STUDIES RELATED TO WILDERNESS

ALPINE LAKES, WASHINGTON

U.S. DEPARTMENT OF THE INTERIOR
March 3, 1849

GEOLOGICAL SURVEY BULLETIN 1542

Mineral Resources of the Alpine Lakes Study Area and Additions, Chelan, King, and Kittitas Counties, Washington

By U.S. GEOLOGICAL SURVEY *and* U.S. BUREAU OF MINES

STUDIES RELATED TO WILDERNESS—STUDY AREAS

U.S. GEOLOGICAL SURVEY BULLETIN 1542

An evaluation of the mineral potential of the area

Summary and Chapters A through E

UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON: 1989

DEPARTMENT OF THE INTERIOR

DONALD PAUL HODEL, *Secretary*

U.S. GEOLOGICAL SURVEY

Dallas L. Peck, *Director*

Library of Congress Cataloging in Publication Data

Mineral resources of the Alpine Lakes study area and additions, Chelan, King, and Kittitas counties, Washington.
(Studies related to wilderness—study areas)
(Geological survey bulletin ; 1542 A–E)
Prepared by the U.S. Geological Survey and the U.S. Bureau of Mines.
Bibliography: p.
Contents: Geology of the Alpine Lakes study area and additions, Washington / by J.L. Gualtieri and George C. Simmons — Aeromagnetic interpretation of the Alpine Lakes study area and additions, Washington / by W.E. Davis — Mineral deposits of the Alpine Lakes study area and additions, Washington ; Geochemical exploration of the Alpine Lakes study area and additions, Washington / by J.L. Gualtieri and George C. Simmons — [etc.]
1. Mines and mineral resources—Washington (State)—Alpine Lakes Wilderness. I. Geological Survey (U.S.). II. United States. Bureau of Mines. III. Series: IV. Series: Geological Survey bulletin ; 1542 A–E.
QE75.B9 no. 1542 A–E [TN24.W2] 557.3s 82–6191
[553′.09797′5] AACR2

For sale by the Books and Open-File Reports Section
U.S. Geological Survey, Federal Center
Box 25425, Denver CO 80225

STUDIES RELATED TO WILDERNESS STUDY AREAS

In accordance with the provisions of the Wilderness Act (Public Law 88-577, Sept. 3, 1964) and the Conference Report on Senate bill 4, 88th Congress, the U.S. Geological Survey and the U.S. Bureau of Mines have been making mineral surveys of wilderness and primitive areas. Studies and reports of all primitive areas have been completed. Areas officially designated as "wilderness," "wild," or "canoe" when the act was passed were incorporated into the National Wilderness Preservation System, and some of them are presently being studied. The act provided that areas under consideration for wilderness designation should be studied for suitability for incorporation into the Wilderness System. The mineral surveys constitute one aspect of the suitability studies. This report discusses the results of a mineral survey of some national forest lands in the Alpine Lakes study area and additions thereto, Washington, that may be considered for wilderness designation. The areas studied are on the crest of the Cascade Range in west-central Washington.

CONTENTS

ILLUSTRATIONS

MINERAL RESOURCES OF THE ALPINE LAKES STUDY AREA AND ADDITIONS, CHELAN, KING, AND KITTITAS COUNTIES, WASHINGTON

SUMMARY

The Alpine Lakes area is rugged terrain on the crest of the central part of the Cascade Range of Washington State (fig. 1). The original study area of 324 mi^2 (square miles) (839 km^2 or square kilometers) was investigated in the field seasons of 1971 and 1972, and eighteen additions to the original area which range from 0.3 mi^2 (0.8 km^2) to 62.9 mi^2 (162.9 km^2) and total 275 mi^2 (712 km^2), were studied mostly in the field season of 1973.

The studies included reconnaissance geologic mapping, geochemical sampling and examination of mines, prospects, and claims.

The Alpine Lakes area is divided into two blocks of diverse geology, an eastern block containing dominantly pre-Cretaceous metamorphic, mafic, and ultramafic rocks and Cretaceous granitic rock, and a western block characterized by Mesozoic and Tertiary sedimentary and volcanic rocks, Tertiary granitic rocks, and minor amounts of pre-Mesozoic rocks. The two blocks are more or less separated by the Deception Creek fault zone, a group of anastomosing northwest-trending vertical faults. The Deception Creek structure also forms a shear zone in serpentinized peridotite. Thrust faults and major north- to northwest-trending high-angle faults transect the rocks of the western block. Geochemical sampling was systematically conducted; areas in which anomalous amounts of metal were detected were examined in more detail to determine the source of the metals. U.S. Geological Survey personnel collected a total 4,702 samples for analysis: 2,657 stream-sediment samples, 19 soil samples, 8 panned-concentrate samples, and 2,018 rock samples. U.S. Bureau of Mines personnel concentrated on prospected veins, shear zones, and mineralized areas and collected about 1,200 samples. The samples were analyzed by fire-assay and chemical methods. More than 35 samples from placer claims and gravel deposits were analyzed for gold and heavy-mineral content.

Intensely altered volcanic and granitic rocks that contain anomalous amounts of copper occur in several places in the Alpine Lakes area; for example, the drainage basins of Gold, Mineral, Van Epps, and Lemah Creeks and the Middle Fork Snoqualmie River.

County records show that about 1,900 lode and placer claims, 136 of which are patented, have been located within and adjacent to the study area since the 1870's. Many of the claims lie in groups in established mining districts. For study of the mines and prospects, the area was divided into 20 smaller areas that contain most of the claims. Most prospects are near the margins of granitic masses in or near the western and southern parts of the study area.

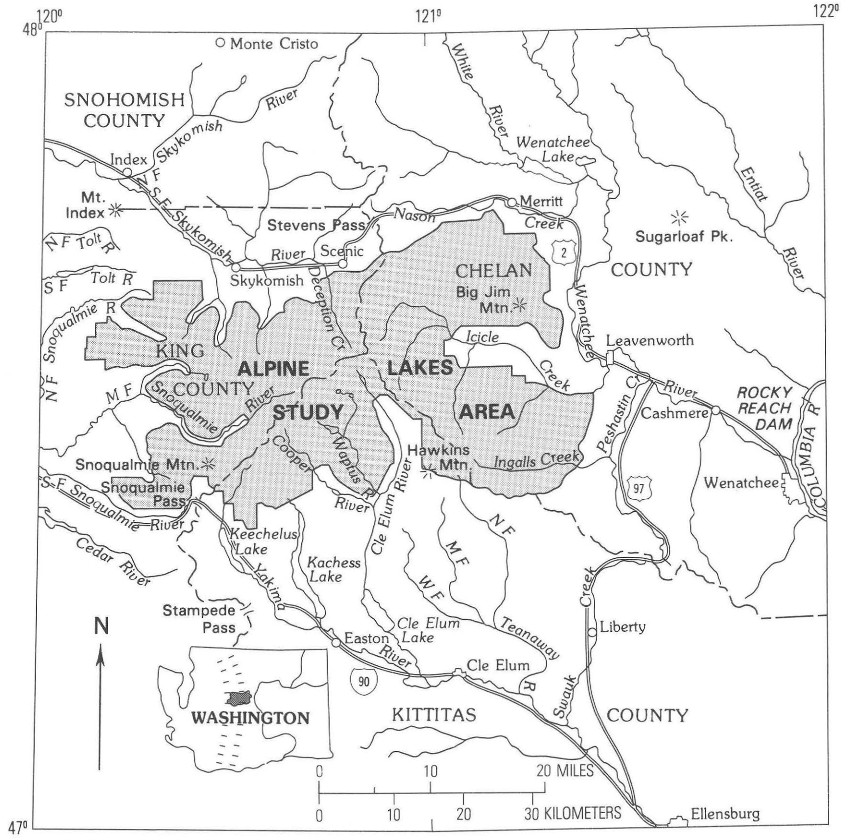


FIGURE 1.—Location of the Alpine Lakes study area.

Production of about 500 tons (450 metric tons) of gold-silver-copper ore has been recorded from the study area and a larger but unrecorded tonnage of ore was probably produced by exploratory work.

A poorly defined belt of disseminated copper deposits appears to extend from the area of the Middle Fork Snoqualmie River southward through the Gold Creek area to the Mineral Creek area. The belt is characterized by anomalously high amounts of copper and, commonly, lesser amounts of molybdenum in intensely to moderately altered rock. Deposits in the Porter and Crawford Creek zones near the Middle Fork Snoqualmie River may contain a potentially large low-grade copper resource; the Porter-Hemlock-Condor mineralized zones may contain a total of 200 million tons (181 million metric tons) of mineralized rock having 0.7 percent copper. The Three Brothers zone of mineralized granodiorite and quartz monzonite may contain as much as 2 million tons (1.8 million metric tons) averaging 0.8 percent copper. The Red Face zone in the same area contains low-grade disseminated copper which may also be a potential resource. A potential resource in Gold Creek valley consists of disseminated sulfide minerals, mainly chalcopyrite and molybdenite, in granitic rock. Two drill holes by Phelps Dodge Co. intersected 300-ft-wide (feet) (91 m or meter) zones that assayed 0.11 and 0.12 percent copper.

High-angle faults may have controlled the emplacement of the deposits in several of these mineralized areas.

Several small base-metal deposits and small patches of hydrothermally altered rock containing disseminated sulfide minerals occur in the Van Epps Pass area. The deposits are in shear zones in ultramafic rock or are associated with intermediate to mafic dikes. Rock and stream-sediment samples taken in the area suggest a possible zonation from relatively high-copper–low-zinc concentrations near the contact of the Mount Stuart batholith and ultramafic rocks, to relatively high-zinc–low-copper concentrations away from the contact. Low-grade mineralized rock in the Van Epps adit and in another zone explored by drilling may represent a potential copper resource. The weighted average of samples taken 242 ft (74 m) along the adit was 0.33 percent copper. Mineralized rock containing 0.10–0.46 percent copper was disclosed in 226 ft (69 m) of drill hole about 3,500 ft (1,067 m) from the adit. The zones are not evident on the surface.

The Mineral Creek area contains anomalous amounts of copper and molybdenum which occur mostly in volcanic rock and to a lesser extent in adjacent granitic rock and schist near a high-angle fault. Copper occurs on the west side of Red Mountain near Snoqualmie Pass near the contact of a granitic stock with sedimentary and volcanic rock.

A shear zone with abundant limonite on the rock surfaces extends southeastward from Green Ridge Lake for about 0.33 mi (0.54 km). Surface samples from the zone, however, contain only minor amounts of silver and copper.

An iron-stained altered area of granitic rock in the eastern part of the Alpine Lakes area on French Ridge near Turquoise Lake shows anomalies in zinc, copper, silver, and tin. Because sparse grains of sulfide minerals are in the altered rocks, the area is considered to have mineral potential.

Vein-type mineral deposits containing base and precious metals occur in the western part of the Alpine Lakes study area and near the eastern part of the area in an arcuate belt roughly paralleling the southern and southwestern edge of the Mount Stuart batholith.

Of the several vein-type mineral deposits in the Alpine Lakes area the Dutch Miller mine in the Chain Lakes basin near La Bohn Gap is the most promising. One vein is exposed at the surface and two are in the subsurface. They may be genetically related to the emplacement of a young stock of the composite Snoqualmie batholith. The veins are on shear zones that have not been explored at depth. The mine contains an estimated 3,700 tons (3,400 metric tons) of copper ore averaging more than 11 percent copper and has the potential for additional discoveries of ore. With suitable access, this deposit may be a minable copper deposit. Other veins may be present in the subsurface in the Chain Lakes basin and possibly other areas surrounding the stock.

Stream-sediment and rock samples collected in the areas of lower Big Creek, Cougar Creek, Lennox Creek, the West Fork of the Miller River, and Gouging Lake contain anomalous amounts of metallic elements that may indicate the possible presence of undiscovered vein deposits of precious and base metals that are similar in size and metal content to known deposits in the area. The deposits are characteristically arsenical and contain silver, copper, and molybdenum. Silver was detected in samples from the main mineralized areas and, in some localities, constitutes the major resource. Most consistent silver values are near a shear zone that extends from the upper West Fork Miller River to Paradise Lakes. The Cleopatra mine is estimated to have more than 100,000 tons (91,000 metric tons) of mineralized rock containing between 6 and 17 oz/ton (ounces per ton) (332.9–514.3 g/metric ton or grams per metric ton) silver. Other prospects in that area contain lesser tonnages and lower grade rock.

Vein deposits of arsenopyrite containing consistent silver values are indicated from the analyses of samples collected in the Sprite Lake area. They contain as much as 6.8 oz/ton (233 g/metric ton) silver. Gold, in addition to silver, is a potential resource in the Sprite Lake veins. Samples from veins on the Transit, Giant, Silver King, and Silver Queen claims, all in the Gold Creek area contain as much as 22.40 oz/ton

(768 g/metric ton) silver. The deposits are not currently economic but represent a small potential resource of silver. Samples from the Dutch Miller mine contain about 2–10 oz/ton (69–343 g/metric ton) silver. There, copper would be the primary product but silver would be a significant byproduct.

Veins containing detectable amounts of gold occur in many places in the study area but only in the Sprite Lake area do they contain significant concentrations. One vein in the Sprite Lake area is estimated to contain more than 2,000 tons (1,814 metric tons) of mineralized rock containing about 1.78 oz/ton (61 g/metric ton) gold. The Lennox mine in the Lennox Creek drainage has produced some gold ore. Two other mines adjacent to the north boundary of the wilderness area contain concentrations of gold, one representing a minable resource. The mineralized structures may extend into the study area. Placer samples from all areas contain only very minor amounts of recoverable gold.

The Paleocene Swauk Formation near Summit Chief Mountain, which is structurally similar to the Swauk which contains the L-D gold deposit near Wenatchee, may have mineral potential.

The study area has no potential for combustible fuels and probably only little potential for fissionable fuels. Small noneconomic iron deposits are present in three, and possibly four places. Small lenticular bodies of marblized limestone that are found near Snoqualmie Pass are not considered suitable for the manufacture of cement. Granitic rock and sandstone, possibly suitable for construction and decorative stone, and sand and gravel are present in the study area but are more readily available at other localities outside the area.

The Snoqualmie batholith is of late Miocene age and may retain sufficient heat to be considered a source of geothermal energy. The only known hot spring occurs near the boundary of the study area but the heat may be generated by the oxidation of an adjacent sulfide body.

Geology of the Alpine Lakes Study Area and Additions, Washington

By J. L. GUALTIERI *and* GEORGE C. SIMMONS, U.S. GEOLOGICAL SURVEY

MINERAL RESOURCES OF THE ALPINE LAKES STUDY AREA AND ADDITIONS, CHELAN, KING, AND KITTITAS COUNTIES, WASHINGTON

U. S. GEOLOGICAL SURVEY BULLETIN 1542-A

CONTENTS

ILLUSTRATIONS

TABLE

MINERAL RESOURCES OF THE
ALPINE LAKES STUDY AREA AND ADDITIONS,
CHELAN, KING, AND KITTITAS COUNTIES,
WASHINGTON

GEOLOGY OF THE ALPINE LAKES STUDY AREA AND ADDITIONS, WASHINGTON

By J. L. GUALTIERI and GEORGE C. SIMMONS,
U.S. GEOLOGICAL SURVEY

INTRODUCTION

The survey of the Alpine Lakes area, which consisted of 324 m^2 (square miles) (839 km^2 or square kilometers) in the scenic, rugged Cascade Range east of Seattle, Wash., began in 1971. Work in this area was completed in 1972, and a report on it was released in 1973 (Gualtieri and others, 1973). Many additions to the study area totalling 275 mi^2 (712 km^2) were studied in 1972 and 1973, and a report on them was released in 1975 (Gualtieri and others, 1975). Both of these open-file reports are here brought together as an integrated published report. The additions, identified by letter symbol, are shown on plate 2. They are also listed in table 1, and the size of their respective areas is indicated.

LOCATION AND GEOGRAPHY

The Alpine Lakes study area is in the central part of the Cascade Range of Washington (fig. 1) and is roughly bounded by Interstate Highway 90 on the southwest, U.S. Highway 2 on the northwest, and U.S. Highway 97 on the southeast. The western boundary lies along the South, Middle, and North Forks of the Snoqualmie River. On the west, south, and east the boundary lies well back from the main highways and follows such natural features as ridge crests and valley floors. The boundary of the southeastern part of the area is about 3 mi (miles) (5 km or kilometers) southwest of Leavenworth, Wash. The

TABLE 1.—*Additions to the Alpine Lakes study area, Washington*

Symbols on plate 2	Name	Area			
		Mi²	Acres	Km²	Hectares
A.	Chiwaukum Mountains	54.5	34,880	141	14,100
B.	Icicle Creek	0.6	384	1.6	160
C.	Blackjack Ridge	1.0	640	2.6	260
D.	Mt. Cashmere	3.0	1,920	7.8	780
E.	Wedge Mountain	0.5	320	1.3	130
F.	Ingalls Creek	4.9	2,956	12.7	1,270
G.	South Fork of Fortune Creek	5.0	3,200	13.0	1,300
H.	Goat Mountain-Polallie Ridge	22.8	14,592	69.0	6,900
I.	Mineral Creek	7.8	4,942	20.2	2,020
J.	Lake Lillian	4.0	2,560	10.4	1,040
K.	Kendall Peak	4.0	320	1.3	130
L.	South Fork-Middle Fork of the Snoqualmie River	49.7	31,808	128.7	12,870
M.	Middle Fork of the Snoqualmie River–Taylor River	38.0	21,920	98.4	9,840
N.	Lennox Creek-Miller River	62.9	41,256	162.9	16,290
O.	Foss River	3.7	2,368	95.8	9,580
P.	Burn Creek	2.0	1,280	5.2	520
Q.	Deception Creek–Tunnel Creek	13.6	8,704	35.2	3,520
R.	Cle Elum River	0.3	192	0.8	80

southwestern part of the area is about 0.5 mi (0.8 km) from the Snoqualmie Pass Recreation Area and the northwestern boundary is about 2 mi (3.2 km) from the Stevens Pass Recreation Area.

The study area is rugged and is characterized by deeply glaciated canyons and serrate ridges. In only a few small highland areas does relatively flat rolling topography exist. Major streams draining the area are Icicle and Ingalls Creeks on the east; the Cle Elum, Waptus, and Cooper Rivers on the south; the South, Middle, and North Forks of the Snoqualmie River, and Taylor River on the west; Lennox Creek and the East and West Forks of the Miller River on the northwest; and the East and West Forks of the Foss River, and Deception Creek on the north. Mount Stuart, in the southeast-central part of the area is the highest peak in the area at an altitude of 9,415 ft (feet) (2,871 m or meters). It is one of several peaks in the Stuart Range having summits above 8,000 ft (2,440 m). In the western part of the study area the highest peaks exceed 7,000 ft (2,135 m), and in the northeastern part they reach almost 8,000 ft (2,440 m); in both parts the lower peaks and ridges average 6,000–7,000 ft (1,830–2,135 m).

Little of the scenery of the Alpine Lakes area is visible from the highways either because of obstruction by intervening terrain or because of steep relief which permits only upward oblique views. Locally, however, parts of the Alpine Lakes area can be seen from certain vantage points: the Stuart Range is visible from places along

Interstate 90 as far east as Moses Lake, which is about 85 mi (136 km) east of the area between Ellensburg and Cle Elum, and from along U.S. Highway 2 between Wenatchee and Leavenworth, as well as from secondary roads southeast of the Alpine Lakes study area; the southwestern part of the area is visible from Interstate 90 near Snoqualmie Pass and from a secondary road in the Cooper Lake area about 15 mi (24 km) north of Cle Elum (fig. 2). The southeastern ridge and the peak of Cashmere Mountain are visible from the Icicle Creek road at a point about 5 mi (8 km) from Leavenworth.

A secondary road in the Alpine Lakes area starts in Icicle Creek canyon and extends about 2 mi (about 3 km) up Eight Mile Creek to a short distance above its confluence with Pioneer Creek. Another road, which requires a four-wheel-drive vehicle, starts in the canyon of the Cle Elum River about 5 mi (8 km) above Salmon La Sac Guard

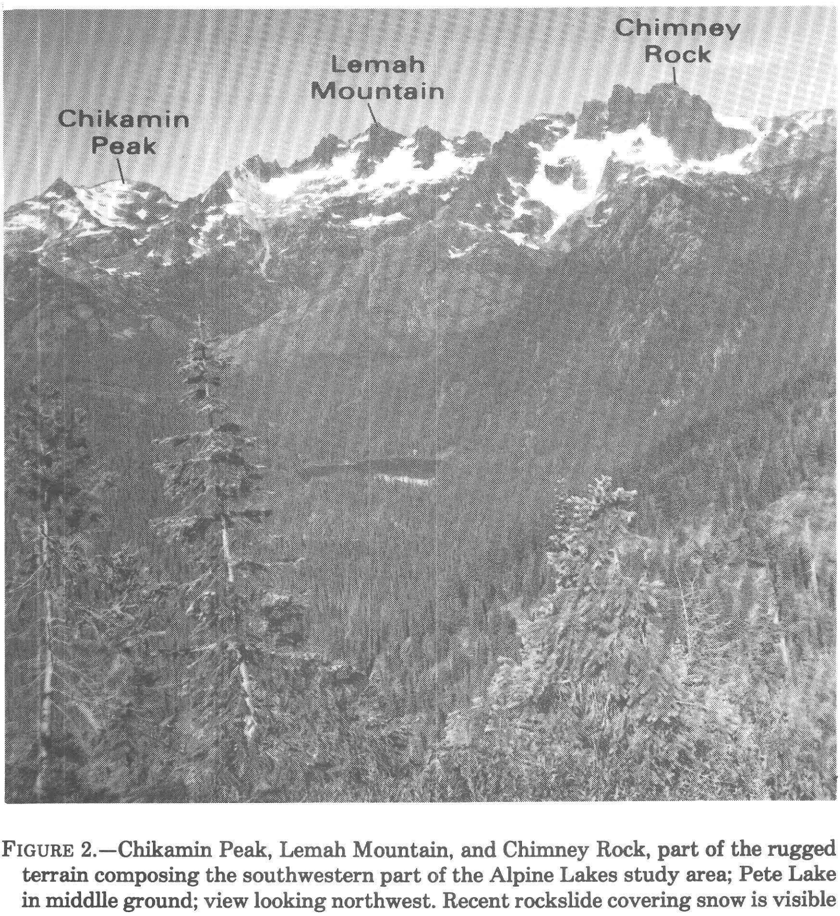


FIGURE 2.—Chikamin Peak, Lemah Mountain, and Chimney Rock, part of the rugged terrain composing the southwestern part of the Alpine Lakes study area; Pete Lake in middlle ground; view looking northwest. Recent rockslide covering snow is visible to left of Lemah Mountain.

Station and extends up Fortune Creek to a few miles (a few kilometers) inside the study area at Van Epps Pass from which the southeast-central part of the area can be seen.

Many Forest Service trails traverse the Alpine Lakes area. The Cascade Crest Trail, perhaps the best known, enters the area along the Middle Fork Snoqualmie River, crosses the Cascade crest at three places, and crosses the area boundary about 2 mi (3 km) southeast of Stevens Pass. A popular side trail takes off from the Cascade Crest Trail near the head of the Middle Fork Snoqualmie River and passes through the Necklace Valley area and leaves the Alpine Lakes area near the confluence of the East and West Forks of the Foss River. Snow Lakes Trail is the most used; it starts in Icicle Creek canyon about 4 mi (6.5 km) west of Leavenworth, passes between the main Stuart Range and The Temple by way of Snow Lakes and Lower Enchantment Lakes, and ends near Upper Enchantment Lakes. In the distance of about 7 mi (11 km) there is a vertical rise of about 6,500 ft (1,980 m).

The Alpine Lakes area has been glaciated and as a result about 30 small glaciers and more than 600 small lakes remain. Glacial features, such as cirques and hanging valleys, are common throughout the area and near the toes of some of the glaciers small morainal deposits of the 19th century glacial advance are evident (fig. 3). The area is mostly below timberline, which is at about 6,000 ft (1,830 m). Dense stands of Douglas-fir and minor pine and other types of conifers cover most of the area. In the southeastern part, which is appreciably drier than the rest of the area, open stands of ponderosa pine grow on the lower south-facing slopes. On valley floors, in the northeastern part, are groves of aspen. Tamarack, spruce, and white pine grow locally in areas near timberline. In areas where fire or snow slides have destroyed the trees, bush alder and vine maple have taken over and form dense thickets. Equally dense thickets of willow grow along streams on some valley floors in the northwestern part of the area. Alpine-type vegetation flourishes where soils have developed.

There was little industrial activity in the area during the study. There was no mining but there was active exploration of several mineral deposits. There was no logging because the area is being considered for wilderness status. Highland meadows permit limited domestic sheep grazing. The area is an important source of water. Streams that flow eastward, notably Icicle Creek, supply fruit orchards in the Wenatchee River valley below Leavenworth. Other streams flow into Keechelus, Kachess, and Cle Elum Lakes, all of which are dammed and serve as reservoirs to conserve the spring runoff which is drawn from the Yakima River for irrigation of Kittitas and Yakima Valleys.

FIGURE 3.—North side of Mount Daniel. Toe of Lynch Glacier shows from beneath névé in lower part of photograph.

PREVIOUS STUDIES

Geologic studies of the Alpine Lakes area have been concerned mainly with the areal geology and description of the rock units; however, there are a few unpublished reports about the mineral deposits in the area.

Russell (1900) sketchily reported on the geology of the Cascade Range of northern Washington and made the earliest known mention of the geologic character of the Alpine Lakes area; he recognized granitic rocks and serpentinized peridotite in the southeastern part of the area.

Smith (1904) mapped the Mount Stuart 30-minute quadrangle, which includes the southeastern part of the Alpine Lakes area. Smith and Calkins (1906) later mapped the adjoining Snoqualmie 30-minute quadrangle which includes the south-central and southwestern part of the Alpine Lakes area. The work of these men has remained a primary source of the knowledge of the geology of the central Cascade Range of Washington, although new studies have modified their interpretations.

Later work in the area includes several unpublished theses and published articles by graduate students of the University of Washington and other schools. Pratt (1954, 1958) made a reconnaissance of most of the Alpine Lakes area east of the Cle Elum River and Deception Creek where he mapped pre-Tertiary schist, ultramafic rock, and the Mount Stuart batholith. Foster (1955, 1960, 1967) studied pre-Tertiary and Tertiary sedimentary and volcanic rocks in the southwestern part of the area near Snoqualmie Pass. Galster (1956) studied the area south of the Skykomish River and west of Deception Creek covering part of the ground along the northwestern boundary of the Alpine Lakes area. He mapped parts of several rock units including pre-Tertiary schist and Tertiary sedimentary, volcanic, and batholithic rocks. Ellis (1959) mapped extensions of Galster's rock units in the southwestern and south-central parts of the study area.

Bethel (1951) studied and mapped rocks of the Snoqualmie batholith and older sedimentary and volcanic units in the western part of the area. Erikson studied first (1965) the eastern part of the Snoqualmie batholith and subsequently (1968, 1969) the whole body. He defined many textural and mineralogic facies of the body, demonstrating the composite nature of the batholith. Plummer (1964) studied the Snoqualmie batholith and older rocks in the northwestern part of the area, and later (1969) he studied the pre-Tertiary schist, ultramafic bodies, and the Mount Stuart batholith in the northeastern part of the area. Southwick (1962) studied the mafic and ultramafic rocks in the Peshastin area and a small part of the southeast corner of the Alpine Lakes area. Grant's (1969) study of ore deposition and related alteration in the central Cascade Range included the western parts of the study area.

Graduate students at the University of Washington (1972) have reported on the environmental aspects of the geology in the central Cascades including the Alpine Lakes study area.

Several mines and mineral deposits in the study area were examined by the U.S. Bureau of Mines and the U.S. Geological Survey during the Strategic Minerals program in the 1940's, and the Bureau of Mines made an unpublished study of copper resources in the Cascade Mountains in the 1950's. The reports briefly describe the workings and mineral occurrences at the mines examined. The U.S. Forest Service has made mineral appraisals in various parts of the study area notably in the Mineral Creek area and at various prospects on the Middle Fork of the Snoqualmie River. Though unpublished, most of these mineral appraisal reports were available to the writers.

Many unpublished geologic studies have been made of mineral deposits in the Alpine Lakes area by mining companies. Some of the reports were available to the writers of this report.

PRESENT STUDIES AND ACKNOWLEDGMENTS

Fieldwork for this report was begun by J. L. Gualtieri and George C. Simmons in the summer of 1971 and continued through the summer of 1973. Fred W. Cater helped with the work for two weeks in 1973. F. Michael Krautkramer and Ronald J. Tucker assisted with the fieldwork in 1971 and Harvard C. Perron assisted with the fieldwork in 1973. Approximately 19 man-months were spent by U.S. Geological Survey personnel in field investigations.

Samples of stream sediments were taken along all the major and medium-sized stream drainages, and soil samples were collected from one mineralized area. Rock samples were collected from the crests and flanks of most ridges, especially near mineral deposits and in areas of hydrothermally altered rock.

The analytical work was performed in the field by U.S. Geological Survey personnel under the immediate supervision of C. L. Whittington. Semiquantitative spectrographic analyses were made by C. L. Forn, E. F. Cooley, and K. J. Curry.

U.S. Bureau of Mines personnel investigated the mining districts and mineralized zones during the summers of 1971–73. The investigations were done by H. K. Thurber, Michael S. Miller, Arel B. McMahan, and Frank E. Federspiel, assisted by Michael B. Whalen, Lanny R. Ream, Fred L. Johnson, Alan L. Hart, John Roswell Hill, Guy W. Curtis, and Thomas L. Hamilton. Approximately 51 man-months were spent by Bureau of Mines personnel in field investigations.

The work of the U.S. Bureau of Mines was concerned mainly with the economic aspect of the mineral resources in and adjacent to the study area. Some information was obtained from the U.S. Forest Service. The records of Chelan, King, and Kittitas Counties were examined to determine the location of patented and unpatented mining claims. Data on production and history of mining were compiled from records of the U.S. Bureau of Mines and the Washington Division of Mines and Geology.

The computer storage and retrieval program work was completed under the direction of Lamont O. Wilch with the assistance of Steven K. McDanal, both with the U.S. Geological Survey.

An airborne magetometer survey was flown in the summer of 1972 by Scintrex Mineral Surveys, Inc. The data were interpreted by W. E. Davis of the U.S. Geological Survey.

Because of its precipitous terrain, helicoptors and fixed-wing aircraft were aids in gaining access to much of the area. Motor vehicles were used in low-lying areas.

The mineral appraisal of the study area was aided by the helpful cooperation of U.S. Forest Service officials of the Wenatchee and

Snoqualmie National Forests. Special acknowledgement is made to John Sargentson, Lands and Recreation Officer, and Charles R. Garrett, Mining Engineer, both of Snoqualmie National Forest, and to Pat Int-hout, Fire Control Officer, and Charles S. Banko, District Ranger, both of the Wenatchee National Forest. James M. Dolan, District Ranger, North Bend, materially aided field parties in work in his district. Thanks are due the personnel of the Leavenworth National Fish Hatchery, notably Henry S. Hosking, Manager, who made available a building for the use of field-laboratory personnel and hatchery grounds for use as a heliport and a storage place for trailers during the winter months.

A. R. Grant, consulting geologist, provided valuable detailed information regarding exploration in the mineralized area along the Middle Fork Snoqualmie River; permission to use much of these data was kindly given by Grant and Gregg C. Macdonald, President, Natural Resources Development Corp. Information on the results of underground core drilling in the Porter and Hemlock zones of the area was furnished by Zoeb Mogri, District Geologist, and Gary Schell, Geologist, Cities Service Minerals Corp. Permission to use the data was kindly granted by Robert W. Osterstock, Chief Geologist for the corporation.

No mining but some exploration for mineral deposits in the Alpine Lakes area was carried out during the study period. Core drilling from underground stations was being conducted by a major copper producing company in the Middle Fork area of the Snoqualmie River. Prospecting and small-scale exploration was being done in the Paradise Lakes and Prospectors Ridge areas, and in the Mineral Creek area a continuing program of geologic studies of copper-resource potential was being performed by the property owners.

GEOLOGY

GEOLOGIC SETTING

The Alpine Lakes area is underlain by metamorphic, sedimentary, and volcanic rocks that have been intruded by granitic plutons. A regional northwest-trending fault, the trace of which roughly follows the courses of Deception Creek and the upper part of the Cle Elum River, divides the area into two blocks of contrasting geology. The block to the east consists mostly of metamorphic, ultramafic plutonic, and mafic volcanic and related sedimentary rocks that have been intruded by a Mesozoic batholith. The block to the west consists mostly of metamorphic, arkosic sedimentary, and intermediate volcanic rocks that have been intruded by a Tertiary batholith.

The oldest rock in the area is schist that was metamorphosed prior to Cretaceous time. Schist that crops out in the eastern part of the area is similar to that in the western part, but, because of slightly different lithologic and metamorphic characteristics, is divided in this report into two formations, the Chiwaukum Schist of Van Diver (1968) and the Easton Schist. Similar rock is exposed at numerous other places along the axis of the central and north Cascade Range in Washington.

Greenstone, argillite, metagraywacke, and tuffaceous rock of the pre-Cretaceous Peshastin and Hawkins Formations crop out in a structurally complex area in the southeastern and south-central parts of the Alpine Lakes area. Other graywacke deposits and andesite flows and tuff crop out in the northwestern part of the area. These rocks cannot be confidently correlated with similar rocks occurring elsewhere in the Cascade Range.

Associated serpentinized peridotite and gabbro, which may be genetically related to each other, are in contact with metamorphic rocks in the southeastern and south-central parts of the study area and form roof pendants in the Mount Stuart batholith in the northeastern part. A small unmapped body of the serpentinized peridotite is in contact with graywacke in the northwestern part of the area. The serpentinized peridotite is similar to that in several other bodies in the Cascade Range of Washington, and it may correlate with them. A period of erosion followed emplacement of the peridotite. Weathering of the eroded surface led to the formation of iron-rich deposits which were subsequently buried beneath arkosic sediment.

In the eastern part of the Alpine Lakes area the granitic Mount Stuart batholith of Late Cretaceous age intrudes the schist and serpentinized peridotite. This body extends eastward and northward beyond the study area and is the southwesternmost occurrence of a group of Mesozoic plutons extending into northeastern Washington and southern British Columbia.

During earliest Tertiary time, shortly following intrusion of the pluton, a thick blanket of stream-laid arkosic sandstone, the Swauk Formation, was deposited over all or most of the Alpine Lakes study area, but today it is preserved only in the western part.

Thrust faulting, probably of a regional scale, followed deposition of the arkosic beds after which there was folding and normal faulting. A period of erosion followed, locally sculpturing a topography having as much as several hundreds of feet (about 200 m) of relief. Shortly thereafter, still in early Tertiary time, the first of several volcanic episodes took place that were to span most of the rest of the Tertiary Period in the central part of the Cascade Range and adjoining areas. Rocks deposited during two or more of these episodes are believed present in the Alpine Lakes area but, either because of structural complexities, because they have not been mapped in adequate detail, or because of lack of adequate age dating their relative stratigraphic positions and places in geologic time are uncertain. The volcanic rocks are present only in the western part of the study area but may once have overlapped the eastern part. Two Tertiary sequences are present in the area: basalt and andesite flows interbedded with arkosic sandstone, and andesite flows interlayered with andesite pyroclastic units. They are part of an extensively exposed belt that lies to the north and south of the Alpine Lakes area, and correlative units may be present in the Puget Sound lowland.

One tectonic event, and possibly more, may have taken place either during the period of volcanic activity or shortly thereafter and produced the major vertical faults that cut the area.

The tectonic events that deformed the layered rocks in the western part of the Alpine Lakes area had far less effect in the eastern part. Only along the southeastern boundary, where there is a west-trending zone of sheared and deformed serpentinized peridotite containing inclusions of greenstone and gabbro, is such activity evident.

In middle Tertiary time, granitic rock (the Snoqualmie batholith) intruded the western part of the study area. Some deformation and uplift accompanied and followed the emplacement of the batholith. A drainage pattern of gently rolling hills and broad valleys was established at this time, and parts of this old topography are still preserved at a few high places in the study area. Final uplift of the eastern part of the area probably occurred at the same time.

Uplift of the Cascade Range on a north-trending southward-plunging axis concluded the tectonic activity in the region. Streams became entrenched to form the deep canyons that give the Alpine Lakes area its steep rugged topography.

With the onset of the Quaternary Period, developing glaciers followed the already existing valley and canyon courses, deepening and broadening them. Two or three major advances and retreats are recorded in the deposits of glacial debris, most of which are at canyon mouths outside the Alpine Lakes area. Very minor advances and retreats are recorded as late as the middle of the 19th century.

ROCKS IN THE EASTERN PART OF THE AREA

FOLIATED METAMORPHIC ROCKS

CHIWAUKUM SCHIST

The pre-Cretaceous Chiwaukum Schist for the most part occurs as roof pendants in the Mount Stuart batholith and constitutes one of the oldest formations in the Alpine Lakes area. It is most extensively exposed in the extreme northeastern part of the Alpine Lakes area, also along Icicle Creek, and at several places near the north boundary of the Alpine Lakes area Schist, marble, and quartzite near the extreme northwestern boundary are mapped as Chiwaukum. The thickness of the unit in the Alpine Lakes area is not known for it occurs only as roof pendants in the Mount Stuart batholith. The formation was first studied and named by Page (1939) in an unpublished Ph. D. dissertation and was subsequently studied by Southwick (1962) and Plummer (1969). Van Diver (1968) was the first worker to publish using Chiwaukum as a title for the unit.

The formation consists mostly of quartz-biotite schist and phyllite and minor amphibolite. Garnet occurs in felsic layers as crystals 0.04–0.08 in. (1–2 mm) across and gives the weathered rock a wart-studded appearance. Minerals visible under the microscope include staurolite, sillimanite, and kyanite. Where biotite rich, the rock is brownish gray to greenish gray; where quartz rich, it is very light gray. The folia are about 0.04 in. (1 mm) thick and in most places are undulant or intricately folded. The rock is ribbed with limonite-stained lenses of white quartz a few inches (10 cm) thick and a few feet (1 m) long that both parallel and cut across the folia.

The Chiwaukum Schist was affected by two episodes of metamorphism, an early regional and a later thermal metamorphism. The thermal metamorphism is restricted to a narrow zone near the contact of the Mount Stuart batholith and is characterized by the development of andalusite and cordierite. The Chiwaukum is believed to be derived from high-aluminous Paleozoic sedimentary and volcanic rocks.

METASOMATIC ROCK

Several small bodies of granitoid rock believed to be metasomatized Chiwaukum Schist occur in a belt extending from the northern part of the Chiwaukum Mountains to the area of upper Cabin Creek. Generally characteristic of such bodies is one on the crest of the Chiwaukum Mountains. It overlies granitic rock and is in contact with Chiwaukum Schist along its southwestern boundary and with coarsely crystalline amphibolide along its northeastern boundary. It is layered, finely to coarsely crystalline, and although texturally different from layer to layer has an overall texture of granitic rock. The mineralogic composition of the individual layers ranges from dominantly feldspar to dominantly amphibole. In one layer abundant dark-green amphibole metacrysts 0.125–0.25 in. (3–6 mm) across and 1–1.5 in. (2.5–4 cm) long are embedded in a finely crystalline feldspathic matrix. In places amphibolite schist is interlayered with the metasomatic rock and in one place an interlayered limy layer 8–10 in. (20–25 cm) thick was noted.

INTRUSIVE ROCKS

SERPENTINIZED PERIDOTITE OF INGALLS CREEK

Serpentinized peridotite south and southwest of the Mount Stuart area was described by Russell (1900, p. 109–111) and later mapped by Smith (1904) and Smith and Calkins (1906). Pratt (1958) mapped a northwestward extension of the main body as well as many roof pendants in granitic plutons. More recently Southwick (1962) made an extensive study of the unit in the southeastern margin of the Alpine Lakes area; he concluded that the body is essentially serpentinite.

Serpentinized peridotite crops out along the southeastern boundary of the Alpine Lakes area, along the ridge just east of the Cle Elum River to a point about as far north as Hyas Lake. It forms a large roof pendant in the Mount Stuart pluton in the east-central part of the study area and other small roof pendants in the northeastern part. The unit is in tectonic contact with the Chiwaukum Schist, greenstone of the Hawkins Formation, and the Peshastin Formation. A small unmapped serpentinized peridotite body in the northwestern part of the study area is tentatively equated with that of the Ingalls Creek area.

The serpentinized peridotite is massive, finely crystalline, medium dark gray to greenish black where unsheared, and weathers dark yellowish orange to moderate brown. Where sheared, the rock is mottled greenish black and light olive or grayish olive, and it is cleaved into angular blocks of unequal dimensions ranging from a few inches to more than a foot (10–30 cm) in maximum dimension. It weathers to an irregular crenulated surface 1/8 in. (3 mm) or more in relief. Outcrops form ridge crests and peaks which are rugged but which are more subdued than those developed in adjacent granitic rock.

The proportion of mineral constituents differs from place to place, apparently reflecting different degrees of serpentinization. In the Wenatchee Mountains, in the south-central part of the study area a typical specimen of this unit was called Ingalls Peridotite by Ellis (1959) and Scott, Stroh, Burk, and Trammell (1972). It is composed of 60–80 percent olivine and about 10 percent enstatite with minor clinopyroxene and chrome magnetite. The other 10–20 percent of the rock is composed of serpentine minerals (Pratt, 1958, p. 101). Serpentinization progressed by stages from initial replacement along fractures in olivine grains to more advanced replacement, producing a rock having a serpentine matrix that contains numerous partially replaced crystals of olivine, to nearly complete replacement with only sparse minute remnant grains of olivine. In the lower Ingalls Creek area the rock is thoroughly serpentinized and commonly contains less than 3 percent olivine (Southwick, 1962, p. 137). In addition to serpentine minerals, small amounts of picotite, talc, carbonate, and chlorite are present, as is minor tremolite, which occurs most abundantly in the peripheral zones of the peridotite. Evidently serpentinization progressed further in the tectonically active area along Ingalls Creek.

METAGABBRO

Metagabbro bodies along lower Ingalls Creek and on the ridges south of the creek were mapped by Smith (1904), who considered them correlative with the Camas Land sill which intrudes the Swauk Formation and is of Tertiary age. Southwick (1962) concluded that the gabbro is not correlative with the Camas Land sill and is pre-Tertiary in age.

The metagabbro occurs as dikelike bodies that crop out as steep-sided ridges and locally form knobs and subordinate spurs. It intrudes all formations older than the serpentinized peridotite of Ingalls Creek and may have been emplaced at the same time as the peridotite (Southwick, 1962, p. 158). The metagabbro is medium to coarsely crystalline and contains relict ophitic and hypidiomorphic igneous textures that have been overprinted by metamorphic textures (Southwick, 1962, p. 162). It is mostly dark grayish green, very dark gray, or black, but locally it is very light gray or white and mottled with dark mafic minerals. The light-colored bodies are anorthositic and are gradational with mafic metagabbro.

Relict minerals include plagioclase, which has been partially replaced by sodic oligoclase and clinozoisite, and diallage, which has been partially replaced by uralitic amphibole (Southwick, 1962, p. 163). To a lesser extent plagioclase is replaced by zoisite and epidote and in places serpentine minerals and chlorite are present. Accessory minerals include magnetite, ilmenite, sphene, leucoxene, prehnite, and carbonate (Southwick, 1962, p. 171).

GRANITIC ROCKS OF THE MOUNT STUART BATHOLITH

Granitic rocks of the Mount Stuart batholith were first noted by Russell (1900, p. 105–107) who sketch mapped the body in the Mount Stuart–Leavenworth area. Smith (1904) mapped the southern part of the body in the Mount Stuart quadrangle and named it. Various parts of the pluton have been mapped by Page (1939), Oles (1951, 1956), Pratt (1954, 1958), Galster (1956), and Southwick (1962), whose collective efforts essentially outlined the body. The batholith is about 40 miles (65 km) long and as much as 15 mi (24 km) wide. The southern and southwestern limits lie within the Alpine Lakes area where about 250 mi^2 (650 km^2) of the body, including roof pendants, is exposed. The batholith may be made up of many plutons that range in composition from granite to gabbro and are dominantly quartz diorite. Many satellite bodies of granitic and intermediate composition, too small to be shown on plate 1, occur peripheral to the batholith. Yeats and McLaughlin (1969) reported a Cretaceous age for one of the plutons based on radiometric determination.

A steep rugged topography was developed on Mount Stuart granitic rocks. Dogtooth peaks and serrate ridges steepled with spines characterize the Stuart Range. Other areas underlain by the batholith are less rugged. Sheeting and jointing are common.

In some parts of the batholith, foliation is caused by subparallel orientation of mafic minerals and in a few places by the alinement of elongate lozenge-shaped mafic inclusions. E. H. Erickson (oral commun., 1972) believes that the erosion of one of the lesser ranges may have been controlled in part by the foliation.

Sparse to abundant xenoliths occur in many parts of the batholith; they are commonly mafic rich and stand out in sharp contrast to the enclosing felsic rock. Most xenoliths occur as discrete rounded bodies that are in such an advanced state of reconstitution as to obscure their original lithology, but abundant unreconstituted inclusions occur locally near the border of the stock (Pratt, 1958, p. 178).

Dikes of aplite and alaskite, too small to be shown at map scale, are sparse in the study area; pegmatites are even less abundant. Some of the pegmatites contain considerable pink orthoclase. The dikes range in size from a few inches (10 cm) wide and a few tens of feet (10 m) long to many feet (3–4 m) wide and hundreds of feet long (60–90 m). They display distinct, abrupt contacts and are thought to be late differentiates of the granitic rocks. They were probably emplaced shortly after solidification of the batholith.

The rock is medium crystalline and mottled very light gray and black. Megascopic minerals are subhedral feldspar, anhedral quartz that is not everywhere discernible, black biotite in books and clots, and more rarely subhedral hornblende. In thin section, rocks of the Mount Stuart batholith generally show a hypidiomorphic crystalline texture. Crystal faces are common on plagioclase and somewhat less so on hornblende. Biotite occurs in ragged bodies, and quartz is invariably anhedral.

INTERMEDIATE PORPHYRY

A small boss of porphyry of intermediate composition about 1,000 ft (300 m) in diameter is exposed on the ridge near Van Epps Pass. The rock contains subhedral light-pink feldspar phenocrysts 0.04–0.16 in. (1–4 mm) across and sparse mafic phenocrysts, possibly an amphibole mineral, as long as 0.16 in. (4 mm). The groundmass is a mosaic of finely crystalline light and dark minerals that give the rock an overall gray color. The body may have borne a significant relation to mineralization that took place in the Van Epps area; other felsic and intermediate rocks not shown on plate 1, either exposed at the surface or in workings, bear a close spatial relation to mineralized rock. This body and the others may be differentiates derived from the nearby Mount Stuart batholith, or they may be unrelated and considerably younger.

AMPHIBOLIDE

Several bodies of amphibolide, some of them dikelike, occur in the area of the Chiwaukum Mountains and the area to the southeast. Although regarded here as igneous, they may be metasomatic. The bodies are composed of coarsely crystalline amphibole and occur in close spatial association with granitic metasomatic rock. A body which lies across the crest of the Chiwaukum Mountains is in contact with granitic rock on its southwestern boundary and with Chiwaukum Schist on its northeastern boundary. The rock there is composed of equant grains of subhedral dark-greenish amphibole about 0.50–0.75 in. (12–20 mm) in diameter, and, except for slight differences in grain size, the rock appears uniform. In thin section it appears to be dominantly tremolite, more than 85 percent, which is locally replaced by chlorite. No other minerals were identified. The other amphibolide bodies are similar, although not so coarsely crystalline.

OTHER INTRUSIVE ROCKS

Many scattered small dikelike bodies and bosses of silicic and intermediate granitic rock intrude ultramafic rock along the periphery of the Mount Stuart batholith. They may be genetically related to the batholith.

Northeast- to east-trending dikes of basalt occur sparsely in the southeastern part of the Alpine Lakes area. Some are as thick as a few tens of feet (5–10 m) and are traceable for several hundreds of feet (100–300 m).

These bodies are considered either too insignificant or too small to be shown on the geologic map.

LAYERED AND STRATIFIED ROCKS

PESHASTIN FORMATION

Smith (1903) named the Peshastin Formation for beds of black slate, chert, and conglomerate along Peshastin Creek. He mapped (1904) isolated bodies of the formation in a belt across the northern part of the Mount Stuart 30-minute quadrangle, and later he and Calkins (Smith and Calkins, 1906) mapped it in the Snoqualmie 30-minute quadrangle. Subsequently, the Peshastin was remapped in the Mount

Stuart area by Pratt (1958) and studied in detail in its type area by Southwick (1962). The formation crops out just outside the southeastern boundary of the Alpine Lakes area (pl. 1), where many isolated bodies of it occur as inclusions in an ultramafic body. The total thickness of the formation is not known but may be a thousand feet to several thousand feet (several hundreds or even a thousand meters).

The Peshastin Formation (Southwick, 1962, p. 65–67) is mostly argillite with lesser amounts of metagraywacke, minor amounts of metaconglomerate and metavolcanic rocks, which include flows and breccias of intermediate composition, and siliceous tuffs. The rocks are mildy foliated and have developed imperfect slaty cleavage. They weather various shades of gray, green, brown, and black.

The metasedimentary rocks are mostly finely crystalline. The argillite contains sparse megascopic pyrite and graphite and microscopic biotite, quartz, and feldspar (Southwick, 1962). The metagraywacke contains megascopic rock fragments, and quartz and feldspar grain in a microscopic matrix of biotite, graphite, chlorite, and quartz. The conglomerate contains mostly pebble-size angular rock fragments in a matrix similar to the graywacke.

HAWKINS FORMATION

Rocks of the Hawkins Formation were first observed and reported by Russell (1900), and later the formation was named by Smith (1904). The formation was subsequently defined by Smith and Calkins (1906). Pratt (1958) remapped the formation in the Mount Stuart area and Southwick (1962) studied it in detail near the southeastern boundary of the Alpine Lakes area. The formation has been intruded by the serpentinized peridotite of Ingalls Creek and split into several large and many small bodies which are surrounded by the intrusive rock; its total thickness is not known.

The Hawkins Formation is composed dominantly of altered volcanic breccias and flows containing sparse feldspar phenocrysts and some fine-grained clastic rocks, all of which have been altered to greenstone (Southwick, 1962). It is commonly dark grayish green, weathering somewhat lighter. Those flow rocks which are recognizable have amygdaloidal fillings of calcite and chlorite. Individual flows are commonly a few tens of feet thick (about 10 m), and volcanic-breccia units range in thickness from several feet to more than 100 feet (2–30 m) (Southwick, 1962, p. 91). The breccias contain rock fragments that range in diameter from 0.25 in. to more than a foot (0.6–30 cm). The original minerals in some of the altered volcanic rocks remain relatively intact; whereas, in others they are completely destroyed and replaced. Relict minerals seen microscopically were feldspar, augite, sphene, and magnetite (Southwick, 1962, p. 94). The alteration minerals are albite, chlorite, clinozoisite, and epidote. Many small isolated bodies of the Hawkins Formation that occur in ultramafic rocks, as shown by Pratt (1958), were not mapped in this study.

MAFIC ROCK

Two bodies of mafic rock of uncertain affiliation occur in the study area. One, at Deception Pass near the head of Deception Creek, is a sliver of mafic rock in the easternmost fault slice of the Deception Creek fault zone. The body can be divided into a lower and upper unit. The upper unit is a distinctly thin-layered siliceous sequence 10–20 ft (3–6 m) thick that resembles the siliceous tuff in the Peshastin Formation described by Southwick (1962, p. 67), except that this unit contains a dark micaceous mineral which gives the rock a foliated character. The lower unit is dominantly a dark-gray to dark-greenish gray, aphanitic, mafic or ultramafic rock which is intensely sheared near the fault. This lower unit may be the volcanic flow or breccia that Southwick (1962, p. 66–67) described as being in the Peshastin, or it may correspond to the Trico peridotite, an informal unit that Pratt (1954) mapped in this area.

The second mafic body is near the head of Snowall Creek between Highchair Mountain and The Cradle. It is about 0.5 mi (0.8 km) wide and occurs as a xenolith in yellowish-orange-weathering ultramafic rock of the serpentinized peridotite of Ingalls Creek. The contact between the two rock types is distinct and sharp. The mafic body is crudely layered and is cut by sills of the serpentinized rock. This body may be an inclusion of the Hawkins Formation, as similar small inclusions were interpreted by Pratt (1958) in this area.

ROCKS IN THE WESTERN PART OF THE AREA

FOLIATED METAMORPHIC ROCKS

EASTON SCHIST

The Easton Schist was named by Smith (1903), who with Calkins (Smith and Calkins, 1906) mapped and described extensive outcrops in the Snoqualmie 30-minute quadrangle. The formation was later mapped and described by Foster (1957), and subsequently by Ellis (1959) who demonstrated that the formation extended northward to the crest of the Cascade Range. The formation, whose thickness in the Alpine Lakes area is not known, is exposed in a fault-bounded belt about 6 mi (10 km) long and 0.5 mi (0.8 km) wide. The character of the rock differs along the belt; in the northern part the rock is quartz-graphite phyllite and in the southern part, according to Ellis, it is blueschist and greenschist.

The quartz-graphite phyllite is brownish gray and finely crystalline having undulant to contorted folia less than 0.04 in. (1 mm) thick. Graphite occurs as wispy films together with sericite, chlorite, quartz, and feldspar (Ellis, 1959). Quartz lenses, commonly a few inches (8 cm) thick and a few feet (1–2 m) long, parallel the folia.

The greenschist and blueschist are composed of interlayered actinolite and soda amphibole, and minor amounts of quartz-graphite phyllite. Epidote, chlorite, quartz, feldspar, stilpnomelane, and sphene are also present in the schist (Ellis, 1959). The rock is greenish gray to dark green. It is thinly foliated, the folia locally contorted or crenulated. Quartz lenses and pods, a few inches (about 20 cm) thick and several inches to 40 in. (20 cm–1 m) long, lie parallel to the foliation.

The Easton Schist is altered in places where it has been intruded by granitic rock; hornfels, characterized by the development of biotite, occurs in a zone as much as 1,000 ft (300 m) wide at the north end of the outcrop belt where schist is cut by the Snoqualmie batholith. In places along its western margin the schist is bleached white to light gray and intensely silicified in a zone 20–100 ft (6–30 m) wide.

CHIWAUKUM SCHIST

The Chiwaukum Schist in the western part of the area is similar to that in the eastern part except that the several bodies north of the Snoqualmie batholith and west of Deception Creek appear more graphitic than the type Chiwaukum. The rocks in these bodies are more like the Easton Schist that occurs just south of the Snoqualmie batholith, but the Chiwaukum is used here in deference to the precedence set by previous workers.

INTRUSIVE ROCKS

SERPENTINIZED PERIDOTITE OF INGALLS CREEK

Several small exposures of serpentinzed peridotite occur along the Cle Elum River. The rock there is not appreciably different from that in the eastern part of the area and will not be discussed further except to point out that along the Cle Elum River sedimentary iron deposits derived from weathered serpentinized peridotite overlie the rock to a thickness of as much as several tens of feet (about 10 m).

DACITE DIKE

A dacite dike intrudes the Swauk Formation in the area of Cone Mountain and the lower Waptus River. The dike is inferred to be emplaced along a fault along the Waptus River. The dike parallels the strike of adjacent beds of the Swauk but is not concordant with them. Near Cone Mountain the dike widens from a few hundred feet (60–90 m) to about 2,000 ft (600 m) and changes from a northwesterly trend to a northeasterly one. Northeast of Cone Mountain, in the floor of the canyon of the upper Waptus River, the dike is inferred to abut a fault.

The dike rock was originally mapped as part of the Keechelus Andesite Series by Smith and Calkins (1906), which here is treated as part of a more extensive volcanic map unit. Ellis (1959, p. 63), however, distinguished it from overlying pyroclastic rock of the Keechelus, which, prior to erosion, was once continuous with volcanic rock that occurs east of the Waptus River. The dike is assumed to be substantially older than volcanic rocks occurring in the general area as Ellis inferred.

The dike rock is light gray to reddish brown and is commonly porphyritic, containing anhedral quartz phenocrysts ranging from 0.04 to 0.24 in. (1–6 mm) across. In places the rock is quartz free but contains subhedral feldspar phenocrysts 0.04–0.08 in. (1–2 mm) across and more rarely an anhedral mafic mineral. Pebbles and angular fragments of the Swauk as much as 1 ft (30 cm) across are abundant to sparse in the wider part of the dike.

VOLCANIC NECK AT CATHEDRAL ROCK

A subcircular body of andesite about 1 mi (1.6 km) in diameter apparently intruded volcanic rock and the Swauk Formation west of Hyas Lake and the Cle Elum River and forms Cathedral Rock. The rock is finely crystalline, and, except for being nonfragmental, closely resembles the surrounding effusive rock in color and texture. Several dikes (too small to be shown on pl. 1) radiate from the body into adjacent pyroclastic rock and arkose beds. The contact between the andesite and the surrounding rock is poorly exposed. Its shape, the similarity between its lithology and effusive rocks, and the presence of radiating dikes all suggest that the body is a volcanic neck which served as a feeder for at least part of the effusive rocks, as Ellis (1959, p. 70) pointed out.

The Cathedral Rock body is the only volcanic neck mapped in the Alpine Lakes area. Dikes related to the volcanic unit occur locally near the contact of the unit with the Swauk Formation.

SNOQUALMIE BATHOLITH

The Snoqualmie batholith is the youngest rock in the area and intrudes the Swauk Formation and Tertiary volcanic rocks. It is late Miocene in age (Baadsgaard and others, 1961; Curtis and others, 1961; and Erikson, 1969).

The Snoqualmie batholith was described by Smith and Mendenhall (1900), Smith and Calkins (1906), Bethel (1951), and Galster (1956). Bethel recognized several intrusive phases; Erickson (1965, 1968, 1969) studied the petrology of the rocks of the batholith.

The Snoqualmie batholith in the Alpine Lakes area ranges in composition from gabbro through diorite to quartz monzonite. It is exposed only in the western part of the Alpine Lakes area where it crops out in a lobe that broadens westward and underlies more than 220 mi^2 (570 km^2). Several outlying bodies of rock include the Three Queens stock, one on the north side of Gold Creek, and one southwest of Goat Mountain, between the Waptus and Cle Elum Rivers.

A steep precipitous topography was developed on Snoqualmie granitic rocks, but it is less rugged than that developed on parts of the Mount Stuart batholith. The rock is jointed almost everywhere and forms copious talus that mantles the flanks of peaks and ridges.

Snoqualmie granitic rocks are mostly medium crystalline, but rock textures vary from one compositional phase to another and also within the respective phases. Color and mottling are those commonly characteristic of granitic rocks depending how mafic or how felsic the individual intrusive phase was. Among the felsic types, one body of quartz monzonite has a distinctive pinkish cast.

Erickson (1965, 1968, 1969) recognized five intrusive phases that in the Alpine Lakes area include gabbro and diorite, pyroxene granodiorite, main-phase granodiorite, quartz monzonite, and late granodiorite. Main-phase granodiorite is the most extensively exposed. The intrusive phases were not mapped as separate units in this study. Most of the following descriptions of rock and alteration are from Erickson's (1965, 1968) work.

Gabbro and diorite crop out in areas east and northwest of Garfield Mountain and lower Lennox Creek. The primary minerals include zoned calcic plagioclase, augite, biotite, hypersthene (En_{64}–En_{73}) and small amounts of quartz, olivine, hornblende, spinel, and opaque minerals (Erikson, 1968, p.12). Olivine, where present, forms reaction rims of granular hypersthene. Hornblende is the dominant mafic mineral in diorite and forms primary overgrowths on augite crystals. Zoned plagioclase in gabbro ranges from An_{90} in the core to An_{50} in the rim; whereas, in diorite it ranges from An_{85} in the core to An_{30-35} in the rim (Erikson, 1968, p. 19).

The gabbro and diorite phases were recrystallized by the younger emplacement of intrusives. Hypersthene and augite are replaced by actinolite and actinolitic hornblende, and locally hypersthene is preferentially replaced by cummingtonite or paragasite (Erikson, 1968, p. 12).

Pyroxene granodiorite crops out along the eastern boundary of the Snoqualmie batholith near Mount Daniel and near the northern boundary south of Money Creek. The primary minerals of the pyroxene granodiorite phase include zoned plagioclase (An_{100} to An_{10}), perthitic orthoclase, hypersthene (En_{63} to En_{68}), augite (commonly overgrown with green hornblende), brown biotite, and quartz (Erikson, 1965, p. 9). The rock was thermally metamorphosed by the subsequent emplacement of main-phase granodiorite; mafic minerals recrystallized into finely crystalline aggregates. Later, an intense low-grade alteration, resulting from either hydrothermal activity or contact metamorphism, changed pyroxene to actinolite, actinolitic hornblende, and biotite and changed hypersthene to cummingtonite, grunerite, and biotite (Erikson, 1965, p. 10).

Main-phase granodiorite is present in most areas underlain by the Snoqualmie batholith except for an area extending from near Snoqualmie Pass northwestward to Garfield Mountain, where other phases are extensively exposed. The primary minerals include zoned plagioclase (An_{100} to An_{14}), perthitic potassium feldspar, quartz, brown biotite, green hornblende, and such accessories as apatite, sphene, zircon, and opaque minerals (Erikson, 1968, p. 28). The granodiorite in the area around Mount Daniel is complexly altered by hydrothermal solutions and by contact metamorphism resulting from the later intrusion of quartz monzonite (Erikson, 1965, p. 23). Where sulfide mineralization has taken place, as along the Middle Fork Snoqualmie River, there are halos of propylitized and griesenized rock (Erikson, 1968, p. 36–37).

Intrusion breccia containing fragments many tens of feet (10–30 m) in length is near the head of Burntboot Creek (Erikson, 1968, p. 28). In the interior parts of the pluton are locally abundant inclusions. They are commonly rounded, a foot (30 cm) or less in diameter, and most are more mafic than the matrix and in advanced states of reconstitution. Some inclusions may be cognate, and none are parallel oriented.

Quartz monzonite stocks are near Mount Hinman, Snoqualmie Mountain, and Preacher Mountain, (Erikson, 1968). In the Mount Hinman body the primary minerals are zoned plagioclase (An_{80} to An_{10}), perthitic orthoclase, quartz, biotite, hornblende, hypersthene, augite, and accessory apatite, zircon, and opaque minerals (Erikson, 1968, p. 38–39). In the Preacher Mountain body the primary minerals include zoned oligoclase, perthitic orthoclase, quartz, biotite, and accessory apatite, hornblende, magnetite, and zircon. This rock is also deuterically altered (Erickson, 1968, p. 43).

Late-phase granodiorite occurs in several parts of the Alpine Lakes area including the Mount Roosevelt area the Garfield Mountain area, and the Bare Mountain area. The primary minerals are orthoclase, zoned plagioclase, quartz, hornblende, and minor amounts of disseminated pyrite and chalcopyrite locally (Erikson, 1968, p. 42–48).

In addition to the principal intrusive phases, all rocks of the batholith are transected by dikes and plugs of aplite, alaskite, and granite pegmatite (Erikson, 1968, p. 53). Aplite and alaskite commonly occur in dikes from less than a foot (8 cm) to as much as 75 ft (22 m) wide. Many of the dikes are in near-horizontal attitudes. Pegmatites are commonly irregular and tend to be podlike.

Primary minerals in the aplite dikes include oligoclase, perthitic orthoclase, quartz, and accessory apatite, schorlite, sphene, pistacite, and opaque minerals. The mineralogy of pegmatites is similar.

OTHER INTRUSIVE ROCKS

Northeast- to east-trending dikes of Eocene Teanaway Basalt occur very sparsely in the west-central part of the Alpine Lakes area. Andesite dikes that intrude the Snoqualmie batholith occur sparsely in the northwestern part of the area. Stellated and (or) glomeroporphyritic sills of basalt as much as several tens of feet (10 m or more) thick and as much as a mile or more (1.6 km or more) long intrude volcanic rock in the southwestern part of the study area. A small boss of serpentinized peridotite, tentatively considered the same age as that of Ingalls Creek, intrudes graywacke northeast of Lennox Creek in the northwestern part of the area.

These bodies are considered either too insignificant or too small to be shown on plate 1.

LAYERED AND STRATIFIED ROCKS

LIMESTONE AND HORNFELS

Several isolated bodies composed mostly of hornfels and lesser amounts of limestone are exposed 1–4 mi (1.6–6.5 km) north, northwest, and west of Snoqualmie Pass on Denny Mountain, Cave Ridge, and Kaleeten Peak. These rocks were originally mapped as part of the Guye Formation by Smith and Calkins (1906), but they were recognized as a separate formation by Foster (1960).

The hornfels is commonly black to dark gray but locally is light gray or olive. It is dense or finely crystalline, and locally it displays relict bedding or flow banding. In places where it is in contact with granitic rock, the hornfels is intensively sheared.

The limestone is commonly medium gray and is obviously recrystallized; on the surface of the rock is a mosaic work of anhedral calcite crystals. Locally, the limestone contains lenses or pods of cherty or silicified argillaceous rock. Where limestone is intruded by granitic rock, tactite, in part composed of epidote and garnet, has developed and in a few places podular bodies of magnetite have formed (Shedd and others, 1922). The thickness of individual limestone units is commonly on the order of several to many tens of feet (10–30 m), but they probably have undergone thinning or thickening in the course of structural deformation and recrystallization.

The total stratigraphic thickness represented by the hornfels-limestone unit is not known; it is not possible to correlate the beds of one body with those of another. Further, the individual bodies are internally deformed so that no uninterrupted stratigraphic sequence can be confidently measured.

The age of the hornfels-limestone is assumed to be Paleozoic because most limestone in the Washington Cascades is regarded as being of that age.

GRAYWACKE AND HORNFELS

Several isolated bodies of interbedded graywacke and hornfels are exposed in areas east and west of Lennox Creek. These rocks have been described by Bethel (1951) who mapped them in a broad north-trending belt extending from south of the Middle Fork Snoqualmie River to Lennox Creek and beyond. Bethel (1951, p. 22) noted the presence of feldspathic graywacke, argillite, tuffs, and tuffaceous sedimentary rocks. In the study area the unit is composed of gray, fine-grained to very fine grained graywacke that locally displays laminations but that in most places is thick bedded or massive. Individual minerals are rarely large enough to be discernable without a hand lens. The hornfels is commonly gray or black and, rarely, a shade of green. It is almost everywhere a dense rock but in places contains anhedral crystals of amphibole 0.04–0.06 in. (1–4 mm) long.

Interbedded volcanic rock is apparently sparse in the area of this study; tuffaceous rock overlain by porphyritic flow rock was observed in one place just east of the lower part of Sunday Creek.

The thickness of the unit is not known. Bethel (1951, p. 23) estimated that it may be 5,000 ft (1,525 m) or more near the Middle Fork Snoqualmie River. Probably much less is preserved in the study area.

The age of the unit is uncertain for it contains no diagnostic fossils. However, because it is intruded by a small boss of serpentinized peridotite (not shown on pl. 1) that is assumed to be the same age as that of Ingalls Creek, the graywacke unit is tentatively regarded as pre-Cretaceous.

OLDER VOLCANIC ROCKS

Older volcanic rocks occur in the areas of Garfield Mountain and Sunday Creek around what may have been volcanic centers (Bethel, 1951, p. 56). In the Garfield Mountain area the older volcanic rocks are mostly dark greenish-gray, massive, andesite tuff interlayered with subordinate andesite flows and breccias. Some pyroclastic units include fragments more than 2 ft (60 cm) across (Bethel, 1951, p. 58–59). In the Sunday Creek area the older volcanic rocks include dark-greenish-gray massive porphyritic andesite flows and light-greenish-gray water-laid tuff which, southeastward, is interlayered with increasing amounts of sedimentary rock (Bethel, 1951, p. 61, 66). Near the contact with granitic rocks, the older volcanic rocks appear to be altered to hornfels.

According to Bethel (1951, p. 67–75), the flow rock is commonly holocrystalline consisting of a finely crystalline groundmass and phenocrysts of feldspar. The discernable minerals are andesine, hornblende, iron-ore minerals, and in places, pyrite. The andesine occurs in tabular bodies or laths and is commonly zoned, but the zoning is not distinct. Hornblende occurs as bodies about 0.04 in. (1 mm) across, either as equigranular or needlelike bodies, and is of the green and brown varieties.

The tuff units are finely granular and Bethel (1951) noted that some have glassy basal zones but others that were originally glassy are now devitrified. The minerals include finely crystalline feldspar having a mosaic texture. The feldspar crystals are penetrated by needles of green hornblende. Where tuff units have been altered to hornfels they have been recrystallized to holocrystalline rock containing feldspar, hornblende, biotite, and sparse quartz.

The thickness of the older volcanic rocks is not known, but perhaps more than 1,000 ft (305 m) is preserved in each area.

The age of the volcanic rock is assumed to be pre-Cretaceous on the premise that the sedimentary rocks with which they are interlayered are probably equivalent to other pre-Cretaceous rocks in the area.

SWAUK FORMATION

Russell (1893, p. 20) included sandstone and shale near Wenatchee and coal, sandstone, and shale near Roslyn in a single stratigraphic unit. When later it was found that volcanic rock underlies the coal-bearing section, Russell (1900, p. 118–127) revised the stratigraphic nomenclature. The Eocene coal-bearing rocks above the volcanic unit he called the Roslyn Formation, those below, of Paleocene age, the Swauk Formation. Many workers have subsequently studied and mapped most of the Swauk in the Alpine Lakes study area (Smith and Calkins, 1906; Pratt, 1954; Galster, 1956; Ellis, 1959).

The Swauk Formation crops out in a northwest-trending belt as much as 8 mi (13 km) wide in the western part of the Alpine Lakes area. The formation is also present east of the Cle Elum River, but it lies south of the Alpine Lakes area roughly paralleling the boundary.

The formation is folded and faulted and the structures become progressively more pronounced from east to west across the belt (fig. 4).

The Swauk Formation is mostly fluvial arkose with minor feldspathic graywacke, conglomeratic arkose, and siltstone. The Swauk is about 95 percent sandstone, 3-4 percent siltstone, and 1-2 percent conglomerate (Ellis, 1959, p. 18).

The arkose beds are light to medium gray, commonly massive and thick bedded, and well indurated. Sorting is fair to poor. Low-angle crossbeds are prevalent but are not commonly distinct. In hand specimens, the light-colored minerals blend in an opaque mass in which individual minerals are not easily distinguishable and dark minerals and rock fragments stand out. Chips of graphitic phyllite 0.04-0.2 in. (1-5 mm) long are generally present and locally very abundant. Biotite, in light-brown ragged books 0.04-0.08 in. (1-2 mm) long, is abundant in places. Where the Swauk Formation is intruded by granitic rock the adjacent arkose beds have been recrystallized to pyroxene hornfels.

Arkose averages about 58 percent quartz, 35 percent plagioclase, 3 percent biotite, 3 percent graphitic phyllite, and a very small fraction of accessory minerals (Ellis, 1959, p. 21). The clasts are tightly

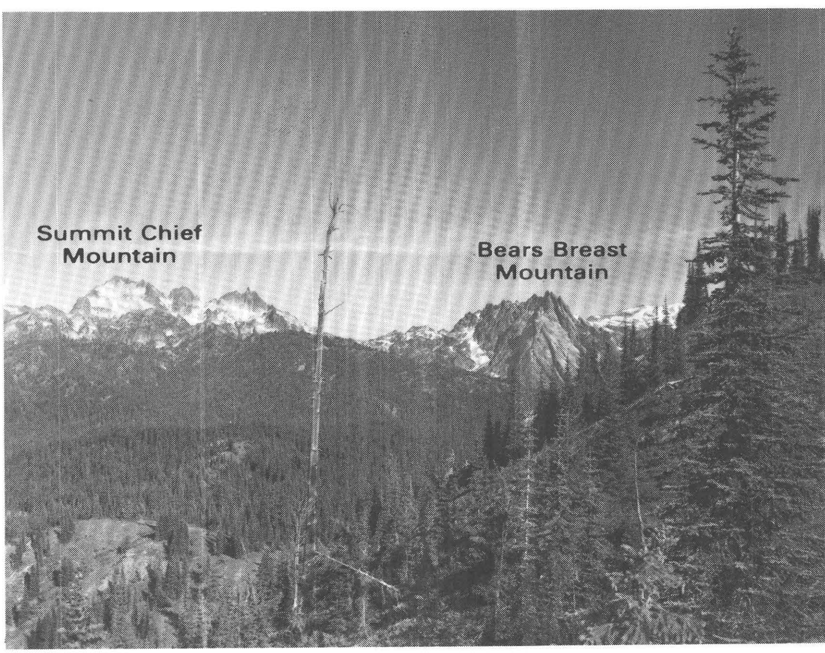


FIGURE 4.—Swauk Formation on Summit Chief and Bears Breast Mountains, faulted and folded into vertical and near vertical attitudes; view looking north.

packed, and the rock contains little or no matrix. The tight packing is evidenced by biotite which is bent around clasts of quartz and feldspar; some biotite books display microscale chevron folds.

Conglomeratic beds range in thickness from less than an inch (2.5 cm) to more than 10 ft (3 m). Well-rounded fragments are about 1–12 in. (2.5–30 cm) long and are composed of granitic rock, quartz, schist, and serpentinized peridotite. The pebble- to boulder-size fragments rarely compose more than 50 percent of the conglomeratic units.

Siltstone beds are dark gray, well indurated and nonfissile, and are several inches (10 cm) to several feet (150 cm) thick. Fossil flora is common but not abundant.

A breccia containing blocks of arkose measuring less than a foot (30 cm) to tens of feet (5–10 m) across occurs locally associated with minor amounts of volcanic rocks at the top of the Swauk Formation. The brecciation seems to be genetically related to the overlying volcanic rock, and hence the breccia is mapped with the volcanic unit.

The preserved thickness of the Swauk Formation in the study area is not known. Pratt (1954, p. 35) measured about 7,000 ft (2,135 m) near Marmot Lake, north of Mount Daniel. Ellis (1959, p. 97) mapped a thickness of 7,500–10,000 ft (2,290–3,050 m) between Dutch Miller Gap and Summit Chief Mountain, but part of this section may be repeated by faulting. Smith and Calkins (1906, p. 4) mapped a thickness of about 5,000 ft (1,525 m) on Goat Mountain near the Cle Elum River.

Plant fossils collected from the upper part of the Swauk led early workers to believe that the formation was Cretaceous, or Cretaceous and Paleocene (F. H. Knowlton, in Smith, 1904, p. 5), but more recent work indicates it is wholly Paleocene (Jack Wolfe, oral commun., 1973).

GUYE FORMATION

The Guye Formation was first described and mapped by Smith and Calkins (1906), who included in it sedimentary rocks of several types and minor amounts of volcanic rock. Foster (1960) restudied these rocks, distinguishing four formations. He restricted the Guye Formation to shale, sandstone, and conglomerate and excluded from it volcanic rocks, limestone, and hornfels. In the area of Snoqualmie Pass and southwestward from the pass the Guye includes only rocks below the Mount Catherine Rhyolite of Foster (1960).

In addition to the Snoqualmie Pass area the Guye Formation is exposed around Denny Mountain, Snoqualmie Mountain, and Snow Lake. The two exposed bodies are separated by a septum of the Snoqualmie batholith. Rocks of the Guye Formation, where intruded by the Snoqualmie batholith, have been converted to hornfels.

Rocks of the Guye Formation include dense carbonaceous siltstone and shale, commonly having poorly developed partings, and carbonaceous arkosic sandstone, some of it conglomeratic. Shale is the dominant rock type, and Foster (1960, p. 113) noted that locally it contains an abundant fossil flora. The sandstone ranges from medium to coarse grained, and, where conglomeratic, it contains cobbles as much as 3 in. (8 cm) in diameter. Beds are commonly several feet (1 m) to more than 10 ft (3 m) thick.

The thickness of the Guye Formation is not accurately known because the base is not exposed. Foster (1960, p. 113) estimated that the thickness is at least 5,000 ft (1,520 m), barring possible repetitions by faulting or other structural complications. The Guye Formation is considered to be Eocene, although it was tentatively given a Paleocene or Eocene age by Foster (1960, p. 113) on the basis of fossil leaves that he collected from along Coal Creek.

MOUNT CATHERINE RHYOLITE

The Mount Catherine Rhyolite was described and named by Foster (1960) who mapped a horse-collar-shaped body of the rock in the area of Snoqualmie Pass, where it is inferred to be truncated by a fault at its northern extremity. The unit unconformably overlies the Guye Formation and apparently conformably underlies beds of sedimentary and volcanic rock, according to Foster (1960, p. 114).

The rock is greenish or bluish gray and weathers yellowish brown. Foster (1960) described the unit as composed of bedded tuff and porphyritic fragmental rock containing embayed quartz phenocrysts. Both rock types contain devitrified glass, according to Foster. Lensoidal bodies of devitrified pumice 1 in. (2.5 cm) to 6 in. (15 cm) long, and as much as 1 in. (2.5 cm) thick occur in part of the unit. It is assumed that the Mount Catherine Rhyolite consists of one or more ash flows.

The thickness of the unit differs along the belt of outcrop, but in and near the study area the mapped thickness is about 100 ft (30 m).

The Mount Catherine is probably Eocene (Foster, 1960).

NACHES FORMATION

Smith and Calkins (1906) mapped and described the Naches Formation in the Snoqualmie 30-minute quadrangle. Ellis (1959) and Foster (1960) mapped it northward to the Cascade Range crest. Foster (1967) remapped part of the area and demonstrated that all volcanic rock lying between Kachess and Keechelus Lakes northward to the crest is Naches.

The Naches is present in the southwestern part of the Alpine Lakes area east of Snoqualmie Pass and south of Gold Creek. It extends eastward to Lemah Creek where its eastern boundary is faulted and intruded by the Three Queens stock (Foster, 1967). In the areas near Snoqualmie Pass, Gold Creek, and Rampart Ridge, strata of the Naches dip moderately eastward; whereas, in the area of Chikamin Ridge and Lemah Creek the strata dip steeply to vertically and most are overturned. The two areas of contrasting structure are inferred to be separated by a high-angle fault.

The Naches Formation is composed mostly of flow and flow-breccia units of basalt and andesite. Flows appear to be more numerous than breccia units, and andesite more abundant than basalt. The basal part of the exposed section contains arkose, siltstone, and shale interbedded with basalt flows.

The arkose is light to dark gray, medium to coarse grained, commonly crossbedded, and occurs in lenses several feet to several tens of feet (2–10 m) thick. Feldspar is not readily distinguished from quartz in hand specimens. Dark-green, grit-size fragments, possibly serpentinized peridotite, and sparse white quartz pebbles as much as 0.5 in. (1.3 cm) in diameter occur in arkose beds at the southwestern tip of the study area; whereas, flakes of graphitic phyllite are present in the arkose in the eastern part of the area. Ellis (1959, p. 48) identified microscopically minor biotite in a groundmass consisting mainly of micaceous minerals.

Siltstone and shale are not abundant nor well exposed. Medium-gray sandy subfissile siltstone occurs in lenticular beds a few feet (1 m) thick; in places it contains plant fossils. No shale was observed in the Naches Formation in the Alpine Lakes area although it may be present.

The basalt flows are dark gray to dark greenish gray and occur in layers several inches (20 cm±) to many tens of feet (25 m) thick. Locally, the flows contain feldspar phenocrysts 0.04–0.12 in. (1–3 mm) long. In a few flows indistinct mafic phenocrysts about 0.04 in. (1 mm) across are present. Vesicles and amygdules are common and are less than an inch to several inches (2.5–7 cm) across. The amygdules are composed of quartz, chalcedony, calcite, and possibly zeolite. Ellis (1959, p. 46) noted some amygdules of epidote and chlorite.

Basalt breccias are composed of the same rock types as the flows. Fragments are rounded to subangular and commonly are less than 1 in. (2.5 cm) across.

Ellis (1959, p. 45) noted euhedral labradorite phenocrysts embedded in trachitic or felted microlites of labradorite. He also identified pigeonite and augite which occur as phenocrysts and in the groundmass.

Basalt of the Naches Formation has been metamorphosed at some places and silicified at others. Adjacent to the contact with granitic rocks, basalt was replaced by more calcic plagioclase and pyroxene minerals were replaced by hornblende, which makes up 30–50 percent of the rock (Ellis, 1959, p. 47). Away from the granitic contact the basalt is locally metamorphosed to a pervasive greenschist facies assemblage (Ellis, 1959, p. 46) that is characterized by epidote, chlorite, actinolite, and serpentine minerals that replace pyroxene.

The andesite is light to medium gray, and greenish and brownish gray; it is finely crystalline, has a granular texture, and it occurs in flows that are commonly tens of feet (5–15 m) thick. Chloritized mafic minerals and mafic clots occur in some flows. Vesicles and amygdules, commonly filled with quartz, are locally abundant.

In several areas of the Alpine Lakes area the Naches Formation is hydrothermally altered. Where incipiently altered, the constituent minerals appear less distinct and the rock locally contains pyrite; where in an advanced state of alteration, the rock is silicified and almost invariably contains pyrite. On a freshly broken surface the altered rock is white or light gray, and sparse, minute, anhedral sulfide grains are scattered through it. Relict feldspar and a mafic mineral can be seen in some of the altered rock. Outcrops of the altered rock are conspicuously stained from oxidized pyrite. Along the northern part of the fault that bounds the Naches on the east, the basalt is intensely silicified, probably the result of hydrothermal activity. The normally dark-gray basalt is bleached very light gray, but its textures are perfectly preserved.

