MINERAL INVESTIGATIONS

IN THE SOUTHERN CHILKAT RANGE

SOUTHEAST ALASKA

1985-1986

By: Albert H. Clough and Terry J. Hayden

ALASKA FIELD OPERATIONS CENTER, JUNEAU, ALASKA

Sampling, Chilkat Mountains west of Sullivan Island

UNITED STATES DEPARTMENT of the INTERIOR

Donald P. Hodel, Secretary

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UNIT OF MEASURE ABBREVIATIONS USED IN THIS REPORT

elev	elevation
ft	foot
in	inch
mi	mile
oz	troy ounce
lbs	pounds
oz/st	ounce per short ton
ppm	parts per million
%	percent
yd^3	cubic yard
ppb	parts per billion

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By Albert H. Clough[1] and Terry J. Hayden[2]

ABSTRACT

During the 1985 and 1986 field seasons the Bureau of Mines (Bureau) conducted mineral investigations in the southern Chilkat Range of northern Southeast Alaska. These investigations were part of the Bureau's study of mineral resources in the Juneau Mining District.

Field investigations included geologic mapping and sampling of known mines, prospects and mineral occurrences in the study area. In addition, selected areas favorable for hosting mineral deposits were examined using geologic reconnaissance, geochemical sampling, and ground geophysics.

During field work 179 geochemical samples were collected from 116 different locations. Analytical results of these samples defined polymetallic geochemical anomalies throughout the study area. Additionally, precious metal anomalies are broadly distributed in volcanic and clastic rocks, along with quartz veins, areawide. An area of special interest contains gold and base metal mineralization in interlayered volcanic and clastic rocks. This mineralized area crops out in mountainous terrain 3 mi to the west of Sullivan Island.

All of the old mines in the area have moderate mineral development potential due to their various grades of mineralization. The widespread occurrence of geochemical anomalies combined with favorable geology for volcanic and sediment hosted mineralization suggest the study area is favorable for economic mineral occurrences.

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[1]Physical Scientist, Alaska Field Operations Center, Juneau, Ak.

[2]University of Idaho, Moscow, Id.

INTRODUCTION

Mineral investigations in the southern Chilkat Range (fig. 1) were conducted as part of the Bureau of Mines (Bureau) Juneau Mining District Study. The purpose of this study was to determine the mineral development potential (MDP) of the Juneau Mining District of northern Southeast Alaska. Mineral development potential is a measure of the favorability of a given mine, prospect or mineral occurrence to become an exploitable mineral deposit. In this case, the individual MDP's were evaluated and used in assigning the overall MDP for the Juneau Mining District. MDP is usually expressed in terms of high, medium or low, as a qualitative estimation based on the known facts concerning the individual mine, prospect or mineral occurrence.

Specifically, the Juneau district study identifies the type, amount and distribution of mineral deposits within the mining district. Additional project goals are to determine selected ore reserves, conduct mineral beneficiation studies of specific deposits, complete economic feasibility studies, perform probabilistic computer reserve studies and address economic and legislative effects on mineral development.

To facilitate field work and reporting, the Juneau District was subdivided based on geologic and geographic factors. The Chilkat Range area is one subdivision.

This report presents preliminary results of the Bureau's mineral investigations in the southern Chilkat Range. The Bureau's field and laboratory investigations are ongoing; additional results will be published in subsequent reports.

ACKNOWLEDGMENTS

Local Juneau prospector Mr. Dale Henkins generously allowed the Bureau to sample and map several of his prospects in the area and his cooperation is greatly appreciated. We would also like to thank Mr. Bill Salisbury, of Salisbury and Associates, for providing the Bureau access and information concerning his claims in the southern study area.

The authors were ably assisted in their field investigations by seasonal Bureau employees Messrs. Rich Giraud, Edmund Fogels, Lance Miller and Dennis Southworth. Their endeavors in mapping, sampling and locating mines, prospects, and mineral occurrences made a significant contribution to this report.

LOCATION, ACCESS AND LAND STATUS

The southern Chilkat Range study area is located along the mainland to the west of Lynn Canal, between tidewater and the Glacier Bay National Park and Preserve boundary (fig. 1). The study area also includes many of the islands in Lynn Canal. For purposes of this report the study area extends in a northerly direction from Pt. Couverden to the Sullivan Island area (northwest map area, fig. 1). The only permanent settlement in the area is the village of Excursion Inlet (fig. 1), located on the western margin of the study area.

Terrain within the study area is varied. Rocky beaches predominate along the coast. Elevations below 2,500 ft are generally heavily forested by mature spruce, hemlock and cedar with dense underbrush. Lowlands are commonly mantled with thick bog and muskeg. Outcrops below 2,500 ft are scarce, except along beaches. Elevations above 2,500 ft generally have much outcrop, except where covered by glacier ice or seasonal and perennial snowfields. Due to persistent snow cover, the upper elevations can only be effectively worked after mid summer.

The study area is accessible from Juneau by aircraft (either fixed wing or helicopter) or by small boat. Logging operations near Excursion Inlet and Pt. Couverden provide the only roads within the report area. Aside from logging roads, travel within the study area is entirely by foot, boat or helicopter.

The majority of lands within the study area are within the Tongass National Forest and administered by the U.S. Forest Service, U.S. Department of Agriculture. Most of these lands are open to mineral entry and exploration, with the exception of the large tract which forms the Endicott River Wilderness area (fig 2). These wilderness lands are closed to mineral entry and location. In addition, there are several patented inholdings along with state and native lands and selections (1)[3].

HISTORY AND PRODUCTION

The first reported prospecting and mining activity in the Chilkat Range area was at the Alaska Endicott Mine near William Henry Bay (fig. 2). The original location date of the mine is unknown; however the mine was developed by the Alaska Endicott Mining and Milling Company, starting in 1916 (2, pp. 28-30). Production records for the Alaska Endicott are incomplete and confusing. The mine is reported to have yielded 200 tons of ore by 1919 which resulted in the recovery of 48.38 oz Au and 20 oz Ag (2, pp. 28-30). Bureau mine production records list production as 48 oz Au and 20 oz Ag, but these numbers are for 1922 (3). No base metal production is listed for the mine except for a reference in 1923 of an unstated amount of copper concentrate being shipped (5, pp. 21-22).

At approximately the same time as the Alaska Endicott was being developed the Howard Bay Mine was being explored. The first reference to this deposit was made in 1917, but the mine, with it's shoreline exposures, was likely discovered prior to that date.

3/Underlined numbers in parenthesis refer to items in the list of references preceding the appendix at the end of this report.

