — Paleozoic mafic intrusive rocks.

Pzi — Paleozoic intermediate intrusive rocks.

Ultramafic Rocks

PPu — Pennsylvanian ultramafic rocks.

Pzu — Paleozoic ultramafic rocks.

Stratified Sedimentary Sequence

Qh — Holocene deposits. Alluvial, glacial, lake, swamp, landslide, and flood plain deposits.

Qp — Pliestocene deposits. Alluvial, glacial, dune sand, loess, and reworked sand and silt deposits.

uT — Upper Tertiary rocks. Sandstone siltstone, shale, mudstone, and conglomerate of Miocene and Pliocene age.

mT — Middle Tertiary rocks. Siltstone, sandstone, organic shale, and locally volcanic rocks.

lT — Lower Tertiary rocks. Continental clastic rocks of Palecene and Eocene age.

K — Cretaceous rocks. Shelf deposits of sandstone, siltstone, shale, and limestone of the Kennicott and Chititu Formations.

lK — Lower Cretaceous rocks. Interlayed submarine and subaerial andesitic fragmental volcanic detritus, and interbedded mafic volcanic rocks.

KJ1 — Cretaceous and Upper Jurassic rocks. Graywacke, slate, argillite, minor conglomerate, volcanic detritus, and interbedded mafic volcanic rocks.

KJ2 — Lower Cretaceous and Upper Jurassic rocks. Shallow and deep water clastic deposits (Oxfordian to Barremian) north of the Wrangell Mountains.

J — Jurassic rocks. Shale, siltstone, and sandstone of the Nizina Mountain Formation and the Kotsina Conglomerate along the southern Wrangell Mountains.

JTr — Jurassic and/or Triassic rocks. Limestone with minor dolomite, shale, and chert of the Chitistone Limestone, Nizina Limestone, and the McCarthy Formation along the southern Wrangell Mountains.

TrP — Triassic and Permian rocks. Mafic volcanic rocks, limestone, and calcareous argillite.

PPP — Permian and Pennsylvanian rocks. Basaltic to andesitic lavas and derivative volcaniclatic rocks, tuffs, minor gabbro, and local shallow-water sedimentary rocks metamorphosed to greenshist facies, and locally, amphilbolite facies. Includes the Skolai Group, Strelna Formation (Permian), and Tetelna Volcanics.

Pz — Paleozoice rocks. Marble in places containing tremolite.

D — Paleozoic rocks. Pyroclastic rocks and ash flows interbedded with sedimentary rocks metamorphosed to schist and gniess.

Continental Deposits

Tmc — Miocene continental deposits. Sandstone, siltstone, shale, claystone, and conglomerate.

TKc — Tertiary and Cretaceous continental deposits. Conglomerate, breccia, sandstone, arkose, mudstone, shale, and tuffaceous rocks.