The stratigraphic thickness of the Naches is not known; near Snoqualmie Pass where the base is exposed, the formation rests upon the Mount Catherine Rhyolite, but the top, if present in the study area is not recognized. The difficulty of estimating the thickness is due in part to structural complications and also due to many concordant bodies of intrusive rock, which have had the effect of thickening the stratigraphic section (Foster, 1967, p. 38–41).

The age of the Naches Formation is not known definitely. Fossil flora led Smith and Calklins (1906, p. 5–6) to correlate the formation with both the Paleocene Swauk Formation and the Eocene and Oligocene Puget Group. Foster (1960, p. 116) recommended that the Naches be tentatively dated Eocene.

TERTIARY VOLCANIC ROCKS

Volcanic rocks in the areas of Goat Mountain–Spinola Creek, Mount Daniel–Marmot Lake, and the Foss and Miller Rivers are placed in a single map unit. Also included in this unit are several small bodies of volcanic rock west and northwest of Snoqualmie Pass and near the upper part of the Middle Fork Snoqualmie River. Rocks in the unit have been variously mapped as the Keechelus Andesitic Series (Smith and Calkins, 1906; Ellis, 1959; Foster, 1960) and Temple Mountain Andesite (Galster, 1956; Scott and others, 1972). All these rocks may be part of a single consanguineous unit which once may have been continuous through the central Cascade area.

The unit is composed of flows, flow breccias, and pyroclastic rocks, almost all of which are in massive units many tens of feet (15–30 m) thick. Locally, thin tuff beds are present. In the area between Goat Mountain and Marmot Lake, Ellis (1959, p. 68) estimated about 75 percent of the formation is pyroclastic deposits and 25 percent is flow rock.

Some layers are amygdaloidal. The amygdules are commonly 1 in. or less (1.5–2.5 cm) in diameter but some are as much as 2 in. (5 cm) long and contain quartz, chlorite, and possibly a zeolite mineral.

The rock is commonly dark greenish gray to dark gray and rarely reddish gray or maroon. In pyroclastic units the fragments are commonly the same color as the matrix but of a slightly different shade.

Phenocrysts of feldspar occur as subhedral to euhedral laths less than 0.04–0.18 in. (1–5 mm) long. The visible feldspar constitutes only 5–10 percent of the rock (Ellis, 1959, p. 67). Anhedral crystals of augite that occur sparsely in some layers appear to be altered and in at least one place were replaced by chlorite. Small wispy lenticular bodies of epidote occur sparsely.

The groundmass of the rock is finely crystalline whether the rock is flow, flow breccia, or breccia fragment.

Those rocks which Ellis (1959, p. 68) studied in thin section, he noted, have a groundmass composed of felty- to trachitic-textured altered plagioclase and chloritic and opaque minerals. The plagioclase where fresh is andesine. Ellis (1959, p. 65) considered these rocks to be deuterically altered.

Breccia fragments are of the same general composition and texture as the matrix rock. The fragments range from a fraction of an inch (1 cm) to several feet (1 m) across and are subangular to subrounded. Fragments of arkosic sandstone are locally present in the basal lava flows and flow breccias of the unit where it overlies the Swauk Formation. In places the fragments occur as sparse inclusions but elsewhere they occur so abundantly as to constitute a large part or all of basal breccias and may be fossil talus deposits (Ellis, 1959, p. 66). On the peak east of Deadhead Lake and elsewhere, breccias are composed of angular blocks of Swauk that are as much as tens of feet (5–10 m) across and have little or no admixed volcanic material. They may be in diatremes or in areas of cryptoexplosion activity. Galster (1956, p. 43–44, 62) noted similar occurrences near Meloney Creek, outside the northwestern boundary of the Alpine Lakes area.

The age of the volcanic rocks is not accurately known. They are obviously older than the Snoqualmie batholith of late Miocene age that

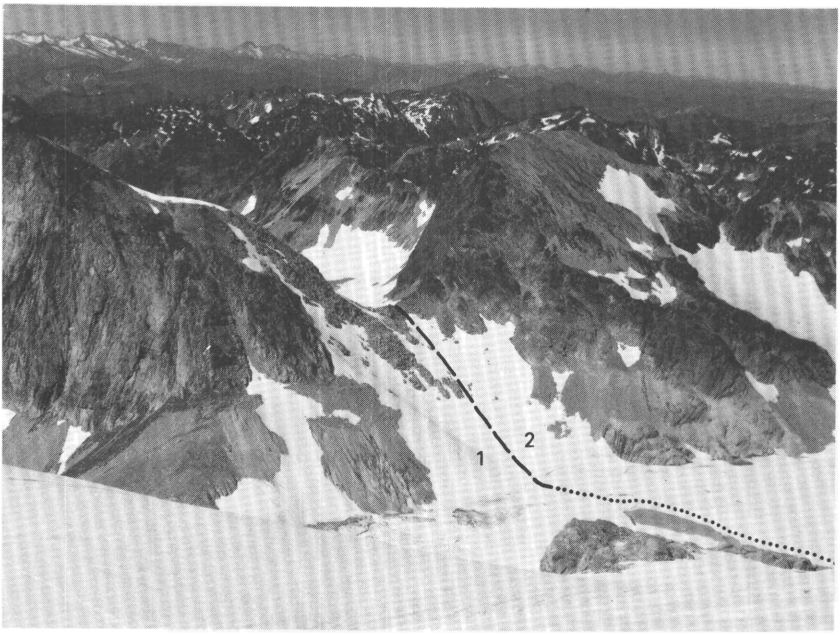


FIGURE 5.—Trace of contact (1) of Snoqualamie batholith with (2) Tertiary volcanic rocks in saddle north of Mount Daniel, dotted where concealed. View looking north.

intrudes them (fig. 5). An oreodont collected from the formation several miles (about 10 km) south of the study area is suggestive of an Oligocene to Miocene age (Grant, 1941, p. 590).

CLASTIC DIKE

A clastic dike on the northwest side of Marmot Lake cuts the Swauk Formation from about the level of the lake to the ridge crest and is about 40–50 ft (12–15 m) wide at its widest point. The dike apparently is at the northwest end of a fault which, south of the lake juxtaposes Tertiary volcanic rock with the Swauk Formation. The dike is composed of angular to subangular fragments of arkose ranging in size from a fraction of an inch (1 cm) to as much as 2 ft (60 cm) across, embedded in a comminuted matrix of arkosic material. Some dense dark-green to olive fragments may be of volcanic origin but are more likely derived from siltstone beds of the Swauk Formation.

An unmapped igneous dike 10–25 ft (3–8 m) wide is adjacent to the west wall of the clastic dike. The dike rock is dark gray, finely crystalline, contains small subhedral phenocrysts of feldspar, and may have been a younger feeder for andesite. If the igneous dike is related to the faulted volcanic rocks, then the fault was active during the early part of their deposition and may have been accompanied by explosive vulcanism which could have fragmented the rock. In any case the clasts were not produced solely by fault movement.

SURFICIAL DEPOSITS

Glacial, alluvial, and other unconsolidated deposits occur throughout the Alpine Lakes area.

Two and possibly three ages of glaciation are recognized in the Alpine Lakes area (Page, 1939, p. 141–180). The only mapped glacial deposits are two moraines in the extreme northeastern part of the area. Many other glacial deposits, mostly preserved remnants of lateral moraines, occur sporadically along the walls of some canyons. Small terminal moraines, products of the 19th century glacial advance, lie at short distances below existing glaciers. The principal glacial deposits lie at the canyon mouths, outside the Alpine Lakes area.

Alluvial deposits occur as thin mantles of silt, sand, and gravel which locally cover the floors of valleys and canyons, commonly where they have been overdeepened by glaciers.

Colluvial deposits, mostly talus but also including a few rock slides and rock glaciers, occur generally throughout the area.

STRUCTURE

The principal faults in the Alpine Lakes area are part of a regional belt of thrust and high-angle faults that extends southward from the northern Cascade Range. The continuity of the structures has been locally interrupted by the Snoqualmie batholith.

THE DECEPTION CREEK FAULT ZONE

The Deception Creek fault zone (pl. 1), which was first mapped and described by Pratt (1958, p. 59–61), divides the Alpine Lakes area into two blocks of diverse geology. The faults are exposed in only a few places; elsewhere, their existence is inferred from the juxtaposition of unlike rocks and from topography. In some places the zone consists of a single fault, in some it consists of several faults, and in others it consists of multiple faults that form a braided pattern. South from the Hyas Lake area the eastern fault, as described by Pratt (1958, p. 60–61), is a zone of sheared serpentinized peridotite and gouge that separates rock that is relatively less serpentinized from rock that is intensely serpentinized. Total displacement on the structure is unknown but may measure thousands of feet (several hundreds of meters), and part of the movement may be lateral, as Pratt (1958, p. 61) noted. The structure may have been active over a considerable span of time, but the available evidence indicates movement only in the early or middle Tertiary.

AREA EAST OF DECEPTION CREEK FAULT ZONE

Pronounced foliation in the Chiwaukum Schist strikes mostly northwestward and dips northeastward. In many places the schist is intricately folded into tight structures a few inches (15 cm) to a few feet (3 m) in amplitude and length. The axes of the folds, in the few places they were measured, plunge northwest and southeast. Presumably, the rock has been isoclinally folded for there is no evidence of large-scale open folds. Marginal to the Mount Stuart batholith a second foliation developed in the Chiwaukum as a result of the intrusion of the batholith (Plummer, 1969, p. 57). The two mapped bodies of mafic rock, near Deception Pass and Highchair Mountain, are foliated and sheared, but the Peshastin and Hawkins Formations appear undeformed, probably because deformation has been obscured by contact metamorphic effects related to the intrusion of the serpentinized peridotite of Ingalls Creek.

The serpentinized peridotite of Ingalls Creek is intensely fractured in two separate zones subparallel to the southwestern contact of the Mount Stuart batholith. One zone extends from the south flanks of Huckleberry Mountain eastward to beyond the Alpine Lakes area (Pratt, 1958, p. 60–70). Pratt observed breccia composed of serpentinized fragments of greenstone and gabbro that range in size from 1 ft (30 cm) to several thousand feet (few thousand meters). A second zone extends from the north flank of Hucklebery Mountain northwest along the northeast side of the Cle Elum River. The outline of the zones is irregular and the contact with relatively undeformed and unaltered rock to the east and north is gradational; whereas, to the west and south it is more abrupt. The zones apparently developed in response to uplift of the block lying east of the Deception Creek fault zone and north of Ingalls Creek for the zones are only in areas away from the block. As uplift proceeded, peridotite in the zones was sheared, hydrated, and reconstituted to serpentinized rock that reacted plastically (Southwick, 1962, p. 130). The inclusions of greenstone and gabbro, in contrast, generally resisted deformation, although locally they were fragmented. As a result, the more mobile serpentinized rock flowed by and around the resistant inclusions.

The total movement in the deformed zones might amount to thousands of feet (hundreds of meters). Movement in the zones is believed to postdate the deposition of the Swauk Formation and to have occurred in Tertiary time for deformed dikes of Teanaway Basalt occur in serpentinized peridotite (Southwick, 1962, p. 131). The deformed zones, however, are older than some of the movement on the Deception Creek fault zone, as shown by the fact that a branch of the fault zone separates rock that is relatively less serpentinized from rock that is intensely serpentinized (Pratt, 1958, p. 60–61).

Foliated granitic rocks of the Mount Stuart batholith are evident in the areas of lower Eightmile Creek, the Lower Enchantment Lakes, and upper Ingalls Creek. The foliation in the Eightmile Creek and Enchantment Lakes areas is purely a magmatic feature and is characterized by the alinement of mafic minerals and locally by lensoidal xenoliths. It trends east to northeast and dips steeply. Some foliation also occurs in mylonitized serpentinized peridotite at the margin of the Mount Stuart batholith in the Ingalls Creek area. The strike parallels the contact—roughly due north. The dip is nearly vertical.

Jointing in the Mount Stuart granitic rock and nearby rocks was not studied systematically but was noted in the vicinity of mineral deposits. The dominant joint system strikes northwest, but a second system striking northeast is indicated by the alinement of Teanaway dikes.

AREA WEST OF THE DECEPTION CREEK FAULT ZONE

Foliation is well developed in the Easton Schist. The folia strike north and dip steeply to the east and west, but locally, as on Chikamin Ridge east of the Three Queens, the folia strike west and dip at low to moderate angles to the north and south. In many places the folia are folded into tight structures a few feet (0.5–2 m) in amplitude and length. The trend of the axial traces is north.

Several folds, most of them of little known extent, occur in several places in the Swauk Formation. The folds appear to have formed both previous to and concurrent with high-angle faults. The folds are open and plunge moderately to the southeast (pl. 1). The flanks of a typical trough are conspicuous on the southeastern face of Bears Breast Mountain (fig. 6).

Many of the southeast-trending synclines, similar to the one lying along the east side of the high-angle fault on Summit Chief Mountain, are believed to be drag folds formed concurrently with the fault, whereas others in the area between Escondido Lake and lower Lemah Creek are inferred to be truncated by the high-angle fault cutting Summit Chief Mountain.

Many northwest-trending, steeply dipping to vertical faults cut the Swauk and other formations. The faults are commonly a few miles (about 5 km) long but their full extent is not known, either because they extend beyond the Alpine Lakes area or because they were cut off

FIGURE 6.—Steeply dipping beds of Swauk Formation on south face of Bears Breast Mountain form a southeastward-plunging syncline.

by the Snoqualmie batholith, and the separated segments, if part of the same fault, cannot be confidently correlated across the batholith.

The displacement on the faults is unknown because of the absence of marker beds, but on many of the more extensive faults it is perhaps thousands of feet (hundreds of meters). Ellis (1959, p. 104) estimated that at least 4,000 ft (1,200 m) of Swauk section has been eliminated on the west side of the high-angle fault that cuts Summit Chief Mountain. The age faulting is considered to be early Tertiary; the fault in the area of Deep Lake appears to predate Tertiary volcanic rock, and several other faults are cut by the Snoqualmie batholith.

Layered rocks of the Naches Formation in the area of Lemah and Delate Creeks strike roughly north to northwest and have steep to vertical dips, but the rocks are mostly steeply overturned to the west. There, the Naches is inferred to be cut by several high-angle faults.

The northwest-trending high-angle fault that forms the eastern boundary of the Naches Formation was first mapped by Ellis (1959, p. 101–104), who called it the Easton-Naches fault. It appears to be a continuation of a fault mapped by Smith and Calkins (1906) in the area of Kachess Lake; the fault is truncated by the Three Queens stock.

A subsidiary fault, branching from the main fault near the head of Kachess Lake and rejoining it near Delate Creek, forms a lens-shaped horst of Easton Schist that lies between the Naches Formation on the west and the Swauk Formation on the east. At the south end of the horst a block of volcanic rock, mapped as Naches, but which may be another unit, is separated from the Easton Schist to the north by a cross fault. Mylonite and other cataclastic rock along the Easton-Naches fault was observed only in the area of the upper Kachess River where there is a zone more than 300 ft (about 100 m) wide composed of fragmented schist and lenticular bodies of sandstone recrystallized to quartzite. In the area east and southeast of Chimney Rock, the rocks along either side of the fault plane are silicified and bleached in a zone about 1.5 mi (2.5 km) long and as much as 2,000 ft (610 m) wide. Ellis (1959, p. 103–104) estimated a minimum movement of about 2 mi (about 3,200 m) on the main fault in the area near the Cascade Crest. South of the Alpine Lakes area formations younger than the Easton or Naches are locally in contact on opposite sides of the fault and indicate the same direction of movement (Foster, 1960).

The fault is truncated by the Snoqualmie batholith of late Miocene age. The silicified zone developed along the fault is considered the result of hydrothermal activity related to the batholith.

Jointing in the Snoqualmie batholith and the other rocks was not studied systematically but was noted only in the near vicinity of mineral deposits. The dominant joint sets strike northwest, parallel to the regional structural grain. Dips are to the northeast and southwest and are commonly steep to vertical.

Several thrust faults cut the Swauk Formation in the areas of Summit Chief Mountain and Chief Creek. A major thrust forms most of the western edge of the Swauk Formation along Lemah Creek, Cooper Pass, and the Three Queens, and it is inferred to be present in the areas of the Cle Elum and Foss Rivers and Deception Creek.

Along Lemah Creek the Swauk has been thrust on Easton Schist. The fault is traceable for 2.5 mi (4 km) and is inferred to extend southward about another 3 mi (5 km) where it is cut by a high-angle fault. The thrust is also evident in the areas of Cooper Pass and near the Three Queens stock. Superficially, the contact between the thrust sheets appears to be depositional; bedding planes of the Swauk are more or less parallel to the fault plane. A zone of deformed or reconstituted rock, however, is developed along the thrust plane. Dark basaltic-appearing pseudotachylite as much as several tens of feet

(10 m) thick has formed along the zone, and in places, lenses of Swauk, many feet (2–3 m) thick and tens of feet (10 m) long, have been torn from the upper plate and driven into the underlying Easton Schist. In other places the schistosity of the Easton has been obliterated near the contact with the Swauk, and locally, breccia, composed of fragmented quartz lenses and schist, has developed. Neither the amount of movement nor the amount of section missing from the base is known. Possibly little or no section is missing where the Swauk is in contact with the Easton; rather, movement there may have taken the form of décollement.

In the area of the Cle Elum River drainage the existence of the thrust is inferred; minor thrusts in or near the base of the Swauk are inferred by Lamey and Hotz (1952) on the basis of subsurface information. More important, however, the iron formation—iron-rich strata formed by the weathering of underlying ultramafic rock—is locally intensely sheared and made schistose, which structure Lamey and Hotz (1952, p. 44) attributed to the differential movement between the iron deposits and the underlying serpentinized peridotite.

Contrary to what has been previously reported (U.S. Geological Survey, 1973, p. 61), the direction of main thrusting appears to be eastward rather than westward. This conclusion is based on the observation that the western sandstone facies of the Swauk Formation appears to ride over the eastern sandstone-shale facies in the area of the Middle Fork Teanaway River, south of the study area. Rocks in the upper plates of thrust faults mapped just east of Summit Chief Mountain may likewise have moved eastward. The eastward-dipping thrust planes of these faults would, in that case, be overturned, possibly in response to later folding in the area. Alternatively, the thrust faults east of Summit Chief Mountain may have occurred later than the main thrust, contemporaneous with folding that on Bears Breast Mountain just to the east is the most intense in the area. Rocks of the upper plate would, in that case, be considered to have moved westward and the thrust planes would not be overturned. This is the way it is shown on plate 1.

In at least one place the Swauk has been hydrothermally altered adjacent to the main thrust plane. In a roughly circular area just west of Summit Chief Mountain, arkosic sandstone, in part silicified and kaolinized, extends from the thrust plane through several hundreds of feet (100–150 m) of section. The alteration was probably an effect of the intrusion of the nearby Snoqualmie batholith.

Aeromagnetic Interpretation of the Alpine Lakes Study Area and Additions, Washington

By W. E. DAVIS, U.S. GEOLOGICAL SURVEY

MINERAL RESOURCES OF THE ALPINE LAKES STUDY AREA AND ADDITIONS, CHELAN, KING, AND KITTITAS, COUNTIES, WASHINGTON

U.S. GEOLOGICAL SURVEY BULLETIN 1542-B

MINERAL RESOURCES OF THE
ALPINE LAKES STUDY AREA AND ADDITIONS,
CHELAN, KING, AND KITTITAS COUNTIES,
WASHINGTON

AEROMAGNETIC INTERPRETATION OF THE ALPINE LAKES STUDY AREA AND ADDITIONS, WASHINGTON

By W. E. DAVIS, U.S. GEOLOGICAL SURVEY

An aeromagnetic survey of the region between lat 47°24′ N. and 47°45′ N. and long 120°40′ W. and 121°24′ W., which includes the Alpine Lakes area was made by the Scintrex Mineral Surveys, Inc., under contract for the U.S. Geological Survey. Total intensity magnetic data were obtained along east-west lines flown about 1 mi (1.6 km) apart at an average barometric altitude of 9,500 ft (2,900 m) above sea level. The data were compiled at a scale of 1:62,500 and contoured at intervals of 20 and 100 γ (pl. 1). No laboratory study of the magnetic properties of the rocks was made. The magnetic features, which were interpreted from the geology of the area, are discussed briefly in the following paragraphs.

The magnetic pattern is dominated by a broad high over rocks of the serpentinized peridotite of Ingalls Creek and the Hawkins Formation along the south-central margin of the area. Although the southern flank of the feature was not completely flown, magnetic gradients indicate that the high reaches a maximum relief of more than 1,000 γ over the greenstone of the Hawkins Formation near Hawkins Mountain. The northwest part of the anomaly has a maximum difference of about 600 γ near the head of Silver Creek and seems to be associated mainly with serpentinized peridotite. Steep magnetic gradients on the northeastern flank of the broad high correspond with the contact between granitic rocks of the Mount Stuart batholith and the ultramafic rocks. These gradients suggest that the contact is sharp and fairly steep in most places. The magnetic low over Mount Stuart granitic rocks northeast of its contact with serpentinized peridotite indicates that the direction of magnetization in the greenstone and serpentinized peridotite is similar to that of the Earth's present magnetic field. Very likely the main high indicates that the mass of greenstone and serpentinized peridotite is thick.

General low magnetic relief and intensity occur over the Mount Stuart batholith and older rocks in the northeastern part of the area. Undulations in the contours indicate that a weak magnetic low is associated with the schist, but there seems to be no magnetic indication of the serpentinized peridotite in the southern part of the large roof pendant. Perhaps the magnetic response of the serpentinized peridotite is masked by the bordering dipolar low. The lack of more prominent magnetic relief suggests that the roof pendant does not extend to great depth.

In the eastern part of the area a small partly mapped high is indicated by a closed contour over Icicle Ridge. This feature is probably caused by the elevated position of granitic rocks near the crest of the ridge.

In the western part of the area a narrow arcuate magnetic high lies over Chikamin Ridge, the headwaters of Cooper River, and the Middle Fork Snoqualmie River. The southern part of the feature is associated with volcanic rocks, but it includes granitic rock exposed at the southeastern end of the ridge and southwest of Huckleberry Mountain. Maximums of about 100 γ that are probably enhanced by topography occur near Chikamin Peak and over the southern part of the ridge. Northward the anomaly has a maximum of about 80 γ and appears to be caused by the Snoqualmie batholith. Topography also contributes to the magnetic expression of these rocks. The anomaly indicates that the pluton extends southward beneath volcanic rocks along the ridge to connect with the Three Queens stock and the stock north of Silver Creek. Steep magnetic gradients along the eastern flank of the anomaly may represent a steep contact of the pluton. Small variations in the magnetic pattern probably are related to intense deformation in the bordering basaltic and arkosic rocks.

Part of a magnetic high is shown in the northwestern part of the area. The apparent maximum of this feature may be the magnetic expression of subsurface plutonic rocks in the southern part of Maloney Ridge.

Intensity variations in the magnetic pattern are probably caused mostly by magnetic contrasts in materials near the surface of the ground. None of the anomalies are considered to be of the type commonly associated with large deposits of magnetite or with metalliferous lodes that occur in extensive zones of altered country rock.

Mineral Deposits of the Alpine Lakes Study Area and Additions, Washington

By J. L. GUALTIERI *and* GEORGE C. SIMMONS, U.S. GEOLOGICAL SURVEY

MINERAL RESOURCES OF THE ALPINE LAKES STUDY AREA AND ADDITIONS, CHELAN, KING AND KITTITAS COUNTIES, WASHINGTON

U.S. GEOLOGICAL SURVEY BULLETIN 1542-C

CONTENTS

MINERAL RESOURCES OF THE
ALPINE LAKES STUDY AREA AND ADDITIONS,
CHELAN, KING, AND KITTITAS COUNTIES,
WASHINGTON

MINERAL DEPOSITS OF THE ALPINE LAKES STUDY AREA AND ADDITIONS, WASHINGTON

By J. L. GUALTIERI and GEORGE C. SIMMONS,
U.S. GEOLOGICAL SURVEY

SETTING

The central Cascade Mountains constitute the southern extension of a metallogenic belt in British Columbia characterized by porphyry copper and low-grade molybdenum deposits (Little and others, 1968, p. 504). The known mineral deposits are associated with late leucocratic biotitic quartz monzonite facies of Mesozoic and Tertiary granitic complexes (Little and others, 1968, p. 504) and with transverse shear zones (Grant, 1969, p. 39–46). At least 18 major plutonic masses and six known or inferred large shear zones are present in the Cascade Range of Washington (Grant, 1969, p. 23, 39). The shear zones trend east to northeast and their intersection with older northwest-trending geologic structures near favorable plutonic rocks are loci for many mining districts (Grant, 1969, p. 45). Examples include the copper deposit at Holden, gold deposits at Monte Cristo, copper ore bodies at Glacier Peak and in the Sultan Basin, and an area explored along the Middle Fork of the Snoqualmie River.

The Alpine Lakes area contains many deposits of copper and other base metals, and although many have been prospected and explored, few have produced ore. The area is overlapped by five mining districts (Washington Division of Mines and Geology, 1971, fig. 2) that are of past or current importance: Blewett (southeast), Cle Elum (south-central), Leavenworth (northeast), Miller River (northwest), and Snoqualmie (southwest) (pl. 2).

Alteration haloes have developed around many mineralized occurrences. Propylitic, quartz-sericitic, potassium-silicic, and silicic are important types of alteration (Grant, 1969, p. 49–50). The zones of altered rock shown on plate 1 are conspicuously sericitized or silicified and commonly contain pyrite and other sulfide minerals. Where oxidized, the rock surfaces are stained with limonite.

LODE DEPOSITS

Gold was produced from the Blewett district adjacent to the southeastern part of the Alpine Lakes area. Most production took place near the end of the 19th century; the district is essentially idle now. Gold ore shoots were along northwest- to west-trending quartz-carbonate veins in mafic and ultramafic rock (Weaver, 1911, p. 72–73). The ore shoots were irregular lensoidal bodies a few feet to more than 10 ft (1–3 m) wide, as much as several hundred feet long (100 m), and a few tens to hundreds of feet (10–100 m) in vertical extent. The ore is oxidized near the surface and contains free gold; at depth the ore minerals are arsenopyrite and pyrite. In addition to gold the ore bodies contain minor amounts of silver, copper, and lead.

Many other precious- and base-metal deposits occur in an arcuate belt that extends westward from the Blewett district through the Swauk district and northwestward into the Cle Elum and Leavenworth districts. The belt roughly parallels the boundary of the Mount Stuart batholith and in most places lies some distance away. Many of the deposits in the arcuate belt are gold bearing like those of the Blewett district and occur in sulfide-bearing quartz or quartz-carbonate veins in ultramafic rock (Huntting, 1955, p. 64, 66–67). The veins were apparently emplaced along shear zones or faults. Other auriferous deposits are in contact metamorphic zones between granitic and ultramafic rock in silicified-carbonatized rock that contains sulfide minerals (Purdy 1951, p. 62–66).

Base- and precious-metal deposits, that contain mostly copper are most numerous in the Van Epps Pass area and constitute part of the arcuate belt of mineral deposits. The deposits lie in the Cle Elum and Leavenworth mining districts. They occur as disseminated sulfide minerals deposited along weakly developed shear planes in slightly to intensely serpentinized peridotite. In some prospect pits only copper carbonate stain is visible. Other copper-bearing deposits consist of sulfide minerals sparsely disseminated through dikes of intermediate composition. The sulfide minerals may be syngenetic, or they may be derived from deposits intruded by the dikes.

Locally, along the arcuate mineral belt, west-trending nickeliferous veins occur in ultramafic rocks (Lupher, 1944, p. 10). The nickel in these deposits was apparently liberated from ultramafic rock either through weathering, serpentinization, or hydrothermal activity and was combined with the vein-formning solutions (Vhay, 1966, p. 122).

Nickeliferous iron deposits occur in an arcuate belt that extends from the Blewett mining district through the Swauk district and into the Cle Elum district (Lupher, 1944; Lamey and Hotz, 1952). The deposits are thin—at the most no thicker than a few tens of feet (about 10 m)—discontinuous lenses and are in a zone lying between ultramafic rock and sandstone of the Swauk Formation. The deposits are residual, were formed through the weathering of ultramafic rock, and apparently were modified by physical processes. The more soluble constituents of the source rock were removed during weathering leaving a relatively insoluble residue enriched in iron, nickel, aluminum, and chromium.

Iron deposits containing magnetite occur in the area of Denny Mountain at Snoqualmie Pass, and near Goat Basin in the northwestern part of the Alpine Lakes area. The deposits near Denny Mountain formed in tactite zones along the contact of granitic rock with limestone (Smith and Calklins, 1906, p. 13); whereas, those near Goat Basin formed in an agmatite zone composed of diabase fragments in a granitic matrix (Plummer, 1964, p. 25).

Gold was mined in the Liberty area (fig. 1) of the Swauk district near the end of the 19th century (Smith, 1904, p. 9) from quartz-carbonate veins in narrow, brecciated fissures cutting sandstone or shale beds of the Swauk Formation. In places the veins have sharp walls, but elsewhere they grade into shattered wallrock. The gold, mostly native and containing some silver, commonly occurs in vein quartz and in silicified wallrock. Sulfide minerals are rare. The veins trend northeastward more or less parallel to older basalt dikes.

Gold and silver, copper and other base metals have been produced in significant quantities from the Miller River mining district. (The high prices paid for these metals in 1974 encouraged exploration in this area.) Much of the mining district is in the northwestern part of the Alpine Lakes area. Most deposits are in granitic rock of the Mount Stuart batholith (Purdy, 1951, p. 78–87), and some are in andesite (Livingston, 1971, p. 144). The deposits occur as veins in faults and shear zones that strike northwest and northeast and dip steeply. Ore minerals include pyrite, arsenopyrite, chalcopyrite, galena, tetrahedrite, sphalerite, and jamesonite (Livingston, 1971, p. 137–147). The wallrock adjoining the veins is variably altered; in places only the mafic minerals are affected, but commonly the rock is kaolinized or sericitized; locally, wallrock has been replaced by vein material.

Other deposits, containing dominantly copper, a little molybdenum, and sparse silver and gold, occur in the Quartz Creek area of the Miller River mining district (the Snoqualmie mining district of Livingston, 1971, p. 149–152). The district is on a large east-trending transverse shear zone (Grant, 1969, p. 40) that in mineralized areas is recognizable as sets of small east-trending shears. The deposits are in elliptical, near-vertical breccia pipes in granitic rock (Grant, 1969, p. 79–81). The pipes are hundreds of feet (100–200 m) across. Angular granitic fragments within the pipes are inches to feet (10–100 cm) long and are cemented with quartz and sulfide minerals. The principal sulfide minerals are pyrite, pyrrhotite, chalcopyrite, and arsenopyrite that occur as disseminations, veinlets, and lenticular replacement pods. The granitic fragments are intensely chloritized and sericitized (Grant, 1969, p. 81). This alteration was superposed on an earlier biotitic alteration of the breccia.

Copper deposits similar to those of the Quartz Creek area occur in the Snoqualmie mining district along the Middle Fork Snoqualmie River above Burntboot Creek. The deposits are in breccia pipes, shatter zones, and shears which transect granitic rock. They are alined along a northeast-trending zone more than 6 mi (10 km) long and 400–2,500 ft (120–750 m) wide (Grant, 1969, p. 81–88). The mineralized zone is cut by a series of northwest-trending faults that subdivide it into several separate mineralized bodies (Grant, 1969, p. 85).

Sulfide minerals, principally chalcopyrite, molybdenite, pyrite, and pyrrhotite, occur in veins and fracture fillings and as disseminations in the host rock. There were two stages of mineralization: the earlier one took place at an upper level and the later, richer one was at a deeper level. Biotite–potassium feldspar alteration and quartz-sericite alteration accompanied the mineralization. Propylitic alteration also developed during the periods of mineralization but in areas surrounding those being mineralized with copper and molybdenum.

Much of the mineralized ground along the Middle Fork Snoqualmie River is in the study area and lies along the transverse shear zone described by Grant (1969, p. 40). The zone may extend several miles (5 km) into the study area.

The Mineral Creek area of the Snoqualmie mining district may be a high-level equivalent of the copper deposits along the Middle Fork Snoqualmie River (Grant, 1969, p. 87). The mineralized zone of the Mineral Creek area is on a northeast-trending transverse shear zone. Mineralization and accompanying alteration occurred in the upper parts of the Three Queens stock and in adjoining volcanic rock and roughly correspond to the propylite zones of the Middle Fork area.

Copper sulfide minerals have been found by drilling altered country rock.

The geologic setting in the area of Summit Chief Mountain in the study area has some characteristics in common with the L-D gold mine 40 mi (64 km) east near Wenatchee, Wash. According to Patton and Cheney (1971) mineralization at the L-D mine occurred in a northwest-trending imbricate thrust zone in the Swauk Formation along which small bodies of intermediate and mafic rock were intruded. The mineralization was accompanized by repeated episodes of silicification. Near the ridge of Summit Chief Mountain is a similar zone of northwest-trending imbricate thrust faults, as well as a major vertical fault, cutting the Swauk Formation. The Snoqualmie batholith intrudes the Swauk a short distance north of the ridge, and a small satellitic body of the Snoqualmie intrudes the Swauk near the thrust fault zone. An elliptical zone of silicified iron-stained Swauk occurs near a vertical fault cutting the upper plate of the westernmost thrust. In other ways, however, the two areas differ: rocks of the Snoqualmie batholith are more felsic than the intrusive bodies associated with the L-D deposit, and the Snoqualmie batholith appears most likely to have intruded the Swauk after the period of faulting; whereas, the intrusive rocks of the L-D deposit appear to have been emplaced penecontemporaneously with folding and faulting. Mineralization in and adjacent to the Snoqualmie batholith mostly produced base metals; whereas, that near Wenatchee produced only precious metals.

PLACER DEPOSITS

Placer deposits of gold occur in those areas where significant lode gold deposits exist, as, for example, along Peshastin Creek in the Blewett district and along Swauk Creek (fig. 1) in the Swauk district. The gold is mostly in stream-level gravels, but along Swauk Creek it also occurs in older terrace gravels (Smith, 1904, p. 9). Other deposits were worked in lower Fortune Creek near its confluence with the Cle Elum River. The gold there is assumed to be derived from mineralized areas on the west side of Van Epps Pass.

OTHER COMMODITIES

Potential resources of some mineral, fuel, or rock products that are or might be present in the Alpine Lakes area were also investigated.

Analyses were made for platinum and platinum-group metals because of the known association of these metals with mafic and ultramafic rock. Twenty-three samples of serpentinized peridotite, 5 samples of mineralized rock, and 6 samples of panned concentrates were analyzed by fire assay for these metals. Twenty-two rock samples contained traces of platinum and (or) palladium. The highest platinum value (0.010 ppm) was in sheared talcose serpentinized peridotite, and the highest palladium value (0.008 ppm) was in serpentinized peridotite. No other platinum-group metals were detected. None of the panned-concentrate samples contained detectable amounts of any of the platinum-group metals.

The Swauk Formation was examined for uranium. Sandstone similar to that in the Swauk elsewhere in the United States contains uranium deposits of various types that if oxidized contain a conspicuous suite of yellow minerals. Nothing observed, however, indicated the presence or likely presence of uranium deposits in the Alpine Lakes area. As a further check, selected samples from the formation were tested radiometrically for equivalent uranium (eU) and several samples from the Mount Stuart and Snoqualmie batholiths also were tested. All tests were negative.

Nickeliferous iron deposits are outside the Alpine Lakes study area and are present in the valley of the Cle Elum River as far north as a point about opposite the Fish Lake Forest Service guard station. A major high-angle fault, roughly parallel to the Cle Elum River, extends through part of the area and juxtaposes the Swauk Formation and volcanic rock on the west against serpentinized peridotite on the east. The weathered zone and iron deposits are assumed to be present beneath the Swauk on the west side of the fault, and they probably extend into the Alpine Lakes area. Their depth, however, precludes them from being economic now or in the foreseeable future.

Pegmatites occur in parts of the Snoqualmie and Mount Stuart batholiths, but they do not contain economic quantities of muscovite, valuable feldspar, or other minerals.

Although coal occurs in a formation equivalent to the Swauk in the Bellingham, Washington area, no coal is known to occur in the Alpine Lakes area. The Swauk has a very high sandstone-to-shale ratio and appears to have been deposited in a piedmont or high-energy floodplain environment—environments unfavorable for the formation of coal. Only sparse carbonized fragments and imprints of plant fossils were observed in the Swauk.

Granitic rocks, like those in both the eastern and western parts of the study area may be crushed for road metal and railroad ballast, or blasted or split into large blocks for riprap; however, neither of the granitic bodies within the study area can be considered an economic resource because they are not accessible to the main routes of transportation.

The arkosic sandstone of the Swauk possibly may be suitable as building stone to veneer small buildings, domestic dwellings, and fireplaces. The esthetic attractiveness of the rock as a building stone is questionable, however, and because the sandstone is in thick to massive beds, it probably cannot be easily cleaved into blocks of specified sizes. Further, other more accessible deposits of the sandstone are outside the study area.

Sand and gravel suitable as aggregate for concrete occurs in many deposits along stream valleys of the Alpine Lakes area. Deposits of such material ample for foreseeable needs are available, however, in the Puget Sound lowlands and the Columbia River and Spokane River basins, near urban and industrial areas where these materials are most used.

Lenticular bodies of marblized limestone interlayered with other metamorphic rock occur in several bodies of pre-Cretaceous rock that crop out north and northwest of Snoqualmie Pass. The limestone layers are regarded as too small or are on slopes too precipitous to be amenable to open-pit or quarry-type mining operations, and most are too inaccessible for economic development. Further, the rock is chemically so variable that additional blending would be required to yield a consistent product suitable for the manufacture of cement.

A possible source of geothermal energy in the Alpine Lakes area could be the Snoqualmie batholith. It was emplaced in late Miocene time and may retain enough heat to have a greater than normal geothermal gradient. A hot spring associated with the batholith occurs just outside of the study area but the heat may be generated by the oxidation of a nearby sulfide deposit. Other batholithic rock, assumed to be as young as that of the Snoqualmie, is extensively exposed outside the Alpine Lakes area and potential development would probably occur outside the area.

GEOLOGIC APPRAISAL OF MINERAL RESOURCES

Most of the known mineral deposits in the Alpine Lakes area appear to be genetically related to granitic plutons of the Mount Stuart and Snoqualmie batholiths. The areas having the greatest potential for mineral resources, therefore, lie along or near borders of granitic plutons. More mineral deposits are associated with the Snoqualmie batholith than with the Mount Stuart batholith.

A discontinuous mineralized belt roughly parallels the southern and southwestern periphery of the Mount Stuart batholith. The deposits occur along the border of the batholith; however, some are as much as 4 mi (6.5 km) from it. The belt is delineated by gold vein deposits in the Peshastin Creek and Paddy-Go-Easy Pass areas and by copper vein deposits near Van Epps Pass, along the ridge south and southwest of Ingalls Creek, and near Hawkins and Hucklebery Mountains. The Van Epps Pass area also contains a disseminated copper deposit.

Two mineralized areas within the Mount Stuart batholith may be near borders of plutons that constitute that body.

Disseminated copper deposits occur near the periphery of the Snoqualmie batholith and outlying stocks. The deposits appear to be associated with main-phase granodiorite. The most extensively explored disseminated copper deposit lies on the nose of a ridge between the Middle Fork Snoqualmie River and Burntboot Creek. Other similar deposits occur along the ridge between Hardscrabble Lakes and the Middle Fork Snoqualmie River, in upper Gold Creek, and on the northeastern side of lower Mineral Creek. A hydrothermally altered area on Red Mountain suggests the presence of similar deposits.

Many vein deposits of base and precious metals were emplaced in shear zones within or near the Snoqualmie batholith. Most of the deposits are concentrated between Lennox Creek and the Miller River. They are in or near diorite and pyroxene granodiorite that were intruded by main-phase granodiorite, which is believed to be the magma that generated the deposits. The vein deposits in Gold Creek also appear to be related to main-phase magma; whereas, the deposit in the Chain Lakes area appears to be related to an adjacent quartz monzonite body. Undiscovered vein deposits may occur associated with main-phase or quartz-monzonite bodies of the Snoqualmie batholith in the Alpine Lakes area.

Geochemical Exploration of the Alpine Lakes Study Area and Additions, Washington

By J. L. GUALTIERI *and* GEORGE C. SIMMONS, U.S. GEOLOGICAL SURVEY

MINERAL RESOURCES OF THE ALPINE LAKES STUDY AREA AND ADDITIONS, CHELAN, KING, AND KITTITAS COUNTIES, WASHIINGTON

U.S. GEOLOGICAL SURVEY BULLETIN 1542-D

CONTENTS

TABLES

[Tables 18 and 19 follow chapter E]

MINERAL RESOURCES OF THE
ALPINE LAKES STUDY AREA AND ADDITIONS,
CHELAN, KING, AND KITTITAS COUNTIES,
WASHINGTON

GEOCHEMICAL EXPLORATION OF THE ALPINE LAKES STUDY AREA AND ADDITIONS, WASHINGTON

By J. L. GUALTIERI and GEORGE C. SIMMONS,
U.S. GEOLOGICAL SURVEY

INTRODUCTION

During the geologic reconnaissance of the Alpine Lakes area a total of 4,702 samples were collected for analyses: 2,657 stream-sediment samples, 19 soil samples, 8 panned concentrates, and 2,018 rock samples. Sample localities are shown on plate 2 and selected analytical data in tables 18 and 19. The type of sample—stream sediment, panned concentrate, soil, or rock—collected is indicated by symbol on plate 2. The samples are numbered and where two or more specimens were taken at the same sample site, the additional samples are indicated by letter suffixes in the table. An exception to this, however, is a few samples taken from sites in the northwestern part of the study area. There, samples having letter suffixes are from separate sites. Where more than one worker collected from the same site, different prefixes and numbers are shown. Anomalous samples are underlined, and anomalous areas are outlined. The anomalous areas are indicated by number and title on plate 2, and the samples therein are shown in table 18 and are discussed in the text.

Stream-sediment samples may contain anomalous amounts of metals carried in solution by stream water. The metals are absorbed in association with oxides of iron and manganese on clay- and silt-size particles in the stream sediments. Stream sediments having anomalously high metal content may indicate mineralized rock somewhere in the drainage basin. The magnitude of the anomalous values may reflect the volume and concentration of metal in the source area, but the magnitude can be affected by such factors as availability of the contained metals to solution, the distance from the source area, and the volume of the stream. For example, tributary streams at the head of Van Epps Creek drain nearby mineralized rock, some of which was exposed by prospecting and mining operations. Stream-sediment samples from the tributaries are high in metals, but about 1 mi (1.6 km) downstream near the mouth of Van Epps Creek no anomalous concentrations of metals were detected.

Stream-sediment samples were collected from most small tributary streams, usually just above their confluence with medium or large streams. The samples, taken from the finest material available, commonly clay- and (or) silt-size material, were sieved, and the minus 80-mesh fraction was used for analysis. Sediment samples containing sufficient fine material were analyzed by the citrate-soluble heavy-metals (c×HM) colorimetric test for combined zinc, cobalt, copper, and lead (Ward and others, 1963). Samples in which 3 ppm (parts per million) or more of metals was detected by the citrate-soluble method were also analyzed for copper and zinc by atomic absorption.

All stream-sediment samples were analyzed by six-step semiquantitative spectrographic analysis for a group of 30 elements (Grimes and Marranzino, 1968). Samples containing more than normal amounts of copper, lead, or zinc were further analyzed for copper and zinc by atomic-absorption analysis (Ward and others, 1969). Further testing was necessary because the limit of detection of zinc by spectrographic analysis is 200 ppm, which in the Alpine Lakes area is considered to be an anomalous value.

Stream gravels were panned from a few streams, and the concentrates were tested for gold by atomic absorption and for other metals by spectrographic analysis. A few such samples collected from areas underlain by ultramafic rock were analyzed for platinum and platinum-group metals by fire assay.

All the soil samples except one were collected from a mineralized area near Van Epps Pass. The soil samples were analyzed by the c×HM test and by spectrographic analysis, and they were further analyzed for copper and zinc by atomic absorption.

Grab samples of rock were collected throughout the study area. If stream sediments contained anomalous amounts of metal, rock samples were taken in the drainage basin in an attempt to locate the source of the metal. Others were taken from areas of hydrothermal alteration or in the vicinity of geologic structures that might contain mineral deposits. Some were taken near mines and prospects to determine not only the amount of metal in the visible ore minerals, but also to determine other elements which occur in trace amounts and which might serve as indicators of as yet undiscovered mineral deposits. Most grab samples, however, were taken to check for possible metal anomalies or anomalous trends and to establish the normal amounts of metal in the different rock formations. The samples were tested by spectrographic analysis, and selected samples were further checked by atomic absorption for copper, gold, and zinc.

Selected samples of arkosic sandstone and granitic rock were tested for uranium by paper chromatography, and for uranium or equivalent uranium by radiometric instrumentation. Typical samples of ultramafic rock were assayed for platinum and platinum-group metals, mainly to establish background levels for these metals. These samples were further checked by atomic absorption for cobalt, copper, nickel, and silver.

Review of the analytical data especially that from areas of known mineralization and hydrothermal alteration, indicates that minimum values for anomalous amounts of elements, regardless of rock type or stream sediment source, are those shown in table 2.

In intermediate and mafic dikes 100 ppm of copper may be close to the background level, but not many such bodies were sampled. The relatively high chromium and nickel content found in samples of ultramafic rock is considered to be normal background.

Only the analytical data for samples regarded as anomalous are shown in tables 18 and 19. Other data are on computer tape (Forn and others, 1974).

AREAS OF ANOMALOUS VALUES

Many parts of the Alpine Lakes area may have a potential for the occurrence of mineral deposits. These parts have been designated anomalous areas on the bases of the number and distribution of anomalous samples, number of elements that are anomalous in the samples, and on various geologic factors. Included in the anomalous areas are areas known to have been prospected or mined and for which there are supporting analytical data. The areas are discussed in a roughly east to southwest to northwest order.

Many samples were analyzed by more than one method, and many sample values are anomalous in more than one element. Consequently, in the following discussions of the anomalous areas, the number of chemical anomalies cited commonly exceeds the number of anomalous samples.

BULLS TOOTH AREA

One rock sample collected from the Bulls Tooth area (pl. 2, area 1; table 18) was anomalous solely in tin—10 ppm—detected by six-step semiquantitative spectrographic analysis. The area is underlain by limonite-stained granitic rock which otherwise appears unaltered or

TABLE 2.—*Anomalous threshold values in analyzed samples, Alpine Lakes study area, Washington*

[All of the data for the above elements are shown in tables 18 and 19 for each sample in which one of the elements was detected at or above the minimum values considered anomalous]

Method	Element	Value (ppm)
Stream sediment and soil samples		
Citrate-soluble heavy-metals colorimetric test (cXHM).	Zn	10
	Co	
	Cu	
	Pb	
Atomic absorption	Cu	100
	Zn	100
Six-step semiquantitative spectrographic analysis.	Ag	0.5
	As	200
	Cu	100
	Mo	5
	Pb	50
	Sn	10
	W	50
	Zn	200
Rock and panned concentrate samples		
Atomic absorption	Au	1
	Cu	100
	Zn	100
Six-step semiquantiative spectrographic analysis.	Ag	.5
	As	200
	Bi	100
	Cd	100
	Cu	100
	Mo	5
	Pb	50
	Sb	100
	Sn	10
	W	50

very slightly altered. The stained rock underlies an area about 100 ft (30 m) wide and a few hundred feet (about 100 m) long. Samples of an aplitic dike and a quartz vein which cut the iron-stained rock were not found to be anomalous.

The Bulls Tooth area is similar geologically to an area on French Ridge near Turquoise Lake, about 4 mi (6.5 km) southwest, which is also underlain by iron-stained granitic rock. Rock samples collected there were anomalous in several metals including tin.

FRENCH RIDGE AREA

Three anomalous stream-sediment samples and eight anomalous rock samples were collected from the French Ridge area (pl. 2, area 2; table 18) west of Turquoise Lake.

The sediment samples contain 18 and 70 ppm cXHM; the heavy-metals component apparently is mostly zinc for as much as 500 ppm zinc was determined by atomic absorption. Two of the stream-sediment samples are from a stream draining the northwestern part of the altered area.

The rock samples contain as much as 500 ppm copper, 1.5 ppm silver, and 15 ppm tin, all determined by semiquantitative spectrographic analysis. The maximum amounts of copper occur in intermediate dike rock, but copper is also present in anomalous amounts in altered and in some relatively fresh-appearing granitic rock. Silver occurs in anomalous amounts in both intermediate dike rock and altered granitic rock and is present in a quartz vein.

The rock samples are from an oval area of iron-stained, slightly altered, granitic rock about 1,500 ft (460 m) across that straddles the ridge crest.

The French Ridge area is underlain by altered granitic rock slightly more finely crystalline than surrounding granitic rock. Biotite and feldspar have been partly altered to sericite. Dikes of intermediate composition and at least one quartz vein cut the granitic rock and all contain anomalously high amounts of metal. Sparse, minute grains of sulfide minerals and traces of malachite were noted in some of the more finely crystalline granitic rock.

This area is clearly anomalous; the contained metals probably occur in the sulfide minerals. The area is considered to have mineral potential and is worthy of further investigation.

LELAND CREEK AREA

Fourteen anomalous stream-sediment samples and one anomalous soil sample were collected from the Leland Creek area (pl. 2, area 3; table 18). The sediment samples were taken from tributary streams along the course of Leland Creek from a point just above Lake Leland to near its confluence with Prospect Creek. Most of the samples were from an area just downstream from the lake. The area is wholly underlain by granitic rock of uniform character.

Nine sediment samples contain anomalous amounts of molybdenum in concentrations that range from 5 to 20 ppm and average 8 ppm, determined by spectrographic analysis. All but one of the samples came from the right bank of Leland Creek. Two samples, EG0270 and ES0002, contain 10 and 16 ppm cXHM, respectively. Atomic-absorption analysis of sample ES0002 shows concentrations of 100 ppm copper and 120 ppm zinc. Another sample, ES0004, contains 110 ppm zinc and some copper.

Three samples, two from near the head of Lake Leland, EG0258 and EG0260, and one from the head of Todd Lake, EG2300, are minimally anomalous in lead. Two other samples, EG0224 and EK0448, from the north part of the area are also minimally anomalous in lead. The lead may be derived from a different source than the molybdenum.

The soil sample (EG2292) was collected from what may be an unaltered or slightly altered shear zone in granitic rock on a saddle about 0.5 mi (about 0.8 km) southwest of Swallow Lakes. The sample contains 30 ppm molybdenum and is anomalous in no other metal.

The basins drained by the streams containing anomalous stream-sediment samples were examined for evidence of mineralization. Analyzed rock samples from these areas, including those collected from near where the soil sample was taken, showed no anomalous or near-anomalous amounts of molybdenum or other metals. All but one of the areas are underlain by unaltered granitic rock that is texturally similar to that of the adjoining areas. The one exception is an area of limonite-stained granitic rock about 200–300 ft (60–90 m) across that lies near the crest of French Ridge, southwest of Todd Lake and north of Klonaqua Lakes. There, biotite books are partly altered, but otherwise the rock appears fresh. Analyses of a sample of the limonite-stained rock and stream-sediment samples from around Todd Lake do not show anomalous contents of metals. Nevertheless, this area is the only likely source of the copper and zinc anomalies.

THE CRADLE AREA

Forty-three stream-sediment samples and 16 rock samples that contain anomalous amounts of metals were collected from The Cradle area (pl. 2, area 4; table 18). The stream-sediment samples were taken from small streams tributary to Meadow, the upper part of French, and Snowall Creeks, and from Cradle Lake, and most of them came from an area at the heads of Meadow and French Creeks. Most rock samples are from veins and country rock in a narrow isthmuslike body of the Mount Stuart batholith that intrudes serpentinized peridotite of Ingalls Creek near The Cradle.

Thirty-three sediment samples analyzed by semiquantitative spectrographic methods contain molybdenum in concentrations of 5–30 ppm and average about 11 ppm. Five of these 33 stream-sediment samples analyzed by a colorimetric method contain 25 ppm or more molybdenum. An additional stream-sediment sample was found anomalous by this method only.

Four sediment samples, all from Meadow Creek, contain 18–25 ppm cXHM. Of the several sediment samples checked by atomic absorption for copper and zinc, four were found anomalous in copper and one in zinc; the copper content averages about 120 ppm.

Two sediment samples, ES0018 from near the head of Snowall Creek and EK0172 on French Creek, contain tungsten in concentrations of 50 and 100 ppm, respectively, as determined spectrographically. U.S. Bureau of Mines personnel collected panned-concentrate samples on upper Meadow Creek which contain scheelite and 0.015–0.018 percent tungsten.

The search for the source of the anomalous metals in the stream-sediment samples was concentrated on The Cradle, a northwest-trending ridge that is bound by Meadow, French, and Snowall Creeks. Four samples of quartz veins and three of granitic rock that were collected along the ridge contain anomalous amounts of metals. The quartz veins appear barren and are 3–15 in. (8–38 cm) wide. They contain by spectrographic analysis 300 ppm arsenic, 70–300 ppm tungsten, 10–15 ppm molybdenum, and 0.5–0.7 ppm silver. Not all the elements cited are common to each of the vein samples. Other quartz veins were sampled but were not found to contain anomalous amounts of metals. Quartz veins containing sparsely disseminated molybdenite have been reported from the area at the head of Snowall Creek (E. Erikson, oral commun., 1973).

Of the three anomalous samples of granitic rock collected on The Cradle two are from a small limonite-stained area the only such area observed on the ridge. Sample EG0840 contains 70 ppm tungsten and sample EG0840A contains 150 ppm copper.

Metal anomalies occurring in other rock samples in The Cradle area do not appear to be genetically related to those occuring in the quartz veins or granitic rock. Two samples from near the contact of granitic and ultramafic rock are anomalous in lead and tin; two other samples from along the crest of Sixtysix Hundred Ridge are anomalous in copper. One of the latter samples, EG0417, is from a vein of asbestiform amphibole about 1 in. (2.5 cm) wide that occurs near a shear zone.

PADDY-GO-EASY PASS AREA

One anomalous stream-sediment sample and 15 anomalous rock samples were collected from the Paddy-Go-Easy Pass area (pl. 2, area 5; table 18). The stream-sediment sample, from the outlet of Sprite Lake, is anomalous only in lead which was detected by spectrographic analysis. Stream-sediment samples from along French Creek and Cle Elum River and from streams draining the Paddy-Go-Easy Pass area are not anomalous.

The rock samples collected from prospect pits and dumps are mostly vein and wallrock containing sulfide minerals; the metal content is expectably high and is not necessarily representative of the overall tenor of the deposits. Detection of metals in the rock samples was by spectrographic analysis. Of the 15 samples 9 contain anomalous concentrations of silver, 0.7–150 ppm and averaging about 23 ppm; 4 contain gold, 10–70 ppm and averaging 30 ppm; 12 contain copper, 150–20,000 ppm and averaging about 4,400 ppm; 8 contain arsenic, 300–10,000 ppm and averaging about 5,700 ppm; also, 2 samples contain anomalous concentrations of lead, 2 contain molybdenum, 3 contain antimony, 1 contains tungsten, and 2 contain zinc. Gold was detected in 8 sampled by atomic absorption in amounts ranging from 1 to 70 ppm and averaging about 20 ppm.

Gossan and copper-stained outcrops in the Paddy-Go-Easy Pass area were prospected before 1900. The area is mostly underlain by ultramafic rock which is intruded by small bosses of granitic rock.

The occurrence of arsenic in most of the Paddy-Go-Easy Pass area samples reflects the presence of arsenopyrite in the deposits; only two of the deposits sampled were rich in pyrite. The association of gold with arsenopyrite is common in many mineral deposits. The presence of similar mineral assemblages of silver and base metals and the near spatial association of small granitic bodies probably related to the Mount Stuart batholith are characteristics that the Paddy-Go-Easy Pass area deposits have in common with those in the Blewett mining district. The Paddy-Go-Easy Pass deposits, however, unlike those of the Blewett district, occur in narrow discontinuous veins and have neither the tenor nor the volume of those in the Blewett district.

VAN EPPS PASS AREA

Seventeen anomalous stream-sediment samples, 14 anomalous soil samples, and 30 anomalous rock samples were collected from the Van Epps Pass area (pl. 2, area 6; table 18). The stream-sediment samples were collected from the drainages of Solomon, Van Epps, and Fortune Creeks.

Three stream-sediment samples were collected from tributaries at the head of Solomon Creek were found by semiquantitative spectrographic analysis to contain anomalous concentrations of molybdenum; each contains 5 ppm molybdenum. A fragment of granitic rock taken from stream gravel contains 200 ppm copper by spectrographic analysis. In addition, a sample from a lensoidal quartz body emplaced in a shear zone near the head of Solomon Creek contains 3 ppm silver and 200 ppm lead by spectrographic analysis.

Seven anomalous stream-sediment samples were collected from the upper part of Van Epps Creek drainage basin, six of which contain copper ranging from 200 to 1,000 ppm and averaging about 480 ppm. The high copper content was expected in most of these samples because they were from streams draining areas in which there are copper prospects. Three of the samples, however, including the one containing the highest copper concentration, were from streams draining an iron-stained hydrothermally altered area on the south and southwestern part of the headwall of Van Epps Creek where there is little evidence of prospecting activity. Five of the samples from the Van Epps drainage basin also contain molybdenum ranging from 5 to 30 ppm and averaging 16 ppm, and six contain zinc ranging from 200 to 500 ppm and averaging 300 ppm. The c×HM content of the samples and the copper and zinc found by atomic absorption more or less parallel the concentrations of metals found by spectrographic analysis. Copper detected by atomic absorption ranges in concentration from 110 to 1,300 ppm and averages about 450 ppm and zinc ranged from 120 to 440 ppm and averages 220 ppm.

Seven anomalous stream-sediment samples were taken from tributaries north and east of Fortune Creek. Five of the seven samples contain anomalous concentrations of zinc—200–300 ppm and averaging 220 ppm—detected by semiquantitative spectrographic analysis. Three samples collected from tributaries north of Fortune Creek (EK0358, ET0304, and ET0306) contain anomalous concentrations of silver, whereas no silver was detected in samples EG1097, EG1100, and EG1107, which were taken higher on the wall of the canyon. The source or sources of the metal apparently lies some place between the groups of sample sites.

The soil samples, 14 of which were anomalous, were taken from a partly mineralized area a short distance southeast of Van Epps Pass. The samples were collected a few feet apart along north-south lines, oblique to and crossing the ridge line. Twelve of the soil samples contain anomalous silver, 12 (not the same 12) contain anomalous copper, and 10 contain anomalous molybdenum, all detected by spectrographic analysis. Silver ranges from 0.7 to 10 ppm and averages about 1.5 ppm, copper ranges from 150 to 1,500 ppm and averages about 820 ppm, and molybdenum ranges from 5 to 70 ppm and averages about 19 ppm. By atomic-absorption analysis the copper content of the soil samples is comparable to that found by spectrographic analysis. One sample, EP2149, is anomalous only in c×HM and in zinc found by atomic-absorption analysis.

Most of the rock samples collected in the Van Epps Pass area were mineralized specimens from workings and dumps in drainages of Van Epps and Fortune Creeks. The high metal content in the analyses is expectable and does not necessarily reflect the average tenor of the deposits.

Of the several metals detected in anomalous quantities, copper, silver, zinc, and molybdenum are the most common, and tin, lead, arsenic, and antimony are anomalous locally. Copper ranges from 100 to 20,000 ppm, and zinc from 200 to 10,000 ppm by spectrographic analysis. Molybdenum ranges from 7 to 500 ppm, and silver from 0.5 to 100 ppm. Selected samples were checked for gold by atomic absorption, but only one, containing a concentration of 2 ppm, was found to be anomalous.

The metallic minerals are mostly pyrite, chalcopyrite, and sphalerite; malachite bloom is evident in many samples. Silver appears to be more closely associated with copper than with zinc. The content of silver and arsenic in the samples does not correlate well; therefore, it is assumed that arsenic is in some mineral other than an arsenic-bearing silver sulphosalt, perhaps arsenopyrite.

The mineral deposits are along shear zones or joints in ultramafic rock that is silicified or otherwise altered and commonly iron stained. The metallic minerals occur disseminated or in veinlets in the sheared rock, and in quartz veins. The shears and veins strike northwest to west and dip steeply to the north. Some deposits are closely associated with intrusive bodies of intermediate composition.

The Van Epps Pass area has been extensively prospected over a period dating from before 1900, but only minor production is recorded. The area is mostly underlain by ultramafic and granitic rock.

The most intensely mineralized part of the Van Epps Pass area is within 2,000–3,000 ft (600–900 m) of the contact zone between serpentinized peridotite of Ingalls Creek and the Mount Stuart batholith and appears to be dominantly copper bearing and subordinately zinc bearing. Westward, in the Fortune Creek area the abundance of both metals diminishes, but zinc predominates over copper. This zonation, if real, imples that the mineralization process was extensive and may have produced other deposits in the area. Areas known to be hydrothermally altered are shown on the geologic map (pl. 1). The area is considered to have unexplored mineral potential.

ESMERELDA PEAKS AREA

Two stream-sediment and seven rock samples collected from the area around Esmerelda Peaks and Gallagher Head (pl. 2, area 7; table 18) contain anomalous values. The area contains two known copper-bearing mineral deposits and was examined for possible extensions of mineralized ground.

The two anomalous sediment samples are from tributary streams in the headwaters area of the North Fork Teanwaway River and apparently reflect the presence of a known mineral deposit in that area.

One of the sediment samples, EG1071, contains only zinc in anomalous concentrations—200 ppm by spectrographic analysis; the other sediment sample, EK0119, contains 12 ppm cXHM. A concentration of 120 ppm zinc was found in this sample by atomic absorption.

Two anomalous rock samples were taken from mine dumps in the upper Teanaway area. Sample EG1070 is an iron-stained silicified sulfide-bearing ultramafic rock that contains a disseminated green mineral, presumedly malachite; sample EG1070A is similar but contains fewer sulfide bodies and no visible copper minerals. Spectrographic analysis showed that sample EG1070 contains 3 ppm silver, 15 ppm gold, 300 ppm zinc, and 1,000 ppm arsenic, and sample EG1070A contains 500 ppm copper and 3,000 ppm zinc. Atomic absorption analysis showed that the two samples contain 16 and 2.5 ppm gold, respectively. The high arsenic content in EG1070 indicates that the sulfide mineral is probably arsenopyrite, which may account for the relatively high gold content.

Sample EK0114D, collected from gravel about 2,000 ft (600 m) downstream from the dumps, is composed of limonite-stained quartz. It contains anomalous concentrations of silver and copper and may have been carried downstream from dumps that contain vein quartz.

Samples EG1081, EG1081A, and EG1081B are from a prospect near Gallagher Head. Although outside the study area the deposit was briefly examined because it may be on a structure related to that in the Teanaway drainage. The samples are from malachite-stained silicified and pyritized rock occurring in shear zones that cut greenstone. In addition to copper, the samples contain some zinc and minor molybdenum and silver.

The mineralized shear zone in the Gallagher Head area trends N. 70° E., but its extension was not recognized east of the pass. The mineralized structure in the upper basin of the North Fork Teanaway River may be similarly oriented, although this could not be verified because the workings are inacessible.

GOLD CREEK–DELATE CREEK–MINERAL CREEK AREA

Fifty-five stream-sediment samples, two panned-concentrate samples, and 54 rock samples collected from the Gold Creek–Delate Creek–Mineral Creek area (pl. 2, area 8; table 18) contain anomalous values.

Twenty-five of the stream-sediment samples contain anomalous concentrations of silver (0.5–2 ppm and average about 1 ppm); 30 contain anomalous concentrations of copper (100–700 ppm and average about 140 ppm); 22 contain anomalous concentrations of molybdenum, (5–30 ppm and average about 11 ppm); detected by spectrographic analysis. These samples and some additional ones were further analyzed by atomic absorption for copper and zinc. Twenty-nine were found to contain anomalous concentrations of copper and 25 of zinc; copper ranges from 100 to 590 ppm and averages about 185 ppm, and zinc ranges from 100 to 390 ppm and also averages about 185 ppm.

Sixteen of the stream-sediment samples were anomalous in cXHM, and these correspond fairly well with samples found anomalous in copper and zinc by atomic absorption but correspond less well with samples found anomalous in copper and lead by spectrographic analysis.

Most of the stream-sediment samples having anomalous values are from the drainages of Gold, Delate, Box Canyon, and Mineral Creeks. Some of the 28 anomalous samples from the Gold Creek area, especially the upper part of the drainage basin, reflect the presence of altered and mineralized rock. Other anomalous samples from tributary streams west of the altered area may reflect either slightly altered and mineralized rock that was not recognized or possibly a body of mineralized rock in the subsurface.

Anomalous stream-sediment samples from upper Delate Creek below Spectacle Lake, upper Mineral Creek, and the outlet of Three Queens Lake may reflect unrecognized mineralized areas at the northwest, north, and southeast sides of the Three Queens stock. It is also possible that the samples from upper Delate Creek below Spectacle Lake reflect mineralized rock that may be present along the major north-trending fault crossing the creek there.

Some of the anomalous stream-sediment samples collected in lower Mineral Creek almost certainly reflect the altered mineralized area on the northeastern wall of the canyon. The few anomalous stream-sediment samples from tributaries to Box Canyon Creek appear unrelated to known areas of altered and mineralized rock.

The panned-concentrate samples were collected from upper Gold Creek and lower Mineral Creek. Both samples were anomalous in silver and copper by spectrographic analysis. The sample from Mineral Creek contains 700 ppm copper.

Rock samples were collected throughout the Gold Creek–Delate Creek–Mineral Creek area and especially from altered or mineralized rock. Analysis was by the semiquantitative spectrographic method. Twelve of the 54 anomalous rock samples collected were from workings driven on vein or other lode deposits, and the metal content of these samples is not representative of the tenor of the more extensively mineralized areas, nor does it necessarily reflect the tenor of the deposits from which they were collected. Excluding those from vein deposits, the samples most commonly contain silver in anomalous concentrations of 0.5–3 ppm; copper, 100–1,500 ppm; molybdenum, 5–50 ppm; zinc, 200–7,000 ppm; and rarely lead, tin, and tungsten. The abundance of metals in the anomalous rock was generally similar to that in the anomalous stream-sediment samples, with the exception of lead which in the rock samples commonly occurs in less than anomalous amounts.

Samples EG2431, EG2431A, EG2431B, and EG2431C were collected from an area of relatively high concentrations of disseminated sulfide minerals in granitic rock near a mine on Mineral Creek. All the samples contain silver, 0.5–2 ppm; and copper, 500–2,000 ppm; only two are anomalous in molybdenum. These few anomalous metals contrast with the large number from the vein deposits in the Gold Creek drainage, which is expectable considering the differences in the character of the deposits.

Samples EG1396, EG1396A, and EG1396B, and ES1097, ES1097A, ES1097B, ES1097C, and ES1097D were collected from the workings and dumps that explored two vein deposits on the southeast headwall of the canyon of Gold Creek. The veins are confined to shear zones and composed of quartz, pyrite, and ore minerals of base metals, and, unlike the pervasively altered and mineralized rock of the Gold Creek area, they contain proportionally more lead and zinc and less copper. In addition, traces of tin, tungsten, antimony, and gold were also detected in vein samples. The assemblages of metals and their relative abundances are very similar in the two veins, with the exception of arsenic, which was found only in samples from the lower vein (EG1396, EG1396A, and EG1396B).

Parts of the Gold Creek–Delate Creek–Mineral Creek area have been prospected and explored from before 1900 to the present. A dogleg-shaped area along Gold Creek, about 15,000 ft (4,600 m) long and 1,000–3,000 ft (300–900 m) wide, is hydrothermally altered and mineralized. The area is at the tip of a lobe of the Snoqualmie batholith, and both granitic and volcanic rocks are affected. Several other smaller altered and mineralized areas are within volcanic rock southeast of Gold Creek (pl. 1). A few veins and other lode deposits that occur in the area are more thoroughly discussed in the section dealing with mines and prospects.

The granitic rock in the Gold Creek area has undergone quartz-sericite alteration with the attendant destruction of mafic minerals and feldspar. The alteration of the volcanic rocks is less clear, however. In many areas it did not go beyond the propylitic stage, and evidence of it is not readily recognizable in the field. Only where the alteration process reached advanced stages is the rock silicified, and where not iron-stained, it appears bleached.

Sulfide minerals are common throughout the altered areas and commonly occur as disseminated grains; elsewhere, they occur in veinlets. Pyrite was the only sulfide mineral recognized, but evidently copper sulfide minerals are also present.

The area along Mineral Creek is relatively complex geologically; it is underlain by andesite flows, schist, and arkosic sandstone in contact with each other along high-angle faults, and all are intruded by a granitic stock. In contrast to the Gold Creek area only volcanic rock is substantially altered; the altered area is about 1.5 mi (2.4 km) long by 1 mi (1.6 km) wide. The volcanic rock appears to have undergone intense quartz-sericite and propylitic alteration, whereas the schist and granodiorite show the effects of only mild alteration. Sulfide minerals are rare on the limonite-stained canyon wall on the northeast side of the lower part of Mineral Creek, but they are abundant in the more intensely mineralized areas near the level of Mineral Creek.

Although no deposits have been discovered that are economic under current conditions, there is a potential for the future discovery of a low-grade copper deposit.

LEMAH CREEK–MIDDLE FORK SNOQUALMIE RIVER–CRAWFORD CREEK AREA

Thirty-nine stream-sediment samples, 1 panned-concentrate sample, and 36 rock samples anomalous in metals were collected from the Lemah Creek–Middle Fork Snoqualmie River–Crawford Creek area (pl. 2, area 9; table 18). The stream-sediment samples from the area were found anomalous in metals by spectrographic analysis. Three of the samples are from Lemah Creek and its tributaries, 1 from the Summit Chief Lake area, 1 from the Iceberg Lake area, 1 from a small stream on the north side of Summit Chief Mountain, 28 from tributaries of the Middle Fork Snoqualmie River, 2 from the Crawford Lake area, and 3 from the Lake Rowena area.

Of the 39 stream-sediment samples, 15 samples contain anomalous silver in concentrations that range from 0.5 to 3 ppm and average about 1 ppm; 14 contain anomalous copper in concentrations that range from 100 to 500 ppm and average about 180 ppm; 17 contain anomalous molybdenum in concentrations that range from 5 to 20 ppm and average 11 ppm; and 15 contain anomalous lead in concentrations that range from 50 to 150 ppm and average about 77 ppm.

Fourteen samples, most of which were from tributary streams along the Middle Fork Snoqualmie River, contain anomalous amounts of c×HM in concentrations that range from 10 to 50 ppm and average about 22 ppm. These and several other samples were analyzed again by atomic absorption for copper and zinc; 14 contain anomalous copper in concentrations that range from 100 to 460 ppm and average about 200 ppm, and 16 contain anomalous zinc in concentrations that range from 100 to 350 ppm and average about 176 ppm.

Three stream-sediment samples, EG0637, EG0638, and ES0200, are from streams along or near known or inferred faults. Samples EG0637 and EG0638, collected near silicified schist and volcanic rock along a high-angle reverse fault, are anomalous in copper.

Sediment-sample EG1324 from a small northeastward-flowing stream on the north side of Summit Chief Mountain, contains anomalous amounts of silver, base metals, tin, and arsenic, probably derived from nearby deposits.

Fourteen anomalous sediment samples, taken along the Middle Fork Snoqualmie River from Williams Lake to a point about 2 mi (3 km) downstream, cannot be related to know mineralized or altered rock. The samples came from tributary streams on both sides of the river and the source of the metals is, therefore, assumed to be of considerable areal extent. Finely disseminated sulfide minerals associated with unrecognized low-grade propylitic alteration may be the source. Most samples are anomalous in copper and molybdenum, a few are also anomalous in lead and zinc, and very few are anomalous in tin.

Thirty-six anomalous rock samples were collected from the area and most of them came from the area of Lemah Creek or between Lemah Creek and the Middle Fork Snoqualmie River. Ten of the samples were taken from workings 0.5–0.75 mi (0.8–1.2 km) northwest of Summit Chief Mountain. The samples were found anomalous by spectrographic analysis.

Most of the anomalous rock samples collected from sites other than at known mineral deposits, but including sites in visibly altered areas, contain notable concentrations of copper (100–300 ppm) or zinc (200–700 ppm). Two samples from the altered area on the west side of Summit Chief Mountain contain anomalous silver (0.5–2 ppm), lead (50–150 ppm), tin (15 ppm), and zinc (200 ppm).

Most samples from prospects (EG1322, EG1322A, EG1322B, EG1322C, EC1322D, and EG1322E, and ES1100, ES1100A, and ES1100B) contain anomalous concentrations of silver (0.7–300 ppm), arsenic (300–7,000 ppm), bismuth (100–300 ppm), cadmium (150–200 ppm), copper (300–20,000 ppm), antimony (100–2,000 ppm), and zinc (200–10,000 ppm). Other metals found in anomalous concentrations in samples from the workings include tin and tungsten. The workings are in an area of altered and mineralized sandstone that lies along the inferred projection of a high-angle fault.

The Lemah Creek–Middle Fork Snoqualmie River–Crawford Creek area straddles the contact between granitic rocks of the Snoqualmie batholith and the older mafic volcanic rocks and sandstone. The volcanic rocks are extensively altered by low- to high-temperature thermal metamorphism, and the sandstone is similarly affected but to a lesser degree. Several areas of propylitic, sericitic, and silicic alteration are known, and in the last 90 years many have been prospected and explored. Nevertheless, the exploration that has been conducted to date there has not thoroughly tested the area. A fair potential remains for the discovery of deposits of precious and base metals.

BURNTBOOT CREEK AREA

Six anomalous stream-sediment samples and one anomalous rock sample were collected from the Burntboot Creek area (pl. 2, area 10; table 18); the area lies approximately along the contact of the Snoqualmie batholith with volcanic rocks of the Naches Formation.

Most of the sediment samples contain anomalous concentrations of either copper or lead at near minimal levels, determined by semiquantitative spectrographic analysis. An anomalous amount of molybdenum was found in one sample and silver in another. The lead anomalies occur in streams draining the area south of Burntboot Creek, which is underlain by volcanic rock; whereas, the copper anomalies, with one exception, occur in streams draining the area north of the creek, which is underlain by granitic rock.

The samples anomalous in copper by spectrographic analysis were analyzed again by atomic absorption; the determinations agree fairly well. One of the samples was also found to contain barely anomalous zinc by atomic absorption.

The anomalous rock sample contained anomalous lead by spectrographic analysis.

On the basis of these few weakly anomalous samples, the Burntboot Creek area does not appear to have a high mineral potential.

LAKE LILLIAN AREA

Three anomalous stream-sediment samples and three anomalous rock samples were collected from the Lake Lillian area (pl. 2, area 11; table 18). The area is underlain by andesite flows of the Naches Formation which are intruded by basalt sills. The extreme southern part of the area is underlain by granodiorite of an outlying stock of the Snoqualmie batholith.

Two of the three anomalous sediment samples were anomalous solely in lead in concentrations of 70 and 200 ppm, detected by spectrographic analysis. The other stream-sediment sample is anomalous solely in c×HM.

The three anomalous rock samples contain concentrations of molybdenum ranging from 5 to 15 ppm found by spectrographic analysis, and in addition one of them contains 300 ppm copper, also found by spectrographic analysis.

The anomalous sample sites occur in a north-trending belt alined roughly parallel to the strike of the layered rocks in the area but no obviously mineralized rocks were observed.

RED MOUNTAIN AREA

Seven stream-sediment samples and three rock samples anomalous in metals were collected from the west side of Red Mountain (pl. 2, area 12; table 18). The rock samples are from altered and iron-stained volcanic and sedimentary rocks of the Naches Formation. All the stream-sediment samples are from streams draining the west face of Red Mountain.

Four of the stream-sediment samples are anomalous in cXHM in amounts that range from 10 to 300 ppm; the heavy-metals component must be mostly copper as 220–1,700 ppm copper was determined by atomic absorption in five of the samples. These determinations check closely with the spectrographic analyses that range from 150 to 1,500 ppm copper in the same five samples. Using spectrographic analysis and atomic absorption, other samples were determined to be anomalous either in molybdenum or zinc.

Stream-sediment sample EG2459 is notable both for its high copper content (1,500 ppm by spectrographic analysis and 1,700 ppm by atomic absorption) and the unusual character of the sampled material. The material is an ocherous-colored glutinous clay-sized sediment uncommon to the Alpine Lakes study area. It is thought that it may have been flushed by circulating ground water from intensely altered rocks in the subsurface.

Stream-sediment sample EP2270, collected from lower Commonwealth Creek and outside the Red Mountain area, is anomalous in copper that probably came from the Red Mountain area.

The rock samples are anomalous only in copper (100–150 ppm), determined by spectrographic analysis.

The area is considered significantly anomalous. The extent of the altered area, the presence of iron-stained rock, the presence of clay-size material that may have been flushed from argillic, altered rocks at depth, and the nearby existence of a granitic intrusive suggest that the area is underlain by a disseminated mineral deposit.

THUNDER CREEK AREA

Eight stream-sediment samples and one rock sample anomalous in metals were collected from the Thunder Creek area (pl. 2, area 13; table 18). Most samples are from tributary streams on the south side of the valley of the Middle Fork Snoqualmie River. The area is underlain by quartz monzonite (Erickson, 1969).

The stream-sediment samples are anomalous in copper, lead, molybdenum, silver, and zinc, as determined by spectrographic analysis. Only three of the eight anomalous sediment samples are anomalous in more than one metal. Silver is the most prevalent of the anomalous metals; it occurs in four samples and its concentrations range from 0.7 to 1.5 ppm and average about 1 ppm. One sample is relatively high in molybdenum at 100 ppm.

The only anomalous rock sample collected in the Thunder Creek area was a cobble of pyritized granitic rock taken from the stream gravel; it is probably extraneous to the area. It is anomalous only in tungsten (70 ppm), determined by spectrographic analysis.

This area, although adjacent to one known to be mineralized, is considered to have low possibilities for the discovery of mineral deposits.

MELAKWA PASS AREA

Ten anomalous stream-sediment samples and seven anomalous rock samples were collected from the Melakwa Pass area (pl. 2, area 14; table 18). The area is underlain by several rock types including quartz monzonite (Erickson, 1969), pyroclastic and flow rocks, sandstone, hornfels, and tactite.

Nine stream-sediment samples are anomalous in copper and (or) lead, detected by spectrographic analysis. Anomalous amounts of the two metals occur together in only five samples. Copper ranges from 100 to 150 ppm and lead from 70 to 300 ppm; they average 130 and 174 ppm, respectively. Anomalous amounts of silver ranging from 0.5 to 1 ppm occur in four samples, most of which are also anomalous in copper and lead. The stream-sediment samples were also anomalous in molybdenum (one sample), tin (two samples), and zinc (two samples). Two stream-sediment samples are anomalous in c×HM; these samples are also anomalous in copper, lead, and zinc as detected by spectrographic analysis.

The anomalous sediment samples appear not to be derived from any one geologic environment or rock type; the samples were taken from streams draining areas underlain by hornfels, and granitic and volcanic rocks.

The rock samples are anomalous in copper, lead, molybdenum, and zinc by spectrographic analysis. Most of the anomalies are near minimal levels, and in most of the samples the anomalies occur in only one metal. Four samples that were checked by atomic absorption were found anomalous in zinc, having concentrations ranging from 190 to 440 ppm and averaging 315 ppm. Most of the anomalous rock samples were collected from tactite; others were collected from mylonitized hornfels, granite, sandstone, and volcanic rock.

The area is considered to have low possibilities for the discovery of mineral deposits, although small podular mineral deposits of base metals may be present in tactite zones.

TUSCOHATCHIE LAKE AREA

Ten stream-sediment samples and one rock sample that contain anomalous amounts of metals were collected in the area of Tuscohatchie Lake (pl. 2, area 15; table 18). The area is underlain by medium-crystalline granodiorite or quartz diorite that is not visibly altered.

Six of the stream-sediment samples are anomalous in molybdenum and five are anomalous in lead, determined by spectrographic analysis; in only two samples is there more than one anomalous element. Molybdenum ranges in concentration from 5 to 10 ppm and averages 7 ppm; lead ranges in concentration from 50 to 300 ppm and averages 120 ppm. Silver and tin are also present in anomalous amounts, silver in one sample and tin in another. The sample showing the highest lead amount was analyzed again by atomic absorption for copper and zinc and was found to contain no anomalous amount of copper and only a slightly anomalous amount of zinc (110 ppm).

The sole anomalous rock sample contains 50 ppm molybdenum.

The area is considered to have low possibilities for the discovery of mineral deposits.

TALAPUS LAKE AREA

Four stream-sediment samples that contain anomalous amounts of metals were collected from the area east and north of Talapus Lake (pl. 2, area 16; table 18). The area is underlain by medium-crystalline granodiorite.

All of the samples are anomalous in molybdenum which ranges from 5 to 15 ppm and averages 8 ppm. One sample is also anomalous in silver and copper. The determinations were by spectrographic analysis and the copper content was verified by atomic absorption.

The area is considered to have low possibilities for the discovery of mineral deposits.

LAKE KULLA KULLA AREA

Five anomalous stream-sediment samples and two anomalous rock samples were collected from the Lake Kulla Kulla area (pl. 2, area 17; table 18). The area is underlain by medium-crystalline granodiorite.

The stream-sediment samples are anomalous in molybdenum and lead, as determined by spectrographic analysis. Lead ranges in concentration from 70 to 100 ppm and averages 85 ppm.

The rock samples are both anomalous in copper, 100 and 150 ppm, as determined by spectrographic analysis.