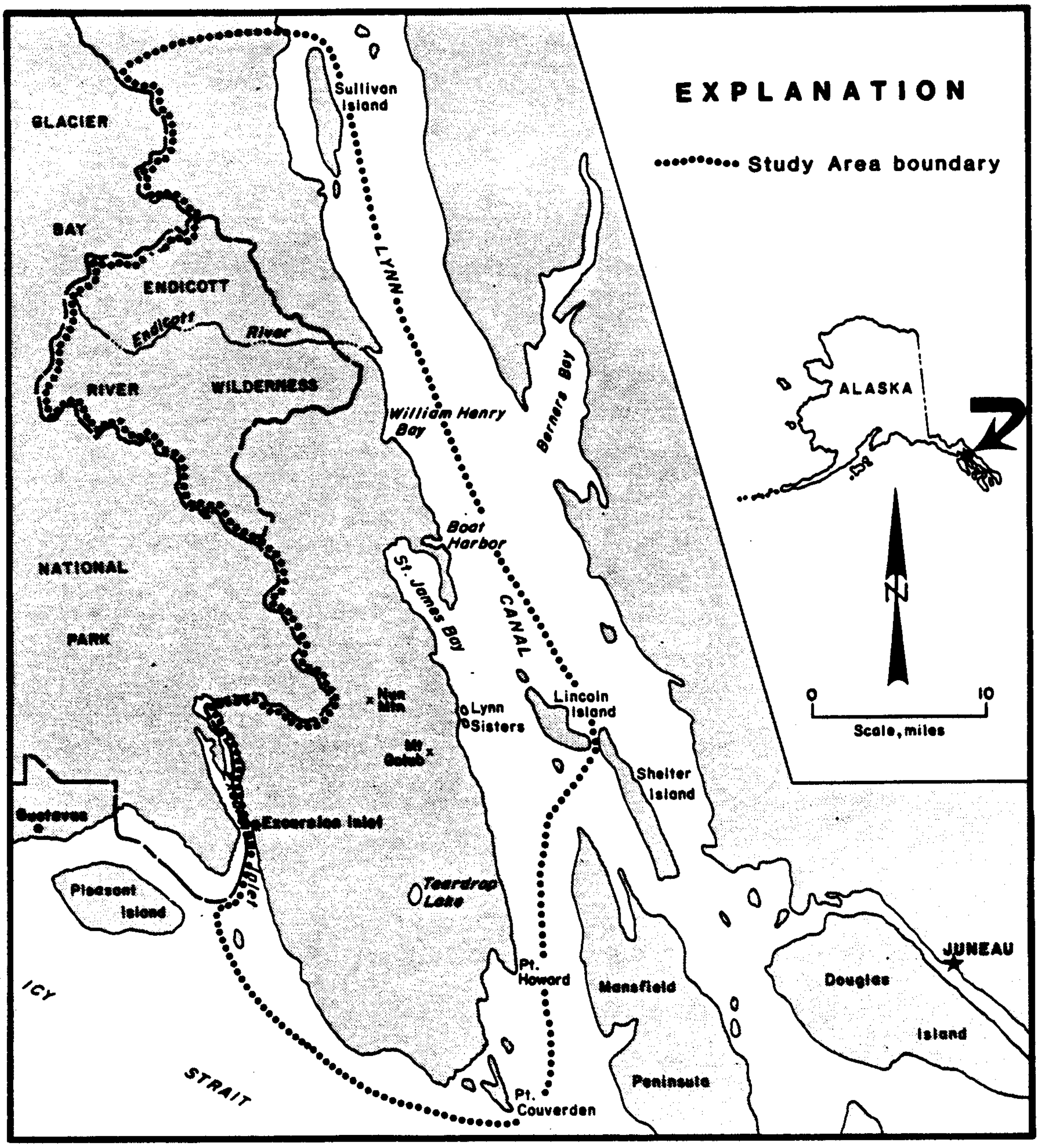

Figure 1. - Location of the Southern Chilkat Range Study Area

Reported production from the Howard Bay Mine is 7 tons of ore which was shipped to the Tacoma, Washington smelter. This shipment assayed 44 oz/st Ag, $1.50 Au (@ $20.67/oz), 3.5 % Cu and trace Zn (6). The only other reported production from the Chilkat Range area came from the Alaska Silver King Mine (fig. 2), near Excursion Inlet. This property was located in 1938, and developed with trenches and an aerial tram to the beach north of Excursion Inlet. Approximately one ton of high grade silver ore was reported to have been hand cobbed from a narrow lens, trammed to the beach and shipped to the Tacoma smelter. This shipment returned high silver values (7). No other work was done on the prospect and the mining and tram equipment were lost when fire destroyed the cannery in which they were stored (7).

Additional minerals related activity in the area has been confined to prospecting and exploration. Mineral discoveries of uncertain significance have been made at numerous locations. These sites include uranium, thorium and rare-earth element mineralization in narrow carbonatite veins within a syenite intrusive northwest of William Henry Bay (fig. 2) (8, p. 2, 9, pp. 12-17) and massive sulfide and precious metal mineralization in metasediments and metavolcanics exposed along logging road cuts to the north of Pt. Couverden. Furthermore, numerous geochemical anomalies identified by the U.S. Geological Survey in their preliminary Juneau quadrangle geochemical report (10) aid in defining prospective mineralized areas.

PURPOSE AND SCOPE

The purpose of this work was to identify and catalog the known mines, prospects and mineral occurrences in the southern Chilkat Range area. In addition to studying the known occurrences, geochemical anomalies were evaluated and areas which were deemed favorable due to geologic, geochemical and geophysical factors were investigated. Methods of investigation included geologic mapping, geochemical sampling and ground geophysics.

This report is preliminary in nature and scope. Additional field investigations within the study area are ongoing with the results to be published in subsequent reports.

GENERAL GEOLOGY AND MINERALIZATION

The area of this report (fig. 1) is bounded by the Lynn Canal-Chatham Strait fault on the east and the Excursion Inlet-Beartrack fault on the west (11). Lithologically, the area is part of the Alexander tectonostratigaphic terrain and composed predominantly of metasedimentary and metavolcanic rocks along the coastal areas, with the central part of the range containing abundant gneisses and granites. Most of the layered rocks are north-trending with a well developed foliation. Local ductile flow and tight folding is common, especially in the Pt. Couverden area. The granitic rocks are predominantly biotite hornblende granodiorite and are locally foliated (11). Similar granitic rocks also crop out along the eastern margin of Excursion Inlet.

Lithologically, the southern portions of the study area are characterized by thick carbonate units interbedded with shale. These units have been metamorphosed to marble and argillite near the granitic contacts. Argillite prodominates over carbonate in the northern study area (north of the Endicott River). Furthermore, interlayered mafic and felsic volcanic rocks are common.

Green, commonly altered, slightly porphyritic andesitic dikes crosscut many of the rock types in the area. Also noted are minor basaltic and aplitic dikes which locally cut the metasedimentary units.

The region is cut by numerous steeply-dipping to vertical faults. Faults observed in the St. James-William Henry Bay areas tend to strike northwest, whereas the faults in the southern portions of the study area (near Pt. Couverden) tend to strike east-northeast. Shearing along many of the faults has been intense and locally has developed internal boudinage in the metasedimentary sections.

Known base and precious metal mineralization in the area consists predominantly of small discontinuous quartz-sulfide veins which are commonly brecciated. Examples of these types of mineralization are present in Howard Bay (Buttercup Mine) and at the Alaska Silver King Mine, to the northeast of Excursion Inlet. Similar occurrences are also known in the St. James Bay area (fig. 2) and to the south near the Lynn Sisters. Other types of mineralization present include the calcite-quartz-chalcopyrite veins at the Alaska Endicott Mine near William Henry Bay and the uranium occurrences south of the Endicott River (Lucky Six fig. 2) (9, pp. 12-17). Several base metal geochemical anomalies which have yet to be adequately explained are also known in the area (12, pp. 25-27). Diopside-epidote-garnet skarns are common along the contact areas between the granitics and the surrounding country rocks throughout the study area. To date none of these skarns are known to contain economic mineral deposits.

MINES, PROSPECTS AND MINERAL OCCURRENCES

The following section provides descriptions of the known mines, prospects and mineral occurrences in the study area which the Bureau has thus far examined. In addition to a brief summary of previous work on individual mineral localities, results of Bureau fieldwork completed to date for this study is presented. Geochemical results are also highlighted. Complete sample results are tabulated in the appendix of this report.

West of Sullivan Island

A traverse was made along the ridge line of the 4,720 ft peak which lies on the mainland, immediately to the west of Sullivan Island (fig. 2). Lithologically, this area consists of a well foliated thick argillite section, locally containing interlayered chert bands. Subvolcanic dikes (dacitic in composition) are common as well as interlayered pyritic tuffs.

The precipitous terrain exhibits conspicuous abundant milky quartz veins up to several ft thick, which approximate the foliation of the argillite. A grab sample was taken of one of the quartz veins, which is exposed in a prominent saddle at the 3,650 ft level. This sample (7799, 3)[4] analysed 1.6 ppm Au and greater than 4,000 ppm Cu.

Endy group

The Endy group of claims is located north of the Endicott River, near the center of the Endicott River Wilderness area (fig. 2). The group consists of 30 lode claims which were staked in 1974 (13).

The Bureau spend 1/2 day on the claim group in 1986. During this examination much of the claim group was covered by a late summer persistent snow cover and outcrops were scarce. A sample collected from quartz vein float (7551, 6) analysied 18 ppm As, 20 ppb Au and 1400 ppm Cu. Lithologies noted in the area included gray massive limestone, volcanic tuff, and black argillite. Additional work needs to be done to further define the mineral occurrence at this site.

William Henry Mountain area

Anomalous Au and Ag values were reported by the USGS in their geochemical sampling work to the northwest of William Henry Bay (10). These precious metal anomalies were obtained from panned concentrate stream sediment samples taken from the area.