Other

Water

Ice

Map symbols

Fault

Fault, dotted where concealed

Park and preserve boundary

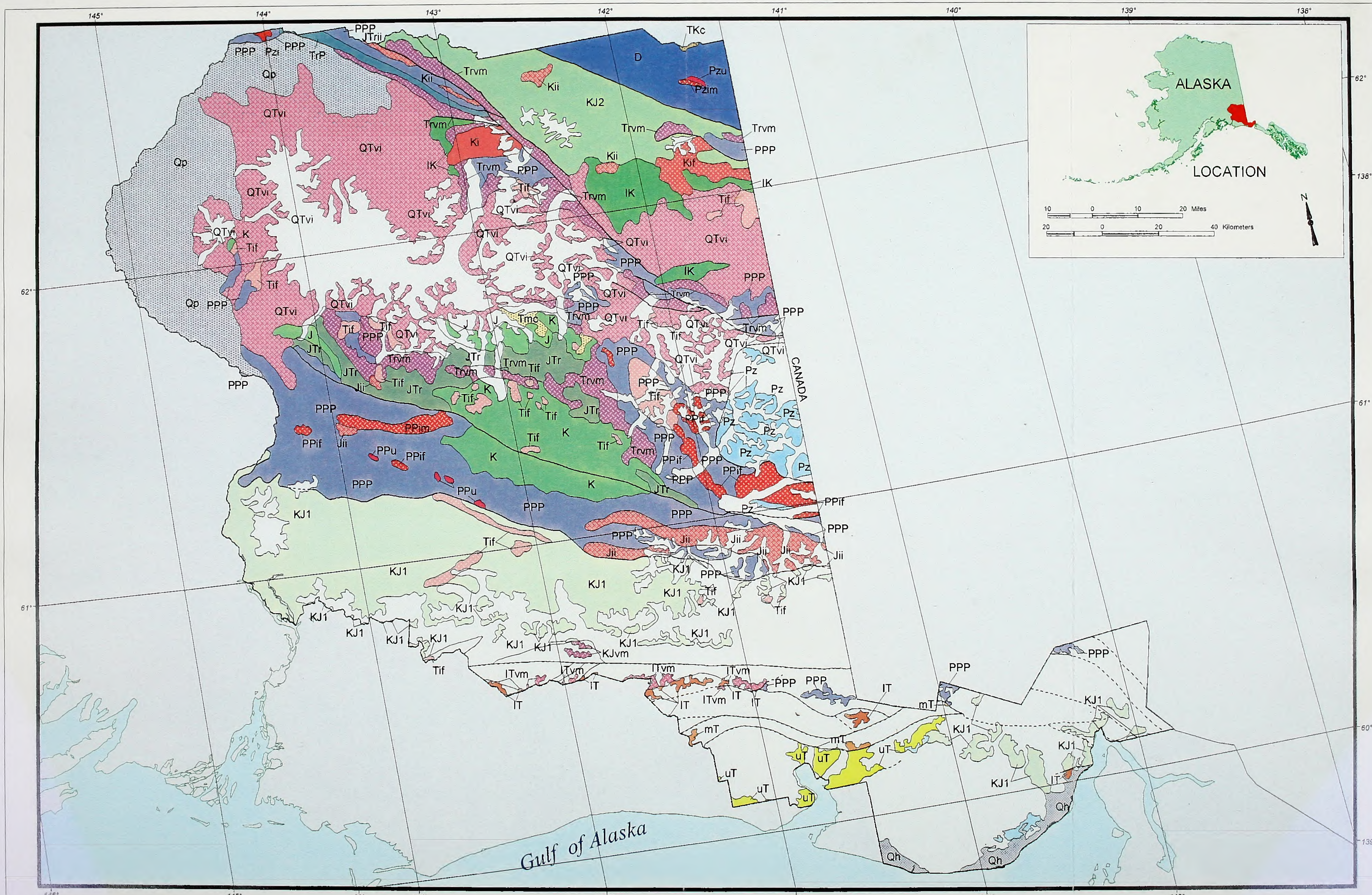
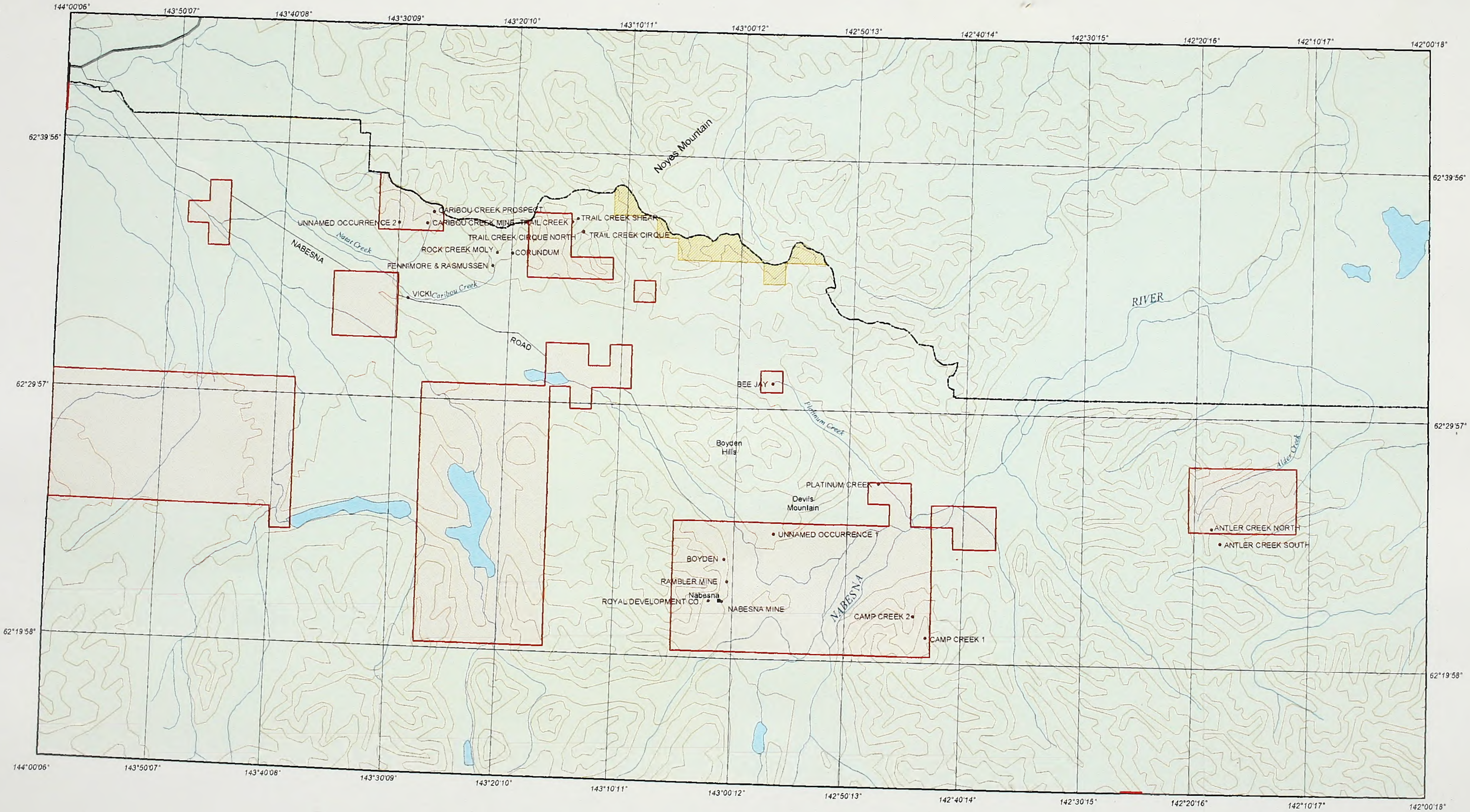