The area is considered to have low possibilities for the discovery of mineral deposits.

DERRICK LAKE AREA

Twelve stream-sediment samples and six rock samples collected from the Derrick Lake area (pl. 2, area 18; table 18) are anomalous. The area is underlain by granodiorite and quartz monzonite (Erickson, 1968) that in places is cut by lensoidal veins containing schorlite, pistacite, and garnet.

Ten of the sediment samples are anomalous in molybdenum, which ranges in concentration from 5 to 30 ppm and averages about 12 ppm. Four samples are anomalous in lead and one in silver. Detection was by spectrographic analysis. One sample checked by atomic absorption shows a near-minimal anomaly in copper.

The rock samples are anomalous in lead, molybdenum, tin, and zinc, as determined by spectrographic analysis. Anomalies in more than one metal occur in only two samples, ES2058, and ES2076. These two samples contain relatively high amounts of zinc, 1,500 and 1,000 ppm, respectively. When analyzed by atomic absorption, the samples were determined to contain 430 and 1,600 ppm zinc, respectively. Sample ES2058 is from mafic rock, probably an amphibolite inclusion or amphibole-rich segregation in granitic rock. Sample ES2076 is from a garnetiferous vein.

The area, although containing some high zinc values, is considered to have low to moderate possibilities for the discovery of mineral deposits.

MIDDLE FORK SNOQUALMIE RIVER–HARDSCRABBLE CREEK AREA

Nineteen stream-sediment samples and 29 rock samples collected in the Middle Fork Snoqualmie River–Hardscrabble Creek area (pl. 2, area 19; table 18) were found to be anomalous. The area is underlain by main-phase granodiorite of the Snoqualmie batholith.

Spectrographic analysis showed that 10 sediment samples are amomalous in copper, having concentrations ranging from 100 to 3,000 ppm and an average of 715 ppm; 13 are anomalous in molybdenum, having concentrations ranging from 5 to 70 ppm and an average of about 20 ppm; and 11 are anomalous in silver, having concentrations ranging from 0.5 to 3 ppm and an average of about 1.2 ppm. Anomalous lead occurs in eight samples but is not significantly abundant. A few samples also contain anomalous tungsten and tin.

Sediment sample EG2502 was collected from a stream draining the mineralized ground in the central part of the area. It contains 300 ppm c×HM, 3,000 ppm copper determined by spectrographic analysis, and 4,700 ppm copper determined by atomic absorption. Sediment sample EG2511 was collected from a stream flowing from an exploratory adit driven into mineralized ground in the southwestern part of the area. It contains 60 ppm c×HM, 2,000 ppm copper determined by spectrographic analysis, and 2,200 ppm copper determined by atomic absorption. Three other of the 10 sediment samples found anomalous in copper by spectrographic analysis were also found anomalous in copper and zinc by atomic absorption.

Twenty-three rock samples are anomalous in copper (100–15,000 ppm and averaging about 1,150 ppm); seven are anomalous in molybdenum (10–70 ppm and averaging about 33 ppm); and 21 are anomalous in silver (0.7–200 ppm and averaging about 12 ppm), determined by spectrographic analysis. A few samples are also anomalous in lead, tin, tungsten, and zinc. Sample EG2568 is unusual in that it contains 5,000 ppm lead and some silver and zinc, but no copper or molybdenum. The sample was limonite-stained medium-crystalline granodiorite, which appears to be slightly altered; it was from the ridge between Burntboot Creek and the Middle Fork Snoqualmie River. The analytical data support the visual impression that parts of the area are highly mineralized.

Part of the anomalous area along the Middle Fork Snoqualmie River was being explored for copper in 1973. The anomalous area is about 4 mi (6.5 km) long and, in places, as much as 1 mi (1.6 km) wide. It lies along a northeast-trending shear zone (Grant, 1969, p. 45) that in places is offset by cross faults. The shear zone is characterized by many breccia pipes and shear structures. The central and southwestern parts of the area are mineralized, principally by sulfides of copper and molybdenum accompanied by minor amounts of silver and other metals. Plutonic rock in the mineralized parts of the area has undergone three principal types of alteration: potassic (which is characterized by the formation of secondary biotite and potassium feldspar), quartz-sericitic, and propylitic (A. R. Grant, written commun., 1971). The discovery of any bodies in the area will depend on exploration like that conducted in 1973.

HESTER LAKE AREA

Five stream-sediment samples that contain anomalous amounts of metals were collected from the Hester Lake area (pl. 2, area 20; table 18). Two samples are anomalous in lead and three are anomalous in molybdenum, determined by spectrographic analysis. All anomalies are at or near minimal levels; no sample is anomalous in more than one metal. The area is underlain by medium-crystalline granodiorite.

The area is not considered to have significant mineral potential.

DINGFORD CREEK AREA

Four stream-sediment samples and one rock sample collected from the Dingford Creek area (pl. 2, area 21; table 18) are anomalous. The area is underlain by granodiorite.

The sediment samples are anomalous in copper, lead, molybdenum, and silver, determined by spectrographic analysis. The anomalous values do not greatly exceed minimal levels. In sample EG2646 all four metals are anomalous.

The sole anomalous rock sample is anomalous in copper and tungsten.

The area is considered to have very low possibilities for the discovery of mineral deposits.

GREEN RIDGE LAKE AREA

One stream-sediment sample and one rock sample collected from the Green Ridge Lake area (pl. 2, area 22; table 18) are anomalous in metals. The anomalies were determined by spectrographic analysis. The sediment sample is anomalous only in silver at a near minimal level. The rock sample is anomalous in copper (100 ppm), lead (70 ppm), molybdenum (30 ppm), silver (2 ppm), and zinc (300 ppm).

The Green Ridge Lake area appears to be underlain by a limonite-stained northwest-trending shear zone cutting granodiorite. The shear planes strike roughly N. 20°–30° W. and dip about 65° NE. Quartz-lined vugs are common and contain crystals as much as 1.5 in. (4 cm) long and 0.75 in. (2 cm) across. The quartz-lined vugs and limonite-stained rock may be indicative of hydrothermal activity, although the paucity of anomalous samples does not indicate the presence of large amounts of metals.

GARFIELD MOUNTAIN LAKES AREA

Two anomalous stream-sediment samples and four anomalous rock samples were collected from Garfield Mountain Lakes area (pl. 2, area

23; table 18). The area is underlain by andesite flows, quartz monzonite, and diorite (Erickson, 1969).

The sediment samples are anomalous only in lead at minimal or near minimal levels determined by spectrographic analysis. The samples were collected from the outlet and inlet of Lower Garfield Mountain Lake, an area surrounded by volcanic rock.

The rock samples are anomalous in copper, molybdenum, and silver at minimal or near minimal levels, determined by spectrographic analysis. Samples anomalous in copper and silver are from volcanic rock.

The area is considered to have low possibilities for the discovery of mineral deposits.

SNOQUALMIE LAKE POTHOLES AREA

Seven stream-sediment samples and five rock samples collected from the Snoqualmie Lake Potholes area (pl. 2, area 24; table 18) are anomalous. The area is underlain by medium to coarsely crystalline granodiorite.

The stream-sediment samples are anomalous in copper, lead, molybdenum, and silver, determined by spectrographic analysis. Molybdenum is present in six samples and ranges from 5 to 20 ppm and averages 12 ppm; copper is present in three samples, lead in three samples, and silver in three samples. Four of the samples are anomalous in two or more metals; two of them are anomalous in all four metals. Two samples, EC2030 and EG2671, are from the same site.

Three of the rock samples are anomalous only in copper, one is anomalous only in silver, and one is anomalous only in molybdenum, determined by spectrographic analysis. The analysis for sample EG2666 shows 1,000 ppm copper. Although one sample is high in copper, the area is considered to have only low possibilities for the discovery of mineral deposits.

LAKE DOROTHY–CAMP ROBBER CREEK–FOSS RIVER AREA

Forty-two anomalous stream-sediment samples and four anomalous rock samples were collected from the Lake Dorothy–Camp Robber Creek–Foss River area (pl. 2, area 25; table 18). The area is underlain by granodiorite.

Forty of the stream-sediment samples were found to be anomalous in metals by spectrographic analysis. Twelve samples contain anomalous concentrations of copper (100–150 ppm and averaging about 125 ppm), 16 contain anomalous concentrations of molybdenum (5–30 ppm and averaging about 9 ppm), and 21 contain anomalous concentrations of lead (50–150 ppm and averaging about 62 ppm). Five of the samples also contain anomalous amounts of silver (0.5–1 ppm).

Two sediment samples, not found to be anomalous by spectrographic analysis, contain anomalous c×HM and one of these, further analyzed by atomic absorption, also was found to contain an anomalous amount of copper. An additional sample was found by atomic absorption to contain an anomalous amount of zinc. In general, concentrations of copper determined by spectrographic analysis and by atomic absorption were about the same.

All four of the anomalous rock samples contain anomalous concentrations of copper. One sample, EG2108, from the north part of the area contains minimally anomalous silver, and another, EG2711, from the crest of the ridge between Lake Dorothy and Camp Robber Creek, contains anomalous amounts of silver and tungsten.

The anomalous samples, although many, do not contain concentrations of metals much above minimal levels. The area is considered to have only low possibilities for the discovery of mineral deposits.

CHAIN LAKES AREA

One stream-sediment sample and 13 rock samples containing anomalous concentrations of metals were collected from and near a sulfide vein in the Chain Lakes area (pl. 2, area 26; table 18). The vein is in a northwest-trending shear zone cutting granodiorite and was mined for base and precious metals. Two other similar veins, which do not crop out at the surface, were reached through underground workings. The vein at the surface is 15–20 ft (4.5–6 m) wide and several tens of feet (about 20 m) long. The properties, workings, and reserves are discussed at length in the section on "Mining Claims."

The sole sediment sample collected from the area was analyzed spectrographically and was found to contain an anomalous concentration of only one metal, lead, and that at a near-minimal level. The stream from which the sample was taken flows across the northwestern end of the vein where the vein is narrow, oxidized, and probably leached of its metal content. This may explain the lack of high concentrations of metals in the sample.

The rock samples include unaltered granodiorite near and distant from the vein, tourmaline-rich rock containing quartz, and massive aggregates of pyrite, chalcopyrite, covellite, sphalerite, arsenopyrite, cerussite, and malachite. They were analyzed spectrographically and some of them were further tested for gold by atomic absorption. The analytical results do not necessarily reflect the overall tenor of the vein. Most of the samples contain anomalous amounts of silver (0.7–500 ppm), arsenic (200–10,000 ppm), copper (150–20,000 ppm), tin (15–50 ppm), and zinc (700–10,000 ppm). Some samples were also found to contain cadmium (150–500 ppm), antimony (150–10,000), and tungsten (50-300 ppm). Some of the samples were further tested by atomic abosrption for gold, and anomalous concentrations (1.5-2 ppm) of the metal were found in two of them. Gold was detected in those samples in which arsenic is high. The gold is assumed to be in arsenopyrite, a mineral that in the Chain Lakes area is the sole constituent of veins that cut earlier veins containing pyrite, chalcopyrite, and sphalerite.

The veins in the Chain Lakes area may have formed from late-stage hydrothermal activity around a young stock in the Mount Hinman area (Erickson, 1965, p. 39-40). Undiscovered veins, like those in the Chain Lakes area may be present peripheral to the stock.

NECKLACE VALLEY AREA

Eleven anomalous stream-sediment samples and two anomalous rock samples were collected from the Necklace Valley area (pl. 2, area 27; table 18). The sediment samples are from tributary streams around the lakes and from the lake outlets; both rock samples are from near the south end of Locket Lake.

Ten of the stream-sediment samples were found to contain anomalous concentrations of metals by spectrographic analysis; of these, five were found to contain anomalous amounts of molybdenum (5-15 ppm and averaging 10 ppm) and six were found to contain anomalous amounts of lead (50-100 pm and averaging about 60 ppm). Another sample was found to contain an anomalous amount of zinc (110 ppm) by atomic absorption. Only one of the samples contains more than one metal in anomalous amounts.

The rock samples contain anomalous concentrations of copper and are from apparently unaltered granitic rock. Sample EG0470A, from an alaskite dike, contains 150 ppm copper, and sample EG0470B, from mafic-rich rock associated with the alaskite dike, contains 100 ppm copper.

The Necklace Valley area is considered to have low possibilities for the discovery of mineral deposits.

LAKE DOROTHY AREA

Seven anomalous stream-sediment samples and one anomalous rock sample were collected from the outlet of Lake Dorothy and the upper part of the East Fork Miller River (pl. 2, area 28; table 18). The area is underlain by granodiorite.

The sediment samples, like those along the lower part of the East Fork Miller River, are anomalous in copper, lead, and molybdenum at minimal levels by spectrographic analysis. Three of the samples are anomalous in more than one metal.

The sole anomalous rock sample was of apparently unaltered granodiorite and was found anomalous in gold in the amount of 3.5 ppm, as determined by atomic absorption.

The area is considered to have low possibilities for the discovery of mineral deposits.

TAYLOR RIVER AREA

Four anomalous stream-sediment samples and one anomalous rock sample were collected from the Taylor River area (pl. 2, area 29; table 18). Most of the area is underlain by granodiorite and a small part is underlain by andesite.

The stream-sediment samples are anomalous in lead, molybdenum, and silver as detected by spectrogaphic analysis. The anomalies are at or near minimal levels and probably reflect low concentrations of these metals in granitic rock.

The anomalous rock sample, EG2694, is andesite that does not appear mineralized or altered. It contains 700 ppm arsenic and 15 ppm tin, determined by spectrographic analysis. Arsenic is characteristic of sulfide-bearing veins in the Lennox Creek and Miller River areas.

The area is considered to have low possibilities for the discovery of mineral deposits.

BIG CREEK AREA

Four stream-sediment samples, anomalous in arsenic, copper, molybdenum, tungsten, tin, and silver, were collected from the area (pl. 2, area 30; table 18). The area is underlain by medium-crystalline granodiorite.

Molybdenum and tungsten are common to three of the samples; molybdenum is present at minimal or near minimal levels; whereas, tungsten is 70 ppm in each of the three samples. Arsenic is present in two samples in amounts of 200 and 300 ppm. One sample was anomalous solely in tin. Determination was by spectrographic analysis.

The arsenic and tungsten in the samples may have been derived from a sulfide vein similar to those occurring in the Lennox and Miller River areas; however, no such vein is known in the Big Creek area.

The area is considered to have low possibilities for the discovery of mineral deposits.

MARTEN LAKE AREA

Three stream-sediment samples and two rock samples that contain anomalous amounts of metals were collected from the Marten Lake area (pl. 2, area 31; table 18). The area is underlain by biotite- and pyroxene-bearing granodiorite (Erikson, 1968).

One sediment sample contains 10 ppm cXHM. The other two contain 5 and 10 ppm molybdenum, determined by spectrographic analysis. The rock samples are both anomalous in copper in 100- and 300-ppm amounts, as determined by spectrographic analysis.

The area is considered to have very low possibilities for the discovery of mineral deposits.

LAKE ISABELLA AREA

Five anomalous stream-sediment samples and one anomalous rock sample were collected from an elongate area extending from Lake Isabella east to Mowitch Lake and straddling upper Sunday Creek (pl. 2, area 32; table 18). The area is almost entirely underlain by granodiorite.

The sediment samples are minimally or near minimally anomalous in lead, molybdenum, and silver, as determined by spectrographic analysis. The sole anomalous rock sample contains 200 ppm zinc, also determined by spectrographic analysis.

The area is considered to have low possibilities for the discovery of mineral deposits.

SUNDAY CREEK AREA

Four stream-sediment samples and three rock samples anomalous in several metals were collected from along lower Sunday Creek (pl. 2, area 33; table 18), which is underlain by granodiorite, andesite, graywacke, and hornfels.

Most of the sedimnent samples are anomalous in lead and zinc, and two samples also contain molybdenum and silver, all determined by spectrographic analysis. Anomalous zinc was determined in two samples by atomic absorption. One sample contains 16 ppm cXHM, most of which apparently are lead and zinc. Sample EG2538, collected from the outlet of Sunday Lake, is notable in that it is anomalous in seven metals including arsenic and tungsten.

The rock samples are commonly anomalous in copper and also contain anomalous lead and silver, all determined by spectrographic analysis. The most notably anomalous rock sample is EG2535, collected from an outcrop of altered porphyritic andesite. In addition to anomalous copper and lead, it contains 300 ppm arsenic, 10 ppm silver, and 300 ppm zinc; by atomic absorption it contains only 190 ppm zinc.

The area is considered to have moderate possibilities for the discovery of mineral deposits; apparently metals have been introduced into volcanic rock in places where it has been intruded by granitic rock.

GOUGING LAKE AREA

Three stream-sediment samples and three rock samples collected in the Gouging Lake area (pl. 2, area 34; table 18) are anomalous. The area is underlain by granodiorite which is locally mineralized along joint planes.

The sediment samples are anomalous only in lead which ranges from near minimal levels to 150 ppm, as determined by spectrographic analysis.

Two samples of apparently unmineralized or unaltered rock were determined to be anomalous in copper and zinc by spectrographic analysis. The other sample, EC2097A, appears to be mineralized and is anomalous in arsenic (10,000 ppm), bismuth (700 ppm), and copper (1,000 ppm) as well as in lead, molybdenum, tin, tungsten, and silver. Because these elements in general characterize vein deposits in the nearby Lennox Creek and Miller River areas, the Gouging Lake area is considered possibly to contain similar veins.

LENNOX CREEK AREA

The Lennox Creek area covers more than 10 mi^2 (26 km^2), including the drainages of Cougar Creek, Bear Creek, and northward-flowing streams tributary to the upper part of the North Fork Snoqualmie River (pl. 2, area 35; table 18). The area is mostly underlain by diorite, granodiorite, and some graywacke and contains many vein deposits of base and precious metals.

Of the 48 anomalous stream-sediment samples collected from the area 9 samples contain anomalous arsenic in concentrations that range from 200 to 1,500 ppm and average about 480 ppm; 7 samples contain anomalous copper in concentrations that range from 100 to 500 ppm and average about 260 ppm; 10 samples contain anomalous lead in concentrations that range from 50 to 300 ppm and average about 120 ppm; 31 samples contain anomalous molybdenum in concentrations that range from 5 to 30 ppm and average about 11 ppm; and 13 samples contain anomalous silver in concentrations that range from 0.5 to 3 ppm and average about 1 ppm. All determinations were by spectrographic analysis. Other elements present in anomalous concentrations include tungsten and zinc. Four samples contain anomalous concentrations of cXHM. Five samples further analyzed by atomic absorption were determined to contain more of either copper or zinc than most of the same samples as determined by spectrographic analysis. Anomalous zinc was detected by atomic absorption in some samples where none was detected spectrographically because of the high detection limit.

Two samples contain expected high amounts of several metals; EG2534 was collected from a stream draining a steep cliff face just below a known mine and EP2368 was collected from water draining a prospect drift.

Of the 25 anomalous rock samples collected from the Lennox Creek area, most are from mine or prospect dumps, and the high metal contents are therefore to be expected; spectrographic analysis showed that 9 samples are anomalous in arsenic (300–10,000 ppm, averaging about 4,500 ppm), 14 samples are anomalous in copper (150–15,000 ppm, averaging about 2,740 ppm), 12 samples are anomalous in molybdenum (5–1,000 ppm, averaging about 180 ppm), 13 samples are anomalous in silver (0.5–300 ppm, averaging about 28 ppm), and 8 samples are anomalous in zinc (300–7,000 ppm, averaging about 1,600 ppm). Other anomalous metals include antimony, lead, tin, and tungsten. Atomic absorption revealed anomalous amounts of zinc in two additional samples.

Samples from workings or dumps (EG2524A and EG2524B, EG2761, EG2761A, and EG2761B, and EG2762B) reflect in their high arsenic anomalies the arsenical character of the mineralized rock in the Lennox Creek area although samples EP2368A, EP2368F, EP2368G, and EP2368H from a working in the lower part of the Lennox Creek drainage apparently contain no detectable amounts of the element. Samples EG2738A and EG2738B, which were taken from a narrow limonite-stained shear zone in granitic rock near the summit of Goat Mountain, are also high in arsenic. In addition, EG2738A contains silver, bismuth, copper, molybdenum, lead, and antimony.

Samples EG2518A and EG2519A are molybdenite-bearing quartz fragments collected along lower Cougar Creek. The samples appear to contain no other ore mineral than molybdenite, and this is verified by the analyses.

The many anomalous stream-sediment samples collected along Cougar Creek, Lennox Creek, and tributary streams to the North Fork Snoqualmie River may reflect the existence of many undiscovered vein deposits, probably similar in mineralogy, size, and tenor to those already discovered and worked. Further diligent searching in the area may lead to the discovery of new deposits.

EAST FORK MILLER RIVER AREA

Twelve stream-sedimnent samples and one rock sample collected from the East Fork Miller River area (pl. 2, area 36; table 18) are anomalous. The area is underlain by granodiorite and andesite.

The stream-sediment samples are anomalous in copper, lead, and molybdenum at minimal or near minimal levels, as determined by spectrographic analysis. Only two samples are anomalous in more than one metal.

The sole anomalous rock sample is from a mafic dike cutting granodiorite. The sample is anomalous only in antimony, 100 ppm, and also contains 200 ppm boron.

The area is considered to have low possibilities for the discovery of mineral deposits.

WEST FORK MILLER RIVER AREA

Nineteen stream-sediment samples and six rock samples anomalous in one or more metals were collected from the West Fork Miller River area (pl. 2, area 37; table 18). The area includes not only ground along the West Fork but also ground west of the main river below the confluence of the West and East Forks. The area along the West Fork is underlain by granodiorite and that below the confluence of the two forks by andesite flows (Galster, 1956). Many vein-type deposits of base and precious metals are contained in the area along the West Fork.

Of the 19 anomalous stream-sediment samples, spectrographic analysis showed that 5 samples are anomalous in arsenic (200–1,000 ppm, averaging 560 ppm), 9 samples are, with a single exception, minimally or near minimally anomalous in lead (50–300 ppm, averaging about 90 ppm), 7 samples are anomalous in silver (0.5–7 ppm, averaging about 3 ppm), and 6 samples are minimally anomalous in molybdenum. Other metals in anomalous amounts are copper, tin, tungsten, and zinc. Only seven of the samples are anomalous in more than one element. Two additional sediment samples were found anomalous in copper by atomic absorption; one of these also contains 18 ppm c×HM.

Most of the six anomalous rock samples were collected from mine dumps and workings. All are aresenical; arsenic ranges in concentration from 1,000 to 10,000 ppm and averages about 4,300 ppm. Four samples contain anomalous tin in amounts ranging from 10 to 30 ppm and averaging about 19 ppm. Determination was by spectrographic analysis. Other anomalous elements include lead, antimony, and silver; but, in general, the analytical data show the samples collected from most of the worked deposits to be barren of valuable metals. The area is, nevertheless, considered to have at least moderate possibilities for the discovery of additional mineral deposits. The presence of copper, lead, molybdenum, and silver in the stream-sediment samples may reflect the presence of undiscovered veins in the area.

GOAT CREEK AREA

Three anomalous stream-sediment samples and one anomalous rock sample were taken from the Goat Creek area (pl. 2, area 38; table 18). The area is underlain by granodiorite.

Two of the anomalous stream-sediment samples were collected from lower Goat Creek and contain anomalous concentrations of arsenic (300 and 700 ppm) and lead (100 and 200 ppm), detected by spectrographic analysis. One of the samples also contains anomalous amounts of silver and molybdenum, detected by spectrographic analysis. Both samples were found to contain anomalous amounts of zinc by atomic absorption.

Another stream-sediment sample (EC2137) collected from Goat Basin contains concentrations of molybdenum and lead that are minimally anomalous.

The anomalous rock sample was a fragment of vein quartz the size of a small boulder collected from the gravel of lower Goat Creek. It appeared visibly mineralized with arsenopyrite, and that was verified by the analysis that shows arsenic (10,000 ppm) and antimony (300 ppm), detected by spectrographic analysis. Minimally anomalous amounts of silver and lead were also found in the sample by spectrographic analysis.

The anomalous concentrations of metal in the stream-sediment samples and the mineralized rock fragment are believed to be derived from a mineralized shear zone in the Goat Basin area. The area is considered to have moderate possibilities for the discovery of mineral deposits.

OTHER ANOMALOUS SAMPLES

Scattered anomalous samples that occur outside the areas just discussed are shown in table 19. Some of them are discussed briefly here. Determinations were by spectrographic analysis.

Many stream-sediment and rock samples from the schistose-granitic terrane of the Chiwaukum Mountains were found minimally anomalous in copper, molybdenum, and zinc. Molybdenite may be present in quartz lenses in schist.

Many stream-sediment samples collected along Icicle Creek and some of the major streams tributary to it contain low but anomalous amounts of lead. A group of three stream-sediment samples, EG0335, EG0338, and EG0339, collected from the upper part of Eightmile Creek contain anomalous amounts of molybdenum. The source of the metal was not determined. Two other stream-sediment samples, ET0035 from the upper part of Icicle Creek and EK0058 from the lower part of Mountaineer Creek, were collected from terranes of unaltered granitic rock. The samples may be contaminated; each contains 1,500 ppm copper and 200 ppm tin. Samples of a malachite-stained orthoclase pegmatite dike, quartz vein, and schist from the area around Cashmere Mountain contain 100–300 ppm copper.

A malachite-encrusted, sheared, and serpentinized sample of peridotite, EG1044, collected from a shallow prospect pit between Ingalls Creek and the North Fork Teanaway River, contains 3 ppm silver and 10,000 ppm copper. The prospect pit and surrounding area were examined for the presence of sulfide minerals, and none were found; it seems unlikely that the high copper content is solely attributable to the malachite, whatever its source.

Mineralized rock samples (EG2809 and EG2809A) from a working near Huckleberry Mountain in the Cle Elum River drainage are anomalous in silver, arsenic, gold, and copper. The mineralized rock lies along northwest-trending fault zones. Other anomalous samples in the Cle Elum River drainage include rock from the iron formation which contains low but anomalous amounts of copper, tin, and zinc and expectably high amounts of ion, chromium, cobalt, and nickel. Another sample from that area, EG1469C, contains a high amount of antimony and some silver, lead, and zinc. The sampled rock contained visible amounts of stibnite that was apparently deposited along a fault or shear zone.

A few arkosic sandstone and volcanic rock samples were collected from the Goat Mountain area (between the Waptus and Cle Elum Rivers) and contain barely anomalous amounts of molybdenum. Several scattered anomalous stream-sediment and rock samples were collected along the periphery of the Snoqualmie batholith in the areas southwest of Mount Hinman and north of Mount Daniel. The sediment samples contain low to moderate amounts of lead and copper. The rock samples, which include granitic rock, arkosic sandstone, and volcanic rock, contain low to moderate anomalous amounts of zinc, molybdenum, and silver.

Several scattered anomalous stream-sediment and rock samples from outside indicated anomalous areas were collected in the area of the South and Middle Forks of the Snoqualmie River. Most of the anomalous samples contain copper and zinc at or near minimal levels.

Several scattered stream-sediment and rock samples collected in the areas of Lennox Creek and the Miller River are anomalous in arsenic, copper, molybdenum, and lead, elements which are more or less characteristic of vein deposits there.

Economic Appraisal of the Alpine Lakes Study Area and Additions, Washington

By H. K. THURBER, MICHAEL S. MILLER, AREL B. MCMAHAN, *and* FRANK E. FEDERSPIEL, U.S. BUREAU OF MINES

MINERAL RESOURCES OF THE ALPINE LAKES STUDY AREA AND ADDITIONS, CHELAN, KING, AND KITTITAS COUNTIES, WASHINGTON

U. S. GEOLOGICAL SURVEY BULLETIN 1542-E

CONTENTS

ILLUSTRATIONS

TABLES

MINERAL RESOURCES OF THE
ALPINE LAKES STUDY AREA AND ADDITIONS,
CHELAN, KING, AND KITTITAS COUNTIES,
WASHINGTON

ECONOMIC APPRAISAL OF THE ALPINE LAKES STUDY AREA AND ADDITIONS, WASHINGTON

By H. K. THURBER, MICHAEL S. MILLER,
AREL B. MCMAHAN, and FRANK E. FEDERSPIEL,
U.S. BUREAU OF MINES

HISTORY AND PRODUCTION

Mining activity near the Alpine Lakes study area began with the discovery of placer gold along Peshastin Creek in 1860. Similar deposits were discovered in 1868 along Swauk Creek. The first claims on the lode sources of the Peshastin placers were located in 1874 (Patty, 1921, p. 267–268), and vein deposits of gold in the Swauk district were discovered in 1881. The combined value of production from the Peshastin and Swauk districts before 1901 exceeded $2 million (Smith, 1904, p. 8).

The discovery in 1874 of lode deposits in the Index district near the northwest part of the study area stimulated prospecting in that vicinity. Claims were staked along Money Creek in 1889 (Hodges, 1897, p. 39) and in the Miller River drainage in 1892 (Hodges, 1897, p. 36). The most significant development in these areas was during the period from 1893 into the 1920's but sporadic small production from the Miller River drainage has continued to the present.

Exploration activity in the Buena Vista district, in the Lennox Creek–North Fork Snoqualmie River area began about 1896 (Hodges, 1897, p. 43) mainly on shear zones traced from the Miller River drainage. Only minor production has come from the district, mostly from the Lennox and Bear Basin prospects.

A section of the Cle Elum River drainage (the Camp Creek and Big Boulder Creek drainages) in the south-central part of the study area was first prospected in 1881, mainly for iron-ore deposits (Hodges, 1897, p. 61). Prospecting continued eastward along an iron-enriched zone extending roughly through Iron Peak, Earl Peak, Navaho Peak, and Iron Mountain to the Blewett district. Some of the properties on the west end of the zone were explored between 1889 and 1892 (Shedd, 1902, p. 7). The iron deposits were first studied systematically in 1892 (Bethune, 1892). The U.S. Bureau of Mines conducted a drilling program in 1942 on deposits near the Cle Elum River. Sulfide deposits in the Gallagher Head Lake area (fig. 7, area 18) were discovered in 1881. Although many claims have been located, only small tonnages for smelter tests have been produced.

Iron deposits in the Snoqualmie Pass area were discovered in 1869 on Denny Mountain. No significant work was done until 1883 when development adits were driven (Hodges, 1897, p. 40–41). The Guye iron deposits, approximately 2 mi (3.2 km) northeast of Denny Mountain, were discovered in 1881 (Shedd, 1902, p. 7). The only production from the iron deposits in the Snoqualmie Pass area has been small tonnages for metallurgical testing. The limestone deposits in the same area were first noted during the late 1880's (Hodges 1897, p. 40).

Arsenopyrite veins in the Sprite Lake area (fig. 7, area 14) were discovered in the mid-1880's. By 1896 a number of workings had been completed on both the Aurora group of claims and the American Eagle group of claims, and a small stamp mill had been erected near Tucquala Lake on the Cle Elum River to treat ores from the various properties (Hodges, 1897, p. 61–62). Later prospecting discovered deposits nearer to French Creek. Although there are many scattered workings, no production has been recorded from the Sprite Lake area.

The mineral deposits in the Van Epps Creek–Solomon Creek area (fig. 7, area 15) were discovered in the 1880's. Little significant work was done on the deposits until 1896 when existing properties were obtained by the Pickwick Mining and Development Co. Patents were granted October 31, 1904, on 18 lode claims covering much of the mineralized area. Sporadic exploration on the property continued until the 1950's. Production of 13 tons (12 metric tons) of ore is recorded (E. A. Magill and W. P. Puffett, written commun., 1955).

The deposits near Gold Creek (fig. 7, area 12) were first prospected in 1890. The first claims were staked mainly in the higher elevations near the head of the drainage. By 1896 a number of exploration workings had been opened. In the same year the Esther and Louisa mine shipped 10 tons (9 metric tons) of sorted ore, valued at $100 per ton, to the Tacoma, Wash., smelter (Hodges, 1897, p. 61).

The Trout Lake area (fig. 7, area 7) was prospected in the late 1890's, and by 1902 claims covered most of the area surrounding Trout Lake, Copper Lake, and Lake Malachite. A significant amount of exploration had been done by 1906 (McIntyre, 1907, p. 238–250). Six claims and a millsite were patented after 1918, but there has been no recorded production from any claims in the Trout Lake area.

The copper deposits in the Mineral Creek area (fig. 7, area 13) were prospected in the late 1800's. Several workings were noted in 1899 when the area was mapped by Smith and Calkins (1906, p. 14). Development work continued, and a mill having a capacity of 25 tons (23 metric tons) per day was built in 1920; however, production from the district has been minor (Patty, 1921, p. 277–278).

The mineral deposits in the Middle Fork Snoqualmie River area (fig. 7, area 9) were discovered in the late 1890's. The copper deposit on the Dutch Miller group of claims was discovered in 1896, and by 1901 several small shipments of ore had been made (Landes and others, 1902, p. 86). Exploration by a succession of owners and lessees has continued to the present time, but there has been little additional production. Copper-molybdenum deposits on the Clipper group of claims and in the Pedro zone were discovered around 1900, and claims were located in 1902. A number of claims on the Clipper and Pedro mineralized zones were surveyed for patent in 1908, and some patents were granted. Although some copper-ore production probably resulted from the larger workings, none is recorded. Exploration in the early 1970's by major mining companies of the southwestward extension of the mineralized zone has disclosed potentially large tonnages of mineralized rock that may constitute a large copper resource. Exploration was continuing as of 1975.

Claims have elso been located outside of the main mineralized areas throughout the study area. Most are on altered iron oxide stained zones but some were on quartz-rich zones. Dates of location range from the 1900 to recent years. Only a few have even minor development, and no production has been recorded.

MINERAL COMMODITIES

The search for gold and silver first brought prospectors to the study area and some small deposits were found. Discovery of iron deposits inside the south boundary stimulated prospecting for iron in other parts of the study area but no other deposits were found. Prospecting for copper, the most significant mineral commodity within the study area continues as of 1975. National and world data for the following section on economic considerations are from the U.S. Bureau of Mines "Commodity Data Summaries" (U.S. Bureau of Mines, 1975) and Engineering and Mining Journal (1975).

COPPER

In 1974 domestic copper consumption, which was estimated at 2.3 million tons (2.1 million metric tons), approximately equaled domestic production from mines and secondary sources including copper from U.S. Government stockpiles. With Congressional approval, the national copper stockpiles objective was reduced to zero in March 1973, and all of the 252,000 tons (228,614 metric tons) of stockpiled surplus copper was sold during 1974. The largest percentage of copper is used as refined copper metal for electrical applications; some is used in alloys. Barring technological changes, demand is expected to increase at an annual rate of about 3.5 percent through 1980. The price of copper averaged approximately $0.6356 per pound ($1.40/kg or kilogram) during the first quarter of 1976. Large disseminated deposits containing as little as 0.4 percent copper are now being surface mined.

The Middle Fork Snoqualmie River area in the Alpine Lakes additions and the Dutch Miller mine both contain copper resources along the west side of the study area within and near the east edge of the granitic rocks of the Snoqualmie batholith. The Mineral Creek area to the south also has a potential for copper deposits.

Estimates based upon incomplete data (B. Thomas, written commun., 1907) indicate that more than 800,000 pounds (363,000 kg) of copper is contained in approximately 3,700 tons (3,357 metric tons) of high-grade copper ore on the dumps and in limited underground workings at the Dutch Miller mine. Only small shipments were made during early exploration and development work.

In the Middle Fork Snoqualmie River area copper-rich rock occurs as small bodies in a series of brecciated or shattered zones, 400–500 ft (120–150 m) wide, some of which have been explored by core drilling and adits. One of these—the Clipper zone—is estimated to contain 250,000 tons (226,800 metric tons) of mineralized rock containing 0.9 percent copper and significant percentages of molybdenum (A. R. Grant, written commun., 1971). Geologic conditions suggest that an additional large tonnage of rock of similar copper content may be present in the zone. In the Three Brothers zone, where brecciation and mineralization were somewhat more intense than in the Clipper zone, there is a probable additional large tonnage of copper-bearing rock that may be of similar grade to that in the Clipper zone. Exploration by large companies in the Porter, Hemlock, and Condor breccia zones has indicated large copper resources favorably situated for low-cost mining. Additional exploration will probably define additional resources.

The main mineralized zone of the Mineral Creek area (fig. 7, area 13) has been explored for copper since the late 1800's, and small production has come from mines there. Geologic investigations are continuing in the Mineral Creek area.

Small paramarginal and submarginal copper resources exist in other prospects in the study area.

SILVER

In 1974 domestic silver consumption, which was estimated at about 178 million troy ounces (5 billion g or grams), was more than five times the domestic mine production. About two-thirds of the domestic production is a byproduct of base-metal mining. Most imported silver is from Canada. Silver is primarily used for electroplated ware, photographic materials, and electrical and electronic equipment. Silver sufficient to supply a little over three-fourths of a year's demand is stockpiled by the U.S. General Services Administration. The price of silver averaged $4.19 per ounce ($0.13/g) during January 1975.

Significant amounts of silver were detected in samples from the main mineralized areas in the study area but only one deposit can feasibly be mined solely for its silver content. In some localities, however, the silver would contribute to the total value of the ore. The most consistent silver values are found in the Cleopatra mine and in the prospects on or near the Cleopatra–Bear Lakes shear zone; samples from the Dutch Miller mine contain as much as 10.0 oz/ton (343 g/metric ton) silver. If it were economically feasible to mine the deposits, copper would be the primary metal produced in these areas, but silver would be a significant additional value.

GOLD

Domestic gold-mine production in 1974 was about one-fourth of consumption, which was estimated at 4.20 million troy ounces (131 million g); most United States gold imports come from Canada. Jewelry manufacturing accounts for most of the domestic consumption of gold. Gold prices averaged approximately $132 per ounce ($4.24/g) during the first quarter of 1976. In the Alpine Lakes region, gold, if produced, would be as a byproduct or coproduct from lode deposits of other metals.

Gold occurs in minor amounts in most of the mineralized areas within the study area but the most important occurrences are in the Money Creek area. The Apex mine in the Money Creek area is adjacent to the study area and contains indicated gold resources. The gold-containing structure explored in the Apex mine might extend into the study area.

OTHER COMMODITIES CONSIDERED

There appears to be no potential for the existence of petroleum or natural gas in the Alpine Lakes study area; there are no Federal oil and gas leases in or near the study area. Resources of leasable minerals that occur in the study area are more accessible elsewhere at localities closer to markets.

A potential for the production of electricity exists within the study area; favorable damsites are available and their utilization would not appear to affect mineral resources adversely and would provide a nearby source of power.

SAMPLING AND ANALYTICAL TECHNIQUES

Five types of lode samples were taken: Chip, a series of continuous rock chips across or along an exposure; random chip, a collection of rock chips from an exposure; grab, an unselected assortment of rock pieces from a rock pile or exposure; select, hand-picked material of the highest grade rock available; trench, a cut of uniform cross section in a dump or stockpile sufficiently deep to gather a wide range of sizes of broken rock typical of that part of the pile in the vicinity of the sample site.

Most lode samples were fire-assayed to determine their gold and silver contents. Samples containing visible metallic minerals were analyzed by atomic-absorption, colorimetric, or X-ray fluoresence methods. At least one sample from each mineralized structure on a property was analyzed by semiquantitative spectrographic methods. If anomalous amounts of economic elements were detected in a sample by spectrography, the sample was further analyzed by more accurate means. All were checked for the presence of radioactive and fluorescent minerals.

Measured volume stream gravel samples were taken from major streams and their tributaries. The samples were reduced by screening and hand-panning to rough, heavy-mineral concentrates. They were further concentrated mechanically and amalgamated to determine their free gold content.

RESOURCE CLASSIFICATION

Resource classifications developed by joint agreement of the Geological Survey and the Bureau of Mines are used in this report. A mineral resource is a concentration of naturally occurring materials in such form that economic extraction of a commodity is currently or potentially feasible. A reserve is that part of the identified resource from which a usable mineral commodity can be economically and legally extracted. The term "ore" is used for reserves of some minerals.

Identified subeconomic resources are known resources that may become reserves as a result of changes in economic and legal conditions. A paramarginal resource is that part of a subeconomic resource that (a) borders on being economically producible, or (b) is not commercially available solely because of legal or political circumstances. Submarginal resources are those parts of subeconomic resources which would require a substantially higher price or a major cost-reducing advance in technology to become economically producible.

MINING CLAIMS

The location of patented and unpatented mining claims in and adjacent to the study area was determined by a search of the records of Chelan, King, and Kittitas Counties, and of the U.S. Forest Service. Many recorded claims could not be found in the field because their locations are poorly described. More than 1,900 unpatented lode and placer claims within and adjacent to the study area were listed in county records, but only a small percentage of these are currently held. The majority of unpatented claims are in the areas outlined in figure 7; the remainder are scattered throughout the study area.

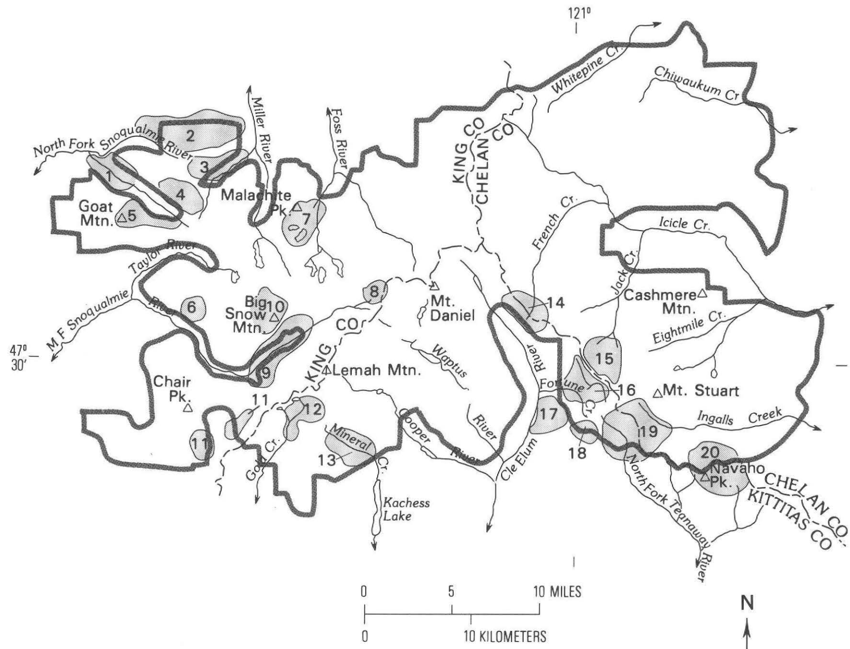
Approximately 136 patented claims are within or immediately adjacent to the study area. Nearly all were patented in the period 1902 through 1912. The largest group of patented claims is the Kimball Creek group (29 claims) which extends across the north boundary of the Money Creek area. A large group of patented claims (18 claims) is mostly in the Van Epps basin but extends into the Fortune Creek drainage. Fifteen patented claims cover most of the workings in the Sprite Lake area and a similar size group is contiguous to the study area in the Middle Fork Snoqualmie River area (fig. 7, area 9). The remaining patented claims are in the Dutch Miller Gap–La Bohn Gap area, the Teanaway River–Ingalls Creek area and the Trout Lake area.

In the following section the areas and properties are discussed in the order of their importance.

MIDDLE FORK SNOQUALMIE RIVER AREA

The most important mineralized zones in the study area are the disseminated copper-molybdenum deposits along the Middle Fork Snoqualmie River (fig. 7, area 9), mainly above the confluence of Burntboot Creek (fig. 8). Cities Service Minerals Corp. has explored 15 patented claims, 225 unpatented claims, and 19 fractions of claims which cover the area. Fourteen mineralized zones are known.

Most of the following geologic descriptions are based on work done during 1971 and 1972 by A. R. Grant and T. C. Patton for the Natural Resources Development Corp. The material is used with the kind



EXPLANATION

Study area boundary

1. Prospectors Ridge
2. Money Creek
3. Lower West Fork Miller River
4. Upper West Fork Miller River–Bear Creek
5. Cougar Creek
6. Green Ridge Lake
7. Trout Lake
8. Dutch Miller Gap–La Bohn Gap
9. Middle Fork Snoqualmie River
10. Big Snow Mountain
11. Snoqualmie Pass
12. Gold Creek
13. Mineral Creek
14. Sprite Lake
15. Van Epps Creek–Solomon Creek
16. Fortune Creek
17. Huckleberry Mountain
18. Gallagher Head Lake
19. Teanaway River–Ingalls Creek
20. Navaho Peak

FIGURE 7.—Map of Alpine Lakes study area showing areas of many prospects.

permission of A. R. Grant, and Gregg C. MacDonald, President, and Robert W. Osterstock, Chief Geologist, and other officials of the Cities Service Minerals Corp.

Most mineralized rocks are quartz diorite but range in composition from syenite to diorite and locally include aphanitic to porphyritic varieties of these rocks. Aplite and porphyritic andesite intrude the granitic rocks in areas of intense structural deformation. The mineralized zones are characterized by en echelon faults, breccia pipes, and large shattered zones (fig. 8). The mineralized zones trend northeast for a distance of 5 mi (8 km). Widths of the individual zones range from 400 to more than 2,500 ft (122–762 m).

A. R. Grant (oral commun., 1973) suggested that the mineralized

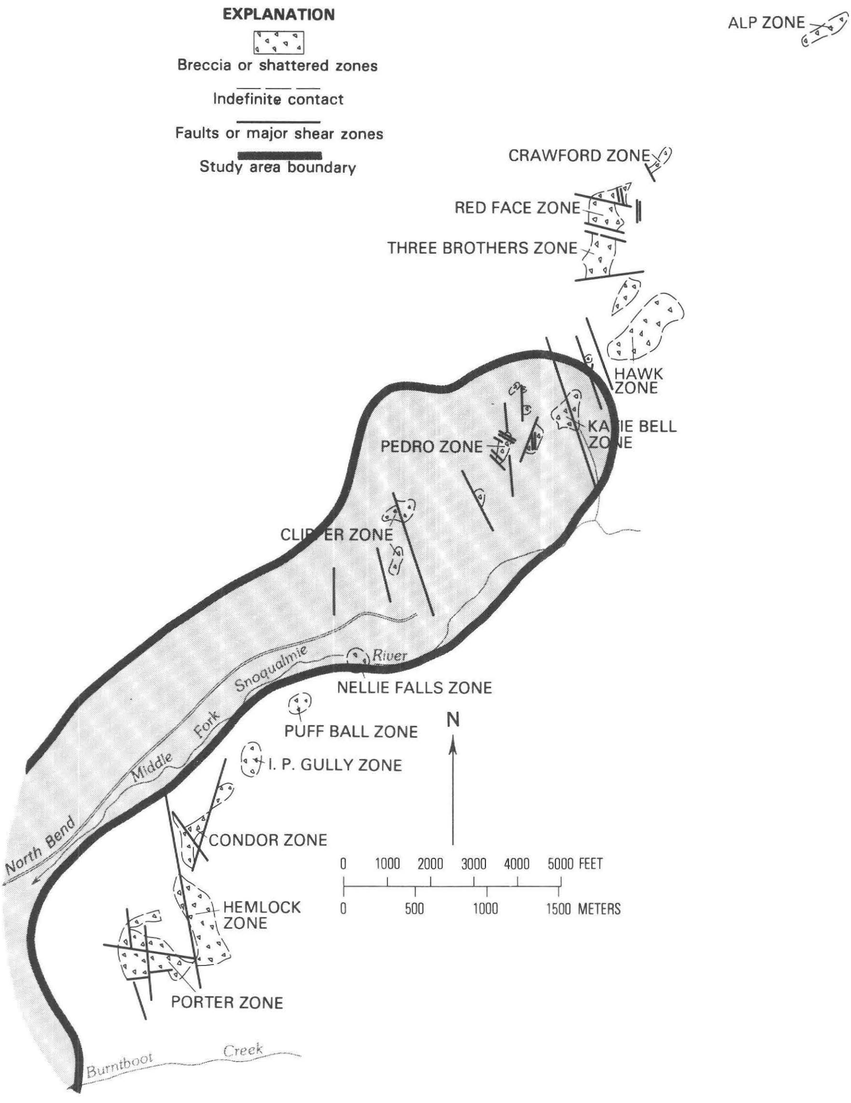


FIGURE 8.—Map showing mineralized breccia zones in the Middle Fork Snoqualmie River area.

zones were once a continuous or near-continuous linear body of breccia that has been broken into a group of fault blocks by many north- to northwest-trending cross faults (fig. 8). Although a maximum vertical displacement of 700 ft (213 m) has been measured on these faults, some evidence indicates a greater displacement. Movement along these faults probably occurred before, during, and after mineralization.

A. R. Grant (written commun., 1971) observed that the total sulfide content is generally directly proportional to the intensity of fracturing and brecciation. He believes that "multi-cyclic deformation appears to be the key to significant sulfide deposition." Multicyclic deformation is evident in some zones in which early intense alteration has healed the original breccia and in which subsequent additional brecciation has taken place. Significant sulfide deposition has only occurred where host rocks underwent the additional brecciation.

The degree and type of alteration in the breccia zones are reliable guides to copper content in this area. A detailed sampling and petrographic study by A. R. Grant (written commun., 1971) of rocks from an underground working showed that "without exception the more advanced the wallrock alteration, the more advanced the copper mineralization." The vertical alteration pattern and increase of copper content at depth has been well substantiated by surface and underground drilling and geologic mapping.

The alteration associated with the introduction of copper (as chalcopyrite) involved the depletion of silica and the replacement of plagioclase by orthoclase in the host rocks. The silica that was removed from the copper zones was redeposited in the overlying rocks.

PORTER, HEMLOCK, AND CONDOR ZONES

The southwest part of the Middle Fork Snoqualmie River area, which includes the Porter, Hemlock, and Condor zones, is considered to have the greatest resource potential (fig. 9). The three zones are along or near the Copper Queen fault and the less well developed faults that intersect it. The Hemlock and Porter zones are believed to be contiguous and are discussed together. The 2380 adit is the main working level for the Hemlock zone.

Surface sampling and shallow core holes in the Porter and Hemlock zones indicated areas of copper-rich rock as much as 85 ft (25.9 m) wide, mainly in northeast-trending structures. Drilling results in these zones show that the disseminated copper is mainly below the 3,200-ft (975-m) elevation.

Two core drill holes, one from the surface outside the boundary of the Hemlock zone and one from underground in the 2795 adit (fig. 9), penetrated to 2,277-ft and 2,155-ft (694.0- and 656.8-m) elevations, respectively, in the downward projection of the Hemlock zone. Silicified rock and the disseminated sulfide minerals indicate that a deeper zone of copper-rich rock may exist at depth below the bottoms of the holes.

Sampling and petrographic studies of rock from the 1,990-ft-long (606.7 m) 2380 adit confirm the existence of copper there. The Hemlock breccia zone was penetrated from the portal of the adit to the 1,365-ft (416.1-m) point. From that point to the working face, another 625 ft

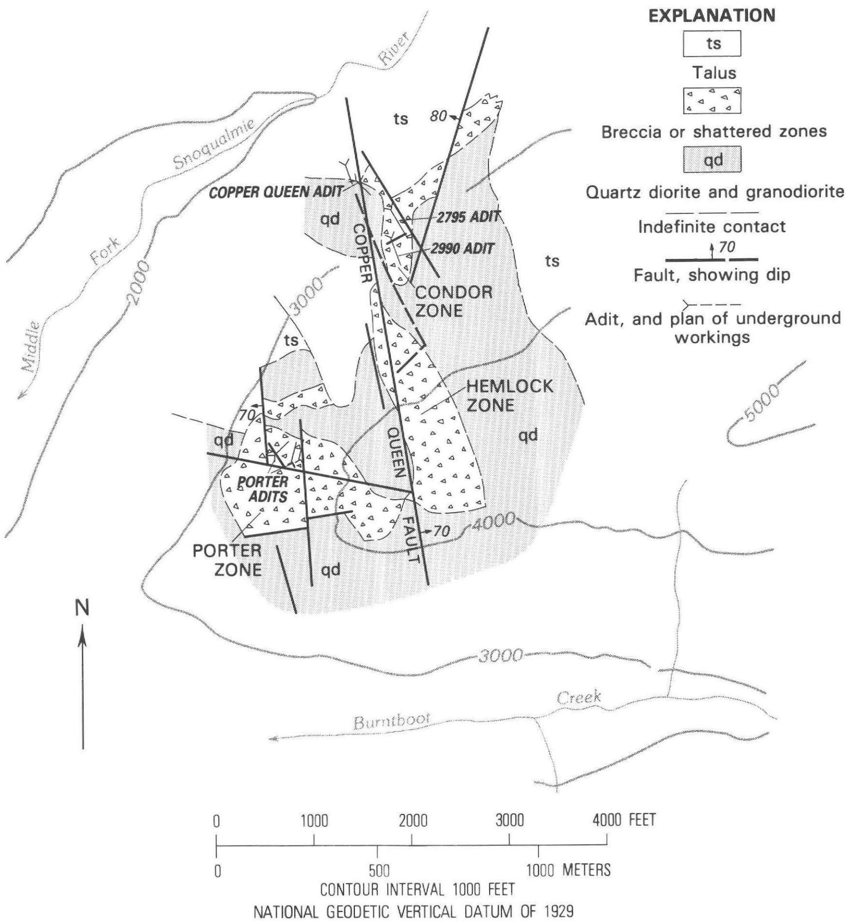


FIGURE 9.—Map of Porter, Hemlock, and Condor breccia zones.

(109.5 m), the rock becomes increasingly brecciated, altered, and mineralized, and the ratio of chalcopyrite to other sulfides becomes greater. Copper content of the wallrock averages approximately 0.44 percent from the 1,400-ft (426.7-m) point to the face and increases to 0.61 percent in the innermost 90 ft (27.4 m). Also, in the innermost 100 ft (30.5 m) of the adit, some 5-ft-long (1.5 m) samples contain as much as 1.14 percent copper.

Samples from a 393-ft-long (119.8 m) crosscut driven (fig. 9) from the 2380 level toward the center of the Hemlock zone show an overall increase in copper values near the face. Samples taken from a 30-ft-long (9.1 m) interval between 338 and 368 ft (103.0 and 112.2 m) have a weighted average of 0.78 percent copper. The copper minerals and the rock alteration in the crosscut are similar to those in the 2380 adit.

A comparison of the rocks observed on the surface of the Hemlock breccia zone with those found approximately 1,650 ft (503 m) vertically below in the workings shows a pronounced increase in intensity of alteration and in the amount of copper with depth. On the surface, intensely altered rock and copper sulfide minerals commonly occur only within or adjacent to fractures; whereas, at the 2380 level, alteration and copper mineralization have been pervasive through large volumes of the brecciated rock (fig. 10). A. R. Grant (written commun., 1971) observed that some large blocks of massive unaltered rock at the surface have graded vertically into mineralized and altered rock at the 2380 level. Further, because the eastern wall of the breccia zone dips steeply eastward, the area of the mineralized zone on the 2380

FIGURE 10.—Brecciated granodiorite in the 2380 adit, Middle Fork Snoqualmie River.

level is larger than on the surface. The core drilling program by a lessee in 1975 confirmed that the altered and copper-mineralized rock continues to lower elevations in the Hemlock breccia zone. The program explored the Hemlock zone to the 1,000-ft (305-m) elevation.

Outcrops within the Porter zone show more intense alteration, greater chalcopyrite content, and greater silicification than outcrops within the Hemlock zone; hence, the Porter zone is believed to have a greater area and copper content at depth than the Hemlock zone.

The expenditure of exploration money by the present lessee was made in anticipation of potential production of about 100 million tons (91 million metric tons) of rock containing 0.6–0.8 percent copper and 0.012–0.03 percent molybdenum from the Porter and Hemlock zones. The brecciated character of the mineralized zones and their relatively large extent make it possible to exploit them by low-cost block-caving mining methods. The probable grade of the ore, the topography, and environmental considerations also favor block caving.

The Condor zone (fig. 9) was considered by A. R. Grant (written commun., 1971) to be a wedge-shaped horst displaced from a larger brecciated zone occurring at depth and continuing to the south. The copper content of the zone, determined from holes drilled from the surface and samples from the underground workings, is higher than in the Porter and Hemlock zones but is confined to bodies less than 200 ft (61 m) wide. Mineralized zones sampled in eight core drill holes range in thickness from 41 to 192 ft (12.5–58.5 m) and in grade from 0.52 to 0.81 percent copper. A sample from a 50-ft-long (15.2 m) section of the 2795 adit (fig. 9) contains 0.65 percent copper. Molybdenum values are erratic. Drilling and sampling by the lessee indicate that as much as 2.5 million tons (2.3 million metric tons) of rock containing 0.65 percent copper and minor silver may exist from the surface down to the 2,270-ft (692-m) elevation in the Condor zone.

Poorly exposed mineralized outcrops occur northeast of the Condor zone, mostly along the river, following the trend of the general mineralized area. They are named, from south to north, the I. P. Gully zone, Puff Ball zone, and Nellie Falls zone (fig. 8). Further exploration will indicate the spatial relationship of these outcrops to the Condor or Clipper zones (fig. 8).

CLIPPER ZONE

The Clipper zone (fig. 11) is north of the Middle Fork Snoqualmie River, just outside the study-area boundary (fig. 8). The workings are on patented claims where several exploratory adits were driven by the Snoqualmie Copper Co. between 1908 and 1912. Various lessees explored the zone by geophysical methods and diamond core drilling

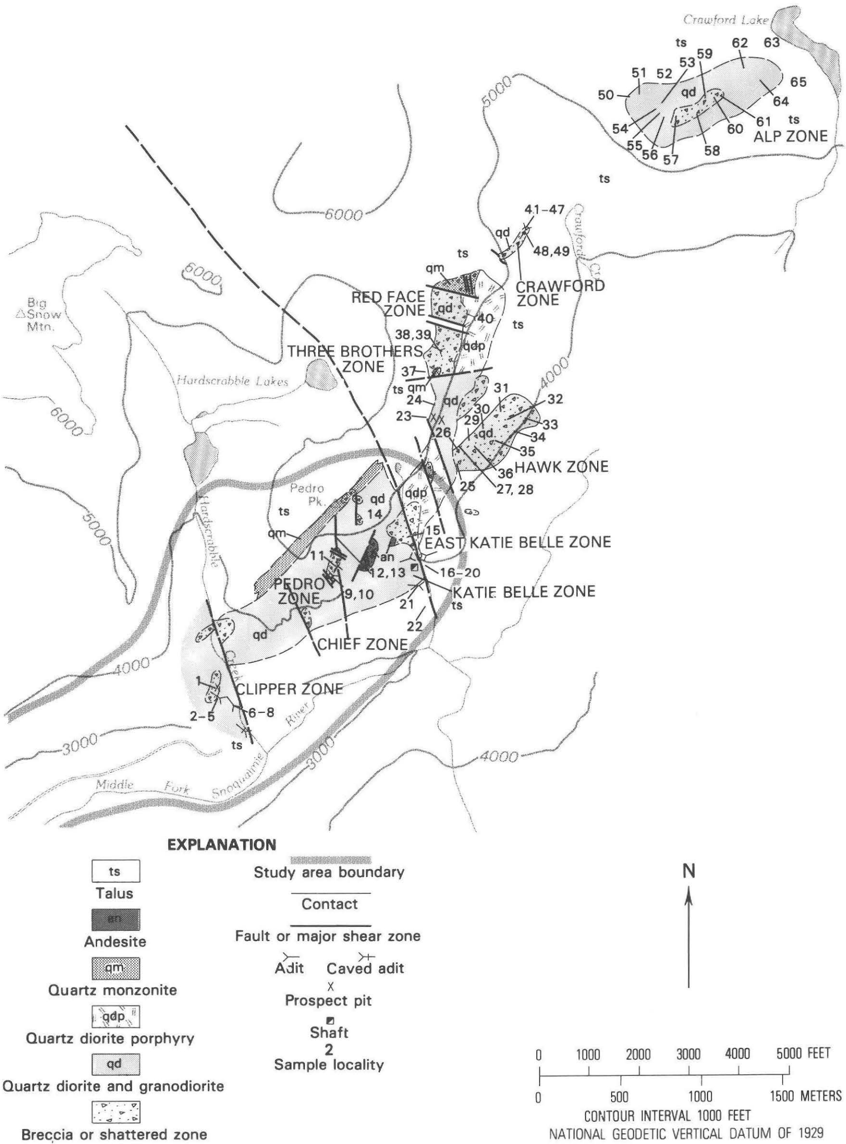


FIGURE 11.—Map of Clipper, Chief, Pedro, East Katie Belle, Katie Belle, Hawk, Three Brothers, Red Face, Crawford Creek, and Alp breccia zones.

intermittently between 1963 and 1969 (A. R. Grant, written commun., 1971). On the basis of samples taken from underground workings and diamond-drill core, Grant has inferred that a relatively small area contains a resource of 250,000 tons (226,800 metric tons) of mineralized rock which averages 0.9 percent copper and 0.07–0.24 percent

Data for samples collected from the Clipper, Pedro, East Katie Belle, Katie Belle, Hawk, Three Brothers, Red Face, Crawford Creek, and Alp zones, Middle Fork Snoqualmie River area

[Tr., trace; N, none detected; --, not analyzed; NA, not applicable]

Sample				Gold		Silver		
		Length						
No.	Type	(ft)	(m)	(oz/ton)	(g/metric ton)	(oz/ton)	(g/metric ton)	Copper (percent)
1--	Chip---	8.0	2.4	Tr.	Tr.	0.1	3.4	0.24
2--	do-----	54.0	16.8	tr.	tr.	.2	6.9	.37
3--	Grab---	NA	NA	tr.	tr.	.2	6.9	.19
4--	Chip---	4.5	1.4	tr.	tr.	.1	3.4	.05
5--	do-----	.8	.2	tr.	tr.	Tr.	Tr.	.04
6--	do-----	8.0	2.4	tr.	tr.	.1	3.4	.36
7--	Grab---	NA	NA	tr.	tr.	.6	20.5	.44
8--	do-----	NA	NA	tr.	tr.	.5	17.1	.50
9--	Chip---	8.0	2.4	tr.	tr.	--	--	.02
10--	do-----	60.0	18.3	tr.	tr.	--	--	.01
11--	do-----	20.0	6.1	tr.	tr.	2.2	75.3	.86
12--	do-----	550.0	167.7	0.01	.034	.2	6.9	.06
13--	do-----	17.0	5.2	tr.	tr.	.1	3.4	.39
14--	do-----	9.8	3.0	tr.	tr.	.3	10.3	.08
15--	do-----	35.0	10.7	0.01	0.34	.5	17.1	.27
16--	do-----	7.4	2.26	.01	0.34	.5	17.1	.16
17--	do-----	70.0	21.4	tr.	tr.	.3	10.3	.10
18--	do-----	50.0	15.2	.01	0.34	.3	10.3	.21
19--	do-----	2.0	0.6	.01	0.34	tr.	tr.	.29
20--	Chip---	4.0	1.2	tr.	tr.	0.4	13.7	0.20
21--	do-----	4.6	1.4	tr.	tr.	N	N	.048
22--	do-----	1.0	0.3	0.01	0.34	.2	6.9	.81
23--	Grab---	NA	NA	tr.	tr.	N	N	.02
24--	Chip---	5.5	1.7	tr.	tr.	N	N	.02
25--	do-----	70.0	21.4	N	N	.2	6.9	.04
26--	do-----	80.0	24.4	N	N	.1	3.4	.022
27--	do-----	130.0	39.6	N	N	.1	3.4	.018
28--	do-----	62.0	18.9	N	N	.2	6.9	.015
29--	do-----	39.0	11.9	tr.	tr.	.3	10.3	.01
30--	do-----	77.0	23.5	N	N	tr.	tr.	.021
31--	do-----	56.0	17.1	N	N	.1	0.34	.01
32--	do-----	68.0	20.6	N	N	.2	6.9	.039
33--	do-----	31.0	9.4	N	N	.1	3.4	.012
34--	do-----	23.0	7.0	N	N	.1	3.4	.012
35--	do-----	32.0	9.8	N	N	.2	6.9	.009
36--	do-----	71.0	21.6	N	N	.1	3.4	.018
37--	Grab---	NA	NA	--	--	--	--	.07
38--	Chip---	8.2	2.5	tr.	tr.	.5	17.1	.50
39--	Grab---	NA	NA	tr.	tr.	.2	6.9	.40
40--	Chip---	4.0	1.2	tr.	tr.	N	N	.03
41--	Grab---	NA	NA	tr.	tr.	.1	3.4	.03
42--	Chip---	10.0	3.0	N	N	N	N	.039
43--	do-----	1.4	0.4	N	N	N	N	0.035
44--	do-----	7.8	2.4	N	N	N	N	.035
45--	do-----	10.0	3.0	N	N	tr.	tr.	.026
46--	do-----	10.0	3.0	N	N	N	N	.067
47--	do-----	10.0	3.0	tr.	tr.	0.1	3.4	.055
48--	do-----	5.0	1.5	N	N	N	N	.027
49--	Grab---	112.0	34.2	N	N	.1	3.4	.047
50--	Chip---	78.0	23.8	N	N	N	N	.01
51--	do-----	90.0	27.4	N	N	N	N	.012
52--	do-----	121.0	36.9	N	N	tr.	tr.	.017
53--	do-----	94.0	28.7	N	N	.1	3.4	.011
54--	do-----	23.0	7.0	N	N	.1	3.4	.012
55--	do-----	50.0	15.2	N	N	.1	3.4	.016
56--	do-----	44.0	13.4	N	N	.1	3.4	.012
57--	do-----	94.0	28.7	N	N	tr.	tr.	.02
58--	do-----	17.0	5.2	N	N	.1	3.4	.009
59--	do-----	42.0	12.8	tr.	tr.	.2	6.8	.020
60--	do-----	35.0	10.7	N	N	.1	3.4	.025
61--	do-----	28.0	8.5	N	N	N	N	.022
62--	do-----	55.0	16.8	N	N	.1	3.4	.014
63--	do-----	100.0	30.5	N	N	.1	3.4	.017
64--	do-----	100.0	30.5	N	N	.1	3.4	.012
65--	do-----	100.0	30.5	tr.	tr.	.2	6.8	.009

molybdenum. Some samples contain more than 0.24 percent. The zone as a whole has not been adequately enough explored to infer total resources.

PEDRO ZONE

The Pedro zone is about 1,500 ft (457 m) outside the boundary of the study area (fig. 11). A. R. Grant (written commun., 1971) described the Pedro zone as an elliptical breccia pipe about 300 ft (91 m) wide and 600 ft (183 m) long at the surface. The core of the zone is highly mineralized, and it contains 5-10 percent sulfide minerals, mostly pyrite, and at least 10 percent quartz. Chalcopyrite constitutes less than 20 percent of the sulfide minerals, and, in addition, there are minor amounts of sphalerite, galena, and rare molybdenite.

KATIE BELLE ZONE

The Katie Belle zone is about 1,600 ft (488 m) outside the study area. It was considered by A. R. Grant (written commun., 1971) to be a stockwork deposit and is cut by a major shear structure (fig. 11). Minor underground workings exist in the vicinity of the major shear zone, and two drill holes were completed in the zone in 1963 and 1965. A sample (fig. 11, loc. 13) was taken from an exposure of mineralized rock in one of the minor underground workings.

EAST KATIE BELLE ZONE

The East Katie Belle shear zone cuts granitic rock in the area of a steep gulch about 4,000 ft (1,220 m) northeast of Hardscrabble Creek and is alined with another similar structure on the ridge northeast of Big Snow Mountain. If the two are parts of a single structure, their combined length is at least 3.5 mi (5.6 km). Most of the rock along the shear structure is slightly crushed, intensely altered granodiorite(?). In the area of the gulch, the medial part of the structure is composed of intensely sheared rock 5-15 ft wide (1.5-4.6 m) that contains siderite, sulfide minerals, mica, and quartz. Pyrite and arsenopyrite are the most abundant sulfide minerals. Chalcopyrite and molybdenite are less abundant.

A well-defined zone of altered granodiorite crosscuts the main East Katie Belle shear structure and strikes about N. 50°-75° E., is nearly vertical, and is 60 ft (18.3 m) or more wide. The zone contains pyrite, arsenopyrite, chalcopyrite, and molybdenite in quartz lenses as much as 3 ft (0.9 m) wide. The lenses constitute 10-25 percent of the altered zone.

Samples from the Katie Belle and East Katie Belle zones (fig. 11, locs. 13–20) contain a maximum of 0.39 percent copper, 0.5 oz/ton (17.1 g/metric ton) silver, and 0.01 oz/ton (0.3 g/metric ton) gold; and in spite of the low metal content, the existence of intensely altered rock and of sulfide minerals suggests that the two zones have potential for discovery of mineral resources of higher tenor.

HAWK ZONE

The Hawk zone is within the study area (fig. 11) and crops out on subparallel hummocky ridges along a system of north-trending shears. The outcrops of the Hawk zone are altered brecciated granodiorite(?) and contain less than 10 percent disseminated pyrite, pyrrhotite, and other sulfide minerals. Most of the sulfide blebs are less than 1 mm across.

Surface samples contain a maximum of 0.04 percent copper, 0.3 oz/ton (10.3 g/metric ton) silver, and a trace of gold. However, because of the existence of brecciated, altered rock and nearness of other zones in which the copper content increases at depth, the zone may contain potential resources.

THREE BROTHERS ZONE

The Three Brothers zone is mineralized granodiorite and quartz monzonite lying between two steeply dipping faults striking N. 75° W., and N. 80° E., in contrast to the major faults striking N. 15–20° W. (fig. 11) mapped in the Pedro and Katie Belle zones. The zone is bounded on the east by quartz diorite porphyry and is covered by talus to the west. It has been explored by means of a drill hole (drilled in 1963), a short adit, and three shallow pits.

The brecciated and altered quartz monzonite in a sample from a shallow surface cut made near the probable south edge of the Three Brothers zone (fig. 11, loc. 27) contains stringers of vuggy quartz. Chalcopyrite, magnetite, hematite, and quartz crystals line or fill some of the vugs. Chalcopyrite also is disseminated near fractures and quartz veinlets.

The adit (fig. 11, locs. 38 and 39) crosscuts three parallel steeply dipping shear zones striking N. 5° W. The adit was driven N. 38° W. for about 30 ft (9.1 m) through altered granodiorite containing disseminated pyrite. The adit ends at the footwall of a 5-ft-wide (1.5 m) shear zone where a 6-ft-deep (1.8 m) winze was put down. The zone is gouge-like material, highly brecciated, has irregular walls, and contains horses of altered granodiorite. Pyrite occurs as blebs and fine disseminations throughout the brecciated rock. The other two shear zones are narrower (2–3 ft or 0.6–0.9 m wide) but otherwise resemble the major zone; they can be traced on the surface for about 250 ft (76 m).

Data from surface sampling and drilling suggest the possible existence of as much as 2 million tons (1.8 million metric tons) of ore containing between 0.7 and 0.9 percent copper.

RED FACE ZONE

The Red Face zone is composed of pyrite-rich, closely jointed or brecciated granodiorite. A flat-lying shear zone near the portal of an adit penetrating the zone (fig. 11, loc. 40) contains many blebs of pyrite, arsenopyrite, and marcasite. A sample cut from a length of 4 ft (1.2 m) along the flat-lying fracture contains a trace of gold, no silver, and 0.03 percent copper.

North of the Red Face zone, a large area of leached rock, 500 by 1,000 ft (152 by 305 m), containing minor secondary chalcocite, yielded a significant induced polarization anomaly. In addition, soil samples taken downslope from the leached area contain more than 1,000 ppm copper. No drilling has been done here.

CRAWFORD CREEK AND ALP ZONES

The Crawford Creek and Alp zones (fig. 11) are breccia or shatter zones, apparently too low in grade to be a resource. Samples from the Crawford Creek zone contain a maximum of 0.067 percent copper, 0.1 oz/ton (3.4 g/metric ton) silver, and a trace of gold. Those from the Alp zone contain a maximum of 0.025 percent copper, 0.2 oz/ton (6.8 g/metric ton) silver, and a trace of gold. These zones lack the intensity of alteration and brecciation characteristic of zones believed to have potential for the discovery of copper deposits.

DUTCH MILLER GAP–LA BOHN GAP AREA

The Dutch Miller mine and nearby prospects are near La Bohn Gap at the head of the Middle Fork Snoqualmie River (fig. 7, area 8; fig. 12). The mine and outlying prospects are in rugged cirques and on sharp ridges at elevations from 4,800 to 6,000 ft (1,463–1,829 m) at the crest of the Cascade Range. The terrain is snow covered for a large part of the year (fig. 13).

Sulfide minerals occur in quartz-tourmaline veins in granodiorite in the area. The Dutch Miller mine is the only property believed to have potential mineral resources.

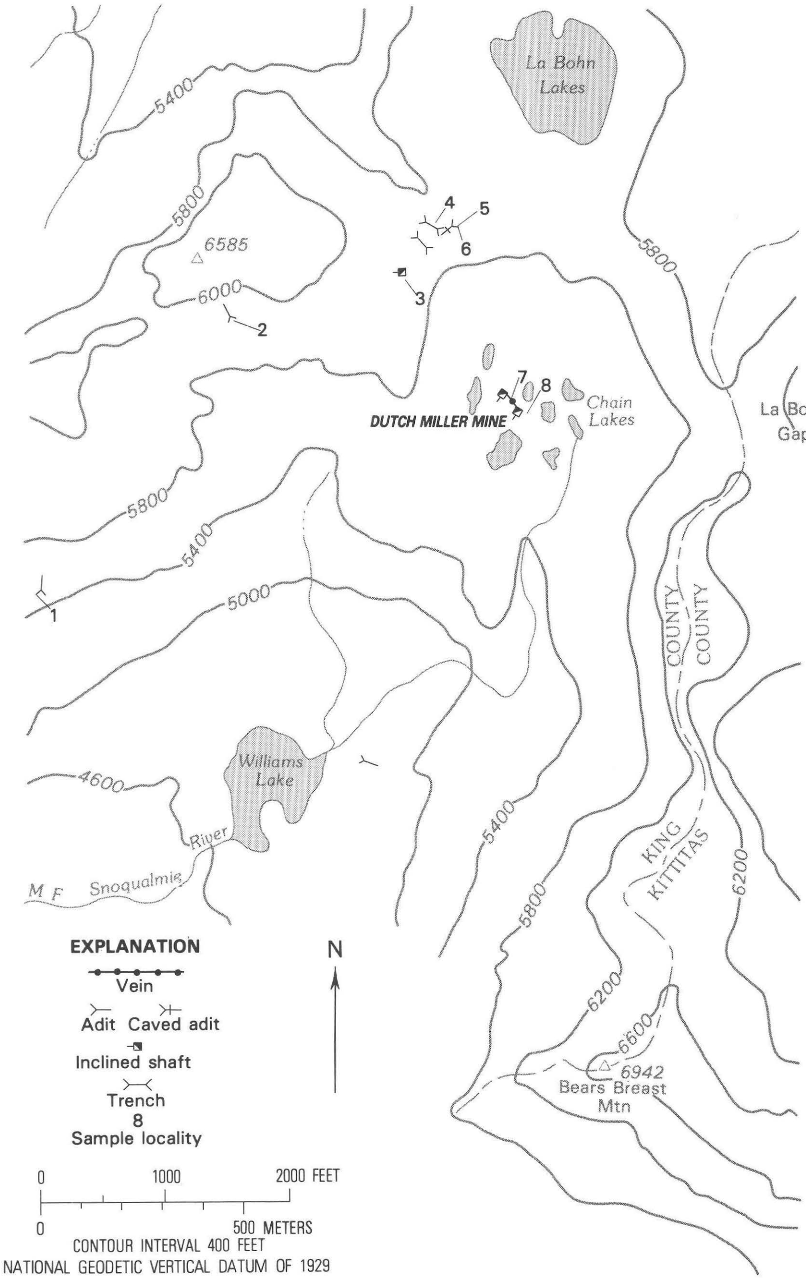


FIGURE 12.—Map showing mines and prospects in the Dutch Miller Gap–La Bohn Gap area.

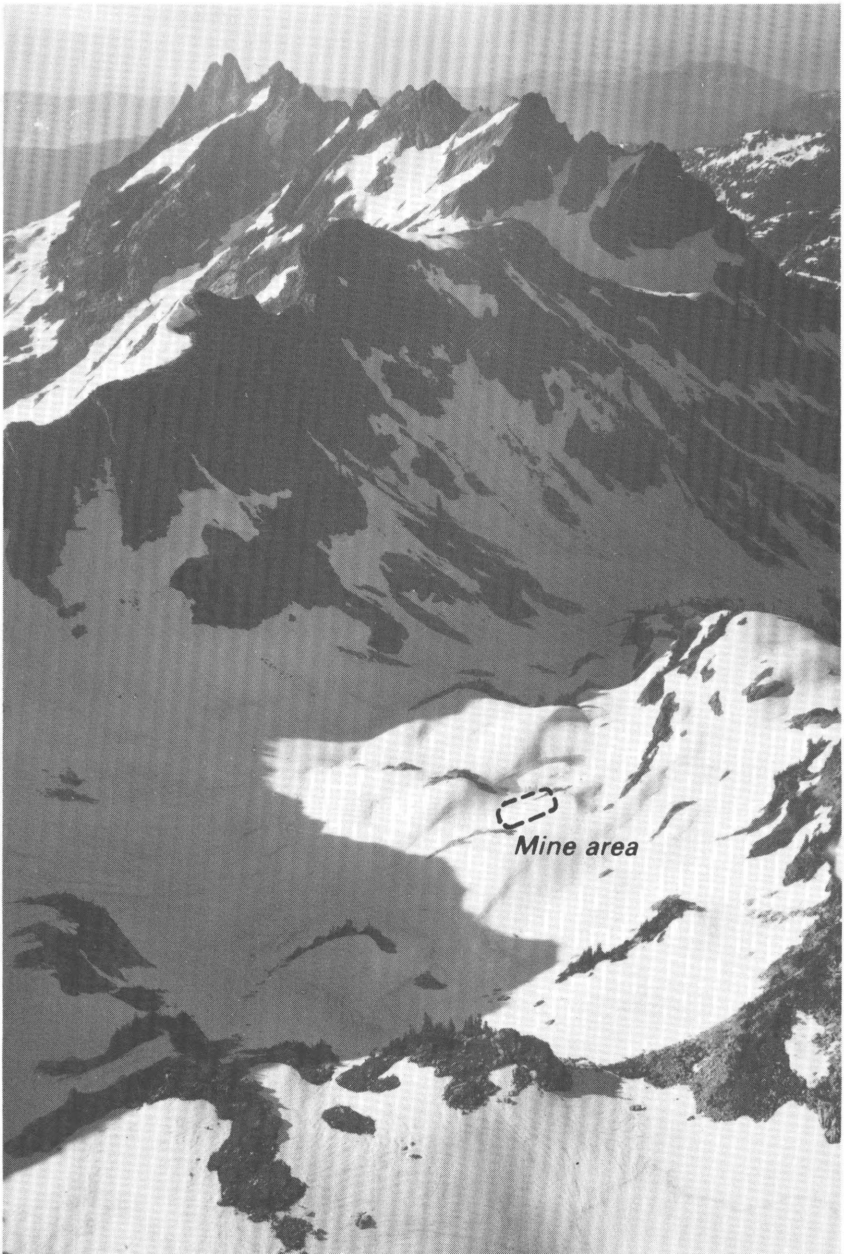


FIGURE 13.—Dutch Miller mine area from the north.

DUTCH MILLER MINE

The small high-grade copper deposit has been the impetus for a number of mining ventures since the discovery of the outcrop in 1896 (Landes and others, 1902, p. 86). The minerals, mainly chalcopyrite, tetrahedrite, and arsenopyrite, occur as shoots in a quartz-tourmaline vein that also contains minor pink dumortierite. The shoots are wide parts of narrow discontinuous branching veins in the jointed granodiorite. The main vein strikes N. 40° W. and dips 74°–80° SW.; it is more than 330 ft (100 m) long and as much as 30 ft (9.1 m) wide (fig. 14). The mine is estimated to have about 3,500 tons (3,200 metric tons) of indicated reserves exposed in the workings (B. Thomas, written commun., 1907), and 200 tons (181 metric tons) of ore is stockpiled. The reserves contain from 4 percent to more than 20 percent copper and more than 5 oz/ton (171 g/metric ton) silver. The 200 tons (181 metric tons) of ore stockpiled near the southeast shaft (fig. 15) contain a weighted average of 12.8 percent copper and 7.7 oz/ton (264 g/metric ton) silver.

The major workings on the property are two open adits and two inclined shafts not accessible because of water. The two 100-ft-deep (30.5 m) inclined shafts were sunk in the plane of the main vein (fig. 14). The one collared near the portal of the main adit penetrated intensely mineralized rock. The other, sunk northwest of the first shaft, evidently did not penetrate mineralized rock. One adit was driven from an open pit N. 40° W., about 70 ft (21 m) through mineralized rock. A 25-ft-long (7.6 m) adit was driven on a slightly mineralized vein northwest of the northwest shaft, but no ore was found. A recent lessee began a long adit from the vicinity of Williams Lake (fig. 12). It was planned to extend 2,800 ft (853 m) and to intersect the ore zone at a point about 750 ft (229 m) below the collar of the shaft, but work on the adit was stopped at 88 ft (26.8 m).