Bureau work in this area during the 1986 season consisted of several traverses and spot helicopter landings to examine local geology and mineralization. The region is composed predominantly of limestone and argillite. The argillite is black, commonly shows well-developed lamination and contains pyrite, locally up to several percent. One sample of argillite (3336, 24) contained a trace of native copper and in thin-section was found to be brecciated with minor amounts of galena and sphalerite. Carbonate units present in the area included a light grey to white recrystallized limestone, a black fossiliferous limestone, a red recrystallized limestone, and a black moderately to finely laminated limestone.

Rock sampling in this area by the Bureau identified several gold anomalies which deserve further attention (table 1). A noteworthy sample (6385, 11) returned 280 ppb Au. This sample was collected from a siliceous, altered zone along a porphyritic andesitic dike. This altered zone contained 8 -10% pyrite by visual estimate. Argillite in this area exhibits microbrecciation of some of the laminae with adjacent laminae remaining unbroken. This suggests that much of the deformation is penecontemporaneous in origin.

4/ Numbers in parenthesis refer to sample numbers refered to in appendix, followed by map number shown on fig. 3. This convention followed throughout text.

William Henry Bay

Rocks along the eastern shoreline of William Henry Bay (fig. 2) consist of a series of silicified metavolcanic rocks, predominantly mafic in composition. These rocks contain abundant pyrite and local chalcopyrite. Calcareous metasediments, which grade to a coarse-grained white marble are locally infolded with the mafic volcanics. These metasediments locally become very siliceous and take on a jasperoidal appearance with accompanying disseminated pyrite and pyrrhotite.

Rocks of similar nature crop out along the west side of the bay, though the section there is less deformed than on the east side. Due to the close spatial and lithologic association it is likely that this section comprises the host for the mineralization at the Alaska Endicott mine, approximately one mile to the south of the head of William Henry Bay. The infolded carbonate unit could represent the protolith of the Alaska Endicott quartz-carbonate vein.

The shoreline area of William Henry Bay was traversed by the Bureau during the 1986 field season. Geochemical samples were taken of mineralized and altered outcrops. The best sample (7168, 31) was taken from a pyrite breccia zone in a silicified limestone that crops out on the east side of the bay near the head. This sample returned anomalous in Au (1.1 ppm) and Zn (250 ppm).

Alaska Endicott Mine

The Alaska Endicott Mine (fig. 2) is located approximately one mile south-southwest of the head of William Henry Bay at an elevation of 160 ft. Access to the mine site is either via helicopter, landing in an unimproved site approximately 100 ft east of the mine portal or overland via an overgrown logging road from the beach at William Henry Bay.

The original claimants of the mine are unknown. The property was reportedly aquired by the Alaska Endicott Mining and Milling Company in 1916 (2, pp. 28-30). By 1918, 250 ft of drifting was completed on the vein and the adit was reported to have been extended for 26 ft (14, p. 30). In 1921 the main drive was completed for a distance of 1,600 ft from the portal, a 150 ft crosscut had been driven and 80 ft of raise had been completed (15, p. 67). During 1922 a 15-stamp mill was reportedly completed and operational on the property (4, p. 37).

Production records for the Alaska Endicott are incomplete and unclear. The reported mine production is 48.38 oz Au and 20 oz Ag, from 200 tons of ore (2, pp. 28-30, 3).

The Alaska Endicott mine was examined by Bureau personnel during the 1985 field season. During this examination the mine was surveyed using a compass and tape and the geology mapped at a scale of 1 in to 50 ft (fig. 4). Selected rock-chip and channel samples were collected from the underground workings and submitted for geochemical analysis.

The geology in the vicinity of the Alaska Endicott Mine is not well defined or understood. In general terms, rocks in the William Henry Bay area are predominantly argillite, shale and limestone interlayered with mafic volcanic rocks. North of the bay, greenstone predominates. The geology of the mine, as revealed underground, consists of a well foliated greenstone, likely a metabasalt, which is bounded on both sides by fine grained clastic rocks and local muscovite schist. The schist likely represents a metamorphosed tuff. The majority of the mineralization seems to be hosted by the metabasalt. Mineralization is confined to a calcite-quartz vein which averages 10 ft thick, strikes generally 290^{o} and dips generally 70^{o} to 85^{o} to the south.

Sulfide minerals present are chalcopyrite with subordinate pyrite. These sulfides occur as streaks and blebs within the quartz-rich parts of the vein. Brecciation is common throughout the vein, especially near the vein margin. Angular fragments of greenstone are very common in the breccia zones. Country rocks within the mine are highly deformed, but generally strike north-northwest and dip steeply to the south. Based on underground mapping, the vein appears to be vertically continuous for at least 100 ft. Copper mineralization is erratic and spotty, but appears to be concentrated along the contacts of the quartz-carbonate vein. The best sample collected by the Bureau in 1985 (7017, 32) analysied 1.7% Cu, 5.6 ppm Ag, and 0.04 ppm Au.

North of Boat Harbor

Approximately 0.8 mi to the north-northwest of Boat Harbor the Bureau located several quartz veins which crop out in a stream drainage. These veins range from 4 to 10 in wide and contain galena, chalcopyrite, malachite and sphalerite. One sample, (7559, 39), contained 610 ppm Cu, 320 ppm Pb, 180 ppm Zn, and 17 ppm As.

Approximately 2 mi north of the entrance to Boat Harbor, on the shoreline, iron stained jasperoid is common. The Bureau collected several samples of this jasperoid, one of which (7532, 34) analyzed 110 ppm As, 20 ppb Au, 200 ppm Pb, and 31 ppm Sb.

West-northwest of St. James Bay

The area to the west-northwest of St. James Bay, near the Glacier Bay National Park and Preserve divide, is predominantly composed of folded and faulted limestone and argillite.

Andesitic dikes are common, but volumetrically unimportant in the area. This sector of the Chilkat Range area is highly glaciated and many of the higher elevations are still occupied by valley and cirque glaciers.

Bureau work in this area consisted of several geologic traverses on which selected rock samples were collected. Anomalous metal values were obtained from several of the samples. One sample (7540, 35) from a quartz vein analysied 21 ppm As, 880 ppm Cu, 570 ppm Pb, and 710 ppm Zn. Another sample (7554, 40), from a siliceous limestone outcrop, analysied 120 ppm As, 50 ppb Au, and 45 ppm Mo. Additionaly, quartz veins and jasperoidal rocks in the area contain variable amounts of galena, chalcopyrite, and pyrite. Not enough data are currently available for this area to speculate on the significance of these anomalies.

St. James Bay area

Mineralization in the St. James Bay area (fig. 2) consists of quartz veins containing base and precious metals. These veins are similar to those of Howard Bay (quartz-carbonate veins with local chalcopyrite, sphalerite, galena, and tetrahedrite). Veins of this type have been found along the west shoreline in the central part of St. James Bay and to the south along the shoreline west of the Lynn Sisters (16). The veins in the St. James Bay area were prospected at one time with an adit of unknown extent (16). All vestiges of this adit have been removed by subsequent shoreline erosion.

During the 1985 field season several shoreline traverses were made by Bureau personnel along St. James Bay and to the south by the Lynn Sisters. Two areas which have quartz-carbonate veins were located along the west shore of St. James Bay, presumably one of these being the vein referenced by Roehm (16). These veins are highly vuggy, milky white and composed predominantly of quartz and calcite. Aragonite and siderite are common accessory minerals. Average vein thickness ranges from 2 in to 2 ft. The veins occur in swarms whose general strike is 340° with vertical to near vertical dips. Country rock surrounding the veins is predominantly carbonate and fine-grained clastic in composition. A quartz vein sample (7114, 44) collected by the Bureau in 1985 analysied 4.8 ppm Ag, 5280 ppm Pb, and 1.51% Zn. The veins described by Roehm (16) at Lynn Sisters were searched for but not located.

Lincoln Island copper

The Lincoln Island prospect (fig. 2) is located at the northern tip of Lincoln Island. Lithologically, the area is a series of chert, tuff, argillite, and mafic volcanic rocks; all of which have been infolded. Each of the units contain various amounts of disseminated sulfides, predominantly pyrite and pyrrhotite.