PLATE 2. - Geologic map of the Wrangell-St. Elias National Park and Preserve.
(adapted from Geologic Map of Alaska by Helen M. Beikman - 1980)



LEGEND

- Property location
- Ahtna, Inc. conveyed lands (as of 11/13/97)
- Ahtna, Inc. selected lands (as of 11/13/97)
- Town / village
- Park and preserve boundary

LOCATION MAP

Plate 3. Property location map of the northern study area Wrangell-St. Elias National Park and Preserve

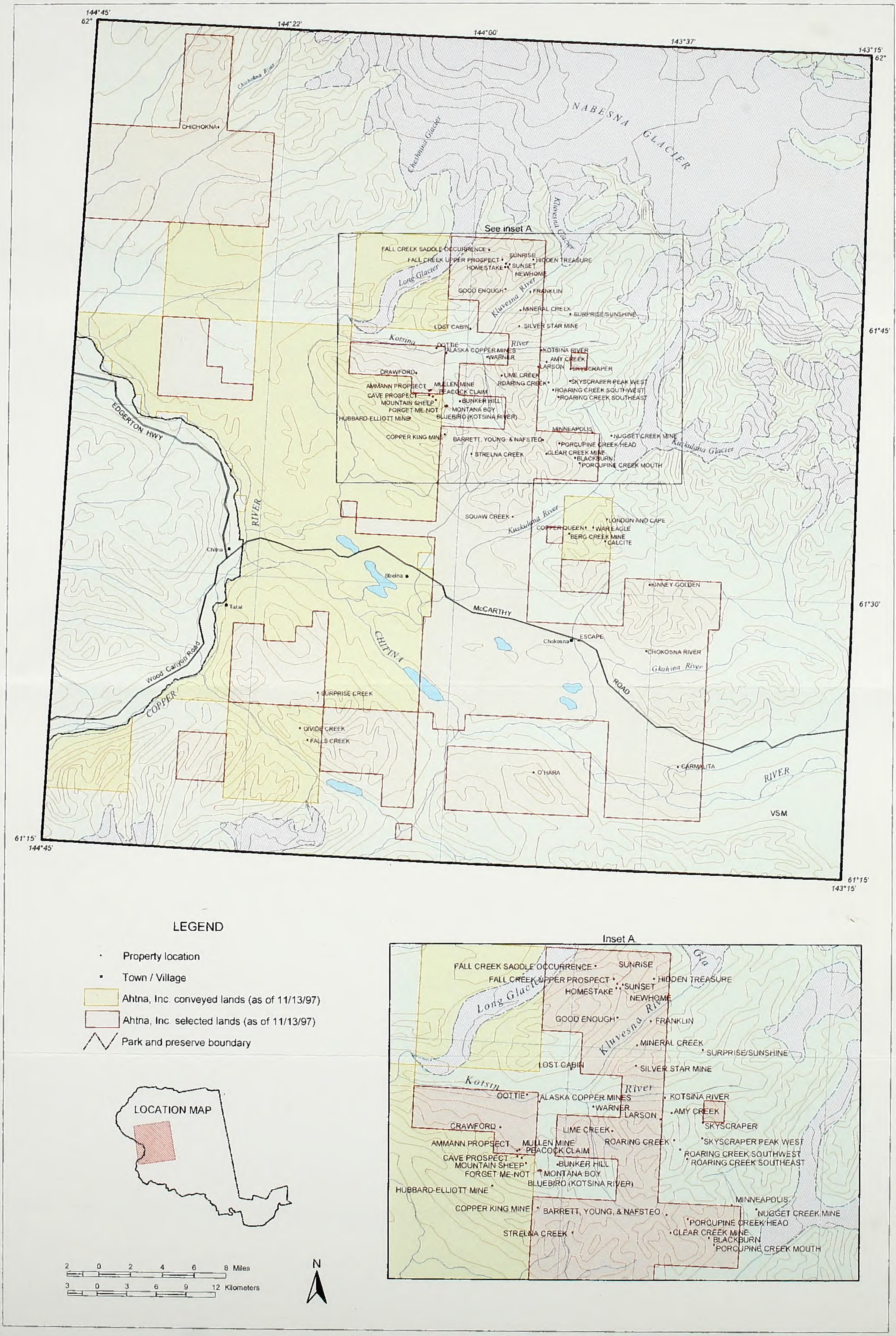


Plate 4. - Property location map of the southern study area Wrangell-St. Elias National Park and Preserve