In a 1907 mine-examination report, B. Thomas (written commun., 1907) reported that workings were opened from the shaft on the 50- and 100-ft (15 and 30 m) levels. On the 50-ft (15 m) level, a 74-ft-long (22.6 m) drift was driven southeast on the main vein to intersect the extension of the ore shoot found near the collar of the shaft. The drift exposed copper-mineralized rock between 43 ft (13.1 m) and its face as did a 9-ft (2.7 m) winze sunk near the end of the drift. Two 16-ft-long (4.9 m) crosscuts driven into the footwall exposed only soft decomposed granodiorite. On the 100-ft (30.5 m) level of the shaft a 50-ft-long (15.2 m) crosscut along a sulfide stringer northeastward into the hanging wall intersected copper minerals 30 ft (9.1 m) from the shaft in a shear zone possibly parallel to the main vein. Drifts driven 25 ft (7.6 m) southeast and 35 ft (10.7 m) northwest on the shear zone

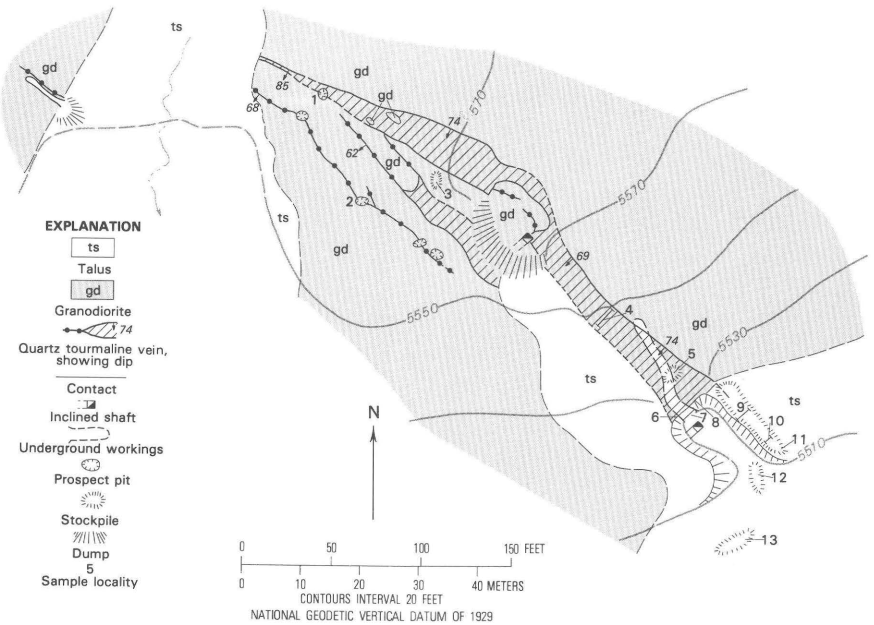


FIGURE 14.—Map of Dutch Miller mine.

Data for samples from Dutch Miller mine, Dutch Miller Gap-La Bohn Gap area

[Tr., trace; N, none detected; --, not analyzed; NA, not applicable]

Sample No.	Sample Type	Length (ft)	Length (m)	Gold (oz/ton)	Gold (g/metric ton)	Silver (oz/ton)	Silver (g/metric ton)	Copper (percent)	Lead (percent)	Zinc (percent)
1--	Grab--	NA	NA	Tr.	Tr.	0.4	13.6	0.49	0.14	0.21
2--	do----	NA	NA	tr.	tr.	.3	10.26	.12	.87	.21
3--	do----	NA	NA	tr.	tr.	10.3	352.4	15.0	1.56	2.73
4--	Chip--	12.0	3.7	N	N	.08	2.74	.30	N	--
5--	Grab--	NA	NA	tr.	tr.	12.00	410.57	13.40	1.97	--
6--	Chip--	6.7	2.0	tr.	tr.	3.7	126.6	9.83	.79	1.13
7--	do----	3.7	1.1	tr.	tr.	8.1	273.1	16.9	2.45	3.17
8--	do----	7.0	2.1	tr.	tr.	4.4	150.5	2.29	1.61	1.05
9--	Trench	8.0	2.4	tr.	tr.	7.5	256.6	12.2	.95	.76
10--	Chip--	3.3	1.0	N	N	9.1	311.3	16.2	1.50	2.22
11--	do----	3.8	1.2	tr.	tr.	8.0	273.7	11.5	1.57	1.05
12--	do----	5.5	1.68	N	N	N	N	.02	.55	.05
13--	Grab--	NA	NA	tr.	tr.	6.6	225.8	12.4	.92	.98

exposed mineralized rock 1-4 ft (0.3-1.2 m) wide containing a reported 14-25 percent copper and as much as 11.4 oz/ton (391 g/metric ton) silver. Near the face of the crosscut a 0.8-ft-wide (0.2 m) vein containing chalcopyrite assayed 24 percent copper. Thomas also reported that copper minerals were found in samples of the brecciated altered granodiorite.

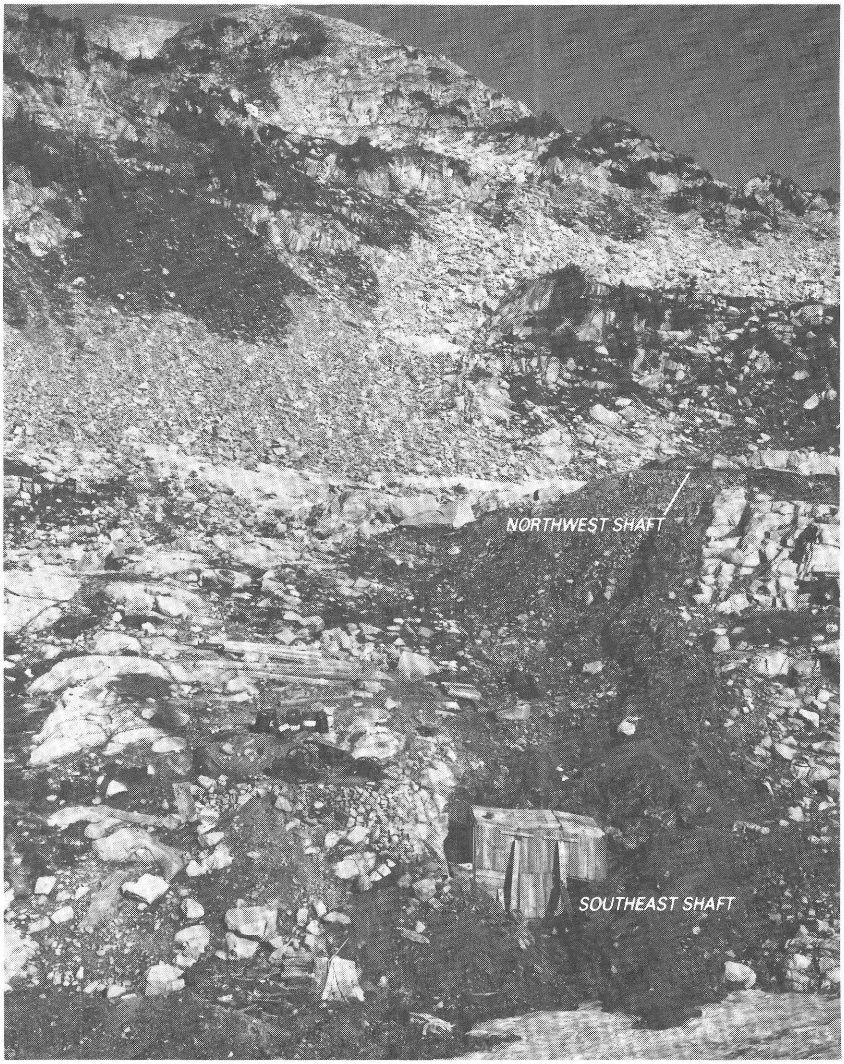


FIGURE 15.—Dutch Miller mine workings.

Two distinct assemblages of sulfide minerals were observed by J. W. Melrose and W. Carithers of the State of Washington Division of Mines and Geology (written commun., 1942), one from surface exposures and one from the underground workings. One sample (fig. 14, loc. 5) is from an ore pile that is believed to represent the ore exposed on the surface. This material is predominantly massive chalcopyrite with minor pyrite, arsenopyrite, and little tetrahedrite. The ore from the underground workings is mostly tetrahedrite and arsenopyrite in quartz and tourmaline gangue and contains some galena, sphalerite, and minor chalcopyrite, pyrite, and siderite.

The main vein and its ore shoot are probably terminated by a zone of cross fracturing marked by a well-defined ravine (Melrose and Carithers, written commun., 1942). No evidence of the vein can be seen in a granodiorite outcrop on the southeast side of the ravine. This suggested to J. W. Melrose and W. Carithers (written commun., 1942) that the ore shoot formed a pipe-like structure along the zone of cross fracturing and in the adjacent vein. The northwest limits of the ore shoot can be seen on the surface and in the adit driven northwest along the strike of the vein.

Small shipments of ore are reported to have been made during early development of the mine (Landes and others, 1902, p. 86). A 1,100-pound (499-kg) shipment for metallurgical testing was made in October 1960 from ore in a surface stockpile. About 3,500 tons (3,200 metric tons) of indicated ore were estimated by B. Thomas (written commun., 1907), who mapped and sampled the mine during the time of underground exploration, to contain from 800,000 to 850,000 pounds (362,900 to 386,000 kg) of copper. The grade of the reserves ranges from 4 to more than 20 percent copper and more than 5 oz/ton (171 g/metric ton) silver. The probability of developing additional reserves is good because the full extent of the shoots has not been delimited. With suitable access the deposit may be minable.

MISCELLANEOUS PROSPECTS

Other minor workings are on the unpatented claims of the Dutch Miller group and adjacent area (table 3). These are mainly on quartz-tourmaline veins in granodiorite. None contained visible sulfide minerals and probably do not contain potential resources.

UPPER WEST FORK MILLER RIVER–BEAR CREEK AREA

Claims were first staked in the Miller River drainage (fig. 7, area 4) in 1892 (Hodges, 1897, p. 36). Exploration began in the Buena Vista mining district on the headwaters of the North Fork Snoqualmie River about 1896 (Hodges, 1897, p. 43). As access to the district improved, lode and placer claims were staked along Lennox, Illinois, Sunday, and Bear Creeks. There has been little recent activity.

The deposits in the upper West Fork Miller River area and in the basin at the head of Bear Creek are mostly confined to persistent steeply dipping silicified shear zones. A few disseminated deposits exist. The shear zones are mineralized to various degrees by sulfide minerals. Silver is the most common valuable metal in these deposits.

TABLE 3.—*Miscellaneous prospects in the Dutch Miller Gap–La Bohn Gap area, Alpine Lakes area, Washington*

Sample locality No. (fig. 12)	Prospect	Summary	Sample data
1 -------	Harry's adit	Adit, 6 ft long (1.8 m) driven N. 20° W. adit. from 10-ft-long (3 m) cut. Flat-lying limonite-stained joints in granodiorite cut by 0.5-ft-wide (0.015 m) limonite-stained vertical joints.	Muck-pile grab sample; no gold, silver, or copper.
2 -------	West adit.	Adit, 8.5 ft long (2.6 m), driven N. 65° W. along strike of two parallel quartz-tourmaline veins 1.5 and 2.0 ft (0.46 and 0.61 m) wide dipping 70°–72° SW.	Chip sample 3.9 ft long (1.2 m) across zone at portal; no silver or lead, 0.03 percent copper.
3 -------	Copper King shaft.	Water-filled inclined shaft sunk S. 35° W. on wide section of quartz-tourmaline vein measuring 0.5–2.0 ft (1.5–0.61 m); vein strikes N. 55° W., dips 56° SW. Granodiorite hanging wall altered 4 ft (1.2 m) along cross fractures. Vein traceable for 150 ft (45.7 m).	Chip sample across vein; trace of gold, no silver or lead, and 0.02 percent copper.
4–6 -----	Copper King adit and trenches.	Group of minor workings in area of narrow irregular fractures in granodiorite. Some fractures filled with quartz and tourmaline, others with narrow aplite dikes.	Three samples: 5.5-ft-long (1.7 m) chip sample at adit portal has trace of gold, 0.1 oz/ton (3.4 g/t) silver, 0.01 percent copper; 0.2-ft-long (0.06 m) chip sample at adit portal has trace of gold, 0.2 oz/ton (6.8 g/t) silver, 0.003 percent copper; grab sample at upper trench has trace of gold, 0.1 oz/ton (3.4 g/t) silver, trace of copper.

The mineralized structures are mostly in granitic rocks, but some are in roof pendants composed of metamorphosed pre-Cretaceous sedimentary and igneous rocks that overlie the granitic rocks and are commonly exposed on ridges.

The most persistent shear zone in the area is the Cleopatra–Bear Lakes zone, a well-defined structure that can be traced at the surface from the Aces Up prospect northwestward to Paradise Lakes, a distance of approximately 3 mi (4.8 km) (fig. 16). Other shear zones having various strikes occur in the Paradise Lakes, Bear Basin, and Cleopatra mine areas and some contain metallic sulfides.

NAPCO PROSPECT

The Napco prospect is near Paradise Lakes (fig. 16) and at the apparent northwest termination of the Cleopatra–Bear Lakes shear zone. Granitic rocks of the Snoqualmie Batholith intrude metamorphosed sedimentary and igneous rocks near Paradise Lakes. The

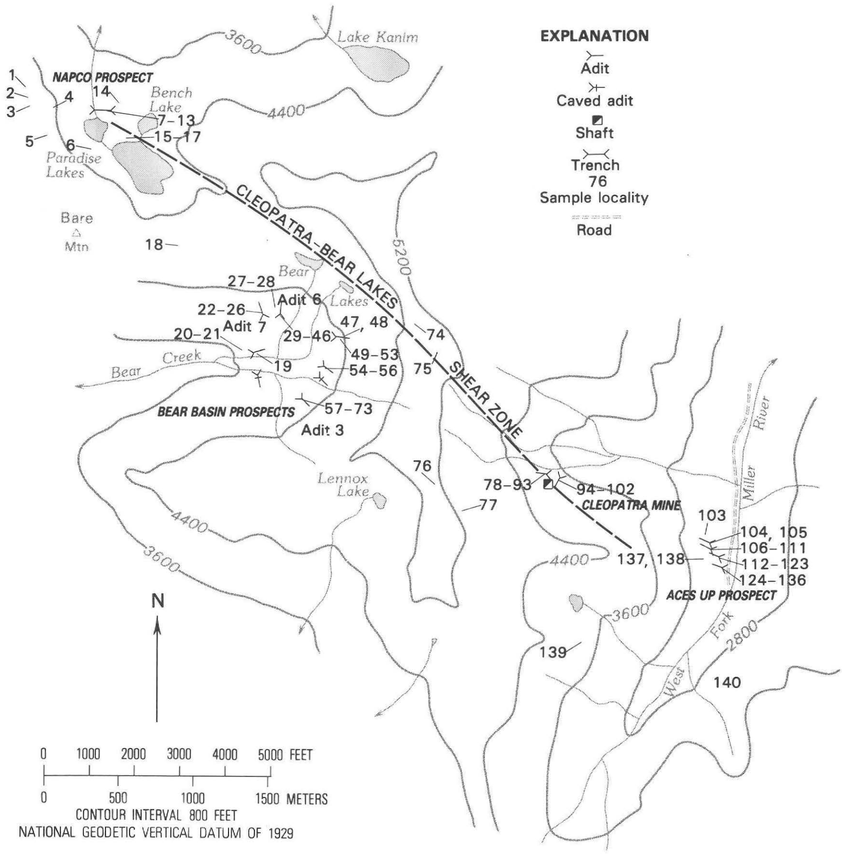


FIGURE 16.—Map showing mines and prospects in the upper West Fork Miller River-Bear Creek area.

intruded rocks are partly altered, contain small amounts of sulfide minerals, and are cut by subparallel shear zones.

A 14-ft-wide (4.3 m) mineralized shear zone in granodiorite that strikes N. 70°-90° W. and dips 55° SW. to vertical is exposed in a trench below the outlet of Paradise Lakes. The zone is composed of four subparallel veins which average about 0.5 ft (0.15 m) wide and are separated by lenses of altered granodiorite. Sulfide minerals constitute approximately 70 percent of the veins and include pyrite, arsenopyrite, galena, sphalerite, chalcopyrite, and tetrahedrite. Quartz and mica are also present. The altered granodiorite matrix of the veins contains about 10 percent gray metallic grains 0.004–0.079 in. (0.1–2.0 mm) in diameter. The contact of the zone with the surrounding granodiorite is sharp; wallrock is nearly fresh. A sample (fig. 16, loc. 7) 13.5 ft (4.1 m) long taken in a trench and across the shear zone contains a trace of gold, 28.3 oz/ton (970.3 g/metric ton) silver, and 0.084 percent copper. Six other samples, however, (fig. 16, locs. 8–13) ranging in length from 0.5 to 2.5 ft (0.15–0.8 m), taken across vein material or wallrock, averaged only 0.03 oz/ton (1.0 g/metric ton) gold, 2.66 oz/ton (91.2 g/metric ton) silver, and 0.006 percent copper.

A 15-ft-wide (4.6 m) shear zone, possibly an extension of the zone in the trench, crops out in a cliff 400 ft (122 m) to the northwest (fig. 16, loc. 14). A 1.5-ft-long (0.5 m) chip sample (fig. 16, loc. 14) across a vein in the zone contains a trace of gold, 0.1 oz/ton (3.4 g/metric ton) silver, and 0.029 percent copper. Outcrops of hornfels containing less than 5 percent sulfide minerals and weathered shear zones occur in the area of the claims. Samples (fig. 16, locs. 1–6, 15–17) from these outcrops and zones contain a maximum of 0.02 oz/ton (0.7 g/metric ton) gold, 0.3 oz/ton (10.3 g/metric ton) silver, and 0.028 percent copper.

Deep overburden obscures most of the mineralized zone on the prospect. However, submarginal resources of silver amounting to a few tens of tons probably exist in the area of the Napco trench. Further exploratory work may disclose additional resources of silver.

BEAR CREEK PROSPECTS

In the early 1900's, eight adits were driven along steeply dipping shear zones that cut granodiorite and alaskite in the cirque at the head of Bear Creek (fig. 16). In 1922, 360 ounces (11.2 kg) of silver was smelted from concentrates produced in a small flotation mill on the property, but little work has been done since 1934 when the mill burned (Livingston, 1971, p. 127, 128).

Two sets of mineralized shear zones occur in the basin. One set trends about N. 50° W., parallel to the Cleopatra–Bear Lakes shear zone; the other trends about N. 80° W. Intersections of the two sets of shear zones have not been explored.

Adit 3 (fig. 16, locs. 57–73) follows a vein of irregular width in a shear zone striking approximately N. 80° W. and dipping 85° SW. to vertical (fig. 17). Country rock in the adit is granodiorite, fresh on the footwall but altered on the hanging wall. The shear zone can be traced on the surface for more than 3,000 ft (1.067 m), but brush and talus cover prevented sampling over most of the length. Quartz stringers in the shear zone range in width from 0.6 to 5.9 ft (0.2–1.8 m).

Samples of quartz and mineralized material from adit 3 and the exposures on the surface (fig. 17, locs. 58–73) show erratic silver values ranging from 0.1 to 33.7 oz/ton (3.4–1,155.4 g/metric ton) and averaging 5.6 oz/ton (192.0 g/metric ton). Maximum gold and copper contents of the samples were only 0.05 oz/ton (1.7 g/metric ton) and 0.16 percent,

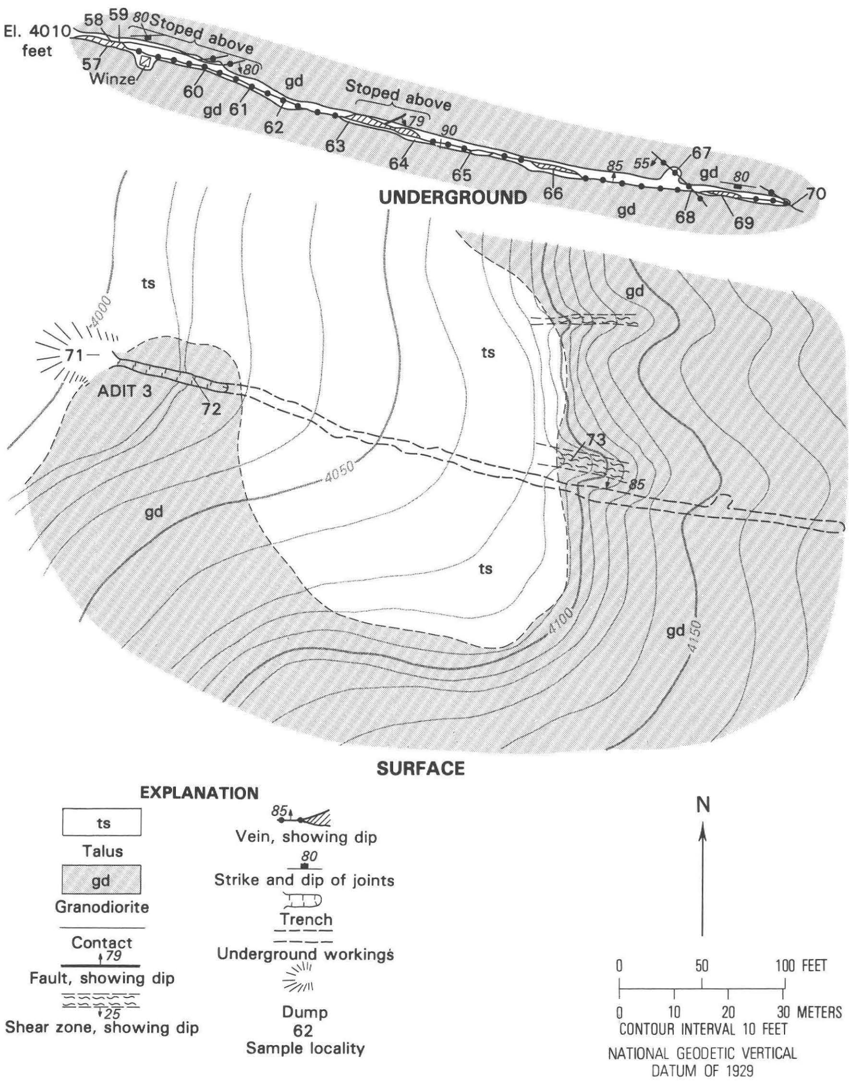


FIGURE 17.—Map of Adit 3, Bear Creek prospects.

respectively. Indicated reserves near the portal of the adit are estimated to be small.

A parallel but wider shear zone lies approximately 400 ft (122 m) south of the structure in adit 3 and extends eastward from the area covered by figure 17 into the basin in which the Cleopatra mine is located. This large structure contains only a few quartz stringers and

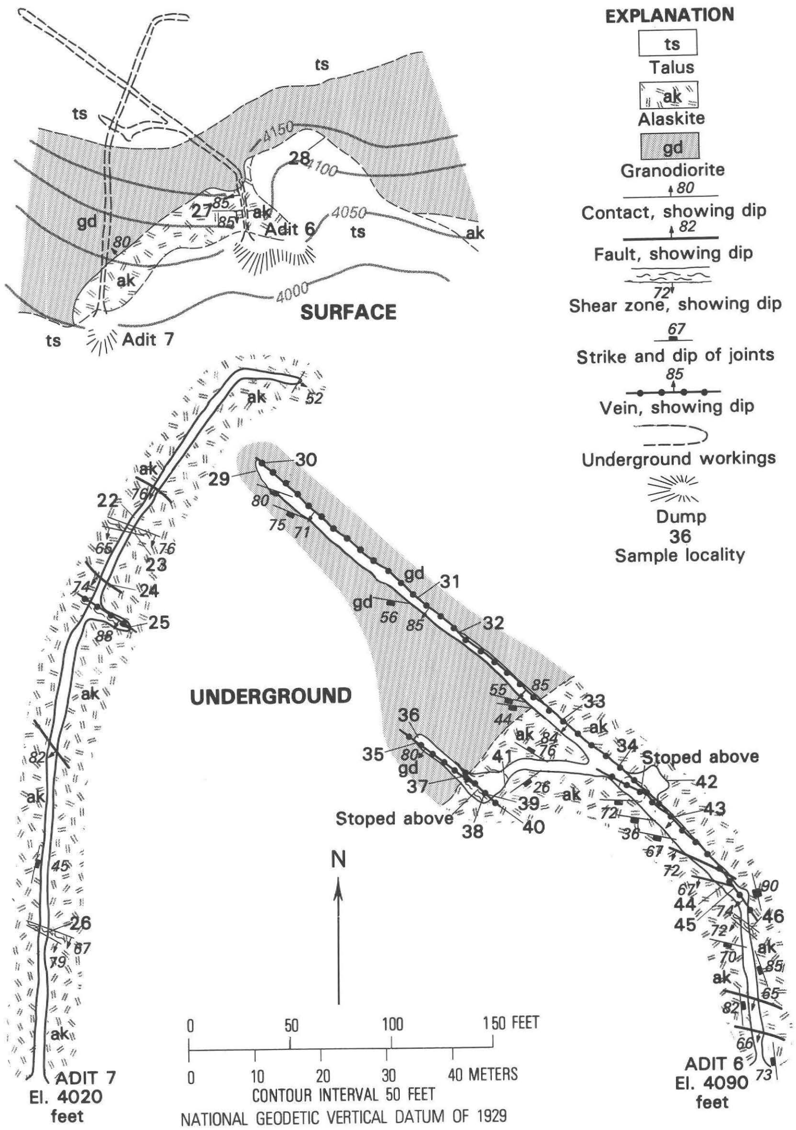


FIGURE 18.—Map of Adits 6 and 7, Bear Creek prospects.

apparently is not mineralized at the surface. Smaller intervening shears are not mineralized.

Adits 6 and 7 (fig. 16) are along two minor shear zones paralleling the Cleopatra-Bear Lakes structure. The portal of adit 6 is in slightly altered and slightly mineralized alaskite, but along the drift the rock grades into relatively fresh granodiorite (fig. 18). Adit 7, driven as a crosscut at an elevation approximately 70 ft (21 m) lower than adit 6, is in alaskite (fig. 18). Pods and irregular stringers of sulfide minerals as much as 2 ft (0.6 m) wide occur in quartz veins within the persistent shear zones. The shear zones strike about N. 50° W. and dip 71°–88° SW. Pyrite is the most abundant sulfide mineral and minor chalcopyrite is present. Locally, the wallrock contains as much as 2 percent disseminated sulfide minerals. Maximum gold, silver, and copper contents of samples of the quartz and mineralized material are 0.04 oz/ton (1.4 g/metric ton), 1.5 oz/ton (51.4 g/metric ton), and 0.35 percent, respectively. Sulfide minerals in the shear zones decrease in abundance from the alaskite into the granodiorite.

Other short adits driven on shear zones expose very low grade deposits of sulfide minerals. Except for one 1.5-ft-long (0.5 m) sample (fig. 16, loc. 55) that contains 2.9 oz/ton (99.4 g/metric ton) silver, samples from the shear zones (fig. 16, locs. 18, 19, 47–56) contain a maximum of 0.01 oz/ton (0.3 g/metric ton) gold, 30.9 oz/ton (0.9 g/metric ton) silver, and 0.05 percent copper. Two grab samples from the ore bin (fig. 16, locs. 20, 21) average 0.04 oz/ton (1.4 g/metric ton) gold, 12.6 oz/ton (432.0 g/metric ton) silver, and 0.05 percent copper.

The silver resources exposed by the workings and the number of persistent intersecting shear zones indicate that places in upper Bear Creek are favorable for exploration.

CLEOPATRA MINE

The Cleopatra mine workings are in a basin (fig. 19) on the west wall of the Canyon of the West Fork Miller River. The workings are along a section of the major shear zone that trends northwest into the Bear Lakes–Paradise Lakes area (figs. 16, 19).

The mine produced approximately $250,000 worth of silver-lead-copper ore intermittently between 1897 and 1941 (Livingston, 1971, p. 139); in 1942, the operation was terminated by U.S. War Production Board Order L–208.

The workings total about 2,100 ft (640 m) and consist of drifts, crosscuts, winzes, raises, and a shaft (Livingston, 1971, p. 140); only 530 ft (162 m) of drifts and crosscuts were accessible in 1973 (fig. 20). Information on the mine, including maps and assay results from inaccessible parts of the workings, is from Purdy (1951), Livingston (1971), and Joseph Cashman (written commun., 1973).

Three mineralized shear zones in granodiorite were developed through underground workings. The zones are nearly parallel, strike N. 45°–70° W., and dip 65° SW. to vertical. All are intensely kaolinized and sericitized. They contain sparse sulfide minerals including pyrite, chalcopyrite, jamesonite, galena, sphalerite, and tetrahedrite.

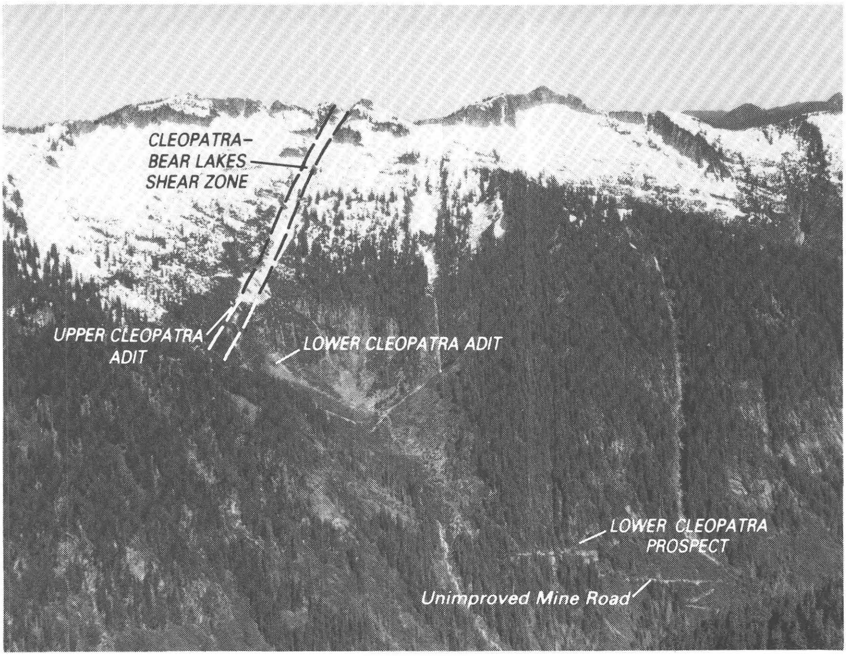


FIGURE 19.—Basin containing Cleopatra mine; view from the east.

The main zone is exposed along a 490-ft-long (149 m) drift and two short drifts now in the inaccessible section of the adit (fig. 20). Two winzes were sunk from the long drift. The main zone is 0.5–37 ft (0.2–11.3 m) wide and averages 2.4 ft (0.8 m) wide (Purdy, 1951, p. 82, 83). Farther southeast, the main zone is exposed in the two short drifts off the southwest branch of the lower adit, making the total length within the Cleopatra mine 910 ft (277 m) (fig. 20). A 210-ft-high (64 m) raise extends in the zone to an upper adit which was driven 160 ft (49 m) along the zone. On the surface, the zone can be traced approximately 230 ft (70 m) northwest from the portal of the upper adit (fig. 20). It is intensely weathered at the surface and only isolated lenses of sulfide minerals remain. Samples from the long drift (Livingston, 1971, pl. 4) have a weighted average of 0.01 oz/ton (0.3 g/metric ton) gold and 6.39 oz/ton (219 g/metric ton) silver across an average width of 2.2 ft (0.7 m); samples taken from the raise across a width of 2.3 ft (0.7 m) (fig. 20) contain 0.04 oz/ton (1.4 g/metric ton) gold, and 17.5 oz/ton (600 g/metric ton) silver.

A second parallel shear zone was intersected by a crosscut extending northward from the long drift. A 190-ft-long (58 m) drift was driven along the zone. This zone is probably exposed in the southwest branch of the lower adit, bringing the total known length of the zone to 850 ft (259 m). Samples from the second zone (Livingston, 1971, pl. 4) average a trace of gold and 6.4 oz/ton (219.4 g/metric ton) silver across an average width of 3.1 ft (0.9 m).

Total inferred reserves for the two parallel mineralized zones above the lower adit level are about 100,000 tons (91,000 metric tons) containing a trace to as much as 0.05 oz/ton (1.7 g/metric ton) gold and 6–17 oz/ton (206–583 g/metric ton) silver.

Winzes were sunk in the main zone to as much as 75 ft (22.9 m) below the lower adit level and reportedly (Livingston, 1971, p. 140) discovered highly mineralized rock. The potential mineral resources may be as great below the lower adit level as they are above it.

A third zone is exposed for 150 ft (46 m) along a drift. Samples (fig. 20, locs. 96–98, 101) contain no gold and a maximum of 0.5 oz/ton (17.1 g/metric ton) silver.

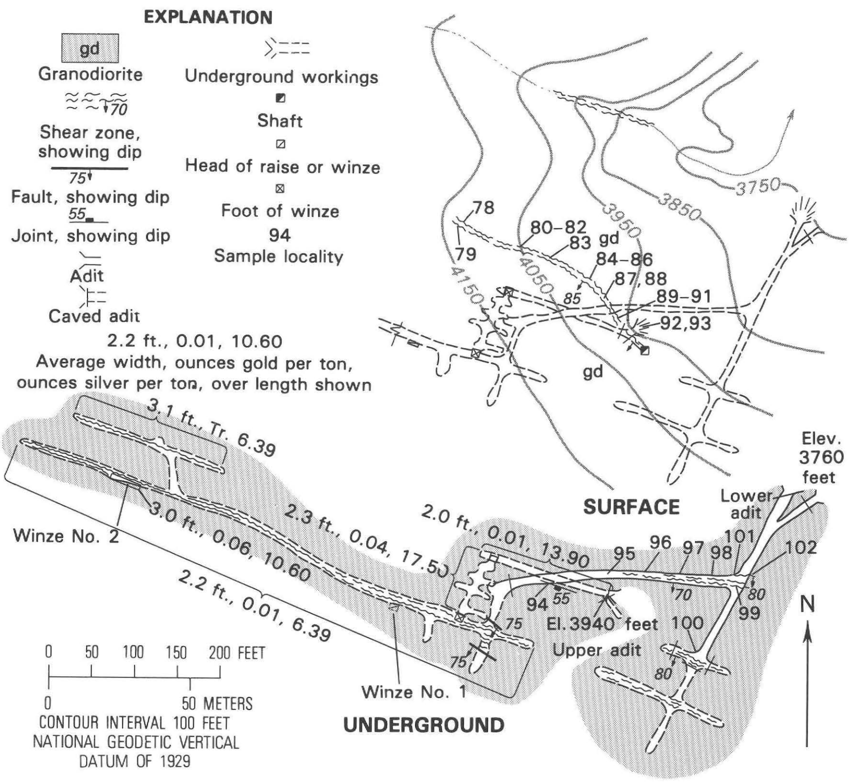


FIGURE 20.—Map of Cleopatra mine.

ACES UP MINE

The Aces Up adits (fig. 21) are on the apparent southeast end of the Cleopatra–Bear Lakes shear zone and near the West Fork Miller River (fig. 16). In 1948 the property produced 400 pounds (181.4 kg) of ore containing a total of 27 oz (839.8 g) of silver.

The adits are along three subparallel mineralized shear zones in granodiorite. The zones, which are in highly altered granodiorite, strike N. 45°–55° W., and dip 60° SW. to vertical (fig. 21). Galena, sphalerite, jamesonite, arsenopyrite, and scheelite occur in lenticular masses in the zones. Gangue minerals include pyrite, quartz, and calcite.

Adit 1, caved 220 ft (67 m) from the portal, was reportedly driven 300 ft (91 m) along the southernmost shear zone (Purdy, 1951, p. 80), which ranges in width from 0.8 to 5.0 ft (0.24–1.5 m) and has an average width of 2.4 ft (0.7 m). Pyrite, sphalerite, and galena are finely disseminated in the zone. An outcrop about 425 ft (130 m) northwest of the portal of adit 1 (fig. 21, locs. 137, 138) appears to be part of the zone.

Data for samples collected from Cleopatra Mine, upper West Fork Miller River–Bear Creek area

[Tr, trace; N, none detected; --, not analyzed; NA, not applicable; all samples are chip except 84 which is a select sample]

Sample No.	(ft)	(m)	Gold (oz/ton)	(g/metric ton)	Silver (oz/ton)	(g/metric ton)	Copper (percent)	Lead (percent)	Zinc (percent)
78--	1.0	0.3	Tr.	Tr.	Tr.	Tr.	--	--	--
79--	2.5	0.8	N	N	0.1	3.4	--	--	--
80--	1.0	0.3	tr.	tr.	1.3	10.3	0.48	0.03	0.21
81--	3.0	0.9	N	N	.1	3.4	--	--	--
82--	3.7	1.1	tr.	tr.	.1	3.4	--	--	--
83--	2.0	0.6	tr.	tr.	.1	3.4	--	--	--
84--	NA	NA	0.01	0.34	97.8	3,346.1	.62	.03	.58
85--	2.5	0.8	.02	0.69	11.0	376.4	.29	.11	.19
86--	2.5	0.8	N	N	.1	3.4	--	--	--
87--	2.0	0.6	.02	0.69	3.5	119.7	.51	.04	.25
88--	2.0	0.6	.02	0.69	1.0	34.2	.37	.02	.17
89--	2.0	0.6	.05	1.71	.2	6.9	--	--	--
90--	2.0	0.6	.04	1.37	tr.	tr.	--	--	--
91--	2.0	0.6	N	N	N	N	--	--	--
92--	3.5	1.1	tr.	tr.	.1	3.4	--	--	--
93--	2.5	0.8	N	N	tr.	tr.	--	--	--
94--	1.2	0.4	N	N	N	N	--	--	--
95--	6.0	1.8	N	N	.2	6.9	--	--	--
96--	6.0	1.8	N	N	.1	3.4	--	--	--
97--	4.5	1.4	N	N	0.1	3.4	--	--	--
98--	1.0	0.3	N	N	tr.	tr.	--	--	--
99--	2.2	0.7	N	N	N	N	--	--	--
100--	5.0	1.5	N	N	.5	17.1	--	--	--
101--	2.3	0.7	N	N	.1	3.4	--	--	--
102--	31.0	9.4	N	N	.1	3.4	--	--	--

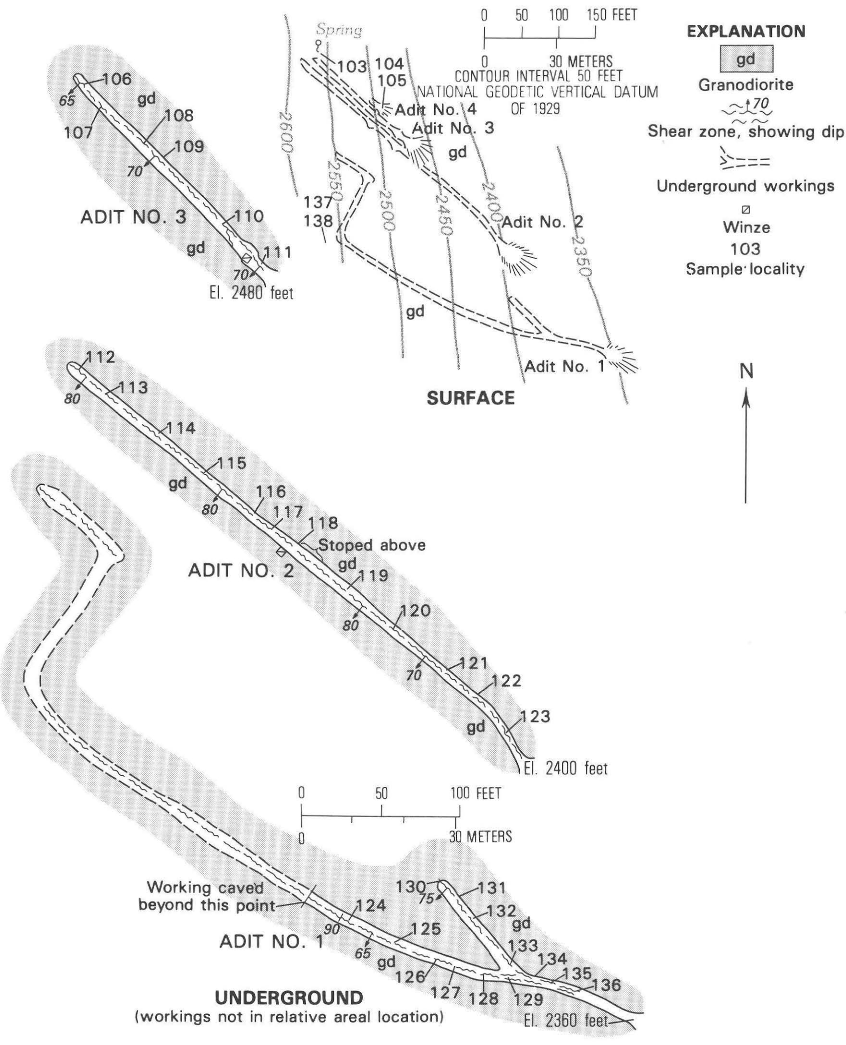


FIGURE 21.—Map of Aces Up mine.

A middle shear zone is exposed for the entire length of adit 2 (fig. 21) and probably in a short drift at the end of adit 1. The zone splits from the main zone close to the portal of adit 1. It ranges in width from 0.5 to 4.0 ft (0.15–1.2 m) and averages 1.5 ft (0.5 m). Minor amounts of galena and scheelite occur in lenses and pods in the zone.

The northernmost shear zone is exposed for 175 ft (53 m) in adit 3. It ranges in width from 0.5 to 5.3 ft (0.2–1.6 m) and averages 2.1 ft (0.6 m). Pyrite accompanied by minor amounts of sphalerite, galena, and chalcopyrite occurs in lenses as much as 2 in. (5.1 cm) wide and

Data for samples collected from Aces Up mine, upper West Fork Miller River–Bear Creek area

[Tr., trace; N, none detected; --, not analyzed; <, less than shown; NA, not applicable; all samples are chip except 103 which is a grab sample]

Sample			Gold		Silver		Copper (percent)	Lead (percent)	Zinc (percent)	Antimony (percent)	Arsenic (percent)
No.	Length (ft)	Length (m)	(oz/ton)	(g/metric ton)	(oz/ton)	(g/metric ton)					
103--	NA	NA	Tr.	Tr.	0.07	2.39	--	--	--	--	--
104--	2.5	0.8	tr.	tr.	4.5	148.9	0.04	0.66	0.37	0.3	0.55
105--	1.5	0.4	tr.	tr.	.9	30.8	--	--	--	--	--
106--	2.5	0.8	0.03	1.03	.1	3.4	.02	<.01	--	--	--
107--	2.8	0.8	N	N	6.5	222.3	--	--	--	--	--
108--	3.5	1.1	.06	2.05	.4	13.9	.02	.06	.82	<.01	.86
109--	3.5	1.1	tr.	tr.	.3	10.3	--	--	--	--	--
110--	1.5	0.4	tr.	tr.	1.2	41.0	.03	.21	--	--	--
111--	5.3	1.6	N	N	Tr.	Tr.	--	--	--	--	--
112--	3.5	1.1	tr.	tr.	.1	3.4	--	--	--	--	--
113--	.5	0.2	N	N	3.2	109.5	--	--	--	--	--
114--	.5	0.2	N	N	N	N	--	--	--	--	--
115--	0.5	0.2	0.05	1.71	tr.	tr.	--	--	--	--	--
116--	2.5	0.8	.11	3.76	.2	6.8	--	--	--	--	--
117--	2.5	0.8	tr.	tr.	.5	17.1	0.02	0.04	--	--	--
118--	.5	0.2	.07	2.39	9.4	321.6	--	--	--	--	--
119--	2.5	0.8	tr.	tr.	.2	6.8	--	--	--	--	--
120--	.5	0.2	N	N	N	N	--	--	--	--	--
121--	1.5	0.4	N	N	N	N	--	--	--	--	--
122--	1.1	0.3	N	N	.2	6.8	--	--	--	--	--
123--	5.0	1.5	N	N	tr.	tr.	.03	--	--	--	--
124--	4.0	1.2	N	N	.2	6.8	--	--	--	--	--
125--	3.5	1.1	N	N	.2	6.8	--	--	--	--	--
126--	3.5	1.1	.05	1.71	9.7	331.9	--	--	--	--	--
127--	1.0	0.3	.03	1.03	6.6	225.8	<.01	<.01	0.012	<0.01	--
128--	.8	0.2	1.27	43.4	.2	6.8	--	--	--	--	--
129--	3.0	0.9	.05	1.71	11.8	407.1	--	--	--	--	--
130--	1.0	0.3	N	N	N	N	--	--	--	--	--
131--	1.0	0.3	N	N	N	N	<0.01	<0.01	0.008	0.015	0.6
132--	3.0	0.9	N	N	N	N	--	.6	--	1.0	0.7
133--	1.0	0.3	0.05	1.71	0.3	10.3	--	.3	--	--	7.0
134--	3.5	1.1	N	N	N	N	--	--	--	--	--
135--	4.0	1.2	N	N	N	N	--	--	--	--	--
136--	2.5	0.8	N	N	tr.	tr.	--	--	--	--	--
137--	.3	0.1	tr.	tr.	.3	10.3	--	--	--	--	--
138--	.8	0.2	N	N	.2	6.8	--	--	--	--	--

1 ft (0.3 m) long. A winze extends downdip from near the portal. Adit 4 was driven in mineralized rock believed to be an updip continuation of the northernmost shear zone. The rock there contains galena pods as much as 0.5 ft (0.2 m) in diameter.

MISCELLANEOUS PROSPECTS

Other minor prospects and mineralized zones were sampled in the area and these are listed in table 4.

LOWER WEST FORK MILLER RIVER AREA

The area (fig. 7, area 3; fig. 22) is underlain by granodiorite of the Snoqualmie batholith that is cut by strong persistent northwest- and west-trending shear zones. Small breccia zones are randomly distributed through the area. The shear zones generally contain pyrite, arsenopyrite, galena, sphalerite, jamesonite, chalcopyrite, tetrahedrite, quartz, calcite, and gouge. The highly weathered parts of the shear zones are at the surface. Magnetite occurs in veins, pods, and as fine-grained disseminations.

Many of the northwest-striking shear zones may contain small resources.

TABLE 4.—*Miscellaneous prospects and mineralized zones in the upper West Fork Miller River–Bear Creek area, Alpine Lakes area, Washington*

Sample locality No. (fig. 16)	Prospect	Summary	Sample data
18 ------	Bear Mountain Ridge No. 1.	Limonite-stained fine-grained hornfels contain less than 5 percent disseminated fine-grained sulfide minerals, mostly pyrite and arsenopyrite.	Chip sample, 8-ft-long (2.4 m) from area of disseminated sulfide minerals; no gold, trace of silver, and 0.2 percent copper.
74 ------	Dawson ---	Outcrop shear zone on divide 5,000 ft (1,500 m) northwest of Cleopatra mine. Zone mostly altered to clay except for remnants along hanging wall.	Chip sample, 1.3-ft-long (0.4 m); 0.3 oz/ton (1.0 g/metric ton) gold and trace of silver.
75 ------	--- do ---	A 2.5-ft-wide (0.8 m) shear zone in granodiorite, 4,300 ft (1,310 m) northwest of Cleopatra mine. Zone near main Cleopatra-Bear Lakes shear zone.	Chip sample across shear zone; no gold, trace of silver.
76 ------	Unnamed -	A 10-ft-wide (3 m) shear zone strikes N. 65° W. and dips vertically. Shear zone in granodiorite, highly altered and iron oxide stained.	Chip sample, 10-ft-long (3 m); no gold or silver.
77 ------	--- do ---	Brecciated rock and granodiorite contain pods of pyritic material and breccia as much as 1.5 ft (0.5 m) in diameter. Pyrite content of pods and breccia greater than 10 percent.	Chip sample, 1.5-ft-long (0.46 m); no gold or silver.
139 -----	--- do ---	Shear zone in granodiorite strikes N. 50° W., dips 60° SW., is 0.8 ft (0.24 m) wide, contains 1 percent pyrite and is highly altered.	Chip sample across zone contained no gold and 0.1 oz/ton (3.4 g/metric ton) silver.
140 -----	--- do ---	A 10-ft-wide (3.0 m) shear zone in granodiorite. Zone strikes N. 50° W., dips 70° SW., and contains 20 percent quartz and finely disseminated pyrite.	One chip sample contains trace of gold and 0.3 oz/ton (10.3 g/metric ton) silver.

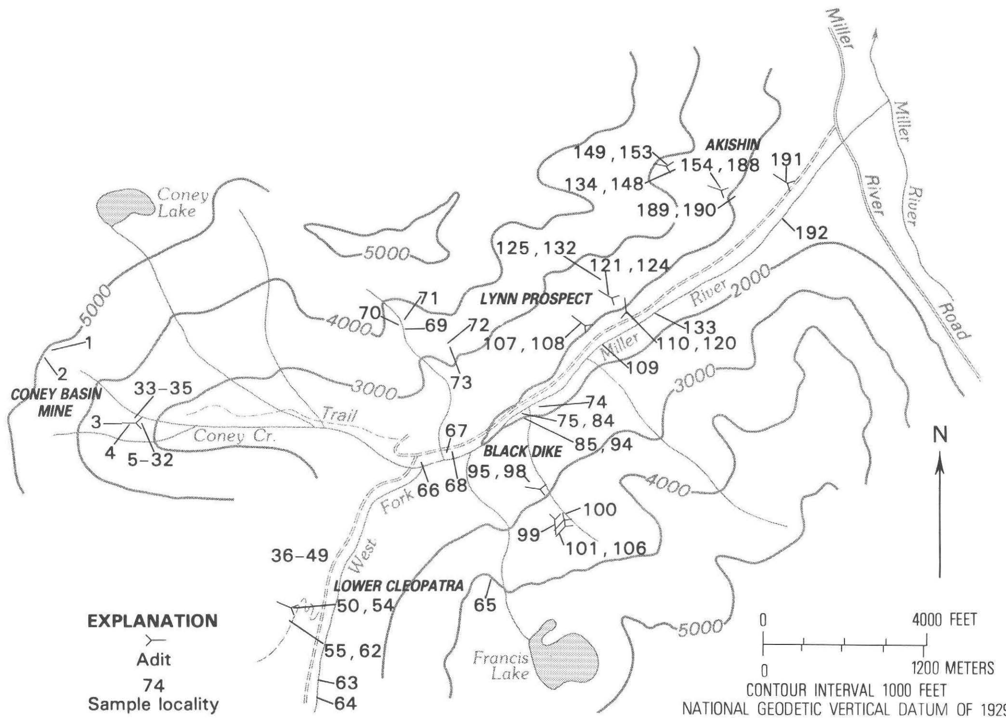


FIGURE 22.—Map showing mines and prospects in the lower West Fork Miller River area.

AKISHIN CLAIMS

A persistent sulfide-bearing shear zone is exposed in two adits on the Akishin claims (fig. 23). The zone strikes N. 70°–90° W., dips 50°–80° SW., and cuts granodiorite. The zone ranges from 0.5 to 15 ft (0.2–4.6 m) in width and averages 2.1 ft (0.6 m). It apparently is continuous between the lower adit, upper adit, and surface west of the upper adit, a total strike length of about 2,000 ft (610 m).

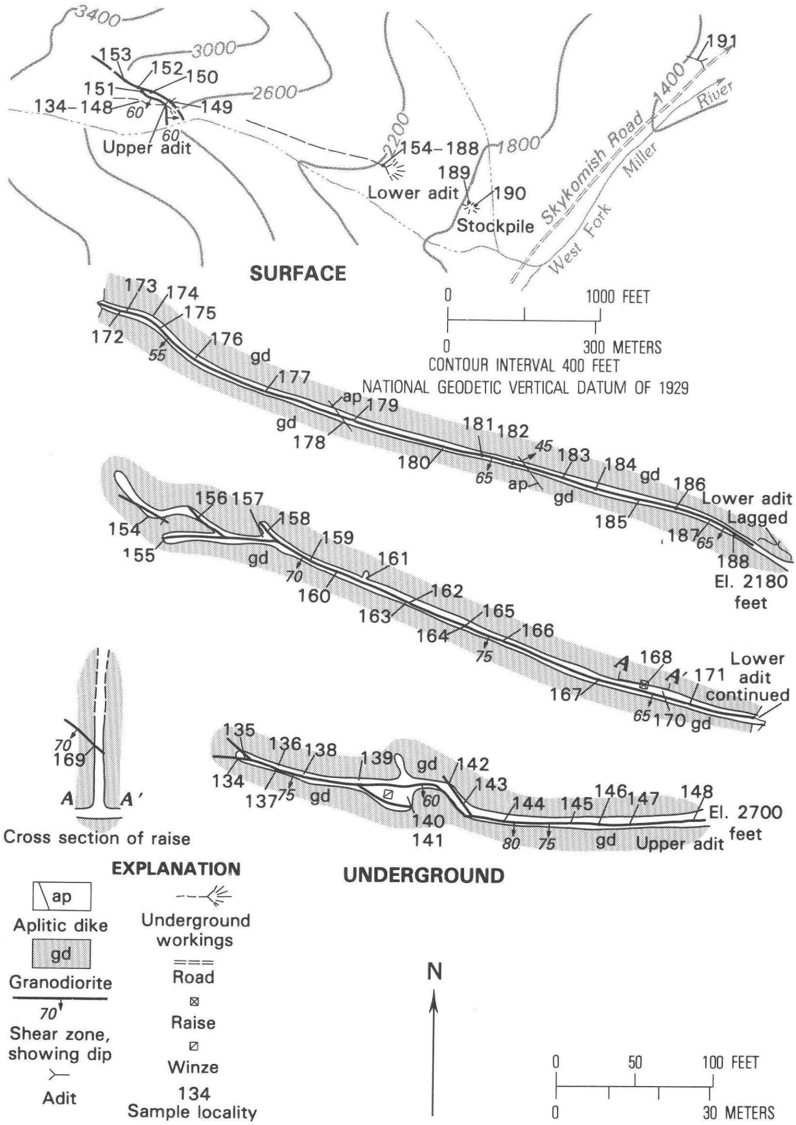


FIGURE 23.—Map of Akishin claims.

Data for samples collected from the Akishin claims, lower West Fork Miller River area

[Tr., trace; N, none detected; --, not analyzed; NA, not applicable, <, less than shown; all samples are chip except 168, 189, and 190 which are grab samples]

Sample			Gold		Silver				
	Length								
No.	(ft)	(m)	(oz/ton)	(g/metric ton)	(oz/ton)	(g/metric ton)	Copper (percent)	Lead (percent)	Zinc (percent)
134---	2.5	0.8	Tr.	Tr.	0.7	23.9	0.045	0.25	0.35
135---	.8	0.2	N	N	N	N	.006	<.01	.008
136---	.7	0.2	N	N	N	N	--	--	--
137---	3.0	0.9	0.03	1.03	4.7	160.8	.14	.093	.17
138---	.5	0.2	.15	5.13	2.2	75.3	.01	.01	.014
139---	2.5	0.8	tr.	tr.	.3	10.3	.16	.074	.17
140---	10.0	3.0	.03	1.03	2.0	68.8	.62	1.56	1.42
141---	1.0	0.3	.06	2.05	5.8	198.4	1.37	.94	.44
142---	2.0	0.6	.01	0.34	.5	17.0	.046	.19	.22
143---	1.6	0.5	tr.	tr.	.2	6.8	.009	.074	.094
144---	.5	0.2	N	N	.1	3.4	.01	.05	.074
145---	2.4	0.7	.02	0.68	.5	17.0	.041	.55	.89
146---	3.0	0.9	tr.	tr.	.2	6.9	--	--	--
147---	.5	0.2	N	N	N	N	--	--	--
148---	4.0	1.2	tr.	tr.	.4	13.7	--	--	--
149---	2.0	0.6	N	N	.1	3.4	.053	.014	.011
150---	2.5	0.8	N	N	N	N	--	--	--
151---	2.4	0.7	N	N	.1	3.4	.01	.34	.38
152---	3.0	0.9	N	N	N	N	--	--	--
153---	4.0	1.2	N	N	tr.	tr.	--	--	--
154---	1.2	0.4	tr.	tr.	0.1	3.4	--	--	--
155---	1.0	0.3	N	N	.2	6.8	--	--	--
156---	5.5	1.6	tr.	tr.	.3	10.3	--	--	--
157---	10.0	3.0	0.05	1.71	.5	17.0	--	--	--
158---	1.8	0.5	.03	1.03	3.1	106.0	0.56	0.16	0.085
159---	1.5	0.4	.01	0.34	.7	23.9	.12	.097	.36
160---	2.5	0.8	.02	0.68	1.5	51.3	--	--	--
161---	7.0	2.1	.07	2.39	.9	30.8	--	--	--
162---	2.0	0.6	tr.	tr.	1.0	34.2	.37	.074	.42
163---	2.5	0.8	.03	1.03	1.9	65.0	--	--	--
164---	1.2	0.4	.03	1.03	2.4	72.9	--	--	--
165---	1.0	0.3	.01	0.34	1.3	44.5	.006	<.01	--
166---	4.0	1.2	.05	1.71	.4	13.7	.2	.1	.35
167---	1.5	0.4	.01	0.34	2.0	68.4	.13	.28	.39
168---	NA	NA	.01	0.34	.3	10.3	--	--	--
169---	6.0	1.8	tr.	tr.	1.1	37.6	.135	.27	1.13
170---	3.0	0.9	tr.	tr.	.2	6.8	.034	.14	.85
171---	2.0	0.6	.01	0.34	.4	13.7	--	--	--
172---	1.1	0.3	tr.	tr.	.4	13.7	.022	.26	.38
173---	.5	0.2	.02	0.68	.3	10.3	.024	.023	.38
174---	.7	0.3	.01	0.34	.5	17.0	--	--	--
175---	.7	0.3	N	N	.2	6.8	--	--	--
176---	2.0	0.6	N	N	N	N	--	--	--
177---	2.2	0.7	N	N	0.2	6.8	0.006	<0.01	0.018
178---	.8	0.2	N	N	.2	6.8	--	--	--
179---	1.5	0.4	0.04	1.07	1.2	41.0	--	--	--
180---	.8	0.2	tr.	tr.	.5	17.0	.021	.33	.17
181---	1.0	0.3	tr.	tr.	.2	6.8	--	--	--
182---	1.2	0.4	N	N	.3	10.3	.015	.05	.045
183---	.8	0.2	N	N	N	N	--	--	--
184---	.7	0.2	N	N	N	N	--	--	--
185---	1.6	0.5	tr.	tr.	.2	6.8	--	--	--
186---	.7	0.2	N	N	.1	3.4	--	--	--
187---	.7	0.2	N	N	.2	6.8	--	--	--
188---	.7	0.2	tr.	tr.	.1	3.4	--	--	--
189---	NA	NA	N	N	1.8	61.6	--	--	--
190---	NA	NA	N	N	.7	23.9	.05	.18	.28
191---	.7	0.2	N	N	.2	6.8	--	--	--

Sulfide minerals in the zone include pyrite, chalcopyrite, galena, and sphalerite which occur with quartz and gouge in erratically distributed lenses and pods. The zone is highly altered and stained with copper carbonate and iron oxide minerals.

Another small shear zone about 2,000 ft (610 m) northeast of the lower adit is exposed in a 10-ft-long (3.0 m) adit (fig. 23, loc. 191). It is 0.7 ft (0.2 m) wide, strikes N. 52° W., and dips 55° SW. A chip sample taken across the vein contains 0.2 oz/ton (6.8 g/metric ton) silver and no gold.

Small areas of the principal shear zone contain as much as 0.06 oz/ton (2 g/metric ton) gold, 5.8 oz/ton (199 g/metric ton) silver, 1.37 percent copper, and minor amounts of lead and zinc. In general, however, the mineralized rock is very irregular and of low grade.

CONEY MINE

Two adits explored shear zones in granodiorite on the west side of the basin south of Coney Lake (fig. 22). Development consists of a total of 3,000 linear ft (914 m) of underground workings (Livingston, 1971, p. 140). The lower adit is caved.

The mine produced 86 tons (78 metric tons) of ore intermittently between 1895 and 1941 (Livingston, 1971, p. 141). Undated records of the U.S. Bureau of Mines indicate that 46 tons (42 metric tons) of the ore contained 26 oz (809.4 g) gold, 598 oz (18,600 g) silver, 400 lb (181 kg) copper, and 2,461 lb (1,116 kg) lead.

A sulfide-rich quartz vein in a west-striking shear zone, which dips 70°-85° S., is followed for about 400 ft (122 m) by the upper adit (fig. 24). The quartz vein is 0.3–4 ft (0.1–1.2 m) wide and contains 5–15 percent sulfide minerals in lenses and pods. The sulfide minerals include pyrite, arsenopyrite, sphalerite, galena, chalcopyrite, and tetrahedrite. Assay results from the quartz-vein samples (fig. 24, locs. 15–32) show only minor amounts of gold, silver, lead, zinc, and copper, with the exception of the sample from locality 32 from the portal at the place where the vein is intersected by the main shear zone. This sample contains 0.22 oz/ton (7.5 g/metric ton) gold and 4.0 oz/ton (137 g/metric ton) silver over a width of 1.2 ft (0.4 m). Samples from localities 3 and 4 (fig. 24) in this same shear zone contain 0.09 and 0.22 oz/ton (3.0 and 7.5 g/metric ton) gold and 8.3 and 1.5 oz/ton (285 and 51 g/metric ton) silver, respectively, over widths of 4 and 1.4 ft (1.2 and 0.4 m). Additional exploration of this shear zone may disclose a gold-silver resource.

Shear zones intersected by the adit near the face contain more than 80 percent fault gouge and 1–3 percent fine-grained sulfide minerals, mainly pyrite. Copper carbonate occurs in a shear zone intersected at 1,260 ft (384 m) from the portal.

LOWER CLEOPATRA PROSPECT

The Lower Cleopatra prospect is above the switchbacks on the Cleopatra mine road (figs. 19, 22).

A segment of a northwest-trending shear zone is developed by a 90-ft-long (27 m) adit (fig. 25, locs. 50–54). The shear zone ranges in width from 1.2 to 12.0 ft (0.4–3.7 m) and contains 3–5 percent sulfide minerals, mainly pyrite, arsenopyrite, galena, and chalcopyrite. Quartz is the principal gangue mineral.

Extensions of the shear zone are traceable in the streambed northwest of the adit (fig. 25, locs. 36–49), where highly leached outcrops contain altered granitic rock, clay, quartz, and 1–5 percent pyrite. Six highly iron-stained shear zones, probably extensions of the main zone, crop out along the mine road southeast of the adit (fig. 25, locs. 55–62).

Average grade of the less altered part of the shear zone explored by the adit is 0.02 oz/ton (0.7 g/metric ton) gold, 5.8 oz/ton (198.8 g/metric ton) silver, and 0.19 percent copper. Several tens of thousands of tons of similar grade material might be developed by exploring along the strike of the shear zone.

BLACK DIKE PROSPECT

Medium- to coarse-grained granodiorite cut by northwest- and northeast-trending joints and shear zones underlies the prospect area. Magnetite is disseminated in a 110-ft-high (33.5 m) cliff near the river (figs. 22 and 26, locs. 75–94) and in rock surrounding adit 1 (figs. 22 and 26, locs 95–98). It also occurs as coarse-grained blebs, as pods as much as 0.4 ft (0.12 m) in diameter, along joint surfaces, and in veins as much as 1 ft (0.3 m) wide. Samples were taken continuously up the cliff face at two localities (fig. 26, locs. 75–84, 85–94). At one locality near the top of the cliff, the samples (locs. 75–84) are higher in iron than those collected from lower on the cliff. Samples of unaltered rock from adit 1 also contain magnetite. Although iron-bearing float was found between the two locations, no magnetite-bearing outcrops have been discovered. A magnetometer survey (Joseph Cashman, written commun., 1973), which showed the anomaly above the cliff to be 180 ft (55 m) long and 120 ft (37 m) wide, failed to indicate a continuity of iron-rich rock between the cliff exposure and adit 1. A total of about 250,000 tons (227,000 metric tons) of rock containing an average of 20.2 percent iron is estimated to exist in the exposure at the cliff (fig. 26, locs. 75–94) and near the adit (fig. 26, locs. 95–98).

Adits 2 and 3 penetrate a highly altered breccia pipe. Exposures indicate that the pipe is at least 25 by 60 ft (7.6 by 18.3 m) in cross section and extends at least 40 ft (12.2 m) vertically. Irregularly

Continued on p. 128.

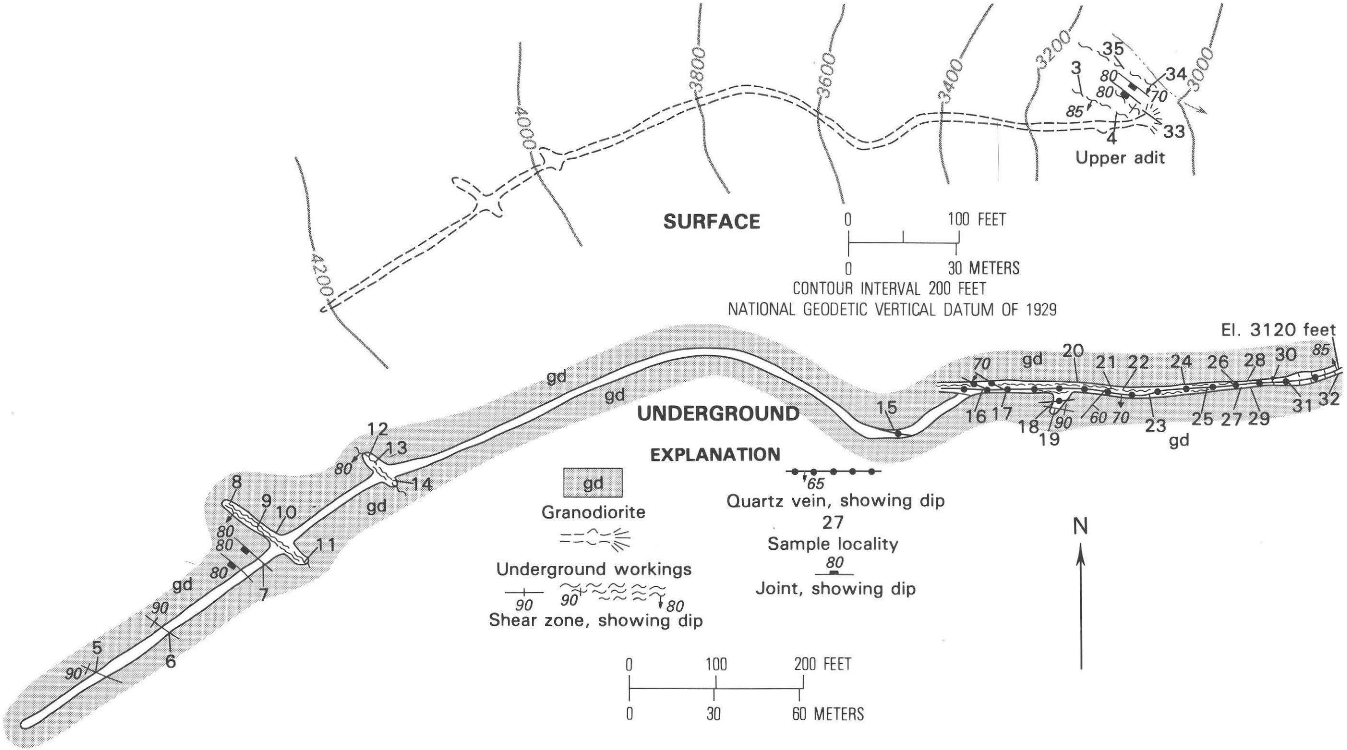


FIGURE 24.—Map of upper adit, Coney mine.

Data for samples collected from upper adit, Coney Basin mine, lower West Fork Miller River area

[Tr, trace; N, none detected; --, not analyzed; all samples are chip]

Sample			Gold		Silver				
	Length								
No.	(ft)	(m)	(oz/ton)	(g/metric ton)	(oz/ton)	(g/metric ton)	Copper (percent)	Lead (percent)	Zinc (percent)
3----	4.0	1.2	0.09	3.08	8.3	284.0	0.04	1.34	--
4----	1.4	0.4	.22	7.53	1.5	51.3	.025	.71	0.065
5----	.3	0.1	.03	1.03	N	N	--	--	--
6----	.7	0.2	.02	0.68	.1	3.4	--	--	--
7----	.8	0.2	.03	1.03	N	N	--	--	--
8----	.8	0.2	.04	1.37	.1	3.4	--	--	--
9----	.4	0.1	.03	1.03	N	N	.012	.01	.005
10----	1.2	0.4	.04	1.37	.1	3.4	.002	n	.002
11----	.4	1.2	.02	0.68	N	N	--	--	--
12----	3.5	1.1	.03	1.03	--	--	--	--	--
13----	3.5	1.1	Tr.	Tr.	.1	3.4	.006	N	.007
14----	1.0	0.3	tr.	tr.	.1	3.4	.008	.011	.007
15----	.5	0.2	tr.	tr.	.7	23.9	.029	.81	.55
16----	4.0	1.2	tr.	tr.	.1	3.4	.006	.012	.002
17----	1.5	0.4	tr.	tr.	.1	3.4	--	--	--
18----	.3	0.9	.01	0.34	.1	3.4	--	--	--
19----	1.8	0.5	tr.	tr.	.1	3.4	--	--	--
20----	1.5	0.4	N	N	N	N	--	--	--
21----	1.0	0.3	N	N	.1	3.4	--	--	--
22----	1.2	0.4	0.04	1.36	tr.	tr.	--	--	--
23----	1.5	0.4	N	N	N	N	0.007	N	0.004
24----	.5	0.2	N	N	N	N	.028	0.023	.014
25----	2.5	0.8	.01	0.34	1.4	47.9	.076	.66	1.38
26----	4.0	1.2	tr.	tr.	.2	6.8	.015	.092	.061
27----	1.5	0.4	.01	0.34	.4	13.7	.016	.20	.076
28----	1.8	0.5	.01	0.34	tr.	tr.	.017	.11	.072
29----	1.0	0.3	tr.	tr.	.1	3.4	.016	.11	.042
30----	2.5	0.8	.01	0.34	.1	3.4	.014	.15	.03
31----	.3	0.1	.01	0.34	tr.	tr.	.016	--	--
32----	1.2	0.4	.22	7.53	4.0	136.8	--	--	--
33----	2.4	0.7	.1	0.34	6.9	236.1	--	--	--
34----	2.5	0.8	N	N	tr.	tr.	--	--	--
35----	.5	0.2	N	N	N	N	--	--	--

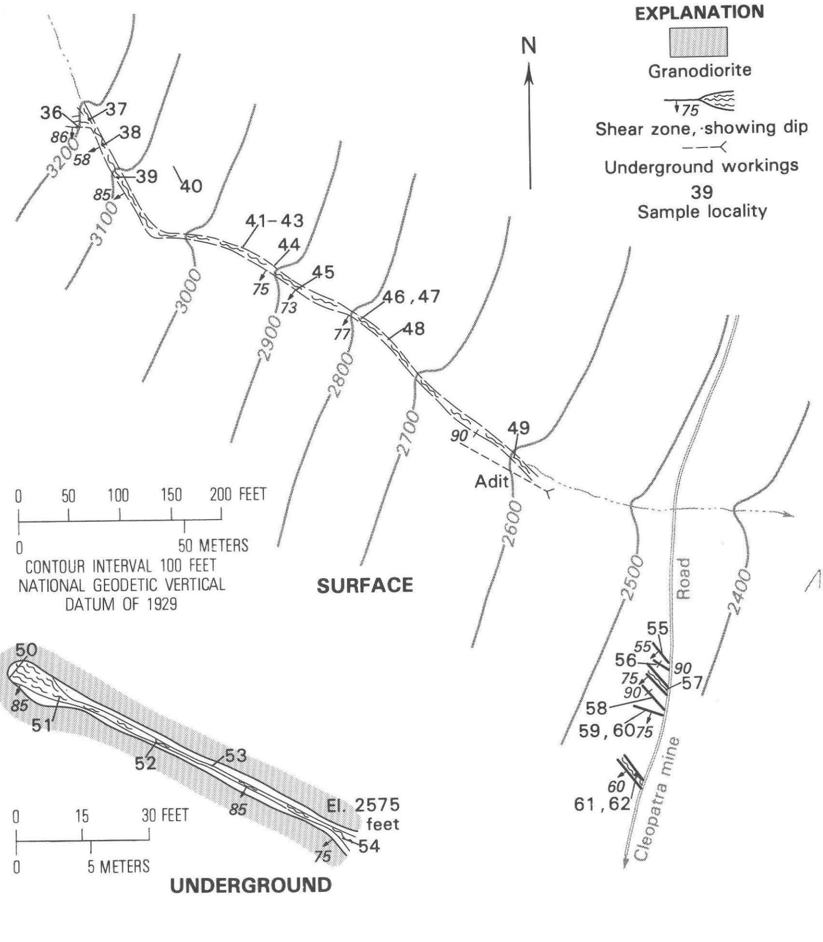


FIGURE 25.—Map of lower Cleopatra prospect.

distributed pyrite and chalcopyrite occur in the pipe, as do clay minerals, micaceous minerals, sericite, and magnetite. About 5,000 tons (4,536 metric tons) of rock containing 0.72 percent copper is estimated to occur above adit 2.

LYNN PROSPECT

The workings in the Lynn prospect are along the West Fork Miller River jeep trail (figs. 22, 27). No production has been reported from the property.

Highly weathered northwest-trending shear zones in granodiorite are intersected by two adits (fig. 27). The lower adit intersects small fractures filled with quartz, pyrite, and gouge in the initial 230 ft

(70 m). The mineralized rock that formed along fractures ranges in width from 0.3 to 1.5 ft (0.09–0.46 m). Beyond the jointed area the drift follows a shear zone containing 15–30 percent quartz, 10–25 percent clay, and 3–5 percent sulfide minerals, which include pyrite, arsenopyrite, galena, sphalerite, and chalcopyrite. The sulfide minerals occur in lenticular bodies.

The upper adit was driven along two parallel shear zones. Both zones strike N. 45° W. and dip steeply southwest. These zones contain fine-grained pyrite, galena, chalcopyrite, sphalerite, and lenses of quartz.

On the surface, northwest- and northeast-trending shear zones can be traced from the upper adit up the drainage for about 1,150 ft (350 m). These structures range in width from 0.7 to 8.0 ft (0.2–2.4 m) and contain highly altered granitic rock, quartz, pyrite, galena, sphalerite, and arsenopyrite. The northeast-trending cross fractures do not contain significant amounts of mineralized rock.

MISCELLANEOUS PROSPECTS

Other prospects in the area have no mineral-resource potential or the deposits are not sufficiently exposed to indicate a potential. Descriptions of these properties are summarized in table 5.

PROSPECTORS RIDGE AREA

Many prospects and mineralized zones are on the north end of Prospectors Ridge and the adjacent areas of the Illinois and lower Lennox Creeks drainages (fig. 7, area 1; fig. 28).

Granodiorite crops out along lower Illinois Creek, on the north end of Prospectors Ridge, and at low elevations along lower Lennox Creek. Metamorphosed volcanic, sedimentary, and ultramafic rocks crop out along upper Illinois Creek and on the south end of Prospectors Ridge. Most mineral deposits occur in altered sheared granodiorite. The deposits contain abundant quartz, mica and pyrite or arsenopyrite. Traces of sulfide minerals also occur in unaltered granodiorite. Sulfide minerals also commonly occur in iron oxide stained hornfels, and, in places, make up as much as 5 percent of the rock.

BEAVERDALE CLAIMS

The main workings on the Beaverdale patented claims consist of three adits. The workings are along an altered shear zone which strikes approximately west and dips nearly vertically (fig. 29). The shear zone ranges in width from 10 ft to more than 100 ft (3–30 m) and is

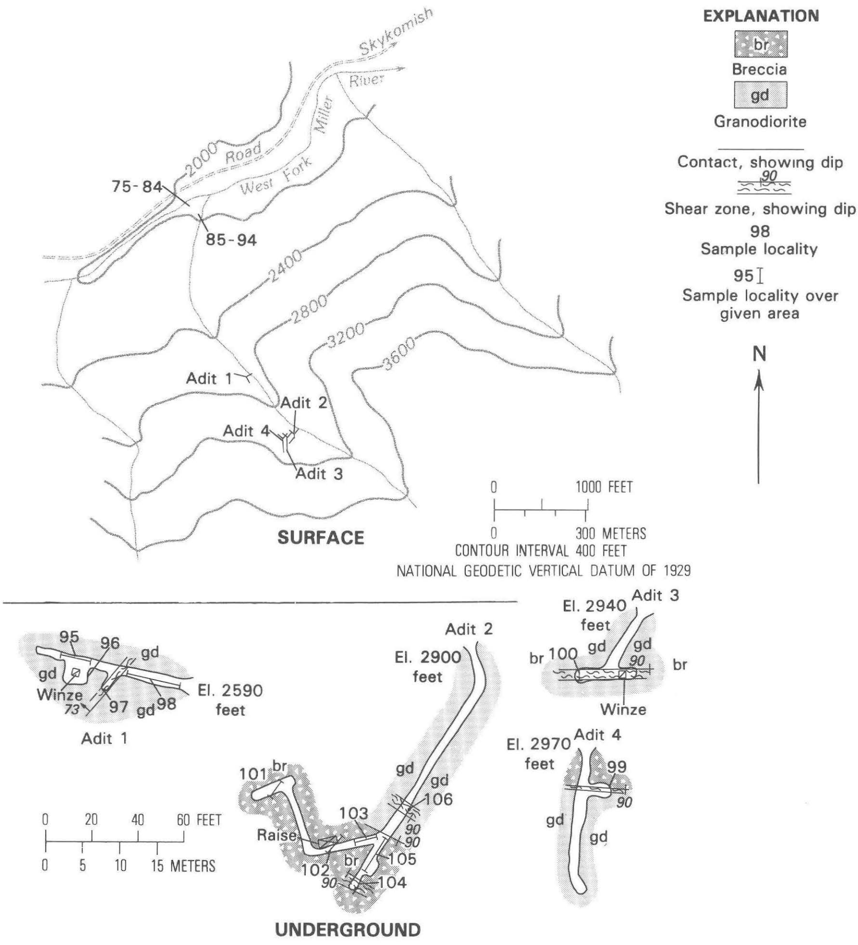


FIGURE 26.—Map of Black Dike prospect.

intermittently exposed for more than 1,000 ft (305 m) on the steep west slope of Illinois Creek. The shear zone might extend 6,500 ft (1,980 m) west to the North Fork Snoqualmie River in the area of two caved adits (fig. 28, near loc. 59).

Near the upper adit the north contact of the shear zone with the granodiorite is sharp and the country rock is unaltered. Large altered lenses of granodiorite occur in the zone near the south contact. Irregular stringers and lenses of sulfide minerals also occur in the zone.

The upper adit was driven along a continuous sulfide-rich vein that averages 1 ft (0.3 m) wide for more than 150 ft (46 m). Pyrite and

Data for samples collected from Black Dike prospect, lower West Fork Miller River area

[Tr., trace; N, none detected; --, not analyzed; all samples are chip]

Sample No.	Length (ft)	Length (m)	Gold (oz/ton)	Gold (g/metric ton)	Silver (oz/ton)	Silver (g/metric ton)	Copper (percent)	Iron (percent)
75----	8.0	2.4	N	N	0.1	3.4	--	4.0
76----	5.0	1.5	N	N	.2	6.8	--	12.5
77----	5.0	1.5	N	N	.1	3.4	--	3.1
78----	5.0	1.5	N	N	tr.	tr.	--	6.1
79----	5.0	1.5	N	N	N	N	--	17.1
80----	5.0	1.5	N	N	.1	3.4	--	23.2
81----	5.0	1.5	N	N	N	N	--	21.3
82----	5.0	1.5	tr.	tr.	.1	3.4	--	27.7
83----	5.0	1.5	N	N	tr.	tr.	--	21.7
84----	7.0	2.1	tr.	tr.	.1	3.4	--	21.9
85----	5.5	1.7	N	N	.1	3.4	--	9.7
86----	5.0	1.5	N	N	N	N	--	12.4
87----	5.0	1.5	N	N	tr.	tr.	--	16.3
88----	7.0	1.7	N	N	.1	3.4	--	19.4
89----	6.0	1.8	N	N	.2	6.8	--	20.3
90----	6.0	1.8	N	N	tr.	tr.	--	22.2
91----	5.0	1.5	N	N	tr.	tr.	--	19.3
92----	5.0	1.5	N	N	.1	3.4	--	18.6
93----	5.0	1.5	tr.	tr.	tr.	tr.	--	20.8
94----	6.0	1.8	N	N	tr.	tr.	--	27.1
95----	12.0	3.7	N	N	tr.	tr.	--	--
96----	5.0	1.5	N	N	0.3	10.3	--	58.7
97----	2.8	0.8	N	N	.1	3.4	--	24.4
98----	29.0	8.8	N	N	.2	6.8	--	30.7
99----	2.0	0.6	tr.	tr.	.1	3.4	0.05	--
100----	5.0	1.5	N	N	.2	6.8	--	--
101----	10.0	3.0	N	N	.3	10.3	3.32	--
102----	10.0	3.0	N	N	.5	17.1	.08	--
103----	4.0	1.2	N	N	.1	3.4	.25	--
104----	5.0	1.5	N	N	N	N	--	--
105----	20.0	6.1	N	N	.1	3.4	.06	--
106----	5.0	1.5	tr.	tr.	.2	6.8	.01	--

arsenopyrite in nearly equal amounts compose about 75 percent of the vein. The remainder is quartz, mica, and altered granodiorite. Altered rock south of the vein contains as much as 10 percent sulfide minerals. The highest precious- and base-metal contents in the upper adit are associated with the sulfide zones. Three samples from the sulfide-enriched sections of the vein contain an average of 0.20 oz/ton (6.86 g/metric ton) gold and 0.78 oz/ton (26.7 g/metric ton) silver over a width of 1–2 ft (0.3–0.6 m). Samples from other parts of the vein average less than 0.01 oz/ton gold and less than 0.1 oz/ton silver (0.34 and 3.4 g/metric ton, respectively) and contain minor amounts of copper, lead, zinc, and molybdenum.