Locally within the mafic volcanic rocks, the sulfides are concentrated in small blebs and stringers up to several inches thick and several feet in strike length. The sulfide mineralization is likely related to submarine volcanism, perhaps hot springs activity in the volcanosedimentary pile. Bright red and yellow iron staining is common where the sulfide concentrations are the greatest. Sulfide mineralization is only noted in shoreline outcrops.

The Lincoln Island area was examined by the Bureau in 1986. The beach area was traversed at low tide to maximize visible exposures and samples were taken from the better mineralized intervals. In addition, a three line ground very-low-frequency (VLF) electromagnetic (EM) geophysical survey was conducted at right angles to the strike of the mineralized mafic volcanic rocks. The survey was done using a Phoenix VLF II[5] instrument. These VLF lines were started at the shoreline and run eastward for 500 ft, well into the densely vegetated portions of the island.

The strike extension of the best mineralization noted on the beach provided a good conductivity response (cross over). However, no additional conductors were noted in the timbered portions of the VLF traverses. The highest grade sample collected (7174, 48), from a siliceous pyrite-pyrrhotite rich zone, analysied 30 ppb Au, 1900 ppm Cu, and 69 ppm Mo.

Teardrop Lake to Mt. Golub

Several of the ridgecrests and cirque headwalls from Teardrop Lake to the drainage south of Mt. Golub were traversed and sampled. The core of this area is composed of a quartz diorite which has intruded limestone and argillite. Very narrow, discontinuous skarn zones are locally developed in the limestone sections within several hundred feet of the granitic contact. These skarn zones are generally devoid of significant mineralization. However, one sample (7519, 59), of limestone which contained sparse galena analysied 110 ppm Ag, 20 ppb Au, 430 ppm Cu, 1600 ppm Pb, and 1600 ppm Zn.

Alaska Silver King (Excursion Inlet)

The Alaska Silver King deposit (fig. 2) was discovered in 1938 by Messrs C. Parker, Floyd Ogden, Oren Jones, and Erwin Hubey (7). According to Thorne (7), the discovery was made in a steep walled creek at an elevation of 1,070 ft.

5/ Reference to a specific product does not imply endorsement by the Bureau of Mines.

Initial development work consisted of the construction of a trail and aerial tram from the prospect to the beach on Excursion Inlet. A small quantity of high-grade silver ore was selectively mined from a narrow sulfide lens on the property (7). No additional development work is evident or reported. Mineralization at the Alaska Silver King consists of sphalerite, galena, stibnite, tetrahedrite, and pyrite in a quartz-calcite gangue (7).

The Alaska Silver King deposit was examined by the Bureau in 1985 with 1.5 days being spent in the area. No signs of the initial prospecting activity were apparent and no evidence of any more recent activity was observed. The lack of historical workings is not surprising since the prospect lies in the middle of a major avalanche path. The rocks cropping out in the drainage basin at the presumed level of the old workings are a series of thick-bedded dark gray to black, limy siltites which strike 310° and dip 70° to the north. These metasediments locally contain pyrite, minor amounts of chert and in places are rich with siderite or ferroan dolomite. A traverse through avalanche debris below the old claim site revealed minor carbonate breccia containing traces of pyrite and pyrrhotite. A geochemical analysis of this sample (3170, 56)[4] was slightly anomalous in Ag (0.7 ppm) and Au (0.055 ppm). The ridge area to the east of the Alaska Silver King deposit is composed mostly of argillite and siltite with local carbonate interlayers. These metasedimentary units are also cut by latite dikes. No mineralization or alteration was observed in this area.

North of Point Howard

Two streams, approximately 1.5 and 4 mi north of Point Howard (fig. 2), were traversed and sampled. Lithologically, the drainages transected by these traverses, are composed predominantly of argillite, carbonate, and quartzite. Locally, limestone breccia is also present, likely the result of tectonism. Several samples, (3332, 71, 3333, 72 and 3334, 73), were taken of this section with no anomalous results. Due to the small size of these drainage basins and the lack of encouraging geologic or geochemical results it is unlikely that significant mineralization is in the area.

Howard Bay (Buttercup)

The Howard Bay (Buttercup) deposit (fig. 2) was discovered prior to 1917. Other names for the property include Vevelstad's lode, Silverton #1 lode and McKecknie prospect. The property is on the west side of a narrow peninsula that juts seaward along the western shore of Lynn Canal, north of Pt. Howard. This is located between Pt. Couverden and St. James Bay. Initial exploration on the deposit took place before 1921 and included several shallow shafts and open cuts (17, 15). Reportedly, 7 tons of ore were shipped from the shallow opencuts on the property to the Tacoma smelter. This shipment assayed 44 oz/st Ag, $1.50 Au (gold @ $20.67/oz equals 0.07 oz/st Au.), 3.55% Cu, and trace zinc (6).

The Howard Bay deposit was visited by the Bureau in 1985. All of the old workings are completely overgrown and sloughed. The southernmost extent of the vein was dug out and sampled. The richest sample (7056, 76) assayed 0.7% Cu, greater than 2% Zn, greater than 1 oz/st Ag, and 0.08 oz/st Au.

The Howard Bay vein strikes 020° and dips 76° south; consists of a brecciated quartz-carbonate filled structure, emplaced at an angle to the predominantly northwesterly regional strike. The vein is truncated to the south by a thick mafic dike and apparently continues underneath cover to the north. Sulfide minerals present include chalcopyrite, sphalerite, pyrite, and minor galena. Ankerite is ubiquitous.

Country rock in the area is predominantly limestone and is folded into an asymmetrical north-plunging antiform, which is locally overturned. The brecciated vein of the Howard Bay prospect appears to be emplaced parallel to the axial plane of this broad antiform, along the AC joint trend.

No additional signs of mineralization or prospecting activity were noted in the area other than at the old workings. It is noteworthy that outside the beach area no outcrops were observed.

Southern study area

This part of the study area comprises the terrain from Teardrop Lake, south to Pt. Couverden, exclusive of the coastal areas of Icy Strait, Excursion Inlet and Pt. Howard (fig. 2). This area is generally forested with natural outcrops being predominantly limited to the stream drainages. Recently, a logging operation in the area has developed approximately 30 miles of gravel haul roads, whose cuts and road metal pits provide much-needed lithologic control for this large underexplored region.

The most prominent lithologies in this area are a black, carbonaceous limestone and subordinate interbedded argillite. Both units are moderately to extremely deformed by folding and faulting. The layered rocks strike predominantly to the northwest with a moderate to steep northeasterly dip. The major faults trend northeast, dip steeply to the northwest and southeast. Most of these structures appear to be strike-slip with minor dip-slip separation.

Igneous rocks present in this area consist of northeast-trending slightly porphyritic andesitic dikes. These dikes are commonly altered to chlorite and carbonate. Some basaltic dikes are also noted in the area, and like the andesitic dikes are also altered, but to a lesser degree. Quartz-bearing gossans are present along a few of the andesitic dikes.

Many of the streams, logging roads, and road cuts in this area were traversed and sampled where mineralization and alteration are present. Narrow quartz veins were locally noted in some of the exposures which contained galena, sphalerite, chalcopyrite, and pyrite.

A sample (8026, 94) of one such vein analysied greater than 30 ppm Ag, 170 ppm Cu, greater than 7500 ppm Pb, and greater than 3800 ppm Zn. Similarly, some of the igneous rocks and fault zones in the area are mineralized. Sample 6414, 102, from an andesite porphyry, analysied 1.7 ppm Ag, 410 ppb Au, and 430 ppm Zn. Sample 6415, 102, from a fault gouge zone, analysied greater than 30 ppm Ag, 719 ppb Au, 210 ppm Cu, 4070 ppm Pb, and 9200 ppm Zn. Also, samples of limestone and argillite collected in the area commonly returned with Zn values greater than 100 ppm.

In general, the southern study area is composed predominantly of carbonates and argillites which exhibit a widespread enrichment in precious and base metal values. Lesser amounts of volcanic rocks also crop out in this area and, like the metasediments, also carry anomalous metal values. Additional work needs to be done before assessing the significance of these anomalies.

MINERAL DEVELOPMENT POTENTIAL

Mineral development potential is a measure of the favorability of a given mine, prospect or mineral occurrence to be developed. For purposes of this report MDP is expressed as either high, moderate, low, or unknown. These terms reflect a qualitative to semiquantitative assessment of favorability based on known facts concerning the individual mineral deposit.