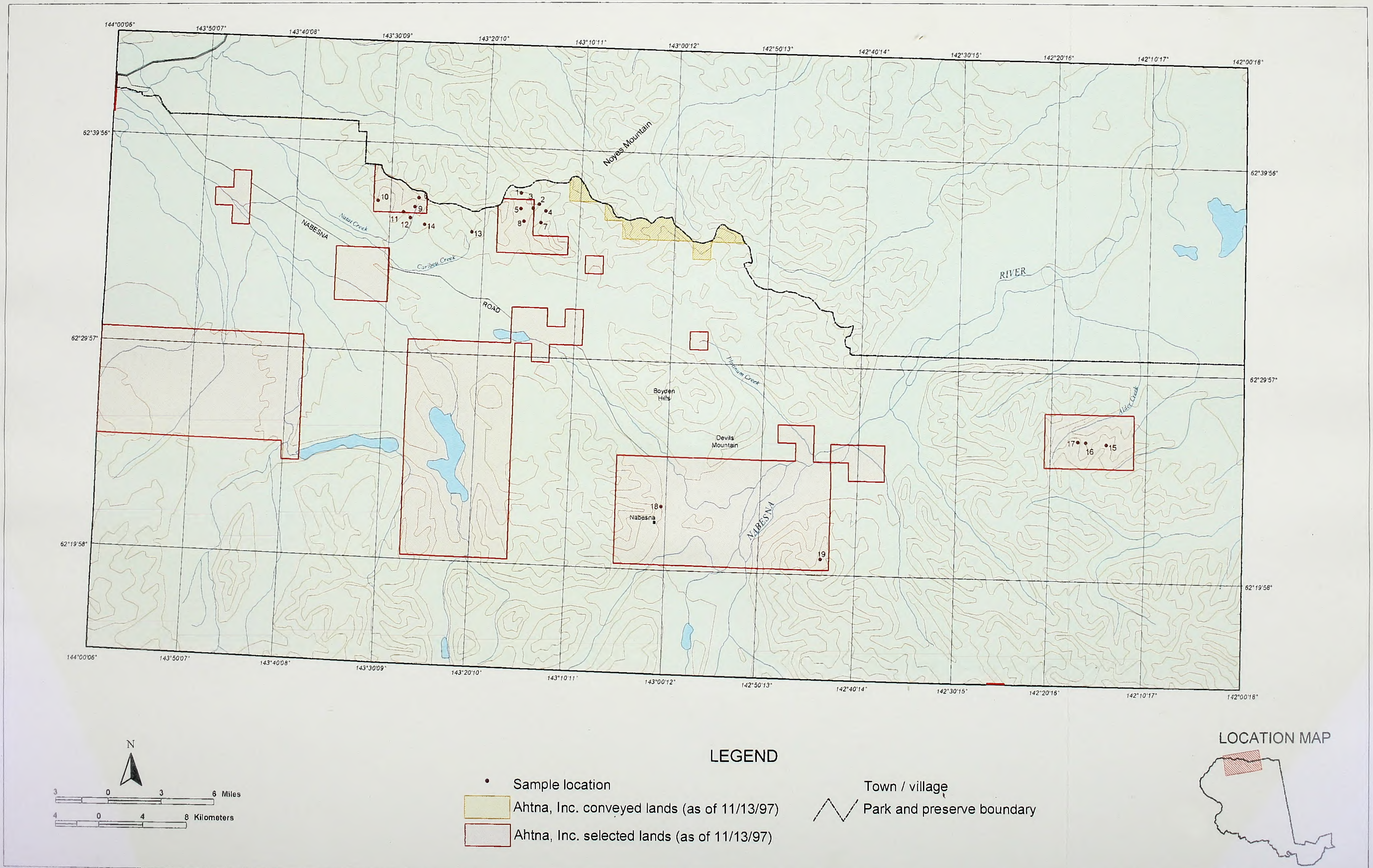


Plate 5. Sample location map of the northern study area Wrangell-St. Elias National Park and Preserve