The caved middle adit (No. 25, fig. 29) was driven 55 ft (17 m) along a vein striking N. 80° W. and dipping 78° SW. The vein is composed of

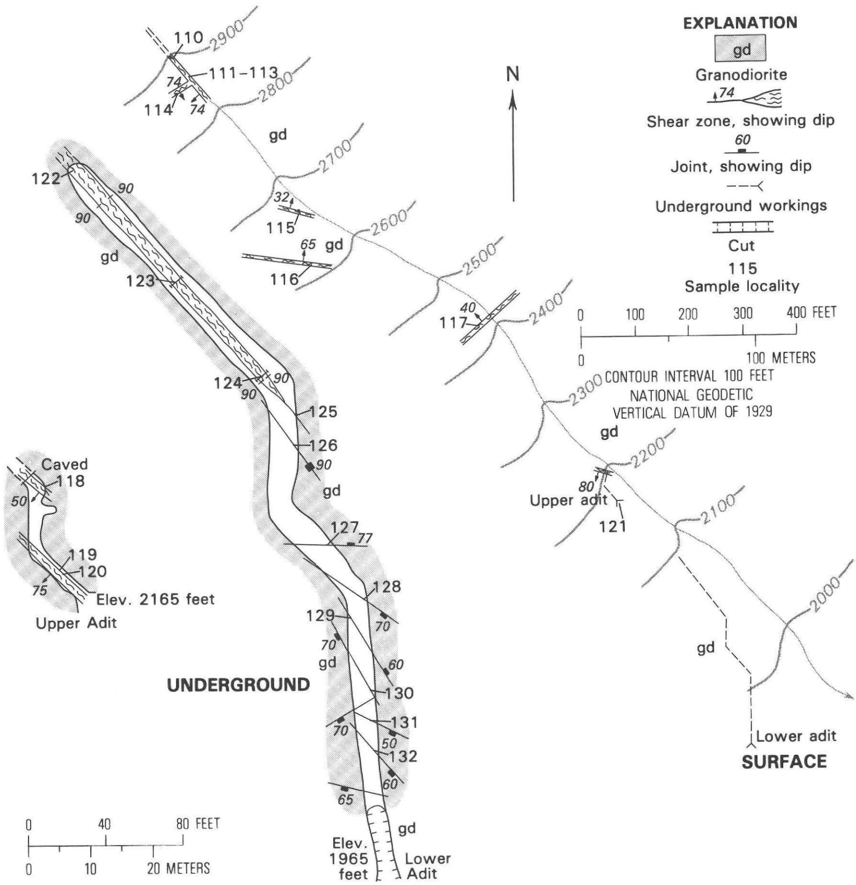


FIGURE 27.—Map of Lynn prospect.

1.3 ft (0.4 m) of quartz and sulfide minerals next to the hanging wall, 1.3 ft (0.4 m) of altered brecciated granodiorite in the center, and 1.0 ft (0.3 m) of gouge next to the footwall (Bethel, 1951, p. 212). Pyrite is the most abundant sulfide mineral with lesser amounts of arsenopyrite.

The lower adit is caved. A grab sample (fig. 29, loc. 28) from the dump contains 0.34 oz/ton (11.6 g/metric ton) gold and 2.3 oz/ton (78.8 g/metric ton) silver.

LENNOX MINE

The most extensive workings along Lower Lennox Creek are the four adits and many trenches and pits at the Lennox mine (fig. 28). Upper adits (fig. 30, locs. 40–42) were driven in the early 1900's shortly

Data for samples collected from Lynn prospect, lower West Fork Miller River area

[Tr., trace; N, none detected; --, not analyzed; NA, not applicable; all samples are chip except 121 which is a grab sample from a dump]

Sample			Gold		Silver				
	Length			(g/metric		(g/metric	Copper	Lead	Zinc
No.	(ft)	(m)	(oz/ton)	ton)	(oz/ton)	ton)	(percent)	(percent)	(percent)
110----	0.8	0.2	N	N	0.1	3.4	--	--	--
111----	4.0	1.2	0.05	1.71	1.9	65.0	0.10	1.4	0.61
112----	4.0	1.2	N	N	.1	3.4	.008	.12	.21
113----	1.0	0.3	.01	0.34	4.6	157.4	.20	5.74	2.57
114----	5.0	1.5	N	N	.1	3.4	--	--	--
115----	.7	0.2	.07	2.39	2.8	85.8	.15	.47	1.79
116----	4.5	1.4	N	N	.1	3.4	--	--	--
117----	2.0	0.6	N	N	.1	3.4	--	--	--
118----	2.0	0.6	.01	0.34	.1	3.4	.015	.079	.022
119----	5.0	1.5	N	N	.1	3.4	--	--	--
120----	.3	0.1	N	N	.1	3.4	--	--	--
121----	NA	NA	Tr.	Tr.	2.1	71.8	.25	1.23	.44
122----	3.0	0.9	N	N	.2	6.8	.007	.015	--
123----	2.0	0.6	N	N	.2	6.8	.006	.001	--
124----	5.0	1.5	N	N	.3	10.3	.033	.45	--
125----	.7	0.2	.01	0.34	.3	10.3	.025	.018	--
126----	.01	0.003	N	N	.1	3.4	--	--	--
127----	.5	0.2	N	N	tr.	tr.	.023	.015	.027
128----	.8	0.2	tr.	tr.	.9	30.8	.16	.052	.15
129----	0.4	0.1	N	N	0.1	3.4	--	--	--
130----	1.5	0.4	N	N	.1	3.4	--	--	--
131----	.3	0.1	N	N	.2	6.8	--	--	--
132----	.3	0.1	N	N	.1	3.4	--	--	--

after the deposit was discovered. The main lower adit (fig. 30, locs. 43–49) was completed in 1950 (E. A. Magill, written commun., 1951). The only recorded production from the mine was approximately 2,400 lb (1,088.6 kg) of sorted ore from the two upper adits. The material contained 1.14 oz/ton (39.1 g/metric ton) gold, 10.42 oz/ton (357.2 g/metric ton) silver, and 1.58 percent copper.

All the adits were started in granodiorite which grades into diorite in the upper adits and near the face of the lower adit (fig. 30). Irregular shear zones containing lenses and stringers of quartz accompanied by pyrite, sphalerite, arsenopyrite, chalcopyrite, and galena trend northwest in the granitic rocks. On the surface the shear zones can be traced for several hundred feet (about 90–150 m).

The upper adits were driven along a west-trending shear zone containing irregular lenses of pyrite locally surrounded by unaltered rock. The middle adit (not showing in fig. 30) was driven along an apparent downward extension of the shear zones found in the upper adits. The lower adit intersected many small faults and shears as well as a sericitic zone containing disseminated sulfide minerals. Holes drilled horizontally from the lower adit intersected mineralized structures,

Continued on p. 138.

TABLE 5.—*Miscellaneous prospects and mineralized zones in the West Fork Miller River area, Alpine Lakes area, Washington*

Sample locality No. (fig. 22)	Prospect	Summary	Sample data
1 -------	Unnamed -	A 9.0-ft-wide (2.7 m) northwest-trending steeply dipping shear zone with three 0.1-ft-wide (0.3 m) pyrite and arsenopyrite veins.	One chip sample across shear zone: 0.02 oz/ton (0.7 g/metric ton) gold, and 0.2 oz/ton (6.8 g/metric ton) silver.
2 -------	--- do ---	A 1.0-ft-wide (0.3 m) shear zone striking west and dipping 80° S.	One chip sample: 0.1 oz/ton (3.4 g/metric ton) silver.
65 ------	Francis Lake.	A 2.0-ft-wide (0.6 m) iron oxide stained zone in granodiorite.	One chip sample: trace of silver.
69 ------	Magnetite prospect.	A 15-ft-wide (4.6 m) northwest-trending zone with pods and lenses of magnetite.	One chip sample: 30 percent iron.
70 ------	Unnamed -	A 1.0-ft-wide (0.3 m) highly altered shear zone in granodiorite.	One chip sample: no valuable metals detected.
71 ------	--- do ---	A 7.0-ft-wide (2.1 m) northwest-trending shear zone containing quartz and less than 1 percent sulfide minerals.	One chip sample: trace of gold and 0.1 oz/ton (3.4 g/metric ton) silver.
72 ------	--- do ---	A highly silicified shear zone with finely disseminated pyrite.	One chip sample: 0.2 oz/ton (6.8 g/metric ton) silver.
73 ------	--- do ---	A 5-ft-wide (1.5 m) fracture zone striking N. 35° W., dipping vertically.	One chip sample: no valuable metals detected.
107, 108 -	--- do ---	Two northwest-trending shear zones, 2.1 and 3.0 ft (0.6–0.9 m) wide containing less than 1 percent pyrite. One 10-ft-long (3 m) adit.	Two chip samples: as much as 0.05 oz/ton (1.7 g/metric ton) gold, 0.2 oz/ton (6.8 g/metric ton) silver, and 0.012 percent copper.
63, 64, 66, 67, 68, 74, 109, 133, 192.	Placer prospects.	Placer samples near bedrock exposures and favorable gravel deposits in West Fork Miller River.	Nine pan samples: no recoverable gold. Samples 64, 66, 74, 133: 0.1–0.3 percent WO_3 in black-sand concentrates.

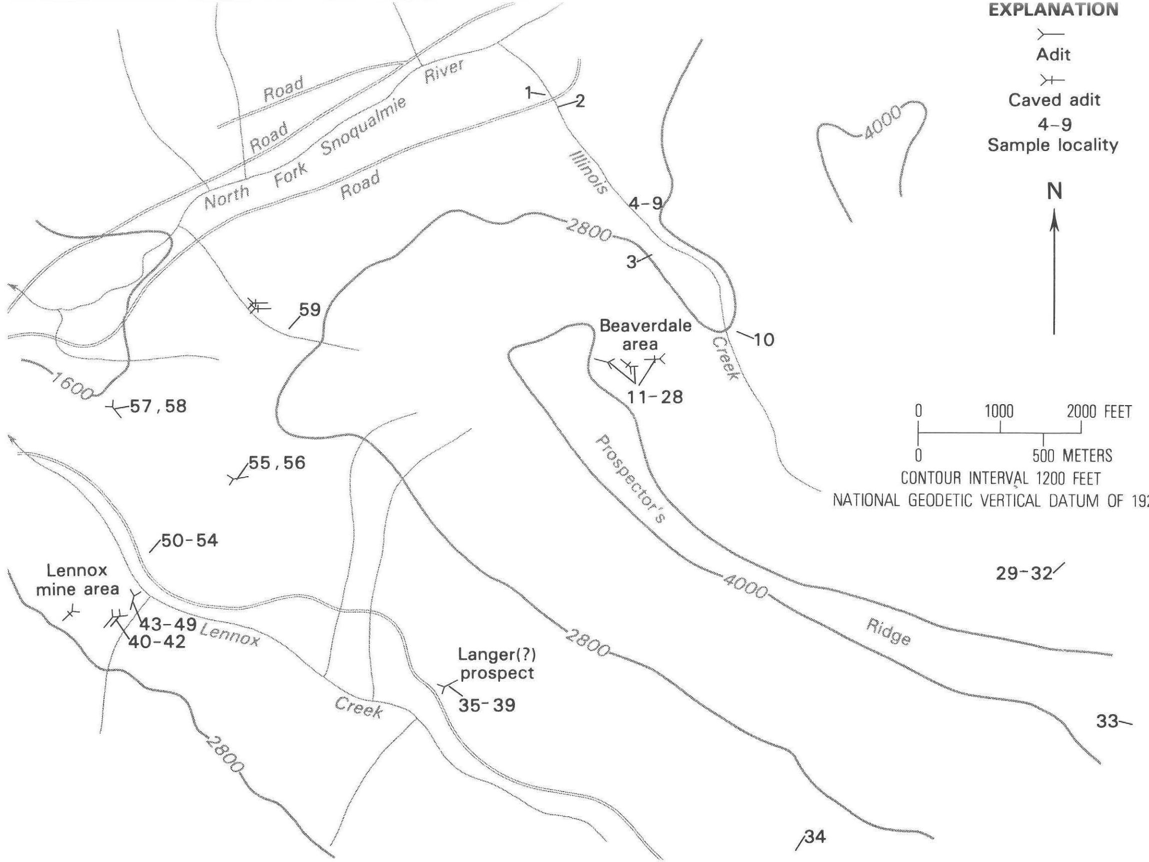


FIGURE 28.—Map showing mines and prospects in the Prospectors Ridge area.

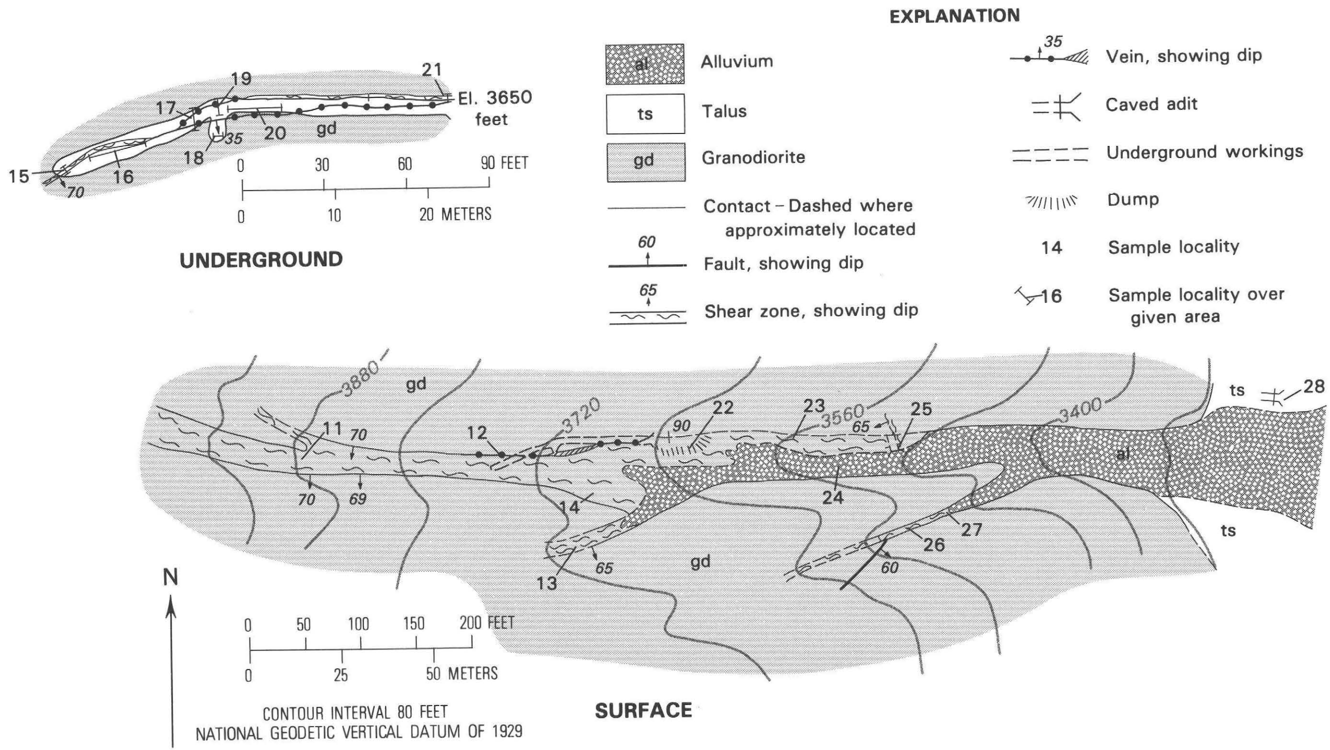


FIGURE 29.—Map of workings on Beaverdale claims.

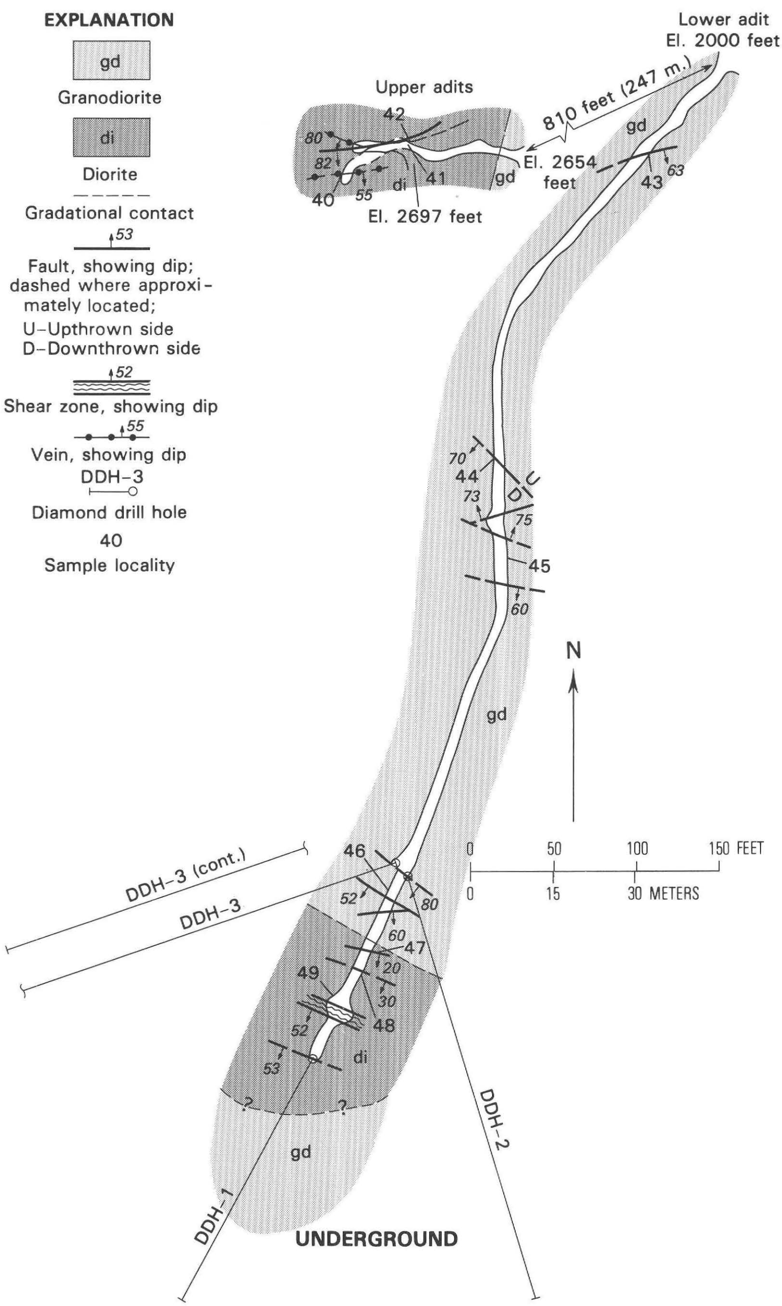


FIGURE 30.—Map of Lennox mine.

possibly downward extensions of the mineralized structures found in the upper adits, but no ore-grade material was found (fig. 30).

Samples from the upper adits across widths averaging 1.5 ft (0.5 m) (fig. 30, locs. 40, 41) contain gold values ranging from 0.07 to 0.39 oz/ton (2.4–13.4 g/metric ton), silver values ranging from 0.4 to 43.8 oz/ton (14–1,501.7 g/metric ton), and copper values ranging from 0.02 to 2.20 percent. The shear zone in the middle adit was sampled by E. A. Magill (written commun., 1951), who found that across 1.3 ft (0.4 m) the vein contains 0.12 oz/ton (4.1 g/metric ton) gold, 4.28 oz/ton (146.7 g/metric ton) silver, and 0.35 percent copper. The metal content of samples from the lower adit is very low (fig. 30, locs. 43–49).

A small gold-silver resource exists in the area between the upper and middle adits. The prospects have a potential for discovery of additional resources.

MISCELLANEOUS PROSPECTS

Other prospects and mineralized areas in the Prospectors Ridge area either have no resource potential or are not well enough exposed to determine the potential. These are summarized in table 6.

TABLE 6.—*Miscellaneous prospects and mineralized zones in the Prospectors ridge, Alpine Lakes area, Washington*

Sample locality No. (fig. 28)	Prospect	Summary	Sample data
1-3 -----	Illinois Creek placers.	Samples 1 and 2 from limonite-stained gravel downstream from bedrock outcrops near Illinois Creek. Sample 3 from sandy alluvium above falls on lower Illinois Creek.	Three pan samples: few very small colors of gold. No resource of gold, silver, or platinum.
4-9 -----	Beaverdale claims.	Altered shear zone in granodiorite. Average strike about N. 10° E., dips vertical. At least 50 ft (15 m) wide. Estimated 10 percent of rock composed of veins 0.25 in. (0.006 m) to 1.5 ft (0.46 m) wide. Maximum of 10 percent sulfide minerals in shear zones and veins, mostly pyrite, chalcopyrite, and molybdenite. Pegmatite pod 10 ft (3 m) long and 3 ft (0.9 m) wide.	Five chip samples from shears and veins: trace of gold, less than 0.2 oz/ton (6.8 g/metric ton) silver, less than 0.25 percent copper, lead, zinc, and molybdenum. One sample from a pegmatite; 0.2 oz/ton (6.8 g/metric ton) silver, 0.17 percent copper, and 0.46 percent molybdenum.
29-33 ---	Illinois Creek peridotite.	Hornfels and sheared peridotite. Some orbicular hornblende-talc masses. Maximum of 5 percent black metallic minerals, disseminated and concentrated along joints and veins. Concentrations are 0.2 ft (0.6 m) wide and 1.5 ft (0.5 m) long.	Four chip samples: trace of gold, maximum of 0.1 oz/ton (3.4 g/metric ton) silver, no detectable platinum. One select sample of chromite-bearing rock; 12 percent chromium.

TABLE 6.—*Miscellaneous prospects and mineralized zones in the Prospectors ridge, Alpine Lakes area, Washington*—Continued

Sample locality No. (fig. 28)	Prospect	Summary	Sample data
34 ------	Unnamed -	Small pit in diorite-hornfels complex is limonite stained and contains 1-5 percent very fine grained disseminated sulfide minerals and some segregations as much as 0.1 ft (0.03 m) in diameter, mostly pyrite and arsenopyrite.	One chip sample: 0.021 percent copper.
35-39 ---	Langer(?) -	Limonite-stained weathered dioritic and metamorphic rock. Irregular lenticular shears and calcite-filled breccia zones 0.5-2.0 ft (0.15-0.6 m) wide. Maximum of 5 percent disseminated sulfide minerals throughout the rock; some concentrated along shears. Sulfide minerals mostly pyrite, arsenopyrite, sphalerite, and chalcopyrite. 402-ft-long (122.5 m) adit.	Five chip samples: maximum 0.04 oz/ton (1.4 g/metric ton) gold, 0.1 oz/ton (3.0 g/metric ton) silver, and 0.012 percent copper.
50-54 ---	Sagmo and Stuber.	Diorite and granodiorite containing shear zones; one averages 1.5 ft (0.46 m) wide. Contains 25 percent sulfide minerals, mostly pyrite, sphalerite, arsenopyrite, chalcopyrite, and galena. Strikes N. 80° W. and dips 60° SW.	Five chip samples from shear zones and silicified rock: as much as 0.2 oz/ton (6.8 g/metric ton) silver, 0.5 percent lead in sample from silicified rock adjacent to shear.
55-56 ---	Jack -----	Thirty-five-foot-long (10.7 m) adit along 0.5-ft-wide (0.15 m) shear zone trending N. 50°-80° E. and dipping 72°-85° SE. in granodiorite and schist. Sulfide minerals, mostly arsenopyrite and pyrite in shear zone.	Two chip samples: maximum 0.11 oz/ton (3.8 g/metric ton) gold, 0.2 oz/ton (6.8 g/metric ton) silver, and 0.26 percent zinc.
57-58 ---	Nellis ----	Twenty-foot-long (6.1 m) adit along 1-2-ft-wide (0.3-0.61 m) shear zone in granodiorite. Shear zone strikes N. 70° W. and dips 69° SW. Maximum of 5 percent sulfide minerals, mostly pyrite.	Two chip samples: negligible values.

MONEY CREEK AREA

Part of the Money Creek mining district described by Livingston (1971, p. 35) extends into the Money Creek area of the Alpine Lakes study area (fig. 7, area 2; fig. 31). The area has been prospected for gold, silver, copper, lead, zinc, and antimony since about 1892. Today much of the land along Money Creek and the drainages extending into the study area is held as mining claims. Patented mineral property inside the study area consists of about 40 acres (16.2 ha) on Kimball Creek.

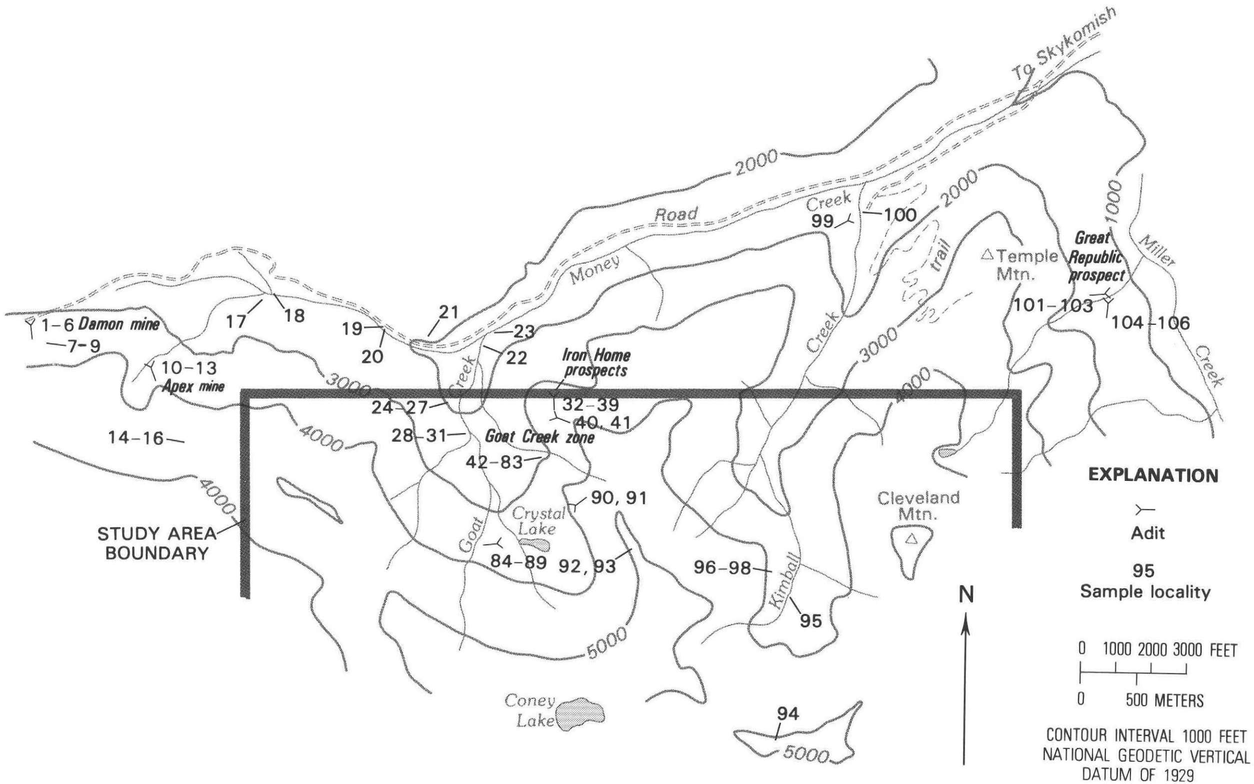


FIGURE 31.—Map showing mines and prospects in the Money Creek area.

Granodiorite of the Snoqualmie batholith, Tertiary volcanic rocks (mostly andesite breccia and andesite flows), and a small amount of pre-Cretaceous metamorphic rocks underlie the area.

Galena, sphalerite, chalcopyrite, stibnite, arsenopyrite, and pyrite associated with quartz, calcite, and tourmaline occur in fissures and shear zones in all the rock types. Most of the major mineralized zones strike in a generally east-west direction. Country rock adjacent to the zones is only slightly altered and mineralized.

The Damon, Apex, and Great Republic properties adjacent to the study area have underground workings totaling 7,000 ft (2,134 m), and the mineralized structures explored by these workings extend into the study area. The Apex and Damon mines contain indicated paramarginal resources, and submarginal resources occur at one other prospect in the study area.

Placer samples contain only trace amounts of valuable detrital minerals.

DAMON MINE

The Damon mine (fig. 31, locs. 1-9) was opened in the 1890's and was worked intermittently until 1941 (Livingston, 1971, p. 147). The only production recorded is of test shipments in 1904 and 1940 which totaled 33 tons (30 metric tons) of ore that contained 21 oz (653 g) gold, 207 oz (6,438 g) silver, and 1,840 lb (835 kg) lead. The principal workings are a 1,400-ft-long (427 m) crosscut adit and 730 ft (223 m) of drifts on two shear zones named the Damon and Priestly "veins."

The crosscut adit was driven S. 5° E. in granodiorite and intersects three shear zones, all of which contain brecciated and leached diorite, white quartz, and metallic sulfide minerals (fig. 32). A minor poorly mineralized shear zone, 3.2 ft (0.98 m) wide, was crosscut 590 ft (180 m) from the portal but was not developed. The Damon "vein" strikes N. 80°-85° W., dips 60°-87° SW., and was crosscut at 920 ft (280 m). The zone ranges in width from 1 to 7 ft (0.3-2.1 m). The Priestly "vein" strikes N. 80°-85° E., dips 55°-75° SE., and was intersected at a point 1,400 ft (427 m) from the portal. The zone ranges in width from 1 to 4.4 ft (0.3-1.3 m).

Metallic sulfide minerals are disseminated in the quartz veins and diorite stringers within the shear zones. The minerals in decreasing order of abundance are arsenopyrite, pyrite, galena, sphalerite, chalcopyrite, and stibnite. The shear zones are highly altered in the

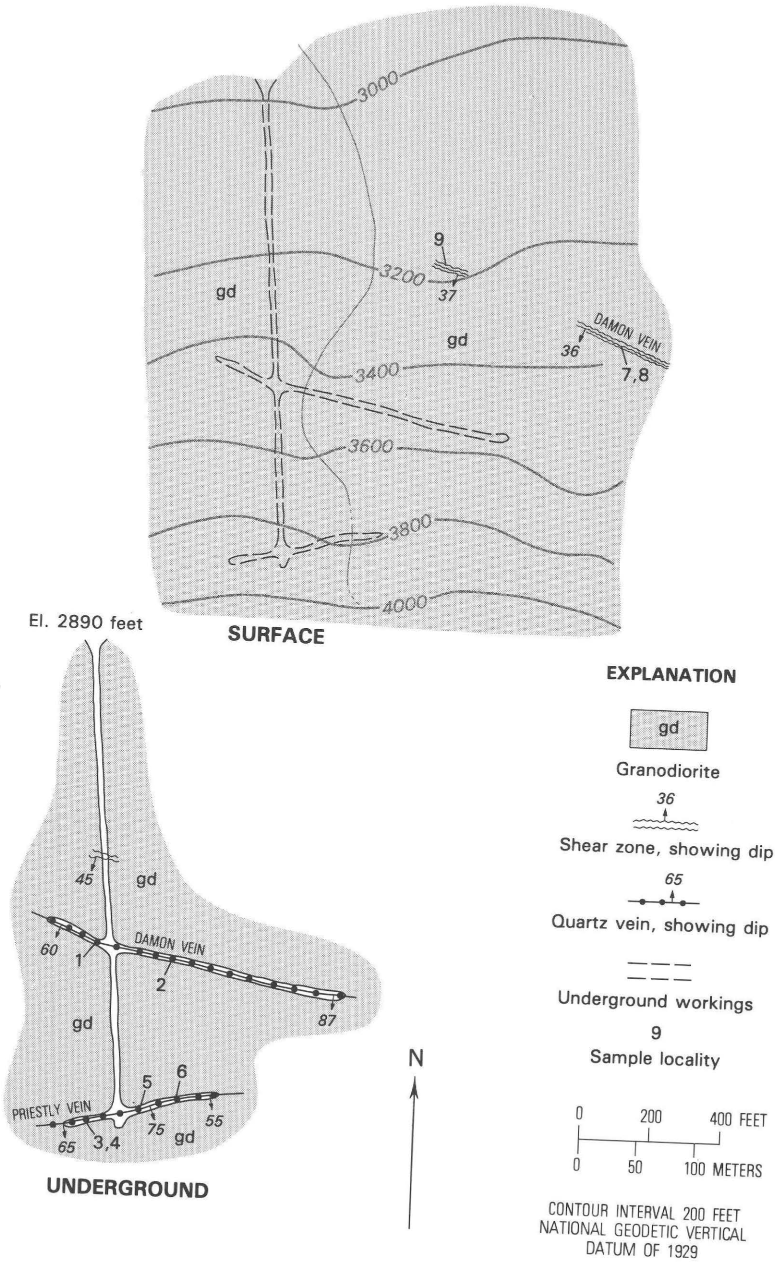


FIGURE 32.—Map of Damon mine.

underground workings and on the surface. Many of the original sulfide minerals have been oxidized or completely removed, and some of the gangue minerals were altered to clay by ground-water leaching.

A summary of results that includes data from the current study, a previous U.S. Bureau of Mines investigation, a study by the State of Washington, (Livingston, 1971, p. 147), and an evaluation by a consulting engineer (J. Cashman, written commun., 1973) indicated paramarginal resources for the Damon and Priestly "veins" of about 340,000 tons (308,448 metric tons) of rock having an estimated average grade of 0.16 oz/ton (5.48 g/metric ton) gold, 0.71 oz/ton (24.3 g/metric ton) silver, 0.11 percent copper, 0.93 percent lead, 0.35 percent zinc, 1.35 percent antimony, and 4.59 percent arsenic. The estimate is based on an average width of the shear zones of slightly more than 2 ft (0.61 m).

Exploration of the shear zone along the strike and at additional depths might substantially increase the potential resource.

APEX MINE

The Apex mine (fig. 31, locs. 10–13) was opened in 1892 by John Maloney (Livingston, 1971, p. 145). Development consists of more than 2,240 ft (683 m) of underground workings on four levels and stopes between the adit levels (fig. 33). Level 2 is the only part of the mine presently open.

Value of mine production is estimated to be approximately $300,000, mainly in gold. The mine was closed by U.S. War Production Board Order L–208 in 1942 and never reopened.

The adits drifted on or intersected a persistent shear zone which strikes N. 70°–80° E. and dips generally 60° SE. The zone includes quartz veins ranging in width from a few inches to more than 6 ft (1.8 m) and averaging 1.2 ft (0.4 m). Arsenopyrite, pyrite, chalcopyrite, galena, and sphalerite occur in the shear zone, associated with quartz, tourmaline, and calcite. Fault gouge commonly occurs near the footwall in the shear zone.

The stoped areas extend approximately 400 ft (122 m) along the strike of the zone and more than 500 ft (152 m) updip from level 4 (fig. 33) and reportedly are backfilled with low-grade ore (Livingston, 1971, p. 147; Patty, 1921, p. 305). An estimated 20,000 tons (18,144 metric tons) of rock containing between 0.14 and 0.50 oz/ton (4.8–17.1 g/metric ton) gold, 0.27 oz/ton (9.3 g/metric ton) silver, and 0.11 percent lead was used as backfill in these stopes.

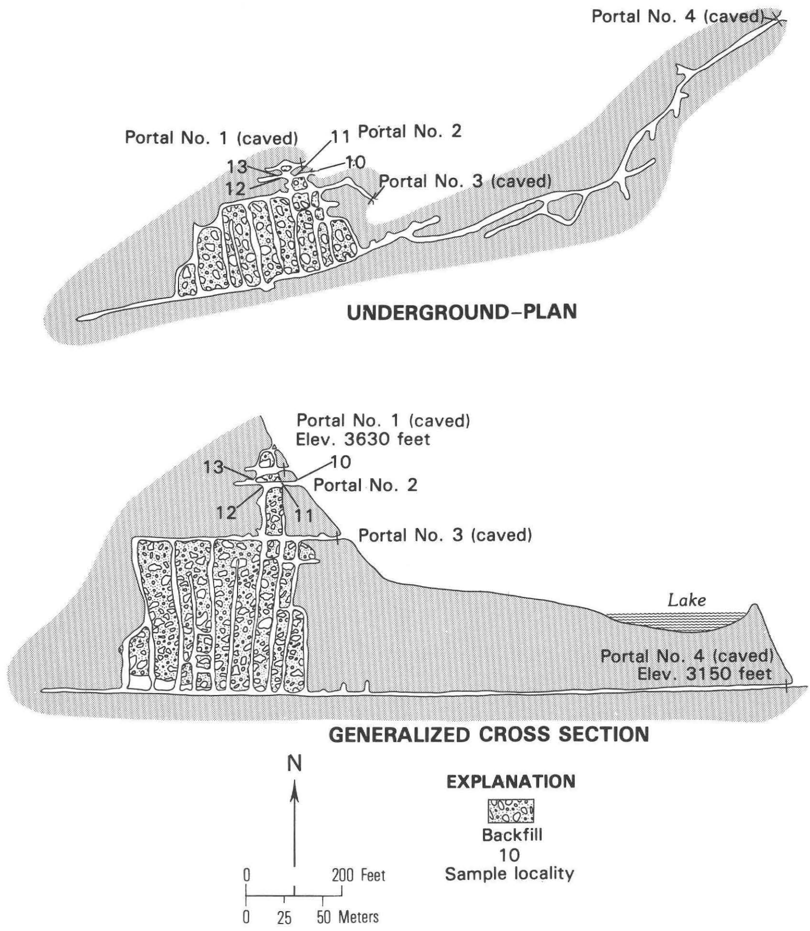


FIGURE 33.—Map and cross section of Apex mine.

Indicated resources of the Apex shear zone, based on results of the present investigation and previous studies by Livingston (1971) and W. K. Beach (written commun., 1972), are 133,000 tons (121,000 metric tons) averaging 1.0 oz/ton (34.3 g/metric ton) gold, 7.16 oz/ton (245.5 g/metric ton) silver, 0.16 percent copper, 0.25 percent lead, and 0.18 percent zinc. Samples from the shear zone and backfill contain as much as 0.18 percent antimony and 2.6 percent arsenic.

Potential for finding additional resources along projections of the Apex shear zone is good.

GREAT REPUBLIC PROSPECT

The Great Republic propsect is on the east slope of Temple Mountain (fig. 31, locs. 101–106). The country rock is andesite and argillite overlying granodiorite. Underground development totals 780 ft (238 m) of workings on two levels and in small stopes. The two adits are connected by a 65-ft-long (20 m) inclined raise (fig. 34).

The workings explore a 1.5- to 3.0-ft-wide (0.5–0.9 m) east-striking mineralized fault zone which dips 20°–30° S. The zone is composed of iron oxide and antimony oxide stained fault gouge. The gouge contains lenses and fine-grained disseminations of stibnite and pyrite.

The most highly mineralized rock is found in the upper adit, where a pod of nearly solid stibnite 2.5 ft (0.8 m) wide and 4.0 ft (1.2 m) long occurs on the left wall near the portal. Thin lenses of stibnite remain on the walls of the four stopes. Beyond the stopes, the main vein ends at a narrow fault zone which strikes N. 70° W. and dips 45° SW. The narrow fault zone contains disseminated pyrite, stibnite, and thin lenses of arsenopyrite.

The mineralized fault zone in the lower adit contains scattered stibnite and pyrite. The wallrock is highly kaolinized and sericitized.

Minor antimony resources may exist along this fault zone.

GOAT CREEK SHEAR ZONE

A sinuous 12- to 110-ft-wide (3.7–30.5 m) shear zone cuts granodiorite on the steep east side of Goat Creek (fig. 31, locs. 42–83; fig. 35); it strikes generally N. 70° W. and dips 55°–65° SW. The well-defined hanging wall is exposed for 1,100 linear ft (335 m). Overburden and talus obscure the footwall.

Most of the shear zone is composed of altered silicified granodiorite and quartz veins. Metallic sulfide minerals are disseminated in both the altered granodiorite and quartz; in descending order of abundance they are pyrite, arsenopyrite, galena, chalcopyrite, and sphalerite.

Samples of altered surface rocks from the fault zone contain low-grade gold, silver, copper, lead, and zinc values (fig. 35). Higher grade material may exist below the leached outcrops.

MISCELLANEOUS PROSPECTS

Other prospects and mineralized zones existing in the Money Creek area have no potential or are not sufficiently exposed to determine their potential. Descriptions of these prospects are summarized in table 7.

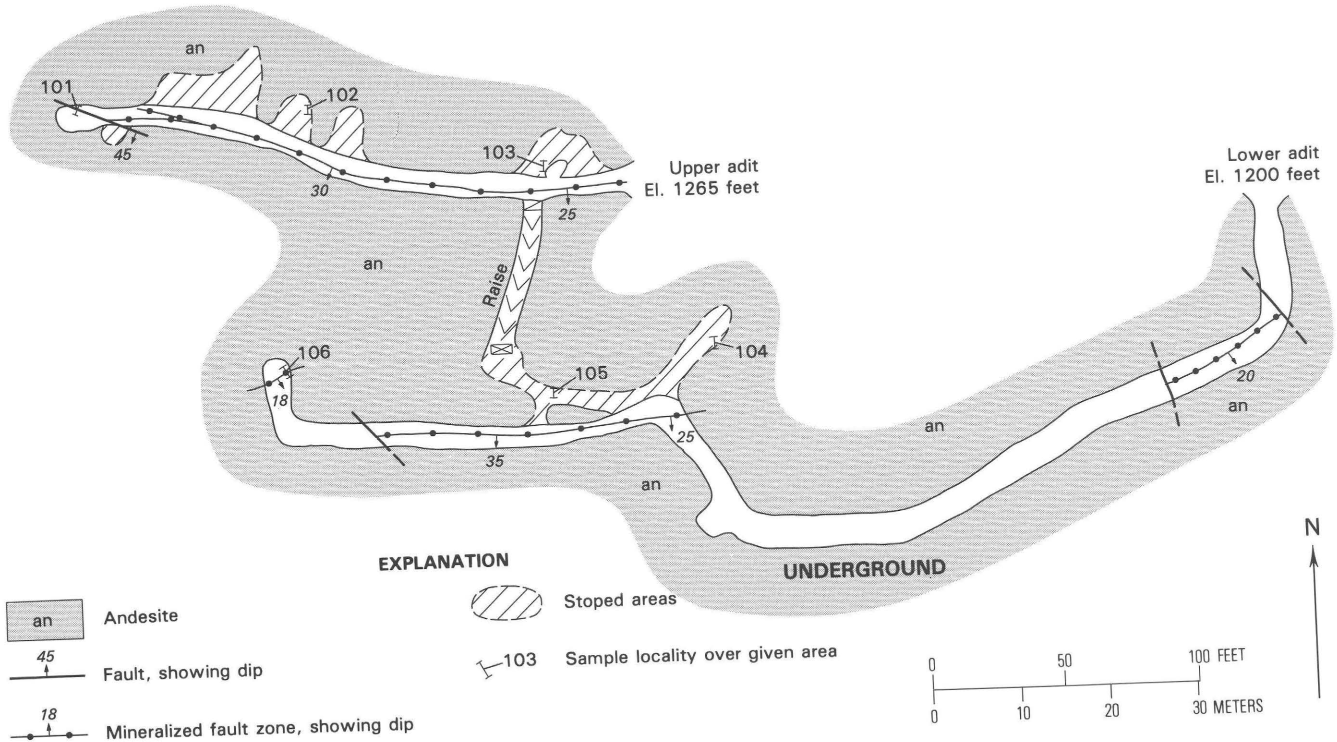


FIGURE 34.—Map of Great Republic prospect.

TABLE 7.—*Miscellaneous prospects and mineralized zones in the Money Creek area, Alpine Lakes area, Washington*

Sample locality No. (fig. 31)	Prospect	Summary	Sample data
14-16 ---	High Tariff. --	A 30- to 87-ft-wide (9.1-26.5 m) brecciated iron oxide stained zone in granodiorite contains pyrite and arsenopyrite.	Three chip samples across zone: 0.1-0.2 oz/ton (3.4-6.8 g/metric ton) silver, 0.1 percent copper, and trace amounts of lead, zinc, and molybdenum.
17, 18 ---	Money Creek placer.	Stream gradient 18 percent. Ninety percent of deposit composed of cobbles and boulders 6 in. to 10 ft (0.15-3.1 m) in diameter.	Two pan samples: trace of black sand.
19 ------	Unnamed -	A 10.0-ft-wide (3.0 m) shear zone in iron oxide stained quartzite. Shear zone strikes N. 80° E. and dips 65° SE. Zone contains disseminated pyrite, and gangue minerals partially altered to clay.	One chip sample: 0.19 oz/ton (6.5 g/metric ton) gold and 0.2 oz/ton (6.8 g/metric ton) silver across a width of 10 ft (3 m).
20 ------	Money Creek placer.	Pan sample from drainage into Money Creek. Stream gradient 30 percent. Deposit composed of angular rock fragments.	One pan sample: trace of black sand.
21 ------	Money Creek Road mine.	A 2.0-ft-wide (0.6 m) iron oxide stained, highly altered shear zone in argillite and quartzite. Zone strikes east, dips 45° S., and contains 10-20 percent disseminated pyrite and arsenopyrite.	One chip sample: 0.2 oz/ton (6.8 g/metric ton) silver, 0.1 percent lead and 0.1 percent zinc.
22 ------	Goat Creek placer.	Stream gradient is 2-5 percent. More than 50 percent of deposit composed of boulders greater than 6 in. (0.15 m) in diameter.	One pan sample: trace of black sand.
23 ------	Money Creek placer.	Stream gradient less than 2 percent. Estimated thickness of gravel 150 ft (45.7 m). Ninety percent of gravel greater than 6 in. (0.15 m) in diameter.	One pan sample: trace of black sand.
24-27 ---	Unnamed -	A shear zone 1-2 ft (0.3-0.6 m) wide is in granodiorite. It strikes east, dips south, and is exposed for 200 ft (61 m). Zone is composed of highly altered granodiorite containing 25-50 percent quartz and 5 percent pyrite.	Four chip samples and one grab sample: trace to 0.07 oz/ton (2.4 g/metric ton) gold, 0.1-0.3 oz/ton (3.4-10.3 g/metric ton) silver and 0.02-0.12 percent copper.
28-31 ---	--- do ---	A shear zone, 0.7-1.8 ft (0.2-0.6 m) wide, is in granodiorite. Zone contains quartz stringers 1-2 in. (0.02-0.05 m) wide, about 1 percent disseminated pyrite. Zone is exposed for 300 ft (91 m).	Four chip samples: two contain 0.1 oz/ton (3.4 g/metric ton) silver, two contain no detectable valuable metals.

TABLE 7.—*Miscellaneous prospects and mineralized zones in the Money Creek area, Alpine Lakes area, Washington*—Continued

Sample locality No. (fig. 31)	Prospect	Summary	Sample data
32-39 ---	Iron Home No. 1.	Mineralized fracture zones occur in argillite, quartzite, and shale. Zones explored by 180 ft (55 m) of underground workings. Fracture zones 0.3-5.0 ft (0.1-1.5 m) wide are iron oxide stained and contain as much as 50 percent quartz and 1-5 percent pyrite, chalcopyrite, bornite, and galena.	Seven chip samples: trace to 0.2 oz/ton (6.8 g/metric ton) silver, trace to 0.53 percent copper, traces of lead, Zinc and antimony, and as much as 0.4 percent arsenic.
40, 41 ---	Iron Home No. 2.	A 1.3-ft-wide (0.4 m) shear zone strikes N. 65° W., dips 60° NE., and occurs in granodiorite. It was explored by a 42-ft-long (12.8 m) adit. Zone contains quartz stringers 1 in. (2.5 cm) wide and galena.	Two chip samples: 0.2 oz/ton (6.8 g/metric ton) silver, 0.09 percent copper, and traces of lead, zinc, and antimony.
84-89 ---	Unnamed -	A 0.3-0.5-ft-wide (0.09-0.15 m) shear zone in granodiorite trends N. 80° E. and dips 55° SE. Zone is exposed for 35 ft (10.7 m) by an adit that is partly flooded.	Six chip samples: as much as 0.18 oz/ton (6.2 g/metric ton) gold, trace to 1.6 oz/ton (54.9 g/metric ton) silver, 0.01-0.14 percent copper, 0.01-1.41 percent lead, and 0.01-2.24 percent zinc.
90, 91 ---	--- do ---	A 10-ft-long (3.0 m) adit explored two parallel shear zones in granodiorite. The zones are 0.3 ft (10.2 cm) and 1.5-5.0 ft (0.5-1.5 m) wide, trend N. 60° W., and dip 60°-80° SW. Zones are composed of altered iron oxide stained granodiorite, minor arsenopyrite and azurite, and about 5 percent pyrite.	Two chip samples: 0.1 oz/ton (3.4 g/metric ton) silver, 0.11 percent copper, and less than 0.1 percent lead and antimony combined, and 0.01 percent zinc.
92, 93 ---	--- do ---	A shear zone in granodiorite trends east and dips 75° S. Zone is exposed for 100 ft (30.5 m). A 4-ft-wide (1.2 m) iron oxide stained altered zone parallels shear zone on footwall side.	Two chip samples: as much as 0.02 oz/ton (0.7 g/metric ton) gold, and 1.6 oz/ton (54.9 g/metric ton) silver.
94 ------	--- do ---	An iron oxide stained fracture zone in granodiorite is 30 ft (9.1 m) wide, trends N. 70° W., and contains minor pyrite.	One chip sample: trace of silver.
95 ------	--- do ---	A 5.6-ft-wide (1.7 m) shear zone trends N. 10° W. and dips 75° NE. Pyrite occurs in 1-in.-1-ft-wide (2.5-30.5 cm) bands.	One chip sample: no valuable metals detected.

TABLE 7.—*Miscellaneous prospects and mineralized zones in the Money Creek area, Alpine Lakes area, Washington*—Continued

Sample locality No. (fig. 31)	Prospect	Summary	Sample data
96-98 ---	--- do ---	A 4.2-ft-wide (1.3 m) shear zone in granodiorite trends N. 75° W. and dips 75° SW. It contains disseminated pyrite and pyrite pods as much as 0.5 ft (0.2 m) in diameter.	Three chip samples: as much as 0.02 oz/ton (0.7 g/metric ton) gold, 0.2 oz/ton (6.8 g/metric ton) silver, and 0.02 percent lead.
99 ------	--- do ---	A caved adit explored a highly altered zone in fractured granodiorite that contains about 5 percent disseminated pyrite.	One sample: no valuable metals detected.
100 -----	Kimball creek placer.	Stream gradient is greater than 20 percent. Small gravel bars occur on lee side of large boulders.	One pan sample: trace of black sand.

MINERAL CREEK AREA

More than 25 underground workings totaling about 1,000 ft (305 m) were mostly completed before 1930 along lower Mineral Creek (fig. 36). A 25-ton-per-day (23 metric ton) mill, now in ruins, was built about 1920. Production from the lower Mineral Creek area includes 2,443 lb (1,108 kg) of copper produced in 1917 and 3,582 lb (1,625 kg) of copper and 25 oz (777.6 g) of silver produced in 1922 (U.S. Bureau of Mines, written commun., undated).

Sedimentary, metamorphic, granodioritic, and volcanic rocks underlie the lower Mineral Creek drainage. The mineralized zone extends at least 3,000 ft (914 m) vertically. Sulfide minerals, mostly pyrite, pyrrhotite, and arsenopyrite, constitute 5–10 percent of the rocks; chalcopyrite and molybdenite commonly compose less than 25 percent of the sulfide minerals. The sulfide minerals are scattered throughout the rock as small irregular blebs and as concentrations in breccias and fracture fillings.

An area of relatively unexplored mineral potential that occurs farther up Mineral Creek and appears to coincide with a magnetic high centered over the Park Lakes area is shown on the aeromagnetic map (pl. 1). This high, which is part of a larger triangle-shaped anomaly that extends from Alaska Mountain through Chikamin Peak to the Three Queens, may be caused by mineralized rock near the margin of the Three Queens stock.

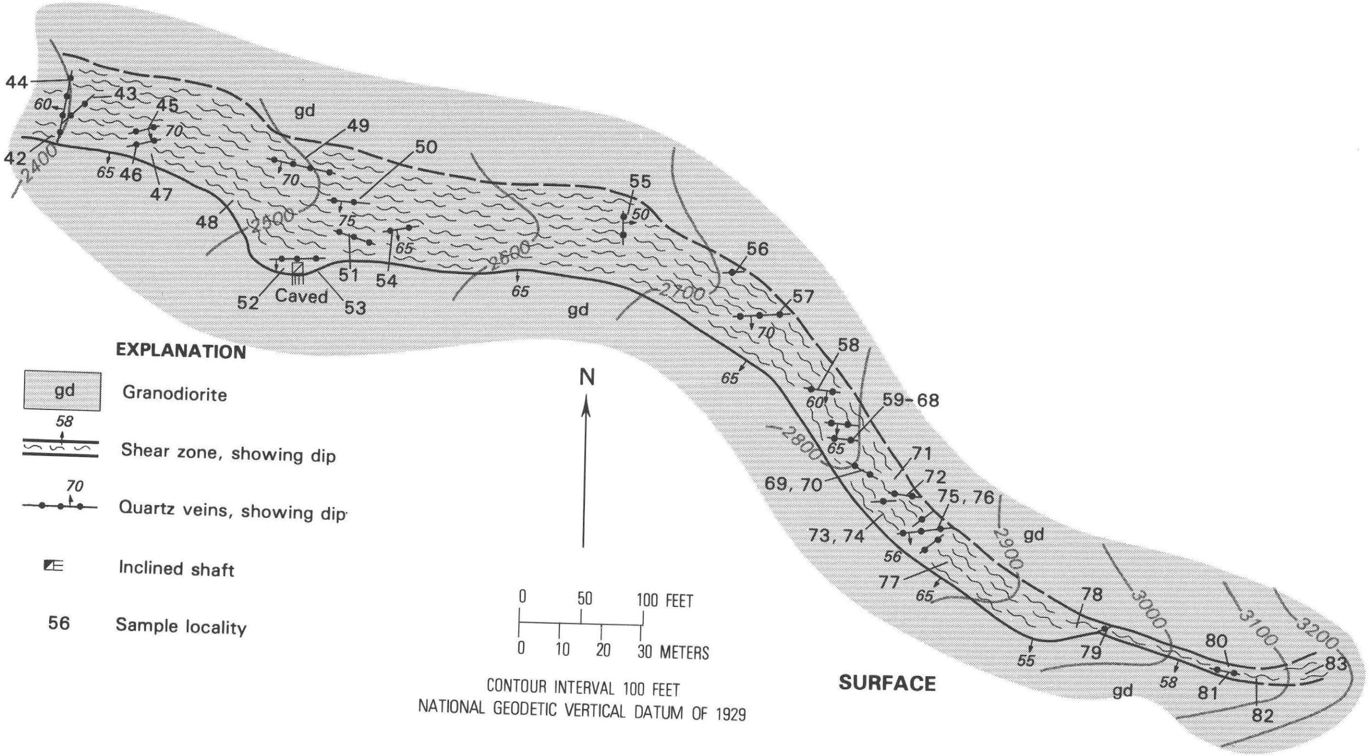


FIGURE 35.—Map of Goat Creek shear zone.

Data for samples collected from Goat Creek shear zone, Money Creek area

[Tr., trace; N, none detected; --, not analyzed; all samples are chip]

Sample	Length		Gold		Silver		Copper	Lead	Zinc	Arsenic
No.	(ft)	(m)	(oz/ton)	(g/metric ton)	(oz/ton)	(g/metric ton)	(percent)	(percent)	(percent)	(percent)
42----	1.0	0.3	0.03	1.03	0.1	3.4	0.1	0.02	0.11	--
43----	.4	0.1	.05	1.71	.6	20.5	.02	.17	.05	--
44----	.8	0.2	N	N	.1	3.4	.01	Tr.	Tr.	--
45----	.5	0.2	N	N	.5	17.1	.03	.30	tr.	--
46----	1.8	0.5	.02	0.68	.5	17.1	.02	.13	.17	--
47----	11.7	3.6	.03	1.03	.2	6.8	--	--	--	0.2
48----	6.0	1.8	.03	1.03	.2	6.8	.01	.03	tr.	1.0
49----	1.0	0.3	.03	1.03	.4	13.7	--	--	--	1.0
50----	2.5	0.8	tr.	tr.	.2	6.8	.01	.02	.02	--
51----	1.0	0.3	tr.	tr.	.1	3.4	--	--	--	--
52----	2.8	0.8	.03	1.03	.3	10.3	.03	.03	.06	--
53----	2.5	0.8	N	N	N	N	.01	.06	.02	4.0
54----	1.7	0.4	.02	0.68	.4	13.7	--	.20	--	1.0
55----	9.0	2.7	tr.	tr.	.1	3.4	--	--	--	.2
56----	2.4	0.7	.02	0.68	.3	10.3	--	--	--	--
57----	.5	0.2	.04	1.37	.3	10.3	--	--	--	--
58----	3.0	0.9	.05	1.71	1.2	41.0	--	.2	--	2.0
59----	3.8	1.2	.04	1.37	.2	6.8	.02	.03	.06	--
60----	2.4	0.7	.01	0.34	.2	6.8	tr.	tr.	.04	--
61----	0.8	0.2	0.06	2.05	0.2	6.8	0.02	0.02	0.05	--
62----	3.5	3.4	tr.	tr.	.1	3.4	--	--	--	0.2
63----	14.0	4.3	tr.	tr.	.2	6.8	--	--	--	.4
64----	5.0	1.5	.02	0.68	.1	3.4	.02	.01	.04	--
65----	3.5	1.1	tr.	tr.	Tr.	--	--	--	--	1.0
66----	.3	0.1	N	N	N	N	--	.3	--	2.0
67----	.3	0.1	tr.	tr.	.1	3.4	--	.2	--	.2
68----	.3	0.1	N	N	tr.	tr.	.01	Tr.	.01	--
69----	2.5	0.8	tr.	tr.	.1	3.4	.02	.05	.06	--
70----	2.5	0.8	.01	0.34	.2	6.8	.02	.08	.16	.11
71----	3.0	0.9	N	N	N	N	.029	.022	.023	2.4
72----	2.0	0.6	tr.	tr.	.2	6.8	.01	.01	.009	.11
73----	.3	0.1	N	N	.2	6.8	.041	.79	.035	--
74----	1.0	0.3	N	N	.1	3.4	.021	.018	.051	--
75----	23.0	7.0	N	N	.1	3.4	.018	.015	.024	.62
76----	.3	0.1	tr.	tr.	.2	6.8	.07	1.41	2.24	2.5
77----	18.0	5.5	tr.	tr.	.3	10.3	--	--	--	--
78----	5.5	1.7	N	N	tr.	tr.	--	--	--	--
79----	.5	0.2	.18	6.16	.7	23.9	.059	.12	.014	--
80----	4.0	1.2	tr.	tr.	.8	27.4	.14	.025	.038	2.1
81----	.5	0.2	.07	2.39	.1	3.4	.055	.022	.003	--
82----	12.2	3.7	tr.	tr.	.2	6.8	.024	.038	.094	--
83----	6.0	1.8	.08	2.74	1.6	54.7	--	1.0	1.0	4.0

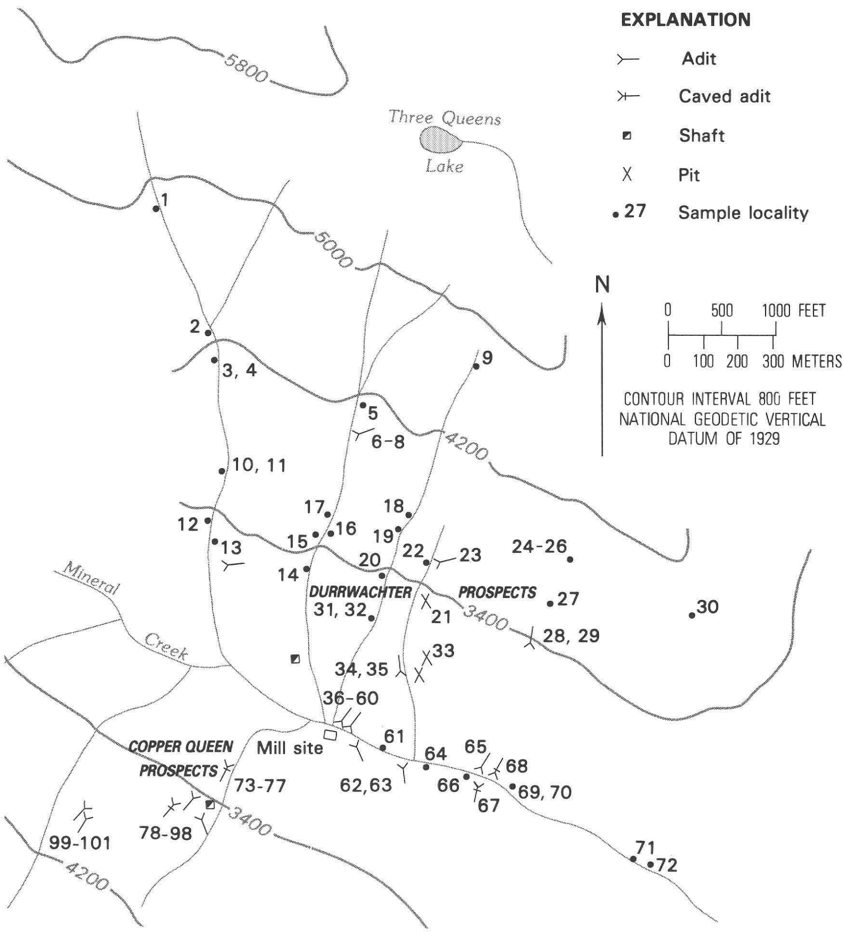


FIGURE 36.—Map showing mines and prospects in the lower Mineral Creek area.

DURRWACHTER PROSPECT

The Durrwachter prospect is along and north of Mineral Creek. Workings and mineralized outcrops are scattered through an area extending a few thousand feet (about 1,000 m) north of the creek and a few thousand feet (about 1,000 m) along the creek (fig. 37). Sulfide minerals are concentrated in brecciated granodiorite, and especially in brecciated granodiorite associated with northeast-trending shear

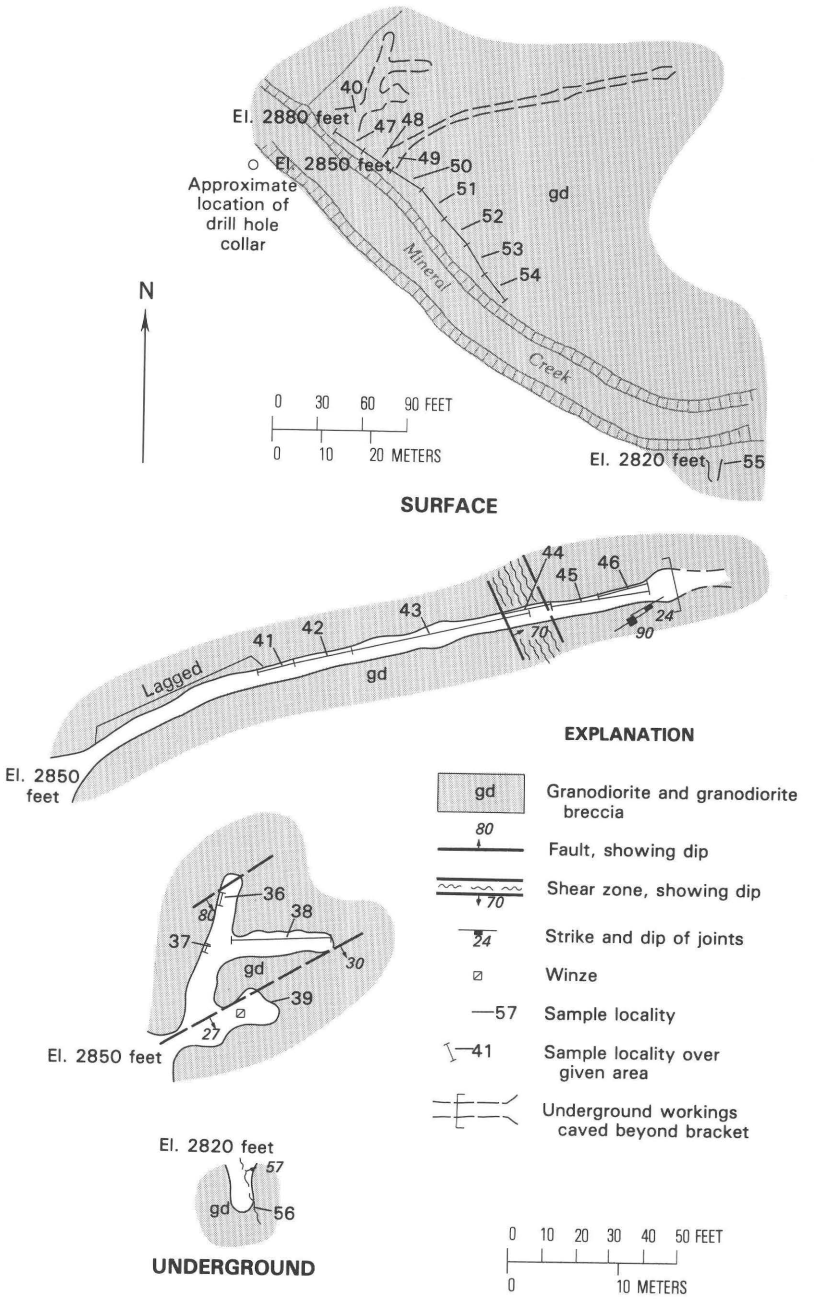


FIGURE 37.—Map of Durrwachter prospect near Mineral Creek.

zones near Mineral Creek. A water-filled winze and short drift in the westernmost Durrwachter adit (fig. 37, locs. 36–39) were driven along a shear zone about 0.5 ft (0.2 m) wide, striking about N. 60° E. and dipping about 30° SE. Pyrite and chalcopyrite are concentrated near the shear zone but the zone is composed mostly of altered gouge and granodiorite fragments. Most or all of the production from Mineral Creek probably came from the 50-ft-deep (15 m) winze (E. A. Magill, written commun., 1955). The longest Durrwachter adit (fig. 37, locs. 41–46) was driven into altered granodiorite containing a maximum of 5 percent disseminated sulfide minerals.

A sulfide zone trending N. 50° W. is at least 200 ft (60 m) long and 80 ft (24 m) wide (fig. 37, locs. 47–54) on the surface. Samples from the zone average 0.33 percent copper, no gold, 0.06 oz/ton (2.06 g/metric ton) silver and less than 0.01 percent molybdenum. Samples from a 1,098-ft-deep (355 m) vertical exploratory core hole (fig. 37) drilled in the zone by Phelps Dodge Corp. (W. K. Brown, written commun., 1972) show a 0.2 percent copper content in a 200 ft (61 m) section of the hole. Surface and near-surface mineralized rock totaling about 100,000 tons (90,000 metric tons) in the vicinity of the major Durrwachter workings along Mineral Creek contains more than 0.2 percent copper.

Most samples from workings and mineralized outcrops away from the mineralized breccia near the stream contain less than 0.05 percent copper. Samples (fig. 36, locs. 6–8, 61) from other breccia zones containing sulfide minerals assayed as much as 0.02 percent copper, no gold, and 0.1 oz/ton (3.4 g/metric ton) silver. One sample (fig. 36, loc. 72) from a quartz vein contains 0.25 percent copper and no gold or silver. Samples (fig. 36, locs. 17, 22, 24–26) from shear zones containing sulfide minerals assayed as much as 0.068 percent copper, no gold, and 0.2 oz/ton (6.8 g/metric ton) silver. Samples from localities 3 and 4 indicate that hornfels carries as much as 0.049 percent copper, no gold, and 0.2 oz/ton (6.8 g/metric ton) silver. Samples (fig. 36, locs. 5, 14–16, 18, 27–30, 32–35, 64, 66, 67) from granodiorite containing disseminated sulfide minerals contain as much as 0.099 percent copper, a trace of gold, and 0.3 oz/ton (10.3 g/metric ton) silver. Most assays of samples of sheared or fractured granodiorite (fig. 36, locs. 19, 62, 63, 65, 68, 69, 70) show less than 0.072 percent copper, a trace of gold, and 0.2 oz/ton (6.8 g/metric ton) silver. One sample (loc. 68), however, contains 0.20 percent copper across a width of 15 ft (4.6 m) but no gold or silver. Samples (fig. 36, locs. 1, 2, 9, 10–13, 20, 21, 23, 31) from metavolcanic rocks contain as much as 0.0074 percent copper, a trace of gold, and 0.02 oz/ton (6.8 g/metric ton) silver. A sample of schist (fig. 36, loc. 71) contains 0.013 percent copper and no gold or silver.

Samples 57 to 60 (fig. 36) were from the mill between the Durrwachter and Copper Queen areas. Grab samples of crushed ore, 57 and 58 (fig. 36), contain 0.65 and 1.71 percent copper, respectively. Sample 58 (fig. 36) also contained a trace of gold and 0.5 oz/ton (17 g/metric ton) silver. A grab sample of material from the rod mill contains a trace of gold, 0.2 oz/ton (6.8 g/metric ton) silver, and 0.27 percent copper. Sample 60 (fig. 36), which consists of burlap from the blanket table, contained no precious metals.

A 9-ft-long (2.7 m) adit near the trail crossing from Park Lakes in upper Mineral Creek is in metavolcanic breccia. A 56-ft-long (17.1 m) chip sample from a mineralized outcrop near the adit contains a trace of gold, 0.2 oz/ton (6.8 g/metric ton) silver, 0.06 percent copper, and 0.01 percent lead.

Further exploration may delineate deep copper-bearing bodies similar to those in the zone intersected by the Phelps Dodge drill hole.

COPPER QUEEN PROSPECT

Country rocks at the Copper Queen prospect (fig. 38) are mostly andesite, basalt, felsite, and felsite breccia. Shear zones and dikes cut the rocks. Except for an intensely mineralized zone, where total sulfide minerals (pyrite, marcasite, arsenopyrite, and minor chalcopyrite) may exceed 30 percent, the rocks contain less than 5 percent sulfide minerals.

The intensely mineralized zone at the Copper Queen workings (fig. 38, locs. 74–77, 82–91) is near the contact of the breccia and andesite. Like the major rock units in the Copper Queen area, the zone strikes about N. 30°–45° W. and dips about 65° SW. It is irregular but probably extends from the head of the shaft through the upper adit to the lower adit, 250 ft (76 m) downdip. Drifts from the upper adit (fig. 38, locs. 82–88) were driven about 40 ft (12 m) along the zone. The intensely mineralized zone appears to be pipe shaped, is 45 ft (14 m) wide and at least 60 ft (18 m) long, as measured on the surface and in the upper adit, and is at least 300 ft (91 m) deep, as indicated by the depth between levels.

Samples 99–101 (fig. 36) are from west of the main Copper Queen workings; they contain a maximum of 0.02 percent copper and 0.3 oz/ton (10.3 g/metric ton) silver.

Indicated resources of nearly 69,000 tons (62,000 metric tons) of rock containing about 0.63 percent copper 0.54 oz/ton (18.5 g/metric ton) silver are estimated to occur in the area of the upper and lower adits. Additional mineralized rock may be found by exploration of extensions of the mineralized zones.

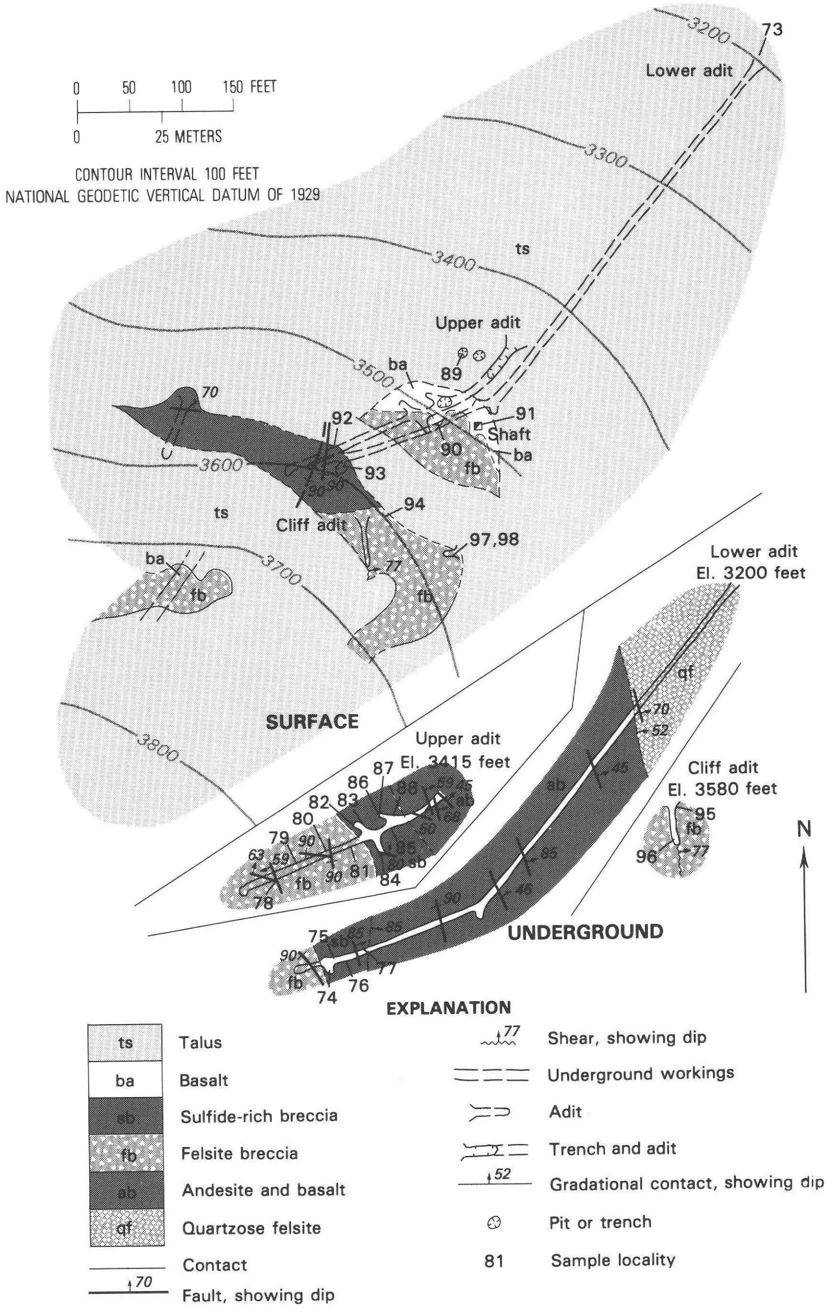


FIGURE 38.—Map of Copper Queen prospect.

SPRITE LAKE AREA

The Sprite Lake area is along the ridge dividing the drainage of the Cle Elum River and French Creek (fig. 7, area 14). The workings are distributed over a wide area mainly on veins and shear zones (fig. 39). Most of the workings in the southern part of the area are probably on patented claims.

The arsenopyrite-rich vein deposits of the Lake adit, the Snow workings, the North area workings, and the Skeeter Creek workings are similar. Most are on mineralized fracture zones in small bodies of granitic rock or along contact zones between the granitic rock and serpentinized peridotite, which is the predominant rock of the area. Assays of samples taken from both underground workings and from stockpiles on the surface show gold to be the predominant valuable metal along with significant silver values in some samples and minor amounts of copper.

Gold values in samples from some veins of the Sprite Lake area may represent economically interesting ore; other veins are probably too narrow to be workable. The workings examined, however, are too limited in extent and too widely separated to establish sufficient horizontal continuity or vertical extent to allow calculation of an ore reserve.

A lineament having a fairly constant westerly strike, as shown on aerial photographs, extends between the major workings in the Skeeter Creek area and the North area workings and for about 1,000 ft (300 m) to the east and west beyond both groups of workings. The lineament probably represents a fracture containing widely spaced deposits of auriferous arsenopyrite, but only the obvious and easily found outcrops have been prospected.

CLAIM NO. 5 ADITS

The middle and upper adits on Claim No. 5 (fig. 39) were driven on a 2.8-ft- to 3.0-ft-wide (0.85–0.9 m) fault zone filled with vuggy quartz containing some sulfide minerals (including arsenopyrite?) in the most intensely sheared parts (fig. 40). This vein, which can be traced between the workings, strikes No. 50°–60° E. and dips 60°–80° NW.

Samples from the adits (fig. 40) indicate that the gold values probably exist sporadically in the vuggy quartz rather than in the gouge, which is less than 1 ft (0.3 m) wide on the hanging wall. Sample data are not sufficient to allow a valid calculation of grade; however, possibly 2,000 tons (1,800 metric tons) having a weighted average of 1.78 oz/ton (61.0 g/metric ton) gold and 0.16 oz/ton (5.5 g/metric ton) silver might be selectively mined.

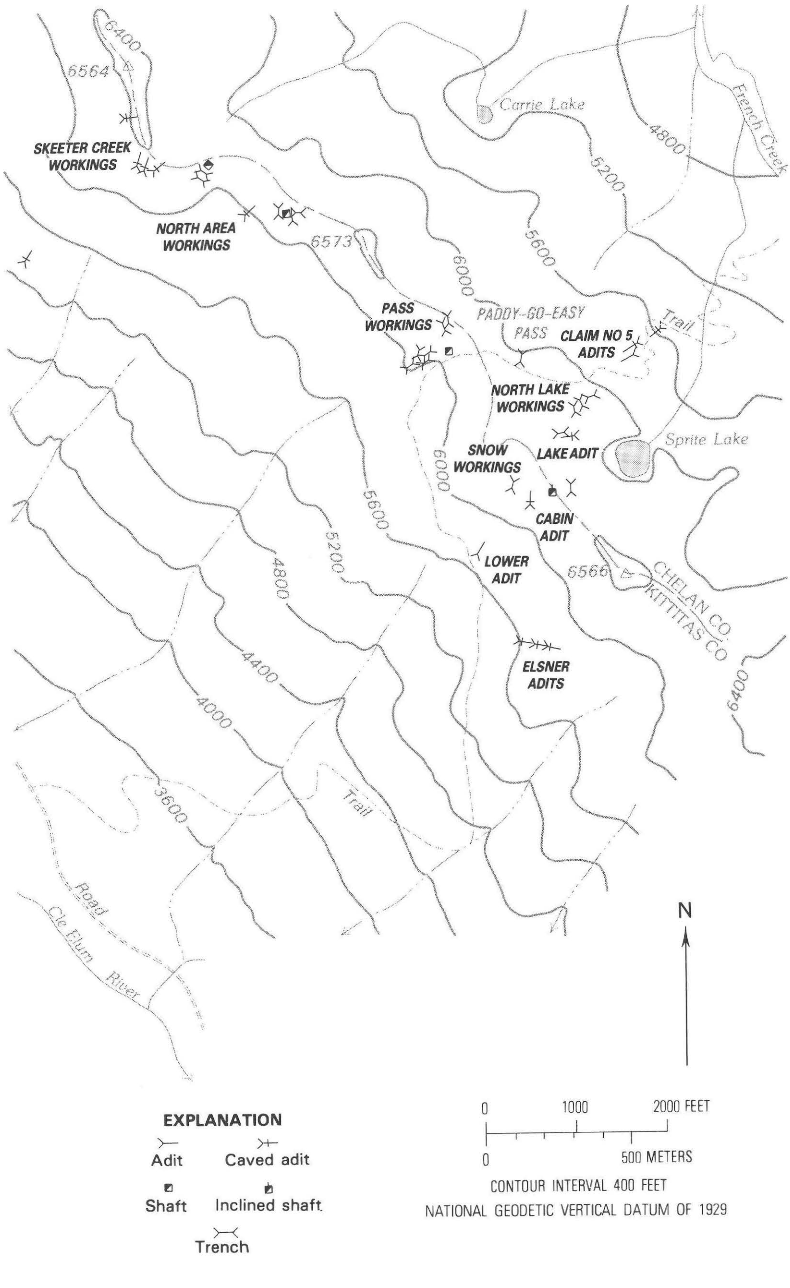


FIGURE 39.—Map showing prospects in the Sprite Lake area.

SNOW WORKINGS AND CABIN ADIT

The Snow workings and the Cabin adit (fig. 39) are southwest of Sprite Lake on the south edge of a small mass of granodiorite near a contact with serpentinized peridotite (fig. 41). A steeply inclined shaft on the Snow workings was sunk along vuggy limonite-stained quartz filling a fracture paralleling the contact but within the granodiorite. The vein is about 2 ft (0.6 m) wide in the area of the caved shaft but narrows to a stringer westward. A 2.4 ft (0.73 m) chip sample (fig. 41, loc. 1) across the width of the quartz vein assayed 0.8 oz/ton (27.4 g/metric ton) gold, a trace of silver, and 0.03 percent copper.

A vein 0.5 to 0.8 ft (0.15–0.24 m) wide in the Cabin adit (fig. 41) consists of quartz and minor pods and stringers of arsenopyrite. A winze, now inaccessible, was driven along the hanging wall of the vein. A selected sample from a stockpile near the portal contains 1.02 oz/ton (38.5 g/metric ton) gold, a trace of silver, and 0.02 percent copper. The material on the stockpile is more massive than observed in the adit and is probably from the winze.