Mineral development potential assignments for the southern Chilkat Range are based on four main parameters. These parameters are whether any past production took place, grade of mineralization, possible tonnage of mineralization, along with geologic, geochemical, and geophysical factors.

High MDP requires near economic grade and continuity of mineralization. Deposits of this rank are likely to have mineable reserves under current economic conditions. Past production is also an important characteristic to consider in assigning a high MDP. The information available on the mines, prospects and mineral occurrences in the study area is insufficient to accurately calculate tonnages of mineralized rock. Potential deposit size may only be surmised based on geologic factors. Due to this lack on tonnage data no high MDP assignment are given in the study area.

Moderate MDP indicates that either sufficient grade or tonnage has been identified, but not both. Deposits of this sort are not likely to be mineable under current economic conditions.

Low MDP dictates low grades and/or little or no evidence of continuity of mineralization.

Unknown MDP indicates that insufficient work has been done to make any assessment.

Mineral development potential assignments are flexible. They need to be updated as additional data becomes available for any given area. Updating MDP applies not only to scientific data availability, but also to economic changes, such as fluctuations in metal and labor prices along with technological advances that could greatly alter the viability of any mining venture.

Table 1. Summary of Mineral Development Potential ratings for mines, prospects and mineral occurrences in the southern Chilkat Range.

Deposit name	MDP	Rationale
Alaska Silver King	Moderate	grade of mineralization, favorable geology
Howard Bay	Moderate	grade of mineralization
St. James Bay	Moderate	favorable geology and geochemical character
Alaska Endicott mine	Moderate	favorable geology and geochemical character, grade of mineralization
Lincoln Island copper	Low	geochemical character, geophysics, which indicates insufficient width of mineralization
Remaining study area	unknown	insufficient work and data

CONCLUSIONS AND RECOMMENDATIONS

The lack of a comphrensive geologic, geochemical and geophysical data base for the southern Chilkat Range study area dictates an unknown mineral development potential rating for the area as a whole. However, the area does contain several small mines and prospects with moderate MDP. Furthermore, numerous base and precious metal geochemical anomalies have been deliniated in the area during this investigation and by previous workers (9, 10, and 12). The presence of these anomalies combined with the known prospects in the region suggests the southern Chilkat Range, taken as a unit, has high potential for hosting significant mineralization. This conclusion is reinforced by the favorable geologic environment in the Chilkat Range for sediment and volcanic hosted mineralization.

Due to the favorable geologic environment of the southern Chilkat Range for hosting significant mineralization further work is warranted. Investigations which should be conducted include, but are not limited to, the following suggestions. First, more regional and detailed geochemistry needs to be done to define the known anomalies. This includes stream, rock, and soil sampling as conditions dictate. Second, the known geochemistry needs to be correlated with the areal geology, which is currently only published in reconnaissance format (11). More complete and detailed regional geologic mapping, at a scale of 1:125,000 or larger, would greatly benefit further mineral investigations.

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APPENDIX GEOCHEMISTRY

Sampling and analytical procedures

Rock samples collected thus far in the Chilkat Range study area total 179. These samples were obtained from mineralized and barren zones in mine workings, prospects, surface mineralized zones, stained zones (color anomalies) and other surface exposures and debris.

Rock samples of four distinct types were collected. These types are as follows: 1. channel samples- those continuously cut across a measured width, 2. chip samples- uniform chips taken at measured intervals across a homogeneous sample interval, 3. select samples- a grab sample taken from an outcrop, commonly composed of only a single specimen and 4) float sample- a select (grab) sample collected from boulders or rubble whose exact origin is uncertain.

To complement rock samples, placer (sluice-box-concentrate) samples were collected as part of the overall geochemical program. Placer samples are taken by processing 0.10 yd^3 of active stream gravels through a 4 ft sluice box to recover the heavy mineral fraction. The resultant heavy fraction is then further concentrated by panning with the resultant concentrate analysed without sieving. Coarse gold is commonly removed from placer concentrate samples and weighed individually. Only one placer sample was taken in the Chilkat Study area and it did not contain any visible gold.

All geochemical values are reported in ppm except for gold which is reported in ppb.

SOUTHERN CHILKAT RANGE
ANALYTICAL RESULTS

Map no.	Name or Location	Sample no.	Sample type	Sample lithology	Ag	As	Au	Ba	Co	Cr	Cu	Mo	Pb	Sb	Sn	Th	U	W	Zn
001	W. of Sullivan Isl.	7795	Chip	Black argillite	<5	20	10	500	5	50	62	<5	8	1.4	<2	3.7	2.9	<3	150
002	W. of Sullivan Isl.	7796	Chip	Quartz vein	<5	<2	<10	<150	4	9	24	<5	14	.2	<2	<.5	<.5	<3	30
003	W. of Sullivan Isl.	7799	Select	Quartz vein	51	14	1600	<150	18	6	>4000	<5	4	.4	8	.9	<.5	5	300
004	W. of Sullivan Isl.	7797	Chip	Black argillite	<5	16	<10	400	3	69	87	6	18	1.1	<2	2.9	4.2	<3	150
004	W. of Sullivan Isl.	7798	Select	Black argillite	<5	3	<10	700	10	48	89	<5	8	.8	2	4.4	4.5	<4	180
005	Endy Group	7543	Chip	Meta tuff	<5	110	10	300	2	<2	43	<5	20	1.3	<2	5.5	4.6	<3	80
006	Endy Group	7550	Select	Pyritic tuff	<5	29	10	400	2	3	86	<5	30	1.2	6	5.4	5.1	3	80
006	Endy Group	7551	Float	Quartz vein	<5	18	20	400	96	3	1400	22	20	.6	4	1.2	1.3	<3	50
007	Endy Group	7535	Chip	Tuff (intermediate)	<5	3	<10	700	5	7	5	14	12	1.6	2	4.1	3.2	7	20
008	S. Endicott River	7542	Chip	Black argillite	<5	2	<10	<150	6	260	38	5	4	.2	<2	1.9	3.1	<3	50
009	William Henry Mt.	6366	Select	Quartz in slate	<5	2	<10	200	2	13	<1	<5	2	.2	<2	.9	.7	<3	40
010	William Henry Mt.	7552	Chip	Siliceous argillite	<5	36	20	200	19	72	160	<5	6	.5	<2	2.8	2.8	<3	70
011	N. William Henry Bay	6384	Chip	Agglomerate	<5	6	<10	1500	5	2	8	<5	20	.3	<2	6.6	3.9	<3	70
011	N. William Henry Bay	6385	Select	Greenstone	<5	150	280	1500	36	110	32	19	28	2.1	<2	4.6	2.4	7	80
012	N. William Henry Bay	6386	Chip	Mylonite	<5	5	<10	<150	7	39	58	10	12	1	<2	2.3	4	<3	20
012	N. William Henry bay	6367	Select	Argillite	<5	4	<10	<150	15	49	97	5	6	.4	2	1.8	3.7	<3	30
013	William Henry Mt.	7571	Select	Quartz vein	<5	3	<10	<150	4	16	38	<5	2	.3	<2	<.5	<.5	<3	30
014	William Henry Mt.	7572	Select	Argillite	<5	110	50	<150	50	5	110	21	12	1.3	2	3.8	5.2	<3	<30
015	N. Lance Point	7541	Chip	Metachert, argillite	<5	9	<10	300	20	86	96	<5	6	.4	<2	2.8	1.4	<3	70
016	William Henry Mt.	7573	Select	Argillite	<5	13	20	200	53	23	<1	<5	6	.2	<2	3.2	1.5	<3	60
016	William Henry Mt.	7574	Chip	Black argillite	<5	3	<10	300	48	11	12	<5	6	.4	<2	4.8	2.2	<3	110
017	N. William Henry Bay	6387	Float	Argillite	<5	4	<10	300	19	38	140	<5	6	.6	<2	3.3	1.9	<3	70
018	N. William Henry Bay	6388	Float	Quartz	<5	2	<10	<150	8	7	26	<5	6	.9	2	.6	.7	<3	330
019	William Henry Mt.	7570	Float	Black argillite	<5	4	10	300	8	62	62	<5	10	.6	<2	3.6	4.4	<3	50
020	William Henry Mt.	7564	Chip	Black argillite	<5	10	<10	300	11	61	29	<5	10	.6	<2	4.5	1.6	<3	90
020	William Henry Mt.	7565	Float	Argillite	<5	5	<10	300	17	37	29	<5	10	.4	<2	8.4	3.1	<3	40
020	William Henry Mt.	7566	Chip	Andesite dike	<5	3	<10	<150	35	650	61	<5	8	.4	2	2.8	1.4	<3	90
021	William Henry Mt.	7567	Chip	Limestone	<5	<2	<10	900	5	5	3	<5	2	.2	<2	17	5.2	<3	50
021	William Henry Mt.	7568	Select	Limestone	<5	6	<10	3000	8	12	<1	<5	4	2.9	<2	.6	1	<3	20

ANALYTICAL RESULTS- Continued.