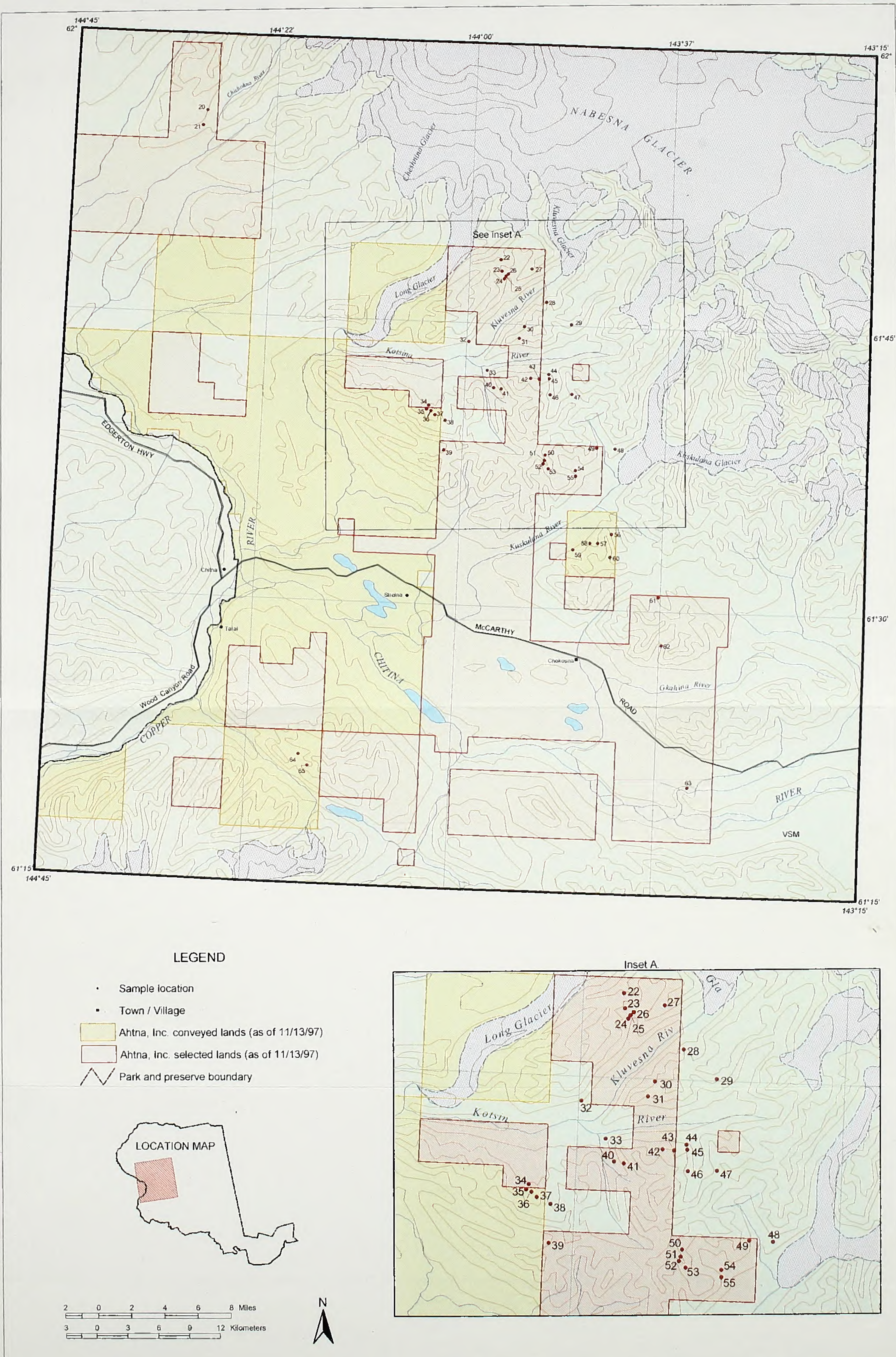


Plate 6. - Sample location map of the southern study area Wrangell-St. Elias National Park and Preserve.