LAKE ADIT

The Lake adit (fig. 39) and associated open cuts (fig. 42) are at the north edge of a small granodiorite body about 450 ft (137 m) west of Sprite Lake. The adit, now caved, was driven in a shattered and altered zone parallel to a narrow but persistent diorite dike. The pits above the adit were excavated along the strike of the shattered zone. No sulfide minerals were observed; however, small piles of rock containing arsenopyrite are near the lower pit and on the adit dump. The arsenopyrite-rich rock may be from pods or stringers in the shatter zone. The occurrence here appears similar to that at the Cabin adit; both are near small intrusive masses. Grab samples (fig. 42, locs. 1, 2) from the stockpile contain 0.5 and 0.96 oz/ton (17 and 33.0 g/metric ton) gold and 0.1 oz/ton (3.4 g/metric ton) silver.

LOWER ADIT

The Lower adit (fig. 39) was probably driven to find downward extensions of veins exposed in the Snow workings and the Lake adit. The adit is about 1,700 ft (518 m) long in barren serpentinized peridotite and probably did not reach the objective. A mineralized fault zone (vein) striking N. 85°–89° E. and dipping 39°–70° NW. crosses the adit about 1,090 ft (332 m) from the portal (fig. 43). A drift was driven

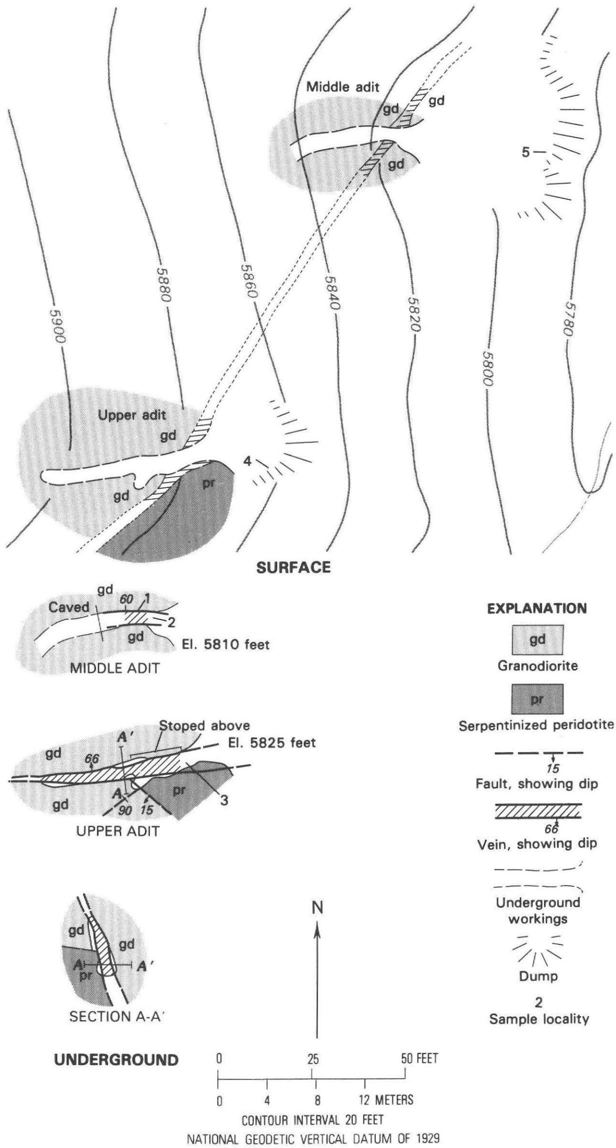


FIGURE 40.—Map of claim No. 5 adits.

Data for samples from Claim No. 5 adits, Sprite Lake area

[Tr., trace; NA, not applicable]

Sample				Gold		Silver	
		Length					
No.	Type	(ft)	(m)	(oz/ton)	(g/metric ton)	(oz/ton)	(g/metric ton)
1-----	Chip------	2.8	0.8	2.71	92.71	0.30	10.26
2-----	do--------	.3	0.1	.29	3.08	Tr.	tr.
3-----	do--------	1.6	0.5	.91	31.13	tr.	tr.
4-----	Grab------	NA	NA	3.01	102.97	.50	17.10
5-----	do--------	NA	NA	tr.	tr.	tr.	tr.

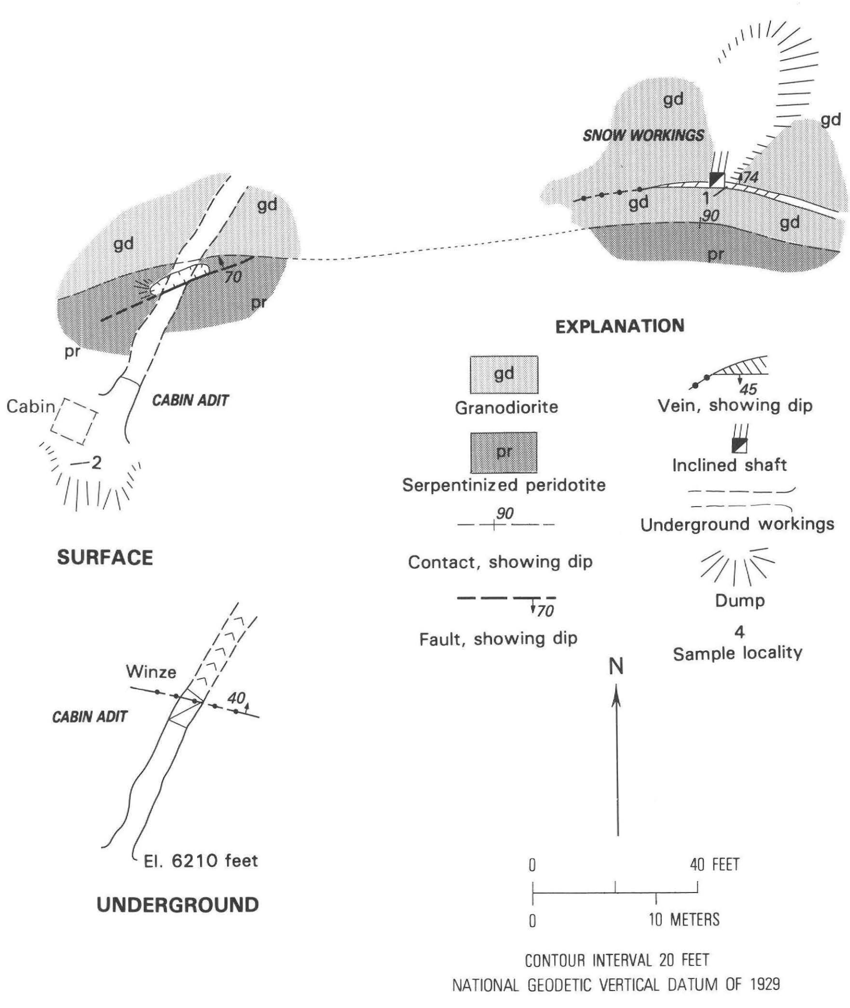


FIGURE 41.—Map of Snow workings and Cabin adit.

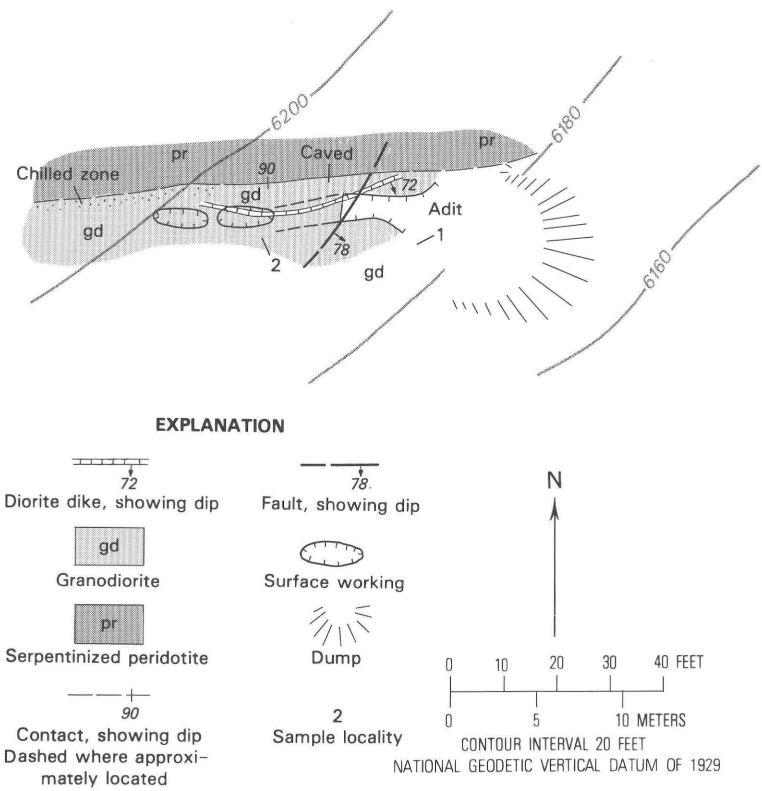


FIGURE 42.—Map of Lake adit area.

eastward along the fault for approximately 160 ft (49 m). The fault zone narrows along the drift and becomes a hairline fracture at the end of the drift. Two samples (fig. 43, locs. 1, 2) taken across the vein near the intersection of the main adit and the side drift contain 0.37 and 0.02 oz/ton (12.7 and 0.7 g/metric ton) gold, and one contains 0.2 oz/ton (6.8 g/metric ton) silver.

ELSNER ADITS

Three adits (fig. 39, Elsner adits), now caved, were driven into a persistent vertical fault zone which strikes N. 80° W. The fault zone is filled with shattered limonite-stained serpentinized peridotite wallrock and narrow, widely separated quartz pods. The fault trace is very evident below the workings, where a ravine has formed in the shatter zone, and above the workings, where a well-defined trench across a saddle extends for about 1,000 ft (300 m). The only mineralized rock

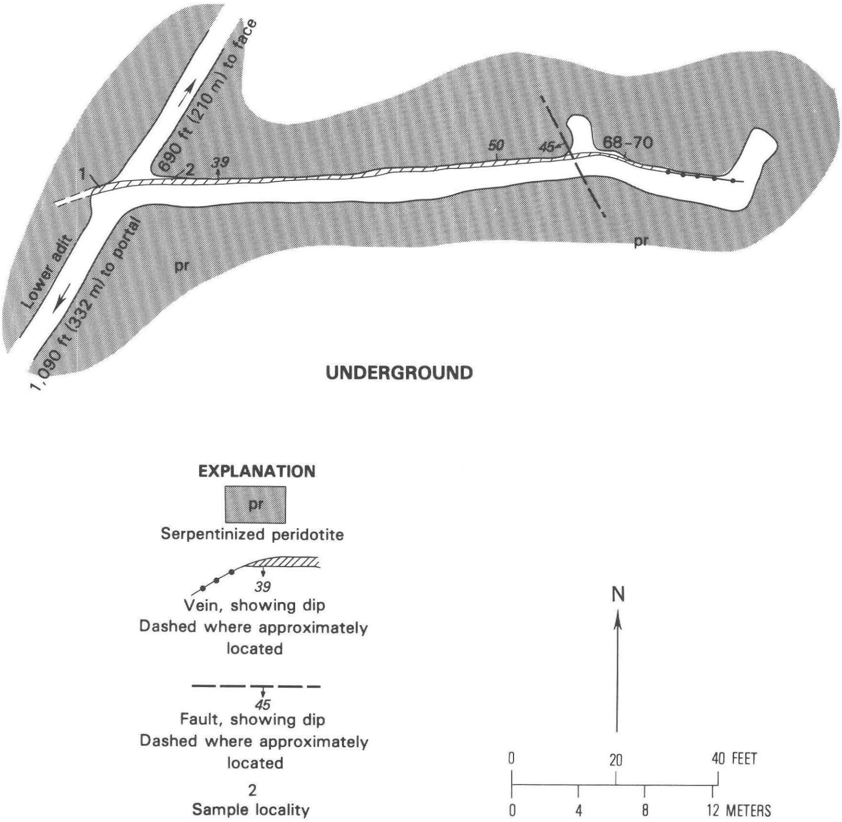


FIGURE 43.—Map of part of Lower adit workings.

observed was a pile of vuggy quartz-rich material on the dump of the uppermost adit. No sulfide minerals were observed in the rock. A random grab sample from this pile contains 0.20 oz/ton (6.8 g/metric ton) gold, 0.80 oz/ton (27.4 g/metric ton) silver, and 0.50 percent copper. The sporadic nature of the quartz pods apparently discouraged additional work.

PASS WORKINGS

The Pass workings (fig. 39) are on and near the contact of serpentinized peridotite and granodiorite. A vertical shaft, estimated to be 150 ft (46 m) deep, was sunk in serpentinized peridotite about 100 ft (30 m) from the contact. Seven shallow pits and trenches were dug on or close to the contact, mainly on limonite-stained fractures. Maximum values in three selected samples from the area are 0.21 oz/ton (7.2 g/metric ton) gold and 0.10 oz/ton (3.4 g/metric ton) silver.

NORTH LAKE WORKINGS

The North lake workings (fig. 39) consist of five pits and trenches in a wide granodiorite dike cutting serpentinized peridotite. The major trench is about 40 ft (12.2 m) long on a limonite-stained fracture. The other pits were probably dug in unsuccessful attempts to find an extension of the fracture. One select sample from a pile of limonite-stained rock near the trench contains 3.2 oz/ton (110 g/metric ton) silver and 4 percent copper. Because of the small size of the mineralized fracture, no resource of gold or silver is estimated to exist.

NORTH AREA WORKINGS

The North area workings (fig. 39) are along outcrops of veins and mineralized zones, mostly in serpentinized peridotite but closely associated with small irregular bodies and dikelike masses of intrusive granitic and porphyritic rocks.

Sulfide veins exposed in the southernmost workings (fig. 44) are nearly identical to those in the Lake adit and the Snow workings. A selected sample contains 0.12 oz/ton (4.1 g/metric ton) gold and 6.80 oz/ton (233 g/metric ton) silver. A 3.5-ft-long (1.1 m) chip sample taken across one vein contains no gold and 0.1 oz/ton (3.4 g/metric ton) silver.

SKEETER CREEK WORKINGS

The Skeeter Creek workings, consisting of four caved adits and several pits and trenches, are near the head of Skeeter Creek (fig. 39). The major workings are along quartz-talc veins containing sulfide minerals, mainly arsenopyrite, or along limonite-stained shear zones containing no sulfide minerals. The veins range from 1 to 5 ft (0.3–1.5 m) in width. Six samples were taken from the workings. A 1-ft-long (0.3 m) chip sample containing 0.39 oz/ton (13.4 g/metric ton) gold and 3.5 oz/ton (120 g/metric ton) silver shows the highest grade.

GALLAGHER HEAD LAKE AREA

The Gallagher Head Lake area is near the divide between De Roux Creek and the South Fork Fortune Creek (fig. 45). The country rock is mostly composed of serpentinized peridotite and greenstone, and remnants of felsitic rock cap some of the ridge crests. Copper and minor amounts of silver and nickel occur in shear zones in the rock. Prospect workings include six adits (five caved), four pits, nine trenches, and two shafts (fig. 45).

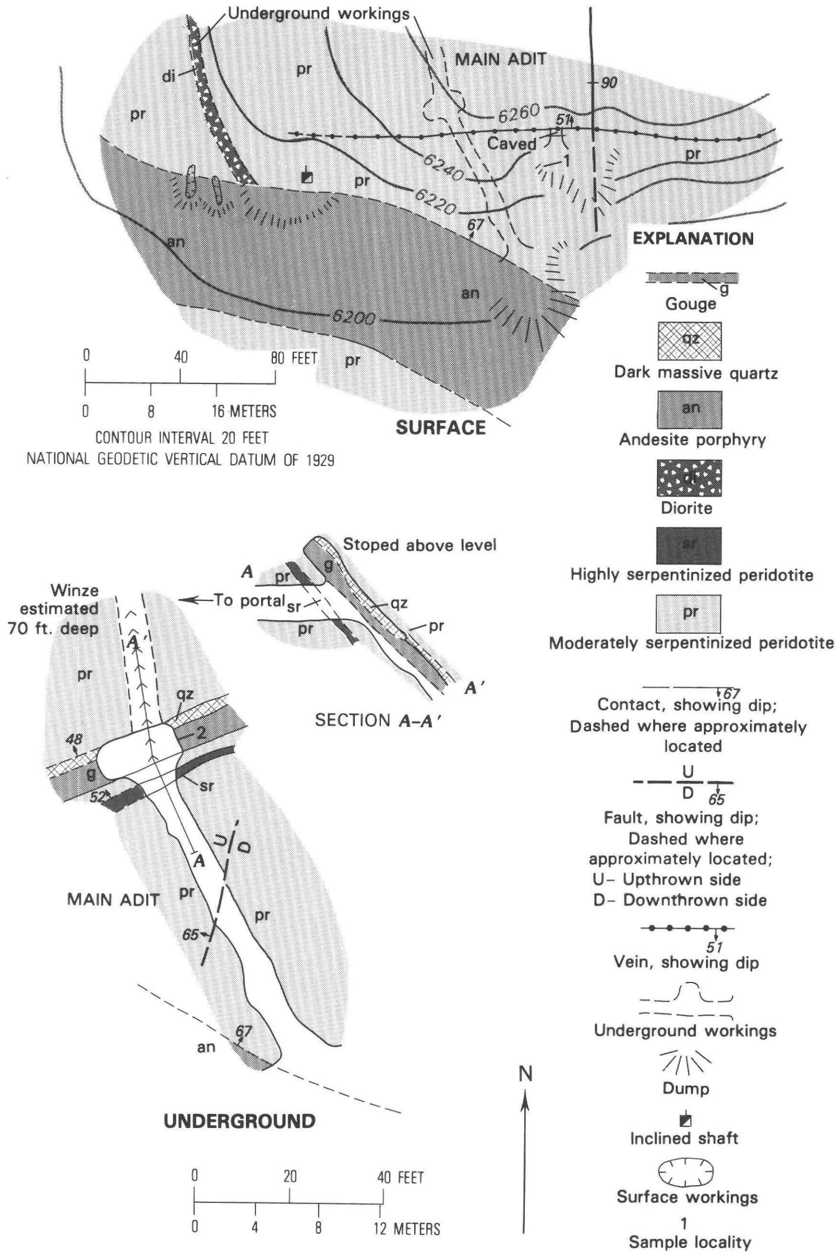


FIGURE 44.—Map of north area workings.

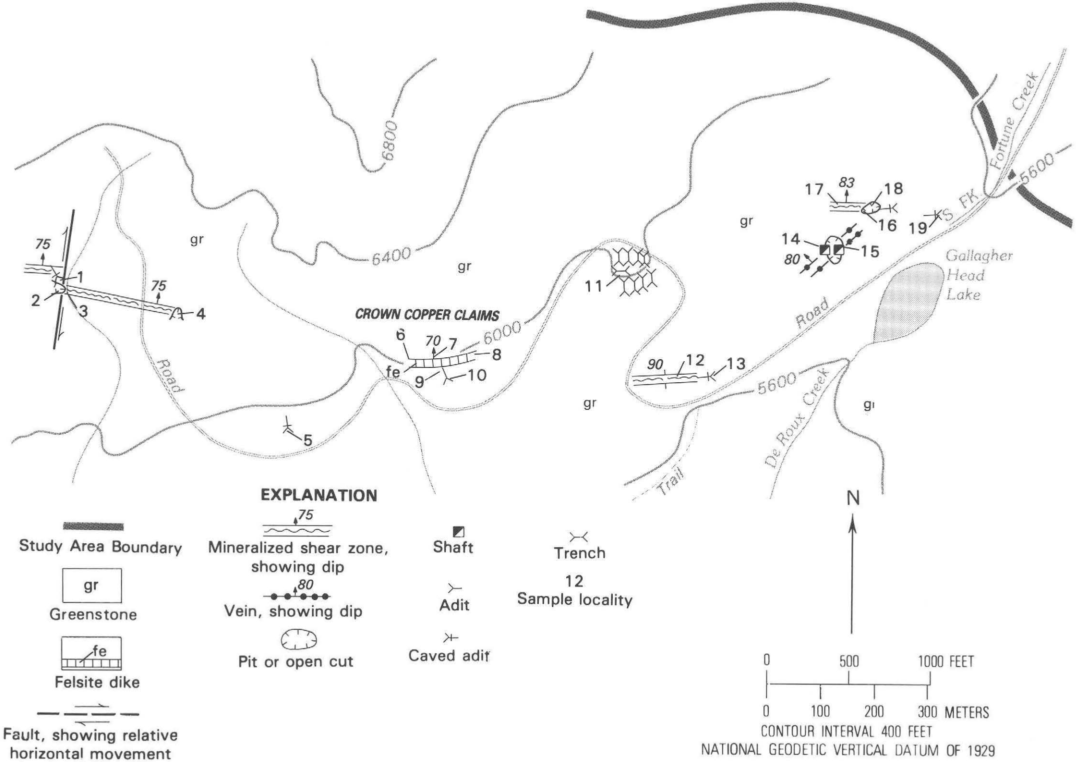


FIGURE 45.—Map showing prospects in the Gallagher Head Lake area.

The shear zones in the area range in width from 3.0 to 13.0 ft (0.9–4.0 m) and are composed of compact schistose iron oxide stained material. Malachite and azurite occur on weathered surfaces of the serpentinized peridotite and felsite. Chalcocite occurs in the unweathered parts of the shear zones. Quartz veinlets 0.25–0.50 in. (0.6–1.3 cm) wide occur in the greenstone and felsite wallrock and as fracture fillings in the shear zones. No copper minerals were observed in the quartz veinlets.

An indicated paramarginal resource occurs in a shear zone at the west end of the mapped area (fig. 45, locs. 1–4). This shear zone is explored by two prospect pits and a caved adit and is intermittently exposed for 925 ft (282 m). The zone averages 6.4 ft (1.95 m) wide and contains an estimated 227,000 tons (205,900 metric tons) averaging 0.3 oz/ton (10.3 g/metric ton) silver and 2.23 percent copper.

Samples from two other shear zones (fig. 45, locs. 12, 13, 16–19) indicate additional submarginal resources. The zones are exposed for 550 and 500 ft (168 and 152 m) and average 12 and 5 ft (3.7 and 1.5 m) wide, respectively. Weathered and leached outcrops contain only minor copper values; however, unweathered material from prospect dumps contains 1 percent or more copper. The inferred combined submarginal resource of the two zones is about 200,000 tons (181,440 metric tons). Samples taken from the leached outcrops of these two zones average 0.24 percent nickel, 0.1 percent copper, and 0.02 oz/ton (0.7 g/metric ton) silver.

Exploration of the shear zones in the Gallagher Head Lake area and their extensions along the southern belt of mafic and ultramafic rock might substantially increase the resource potential.

VAN EPPS CREEK–SOLOMON CREEK AREA

Granodiorite intrudes ultramafic, metasedimentary, and metavolcanic rocks in the Van Epps Creek–Solomon Creek area (fig. 7, area 15). Most shear zones parallel the contacts of the granodiorite with these rocks; other shear zones cross the contacts. Quartz, talc, and carbonate minerals are especially plentiful in these shear zones.

Sulfide minerals occur mostly as accessory minerals in the country rock, although pyrite, pyrrhotite, arsenopyrite, chalcopyrite, sphalerite, stibnite, and galena fill some pores, fractures, and short shear zones distributed throughout the rock. Magnetite and chromite are also accessory minerals in the rocks.

Prospectors have worked in the Van Epps Creek–Solomon Creek area since the late 1880's. Richard Klessatel (written commun., 1911) studied the economic geology of the Van Epps Creek–Solomon Creek area. A report (E. A. Magill and W. P. Puffett, written commun., 1955) on a DMEA (Defense Minerals Exploration Admistration) contract on the Van Epps area was freely used in this report.

The mine workings in the area are distributed mainly in the basin at the head of Van Epps Creek and at the head of Solomon Creek (fig. 46).

Some of the samples from the Van Epps Creek–Solomon Creek area particularly of disseminated sulfides, represent a large enough volume and contain copper values that are high enough to represent potential resources, particularly in view of the fact that small production has been recorded from the Pickwick shaft and the Van Epps adit and possibly from the Ellen mine area. Samples from rock containing disseminated sulfide minerals, taken along 242 ft (73.8 m) of the Van Epps adit, average 0.33 percent copper. U.S. Bureau of Mines DMEA drill hole No. 2, about 3,500 ft (1,070 m) west of the adit, in another zone, penetrated 226 ft (69 m) of mineralized rock containing 0.10–0.46 percent copper (R. N. Appling, written commun., 1955). Samples of leached rock from the surface near the drill hole contained lower values.

VAN EPPS ADIT

The major working in the area is the Van Epps adit (fig. 47). The portal of the crosscut adit is near the north fork of Van Epps Creek at about 5,070 ft (1,545 m) altitude.

The Van Epps adit, which was excavated about 1900, connects with the Pickwick shaft. The adit is driven through glacial deposits, diorite, and serpentinized peridotite.

Disseminated sulfide minerals occur in the rocks throughout the adit but are more abundant in the first 700 ft (213 m) from the portal. The weighted average of samples taken for 242 ft (73.8 m) along this section of the adit was 0.33 percent copper. Samples selected from the dump of the Van Epps adit (fig. 47, locs. 32–34) contain at most 0.01 oz/ton (0.3 g/metric ton) gold, 0.42 oz/ton (14.4 g/metric ton) silver, and 3.85 percent copper.

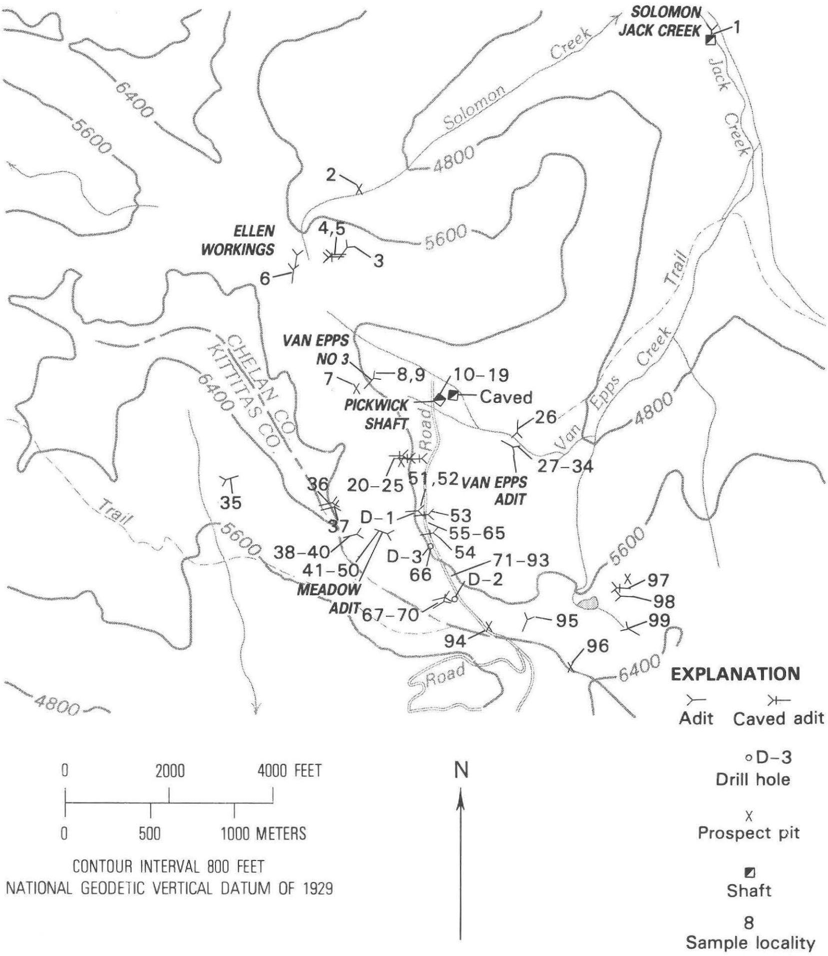


FIGURE 46.—Map showing mines and prospects in the Van Epps Creek–Solomon Creek area.

PICKWICK SHAFT

The DMEA report (E. A. Magill and W. P. Puffett, written commun., 1955) describes much of the Pickwick shaft (fig. 47). The shaft cuts serpentinized peridotite, diorite, and several shear zones. Slumped overburden and exploratory trenching obscure much of the early work near the shaft. The shaft was sunk in 1897 to a depth of at least 110 ft (33.5 m) with drifts at depths of 50, 80, and 110 ft (15.2, 24.4, and

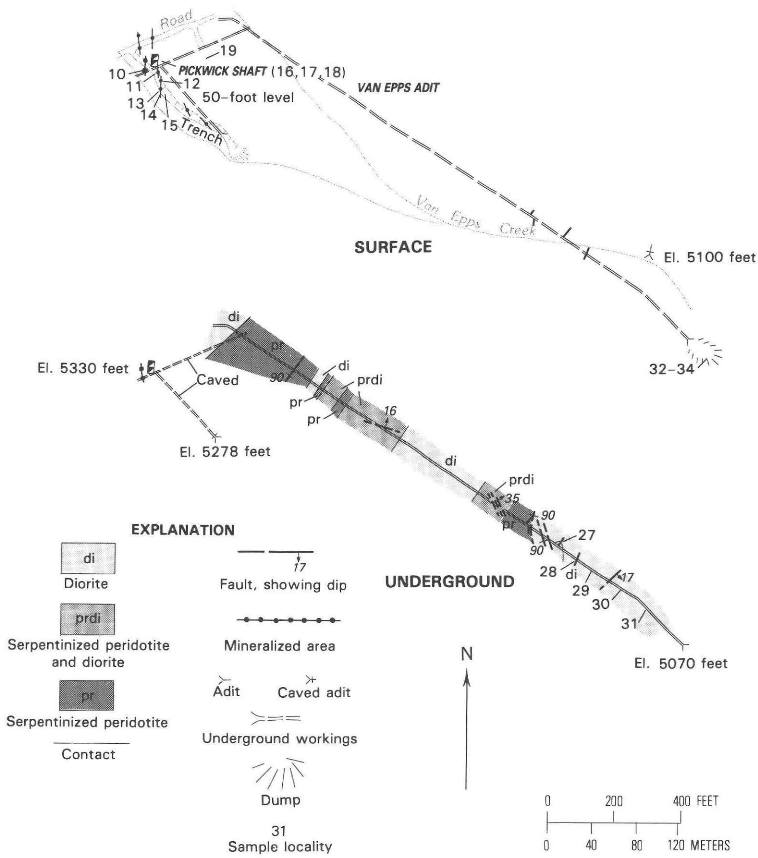


FIGURE 47.—Map of Van Epps adit and Pickwick shaft. Modified from E. A. Magill and W. P. Puffett (written commun., 1955).

33.5 m). A raise, completed about 1924, connected the Van Epps adit to the bottom of the shaft. Workings on the 50-ft (15.2-m) level of the shaft extended to the surface (fig. 47). Minor stoping was done on the 110-ft (33.5-m) level, near the shaft. The sulfide minerals occur in lenticular concentrations along the shear zones, and most of these concentrations near the shaft had been mined out before 1957. By 1957, operators of the Van Epps property had drilled three vertical exploratory diamond-drill holes near the shaft.

Two samples (fig. 47, locs. 16, 17) from the drift at the 110-ft (33.5-m) level of the shaft contain low values, but a sample (fig. 47, loc. 18) from material thought to represent stoped ore from the 80-ft (24.4-m) level contained 0.02 oz/ton (0.7 g/metric ton) gold, 3.10 oz/ton (106 g/metric ton) silver, and 4.62 percent copper.

Data for samples from Van Epps adit and Pickwick shaft, Van Epps Creek-Solomon Creek area

[Tr., trace; N, none detected; --, not analyzed; NA, not applicable]

Sample				Gold		Silver		
		Length						
No.	Type	(ft)	(m)	(oz/ton)	(g/metric ton)	(oz/ton)	(g/metric ton)	Copper (percent)
10---	Chip---	15	4.6	Tr.	Tr.	0.16	5.47	0.42
11---	do-----	2	0.6	0.02	0.68	.16	5.47	1.2
12---	do-----	3	0.9	tr.	tr.	.16	5.47	.25
13---	do-----	18	5.5	tr.	tr.	.34	11.63	.23
14---	do-----	4	1.2	.04	1.37	2.4	82.1	7.69
15---	Grab---	NA	NA	.01	0.34	.1	3.4	1.11
16---	do-----	NA	NA	tr.	tr.	tr.	Tr.	.34
17---	Chip---	20	6.1	.02	0.68	tr.	tr.	.19
18---	Grab---	NA	NA	.02	0.68	3.10	13.68	4.62
19---	do-----	NA	NA	tr.	tr.	1.0	34.2	--
27---	Chip---	3	0.9	N	N	.02	0.68	.10
28---	do-----	20	6.1	.01	0.34	.02	0.68	.26
29---	do-----	39	11.9	N	N	.12	4.10	.71
30---	do-----	100	30.5	tr.	tr.	tr.	tr.	.18
31---	do-----	80	24.4	.02	0.68	.30	10.26	.36
32---	Grab---	NA	NA	N	N	.08	2.74	.04
33---	do-----	NA	NA	.01	0.34	.42	14.37	3.85
34---	do-----	NA	NA	N	N	.18	6.16	.19

MEADOW ADIT

Another large working in the Van Epps area is the Meadow adit (fig. 46). The adit was driven through serpentinized peridotite, felsite, and felsite porphyry for more than 1,500 ft (457 m) (fig. 48). It was apparently intended to intersect mineralized rock beneath gossan. A brecciated fault zone containing gouge is about 1,180 ft (360 m) from the portal. Broken material from the zone has caved into the adit and has dammed a flow of water which has filled the adit behind the caved area to a depth of 4–5 ft (1.2–1.5 m). Only one of the ten samples from the adit (fig. 48, locs. 41–50) contain appreciable amounts of metals.

VAN EPPS NO. 3 WORKINGS

Two small pits at the base of a cliff above the Van Epps No. 3 adit are in a sulfide-rich vein in serpentinized peridotite (fig. 46, loc. 7). The vein is 1 ft (0.3 m) wide, strikes N. 65° E., and dips nearly vertically. The vein is composed of more than 90 percent massive, fine-grained, gray, sulfide minerals. A chip sample across the sulfide lens at the upper workings (fig. 46, loc. 7) contains no gold, 0.3 oz/ton (10.3 g/metric ton) silver, and 0.04 percent copper.

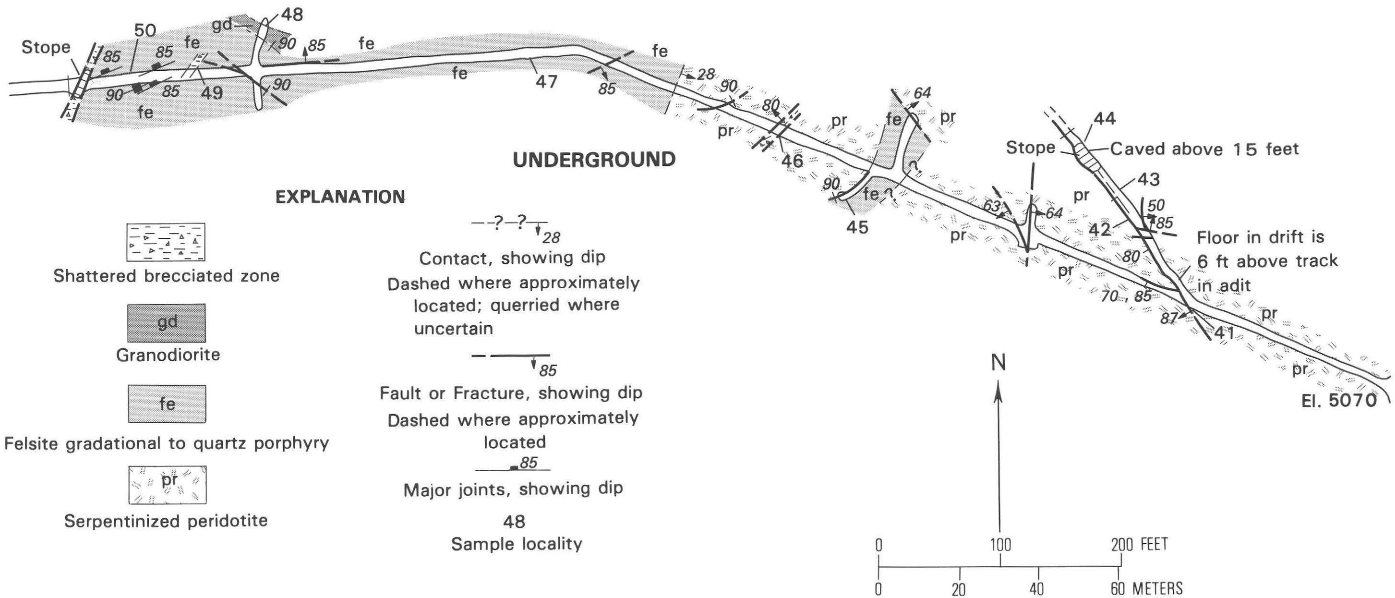


FIGURE 48.—Map of Meadow adit.

Data for samples from Meadow adit, Van Epps Creek-Solomon Creek area

[Tr., trace; N, none detected; --, not analyzed; NA, not applicable]

Sample				Gold		Silver		
		Length						
No.	Type	(ft)	(m)	(oz/ton)	(g/metric ton)	(oz/ton)	(g/metric ton)	Copper (percent)
41---	Chip----	1.3	0.4	N	N	N	N	--
42---	do------	3.2	1.0	Tr.	Tr.	0.1	3.4	--
43---	Grab----	NA	NA	0.01	0.34	.27	9.24	0.58
44---	do------	NA	NA	tr.	tr.	.1	3.4	--
45---	Chip----	8.0	2.4	N	N	N	N	--
46---	do------	4.5	1.4	tr.	tr.	Tr.	Tr.	--
47---	do------	100	30.5	N	N	N	N	--
48---	do------	NA	NA	N	N	.02	0.68	.04
49---	do------	3.2	1.0	N	N	tr.	tr.	--
50---	do------	50	15.2	tr.	tr.	.2	6.9	--

The Van Epps No. 3 adit (fig. 46, locs. 8–9) did not intersect the sulfide vein exposed in the pits or any mineralized structure. Samples 8 and 9 from the dumps assayed no gold or silver and only a trace of copper.

ELLEN WORKINGS

The Ellen workings are near the head of the Solomon Creek drainage (fig. 46). The Chinook, Silver Fiend, Humbug, and White Star were early claims in the same area (Hodges, 1897; Huntting, 1943, Purdy, 1951). A collapsed cabin, millsite, and traces of several foundations are evidence of old surface development near the head of Solomon Creek.

The Ellen adits at sample localities 3, 4, and 5 (fig. 46) are on or near a complex shear zone at the contact of ultramafic and granitic rocks which are silicified or otherwise altered. Purdy (1951) described the geology in detail. The shear zone, 10–15 ft (3.0–4.6 m) wide, strikes about N. 60° E. and dips about 80° NW. The zone crops out for about 150 ft (46 m) horizontally, about 100 ft (30 m) upward to a ridge crest, and an estimated additional 130 ft (40 m) to the adit on the east side of the ridge (fig. 46, loc. 3). Beyond this adit the mineralized zone thins, splits, and is offset by cross faults but may extend approximately 800 ft (240 m) horizontally and 600 ft (180 m) downward toward the pit at sample locality 2 near where it is obscured under slope wash and talus.

The outcrops along the Ellen shear zone are limonite stained, leached, and vuggy. Minor vein minerals in the shear zones, mainly at the workings at sample localities 4 and 5, are galena, sphalerite, tetrahedrite, chalcopyrite, pyrite, and arsenopyrite. The major workings on the Ellen shear zone (fig. 46, locs. 4–5) are a 12-ft-long (3.7 m) adit and a caved adit which Purdy (1951, p. 63) reported to be 210 ft (64 m) long with five crosscuts driven to explore the width of the zone (fig. 49). The shear zone in the vicinity of the workings consists of coarse-grained quartz and carbonate minerals, feldspar stringers, minor veinlets, and sulfide minerals. The hanging wall of the shear zone is granodiorite, and the footwall is serpentinized peridotite (fig. 49). Samples contain as much as 0.74 oz/ton (25.4 g/metric ton) gold

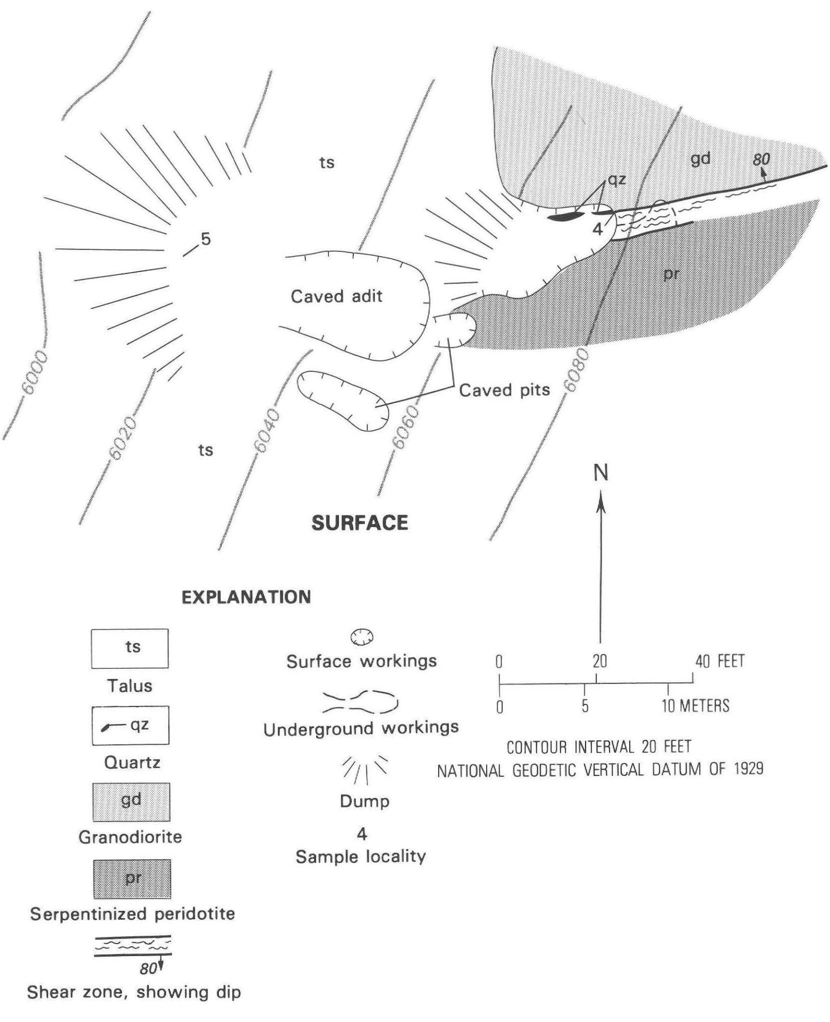


FIGURE 49.—Map of Ellen workings.

and 3.2 oz/ton (110 g/metric ton) silver. Purdy (1951, p. 64) reported that a grab sample of a quartz vein (from the workings at sample localities 4 and 5) contains 0.12 oz/ton (4.1 g/metric ton) gold and 5.98 percent lead.

A 27-ft-long (8.2 m) adit (fig. 46, loc. 3) was excavated through granitic rock, a lamprophyre dike, limy rock, and into about 8 ft (2.4 m) of the sheared rock, which was estimated to be 20 ft (6.1 m) wide at this point. The zone is composed of about 5 percent gouge, 10–20 percent quartz lenses, and 75–85 percent lenticular wallrock inclusions as much as 3 ft (0.9 m) wide. Fine-grained gray metallic minerals occur in layers, mostly less than 0.3 ft (0.09 m) wide.

Several caved excavations and cuts are in granitic slope wash in Solomon Creek valley. Sample 2 (fig. 46) contains 0.13 oz/ton (4.46 g/metric ton) gold and 1.5 oz/ton (51.43 g/metric ton) silver. Granitic rock crops out in large exposures nearby. Fire bricks and some slag in this vicinity may be the remains of a small smelter.

Two caved adits (fig. 46, loc. 6) are probably both on the same mineralized zone which may be an extension of the major Ellen shear zone. The adit, caved at 18 ft (5.5 m) from the portal, is along sheared weathered serpentinized peridotite and decomposed granitic rock. The shear zone is 1–6 ft (0.3–1.8 m) wide, strikes N. 30°–45° E., and dips 55°–65° NW. Weathering has probably leached surficial metallic minerals at the two workings. A 4-ft-long (1.2 m) chip sample across the zone assayed no gold and 0.2 oz/ton (6.8 g/metric ton) silver. Spectrographic analysis indicated less than 0.01 percent copper and lead.

MISCELLANEOUS PROSPECTS

Minor workings in the Van Epps Creek area, listed in table 8, probably have no mineral potential or are not well enough exposed to estimate potential.

FORTUNE CREEK AREA

Scattered prospects (fig. 7, area 16; fig. 50) at the head of Fortune Creek are in an area underlain by serpentinized peridotite and intrusive grandiorite. Much of the rock is sheared, and some serpentinized peridotite is intensely slickensided. Most significant mineralization occurred in sheared zones. Quartz, carbonates, and talc are the most abundant vein minerals; pyrite and arsenopyrite fill some of the fractures in shear zones. Chalcopyrite, the principal economic mineral, occurs in some veins.

TABLE 8.—*Miscellaneous prospects and mineralized zones in the Van Epps Creek-Solomon Creek area, Alpine Lakes area, Washington*

Sample locality No. (fig. 46)	Prospect	Summary	Sample data
1 -------	Solomon-Jack Creek.	Adit and caved shaft in weathered, banded, dolomitized and serpentinized rock.	Select dump sample: 0.01 percent copper, trace of lead, and 0.02 percent vanadium.
20–25 ---	Blackhawk	Four caved adits, total length probably more than 1,000 ft (305 m), in serpentinized peridotite and felsite. Disseminated pyrite, arsenopyrite, galena, chalcopyrite, and sphalerite, some in masses 0.8 ft (0.24 m) wide.	Six select dump samples: as much as trace of gold, 2.10 oz/ton (72 g/metric ton) silver, and as much as 1 percent lead, (lead by spectrographic analyses).
26 ------	Porcupine	Adit extends 71 ft (21.6 m) into serpentinized peridotite.	One sample: 0.02 oz/ton (0.7 g/metric ton) silver and 0.02 percent copper.
35 ------	Unnamed adit.	A 20-ft-long (6.1 m) adit into small pyrite pod and slightly mineralized serpentinized peridotite transected by fracture zones.	One select sample: no gold, 0.18 oz/ton (6.2 g/metric ton) silver, and 0.19 percent copper.
36, 37 ---	Unnamed workings.	Adits extend 32 and 56 ft (9.8 and 17.1 m) into serpentinized peridotite containing 0.1-1.0-ft-wide (0.03-0.3 m) magnetite-chromite and cuprite veins.	Two chip samples: trace of gold and as much as 0.1 oz/ton (3.4 g/metric ton) silver.
38–40 ---	Unnamed adit.	A 20-ft (6.1-m) adit into pyritized silicified felsite and mafic rock.	Three chip samples: maximum of trace of gold and 0.1 oz/ton (3.4 g/metric ton) silver.
51–53 ---	--- do ---	Adit 47 ft (14.3 m) long in sheared contact between silicified felsite and serpentinized peridotite. Caved adit below road has veins at least 0.5 ft (0.15 m) wide containing arsenopyrite and pyrite.	Select sample from adit below road: trace of gold, 0.2 oz/ton (6.8 g/metric ton) silver, and 0.85 percent copper. Chip sample from upper adit: 0.03 percent copper. Grab sample from same area: 0.2 percent copper.
54 ------	--- do ---	Caved adit along near-vertical vein containing pyrite, arsenopyrite, and magnetite. Vein approximately 1 ft (0.3 m) wide in serpentinized peridotite and felsite.	Select sample: trace of gold, no silver, and 0.02 percent copper.
55–58 ---	Roadcut --	A 100-ft-long (30.5 m) zone of mafic rock and felsite cut by mineralized shear zones.	Four chip samples: maximum of 0.02 percent copper.
59–65 ---	--- do ---	Sheared mafic rock for 141 ft (43.0 m) along road.	Seven chip samples: maximum of 0.1 percent copper.
66 ------	Roadcut --	A 33-ft-long (10.1 m) zone of mafic rock cut by shear zones.	One sample: 0.06 oz/ton (2.1 g/metric ton) silver, and less than 0.07 percent copper.

TABLE 8.—*Miscellaneous prospects and mineralized zones in the Van Epps Creek-Solomon Creek area, Alpine Lakes area, Washington*—Continued

Sample locality No. (fig. 46)	Prospect	Summary	Sample data
67-70 ---	The Goldie	Two adits, 68 and 37 ft (20.7 and 11.3 m) long in felsite, serpentinized peridotite, and diorite with scattered pyrite and pyritized shear zones 0.25-12 in. (0.6-0.30 cm) wide.	Average of four chip samples: 0.2 oz/ton (6.8 g/metric ton) silver, and maximum of 0.8 percent copper.
71-93 ---	Roadcut --	Five hundred fifty feet (168 m) of mafic rocks cut by shear zones.	Twenty samples: average less than 0.3 percent copper.
94 ------	Unnamed workings.	Weathered altered rock.	One sample: no gold, no silver, and 0.04 percent copper.
95 ------	--- do ---	Porphyritic aplitic granodiorite with two crosscutting shear zones less than 0.5 ft (0.15 m) wide.	One chip sample: no gold and 0.4 oz/ton (14 g/metric ton) silver.
96 ------	--- do ---	Pit 2-4 ft (0.61-1.2 m) deep in silicified felsite containing scattered sulfide minerals.	One chip sample: no gold, 0.1 oz/ton (3.4 g/metric ton) silver, and 0.05 percent copper.
97 ------	Unnamed adit.	Adit about 20 ft (6.1 m) long into ultramafic rock and along 0.3-0.8-ft-wide (0.09-0.24 m) shear zone. Pyrite along zone.	One select sample: trace of gold, and 0.7 oz/ton (24 g/metric ton) silver.
98 ------	--- do ---	Partly caved adit in serpentinized peridotite. Vein containing pyrite and arsenopyrite at least 1.5 ft (0.46 m) wide.	One select sample: no gold or silver.
99 ------	--- do ---	A 25-ft-long (7.6 m) adit along 0.1 to 0.5-ft-wide (0.03-0.15 m) shear zone in serpentinized peridotite containing chalcopyrite and pyrite.	One sample along shear zone: 0.4 oz/ton (14 g/metric ton) silver and 0.54 percent copper.
D1 -----	U.S. Bureau of Mines drill hole.	Drilled in 250 ft (76.2 m) of mafic rock and shear zones.	Highest assays contained 0.12-0.24 percent copper.
D2 -----	--- do ---	Drilled in 226 ft (68.9 m) of mineralized rock.	Values ranged from 0.10 to 0.46 percent copper.
D3 -----	--- do ---	Hole in mafic rock and shear zones for total depth of 186 ft (56.7 m). Rock mineralized with copper between 138.8 and 146.0 ft (42.3 and 44.5 m).	Values ranged from 0.10 to 0.20 percent copper. Analyses showed a maximum of 0.05 percent WO_3.

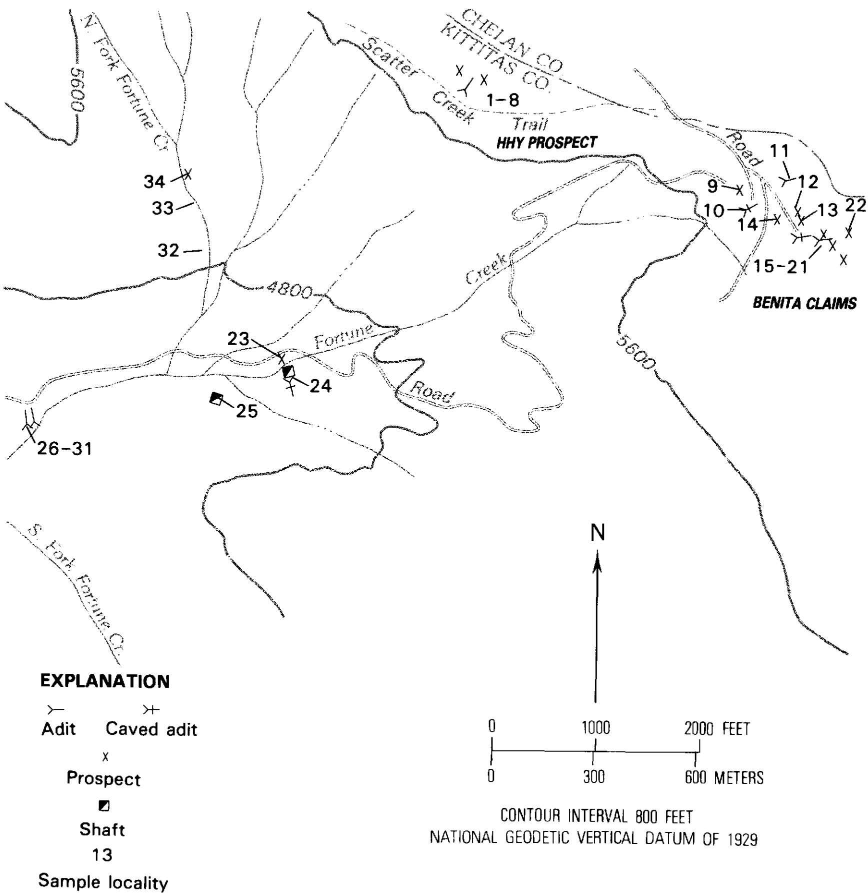


FIGURE 50.—Map showing prospects in the Fortune Creek area.

HHY PROSPECT

The HHY prospect workings (fig. 50, locs. 1–8) were dug in fractured weakly mineralized serpentinized peridotite (fig. 51). Narrow dike-like masses of dacite intrude the serpentinized peridotite at widely spaced intervals subparallel to the major fractures. Pyrite is disseminated in country rock along a few fractures. Most fractures are tight and only slightly mineralized.

A 0.7-ft-long (0.2 m) sample taken across a vein above the adit (fig. 51, loc. 2) contains 2.9 oz/ton (99.4 g/metric ton) silver and 4.2 percent copper. The vein is exposed 24 ft (7.3 m) along the strike. It pinches out to the east and is covered by debris to the west. The area of the HHY prospect has a small potential for discovery of silver-copper resources.

BENITA CLAIMS

The prospect workings on the Benita claims (fig. 50, locs. 9–22) are nearly alined along a silicified zone enriched in sulfide minerals, the Benita shear zone, which strikes N. 45°–55° W. and dips 65°–85° NE. The known length of the Benita shear zone is 1,500 ft (457 m), but it can be inferred for an additional few hundred feet (100–200 m) to the northwest and southeast. Some short adits and pits are along a brecciated and mineralized zone northeast of the main Benita zone.

The main Benita workings are an adit, two trenches, and a caved inclined shaft (fig. 52). The shear zone in the workings is about 8–15 ft (2.4–4.6 m) wide between walls of serpentinized rock. An irregular quartz vein in the center section of the zone averages 0.3 ft (0.09 m) wide and contains 5–10 percent pyrite, chalcopyrite, and galena. Near the bounding faults are massive pyrite-rich elongate sulfide lenses about 0.5 ft (0.15 m) wide and as much as 6 ft (1.8 m) long.

Debris from the Van Epps road covers the portal of an adit (fig. 50, loc. 10). Serpentinized peridotite on the dump of the adit contain less than 5 percent small disseminated pyrite grains. Masses of pyrite, arsenopyrite, and chalcopyrite with quartz and talc as much as 0.5 ft (0.15 m) wide are in some of the broken material.

Samples containing as much as 1.10 oz/ton (37.7 g/metric ton) silver and 2.8 percent copper and the persistence of the Benita shear zone indicate some potential for the discovery of small low-grade deposits of silver and copper.

MISCELLANEOUS PROSPECTS

Other prospects in the Fortune Creek area listed in table 9, have no potential or are not well enough exposed for a potential to be estimated.

GOLD CREEK AREA

The rocks, structural relationships, and mineral deposits of the Gold Creek area (fig. 7, area 12) have been described by Smith and Calkins (1906), Hammond (1961), Stout (1964), Erickson (1969), and A. R. Grant (written commun., 1971).

Granitic rocks of the Snoqualmie batholith intruded volcanic and sedimentary rocks in the Gold Creek area. A. R. Grant (written commun., 1971) reported a conjugate system of strong northwest-trending shear zones and northeast-trending en echelon shears and sheet joints in the Gold Creek area. Some shear zones contain quartz, pyrite, chalcopyrite, pyrrhotite, tetrahedrite, galena, sphalerite, and silver minerals. Extensive hydrothermally altered areas, especially in granodiorite,

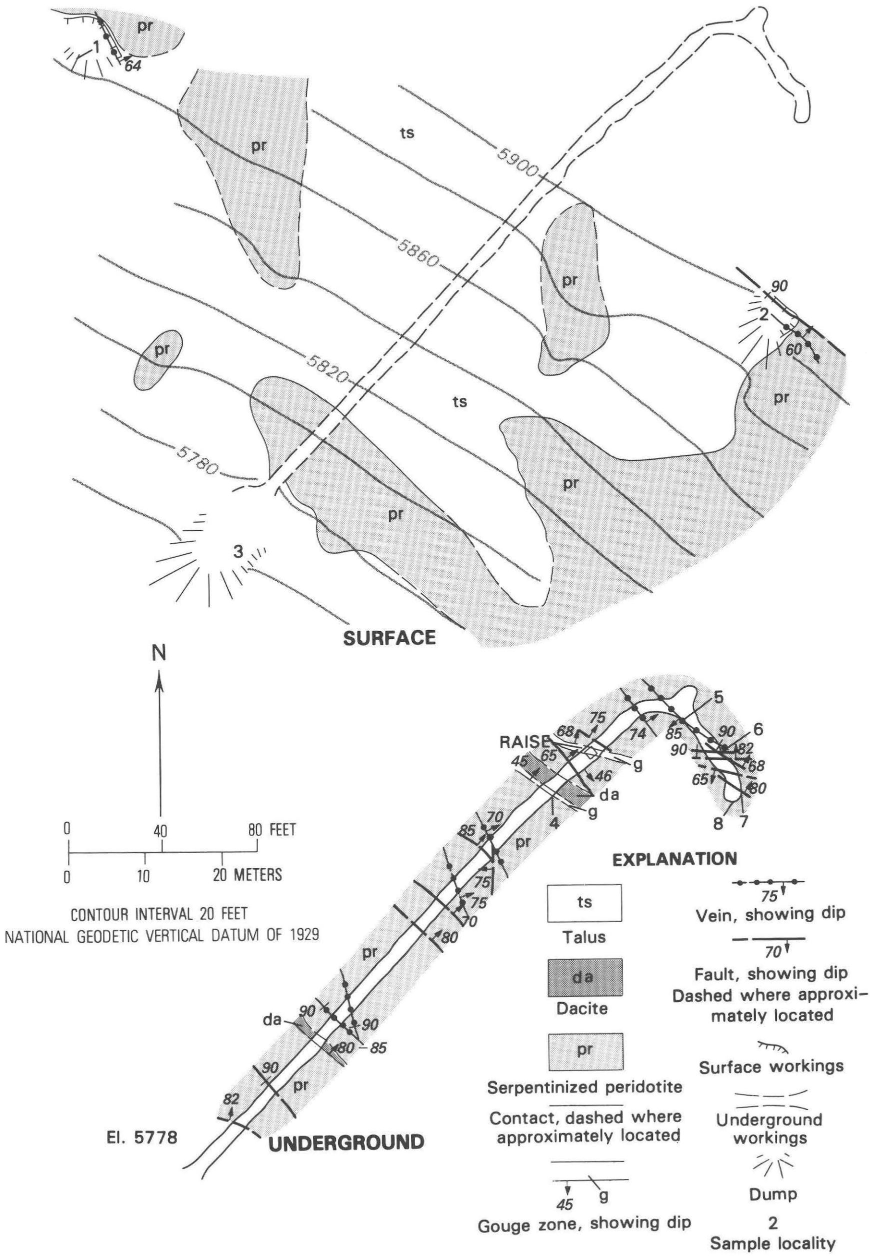


FIGURE 51.—Map of HHY prospect.

Data for samples from HHY prospect, Fortune Creek area

[Tr., trace; N, none detected; --, not shown; NA, not applicable]

Sample		Length		Gold	Silver		Copper
No.	Type	(ft)	(m)		(oz/ton)	(g/metric ton)	(percent)
1---	Grab----	NA	NA	N	0.10	3.42	0.02
2---	Chip----	0.7	0.2	N	2.90	99.21	4.20
3---	Grab----	NA	NA	N	N	N	.30
4---	Chip----	4.0	1.2	Tr.	N	N	--
5---	do------	0.7	0.2	tr.	N	N	N
6---	do------	3.8	1.2	N	N	N	N
7---	do------	1.2	0.4	N	.10	3.42	--
8---	do------	1.5	0.4	N	tr.	tr.	N

contain disseminated quartz, pyrite, pyrrhotite, chalcopyrite, molybdenite, and mica minerals. Phelps Dodge Co. (written commun., 1972) has drilled five holes totaling 3,171 ft (967 m) in Gold Creek basin (fig. 53). Two holes transected 300-ft (91-m) intervals that assayed 0.1 1 and 0.12 percent copper. In the summers of 1973 and 1974, geologic mapping was done by Grant.

In the Gold Creek drainage, many short adits and pits on the south face of Alaska Mountain have been driven along mineralized shear zones (fig. 53). The steeply dipping shear zones on the Tinhorn claims strike approximately N.30° E., subparallal to a possible major fault along Gold Creek (Foster, 1960; Hammond, 1961). A dump of an adit (fig. 53, loc. 17) is nearly on line with the shear zones at workings on the Tinhorn Nos. 3 and 4 claims. They have a difference in elevation of about 1,000 ft (305 m) and are 0.5 mi (800 m) apart. The intervening distance is covered by talus and brush, but the workings probably are on the same structure. Linear features on aerial photographs suggest that the most extensive zone at the Tinhorn workings extends at least to the ridge of Alaska Mountain (fig. 53).

Lode samples from a few prospects in Gold Creek basin contain values that represent small potential resources of copper and silver.

TINHORN NOS. 3 AND 4 CLAIMS

The Tinhorn Nos. 3 and 4 workings are at about 4,300 ft (1,310 m) altitude and are the major workings open on Alaska Mountain (fig. 53. locs. 20–26). The country rock in the area of the portal (fig. 54) is altered granodiorite containing less than 5 percent sulfide minerals disseminated through the rock and concentrated along fractures. The

Continued on p. 185.

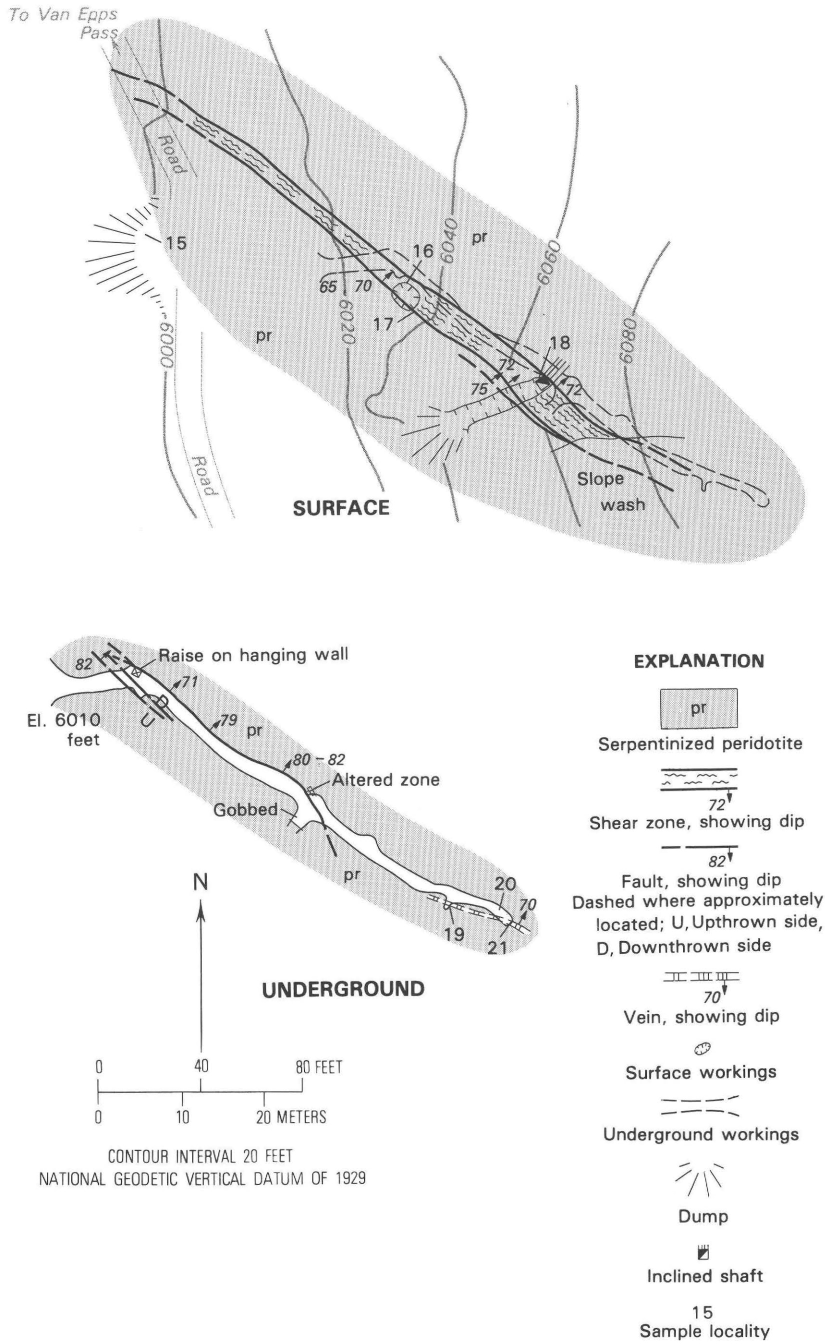


FIGURE 52.—Map of Benita workings.

Data for samples from Benita claims, Fortune Creek area

[Tr., trace; N, none detected; --, not analyzed; NA, not applicable]

Sample				Gold	Silver		Copper (percent)
No.	Type	Length (ft)	Length (m)		(oz/ton)	(g/metric ton)	
15---	Grab---	NA	NA	N	1.10	37.63	2.80
16---	Chip---	1.5	0.4	Tr.	1.00	34.21	--
17---	do-----	2.9	0.9	N	.3	10.3	--
18---	do-----	3.0	0.9	tr.	1.10	37.63	.003
19---	do-----	0.8	0.2	N	.20	6.84	--
20---	Grab---	NA	NA	tr.	.50	17.10	--
21---	Chip---	2.5	0.8	tr.	.10	3.42	--

TABLE 9.—*Miscellaneous prospects in the Fortune Creek area, Alpine Lakes area, Washington*

Sample locality No. (fig. 50)	Prospect	Summary	Sample data
9, 10 ----	Roadcut --	Weathered overburden.	Grab samples, 170 and 50 ft (52 and 15 m) long: as much as trace of gold and 0.04 percent copper.
11 ------	Adit -----	A 42-ft-long (12.8-m) adit into silicified felsite containing scattered sulfide minerals.	Chip samples 40 ft (12.2 m) along wall of adit: trace of gold, trace of silver, and 0.02 percent copper.
12-13 ---	Pits ------	Pits in serpentinized peridotite containing disseminated magnetite and pyrite in shear zones as much as 1.0 ft (0.3 m) wide.	Three samples: maximum of 0.02 percent copper.
14 ------	Pit -------	Pit in slope wash.	Select sample from debris around pit. 0.2 oz/ton (6.8 g/metric ton) silver, and 0.02 percent copper.
22 ------	--- do ---	Caved pit in silicified felsite.	Grab sample: 0.1 oz/ton (3.4 g/metric ton) silver and 0.01 percent copper.
23-24 ---	Silver Bowl prospect.	Caved adit, two trenches, one caved shaft in serpentinized peridotite which is cut by a dolomite-gypsum-quartz-healed shear zone. Evidence of placer mining near adit.	Two chip samples: one contained 0.3 oz/ton (10.3 g/metric ton) silver.
25 ------	Silver Treasury.	Cribbed shaft in serpentinized peridotite with very minor iron oxide stained fractures.	Very minor values of metallic minerals.
26-31 ---	Black Bear	Altered shear zone as much as 1.7 ft (0.52 m) wide in serpentinized peridotite.	Five chip samples: maximum of 0.31 oz/ton (10.6 g/metric ton) gold, 0.10 oz/ton (3.4 g/metric ton) silver, and 1.00 percent copper.
32-33 ---	North Fork	Small pits at trail crossings. Serpentinized peridotite country rock.	Samples contained no metallic values.
34 ------	Jacobson Cabin.	Pits and one caved adit on 60-ft-wide (18.3 m) iron oxide stained shear zone in serpentinized peridotite. Zone strikes N. 11° E., dips vertically. Pyrite and marcasite occur in 15-ft-wide (4.6 m) talcose zone on southeast wall of shear zone.	Grab sample from pit dump: trace of gold, 0.4 oz/ton (13.7 g/metric ton) silver, and 0.07 percent copper.

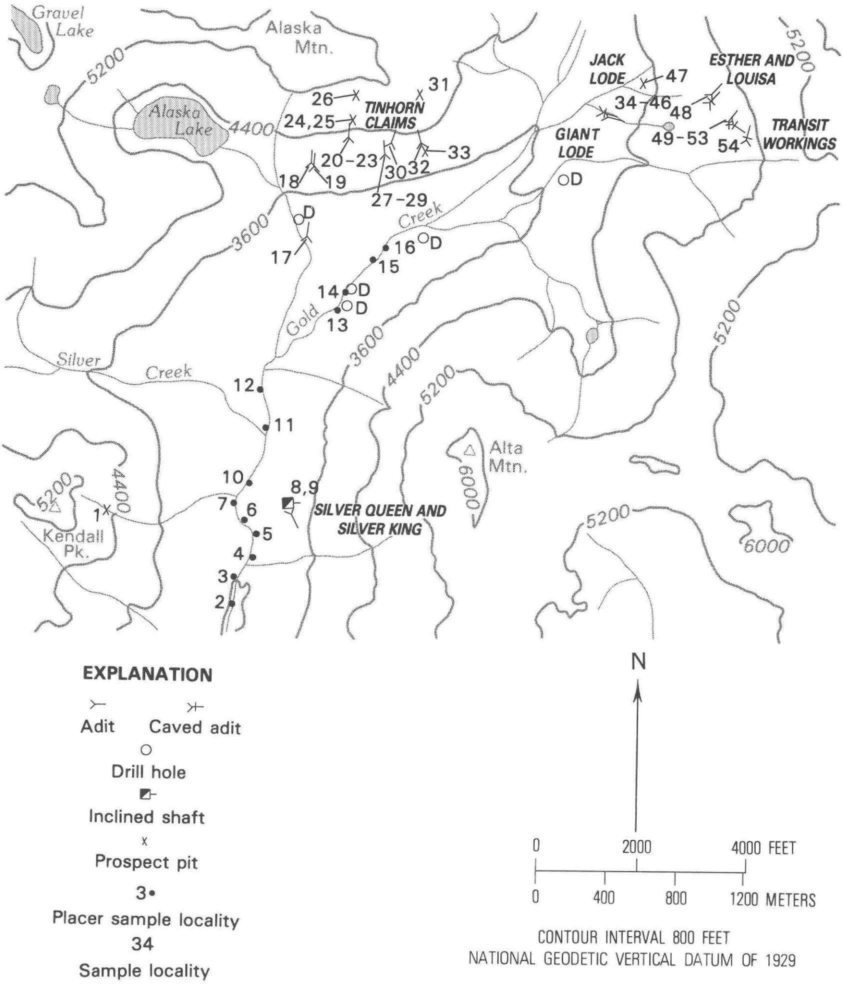


FIGURE 53.—Map showing prospects in the Gold Creek area.

Data for samples from Tinhorn Nos. 3 and 4 claims, Gold Creek area

Tr., trace; N, none detected; --, not analyzed; no gold was detected]

Sample		Length		Silver		Copper	Lead
No.	Type	(ft)	(m)	(oz/ton)	(g/metric ton)	(percent)	(percent)
20---	Grab----	NA	NA	Tr.	Tr.	--	--
21---	do------	NA	NA	0.1	3.4	--	--
22---	Chip----	1.2	.4	1.9	65.2	--	--
23---	Grab----	NA	NA	tr.	tr.	--	--
24---	Chip----	2.6	.8	.1	3.4	--	--
25---	do------	2.0	.6	.6	20.6	--	--
26---	do------	7.0	2.1	3.6	123.5	0.03	0.25

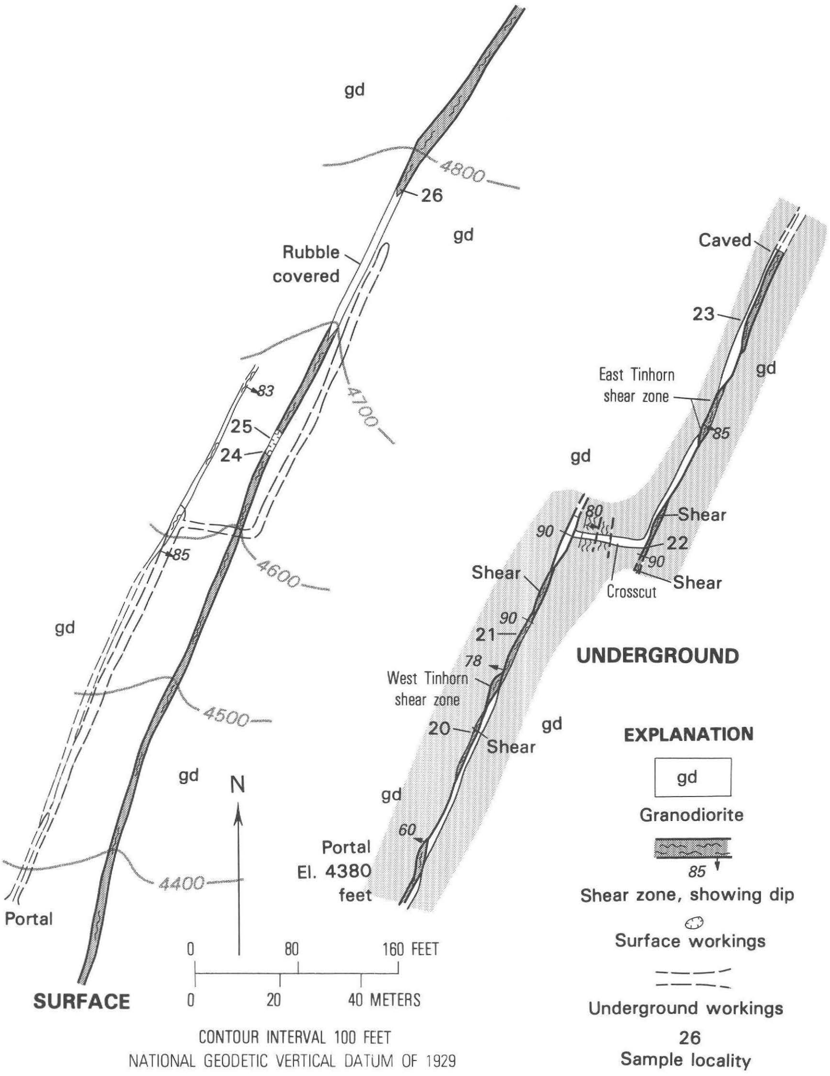


FIGURE 54.—Map of Tinhorn Nos. 3 and 4 claims.

workings were driven along two intensely altered wet gouge zones. The adit first was driven along a 1- to 3-ft-wide (30–90 cm) shear zone composed of 0.5- to 2.0-ft-wide (15–60 cm) lenses of granitic wallrock containing 5–25 percent gouge. The shear zone strikes approximately N. 23° E. and dips from 60° NW. to vertical. Grab samples from the zone contain no gold and 0.1 oz/ton or less (3.4 g/metric ton) silver.

About 320 ft (98 m) from the portal a crosscut was driven eastward to a second shear zone which strikes N. 24° E. and dips nearly vertically. The zone is 0.5–2.0 ft (15–60 cm) wide and contains 5–10 percent sulfide-enriched stringers averaging 0.08 ft (2.4 cm) thick. The zone contains quartz lenses that average 0.5 ft (15 cm) in width but is mostly fragments of wallrock. A pit 2.4 ft (73 cm) wide (fig. 54, loc. 24) has been dug on the shear zone about 280 ft (85 m) vertically above the main adit. A second pit (fig. 54, loc. 26) about 400 ft (122 m) vertically above the main adit exposes the zone, which is about 6 ft (1.8 m) wide and nearly vertical. The richest sample from the zone contains 3.6 oz/ton (123 g/metric ton) silver, 0.03 percent copper, and 0.25 percent lead.

The workings in the two shear zones expose highly oxidized sections of the veins which contain only low-grade material. No potential resource exists above the workings. The persistence of the veins and the oxidized weathered surface material that gives only low assay values indicate a possible zone of enrichment at lower levels in the shear zone and a possible zone of unaltered sulfide minerals at greater depths. The veins, if present at depth, are probably narrow, however.

EAST TINHORN AREA

Two adits were driven on another smaller shear zone (fig. 53, locs. 27–30) about 900 ft (270 m) east from the zones on Tinhorn Nos. 3 and 4 claims. The lower adit (fig. 53, locs. 27–29) was driven for a total distance of 330 ft (101 m) on two closely spaced roughly parallel faults which diverge near the face. Where observed in the adit and on the surface near the portal the fractures are tight. A random grab sample from a stockpile near the portal contains 11.1 oz/ton (381 g/metric ton) silver, no gold, 7.7 percent copper, and 0.008 percent lead. It is not evident where the ore came from in the workings. Two chip samples taken across the zone contain no gold and at best 0.2 oz/ton (6.8 g/metric ton) silver.

The upper adit, probably along the same shear zone (fig. 53, loc. 30) was driven for 20 ft (6 m) on a bearing of N. 20° E. The country rock is jointed to slightly brecciated granodiorite. In the adit the shear zone is 0.5–1.5 ft (15–46 cm) wide and is composed of 50 percent intensely fractured country rock, 30 percent quartz, and about 20 percent sulfide minerals. The sulfide minerals are composed of about 75 percent pyrite, 20 percent chalcopyrite, and 5 percent tetrahedrite. The granodiorite between shears intersecting the main shear zone near the portal is iron oxide stained and contains about 5 percent small irregular masses and stringers of sulfide minerals. A sample (fig. 53, loc. 30) taken across the main shear zone at the portal contains 0.02 oz/ton (0.7 g/metric ton) gold, 4.5 oz/ton (154 g/metric ton) silver, and 1.3 percent copper.

GIANT LODE AND JACK LODE

The Giant lode and Jack lode patented claims are east of Gold Creek. The lower Giant adit portal is caved, but a map of the workings (fig. 55) was obtained from E. A. Magill (written commun., 1971).

The Giant workings are in granitic rock near the contact with volcanic rocks. Disseminated pyrite, chalcopyrite, and galena are concentrated in north-striking steeply dipping shear zones and total less than 5 percent of the mineralized rock.

The upper Giant adit was driven east in the granitic rock, and short drifts were driven north and south along minor shears. A flooded winze close to the portal is reported to be more than 32 ft (9.75 m) deep. The adit was begun in an iron oxide stained altered shear zone about 6 ft (1.8 m) wide. The winze was sunk on an intensely altered 0.5-ft-wide (15 cm) shear zone that strikes N. 8° W. and dips 76° NE. The shear zone consists of 10–25 percent pyrite and silicified rock. At about 27 ft (8.2 m) from the portal, the adit crosses an iron oxide stained 0.5- to 1.0-ft-wide (15–30 cm) pyritic fault that strikes N. 15° W. and dips 50° SW. to vertical. The north 8-ft-long (2.4 m) drift of the upper adit is along a 0.1-ft-wide (3 cm) altered fault that strikes north and dips 82° W. The south drift was driven on a 0.5- to 1.0-ft-wide 15–30 cm) fault zone that strikes mainly N. 10° E. and dips 72° W. The zone is composed mostly of quartz containing 5–10 percent pyrite.

Selected samples (fig. 55) from the dump of the lower adit contain at most 0.20 oz/ton (8.86 g/metric ton) gold, 12.40 oz/ton (425.13 g/metric ton) silver, 0.3 percent copper, and 2.1 percent lead. Samples from the upper Giant adit contain as much as 0.14 oz/ton (4.80 g/metric ton) gold, 14.96 oz/ton (512.9 g/metric ton) silver, 0.08 percent copper, and 0.16 percent lead. A random chip sample from granitic rock in the streambed containing disseminated sulfide minerals contains no gold or silver and 0.03 percent copper. The extent of the disseminated sulfide minerals in the granitic rock on the surface could not be seen because of overburden.

The Jack lode workings are about 1,000 ft (300 m) northeast of the upper Giant adit on the north and south sides of a small creek along which gray granitic rock is exposed. A 3-ft-long (0.9 m) pit undercutting the north bank and a caved adit about 30 ft (9.1 m) away on the south bank are in a 4-ft-wide (1.2 m) shear zone. The zone is nearly vertical, strikes about N. 27° E., and is about 90 percent granitic fragments, 5 percent gouge, and 5 percent pyrite. Sample 47 (fig. 53) from near the Jack workings contains no gold, 0.1 oz/ton (3.4 g/metric ton) silver, and no copper.