Map no.	Name or Location	Sample no.	Sample type	Sample lithology	Ag	As	Au	Ba	Co	Cr	Cu	Mo	Pb	Sb	Sn	Th	U	W	Zn
021	William Henry Mt.	7569	Select	Limestone	<5	16	10	2000	19	20	<1	12	8	4.7	<2	.9	3.2	<3	20
022	William Henry Mt.	3338	Float	Siliceous argillite	<5	24	<10	200	43	26	140	<5	10	1.5	<2	3.9	1.8	<3	80
023	William Henry Mt.	3337	Float	Argillite	<5	9	<10	700	75	39	290	<5	4	.6	<2	3.1	2.2	<3	80
024	William Henry Mt.	3336	Chip	Argillite	.3	20	<10	-	-	-	72	-	4	-	-	-	-	-	92
025	Lance Point	7190	Channel	Quartz vein	<5	<2	<10	<150	2	130	9	<5	8	<.2	<2	.7	<.5	<3	<30
026	William Henry Bay	7184	Chip	Black argillite	<5	62	10	900	17	110	89	<5	48	2	<2	4.3	5.2	<3	140
027	William Henry Bay	7183	Chip	Metachert	<5	<2	<10	600	4	5	7	<5	8	.2	<2	5.5	4.1	<3	90
028	William Henry Bay	7187	Channel	Metachert	<5	53	50	300	42	33	490	<5	18	2.5	<2	4	2.6	<3	360
029	William Henry Bay	7185	Chip	Siliceous limestone	<5	4	<10	800	6	5	99	<5	8	.2	<2	5.6	2.3	<3	130
030	William Henry Bay	7182	Channel	Siliceous limestone	<5	50	<10	400	3	6	24	12	18	1.8	<2	3.7	1.9	<3	110
031	William Henry Bay	7186	Chip	Siliceous limestone	<5	24	1100	<150	50	14	51	5	6	.8	2	2.4	.8	<3	250
032	Alaska Endicott	3423	Chip	Calcite vein	4.5	-	<5	-	-	-	15400	-	11	-	-	-	-	-	24
032	Alaska Endicott	3424	Channel	Calcite vein	.8	-	<5	-	-	-	4050	-	6	-	-	-	-	-	12
032	Alaska Endicott	3425	Channel	Calcite vein	.3	-	<5	-	-	-	1530	-	8	-	-	-	-	-	37
032	Alaska Endicott	3426	Channel	Calcite vein	<.2	-	<5	-	-	-	985	-	9	-	-	-	-	-	13
032	Alaska Endicott	3427	Channel	Calcite vein	<.2	-	<5	-	-	-	520	-	13	-	-	-	-	-	9
032	Alaska Endicott	7017	Channel	Quartz vein	5.6	-	40	-	-	-	17200	-	6	-	-	-	-	-	25
032	Alaska Endicott	7018	Channel	Calcite vein	1.4	-	<5	-	-	-	3340	-	3	-	-	-	-	-	30
032	Alaska Endicott	7019	Channel	Quartz vein	.4	-	<5	-	-	-	835	-	6	-	-	-	-	-	392
032	Alaska Endicott	7020	Channel	Quartz vein	.5	-	<5	-	-	-	2180	-	5	-	-	-	-	-	11
032	Alaska Endicott	7021	Channel	Quartz vein	<.2	-	<5	-	-	-	525	-	4	-	-	-	-	-	10
032	Alaska Endicott	7060	Channel	Calcite vein	1.1	-	<5	-	-	-	1880	-	7	-	-	-	-	-	55
032	Alaska Endicott	7061	Channel	Calcite vein	1.1	-	20	-	-	-	1430	-	6	-	-	-	-	-	35
033	North Boat Harbor	7529	Chip	Rhyolite	<5	18	<10	1900	16	7	<1	<5	16	8.8	<2	4	3.2	<3	30
033	North Boat Harbor	7530	Chip	Quartz vein	<5	2	<10	800	4	3	3	<5	14	1.7	<2	.8	<.5	<3	30
033	North Boat Harbor	7531	Chip	Rhyolite	<5	3	<10	2200	8	6	<1	<5	14	13	6	4	2.3	<3	20
034	North Boat Harbor	7532	Float	Silicified volcanic	<5	110	20	1000	95	3	16	5	200	31	<2	4.8	2.5	<3	60
034	North Boat Harbor	7533	Channel	Silicified volcanic	<5	3	<10	800	4	4	<1	<5	8	5.3	2	8.3	3.9	<3	40
034	North Boat Harbor	7534	Channel	Silicified volcanic	<5	4	<10	1600	5	2	3	<5	8	5.4	6	7	3.7	<3	20
035	WNW St. James Bay	7540	Select	Quartz vein	<5	21	<10	<150	2	5	880	<5	570	.3	2	<.5	<.5	<3	710
036	WNW St. James Bay	7553	Select	Argillite	<5	40	10	600	11	77	42	19	20	2.6	<2	5.4	6	<3	80

ANALYTICAL RESULTS- Continued.