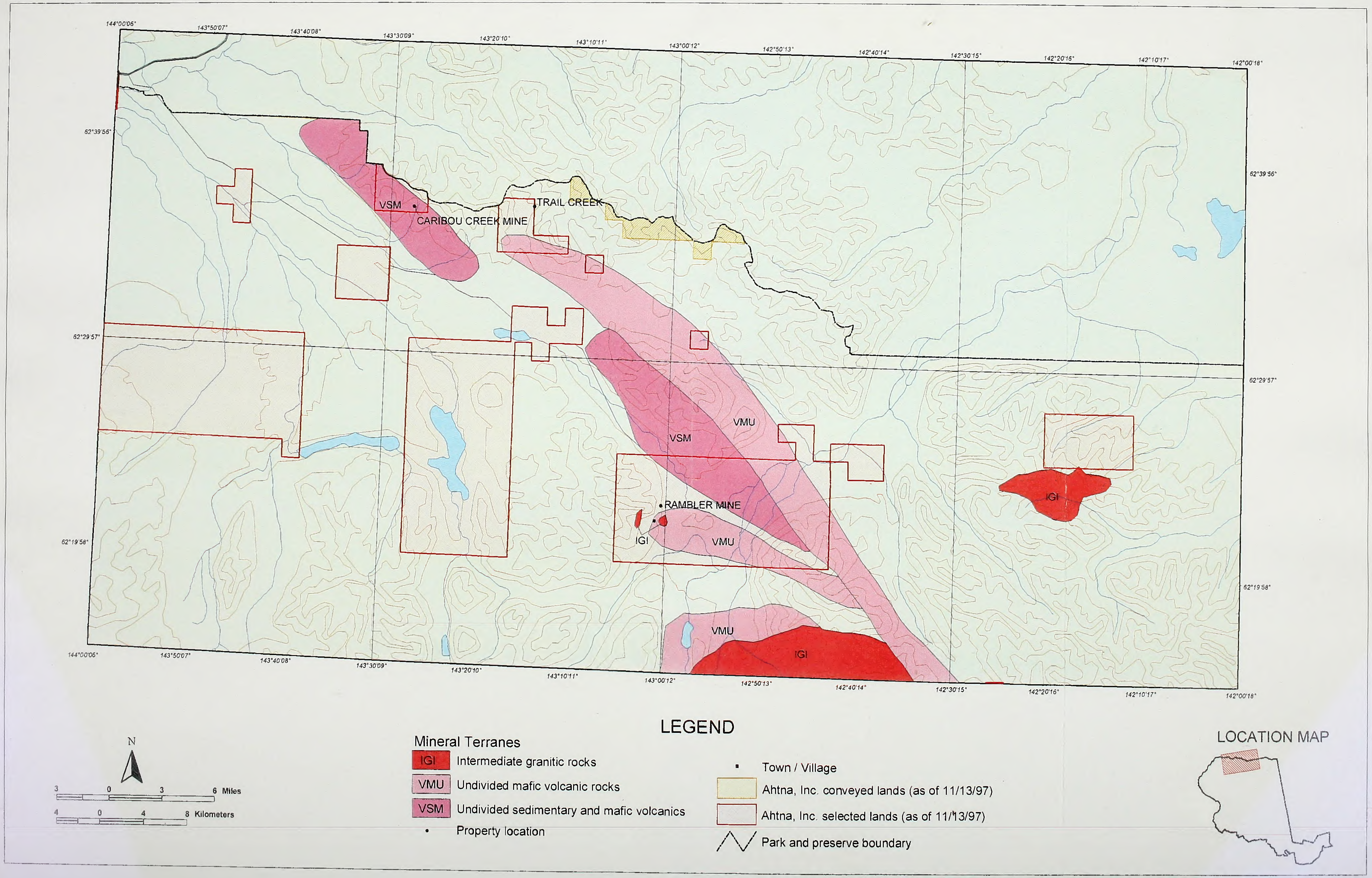
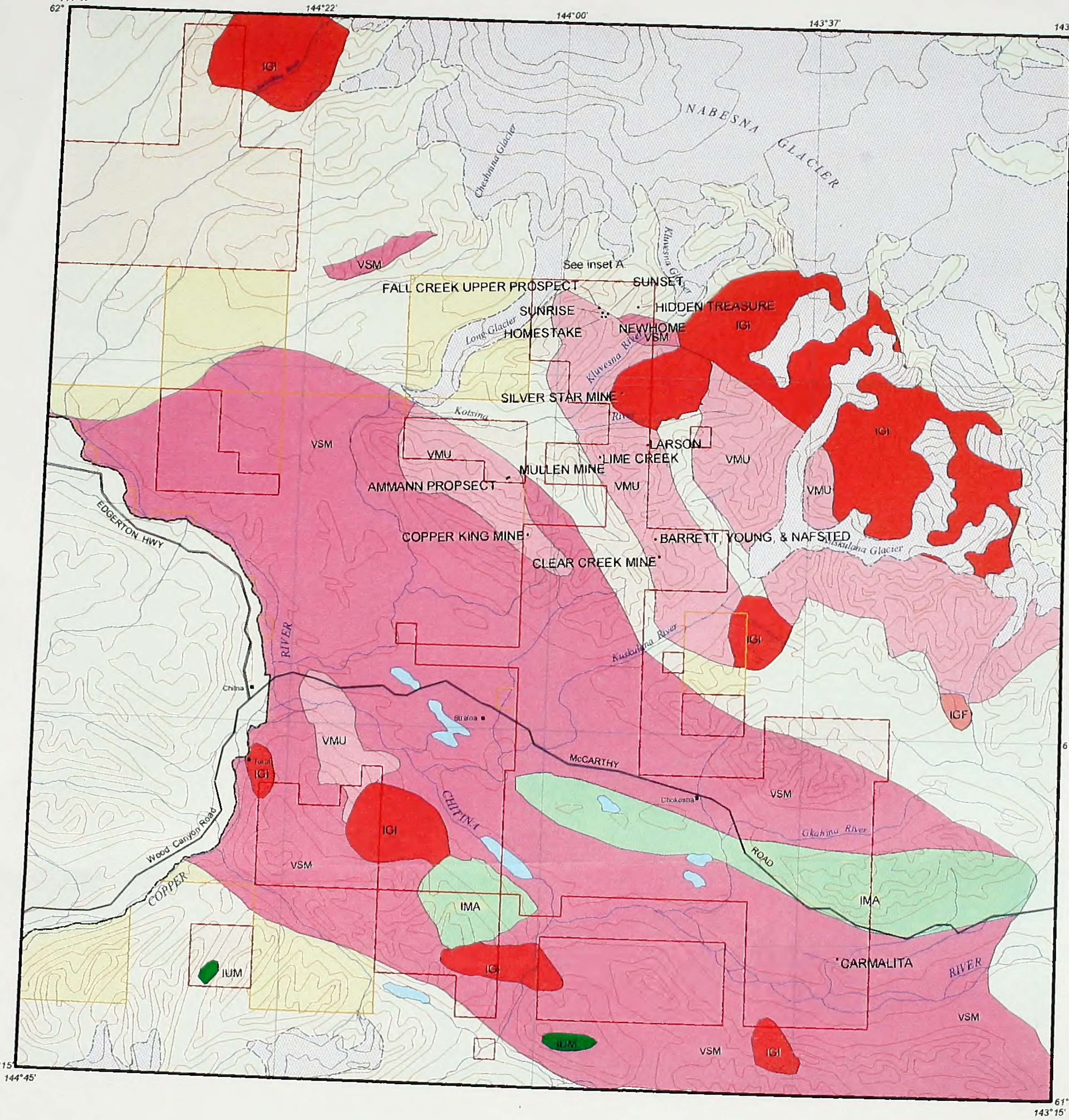