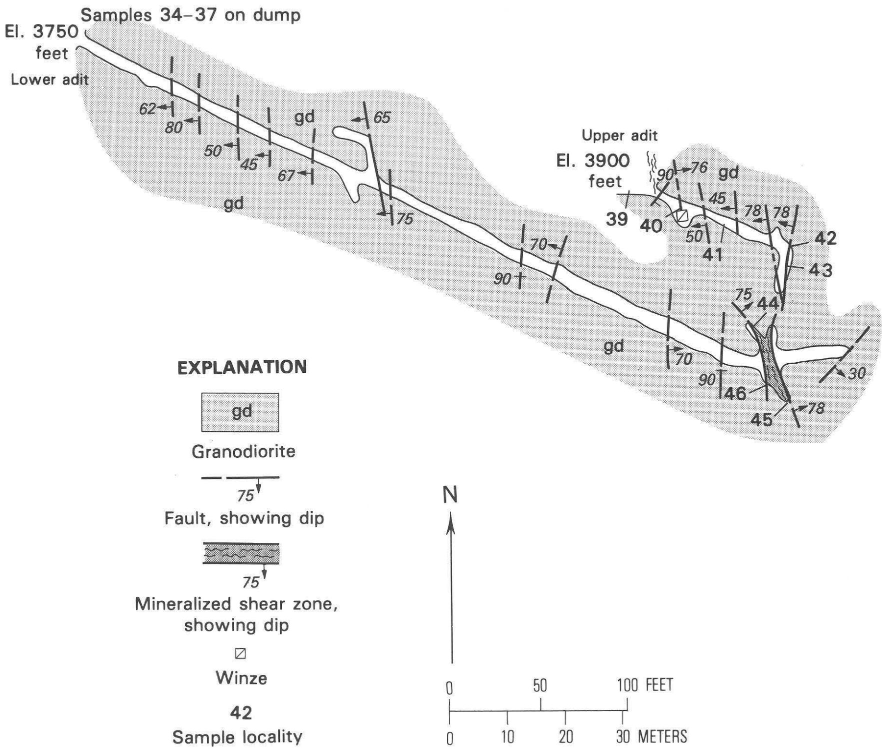


FIGURE 55.—Map of underground workings, Giant lode claim. Modified from E. A. Magill (written commun., 1971).

Data for samples from Giant lode, Gold Creek area

[N, none detected; --, not analyzed, NA, not applicable]

Sample				Gold		Silver		Copper	Lead
		Length							
No.	Type	(ft)	(m)	(oz/ton)	(g/metric ton)	(oz/ton)	(g/metric ton)	(percent)	(percent)
34---	Select---	NA	NA	0.08	2.74	6.2	212.1	0.31	2.1
35---	Grab-----	NA	NA	.08	2.74	12.40	424.20	--	--
36---	do-------	NA	NA	.20	6.84	8.04	275.05	--	--
37---	do-------	NA	NA	.02	0.68	1.04	37.58	--	--
39---	Chip-----	0.5	0.2	.14	4.79	14.96	511.80	--	--
40---	do-------	1.0	0.3	N	N	8.9	304.47	--	--
41---	do-------	100.0	30.5	N	N	1.2	41.052	--	.1
42---	do-------	.7	0.2	--	--	.14	4.79	.04	--
43---	do------	1.5	0.4	N	N	.3	10.3	.08	.16
44---	do------	1.0	0.3	.08	2.74	1.46	49.95	--	--
45---	do------	2.0	0.6	.12	4.10	2.34	80.05	--	--
46---	do------	1.0	0.3	.02	0.68	2.14	73.21	--	--

TRANSIT WORKINGS

The main workings on the patented Transit claim (fig. 53) are on the east side of upper Gold Creek valley. The crosscut adit (fig. 56) on the north side of a steep-sided gulch was driven through mineralized rock along faults that bound a fractured zone in blocky andesite. A drift was turned from the adit N. 48° E. along the zone. The zones converge at a point about 58 ft (18 m) from the intersection of the adit and drift, and a winze of undetermined depth was sunk 14 ft (4 m) from the face of the drift.

The more northern of the two fault zones consists of a 0.5-ft-wide (0.15 m) zone of gouge and a 0.5-ft-wide (0.15 m) vein of pyrite-rich quartz. The other fault zone is narrower and consists of gouge but not quartz stringers. The intervening andesite is dark, fine-grained, intensely fractured, and stained with iron oxides.

No minable ore was found on the Transit claim. One 0.5-ft-wide (0.15 m) sample (fig. 56, loc. 53) from across a mineralized fault zone contains 0.08 oz/ton (2.7 g/metric ton) gold, 10.70 oz/ton (367 g/metric ton) silver, and 0.56 percent copper.

SILVER KING AND SILVER QUEEN CLAIMS

The Silver King and Silver Queen patented claims (fig. 53) are east of Gold Creek and on the west side of Alta Mountain. A fault and an irregular quartz vein intersect in massive andesite on the property (fig. 57). The fault strikes N. 60° E., dips 46° NW., and is evidenced by a straight, very steep gully. The quartz vein crops out at the portal of an inaccessible adit south of the gully and near a caved inclined shaft north of the gully. North of the shaft the vein splits and appears to pinch out. The vein was traced a few hundred feet (about 100 m) south of the adit.

A random grab sample (fig. 57, loc. 8) from a stockpile on a lower dump that appeared to be from the inclined shaft contains 0.07 oz/ton (2.4 g/metric ton) gold, 22.4 oz/ton (768 g/metric ton) silver, and 0.063 percent copper. A second random grab sample (loc. 9) of a stockpile near the shaft collar contained much less than that from sample locality 8.

The intersection of the fault and the vein on the surface is covered by debris. The moderate dip of the two structures indicates an intersection having a relatively flat rake to the northeast that may have localized the emplacement of sulfide minerals. The inclined shaft would penetrate this zone a few tens of feet (about 10 m) from the collar.

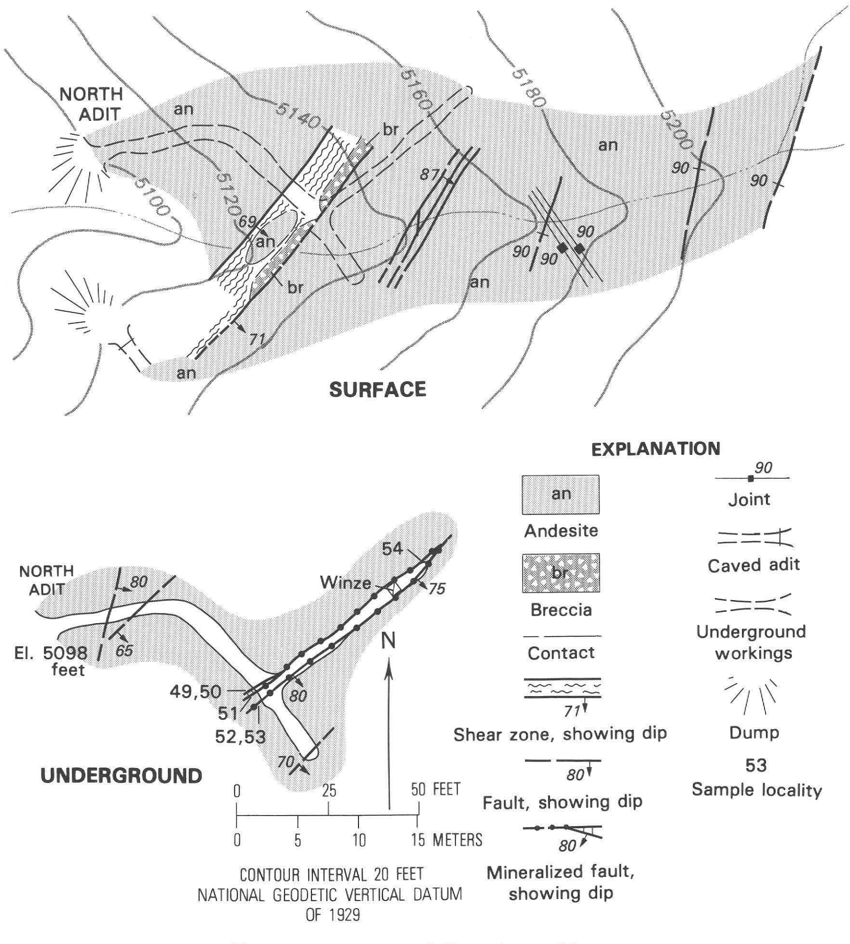


FIGURE 56.—Map of Transit workings.

Data for samples from the Transit workings, Gold Creek area

[Tr., trace; N, none detected; all samples are chip]

Sample			Gold		Silver		
	Length						
No.	(ft)	(m)	(oz/ton)	(g/metric ton)	(oz/ton)	(g/metric ton)	Copper (percent)
49---	1.0	0.3	0.04	1.37	2.86	97.84	0.37
50---	2.2	0.7	N	N	3.20	109.47	.30
51---	2.6	0.8	N	N	Tr.	Tr.	.04
52---	.8	0.2	N	N	.40	13.68	.23
53---	.5	0.2	.08	2.74	10.70	366.05	.56

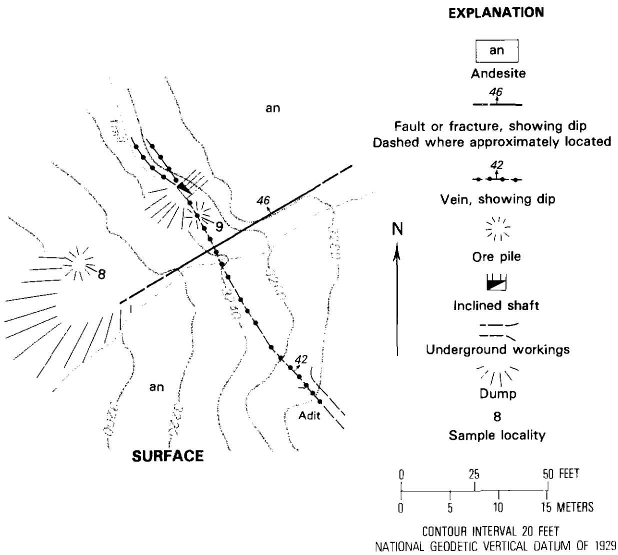


FIGURE 57.—Map of Silver King and Silver Queen claims.

MISCELLANEOUS PROSPECTS

Other lode and placer prospects in the Gold Creek area have no potential or are not well exposed (table 10). Placer samples from carefully selected sites along Gold Creek contained only very minor amounts of gold.

HUCKLEBERRY MOUNTAIN AREA

The area is on the west slope of Huckleberry Mountain, between Fortune and Camp Creeks and east of the Cle Elum River (fig. 7, area 17; fig. 58). Greenstone and serpentinized peridotite intruded by granodiorite underlie most of the area. A roof pendant of bedded silicified volcanic breccia underlies the White Cat prospect (fig. 58, locs. 19–27).

Prospect workings are concentrated along or near the contact between granodiorite and greenstone and along shear zones in the serpentinized peridotite and volcanic breccia. Gold, silver, and copper occur in the area, but surface exposures in most areas are too sparse to determine accurately the extent of resources.

TABLE 10.—*Miscellaneous prospects in the Gold Creek area, Alpine Lakes area, Washington*

Sample locality No. (fig. 53)	Prospect	Summary	Sample data
1 -------	Kendall Peak.	Iron oxide stained shear zone 0.5–3.0 ft (0.15–0.91 m) wide in altered volcanic rock.	Random chip sample: trace of gold, 0.1 oz/ton (3.4 g/metric ton) silver, 0.02 percent copper.
2–7, 10–16.	Placer locations.	Panned samples from bedrock exposures and favorable gravel deposits in and near Gold Creek.	Thirteen samples tested for recoverable gold: calculated on a value of \$168.92/troy oz., one yielded \$0.18/yd^3 (\$0.23/m^3). Others less than \$0.01/yd^3) (\$0.013 m^3) to \$0.05/yd^3 (\$0.065/m^3).
17 ------	Granite King.	Caved adit, estimated 500 ft (150 m) long, in porphyritic granodiorite.	Grab sample from dump: no gold or silver.
18–19 ---	Tinhorn No. 1 and 2.	Two adits, 18 and 34 ft (5.5 and 10.4 m) long, in granodiorite. Some silicified, pyritized, and micaceous country rock.	One chip sample and one grab sample: maximum of 0.8 oz/ton (24 g/metric ton) silver and 0.39 percent copper. No gold in either sample.
31 ------	Ridge breccia.	Pyritized breccia zone in granodiorite.	One sample: no gold, 0.01 oz/ton (0.3 g/metric ton) silver, and 0.5 percent copper.
32 ------	Adit -----	Brecciated granodiorite containing less than 1 percent disseminated pyrite. One 11-ft-long (3.4 m) adit.	One sample: 0.01 oz/ton (0.3 g/metric ton) gold, 1.2 oz/ton (41.1 g/metric ton) silver, and 1.9 percent copper.
33 ------	Pit -------	A pit in 4-ft-wide (1.2 m) pyritized shear zone in silicified breccia.	One chip sample: no gold or silver, 0.02 percent copper.
48 ------	Esther and Louisa.	Open adit 200 ft (61 m) long and caved adit in andesite porphyry. Pyrite in fractures and disseminated in porphyry.	One sample: no gold, 0.2 oz/ton (6.8 g/metric ton) silver.

WHITE CAT PROSPECT

The White Cat prospect is north of Camp Creek near the Cle Elum River road (fig. 58). A total of about 15.5 tons (14 metric tons) of silver-gold ore was shipped from the property in 1929 and 1956 (U.S. Bureau of Mines, written commun., undated).

Three adits were driven southeast along steeply dipping shear zones that cut silicified extrusive rocks containing calcite stringers (fig. 59, locs. 11–27). A northeast-trending shear zone was cut by one adit. Pyrite, arsenopyrite, galena, sphalerite, and chalcopyrite occur as lenses and pods in the shear zones and in fine-grained disseminations. Quartz and calcite are common gangue minerals.

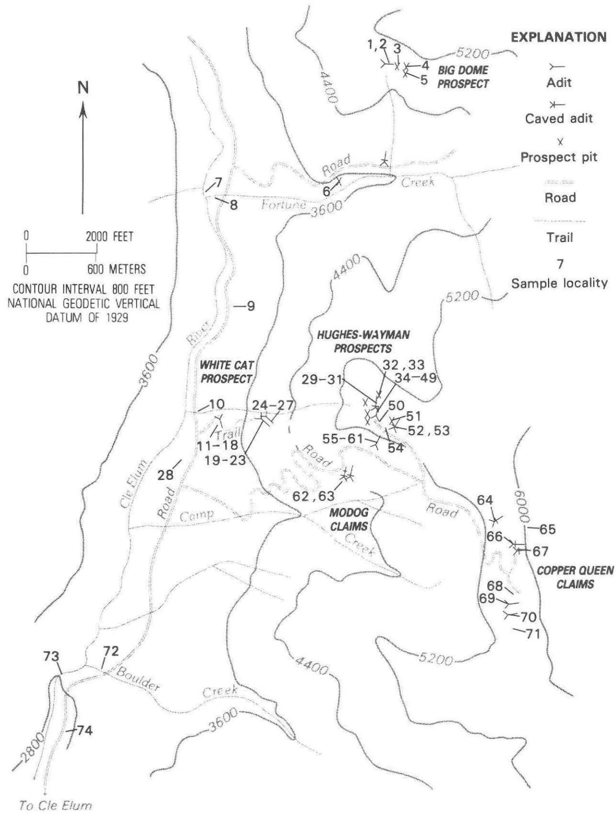


FIGURE 58.—Map showing prospects in the Huckleberry Mountain area.

Adit 1 intersects 1- to 1.5-ft-wide (0.3–0.5 m) shear zones that contain randomly distributed lenses of sulfide minerals. Adit 2 intersects a 4.5- to 6.0-ft-wide (1.4–1.8 m) sulfide-bearing shear zone that strikes N. 55° W. and dips 35°–45° SW. A 20-ft-high (6.1 m) stope 95 ft (29 m) from the portal of adit 2 was driven updip. Adit 3 follows a 3.0- to 3.5-ft-wide (0.9–1.1 m) shear zone that strikes N. 30°–45° W. and dips 50°–67° SW. The zone contains from 5 to 20 percent sulfide minerals in lenses and pods.

The mineralized shear zone explored by adits 2 and 3 has an indicated submarginal resource of about 15,000 tons (13,600 metric tons) averaging about 2.63 oz/ton (90.1 g/metric ton) silver, 0.07 percent copper, 0.34 percent lead, and 0.30 percent zinc.

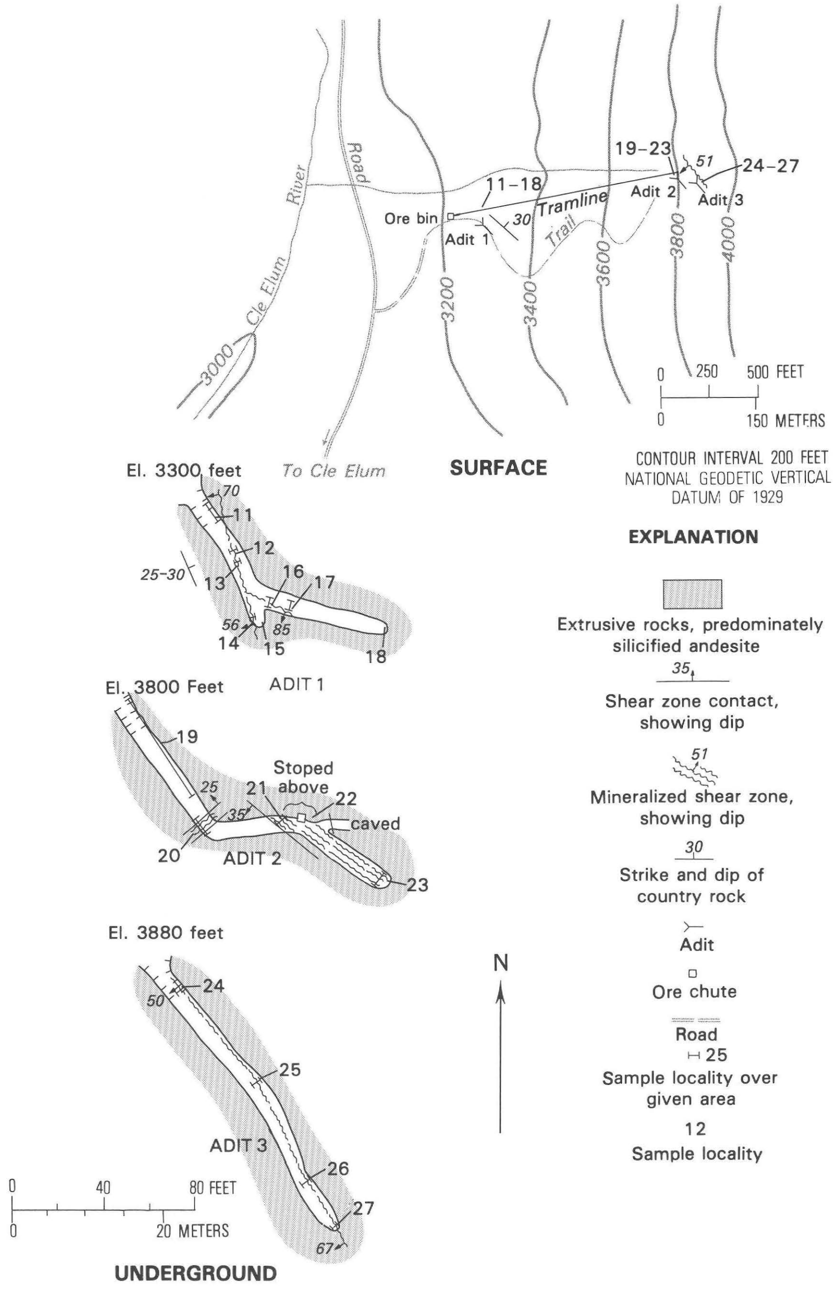


FIGURE 59.—Map of White Cat prospect.

Data for samples collected from White Cat prospect, Huckleberry Mountain area

(Tr., trace; N, none detected; --, not analyzed; <, less than snown; all samples are chip]

Sample			Gold		Silver				
	Length			(g/metric		(g/metric	Copper	Lead	Zinc
No.	(ft)	(m)	(oz/ton)	ton)	(oz/ton)	ton)	(percent)	(percent)	(percent)
11---	13.0	3.9	N	N	0.3	10.3	0.014	<0.01	--
12---	.5	0.2	0.01	0.34	2.2	75.2	.12	.22	--
13---	1.4	0.4	.01	0.34	.5	17.1	.057	.10	0.12
14---	1.1	0.3	Tr.	Tr.	.3	10.3	.06	--	--
15---	3.0	0.9	N	N	.3	10.3	.028	.032	--
16---	1.5	0.4	N	N	.1	3.4	--	--	--
17---	5.0	1.5	N	N	.2	6.8	--	--	--
18---	5.0	1.5	tr.	tr.	N	N	--	--	--
19---	52.0	15.9	N	N	N	N	.009	<.01	.008
20---	5.0	1.5	N	N	Tr.	Tr.	--	--	--
21---	4.5	1.4	tr.	tr.	9.6	328.3	.13	1.	.5
22---	4.5	1.4	.01	0.34	1.5	51.3	.037	.052	.15
23---	6.0	1.8	N	N	tr.	tr.	.004	<.01	.009
24---	3.0	0.9	.01	0.34	.3	10.3	.13	.15	.18
25---	3.5	10.7	tr.	tr.	1.5	51.3	.05	.87	.27
26---	3.0	0.9	tr.	tr.	2.7	92.3	.068	.032	.93
27---	3.5	10.7	.01	0.34	2.7	92.3	.14	.33	.35

HUGHES-WAYMAN PROSPECT

The Hughes-Wayman prospect (fig. 58, locs 29-61) is underlain by serpentinized peridotite which is intruded by granitic rock. The country rock is cut by northwest- to west-trending steeply dipping shear zones that range in width from 1 to 12 ft (0.3-3.7 m) and by less well developed, vertically dipping, northeast-trending shear zones and quartz-filled fractures. The shear zones contain pyrite and chalcopyrite in association with quartz and gouge.

Development consists of two open adits, two caved adits, and five prospect pits (fig. 60). Adit 1 cuts 64 ft (19.5 m) of intensely silicified granitic rock containing disseminated sulfide minerals, a 3.5- to 4.0-ft-wide (1.1-1.2 m) highly altered shear zone, and intersects three other 3- to 7-ft-wide (0.9-2.1 m) shear zones.

Adit 2 follows a 0.5- to 1.5-ft-wide (0.15-0.46 m) quartz vein containing scattered pyrite crystals. The adit crosscuts four north- to northwest-trending, steeply dipping fault zones that are 1.0-3.5 ft (0.3-1.1 m) wide and contain disseminated pyrite, arsenopyrite, chalcopyrite, quartz, and gouge.

North and west of adit 1, northwest-trending, steeply dipping, highly altered shear zones are exposed in prospect pits and on the surface. They contain pyrite, arsenopyrite, chalcopyrite, quartz, and clay. Malachite coats some rocks in the zones.

Continued on p. 198.

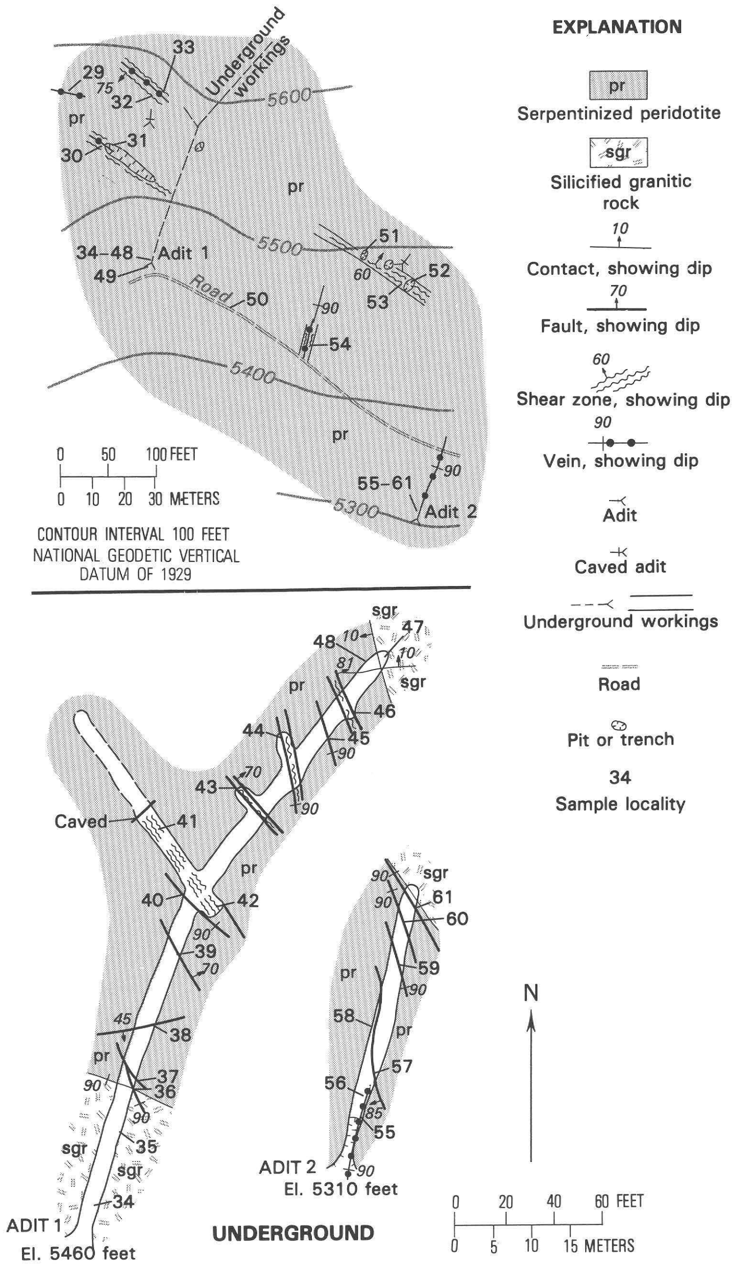


FIGURE 60.—Map of Hughes-Wayman prospect.

Data for samples collected from Hughes-Wayman prospect, Huckleberry Mountain area

[Tr., trace; N, none detected; --, not analyzed; NA, not applicable; all samples are chip except 49 which is a grab sample]

Sample			Gold		Silver		
	Length						
No.	(ft)	(m)	(oz/ton)	(g/metric ton)	(oz/ton)	(g/metric ton)	Copper (percent)
29----	4.0	1.2	N	N	0.1	3.4	--
30----	6.0	1.8	Tr.	Tr.	.2	6.8	0.047
31----	6.0	1.8	0.01	0.34	.2	6.8	.15
32----	6.5	2.0	tr.	tr.	.4	13.7	.16
33----	6.0	1.8	tr.	tr.	.1	3.4	.22
34----	32.0	9.6	N	N	.2	6.8	.016
35----	32.0	9.6	N	N	.1	3.4	.012
36----	1.0	0.3	N	N	.1	3.4	.13
37----	3.5	1.0	.13	4.45	.1	3.4	.11
38----	2.5	0.8	tr.	tr.	.6	20.5	.064
39----	1.0	0.3	tr.	tr.	.2	6.8	.052
40----	1.0	0.3	.47	16.08	.3	10.3	.019
41----	3.5	1.0	N	N	N	N	.08
42----	4.0	1.2	N	N	.1	3.4	.13
43----	3.0	0.9	tr.	tr.	.2	6.8	.21
44----	4.0	1.2	.01	0.34	.2	6.8	.068
45----	3.0	0.9	N	N	N	N	.044
46----	7.0	2.1	tr.	tr.	.5	17.1	.13
47----	3.0	0.9	N	N	Tr.	Tr.	.028
48----	1.0	0.3	N	N	tr.	tr.	--
49----	NA	NA	0.87	29.76	1.4	47.9	1.31
50----	6.0	1.8	N	N	.1	3.4	--
51----	7.0	2.1	.01	0.34	.8	27.4	.31
52----	12.0	3.7	N	N	N	N	.068
53----	6.0	1.8	tr.	tr.	.5	17.1	.38
54----	1.0	0.3	N	N	.1	3.4	--
55----	1.5	0.4	N	N	N	N	.013
56----	1.4	0.4	tr.	tr.	.1	3.4	.01
57----	3.5	1.1	tr.	tr.	.1	3.4	.018
58----	3.0	0.9	tr.	tr.	.1	3.4	.085
59----	1.5	0.4	N	N	.1	3.4	.015
60----	1.0	0.3	tr.	tr.	.3	10.3	.24
61----	2.0	0.6	.01	0.34	.4	13.7	.44

The principal shear zone averages 5.8 ft (1.8 m) wide and is traceable for a total of more than 350 ft (107 m) on the surface, in adit 1, and in prospect pits (fig. 60, locs 32, 33, 40–42, 51, 53). This zone is estimated to have a resource of more than 30,000 tons (27,216 metric tons) averaging 0.12 oz/ton (4.1 g/metric ton) gold, 0.27 oz/ton (9.3 g/metric ton) silver, and 0.34 percent copper. The deposit has potential for the discovery of additional resources.

COPPER QUEEN CLAIMS

The Copper Queen claims are on the west slope of Huckleberry Mountain, east of the Cle Elum River and near the head of Camp Creek (fig. 58, locs. 64–71). Country rock in the area of the claims is sheared serpentinized peridotite that has been intruded by an elongate granitic body that trends north, is 20–80 ft (6–24 m) wide, and is exposed for 600 ft (183 m) (fig. 61). It is traceable for another 800 ft (244 m) by following float. The intrusive rock is intensely silicified, stained by iron oxide, and contains narrow veins and pods of quartz and disseminated pyrite and chalcopyrite.

Two adits, 10 and 20 ft (3 and 6 m) long, crosscut the upper part of the intrusive. A caved adit (fig. 61, loc. 64) estimated to be more than 300 ft (91 m) long, probably marks an attempt to crosscut to the granite at depth.

Two adits, 34 and 60 ft (10 and 18 m) long, crosscut an intensely altered shear zone in peridotite (fig. 61, locs. 68–71). The shear zone is as much as 20 ft (6.1 m) wide and is exposed for 260 ft (79 m). Peridotite near the shear zone is mostly altered to serpentine; the rock is silicified and iron oxide stained, and contains pods and stringers of calcite and narrow quartz veins. Finely disseminated pyrite and chalcopyrite occur in the serpentinized peridotite and quartz. The exposed surfaces and joints contain crusts and scales of malachite and azurite.

A minor gold and copper resource is believed to occur at the Copper Queen prospect, but the mineralized areas are not sufficiently exposed to allow calculation of tonnage and grade. Exploration of the granitic intrusive (fig. 61, locs. 65–67) and the quartz-filled shear zones (fig. 61, locs. 68–71) may delineate other resources, especially in the area of sample 67.

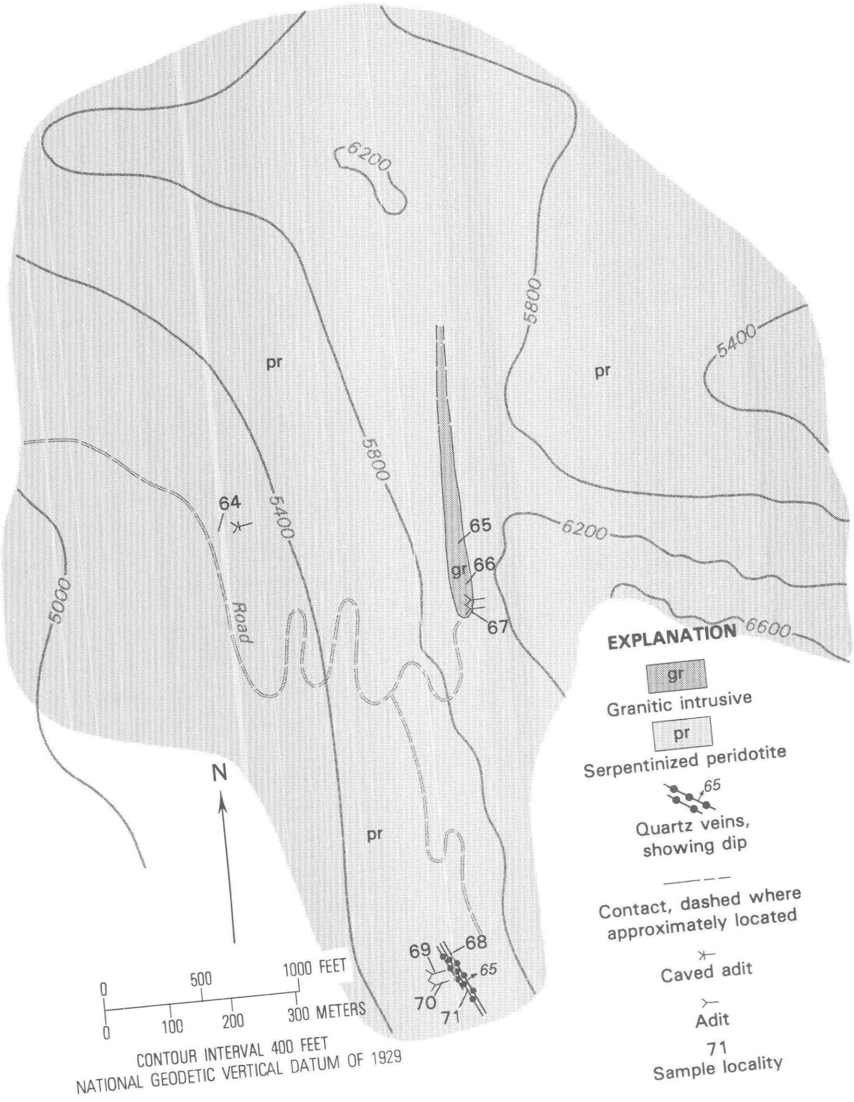


FIGURE 61.—Map of Copper Queen claims.

MISCELLANEOUS PROSPECTS

Other prospects and mineralized zones in the Huckleberry Mountain area are summarized in table 11.

TABLE 11.—*Miscellaneous prospects and mineralized zones in the Huckleberry Mountain area, Alpine Lakes area, Washington*

Sample locality No. (fig. 58)	Prospect	Summary	Sample data
1-5	Big Dome	Pits, trenches, and one 30-ft-long (9.1 m) adit explored granitic porphyry that intrudes serpentinized peridotite. Chalcopyrite disseminated in granitic rock near contact and in joints.	Five chip samples: 0.1–0.3 oz/ton (3.4–10.3 g/metric ton) silver, as much as 0.64 percent copper, 0.02–0.04 percent tungsten, and traces of gold, lead, and zinc.
6	Unnamed	One pit explored a 0.3-ft-wide (0.09 m) quartz vein at a serpentinized peridotite-granodiorite contact.	One chip sample: 0.01 percent copper and traces of silver, lead, and zinc.
7-10, 28	Fortune Creek, Camp and vicinity placers.	Small deposits of stream gravel.	Five pan samples: minor black sand, trace of scheelite, and no gold.
62, 63	Modog	Two caved adits explored a 0.5-ft-wide (0.15 m) quartz vein in serpentinized peridotite near a diorite contact. The contact zone contains chalcopyrite and malachite in quartz veinlets.	One chip sample across quartz vein: 0.98 oz/ton (33.6 g/metric ton) gold, 0.4 oz/ton (13.7 g/metric ton) silver, and 0.5 percent copper. One grab sample of serpentinized peridotite: trace of gold, 0.1 oz/ton (3.4 g/metric ton) silver.
72-74	Little Boulder Creek, Boulder Creek, and Cle Elum placers.	Small deposits of stream gravel.	Three pan samples: very little black sand, no gold.

COUGAR CREEK AREA

Several prospects are along Cougar Creek and on Dog and Goat Mountains in the Cougar Creek area (fig. 7, area 5; fig. 62). Granodiorite cut by steeply dipping mineralized shear zones crops out in the area. Quartz, mica, talc, tourmaline, pyrite, arsenopyrite, chalcopyrite, galena, sphalerite, and molybdenite are the principal minerals in the mineralized zones. Gold and scheelite are minor constituents. Most of the sulfide minerals are confined to or are near altered zones and joints.

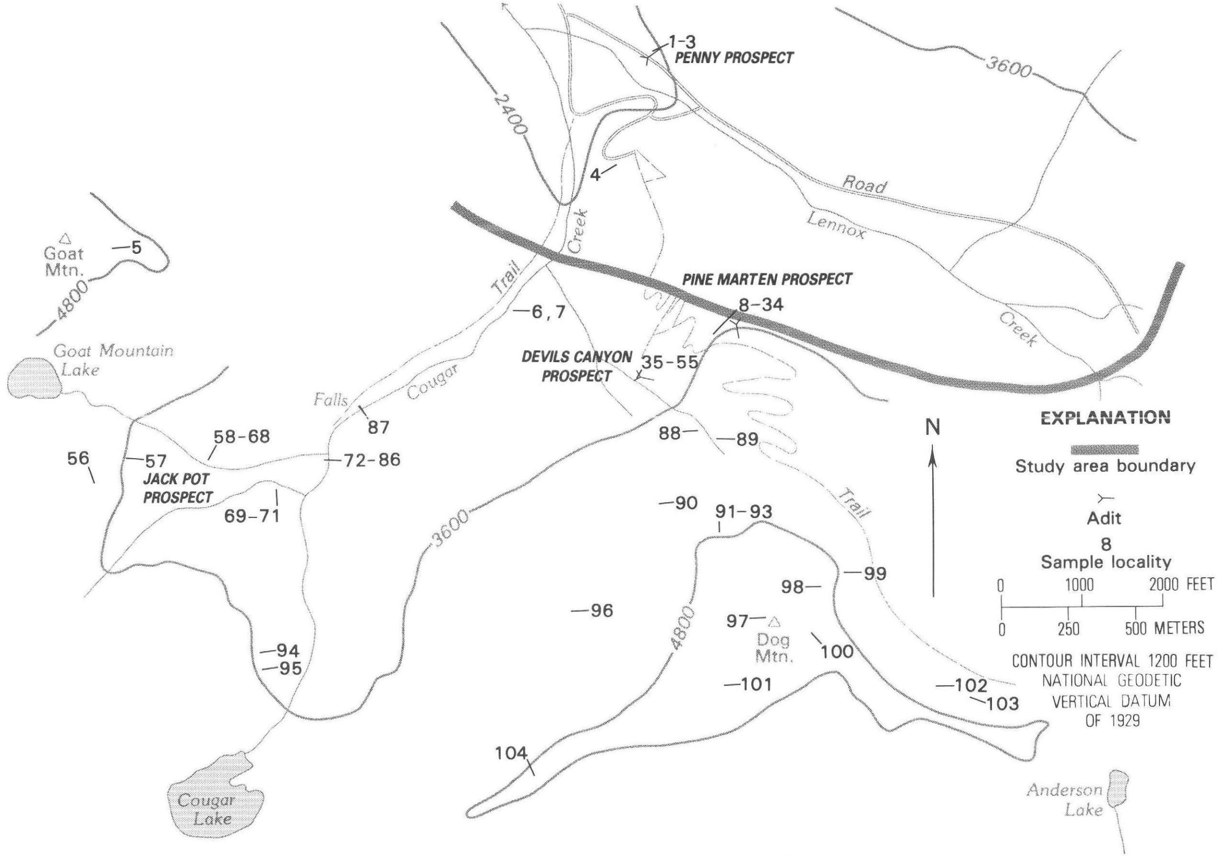


FIGURE 62.—Map showing prospects in the Cougar Creek area.

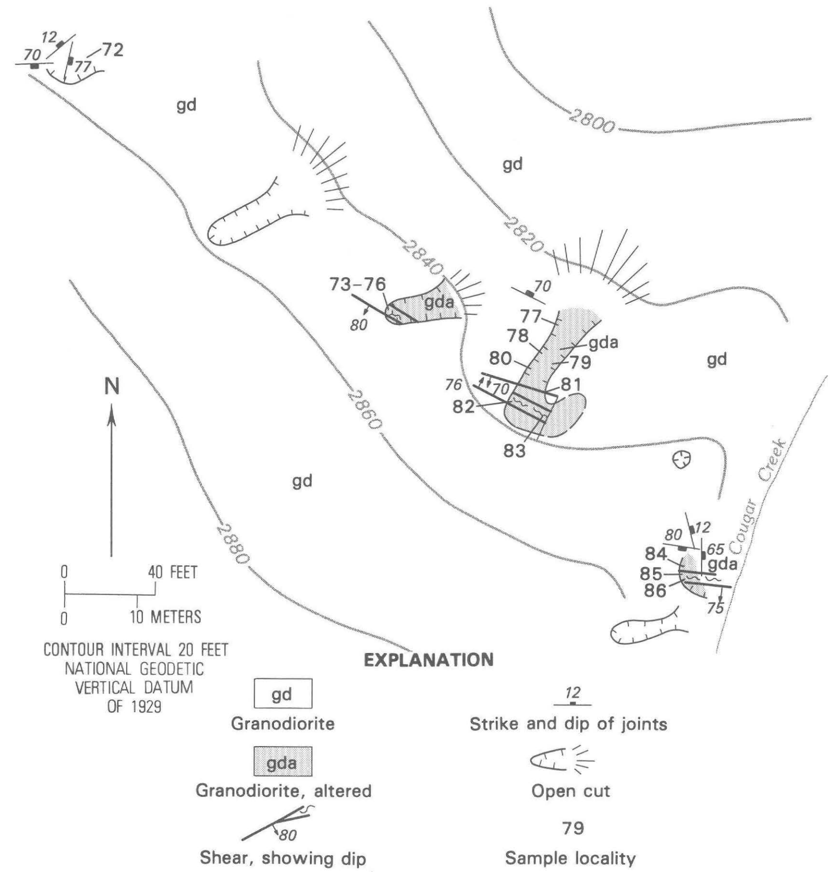


FIGURE 63.—Map of Jack Pot prospect.

JACK POT PROSPECT

The Jack Pot workings (fig. 63) are probably along altered en echelon shear zones which strike N. 60°–70° W. and dip nearly vertically. The width of most zones is 1.5–5 ft (0.5–1.5 m). The most abundant sulfide mineral is arsenopyrite; pyrite is the next most abundant. The matrix is mostly quartz and mica.

Overburden obscures the width and length of the shear-zone system, but some individual zones are, however, traceable. Narrow shear zones were traced over a strike length of approximately 2,000 ft (610 m) (fig. 62, locs. 58–87). The zones are intensely altered and are sulfide rich. The two largest are lenticular, about 140 ft (43 m) apart, and crop out for at least 240 ft (73 m) along the creek draining Goat Mountain Lake.

These two zones average about 2 ft (0.6 m) wide, strike N. 65°–70° W., and dip 40° SW. and 82° SW. Their total content of sulfide minerals may be as much as 30 percent, of which pyrite and arsenopyrite constitute more than 95 percent. Chip samples (fig. 62, locs. 56, 58–86) contain as much as 1.02 oz/ton (35.0 g/metric ton) silver and 0.95 percent copper. The average content of the samples, however, is no gold, 0.1 oz/ton (3.4 g/metric ton) silver, 0.06 percent copper, 0.01 percent lead, 0.02 percent zinc, and 0.04 percent molybdenum.

A 200-ft-wide (61.0 m) shear zone strikes N. 10°–20° W. and dips 70°–90° NE. Overburden obscures the lateral extent. Most of the exposed part of the zone is altered granodiorite containing sulfide-rich segments averaging 0.1–1.0 ft (0.03–0.3 m) wide and about 2–20 ft (0.6–6.1 m) apart. A 100-ft-long (30.5 m) chip sample (fig. 62, loc. 57) taken across the exposure contains no gold, no silver, and only 0.009 percent copper. Leaching by weathering may have decreased the metal content of the sample.

EXTENSION OF DEVILS CANYON PROSPECT

A possible extension of the Devils Canyon shear zone is exposed on the bank of Cougar Creek (fig. 62, locs. 6, 7). The shear zone is approximately 20 ft (6.1 m) wide and is mostly composed of shattered iron oxide stained granodiorite containing sulfide stringers. One select sample of mineralized rock contains a trace of gold, 1.4 oz/ton (48.0 g/metric ton) silver, and 2.64 percent copper. A chip sample (fig. 62, loc. 6) taken across an 18-ft-wide (5.5 m) section of the shear zone contains 0.23 percent copper, 0.2 oz/ton (6.8 g/metric ton) silver, and a trace of gold.

Deep overburden along the projected strike of the shear zone northwest and southeast of the creek obscures possible extensions. The deposit, however, may have potential for discovery of resources.

Two samples (fig. 62, locs. 88, 89) were taken near the southeast limit of the exposure of the Devils Canyon shear zone. Both contained only a trace of gold and silver and a maximum of 0.02 percent copper.

PINE MARTEN PROSPECT

The prospect is at the north end of Dog Mountain (figs. 62, 64) on an outcrop of granodiorite containing disseminated sulfide minerals. Only one very short adit was driven on the prospect, but the sulfide minerals are exposed over a distance of approximately 320 ft (98 m) in an eastwest direction. The exposure ranges in width from about 15 to 160 ft (4.6–48.8 m). To the north, south, and east the granodiorite is covered by talus.

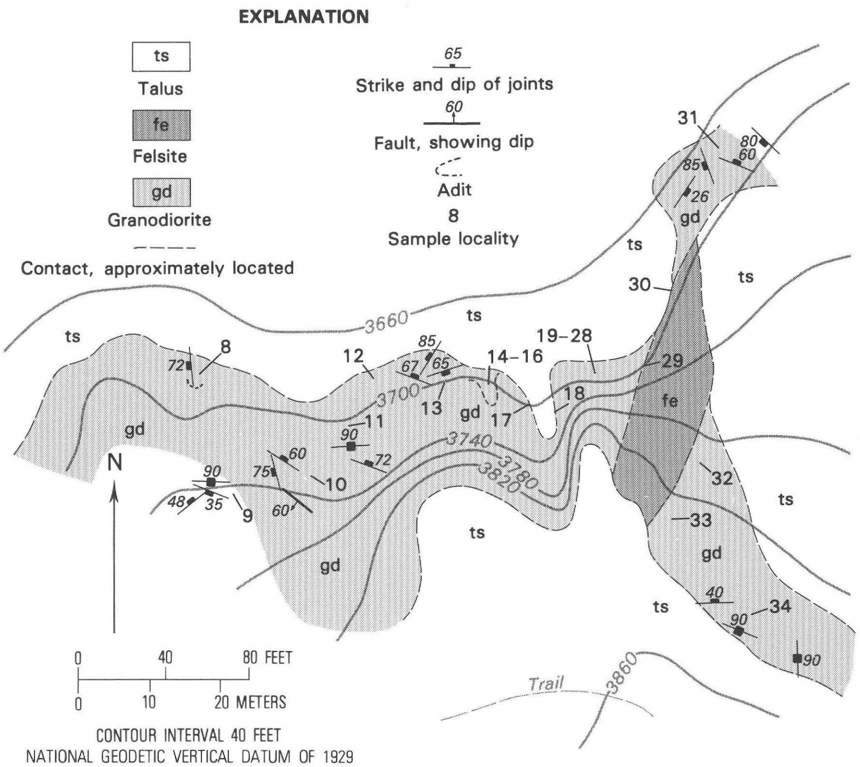


FIGURE 64.—Map of Pine Marten prospect.

Pyrite, chalcopyrite, and molybdenite are disseminated throughout the granodiorite in irregular masses as much as 0.2 in. (5 mm) across and are concentrated along or near fractures in the granodiorite. Total sulfide-mineral content is probably less than 2 percent of the rock but locally may exceed 10 percent. Commonly, pyrite is the most abundant sulfide mineral, but, in places, chalcopyrite and molybdenite predominate. The granodiorite, which is locally moderately stained by iron oxide, is pervasively silicified, but the alteration is much less intense than in most shear zones in the area.

The potential resource in the area of the outcrops is estimated to be in excess of 400,000 tons (362,880 metric tons). Samples (fig. 64), including those taken by earlier investigators (J. R. McWilliams, written commun., 1956), average a trace of gold, less than 0.1 oz/ton (3.4 g/metric ton) silver, 0.17 percent copper, and 0.01 percent molybdenum. Leaching has probably removed some copper from the outcrops, and the grade at depth is probably higher than in these samples. The deposit has potential for discovery of additional resources.

MISCELLANEOUS PROSPECTS

Prospects or mineralized outcrops having no potential or that are not well enough exposed to determine their potential are summarized in table 12.

TABLE 12.—*Miscellaneous prospects and mineralized zones in the Cougar Creek area, Alpine Lakes area, Washington*

Sample locality No. (fig. 62)	Prospect	Summary	Sample data
1-3 -----	Penny prospect.	Adit about 160 ft (49 m) long in altered granodiorite containing sulfide minerals.	Three chip samples: maximum 0.1 oz/ton (3.4 g/metric ton) silver.
4 -------	Unknown -	Granodiorite containing less than 1 percent sulfide minerals, disseminated in rock and as fracture fillings.	One chip sample: no gold, trace of silver, and 0.053 percent copper.
5 -------	Goat Mountain, east ridge.	Altered zone at least 15 ft (4.6 m) wide containing sulfide minerals. Strike N. 85° W., dip near vertical.	One chip sample: 0.01 oz/ton (0.3 g/metric ton) gold, trace of silver and 0.009 percent zinc.
35-41 ---	Devils Canyon prospect.	A 200-ft-long (61 m) adit along a 2- to 20-ft-wide (0.6-6.1 m) shear zone trending N. 70° W. and dipping 60° NE. to vertical in granodiorite. As much as 20 percent of zone is quartz veins. Zone extends at least 2,000 ft (610 m)	Seven chip samples: as much as 0.05 oz/ton (1.7 g/metric ton) gold, 0.30 oz/ton (10.0 g/metric ton) silver, and 0.006 percent copper.
56, 57 ---	Goat Mountain Lake.	Shear zone 2 ft (0.6 m) wide strikes N. 60° W., dips vertically in limonite-stained granodiorite.	One sample across shear zone: 0.1 oz/ton (3.4 g/metric ton) silver, and 0.11 percent copper. One sample from granodiorite: 0.009 percent copper.
87 ------	Falls on Cougar Creek	Limonite-stained granodiorite having prominent joint set trending N. 85° W., dipping 65° SW.	One sample: 0.03 percent copper.
88, 89 ---	Devils Canyon prospect.	Mineralized granodiorite in and along a shear zone. Zone appears to be same structure as in Devils Canyon prospect.	Two chip samples: trace of silver and gold, and maximum 0.02 percent copper.
94, 95 ---	Cougar Lake.	Shear zone 1 ft (0.3 m) wide strikes N. 78° W., and dips vertically in granodiorite.	Sample 94 across shear zone: 0.1 oz/ton (3.4 g/metric ton) silver, and 0.062 percent copper. Sample 95 from granodiorite: 0.1 oz/ton (3.4 g/metric ton) silver, and 0.1 percent copper.
90, 91-93 96, 97-104	Unknown -	Granodionite containing sulfide-quartz-mica-filled shear zones.	Two samples across shear zones: trace of gold, less than 1.0 oz/ton (34.0 g/metric ton) silver, and maximum of 0.26 percent copper. Eleven chip samples (locs. 92, 93, 96, 97-104) from granodiorite: 0.01-0.10 percent copper.

TEANAWAY RIVER-INGALLS CREEK AREA

Prospects in the Teanaway River-Ingalls Creek area (fig. 7, area 19) are in two widely separated sections and are described as the east and west sections.

The west section (fig. 65) covers the headwaters of the North Fork Teanaway River, De Roux Creek, headwaters of Ingalls Creek, and Turnpike Creek. Except for a small area of volcanic rock in the southwest section of the map area the entire area is underlain by greenstone and serpentinized peridotite. With one exception, the prospects within the map explore structures containing very low grade mineralized material and probably have no potential resources. Only at the Tip Top prospect (fig. 65, locs. 2–7) was development work of consequence done. At this location, an adit and a shaft were driven in a pyritized fracture zone in dacite porphyry, which has intruded serpentinized peridotite. A small primitive mill was constructed on the claims, and tailings from the mill indicate that some ore was treated and some metal produced. Table 13 summarizes pertinent geologic information and sample results for the west section of the Teanaway River-Ingalls Creek area.

In the east section of the Teanaway River-Ingalls Creek area two copper prospects are on the flanks of the ridge dividing Fourth Creek and Hardscrabble Creek (fig. 66). Although several adits and pits are on the Grandview prospect, sample values indicate no resource potential. The Copper Glance-Clean Sweep adit is on one of two patented claims. A shear zone along the adit contains only sporadic pods and stringers of sulfide minerals. Because of the discontinuous nature and

Data for samples from the west section of the Teanaway River-Ingalls Creek area

[Tr., trace; N, none detected; --, not analyzed; NA, not applicable]

Sample				Gold		Silver		
		Length						
No.	Type	(ft)	(m)	(oz/ton)	(g/metric ton)	(oz/ton)	(g/metric ton)	Copper (percent)
1----	Grab----	NA	NA	Tr.	Tr.	1.7	58.1	2.2
2----	do------	NA	NA	tr.	tr.	.2	6.8	--
3----	do------	NA	NA	0.34	11.63	Tr.	Tr.	--
4----	do------	NA	NA	.2	6.8	.05	1.71	--
5----	do------	NA	NA	N	N	.02	0.68	--
6----	Chip----	0.5	0.2	.04	1.37	1.0	34.2	.02
7----	do------	.7	0.2	N	N	.1	3.4	.005
8----	Grab----	2.0	0.6	N	N	.003	0.102	.001
9----	do------	20.0	6.1	N	N	.2	6.8	.0005
10----	Chip----	9.0	2.7	tr.	tr.	.1	3.4	--
11----	do------	1.0	0.3	N	N	.1	3.4	--
12----	Grab----	NA	NA	N	N	N	N	--
13----	Chip----	4.0	1.2	N	N	N	N	--
14----	Grab----	NA	NA	N	N	N	N	--
15----	do------	NA	NA	N	N	.1	3.4	--
16----	Chip----	20.0	6.1	tr.	tr.	tr.	tr.	--
17----	do------	10.0	3.0	N	N	N	N	--
18----	do------	10.0	3.0	N	N	N	N	--

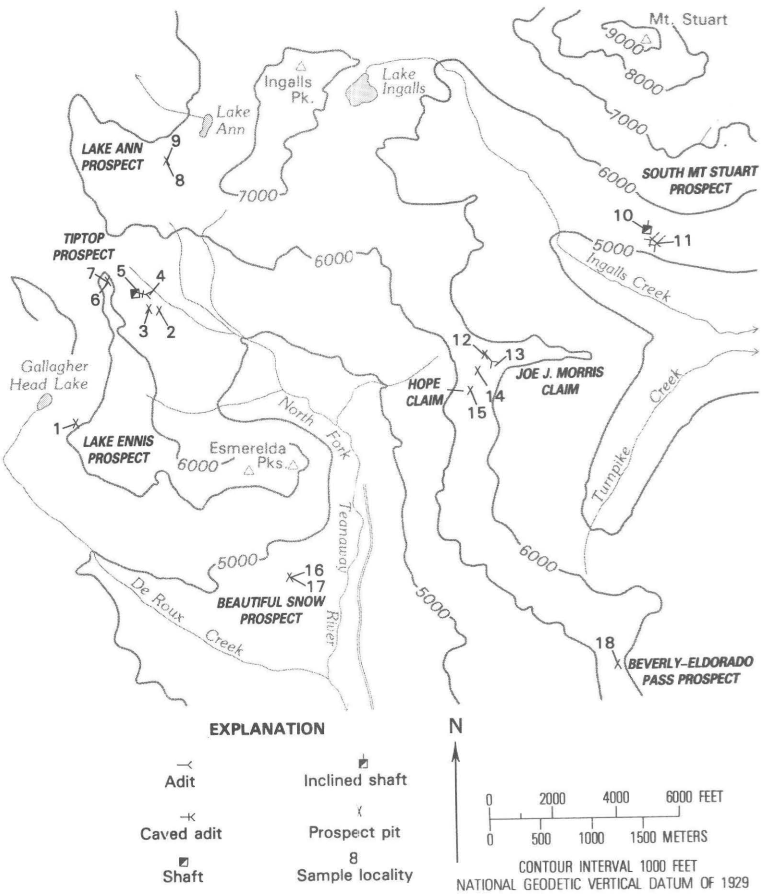


FIGURE 65.—Map showing prospects in west section of Teanaway River–Ingalls Creek area.

limited length of the structures, the deposits are probably of no importance. Details of the workings and sample results are in table 14 and in figure 66.

NAVAHO PEAK AREA

Serpentinized peridotite, metavolcanic rock, and anorthositic gabbro are the predominant rock types in the Navaho Peak area (fig. 7, area 20; fig. 67). Shear zones pervading most of the rock are subparallel to the contact of the diorite. Most highly mineralized rock is in shear zones or associated with rock contacts. Quartz, talc, carbonates, and minor chalcopyrite, bornite, magnetite, and pyrite occur in veins at most contacts and along most shear zones. The prospects are mostly south and southeast of Navaho Peak (fig. 67).

TABLE 13.—*Miscellaneous prospects in the west section of the Teanaway River–Ingalls Creek area, Alpine Lakes area, Washington*

Sample locality No. (fig. 65)	Prospect	Summary	Sample data
1 -------	Lake Ennis	Open cut on narrow irregular iron oxide stained zones in greenstone on hillside.	One select sample from a stockpile: trace of gold, 1.7 oz/ton (58.3 g/metric ton) silver, 2.2 percent copper, and 0.1 percent lead.
2–7 -----	Tip Top --	Pyritized fracture zone in leucocratic gabbro porphyry.	Six samples: as much as 0.34 oz/ton (11.7 g/metric ton) gold, 1.0 oz/ton (34.0 g/metric ton) silver, and 0.02 percent copper.
8–9 -----	Lake Ann -	Small shallow pit in shatter zone striking N. 25° W. and dipping 60° SW. at ridge top. Irregular discontinuous quartz and barite veinlets in highly altered serpentinized peridotite. Grades to greenish-black serpentinized peridotite on west edge; east edge is sharp contact with unaltered serpentinized peridotite.	Two samples: no gold, maximum of 0.2 oz/ton (6.8 g/metric ton) silver, and 0.001 percent copper.
10–11 ---	South side of Mount Stuart.	Caved shafts and pits in intensely weathered contact zone of granodiorite and ultramafic rocks.	Two chip samples: maximum of trace of gold and 0.1 oz/ton (3.4 g/metric ton) silver.
12–13 ---	Joe J. Morris.	Shallow pit on ridge and short adit 150 ft (46 m) east of ridge in serpentinized country rock. No continuous structure observed. No economic minerals observed.	Two samples: no gold or silver.
14–15 ---	Hope claim	Altered area and area of calcite and quartz veins in serpentinized peridotite. No economic minerals observed.	Two samples: no gold, maximum of 0.1 oz/ton (3.4 g/metric ton) silver.
16–17 ---	Beautiful Snow.	Discovery pit in serpentinized peridotite. Irregular vein of highly altered, fine-grained white rock, 0.3–0.7 ft (0.09–0.2 m) wide, strikes N. 50° W. and dips 75° SW. Vein parallels foliation of sheared serpentinized rock.	Two samples: maxmum of trace of gold and silver.
18 ------	Pass at head of Eldorado Creek.	A 50-ft-long (15.2 m) caved trench along altered serpentinized peridotite.	One chip sample: no gold or silver.

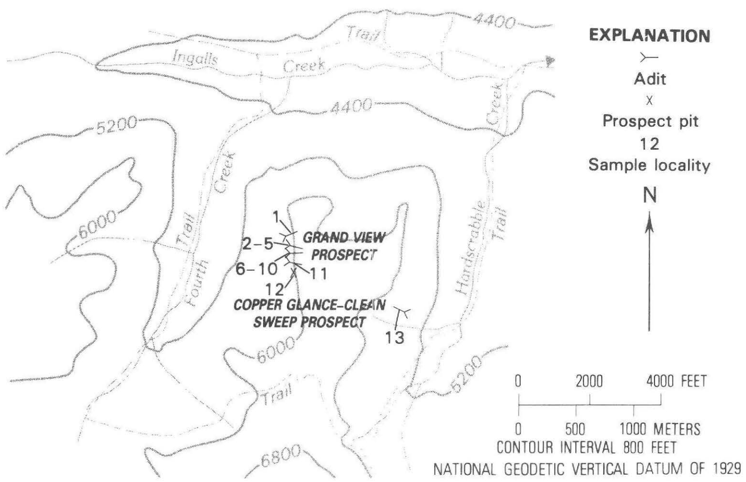


FIGURE 66.—Map showing prospects in east section of Teanaway River-Ingalls Creek area.

Data for samples from the east section of the Teanaway River-Ingalls Creek area

[Tr., trace; N, none detected; --, not analyzed; NA, not applicable]

Sample				Gold		Silver		
		Length						
No.	Type	(ft)	(m)	(oz/ton)	(g/metric ton)	(oz/ton)	(g/metric ton)	Copper (percent)
1----	Chip----	2.0	0.6	N	N	N	N	--
2----	do------	5.0	1.5	N	N	N	N	--
3----	do------	2.0	0.6	N	N	N	N	--
4----	do------	10.0	3.0	N	N	0.1	3.4	1.52
5----	Select--	NA	NA	Tr.	Tr.	.7	23.9	11.6
6----	Chip----	7.0	2.1	N	N	N	N	--
7----	do------	NA	NA	0.01	0.34	Tr.	Tr.	--
8----	do------	2.5	0.8	N	N	N	N	--
9----	Grab----	NA	NA	.01	0.34	tr.	tr.	tr.
10----	do------	15.0	4.6	N	N	.1	3.4	4.2
11----	do------	7.0	2.1	N	N	N	N	--
12----	do------	3.0	0.9	N	N	N	N	--
13----	Select--	NA	NA	N	N	.70	23.95	13.20

TABLE 14.—*Miscellaneous prospects in the east section of the Teanaway River–Ingalls Creek area, Alpine Lakes area, Washington*

Sample locality No. (fig. 66)	Prospect	Summary	Sample data
1-12 ----	Grandview prospect.	Adits and pits in serpentinized peridotite containing a few felsite lenses. Subparallel branching shear zones 0.5–6 ft (0.15–1.8 m) wide containing less than 5 percent cuprite, chalcopyrite, magnetite, chromite, and pyrite. Workings consist of 40-ft-long (12.2 m) trench and adits ranging in length from 13 to 113 ft (4.34 m).	Twelve samples: maximum of 0.1 oz/ton (34. g/metric ton) gold, maximum of 11.6 percent copper (specimen taken by an early investigator). Other chip samples contained maximum of 0.1 oz/ton (3.4 g/metric ton) gold and silver, and 4.2 percent copper. Underground samples contained maximum of 0.3 percent copper.
13 ------	Copper Glance–Clean Sweep prospect.	Mineralized shear zone about 5 ft (1.5 m) wide in serpentinized peridotite. One adit 47 ft (14.3 m) long. Pyrite, magnetite, cuprite, and chalcopyrite in lenticular pods, constituting about 10 percent of shear zone.	Select sample from stockpile; no gold, 0.7 oz/ton (24 g/metric ton) silver, and 13.20 percent copper.

Data for samples from Navaho Peak area

[NA, not applicable; Tr., trace; N, none detected; --, not analyzed; <, less than shown]

Sample No.	Type	Length (ft)	Length (m)	Gold (oz/ton)	Gold (g/metric ton)	Silver (oz/ton)	Silver (g/metric ton)	Copper (percent)
1----	Chip----	4	1.2	N	N	N	N	0.02
2----	Grap----	NA	NA	Tr.	Tr.	0.1	3.4	.35
3----	Chip----	15	4.6	N	N	N	N	--
4----	do------	4	1.2	tr.	tr.	.1	3.4	2.24
5----	Grab----	NA	NA	tr.	tr.	.1	3.4	.48
6----	do------	NA	NA	tr.	tr.	.2	6.8	1.24
7----	do------	NA	NA	tr.	tr.	.3	10.3	<.02
8----	Chip----	NA	NA	tr.	tr.	.1	3.4	N
9----	do------	10	3.0	tr.	tr.	<.05	<1.71	<.02
10----	do------	10	3.0	tr.	tr.	<.05	<1.71	.09
11----	do------	4	1.2	tr.	tr.	.2	6.8	.04
12----	Grab----	NA	NA	tr.	tr.	.1	3.4	<.02
13----	Chip----	3	0.9	tr.	tr.	.1	3.4	--
14----	do------	4	1.2	0.02	0.38	.1	3.4	--
15----	Grab----	NA	NA	tr.	tr.	.1	3.4	--

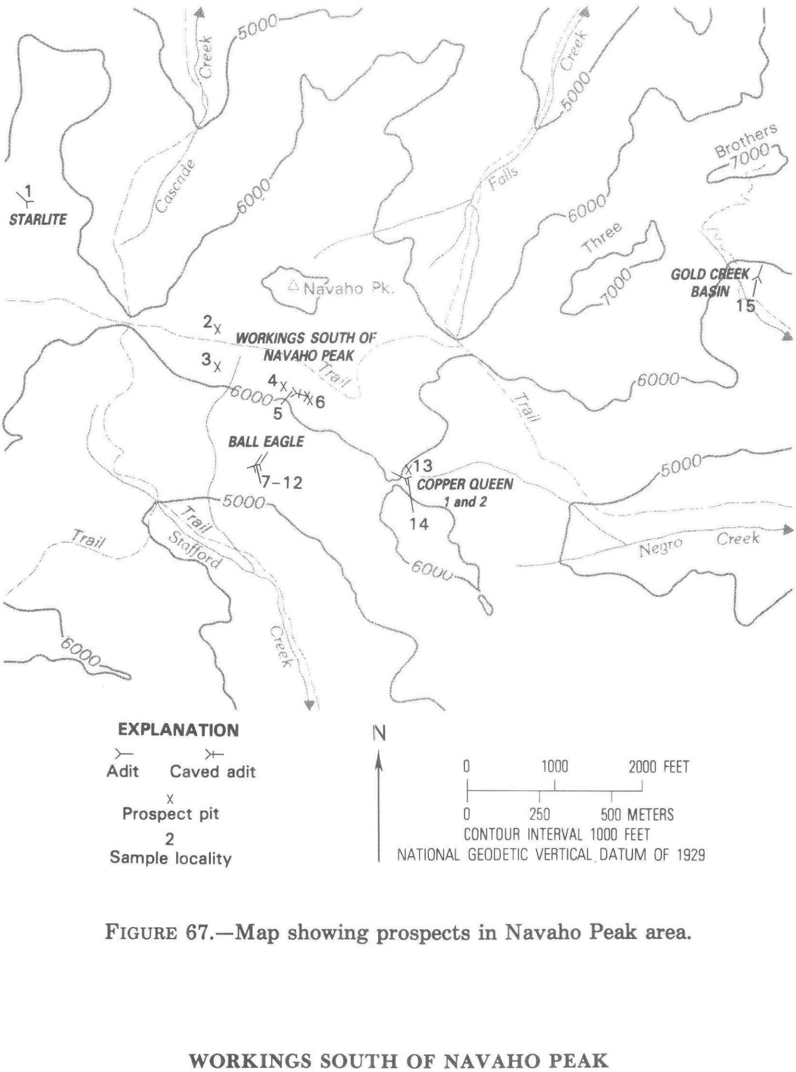


FIGURE 67.—Map showing prospects in Navaho Peak area.

WORKINGS SOUTH OF NAVAHO PEAK

The workings south of Navaho Peak consist of seven pits and caved adits along a copper-bearing shear zone and a pit in black sheared serpentinized peridotite (fig. 68). The workings are outside the study area but the shear zone or similar zones may extend into the study area. A pit at sample locality 4 (fig. 68) exposes an irregular limonite-malachite-stained zone, mostly serpentinized peridotite having an average width of 0.3 ft (0.09 m). The zone, striking N. 75° W. and dipping 50° NE., can be traced only 20 ft (6.1 m). Fine-grained magnetite layers about 0.5 in. (1.27 cm) wide compose 10–40 percent of the shear

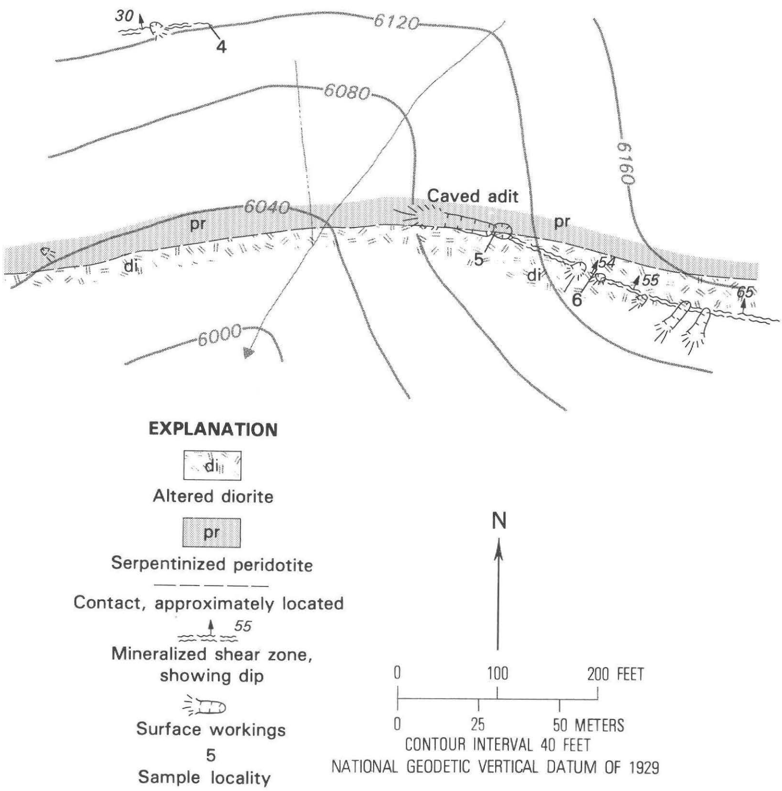


FIGURE 68.—Map showing workings south of Navaho Peak.

zone. Sample 4 (fig. 68), selected from along 4 ft (1.2 m) of the zone, contains a trace of gold, 0.1 oz/ton (0.3 g/metric ton) silver, 2.24 percent copper, 0.13 percent nickel, and 0.19 percent chromium.

A caved adit (fig. 68, loc. 5) and the workings to the east are along a highly irregular sulfide-rich shear zone near and partly along the contact between altered diorite and serpentinized peridotite. The zone strikes N. 65° W. and dips 55°–60° NE. The width averages about 1.5 ft (0.4 m). The zone is composed of about 10–20 percent lenticular quartz masses, 0.05–1.0 ft (0.015–0.3 m) wide, that contain arsenopyrite and pyrite as grains less than 0.25 in. (0.6 cm) in diameter. Some massive layers of arsenopyrite and pyrite, however, are at least 0.25 ft (0.08 m) wide. Sulfide minerals constitute about 5–10 percent of the shear zone, and chalcopyrite makes up less than 25 percent of the sulfide minerals. Sulfide minerals in rock on the dump weathered to produce malachite and azurite.

A sample (fig. 68, loc. 5) of stained quartz and massive sulfide from the pit contains a trace of gold, 0.1 oz/ton (3.4 g/metric ton) silver, and 0.48 percent copper. A sample (fig. 68, loc. 6) selected from malachite-stained material on a dump contains a trace of gold, the equivalent of 0.2 oz/ton (6.8 g/metric ton) silver, and 1.24 percent copper.

The persistence of the shear zone and the amount of copper in the samples indicate a few thousand tons of potential resources in this area. Similar deposits may exist inside the study area.

MISCELLANEOUS PROSPECTS

Miscellaneous properties in the Navaho Peak area (table 15) are all of minor importance and the results of sampling indicate little if any evidence of mineralization; some of the properties are outside the study area.

TABLE 15.—*Miscellaneous prospects in the Navaho Peak area, Alpine Lakes area, Washington*

Sample locality No. (fig. 67)	Prospect	Summary	Sample data
1 -------	Starlite	Adit in slightly sheared greenstone and altered granodiorite dikes.	One sample: trace of gold and silver, 0.02 percent copper.
2 -------	Pass west of Navaho Peak.	Two caved pits in foliated granodiorite having sheared calcite-quartz veins 1-2.5 ft (0.3-0.8 m) wide and 5-15 ft (1.54-4.6 m) long containing less than 5 percent pyrite, chalcopyrite, chalcocite, and bornite.	One sample: Trace of gold, 0.1 oz/ton (3.4 g/metric ton) silver, and 0.35 percent copper.
3 -------	Area southwest of Navaho Peak.	Two caved pits in sheared serpentinized peridotite and fine-grained granodiorite dike (probably outside the study area).	One sample: no gold or silver.
7-12 ----	Ball Eagle.	Irregular quartz stringers and lenses of pyrite and chalcopyrite in peridotite dike (outside the study area).	Six samples: maximum values are trace of gold, 0.3 oz/ton (10.3 g/metric ton) silver, and 0.09 percent copper.
13-14 ---	Copper Queen 1 and 2.	Two adits about 3 and 14 ft (0.9 and 4.3 m) long in sheared serpentinized peridotite and granodiorite. Sheared quartz-carbonate veins less than 5 ft (1.5 m) wide containing less than 5 percent sulfide minerals are exposed (outside the study area).	Two samples: maximum of 0.1 oz/ton (3.4 g/metric ton) gold, and 0.2 oz/ton (6.8 g/metric ton) silver.
15 ------	Tip Top --	Adit 570 ft (174 m) long in altered peridotitic rock (outside the study area).	One sample: no gold, 0.1 oz/ton (3.4 g/metric ton) silver.

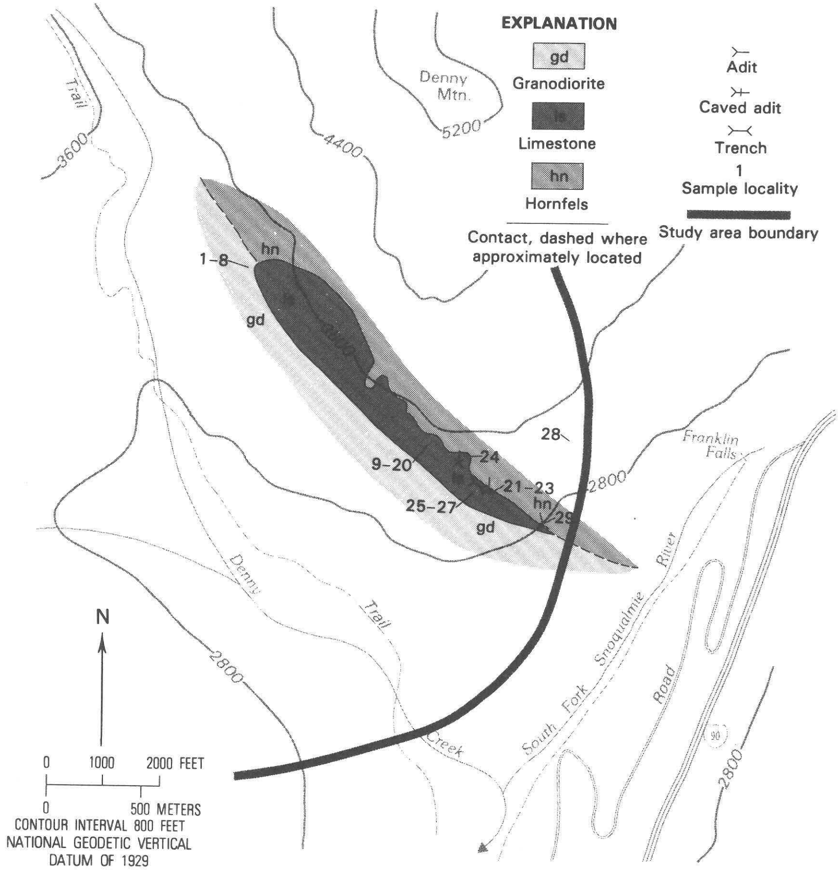


FIGURE 69.—Map showing prospects in the Snoqualmie Pass area.

SNOQUALMIE PASS AREA

Iron and limestone deposits on Denny Mountain (fig. 69) and Guye Peak in the Snoqualmie Pass area (fig. 7, area 11) have been investigated by government agencies and private interests since their discovery in the 1860's and the 1880's. There has been very small production of iron and limestone from the deposits for metallurgical testing, but paramarginal and submarginal resources of both iron and limestone are known to exist in the area.

Intrusive and metamorphic rocks north and west of Chair Peak (pl. 1) were examined in the present study. Some concentrations of magnetite were found, and most of the rock contains very small amounts of metallic sulfides.

Data (in percent) for samples collected from prospects in the Snoqualmie Pass area

[Tr., trace; N, none detected; --, not analyzed; NA, not applicable; <, less than shown; NLG, no length given; all samples are chip except 1 which is a grab sample and 24 which is a select sample. Data for samples 8-23 from Danner (1966), no sample lengths given]

Sample										
		Length								
No.	Type	(ft)	(m)	Cu	$CaCO_3$	MgO	Fe	S	P	Ti
1---	Select	NA	NA	0.01	--	--	13.0	0.58	0.4	--
2---	Chip---	14.0	4.7	.021	--	--	--	--	--	--
3---	do-----	3.0	0.9	--	--	--	63.7	.014	.007	0.008
4---	do-----	8.0	2.4	--	--	--	64.8	.025	<.002	.06
5---	do-----	23.0	7.0	.53	--	--	--	--	--	--
6---	do-----	39.0	11.9	.003	--	--	--	--	--	--
7---	do-----	10.0	3.0	--	--	--	47.3	.014	.004	.03
8---	do-----	NLG	NLG	--	66.3	--	--	--	--	--
9---	do-----	NLG	NLG	--	95.7	1.4	--	--	--	--
10---	do-----	NLG	NLG	--	84.2	1.5	--	--	--	--
11---	do-----	NLG	NLG	--	75.5	5.3	[1]10.5	--	--	--
12---	do-----	NLG	NLG	--	90.0	5.0	--	--	--	--
13---	do-----	NLG	NLG	--	85.9	4.5	--	--	--	--
14---	do-----	NLG	NLG	--	77.4	8.0	--	--	--	--
15---	do-----	NLG	NLG	--	90.9	2.0	--	--	--	--
16---	do-----	NLG	NLG	--	95.7	.91	--	--	--	--
17---	do-----	NLG	NLG	--	84.3	4.04	--	--	--	--
18---	do-----	NLG	NLG	--	89.4	1.40	--	--	--	--
19---	do-----	NLG	NLG	--	91.9	3.12	--	--	--	--
20---	do-----	NLG	NLG	--	78.4	6.85	--	--	--	--
21---	do-----	NLG	NLG	--	81.6	3.6	--	--	--	--
22---	do-----	NLG	NLG	--	86.3	1.7	--	--	--	--
23---	do-----	NLG	NLG	--	84.3	4.06	--	--	--	--
24---	Select-	2.0	6.1	0.14	--	--	--	--	--	--
25---	Chip---	1.0	0.3	.004	--	--	--	--	--	--
26---	do-----	6.0	1.8	.12	--	--	33.0	0.94	0.06	--
27---	do-----	1.0	0.3	.069	--	--	28.0	.78	.03	--
28---	do-----	33.0	10.6	0.01	--	--	--	--	--	--
29---	do-----	5.0	1.5	.17	--	--	--	--	--	--

[1] Fe_2O_3.

DENNY MOUNTAIN PROSPECTS

Diorite, granodiorite, volcanic rocks, limestone, and clastic sedimentary rocks crop out in the Denny Mountain area near Snoqualmie Pass (fig. 69). Most of the older sedimentary and volcanic rocks are metamorphosed; locally, some have been metamorphosed to tactite.

A lens of white to gray limestone crops out on the southwest face of Denny Mountain (fig. 69). Danner (1966, p. 375) estimated that the lens contains 6 million tons (5.4 million metric tons) of crystalline medium- to coarse-grained limestone. The main outcrop of the limestone is about 2,500 ft (760 m) long and 500 ft (150 m) wide (Danner, 1966, p. 377). Tactite—developed where granitic rock intrudes limestone—contains garnet, epidote, amphibole minerals, coarse calcite, quartz, specularite, magnetite, and pyrite. Danner (1966, p. 380) suggested that the steep slopes would hinder open-pit quarrying of the limestone. He also recognized that the sporadic occurrence of magnesium in the limestone would make the material less valuable for use in the manufacture of Portland cement, because the limestone composition would be too variable.

Pods of magnetite and hematite in the limestone have been examined by many geologists to evaluate their potential as an iron resource. The small size of the deposits has probably prevented the use of the high-quality iron-rich rock. Glover (1942, p. 8) estimated more than 5,000 tons (4,500 metric tons) and possibly as much as 100,000 tons (91,000 metric tons) of known iron ore at the Denny property. Zapffe (1949, p. 22) estimated a smaller resource. Contorted rock, steep cliffs, and poor exposures complicate the measurement of the deposits. Two samples of magnetite (fig. 69, locs. 3, 4) from the northwest end of the limestone contain about 64 percent iron. Samples containing specularite (fig. 69, locs. 1, 7) contain as much as 47.3 percent iron. Each sample contains less than 0.1 percent of combined titanium, phosphorus, and sulfur.

Two magnetite-rich samples (fig. 70, locs. 25, 26) from near the southeast end of the limestone body contained 33 percent iron, respectively. If the two samples are from a continuous pod, the magnetite-rich rock at the site will total 1,300 tons (1,800 metric tons).

Samples (fig. 69, locs. 24, 29) from two short adits in tactite near the contact between the limestone and hornfels contain 0.14 and 0.17 percent copper.

Mineral collectors have worked the tactite on Denny Mountain for years. Some of the minerals, many well crystallized and of museum quality, are calcite, quartz, garnet, epidote, magnetite, pyrite, specularite, chalcopyrite, azurite, malachite, and iron oxides. Samples of tactite (fig. 69, locs. 2–6) contain very low metal values except for iron. One 23-ft-long (6.9 m) sample (fig. 69, loc. 5) taken along the base of a cliff, contains 0.53 percent copper.