Map no.	Name or Location	Sample no.	Sample type	Sample lithology	Ag	As	Au	Ba	Co	Cr	Cu	Mo	Pb	Sb	Sn	Th	U	W	Zn
037	WNW St. James Bay	7602	Select	Black slate	<5	28	10	600	11	79	29	9	14	4.3	<2	5	4.9	<3	100
038	North Boat Harbor	7558	Float	Breccia	<5	8	<10	1800	15	33	14	<5	8	.4	4	3.2	1.8	<3	80
039	North Boat Harbor	7559	Chip	Quartz vein	<5	17	<10	200	13	11	610	<5	320	.2	<2	.6	<.5	<3	180
040	WNW St. James Bay	7554	Select	Siliceous limestone	<5	120	50	600	9	36	55	45	50	20	<2	4.7	5	<3	70
040	WNW St. James Bay	7555	Chip	Quartz vein	<5	3	<10	<150	4	15	27	<5	4	.4	6	1	.7	<3	80
040	WNW St. James Bay	7556	Chip	Jasperoid	<5	14	10	600	7	110	48	7	20	2.9	8	4.5	4.4	<3	130
041	WNW St. James Bay	8032	Chip	Argillite	<.2	-	<10	-	-	-	47	-	15	-	-	-	-	-	90
042	W. St. James Bay	7527	Chip	Greenstone	<5	3	<10	700	12	250	14	<5	10	.4	<2	4.8	1.7	<3	70
043	W. St. James Bay	7528	Select	Quartz vein	<5	2	<10	<150	1	6	3	<5	12	.2	4	.5	<.5	<3	30
044	St. James Bay	7112	Select	Quartz vein	1.4	-	<5	-	-	-	45	2	48	-	-	-	-	-	1460
044	St. James Bay	7113	Select	Quartz vein	1.4	-	<5	-	-	-	11	2	20	-	-	-	-	-	1460
044	St. James Bay	7114	Select	Quartz vein	4.8	-	10	-	-	-	43	2	5280	-	-	-	-	-	15100
045	St. James Bay	7115	Select	Quartz vein	1.0	-	<5	-	-	-	4	2	296	-	-	-	-	-	384
046	Lincoln Island	7173	Chip	Pyritic metachert	<5	<2	<10	3600	11	43	64	46	<2	.4	<2	3.2	1.7	<3	110
047	Lincoln Island	7188	Chip	Skarn	<5	8	40	<150	76	170	2200	<5	6	3.6	<2	1.6	5	<3	80
048	Lincoln Island	7174	Channel	Siliceous sinter	<5	<2	30	200	140	30	1900	69	8	.7	6	1.6	3.3	10	50
048	Lincoln Island	7175	Channel	Siliceous sinter	<5	<2	20	4000	81	32	1600	13	4	.9	<2	1.7	1.5	66	60
048	Lincoln Island	7176	Channel	Siliceous sinter	<5	2	20	1200	86	30	470	<5	14	.7	<2	1.9	2.6	41	70
048	Lincoln Island	7177	Channel	Iron Stained argill.	<5	2	<10	1700	15	130	80	<5	6	1.5	<2	2.3	2.2	<3	130
049	Lincoln Island	7178	Chip	Greenstone	<5	82	20	200	47	160	36	<5	6	1.5	2	.7	<.5	<3	140
050	Lynn Sisters	7155	Chip	Chlorite schist	<5	<2	<10	<150	1	7	2	<5	4	<.2	<2	.8	<.5	<3	<20
050	Lynn Sisters	7156	Chip	Quartz vein	<5	<2	<10	<150	5	4	2	<5	4	<.2	<2	.7	<.5	<3	<20
050	Lynn Sisters	7157	Channel	Breccia zone	<5	16	<10	500	41	75	51	<5	8	.6	<2	2.6	1.3	<3	120
051	Lynn Sisters	7158	Channel	Metachert	<5	120	40	700	1	-	5	<5	10	.3	8	14	6.9	<3	550
051	Lynn Sisters	7159	Select	Pyritic chert	<5	94	30	600	1	-	13	<5	44	1.3	<2	13	6.9	<3	90
052	E. Lynn Sisters	7506	Placer	N/A	<5	3	30	<150	48	150	2	<5	14	<.2	<2	6	3	4	220
053	S. Lynn Sisters	7160	Chip	Skarn	<5	<2	<10	400	15	58	45	12	4	<.2	<2	4.5	2.6	<3	170
054	S.W. Nun Mtn.	7023	Chip	Skarn	<.2	-	<5	-	-	-	21	5	15	-	-	-	-	-	30
055	Lincoln Island	7179	Chip	Siliceous argillite	<5	<2	<10	1900	19	180	90	62	8	1.5	<2	3.7	10.2	<3	240
056	Excursion Inlet	3170	Float	Limestone breccia	.7	-	55	-	-	-	71	6	20	-	-	-	-	3	104

ANALYTICAL RESULTS- Continued.

Map no.	Name or Location	Sample no.	Sample type	Sample lithology	Ag	As	Au	Ba	Co	Cr	Cu	Mo	Pb	Sb	Sn	Th	U	W	Zn
057	S. Mt. Golub	7517	Chip	Altered basalt	<5	<2	<10	300	51	250	160	<5	6	<.2	2	2	.8	<3	130
058	S. Mt. Golub	7518	Select	Hornfels (skarn)	<5	3	<10	500	12	120	35	8	6	.4	2	7.3	3.5	<3	80
059	S. Mt. Golub	7519	Select	Limestone	110	11	20	<150	21	200	430	<5	1600	75	<2	3.2	1.4	4	1600
059	S. Mt. Golub	7520	Select	Felsic intrusive	<25	<2	<10	200	33	240	48	<5	8	.6	<2	4.7	1.7	<3	70
059	S. Mt. Golub	7521	Chip	Metavolcanic	<5	4	<10	200	39	340	51	5	6	.7	<2	8.7	3.7	<3	100
060	W. Lynn Canal	7508	Chip	Fractured chert	<5	9	<10	200	14	54	48	<5	12	.3	<2	4	2.6	<3	90
061	N.W. Teardrop lake	7513	Select	Siliceous argillite	<5	<2	<10	1000	16	110	45	5	10	.6	4	6.4	2.6	<3	80
062	N.W. Teardrop Lake	7514	Select	Limestone	<5	1100	<10	300	16	65	24	<5	6	.8	<2	2.2	.9	<3	<30
063	N.W. Teardrop Lake	7526	Float	Limestone	<5	<2	<10	<150	3	21	<1	<5	2	.2	<2	1.2	.8	<3	<30
064	N.W. Teardrop Lake	7515	Select	Black argillite	<5	30	<10	600	13	120	64	7	18	1.7	<2	4.9	6.1	<3	70
065	N.W. Teardrop Lake	7516	Select	Altered limestone	<5	13	<10	500	44	340	32	<5	4	.3	<2	2.3	.9	<3	70
066	N.W. Teardrop Lake	7523	Float	Skarn	<5	<2	<10	200	31	190	120	<5	2	<.2	<2	2.8	1.2	<3	70
066	N.W. Teardrop Lake	7524	Float	Quartz vein	<5	<2	<10	<150	16	250	110	44	<2	<.2	<2	.6	<.5	<3	<20
067	N.W. Teardrop Lake	7525	Float	Quartz diorite	<5	<2	<10	600	7	77	150	7	4	<.2	<2	2.1	.8	<3	<30
068	N.W. Teardrop Lake	7522	Float	Siliceous argillite	<5	4	<10	700	22	120	44	<5	12	1.5	<2	6.5	2.6	<3	150
069	W. Lynn Canal	7507	Select	Rhyolite dike	<5	40	10	300	30	100	33	<5	12	4.3	<2	3	1.4	<3	70
070	S. Excursion Inlet	7189	Select	Quartz-ankerite vein	<5	8	<10	<150	3	42	5	<5	4	.6	2	1.2	<.5	<3	40
071	N. Pt. Howard	3332	Chip	Brecciated mudstone	<5	4	<10	500	19	170	27	<5	8	.3	<2	6.9	1.7	<3	90
072	N. Pt. Howard	3333	Float	Sedimentary breccia	<5	20	10	<150	4	17	2	<5	2	.4	<2	1.3	.6	<3	20
073	N. Pt. Howard	3334	Select	Chert	<5	12	<10	<150	24	18	52	<5	12	.7	<2	3.6	2	<3	60
073	N. Pt. Howard	3335	Chip	Graywacke	<5	7	<10	200	22	20	32	<5	12	.6	<2	2.9	1.8	<3	90
074	E. Porpoise Islands	8024	Chip	Limestone	<.2	-	<10	-	-	-	36	-	7	-	-	-	-	-	66
075	S. Study Area	6394	Chip	Argillite	<5	24	<10	500	24	15	67	<5	14	2	<2	7	2.6	<3	100
076	Buttercup	7054	Chip	Quartz breccia	>30	-	20	-	-	-	6450	-	36	-	-	-	-	-	3500
076	Buttercup	7055	Chip	Quartz breccia	3.8	-	10	-	-	-	49	-	14	-	-	-	-	-	2650
076	Buttercup	7056	Select	Quartz vein	>30	-	80	-	-	-	7540	-	245	-	-	-	-	-	>20000
076	Buttercup	7057	Select	Fault gouge	17	-	10	-	-	-	850	-	14	-	-	-	-	-	1860
076	Buttercup	7058	Select	Limestone	2.9	-	<5	-	-	-	80	-	23	-	-	-	-	-	144
077	Icy Strait	6421	Select	Meta volcanic	1.5	-	10	-	-	-	90	-	32	-	-	-	-	-	50
078	S. Study Area	8009	Chip	Calcareous argillite	<.2	-	<10	-	-	-	27	-	<2	-	-	-	-	-	66
078	S. Study Area	8010	Chip	Graywacke	<.2	-	10	-	-	-	55	-	2	-	-	-	-	-	86
078	S. Study Area	8011	Chip	Volcanic dike	<.2	-	10	-	-	-	40	-	<2	-	-	-	-	-	64

ANALYTICAL RESULTS- Continued.