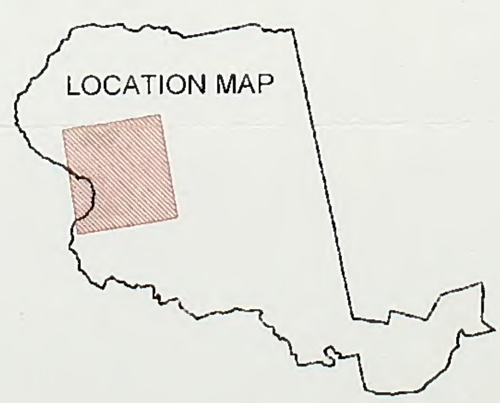
Plate 7. - Mineral Terranes map showing properties favorable for exploration in the northern study area.



LEGEND

Mineral Terranes

IGF	Felsic granitic rocks
IGI	Intermediate granitic rocks
IMA	Mafic intrusive rocks
IUM	Ultramafic rocks
VMU	Undivided mafic volcanic rocks
VSM	Undivided sedimentary and mafic volcanics
•	Property location
▪	Town / Village
	Ahtna, Inc. conveyed lands (as of 11/13/97)
	Ahtna, Inc. selected lands (as of 11/13/97)
	Park and preserve boundary



2 0 2 4 6 8 Miles

3 0 3 6 9 12 Kilometers

N

Plate 8. - - Mineral Terranes map showing properties favorable for exploration in the southern study area.

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Inc., selections in the