Map no.	Name or Location	Sample no.	Sample type	Sample lithology	Ag	As	Au	Ba	Co	Cr	Cu	Mo	Pb	Sb	Sn	Th	U	W	Zn
079	S. Study Area	8015	Chip	Andesite	<.2	-	<10	-	-	-	30	-	7	-	-	-	-	-	68
080	S. Study Area	6395	Chip	Calcareous argillite	<5	8	<10	300	10	81	29	<5	8	.7	<2	3.8	2.6	<3	100
080	S. Study Area	6396	Chip	Tuff	<5	<2	<10	400	18	37	43	<5	6	.6	<2	1.8	.9	<3	90
081	S. Study Area	8012	Chip	Limestone	<.2	-	<10	-	-	-	48	-	3	-	-	-	-	-	90
081	S. Study Area	8013	Chip	Volcanic dike	<.2	-	136	-	-	-	31	-	6	-	-	-	-	-	80
081	S. Study Area	8014	Chip	Limestone	<.2	-	<10	-	-	-	60	-	23	-	-	-	-	-	100
082	Icy Strait	8028	Chip	Mylonite	.8	-	136	-	-	-	61	-	52	-	-	-	-	-	114
083	S. Study Area	8017	Chip	Limestone	.2	-	<10	-	-	-	132	-	9	-	-	-	-	-	94
083	S. Study Area	8018	Channel	Limestone	<.2	-	10	-	-	-	34	-	4	-	-	-	-	-	66
084	S. Study Area	8016	Chip	Andesite porphyry	<.2	-	<10	-	-	-	55	-	<2	-	-	-	-	-	102
085	S. Study Area	6412	Select	Siliceous andesite	<.2	-	<10	-	-	-	15	-	<2	-	-	-	-	-	66
086	S. Study Area	6397	Channel	Black argillite	<5	49	<10	300	19	71	50	<5	10	7	<2	4.3	2.7	<3	130
086	S. Study Area	6398	Channel	Green argillite	<5	19	<10	300	42	140	71	<5	10	4.7	2	.9	<.5	<3	130
086	S. Study Area	6399	Channel	Siliceous argillite	<5	32	<10	400	19	120	65	<5	24	4.6	<2	4.5	2.8	<3	160
086	S. Study Area	8001	Channel	Green argillite	<5	11	<10	300	37	100	95	<5	8	4	<2	1.4	<.5	<4	150
086	S. Study Area	8002	Channel	Argillite	<5	23	<10	300	43	190	85	<5	10	3.7	2	1.4	<.5	<4	150
087	S. Study Area	8003	Chip	Limestone	<5	17	<10	400	11	14	45	<5	6	2.5	2	2.5	.8	<3	70
088	S. Study Area	8004	Chip	Rhyodacite	<5	49	<10	400	25	74	63	<5	8	4.3	<2	1.7	.7	<3	100
088	S. Study Area	8005	Select	Quartz vein	<5	3	<10	<150	1	6	6	<5	4	.7	2	<.5	<.5	<3	<20
089	S. Study Area	8019	Channel	Mylonite	<.2	-	<10	-	-	-	60	-	6	-	-	-	-	-	80
090	S. Study Area	8029	Select	Limestone	<.2	-	<10	-	-	-	30	-	14	-	-	-	-	-	72
090	S. Study Area	8030	Select	Calcite vein	<.2	-	<10	-	-	-	7	-	13	-	-	-	-	-	14
090	S. Study Area	8031	Select	Andesite	<.2	-	<10	-	-	-	60	-	3	-	-	-	-	-	60
091	S. Study Area	6422	Select	Andesite	<.2	-	<10	-	-	-	52	-	5	-	-	-	-	-	80
092	S. Study Area	8027	Channel	Siliceous dike	.2	-	<10	-	-	-	44	-	71	-	-	-	-	-	132
093	S. Study Area	8023	Chip	Basaltic dike	<.2	-	<10	-	-	-	50	-	<2	-	-	-	-	-	74
094	S. Study Area	8025	Chip	Siliceous dike	.8	-	<10	-	-	-	41	-	172	-	-	-	-	-	184
094	S. Study Area	8026	Chip	Quartz vein	>30	-	<10	-	-	-	170	-	>7500	-	-	-	-	-	3800
095	S. Study Area	6382	Select	Andesite	<5	8	<10	300	33	110	48	<5	2	1.2	<2	1.1	<.5	<5	120
096	S. Study Area	6376	Select	Gossan in andesite	<5	60	20	200	21	130	110	<5	280	8.6	4	1.1	<.5	<5	420
096	S. Study Area	6377	Select	Gabbro	<5	4	<10	200	41	140	53	<5	8	1.4	<2	1.2	<.5	<6	150

ANALYTICAL RESULTS- Continued.

Map no.	Name or Location	Sample no.	Sample type	Sample lithology	Ag	As	Au	Ba	Co	Cr	Cu	Mo	Pb	Sb	Sn	Th	U	W	Zn
097	S. Study Area	6378	Select	Andesite porphyry	<5	90	30	200	24	61	19	<5	98	5.6	<2	1.4	.7	<5	170
097	S. Study Area	6379	Select	Diabase dike	<5	9	<10	200	23	80	50	<5	10	3	<2	1.7	.5	<4	90
098	S. Study Area	6381	Select	Andesite breccia	<5	3	<10	<150	5	26	10	<5	2	.4	<2	1.3	.9	<3	50
099	S. Study Area	6383	Select	Andesite	<5	3	<10	700	27	34	66	<5	8	.5	<2	3.4	1.5	<4	140
100	S. Study Area	6404	Select	Meta-volcanic	<.2	-	<10	-	-	-	40	-	<2	-	-	-	-	-	64
101	S. Study Area	6375	Select	Mafic-volcanic	<5	3	<10	300	35	69	48	<5	6	.5	<2	1.7	<.5	<7	180
102	S. Study Area	6413	Chip	Limestone	<.2	-	<10	-	-	-	45	-	13	-	-	-	-	-	100
102	S. Study Area	6414	Select	Andesite porphyry	1.7	-	410	-	-	-	23	-	27	-	-	-	-	-	430
102	S. Study Area	6415	Select	Gouge zone	>30	-	719	-	-	-	210	-	4070	-	-	-	-	-	9200
103	S. Study Area	6380	Chip	Andesite	<5	<2	<10	700	32	190	86	<5	6	.2	<2	3.6	1.8	<3	110
104	S. Study Area	6405	Select	Limy argillite	<.2	-	10	-	-	-	38	-	8	-	-	-	-	-	100
104	S. Study Area	6406	Select	Meta-andesite	<.2	-	<10	-	-	-	43	-	<2	-	-	-	-	-	72
105	S. Study Area	6374	Chip	Andesite	<5	10	<10	400	16	31	19	<5	6	1.7	4	2.6	1	<4	140
106	S. Study Area	6407	Select	Andesite porphyry	<.2	-	<10	-	-	-	40	-	<2	-	-	-	-	-	50
107	S. Study Area	8020	Chip	Andesite	<.2	-	<10	-	-	-	59	-	11	-	-	-	-	-	118
108	S. Study Area	6408	Select	Siliceous andesite	<.2	-	<10	-	-	-	25	-	<2	-	-	-	-	-	66
109	S. Study Area	6409	Select	Andesite	<.2	-	<10	-	-	-	4	-	<2	-	-	-	-	-	82
110	S. Study Area	6410	Select	Fault gouge	<.2	-	<10	-	-	-	62	-	24	-	-	-	-	-	144
111	S. Study Area	6411	Select	Rhyolite dike	<.2	-	<10	-	-	-	52	-	6	-	-	-	-	-	94
112	S. Study Area	6420	Select	Limestone	.2	-	<10	-	-	-	56	-	27	-	-	-	-	-	126
112	S. Study Area	8021	Chip	Volcanic dike	<.2	-	<10	-	-	-	68	-	3	-	-	-	-	-	90
113	S. Study Area	8022	Channel	Volcanic dike	<.2	-	<10	-	-	-	34	-	<2	-	-	-	-	-	70
114	Icy Strait	7510	Select	Meta-andesite	<5	5	10	300	15	14	54	<5	<2	.9	2	2.9	1	<3	40
115	Icy Strait	7509	Select	Cherty limestone	<5	6	90	900	13	76	36	<5	4	2.8	<2	5.2	3.1	<3	100
116	Icy Strait	7511	Select	Limy argillite	<5	8	<10	300	14	75	61	<5	<2	.7	<2	4.4	2.7	<3	140
116	Icy Strait	7512	Float	Cherty limestone	<5	11	<10	<150	12	55	9	<5	4	1	<2	1.1	<.5	<3	<30