GUYE PEAK DEPOSITS

Between Snoqualmie Mountain and Guye Peak (pl. 1), metamorphosed limestone and siliceous sedimentary rocks are intruded by the granodiorite that occurs extensively on Snoqualmie Mountain. Solution caves of this saddle have prompted the name Cave Ridge. Tactite that occurs on Cave Ridge contains magnetite, garnet, diopside, epidote, actinolite, tremolite, sphene, pyrite, galena, and sphalerite

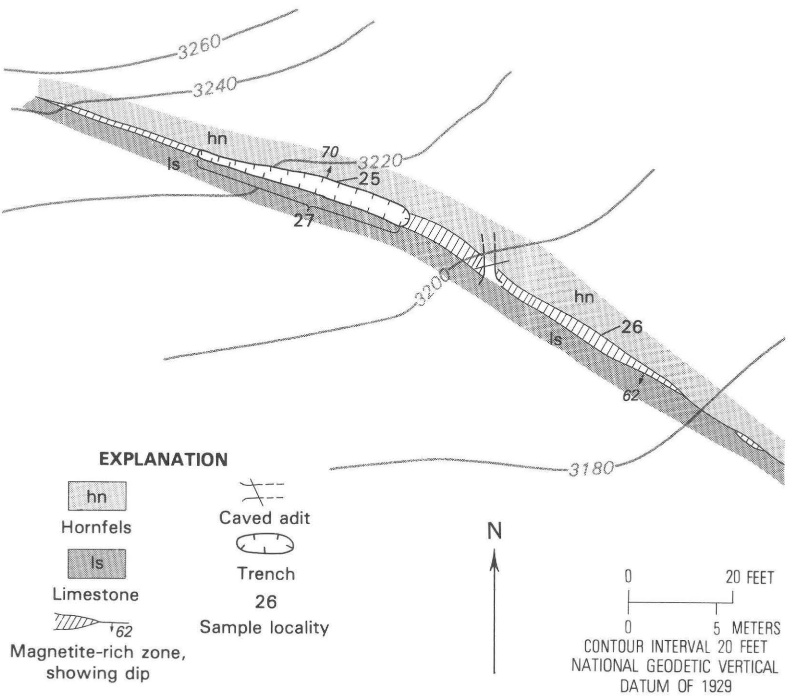


FIGURE 70.—Map showing Denny Mountain deposit.

(Livingston, 1971, p. 171; Pariseau and Gooch, 1960, p. 5–11). Pods of magnetite in or near the limestone are believed to be metasomatic.

Glover (1942, p. 8–9) reported that the Guye Peak magnetite pods possibly are larger than those on Denny Mountain. The magnetite zone, as surveyed by magnetic dip needle, may be at least 1,000 ft (305 m) long (W. R. Green, W. J. LaMotte, and C. P. Purdy, written commun., 1974?). One magnetite body has an exposed length of 80 ft (24 m) and on average a width of 20 ft (6.1 m). Glover (1942) estimated the volume of Guye Peak iron deposits to be 10,000–200,000 tons (9,000–181,000 metric tons) of iron-rich rock containing about 60 percent iron.

CHAIR PEAK DEPOSITS

Granodiorite and diorite have intruded and metamorphosed the volcanic and sedimentary rocks near Chair Peak (pl. 1). Faulting and intense folding have contorted and sheared some of the rocks. Most of the intruded rocks contain less than 2 percent pyrite and arsenopyrite in small blebs. Two samples from sheared limonite-stained granodiorite and diorite south of Snow Lake contain 0.2 oz/ton (6.8 g/metric ton) silver.

Magnetite is present in breccia at Chair Peak Lake. The magnetite, associated with epidote, constitutes less than 1 percent of the rock. Some masses of magnetite are at least 0.5 ft wide (15 cm).

GREEN RIDGE LAKE AREA

The Green Ridge Lake area is near the drainage divide between the North Fork Snoqualmie River and Taylor River (fig. 7, area 6). Breccia zones in quartz diorite as long as 2,500 ft (762 m) are the principal hosts for metallic minerals (fig. 71). Smaller masses of schists and schistose metamorphic rock and tactite crop out near one brecciated area.

The breccia fragments of quartz diorite are altered in different degrees. The material cementing the breccia is quartz, sulfide minerals, and mica; the proportions vary from place to place. Much of the

Data for samples collected from Green Ridge Lake area

[Tr., trace; N, none detected; all samples are chip except 5 and 16 which are grab samples]

Sample No.	Length (ft)	Length (m)	Gold	Silver (oz/ton)	Silver (g/metric ton)	Copper (percent)	Molybdenum (percent)
1----	26.0	7.9	N	0.2	6.8	0.005	0.006
2----	29.0	8.8	Tr.	.1	3.4	.005	.006
3----	36.0	10.9	tr.	.1	3.4	.005	.006
4----	15.0	4.6	N	.2	6.8	.007	.006
5----	NA	NA	N	.1	3.4	.004	.006
6----	25.0	7.6	N	.2	6.8	.005	.006
7----	6.0	1.0	N	.2	6.8	.015	.006
8----	7.0	2.1	N	.3	10.3	.005	.006
9----	8.0	2.4	N	.3	10.3	.007	.006
10----	3.0	0.9	N	1.1	37.6	.009	.006
11----	1.0	0.3	N	.2	6.8	.01	.006
12----	7.0	2.1	N	.1	3.4	.004	.006
13----	24.0	7.2	N	.1	3.4	.004	.006
14----	37.0	11.1	N	.2	6.8	.004	.012
15----	23.0	6.9	N	.2	6.8	.005	.006
16[1]---	NA	NA	tr.	.2	6.8	.009	.005
17----	10.0	3.0	tr.	.3	10.3	.004	.006

[1]Contains 0.5 percent tungsten.

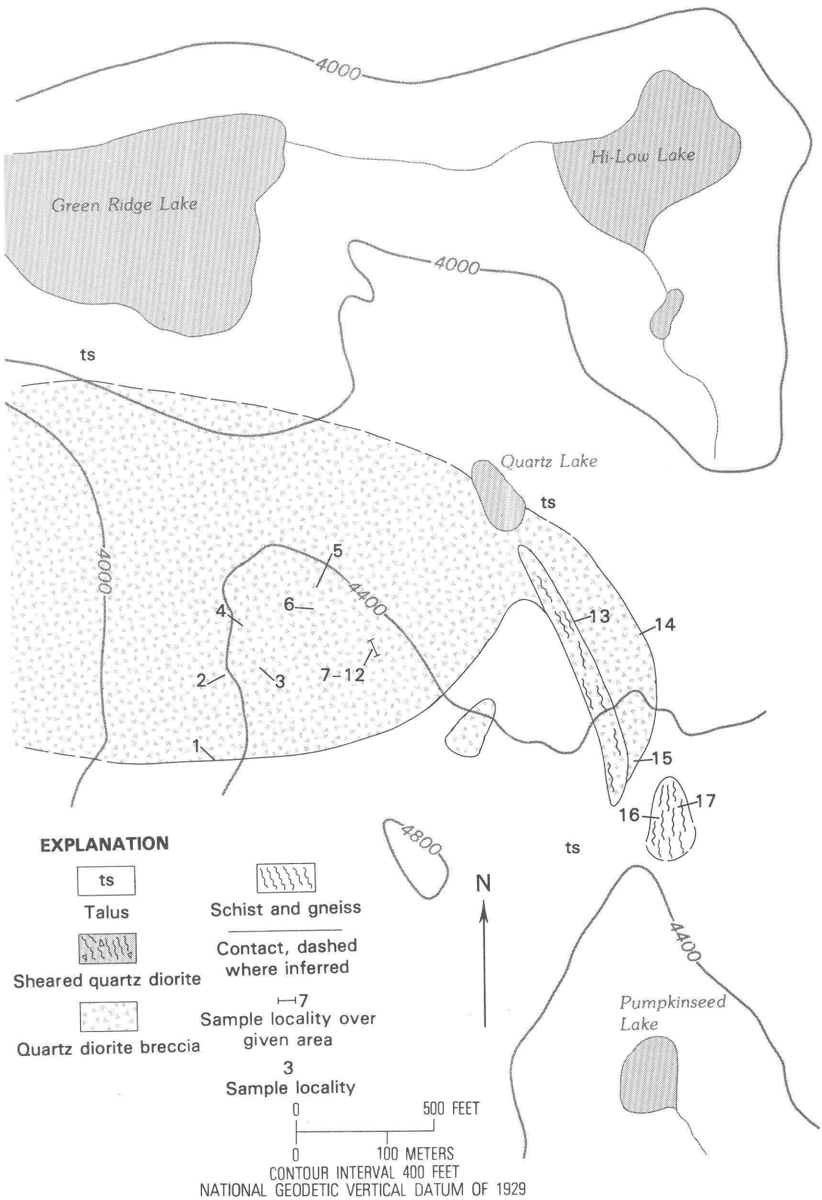


FIGURE 71.—Map of Green Ridge Lake area.

cementing silica is euhedral quartz crystals, most less than 0.2 ft (6 cm) long but some 0.5 ft (15 cm) long. Most of the crystals are colorless, but a small percentage are amethystine.

Assay values are low, but, as all samples were taken at the surface, some of the metal may have leached during weathering. Chip samples from the major granodiorite breccia outcrop, the nearby unbrecciated granodiorite, and the smaller breccia mass at its border all contain traces, at most, of gold and less than 0.3 oz/ton (10.3 g/metric ton) silver; only one sample contains more than 0.02 percent copper and molybdenum. A selected sample (fig. 71, loc. 16) of tactite in the garnet schist taken over an area 15 ft square (4.6 m square) or 225 ft^2 (21 m^2 or square meters) contains approximately 0.5 percent tungsten. Further exploration in the Green Ridge Lake area may reveal a copper-silver-molybdenum resource similar to that in other breccia zones near the Middle Fork Snoqualmie River.

BIG SNOW MOUNTAIN AREA

The Big Snow Mountain area (fig. 7, area 10) is underlain chiefly by granitic rocks cut by shear zones as much as 1 mi (1.6 km) long (fig. 72), and the longest, the Katie Belle shear zone, extends at least another mile (1.6 km) to the Middle Fork Snoqualmie River (fig. 11). On Big Snow Mountain the Katie Belle shear zone is made up of three shear zone systems: one, a strong steeply dipping system strikes about N. 40° W.; a second, intersecting, less extensive system trends mostly N. 50°–80° E. and dips nearly vertically; and third, a locally mineralized, low-dipping (mostly less than 30°) centroclinal system of partly sheared joints is west of Little Myrtle Lake (fig. 72, locs. 1–3). The northwest- and northeast-trending shear zones are locally mineralized near their intersections. In several areas limonite-stained granodiorite (fig. 72, locs. 10–14, 26, 27, 31, 32) contains joints coated with material containing as much as 3 percent sulfide minerals.

The northwest-trending system is made up of many parallel shear zones located every few feet (about 1 m) across a belt several hundreds of feet (tens of meters) wide. The individual shear zones range in width from 0.5 to 2.0 ft (0.2–0.6 m). The poorly exposed medial part of the system commonly contains altered granodiorite ranging in width from 5 to 50 ft (1.5–15 m). Quartz, mica and iron oxide minerals are abundant along outcrops of most of the individual shear zones. Voids, which constitute as much as 15 percent of the sheared rock, formed by the leaching of sulfide minerals. Only a few exposures on Big Snow Mountain, such as in the area of sample locality 20 (fig. 72), contain unweathered sulfide minerals at the surface. Pyrite and arsenopyrite are most abundant; chalcopyrite, sphalerite, and galena are less common. Some of the altered zones contain very small amounts of molybdenite and scheelite, notably in the area of sample locality 27 (fig. 72). In some areas irregular minor shear zones strike N. 20°–30° E. For example, on the Mudge claims near Little Myrtle Lake such zones contain vuggy quartz, pyrite, and pyrrhotite in altered granodiorite. Samples (fig. 72, locs. 4–9) from there contained at most 0.025 percent copper.

Samples from the shear zones and mineralized areas in the granitic country rock contain a trace or less of gold, generally less than 0.2 oz/ton (6.8 g/metric ton) silver, and less than 0.05 percent copper. The oxidized condition of the outcrops indicates that higher values may exist in the shear zones below the leached surface. The area has a potential for the discovery of resources of silver, copper, and molybdenum.

TROUT LAKE AREA

A group of patented lode mining claims, surveyed in 1918, covered most of the east slope of Malachite Peak and the area around Trout Lake (fig. 7, area 7). Unpatented lode claims have, at various times, covered additional areas around Lake Malachite, Copper Lake, and the surrounding ridges. Granitic rocks of the Snoqualmie batholith have intruded metamorphic, volcanic, and sedimentary rocks near Trout Lake. Shear zones, which are mostly weakly mineralized at the surface, are extensive in the volcanic and sedimentary rocks but smaller and less abundant in the granitic rocks. Quartz and carbonates are the main vein materials in the zones. Weathering has removed metallic minerals from many surface exposures, and pyrite, chalcopyrite, arsenopyrite, galena, and sphalerite may be more plentiful at depth.

Figure 73 shows the sample localities in the Trout Lake area. Table 16 summarizes the geologic conditions at the sample localities and tabulates the sample results.

No potential mineral resource is known in the Trout Lake area; however, a shear zone containing sulfide minerals is partially exposed at the Copper Lake "A" workings and at other scattered locations in the area. Weathering probably has decreased the tenor of many of the mineralized shear zone outcrops.

ISOLATED OUTLYING PROSPECTS

Ten prospects or claimed areas are outside the areas shown in figure 7. These isolated prospects either have no potential or the deposits are not sufficiently exposed to estimate their potential. The location descriptions and assay data for samples from these prospects are listed in table 17.

Data for samples collected from prospects and mineralized zones in the Big Snow Mountain area

[Tr., trace; N, none detected; --, not analyzed; NA, not applicable; all samples are chip except 2, 6, 7, and 8 which are grab samples]

Sample	Length			Silver		
No.	(ft)	(m)	Gold	(oz/ton)	(g/metric ton)	Copper (percent)
1---	225.0	67.5	N	N	0.015	
2---	NA	NA	--	--	--	.015
3---	.8	0.2	N	0.2	6.8	.016
4---	NA	NA	--	--	--	.01
5---	.9	0.3	--	--	--	.011
6---	NA	NA	--	--	--	.025
7---	NA	NA	--	--	--	.009
8---	NA	NA	--	--	--	.007
9---	69.0	20.7	--	--	--	.017
10---	125.0	37.5	N	.1	3.4	.02
11---	122.0	36.6	N	Tr.	Tr.	.022
12---	80.0	24.0	N	tr.	tr.	.014
13---	100.0	30.5	Tr.	.1	3.4	.016
14---	83.0	25.5	tr.	tr.	tr.	.017
15---	105.0	31.5	tr.	.1	3.4	.016
16---	1.0	0.3	N	N	.027	
17---	5.0	1.5	N	.2	6.8	.027
18---	15.0	4.5	N	.2	6.8	.015
19---	6.0	1.8	N	.2	6.8	.019
20---	0.5	0.2	N	0.8	27.4	0.043
21---	.8	0.2	N	.2	6.8	.007
22---	77.0	23.1	N	tr.	tr.	.006
23---	26.0	7.8	n	tr.	tr.	.005
24---	65.0	19.5	N	.1	3.4	.008
25---	2.7	0.8	N	.1	3.4	.008
26---	74.0	22.2	N	N	.006	
27---	31.0	6.2	N	.1	3.4	.01
28---	6.0	1.8	N	.1	3.4	.005
29---	14.0	4.2	N	N	.006	
30---	.7	0.2	N	.1	3.4	.012
31---	9.5	2.6	N	.1	3.4	.007
32---	1.0	0.3	N	.2	6.8	.012

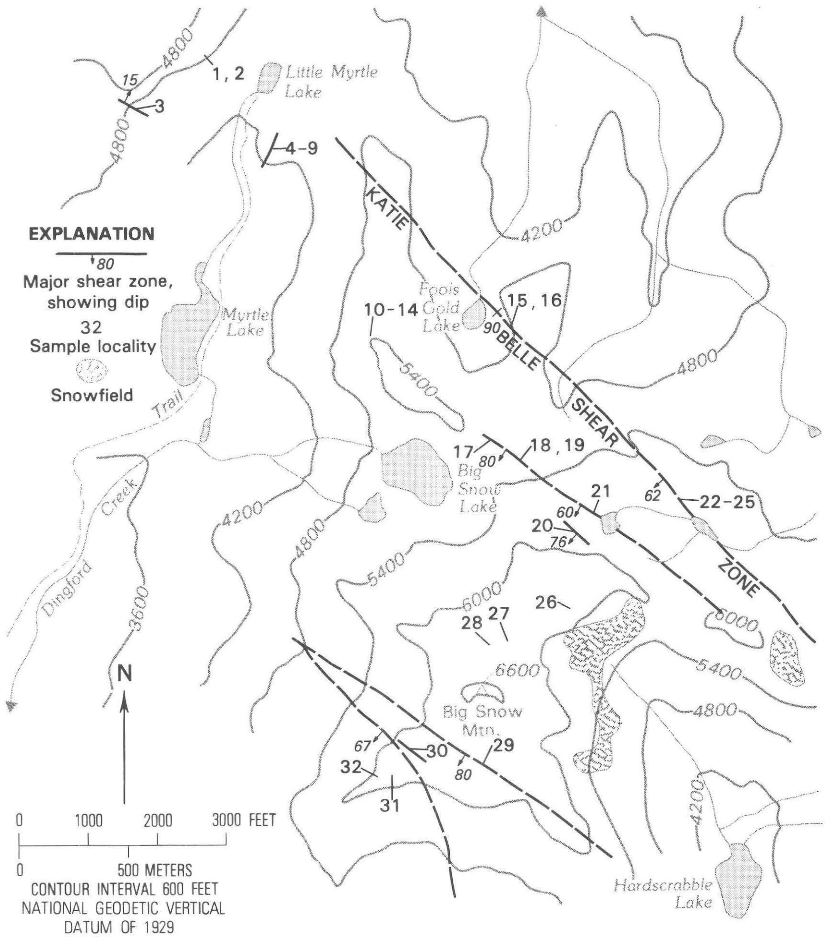


FIGURE 72.—Map showing prospects and mineralized zones in the Big Snow Mountain area.

TABLE 16.—*Miscellaneous prospects in the Trout Lake area, Alpine Lakes area, Washington*

Sample locality No. (fig. 73)	Prospect	Summary	Sample data
1-4 -----	Glacier Hill and Crystal.	Pit and outcrops on 1- to 50-ft-wide (0.3-15.2 m) mineralized shear zones in metavolcanic and sedimentary rocks.	Four grab or chip samples: maximum values of no gold, 0.1 oz/ton (3.4 g/metric ton) silver, and 0.01 percent copper.
5 -------	Jumbo No. 1.	A 1- to 3-ft-wide (0.3-0.9 m) mineralized shear zone in metavolcanic rock.	Chip sample across zone: no gold and 0.3 oz/ton (10.3 g/metric ton) silver.

TABLE 16.—*Miscellaneous prospects in the Trout Lake area, Alpine Lakes area, Washington*—Continued

Sample locality No. (fig. 73)	Prospect	Summary	Sample data
6 -------	Orphan Boy No. 1.	A 1- to 5-ft-wide (0.3–1.5 m) mineralized sheer zone in metavolcanic rock.	Chip sample across shear zone: trace of gold and 0.2 oz/ton (6.8 g/metric ton) silver.
7–8 -----	Vine Maple Discovery.	A 112-ft-long (34.1 m) adit driven along a 4- to 5-ft-wide (1.2–1.5 m) mineralized shear zone in metasedimentary and metavolcanic rock.	Two chip samples, one from face of adit, one from adit wall: no gold, maximum of 0.2 oz/ton (6.8 g/metric ton) silver, and maximum of 0.08 percent copper.
9–11 ----	Imperial No. 2.	A 772-ft-long (235 m) adit in metavolcanic and metasedimentary rock crosscut by many mineralized shear zones.	Samples from shear zones at 142 ft (43.3 m), 390 ft (119 m), and 570 ft (174 m) from portal. Maximum values: 0.1 oz/ton (3.4 g/metric ton) gold, 0.2 oz/ton (6.8 g/metric ton) silver, and 0.001 percent copper.
12 ------	West Fork Placer No. 1.	From fine gravel downstream from 10-ft (3.0-m) diameter boulder.	Value in recoverble gold: less than $0.01/yd^3 ($0.013/m^3), calculated using a gold price of $168.92/troy oz.
13 ------	West Fork Placer No. 2.	Coarse iron oxide stained, bouldery gravel.	No recoverable gold.
14 ------	Southwest Trout Lake.	A 456-ft-long (139 m) adit in schist, gneiss, and granodiorite. Adit started on 0.05- to 0.7-ft-wide (0.015–0.21 m) mineralized shear zone which terminated in zone of crosscutting shears.	Chip sample across shear zone 20 ft (6.1 m) from portal: trace of gold, and 0.2 oz/ton (6.8 g/metric ton) silver.
([1])	Copper Lake "A"	One mile (1.6 km) south of Lake Malachite on ridge west of Copper Lake. One caved pit and a caved adit in 10- to 15-ft-wide (3.0–4.6 m) tourmalinized shear zone in granodiorite.	One grab and two select samples from dumps: trace of gold maximum of 3.3 oz/ton (113.1 g/metric ton) silver, maximum of 5.85 percent copper, and maximum of 0.76 percent lead.

[1]Not shown in figure 73; no sample numbers.

TABLE 17.—*Isolated outlying lode and placer prospects, Alpine Lakes area, Washington*

Prospect	Location	Summary	Sample data
Galena group.	Near the head of Miles Creek, tributary of Middle Fork Snoqualmie River, near Williams Lake. Property is 2.7 mi (4.3 km) S. 32° W. from Dutch Miller mine.	Main working is 75-ft-long (22.9 m) adit in quartz- and pyrite-filled breccia zone in schist. Other workings are two short adits and one open cut in felsite dike in the schist. Portal of another, now inaccessible, adit driven in an altered zone is on north slope of summit of Chief Mountain.	Five samples: maximum of 0.03 oz/ton (1.0 g/metric ton) gold, 3.4 oz/ton (117 g/metric ton) silver, and 1.02 percent copper.

TABLE 17.—*Isolated outlying lode and placer prospects, Alpine Lakes area, Washington*—Continued

Prospect	Location	Summary	Sample data
Chiwaukum Mountains workings.	On the west side of Ewing Basin at the head of Chiwaukum Creek.	A lower adit is 87 ft (26.5 m) long in shear zone in granodiorite near mass of schist. Shear zone contains pyrite. An upper prospect cut is in schist near contact with a tongue of granodiorite. Graphite in fractures and small 6-in.-long (15 cm) pods parallel to the schistosity of the rock.	Assays show no economic minerals.
Elvira claim.	On ridge north of French Creek and approximately 0.75 mi (1.2 km) from junction with Icicle Creek.	An open cut and possibly caved adit in 20-ft-wide (6.1 m) 120-ft-long (36.6 m) quartz lens which strikes N. 74° W., dips 80° NE., roughly parallel to foliation of enclosing schist. Sparse sulfide blebs observed in quartz.	Two samples: no gold, trace of silver, and less than 0.1 percent copper.
Skookum group.	In a draw on the north side of Ben Creek, 0.5 mi (0.8 km) from junction with Jack Creek.	Caved adit and ruins of cabin. Dump of caved adit indicates a 300-ft-long (91 m) working in a vuggy limonite-stained quartz vein. Vein strikes N. 20° E. and dips vertically. Vein estimated to be approximately 3 ft (0.9 m) wide in serpentinized peridotite country rock.	Select sample from quartz on dump contained 0.04 percent copper.
Meadow Creek placers.	Three claims on Meadow Creek beginning 2 mi (3.2 km) upstream from confluence with Jack Creek.	Gravel deposits in present stream. Stream gradient uniform and low with no bedrock exposures in length of stream samples. Boulders as much as 2 ft (0.6 m) in diameter.	Six pan samples: less than $0.01/yd^3 (less than $0.013/m^3) (calculated using gold price of $168.92/troy oz.) All samples contained anomalous amounts of scheelite.
Addie and Pau Hana placer claims (Icicle Creek placers).	Two placer gold claims on south side of Icicle Creek downstream from mouth of Eightmile Creek.	One gravel bar approximately 16 acres (0.065 km^2) and another bar 26 acres (0.105 km^2) in area plus smaller gravel deposits along Icicle Creek. Edges of bars were sampled at seven favorable locations near creek.	Seven samples: $0.03/yd^3 ($0.039/m^3) of gold calculated at a price of $168.92/troy oz). All samples contained garnet.
June Bug-Washika group.	Vicinity of Windy Pass, approximately 2 mi (3.2 km) southwest of Cashmere Mountain.	Subparallel irregular quartz veins and masses striking about N. 10° E. and dipping nearly vertically. Veins are 5-50 ft (1.5-15 m) wide in schist and serpentinized peridotite. No sulfide minerals observed in quartz. Minor narrow pods of asbestos (chrysotile) in serpentinized peridotite. Fibers are coarse, brittle, and short.	No significant values.

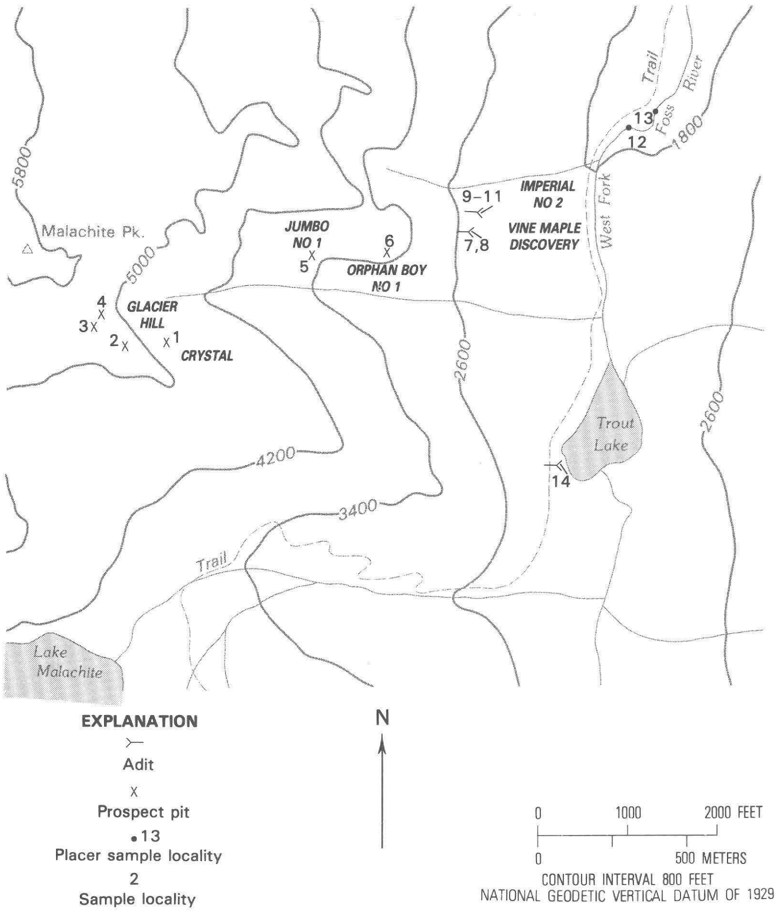


FIGURE 73.—Map showing prospects in the Trout Lake area.

TABLE 17.—*Isolated outlying lode and placer prospects, Alpine Lakes area, Washington*—Continued

Prospect	Location	Summary	Sample data
Garfield Mountain claims.	Near confluence of Middle Fork Snoqualmie River and Taylor River.	Granitic rocks intrude volcanic and sedimentary rocks. Sulfide minerals disseminated in volcanic and sedimentary rocks and concentrated in fracture fillings. Sulfide minerals, mostly less than 2 percent of rock, are mostly pyrite, arsenopyrite, and pyrrhotite.	Five samples of hornfels: less than 0.2 oz/ton (6.8 g/metric ton) silver, and less than 0.02 percent copper, and traces of molybdenum and gold.

Data for samples collected from prospects in the Trout Lake area

[Tr., trace; N, none detected; --, not analyzed; NA, not applicable]

Sample		Length		Gold		Silver		
No.	Type	(ft)	(m)	(oz/ton)	(g/metric ton)	(oz/ton)	(g/metric ton)	Copper (percent)
1----	Grab------	NA	NA	Tr.	0.1	3.4	0.007	
2----	Random chip	30	9	tr.	Tr.	Tr.	.006	
3----	do--------	NA	NA	tr.	.1	3.4	.008	
4----	do--------	4.0	1.2	tr.	N	N	.01	
5----	do--------	1.0	0.3	N	.3	10.3	--	
6----	do--------	3.0	0.9	Tr.	.2	6.8	--	
7----	do--------	4.0	1.2	tr.	.1	3.4	.01	
8----	do--------	.5	0.2	tr.	.2	6.8	.08	
9----	do--------	7.0	2.1	0.01	0.34	.1	3.4	.008
10----	do--------	2.0	0.6	tr.	.2	6.8	.01	
11----	do--------	1.5	0.4	.01	.34	tr.	tr.	.01
12[1]---	Placer channel	1.5	0.4	NA	--	--	--	
13[2]---	do--------	1.5	0.4	NA	--	--	--	
14----	Random chip----	.7	0.2	tr.	.2	6.8	--	

[1]Calculated using a gold price of \$168.92/oz. (\$5.43/g). Gold value is \$0.02/yd^3 (\$0.026/m^3).

[2]No values in gold.

TABLE 17.—*Isolated outlying lode and placer prospects, Alpine Lakes area, Washington*—Continued

Prospect	Location	Summary	Sample data
Trail Creek prospect.	Along Trail Creek about 300 ft (90 m) east from the junction of Trail Creek and Waptus River.	A 3.5-ft-wide (1.1 m) shear zone is exposed in 10-ft-long (3.1 m) adit driven in quartzite. A 1.3-ft-wide (0.4 m) shear zone occurs nearby. Shear zones contain 1-5 percent sulfide minerals with minor chalcopyrite. Shear zones trend east.	One 3.5-ft-long (1.1 m) chip sample: no gold, 0.1 oz/ton (3.4 g/metric ton) silver. One 1.3-ft-long (0.4 m) chip sample: trace of gold, 0.3 oz/ton (10.3 g/metric ton) silver, and 0.5 percent copper.
Sunday Creek claims.	In Sunday Creek drainage, a tributary of North Fork Snoqualmie River.	Several claims were located in Sunday Creek drainage mostly during early 1900's. No workings were found in area and no significant mineralized outcrops were observed.	No samples collected.
Park Lakes trail.	Trail crossing from lower Park Lake.	A 9-ft-long (2.7 m) adit in metavolcanic breccia.	One 56-ft-long (17.1 m) chip sample: trace of gold, 0.2 oz/ton (6.8 g/metric ton) silver, and 0.01 percent lead.

REFERENCES CITED

Baadsgaard, Halfdan, Folinsbee, R. E., and Lipson, J. I., 1961, Potassium-argon dates of biotites from Cordilleran granites: Geological Society of America Bulletin, v. 72., no. 5, p. 689–701.

Bethel, H. L., 1951, Geology of the southeastern part of the Sultan quadrangle, King County, Washington: Seattle, University of Washington Ph. D. thesis, 244 p.

Bethune, G. A., 1892, Mines and minerals of Washington: Washington State Geologist Second Annual Report, 1891, 187 p.

Curtis, G. H., Savage, D. E., and Evernden, J. F., 1961, Critical points in the Cenozoic, *in* J. L. Kulp, ed., Geochronology of rock systems: New York Academy of Science Annals, v. 91, art. 2, p. 342–351.

Danner, W. R., 1966, Limestone resources of western Washington, *with a section on* The Lime Mountain deposit by G. W. Thorsen: Washington Division of Mines and Geology Bulletin 52, 474 p.

Ellis, R. C., 1959, The geology of the Dutch Miller Gap area Washington: Seattle, University of Washington Ph. D. thesis, 113 p.

Engineering and Mining Journal, 1975, E/MJ markets: Engineering and Mining Journal, v. 176, no. 2, p. 40–42.

Erickson, E. H., Jr., 1965, Petrology of an eastern portion of the Snoqualmie batholith, central Cascades, Washington: Seattle, University of Washington M.S. thesis, 52 p.

_____1968, Petrology of the composite Snoqualmie batholith (Miocene and Pliocene lower), central Cascade Mountains, Washington: Southern Methodist University Ph. D. thesis, 111 p.

_____1969, Petrology of the composite Snoqualmie batholith, central Cascade Mountains, Washington: Geological Society of America Bulletin, v. 80 no. 111, p. 2213–2236.

Forn, C. L., Whittington, C. L., and McDanal, S. K., 1974, Magnetic tape containing spectrographic and chemical analyses of stream sediments and rock from the Alpine Lakes study area and additions, Washington: U.S. Geological Survey Report USGS-GD-75-001; available only from U.S. Department of Commerce National Technical Information Service, Springfield, Virginia 22161, as Report PB 240 1487/AS [1975].

Foster, R. J., 1955, A study of the Guye Formation, Snoqualmie Pass, King and Kittitas Counties, Washington: Seattle, University of Washington M.S. thesis, 55 p.

_____1957, Tertiary geology of a portion of the central Cascade Mountains, Washington: Seattle, University of Washinton Ph. D. thesis, 186 p.

_____1960, Tertiary geology of a portion of the central Cascade Mountains, Washington: Geological Society of America Bulletin, v. 71, no. 2, p. 99–126.

_____1967, Geology of the Rampart Ridge–Keechelus Ridge area central Cascade Mountains, Washington: Northwest Science, v. 41, no. 1, p. 32–41.

Galster, R. W., 1956, Geology of the Miller–Foss River area King County, Washington: Seattle, University of Washington M.S. thesis, 93 p.

Glover, S. L., 1942, Washington iron ores, a summary report: Washington Department of Conservation and Development, Division of Mines and Mining Report of Investigations 2, 23 p.

Grant, A. R., 1969, Chemical and physical controls for base metal deposition in the Cascade Range of Washington: Washington Division of Mines and Geology Bulletin 58, 107 p.

Grant, R. Y., 1941, A John Day vertebrate fossil discovered in the Keechelus series of Washington: American Journal of Science, v. 239, no. 8, p. 590–593.

Grimes, D. J., and Marranzino, A. P., 1968, Direct-current arc and alternating-current spark emission spectrographic field methods for the semiquantitative analysis of geologic materials: U.S. Geological Survey Circular 591, 6 p.

Gualtieri, J. L., Simmons, G. C., Thurber, H. K., and Miller, M. S., 1973, Mineral resources of the Alpine Lakes study area Chelan, King, and Kittitas Counties, Washington, *with a section on* Aeromagnetic interpretation, by W. E. Davis: U.S. Geological Survey Open-File Report, 132 p.

Gualtieri, J. L., Thurber, H. K., Miller, M. S., McMahan, A. B., and Federspiel, F. E., 1975, Mineral resources of additions to the Alpine Lakes study area Chelan, King and Kittits Counties, Washington: U.S. Geological Survey Open-File Report 75-3, 161 p.

Hammond, P. E., 1961, Reconnaissance and economic geology of part of the Upper Cle Elum River area Kittitas County, Washington: Seattle, Washington, (Burlington Northern, Incorporated) Northern Pacific Railway Company, Geology Division, Open-File Report, 141 p.

Hodges, L. K., 1897, Mining in the Pacific Northwest: Seattle Post-Intelligencer, 191 p.

Huntting, M. T., 1943, Inventory of mineral properties in Chelan County, Washington: Washington Department of Conservation and Development, Division of Mines and Geology Report of Investigations 9, 63 p.

_____1955, Gold in Washington: Washington Department of Conservation and Development, Division of Mines and Geology Bulletin 42, 158 p.

Lamey, C. A., and Hotz, P. E., 1952, The Cle Elum River nickeliferous iron deposits, Kittitas County, Washington: U.S. Geological Survey Bulletin 978-B, p. 27-67.

Landes, Henry, Thyng, W. S., Lyon, D. A., and Roberts, Milnor, 1902, The metalliferous resources of Washington, except iron: Washinton Geological Survey Annual Report, v. 1, pt. 2, 123 p.

Little, H. W., Belyea H. R., Stott, D. F., Latour, B. A., and Douglas, R. J. W., 1968, Economic minerals of western Canada in R. J. W. Douglas, ed., Geology and economic minerals of Canada [5th ed.]: Canada Geological Survey Economic Geology Report 1, p. 490-546.

Livingston, V. E., Jr., 1971, Geology and mineral resources of King County, Washington: Washington Division of Mines and Geology Bulletin 63, 200 p.

Lupher, R. L., 1944, Stratigraphic aspects of the Blewett-Cle Elum iron ore zone, Chelan and Kittitas Counties, Washington: Washington Department of Conservation and Development, Division of Mines and Geology Report of Investigations 11, 63 p.

McIntyre, A. W., 1907, Copper deposits of Washington: American Mining Congress, Ninth Annual Session, Report of Proceedings, p. 238-250.

Oles, K. F., 1951, The petrology of the Stevens Pass-Nason Ridge area Washington: Seattle, University of Washington M.S. thesis, 92 p.

_____1956, Geology and petrology of the crystalline rocks of the Beckler River-Nason Ridge area Washington: Seattle, University of Washington Ph. D. thesis, 192 p.

Page, B. M., 1939, Geology of a part of the Chiwaukum quadrangle, Washington: Stanford University Ph. D. thesis, 203 p.

Pariseau, W. G., and Gooch, A. E., 1960, Geology of the Guye iron deposit, Mammoth group claims, King County, Washington: Seattle, University of Washington B.S. thesis, 32 p.

Patton, T. C., and Cheney, E. S., 1971, L-D gold mine, Wenatchee, Washington—new structural interpretation and its utilization in future exploration: Society of Mining Engineers [AIME] Transactions, v. 250, no. 1, p. 6-11.

Patty, E. N., 1921, The metal mines of Washington: Washington Geological Survey Bulletin 23, 366 p.

Plummer, C. C., 1964, The geology of the Mount Index area of Washington State: Seattle, University of Washington M.S. thesis, 62 p.

______1969, Geology of the crystalline rocks, Chiwaukum Mountains and vicinity, Washington Cascades: Seattle, University of Washington Ph. D. thesis, 137 p.

Pratt, R. M., 1954, Geology of the Deception Pass area Chelan, King, and Kittitas Counties, Washington: Seattle, University of Washington M.S. thesis, 92 p.

______1958, Geology of the Mount Stuart area Washington: Seattle, University of Washington Ph. D thesis, 228 p.

Purdy, C. P., Jr., 1951, Antimony occurrences of Washington: Washington Department of Conservation and Development, Division of Mines and Geology Bulletin 39, 186 p.

Russell, I. C., 1893, A geological reconnaissance in central Washington: U.S. Geological Survey Bulletin 108, 108 p.

______1900, A preliminary paper on the geology of the Cascade Mountains in northern Washington: U.S. Geological Survey 20th Annual Report, pt. 2, p. 83-210.

Shedd, Solon, 1902, The iron ores of Washington: Washington Geological Survey Annual Report, v. 1, pt. 4, 65 p.

Shedd, Solon, Jenkins, O. P., and Cooper, H. H., 1922, Iron ores, fuels, and fluxes of Washington: Washington Division of Geology Bulletin 27, 160 p.

Smith, G. O., 1903, Geology and physiography of central Washington: U.S. Geological Survey Professional Paper 19, p. 9-39.

______1904, Description of the Mount Stuart quadrangle [Washington]: U.S. Geological Survey Geologic Atlas, Folio 106, 10 p.

Smith, G. O., and Calkins, F. C., 1906, Description of the Snoqualmie quadrangle [Washington]: U.S. Geological Survey Geologic Atlas, Folio 139, 14 p.

Smith, G. O., and Mendenhall, W. C., 1900, Tertiary granite in the northern Cascades [Washington]: Geological Society of America Bulletin, v. 11, no. 4, p. 223-230.

Southwick, D. L., 1962, Mafic and ultramafic rocks of the Ingalls-Peshastin area Washington, and their geologic setting: Maryland, Johns Hopkins University Ph. D. thesis, 287 p.

Stout, M. L., 1964, Geology of a part of the south-central Cascade Mountains, Washington: Geological Society of America Bulletin, v. 75, no. 4, p. 317-334.

University of Washington, Department of Geological Sciences, 1972, The Alpine Lakes—environmental geology: University of Washington [Seattle], Department of Geological Sciences, Publications in Geological Sciences, no. 2, 161 p.

U.S. Bureau of Mines, 1975, Commodity data summaries 1975: Appendix 1 of Mining and minerals policy 1975: Annual Report of the U.S. Secretary of the Interior, under the Mining and Minerals Policy Act of 1970, 193 p.

U.S. Geological Survey, 1973, Lower Tertiary thrust zone in the central Cascades of Washington, *in* Geological Survey Research 1973: U.S. Geological Survey Professional Paper 850, p. 61.

VanDiver, B. B., 1968, Origin of Jove Peak orbiculite in Wenatchee Ridge area northern Cascades, Washington: American Journal of Science, v. 266, no. 2, p. 110-123.

Vhay, J. S., 1966, Nickel and cobalt, *in* Mineral and water resources of Washington: U.S. 89th Congress, 2d session, Committee on Interior and Insular Affairs, Committee Print, p. 116-125.

Ward, F. N., Lakin, H. W., Canney, F. C., and others, 1963, Analytical methods used in geochemical exploration by the U.S. Geological Survey: U.S. Geological Survey Bulletin 1152, 110 p.

Ward, F. N., Nakagawa H. M., Harms, T. F., and Van Sickle, G. H., 1969, Atomic absorption methods of analysis useful in geochemical exploration: U.S. Geological Survey Bulletin 1289, 45 p.

Washington Department of Natural Resources, Division of Mines and Geology, 1971, Statistical report on the mineral resources of the Alpine Lakes area of Chelan, King, Kittitas, and Snohomish Counties, Washington: 8 p.

Weaver, C. E., 1911, Geology and ore deposits of the Blewett mining district, Washington: Washington Geological Survey Bulletin 6, 104 p.

Yeats, R. S., and McLaughlin, W. A., 1969, Radiometric age of three Cascade plutons, Skykomish area Washington, in Abstracts foc 1968: Geological Society of America Special Paper 121, p. 331.

Zapffe, Carl, 1949, A review, iron-bearing deposits in Washington, Oregon, and Idaho: Raw Materials Survey [Portland, Oregon] Research Report 5, 89 p.

TABLES 18 AND 19

TABLE 18

[Analytical data are separated into categories on the basis of type of sample taken: stream sediment, soil, panned concentrate, and rock. Data in table 18 are further classified on the basis of 38 areas containing anomalous amounts of metal.

Letter symbols at heads of columns of analytical data are the following: S, six-step semiquantitative spectrographic analysis; AA, atomic absorption analysis; P, partial digestion; CM-CX-HM, citrate-soluble heavy-metals colorimetric test; CM, colorimetric test; AS, fire assay-spectrographic analysis; and EU, radiometric uranium. Letter symbols at right of analytical data are these: N, looked for but not detected; L, detected but below limit-of-determination value shown; G, detected in quantities greater than value shown; B, not determined. Elements determined are reported to the nearest number in the series 1, 0.7, 0.5, 0.3, 0.2, 0.15, 0.1, and so forth.

All elements are reported in parts per million, except iron, magnesium, calcium, and titanium, which are reported in percent. Citrate-soluble heavy metals are reported in parts per million.

This table is a high-speed computer printout obtained after extensive program manipulation of a large Rock Analysis Storage System data file. Though legibility, style, and format do not meet customary U.S. Geological Survey standards, they are as close as time and the data body allowed]

TABLE 18.—*Analytical results of anomalous samples from anomalous areas in the Alpine Lakes area and additions*

SAMPLE	S-FE%	S-MG%	S-CA%	S-TI%	S-MN	S-AG	S-AS	S-AU	S-B	S-BA	S-BE	S-BI	S-CD	S-CO
ROCK SAMPLE - BULLSTOUTH - AREA 1														
EG1144	10.00	3,00	3,00	1.000	500	0,5 N	200 N	10 N	10 L	500	1,0 L	10 N	20 N	10
ROCK SAMPLES - FRENCH RIDGE - AREA 2														
EG1166A	5,00	2,00	3,00	,500	200	0,5	200 N	10 N	10 L	500	1,0 L	10 N	20 N	15
EG1167	5,00	3,00	3,00	,500	300	0,7	200 N	10 N	10 L	300	1,0 N	10 L	20 N	15
EG1167A	1.50	0.30	0,07	.150	700	0.7	200 N	10 N	10	300	1,0 L	10 N	20 N	7
EG1167B	2,00	1,50	1,00	,300	200	1,5	200 N	10 N	10 L	300	1,0	10 N	20 N	10
EG1168	2,00	1,50	2,00	,200	100	0,7	200 N	10 N	10 N	1000	1,0 L	10 N	20 N	5
EG1169	5,00	2,00	5,00	,300	300	0,5 N	200 N	10 N	10 L	150	1,0 L	10 N	20 N	15
EG1169A	5,00	2,00	3,00	,500	300	0,5 N	200 N	10 N	10 L	100	1,0 N	10 N	20 N	7
EG1169B	2,00	1,00	5,00	,500	150	0,5 N	200 N	10 N	10 L	200	1,0 L	10 N	20 N	5
STREAM-SEDIMENT SAMPLES - FRENCH RIDGE - AREA 2														
EG1172	1.50	0,30	0,70	,150	500	0,7	200 N	10 N	10 L	100	1,0 L	10 N	20 N	5
ES0005	5,00	1,00	2,00	,500	2000	0,5 N	200 N	10 N	10 L	300	1,0	10 N	20 N	7
ES0006	5,00	0,70	1,50	,500	1500	0,5 N	200 N	10 N	10	500	1,0	10 N	20 N	7
STREAM-SEDIMENT SAMPLES - LELAND CREEK - AREA 3														
EG0258	3,00	1,00	1,50	,200	500	0,5 N	200 N	10 N	10	1000	1,0 L	10 N	20 N	7
EG0260	2,00	0,70	1,00	,200	700	0,5 N	200 N	10 N	10 L	200	1,0	10 N	20 N	7
EG0267	3,00	1,00	1,50	,500	1000	0,5 N	200 N	10 N	10 L	500	1,0	10 N	20 N	10
EG0268	3.00	1.00	1,50	.300	1500	0.5 N	200 N	10 N	10 L	200	1,0	10 N	20 N	10
EG0270	3,00	0,70	1,50	,500	3000	0,5 N	200 N	10 N	10 L	200	1,0 L	10 N	20 N	15
EG0273	5,00	1,50	2,00	,700	1000	0,5 N	200 N	10 N	10 L	200	1,0 L	10 N	20 N	15
EG0274	3,00	1,50	1,50	,500	700	0,5 N	200 N	10 N	10 L	300	1,0 L	10 N	20 N	10
EG0276	2,00	1,00	2,00	,300	700	0,5 N	200 N	10 N	10 L	300	1,0 L	10 N	20 N	5
EG2300	3,00	0,70	3,00	,200	1500	0,5 L	200 N	10 N	70	200	1,0	10 N	20 N	7
EK0448	2,00	0,70	1,00	,100	3000	0,5 N	200 N	10 N	10 L	100	1,0	10 N	20 N	15
ES0002	5,00	1,00	3,00	,700	1000	0,5 N	200 N	10 N	10 L	300	1,0 L	10 N	20 N	10
ES0003	5,00	1,50	3,00	1,000	1500	0,5 N	200 N	10 N	10 L	200	1,0 L	10 N	20 N	10
ES0004	5,00	0,70	2,00	,300	700	0,5 N	200 N	10 N	10 L	500	1,0 L	10 N	20 N	7
ET0403	2,00	1,50	1,50	,300	500	0,5 N	200 N	10 N	10	300	1,0	10 N	20 N	10
SOIL SAMPLE - LELAND CREEK - AREA 3														
EG2292	5,00	0,70	0,50	,300	200	0,5 N	200 N	10 N	50	200	1,5	10 N	20 N	5 L
ROCK SAMPLES - THE CRADLE - AREA 4														
EG0326	7,00	2,00	7,00	,700	1500	0,5 N	200 N	10 N	10 L	200	1,0 L	10 N	20 N	20
EG0334	3,00	3,00	5,00	,300	1000	0,7	200 N	10 N	10 N	700	1,0 L	10 N	20 N	15

TABLE 18.—*Analytical results of anomalous samples from anomalous areas in the Alpine Lakes area and additions*—Continued

SAMPLE	S-CR	S-CU	S-LA	S-MO	S-NB	S-NI	S-PB	S-SB	S-SC	S-SN	S-SR	S-V	S-W	S-Y	S-ZN
ROCK SAMPLE - BULLSTOOTH - AREA 1															
EG1144	150	70	70	5 N	10 N	15	15	100 N	30	10	500	200	50 N	50	200 L
ROCK SAMPLES - FRENCH RIDGE - AREA 2															
EG1166A	10 L	500	20 N	5 N	10 N	5 L	10 L	100 N	20	10 N	300	100	50 N	20	200 N
EG1167	10 L	500	20 N	5 N	10 N	5 L	10	100 N	20	10 N	200	150	50 N	20	200 N
EG1167A	20	50	20 N	5 N	10 N	5	10 L	100 N	7	15	100 N	50	50 N	10	200 N
EG1167B	30	100	20 N	5 N	10 N	10	10	100 N	7	10 N	300	70	50 N	10 L	200 L
EG1168	50	200	20 L	5	10 N	10	10	100 N	7	10 N	300	70	50 N	10	200 N
EG1169	20	200	20 N	5 N	10 N	5 L	10	100 N	20	10 N	300	150	50 N	15	200 N
EG1169A	10 L	100	20 N	5 N	10 N	5 L	10 L	100 N	20	10 N	300	150	50 N	15	200 L
EG1169B	10 L	100	20 N	5 N	10 N	5	10 L	100 N	10	10 N	300	50	50 N	10	200 N
STREAM-SEDIMENT SAMPLES - FRENCH RIDGE - AREA 2															
EG1172	10 L	10	20 N	5 N	10 N	5 L	15	100 N	5	10 N	100	15	50 N	10 L	200
ES0005	70	30	20 N	5 L	10 N	15	15	100 N	15	10 N	300	100	50 N	15	200 N
ES0006	50	50	20 L	5 L	10 N	10	30	100 N	15	10 N	300	100	50 N	15	300
STREAM-SEDIMENT SAMPLES - LELAND CREEK - AREA 3															
EG0258	70	7	20 L	5 N	10 N	15	70	100 N	10	10 N	300	70	50 N	10	200 N
EG0260	30	15	20 N	5 N	10 N	10	50	100 N	5	10 N	200	50	50 N	10 L	200 N
EG0267	50	15	20	10	10 N	20	15	100 N	15	10 N	300	70	50 N	15	200 N
EG0268	50	15	20 N	5	10 N	15	15	100 N	10	10 N	300	70	50 N	15	200 N
EG0270	30	15	20 N	20	10 N	15	15	100 N	15	10 N	200	100	50 N	15	200 N
EG0273	70	15	20 N	7	10 N	20	15	100 N	15	10 N	300	100	50 N	15	200 N
EG0274	70	20	20 N	10	10 N	20	50	100 N	15	10 N	300	100	50 N	15	200 N
EG0276	30	15	20 N	5	10 N	10	10	100 N	10	10 N	200	70	50 N	15	200 N
EG2300	30	20	20 L	5 N	20 L	7	70	100 N	7	10 N	300	70	50 N	15	200 N
EK0448	30	10	20 N	10	10 N	10	50	100 N	7	10 N	100	70	50 N	10	200 N
ES0002	30	70	20 N	5 N	10 N	15	10	100 N	15	10 N	300	100	50 N	15	200 N
ES0003	20	15	20 N	5	10 N	15	15	100 N	15	10 N	300	100	50 N	10	200 N
ES0004	30	30	20 N	5 N	10 N	5	15	100 N	10	10 N	200	70	50 N	10	200 N
ET0403	30	7	20 N	7	10 N	10	20	100 N	10	10 N	300	70	50 N	15	200 N
SOIL SAMPLE - LELAND CREEK - AREA 3															
EG2292	10	10	20 L	30	20 L	5	15	100 N	7	10 N	100	70	50 N	10 L	200 N
ROCK SAMPLES = THE CRADLE = AREA 4															
EG0326	300	150	20 N	5 N	10 N	70	10 N	100 N	30	10 N	300	150	50 N	20	200 L
EG0334	150	70	20 N	5 N	10 N	30	10	100 N	20	10 N	500	100	50 N	20	200 N

TABLE 18.—*Analytical results of anomalous samples from anomalous areas in the Alpine Lakes area and additions*—Continued

SAMPLE	S-ZR	AA-AU-P	AA-CU-P	AA-ZN-P	AA-AG-P	AA-CO-P	AA-NI-P	CM=CXHM	CM-SB	CM-MO	AS-PT	AS-PD	AS-RH	AS-RU	AS-IR	EU
ROCK SAMPLE - BULLSTOOTH - AREA 1																
EG1144	100	0,05 N	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
ROCK SAMPLES - FRENCH RIDGE - AREA 2																
EG1166A	70	0,05 N	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG1167	70	0,05 N	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG1167A	50	0,05 N	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG1167B	50	0,05 N	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG1168	50	0,05 N	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG1169	70	0,00 B	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG1169A	70	0,00 B	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG1169B	70	0,00 B	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
STREAM SEDIMENT SAMPLES - FRENCH RIDGE - AREA 2																
EG1172	15	0,00 B	45	500	,0 B	0 B	0 B	70	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
ES0005	150	0,00 B	20	180	,0 B	0 B	0 B	18	1,0	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
ES0006	150	0,00 B	35	400	,0 B	0 B	0 B	40	1,0	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
STREAM SEDIMENT SAMPLES - LELAND CREEK - AREA 3																
EG0258	70	0,00 B	5 L	35	,0 B	0 B	0 B	1 L	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG0260	20	0,00 B	0 B	0 B	,0 B	0 B	0 B	2	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG0267	100	0,00 B	0 B	0 B	,0 B	0 B	0 B	1 L	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG0268	70	0,00 B	15	60	,0 B	0 B	0 B	3	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG0270	150	0,00 B	10	55	,0 B	0 B	0 B	10	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG0273	70	0,00 B	10	30	,0 B	0 B	0 B	3	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG0274	70	0,00 B	10	35	,0 B	0 B	0 B	2	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG0276	30	0,00 B	20	40	,0 B	0 B	0 B	5	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG2300	70	0,00 B	0 B	0 B	,0 B	0 B	0 B	1	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EK0448	30	0,00 B	20	80	,0 B	0 B	0 B	2	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
ES0002	100	0,00 B	100	120	,0 B	0 B	0 B	16	0,5	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
ES0003	150	0,00 B	10	50	,0 B	0 B	0 B	6	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
ES0004	200	0,00 B	25	110	,0 B	0 B	0 B	3	0,5	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
ET0403	100	0,00 B	0 B	0 B	,0 B	0 B	0 B	1 L	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
SOIL SAMPLE - LELAND CREEK - AREA 3																
EG2292	30	0,00 B	10	60	,0 B	0 B	0 B	1 L	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
ROCK SAMPLES = THE CRADLE = AREA 4																
EG0326	70	0,00 B	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG0334	70	0,02 N	75	0 B	,0 B	0 B	0 B	0 B	1,0 L	2 L	,000 B	,000 B	,000 B	,0 B	,00 B	0 B

TABLE 18.—*Analytical results of anomalous samples from anomalous areas in the Alpine Lakes area and additions*—Continued

SAMPLE	S-FE%	S-MG%	S-CA%	S-TI%	S-MN	S-AG	S-AS	S-AU	S-B	S-BA	S-BE	S-BI	S-CD	S-CO
					ROCK SAMPLES = THE CRADLE = AREA 4									
EG0417	3.00	10.00	0.05 L	.002 L	150	0.5 N	200 N	10 N	10 N	20 L	1.0 L	10 N	20 N	50
EG0840	5.00	3.00	3.00	.300	700	0.5 N	200 N	10 N	10 N	700	1.0 L	10 N	20 N	15
EG0840A	3.00	3.00	5.00	.300	500	0.5 N	200 N	10 N	10 L	300	1.0 L	10 N	20 N	7
EG0842	7.00	10.00	5.00	.500	300	0.5 N	200 N	10 N	2000	20	1.0 N	10 N	20 N	50
EG0842B	5.00	7.00	5.00	.500	300	0.5 N	200 N	10 N	1500	20	1.0 N	10 N	20 N	50
EG0842D	7.00	10.00	7.00	.300	500	0.5 N	200 N	10 N	20	20	1.0 N	10 N	20 N	20
EG1117	5.00	3.00	7.00	1.000	1500	0.5 N	200 N	10 N	10 L	100	1.0 N	10 N	20 N	50
EG1125	1.00	1.00	2.00	.100	200	0.5 N	200 N	10 N	15	500	1.0 L	10 N	20 N	5
EG1127	0.50	0.03	0.05	.002 L	100	0.5 N	300	10 N	10 N	20	1.0 L	10 L	20 N	5
EG1128	1.00	1.00	0.10	.150	300	0.7	300	10 N	10 N	700	1.0 N	10 N	20 N	5
EG1131	3.00	3.00	7.00	.300	1500	0.5	200 N	10 N	10 L	1000	1.0 L	10 L	20 N	15
EG1136	5.00	3.00	5.00	.500	1500	0.5 N	200 N	10 N	10 L	700	1.0 L	10 N	20 N	15
EG1141	5.00	10.00 G	0.50	.002 L	500	0.5 N	200 N	10 N	10 L	20 L	1.0 N	10 N	20 N	100
ES1047	10.00	2.00	3.00	.700	2000	0.5 N	200 N	10 N	10 L	50	1.0 N	10 L	20 N	10
					STREAM-SEDIMENT SAMPLES = THE CRADLE = AREA 4									
EG0176	7.00	3.00	5.00	.700	1500	0.5 N	200 N	10 N	10 L	200	1.0 L	10 N	20 N	70
EG0178	7.00	2.00	5.00	.700	1000	0.5 N	200 N	10 N	10 L	150	1.0 L	10 N	20 N	70
EG0181	2.00	1.00	2.00	.500	700	0.5 N	200 N	10 N	10 L	200	1.0 L	10 N	20 N	7
EG0190	5.00	1.50	2.00	.500	700	0.5 N	200 N	10 N	10 L	300	1.0 L	10 N	20 N	10
EG0191	5.00	2.00	3.00	.500	1500	0.5 N	200 N	10 N	10 L	300	1.0 L	10 N	20 N	15
EG0192	5.00	2.00	3.00	.700	1000	0.5 N	200 N	10 N	10 L	300	1.0 L	10 N	20 N	10
EG0197	5.00	2.00	3.00	.700	1000	0.5 N	200 N	10 N	10	300	1.0	10 N	20 N	15
EG0202	7.00	7.00	3.00	.500	1500	0.5 N	200 N	10 N	10	300	1.0 L	10 N	20 N	50
EG0203	7.00	3.00	3.00	.700	5000	0.5 N	200 N	10 N	10 L	300	1.0 L	10 N	20 N	70
EG0216	5.00	3.00	2.00	.500	1500	0.5 N	200 N	10 N	10 L	150	1.0 L	10 N	20 N	50
EG0228	7.00	3.00	3.00	.500	1500	0.5 N	200 N	10 N	10 L	200	1.0 L	10 N	20 N	30
EG0237	7.00	3.00	3.00	.700	1000	0.5 N	200 N	10 N	10 L	300	1.0 L	10 N	20 N	30
EG0299	7.00	5.00	3.00	.500	1000	0.5 N	200 N	10 N	10	300	1.0 L	10 N	20 N	50
EG0300	7.00	3.00	3.00	.500	1500	0.5 N	200 N	10 N	10 L	500	1.0 L	10 N	20 N	30
EG0314	5.00	5.00	1.50	.200	1500	0.5 N	200 N	10 N	10 L	150	1.0 L	10 N	20 N	70
EG0783	5.00	7.00	1.50	.500	700	0.5 N	200 N	10 N	10 L	150	1.0 L	10 N	20 N	30
EK0124	7.00	5.00	5.00	.700	1500	0.5 N	200 N	10 N	10 L	200	1.0 L	10 N	20 N	70
EK0125	7.00	3.00	7.00	1.000	2000	0.5 N	200 N	10 N	10 L	200	1.0 L	10 N	20 N	70
EK0126	5.00	3.00	7.00	.700	2000	0.5 N	200 N	10 N	10 L	300	1.0 L	10 N	20 N	70
EK0127	5.00	3.00	2.00	.300	1000	0.5 N	200 N	10 N	10	200	1.0 L	10 N	20 N	20
EK0128	5.00	3.00	3.00	.300	1500	0.5 N	200 N	10 N	10 L	300	1.0 L	10 N	20 N	30
EK0129	7.00	3.00	3.00	.700	1500	0.5 N	200 N	10 N	10	150	1.0 L	10 N	20 N	50
EK0130	7.00	5.00	3.00	.300	1500	0.5 N	200 N	10 N	10	200	1.0 L	10 N	20 N	70
EK0131	5.00	3.00	5.00	.500	1500	0.5 N	200 N	10 N	10	200	1.0 L	10 N	20 N	50
EK0132	5.00	7.00	3.00	.300	1000	0.5 N	200 N	10 N	10	150	1.0 L	10 N	20 N	20

TABLE 18.—*Analytical results of anomalous samples from anomalous areas in the Alpine Lakes area and additions*—Continued

SAMPLE	S-CR	S-CU	S-LA	S-MO	S-NB	S-NI	S-PB	S-SB	S-SC	S-SN	S-SR	S-V	S-W	S-Y	S-ZN
ROCK SAMPLES =THE CRADLE = AREA 4															
EG0417	1000	300	20 N	5 N	10 N	1500	10 N	100 N	7	10 N	100 N	10	50 N	10 L	200 N
EG0840	150	50	20 L	5 N	10 N	50	10	100 N	15	10 N	300	100	70	15	200 L
EG0840A	300	150	20 N	15	10 N	7	10 L	100 N	20	10 N	300	200	50 N	15	200 L
EG0842	70	300	20 N	5 N	10 N	70	10 N	100 N	30	10 N	100 N	150	50 N	20	200 N
EG0842B	50	150	20 N	5 N	10 N	30	10 N	100 N	30	10 N	100 N	150	50 N	15	200 N
EG0842D	50	200	20 N	5 N	10 N	50	10 N	100 N	20	10 N	100 N	150	50 N	10	200 N
EG1117	300	50	20 N	5 N	10 N	70	10 N	100 N	50	10 N	200	200	50 N	30	200
EG1125	50	20	20 N	5 N	10 N	10	10 L	100 N	5	10 N	300	30	70	10 N	200 N
EG1127	10 L	30	20 N	5 N	10 N	5	10 L	100 N	5 L	10 N	100 N	10 L	300	10 N	200 N
EG1128	50	70	20 N	5 N	10 N	10	10	100 N	7	10 N	100 L	50	50 N	10 L	200 N
EG1131	300	100	20 N	10	10 N	50	10	100 N	20	10 N	700	150	300	10	200 N
EG1136	300	150	20 N	5 N	10 N	70	15	100 N	20	10 N	500	150	50 N	20	200 L
EG1141	2000	7	20 N	5 N	10 N	2000	10 N	100 N	10	20	100 N	20	50 N	10 N	200 N
ES1047	70	100	20 N	5 N	10 N	15	10	100 N	50	10 N	200	300	50 N	30	200 L
STREAM-SEDIMENT SAMPLES = THE CRADLE = AREA 4															
EG0176	500	100	20 N	5 N	10 N	500	10	100 N	30	10 N	200	150	50 N	30	200 N
EG0178	300	100	20 N	5 N	10 N	300	10	100 N	20	10 N	300	150	50 N	20	200 N
EG0181	50	7	20 N	15	10 N	15	10 L	100 N	10	10 N	300	70	50 N	10	200 N
EG0190	70	10	20 N	7	10 N	30	10 L	100 N	15	10 N	300	70	50 N	10	200 N
EG0191	300	20	20 N	10	10 N	70	10 L	100 N	15	10 N	500	100	50 N	15	200 N
EG0192	200	10	20 N	5	10 N	50	10 L	100 N	15	10 N	300	100	50 N	15	200 N
EG0197	100	50	20 N	10	10 N	30	10	100 N	20	10 N	300	150	50 N	20	200 N
EG0202	2000	30	20 N	20	10 N	1000	10 L	100 N	30	10 N	200	150	50 N	20	200 N
EG0203	700	70	20 N	7	10 N	700	20	100 N	20	10 N	300	150	50 N	15	200 N
EG0216	1500	50	20 N	5 N	10 N	700	15	100 N	15	10 N	200	100	50 N	15	200 N
EG0228	700	70	20 N	5 N	10 N	200	10 L	100 N	30	10 N	300	150	50	20	200 N
EG0237	150	20	20 N	5	10 N	70	15	100 N	30	10 N	500	150	50 N	30	200 N
EG0299	1000	50	20 N	10	10 N	300	10	100 N	30	10 N	300	200	50 N	30	200 N
EG0300	500	70	20 N	7	10 N	100	50	100 N	30	10 N	300	200	50 N	20	200 N
EG0314	2000	50	20 N	5 N	10 N	1000	10 L	100 N	15	10 N	150	70	50 N	15	200 N
EG0783	1000	20	20 N	15	10 N	1000	10	100 N	15	10 N	200	100	50 N	10	200 L
EK0124	1000	15	20 N	5	10 N	300	10 L	100 N	30	10 N	500	100	50 N	15	200 N
EK0125	700	30	20 N	15	10 N	150	10 L	100 N	50	10 N	300	200	50 N	70	200 N
EK0126	500	15	20 N	15	10 N	150	10 L	100 N	30	10 N	500	100	50 N	30	200 N
EK0127	300	15	20 N	15	10 N	150	10 L	100 N	30	10 N	300	100	50 N	15	200 N
EK0128	700	20	20 N	15	10 N	300	10 L	100 N	30	10 N	300	150	50 N	20	200 N
EK0129	1500	20	20 N	15	10 N	300	10 L	100 N	30	10 N	300	150	50 N	15	200 N
EK0130	2000	30	20 N	10	10 N	500	10 L	100 N	30	10 N	300	150	50 N	20	200 N
EK0131	700	20	20 N	10	10 N	200	10 L	100 N	30	10 N	300	150	50 N	20	200 N
EK0132	1500	30	20 N	10	10 N	500	10 L	100 N	20	10 N	200	100	50 N	15	200 N

TABLE 18.—*Analytical results of anomalous samples from anomalous areas in the Alpine Lakes area and additions*—Continued

SAMPLE	S=ZR	AA=AU=P	AA=CU=P	AA=ZN=P	AA=AG=P	AA=CO=P	AA=NI=P	CM=CXHM	CM=SB	CM=MO	AS=PT	AS=PD	AS=RH	AS=RU	AS=IR	EU
ROCK SAMPLES = THE CRADLE = AREA 4																
EG0417	10 L	0.02 N	270	0 B	.0 B	0 B	0 B	0 B	1.0 L	2 L	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG0840	70	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG0840A	70	0.05 N	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG0842	30	0.00 B	220	0 B	.2 N	45	30	0 B	0.0 B	0 B	.002 N	.002 N	.002 N	.1 N	.05 N	0 B
EG0842B	30	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG0842D	30	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG1117	150	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG1125	50	0.05 N	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG1127	10 N	0.05 N	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG1128	70	0.05 N	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG1131	100	0.05 N	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG1136	70	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG1141	10 N	0.05 N	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ES1047	100	0.05 N	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
STREAM-SEDIMENT SAMPLES = THE CRADLE = AREA 4																
EG0176	150	0.00 B	55	50	.0 B	0 B	0 B	6	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG0178	70	0.00 B	100	25	.0 B	0 B	0 B	18	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG0181	100	0.00 B	10	20	.0 B	0 B	0 B	2	0.0 B	30	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG0190	100	0.00 B	10	25	.0 B	0 B	0 B	1 L	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG0191	70	0.00 B	10	30	.0 B	0 B	0 B	2	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG0192	150	0.00 B	5	25	.0 B	0 B	0 B	2	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG0197	100	0.00 B	20	20	.0 B	0 B	0 B	1 L	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG0202	150	0.00 B	25	45	.0 B	0 B	0 B	2	0.0 B	20	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG0203	100	0.00 B	50	40	.0 B	0 B	0 B	25	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG0216	150	0.00 B	45	45	.0 B	0 B	0 B	18	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG0228	100	0.00 B	0 B	0 B	.0 B	0 B	0 B	1 L	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG0237	150	0.00 B	0 B	0 B	.0 B	0 B	0 B	1 L	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG0299	100	0.00 B	0 B	0 B	.0 B	0 B	0 B	2	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG0300	100	0.00 B	55	55	.0 B	0 B	0 B	1 L	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG0314	20	0.00 B	30	40	.0 B	0 B	0 B	18	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG0783	70	0.00 B	15	45	.0 B	0 B	0 B	1	0.0 B	20	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EK0124	70	0.00 B	0 B	0 B	.0 B	0 B	0 B	2	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EK0125	150	0.00 B	15	40	.0 B	0 B	0 B	1	0.0 B	25	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EK0126	200	0.00 B	10	40	.0 B	0 B	0 B	2	0.0 B	20	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EK0127	200	0.00 B	10	50	.0 B	0 B	0 B	2	0.0 B	25	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EK0128	70	0.00 B	15	45	.0 B	0 B	0 B	2	0.0 B	25	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EK0129	150	0.00 B	10	35	.0 B	0 B	0 B	2	0.0 B	15	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EK0130	100	0.00 B	0 B	0 B	.0 B	0 B	0 B	2	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EK0131	200	0.00 B	0 B	0 B	.0 B	0 B	0 B	1 L	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EK0132	50	0.00 B	0 B	0 B	.0 B	0 B	0 B	2	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B

TABLE 18.—*Analytical results of anomalous samples from anomalous areas in the Alpine Lakes area and additions*—Continued

SAMPLE	S-FE%	S-MG%	S-CA%	S-TI%	S-MN	S-AG	S-AS	S-AU	S-B	S-BA	S-BE	S-BI	S-CD	S-CO
STREAM-SEDIMENT SAMPLES = THE CRADLE = AREA 4														
EK0134	5,00	3,00	3,00	,500	1000	0,5 N	200 N	10 N	10	300	1,0 L	10 N	20 N	20
EK0138	7,00	5,00	3,00	,500	1000	0,5 N	200 N	10 N	10 L	200	1,0 L	10 N	20 N	50
EK0156	7,00	5,00	5,00	,500	2000	0,5 N	200 N	10 N	10 L	300	1,0 L	10 N	20 N	70
EK0157	7,00	5,00	3,00	,300	1500	0,5 N	200 N	10 N	10 L	200	1,0 L	10 N	20 N	70
EK0158	10,00	7,00	3,00	,500	1500	0,5 N	200 N	10 N	10 L	200	1,0 N	10 N	20 N	70
EK0159	7,00	3,00	3,00	,500	1000	0,5 N	200 N	10 N	10 L	300	1,0 L	10 N	20 N	70
EK0160	7,00	5,00	5,00	,300	1500	0,5 N	200 N	10 N	20	300	1,0 L	10 N	20 N	70
EK0161	5,00	5,00	3,00	,300	1000	0,5 N	200 N	10 N	10 L	200	1,0 L	10 N	20 N	70
EK0163	5,00	5,00	3,00	,500	1000	0,5 N	200 N	10 N	10 L	300	1,0 L	10 N	20 N	70
EK0171	7,00	5,00	3,00	,500	700	0,5 N	200 N	10 N	10 L	300	1,0 L	10 N	20 N	50
EK0172	10,00	5,00	7,00	,700	1000	0,5 N	200 N	10 N	50	300	1,0 L	10 N	20 N	50
EK0173	7,00	5,00	7,00	,500	1000	0,5 N	200 N	10 N	10 L	300	1,0 L	10 N	20 N	30
ES0018	7,00	3,00	3,00	,500	1500	0,5 N	200 N	10 N	10 L	300	1,0 L	10 N	20 N	20
ES0020	7,00	5,00	3,00	,500	1500	0,5 N	200 N	10 N	10 L	300	1,0 L	10 N	20 N	30
ES0022	5,00	3,00	3,00	,700	1500	0,5 N	200 N	10 N	10 L	150	1,0 L	10 N	20 N	20
ES0023	7,00	3,00	5,00	,500	1500	0,5 N	200 N	10 N	10 L	200	1,0 L	10 N	20 N	20
ES0088	7,00	5,00	5,00	,500	2000	0,5 N	200 N	10 N	10 L	300	1,0 L	10 N	20 N	30
ES0244	7,00	5,00	3,00	,500	1000	0,5 N	200 N	10 N	10 L	200	1,0 L	10 N	20 N	30
ROCK SAMPLES = PADDY-GO-EASY PASS = AREA 5														
EG1124	7,00	3,00	7,00	,700	2000	0,5 N	200 N	10 N	10 L	100	1,0 N	10 N	20 N	70
EG1448	3,00	7,00	5,00	,050	1000	10,0	1500	10 N	10 L	20 L	1,0 N	20	20 N	7
EG1448A	15,00	0,20	0,15	,015	70	15,0	10000 G	10	30	20 L	1,0 L	150	20 N	5
EG1449	3,00	10,00	0,20	,050	500	0,5 N	500	10 N	20	20 L	1,0 N	10 N	20 N	300
EG1449A	3,00	10,00	0,70	,070	500	0,5 N	300	10 N	20	20 L	1,0 N	10 N	20 N	300
EG1451	5,00	0,15	0,05 L	,002 L	15	15,0	200 L	70	10 L	20 L	1,0 N	700	20 N	30
EG1451A	5,00	10,00	1,00	,030	500	0,5 N	200 N	10 N	50	20 L	1,0 N	10 N	20 N	100
EG1451C	7,00	5,00	3,00	,070	500	2,0	200 N	10 N	10 N	300	1,0 N	10 N	20 N	50
EG1451D	2,00	0,05	0,05 L	,002 L	10 L	15,0	200 N	10 N	10 N	20 L	1,0 L	30	20 N	5
EG1453	2,00	0,30	0,05	,050	10 L	0,5 N	10000	10 N	700	20 L	1,0 L	10	20 N	5
EG1453A	15,00	0,30	0,70	,020	10	0,7	10000 G	10	2000	50	1,0 N	100	20 N	500
EK0474	5,00	7,00	10,00	,500	1000	0,5 N	200 N	10 N	10	20 L	1,0 L	10 N	20 N	30
EK0474A	5,00	10,00 G	7,00	,100	300	2,0	200 N	10 N	10 L	20 L	1,0 N	10 N	20 N	30
ES1110	15,00	1,00	0,50	,070	100	150,0	3000	10 N	1000	20 L	1,0 N	10 L	20	150
ES1111	20,00	0,10	0,05 L	,010	10 L	5,0	10000 G	30	500	20 L	1,0 L	200	20 N	500
STREAM-SEDIMENT SAMPLE = PADDY-GO-EASY PASS = AREA 5														
ET0421	5,00	3,00	1,50	,500	1000	0,5 N	200 N	10 N	10 L	150	1,0 L	10 N	20 N	30
ROCK SAMPLES = VAN EPPS PASS = AREA 6														
EG1059	15,00	3,00	0,05 L	,050	150	5,0	200 N	10 N	10	20 L	1,0 N	10 L	20 N	100

TABLE 18.—*Analytical results of anomalous samples from anomalous areas in the Alpine Lakes area and additions*—Continued

SAMPLE	S-CR	S-CU	S-LA	S-MO	S-NB	S-NI	S-PB	S-SB	S-SC	S-SN	S-SR	S-V	S-W	S-Y	S-ZN
STREAM-SEDIMENT SAMPLES - THE CRADLE - AREA 4															
EK0134	300	20	20 N	5	10 N	100	10	100 N	30	10 N	300	150	50 N	15	200 N
EK0138	1000	15	20 N	5 N	10 N	300	10 L	100 N	30	10 N	300	200	50 N	15	200 N
EK0156	1000	30	20 N	30	10 N	700	15	100 N	30	10 N	500	200	50 N	20	200 N
EK0157	1500	30	20 N	20	10 N	1000	15	100 N	30	10 N	300	150	50 N	15	200 N
EK0158	1500	30	20 N	10	10 N	1000	30	100 N	30	10 N	300	200	50 N	10	200 N
EK0159	1000	20	20 N	15	10 N	500	10	100 N	30	10 N	300	200	50 N	20	200 N
EK0160	2000	30	20 N	15	10 N	700	10 L	100 N	30	10 N	300	150	50 N	15	200 N
EK0161	1500	15	20 N	10	10 N	700	10 L	100 N	30	10 N	200	100	50 N	10	200 N
EK0163	1500	50	20 N	15	10 N	700	10 L	100 N	30	10 N	200	150	50 N	15	200 N
EK0171	700	150	20 N	5 N	10 N	300	10	100 N	30	10 N	200	300	50 N	20	200 N
EK0172	700	150	20 N	5 N	10 N	200	15	100 N	30	10 N	300	300	50	20	200 N
EK0173	500	100	20 N	5 N	10 N	150	15	100 N	30	10 N	300	300	50 N	30	200 N
ES0019	500	50	20 N	5 L	10 N	150	10	100 N	30	10 N	300	150	100	15	200 N
ES0020	700	50	20 N	5	10 N	200	10 L	100 N	30	10 N	300	150	50 N	20	200 N
ES0022	150	30	20 N	10	10 N	50	15	100 N	30	10 N	300	150	50 N	20	200 N
ES0023	300	30	20 N	5	10 N	70	10	100 N	30	10 N	500	150	50 N	20	200 N
ES0088	1500	20	20 N	7	10 N	500	15	100 N	15	10 N	500	100	50 N	15	200 N
ES0244	500	30	20 N	15	10 N	150	20	100 N	20	10 N	300	150	50 N	15	200 N
ROCK SAMPLES - PADDY-GO-EASY PASS - AREA 5															
EG1124	150	30	20 N	5 N	10 N	70	10 L	100 N	70	10 N	300	300	50 N	30	200
EG1448	1500	150	20 N	5 N	20 N	100	200	100 N	7	15	100 L	50	50 N	10 L	200 L
EG1448A	10 L	1500	20 N	5 N	20 N	30	100	500	5 N	10 N	100 N	10 L	50 N	10 N	200 L
EG1449	3000	70	20 N	5 N	20 N	2000	10 N	100 N	15	10 N	100 N	70	50 N	10 N	200 N
EG1449A	2000	1500	20 N	5 N	20 N	2000	10 N	100 N	15	10 N	100 N	70	50 N	10 N	200 L
EG1451	20	700	20 N	5 N	20 N	200	15	100 N	5 N	10 N	100 N	10 L	50 N	10 N	200 N
EG1451A	3000	500	20 N	5 N	20 N	2000	10 N	100 N	15	10 N	100 N	20	50 N	10 N	200 N
EG1451C	1000	5000	20 N	5 N	20 N	200	10 N	100 N	15	10 N	300	100	200	10 N	200 L
EG1451D	10 L	20000	20 N	5 N	20 N	10	10 N	100 N	5 N	10 N	100 N	10 L	50 N	10 N	200 L
EG1453	20	15	20 N	5 N	20 N	5	10 N	100 N	5 L	10 N	100 N	15	50 N	10 N	200 N
EG1453A	10 L	200	20 N	5 N	20 N	1000	10 N	300	5	10 N	100 N	15	50 N	10 L	200 L
EK0474	150	300	20 N	5 N	10 N	50	10 N	100 N	30	10 N	100 L	150	50 N	20	200 N
EK0474A	3000	2000	20 N	5 N	10 N	1500	10 N	100 N	15	10 N	100 N	70	50 N	10 L	200 N
ES1110	70	20000 G	20 N	7	20 N	70	10 N	100 L	15	50	100 N	50	50 N	10 N	700
ES1111	70	700	20 N	50	20 N	300	10 L	300	5 N	10 N	300	10 L	50 N	10 N	200 L
STREAM-SEDIMENT SAMPLE - PADDY-GO-EASY PASS - AREA 5															
ET0421	700	30	20 N	5 N	10 N	300	50	100 N	15	10 N	300	100	50 N	10	200 N
ROCK SAMPLES - VAN EPPS PASS - AREA 6															
EG1059	1500	200	20 N	5 N	10 N	1500	15	100 N	10	10 N	100 N	50	50 N	10 L	200

TABLE 18.—*Analytical results of anomalous samples from anomalous areas in the Alpine Lakes area and additions*—Continued

SAMPLE	S-ZR	AA-AU-P	AA-CU-P	AA-ZN-P	AA-AG-P	AA-CO-P	AA-NI-P	CM=CXHM	CM-SB	CM-MO	AS-PT	AS-PD	AS-RH	AS-RU	AS-IR	EU
STREAM-SEDIMENT SAMPLES = THE CRADLE = AREA 4																
EK0134	100	0,00 B	0 B	0 B	,0 B	0 B	0 B	1 L	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EK0138	70	0,00 B	0 B	0 B	,0 B	0 B	0 B	1 L	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EK0156	200	0,00 B	20	30	,0 B	0 B	0 B	2	0,0 B	15	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EK0157	100	0,00 B	15	35	,0 B	0 B	0 B	2	0,0 B	15	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EK0158	70	0,00 B	15	35	,0 B	0 B	0 B	2	0,0 B	10	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EK0159	100	0,00 B	15	35	,0 B	0 B	0 B	2	0,0 B	15	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EK0160	70	0,00 B	30	40	,0 B	0 B	0 B	2	0,0 B	20	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EK0161	70	0,00 B	0 B	0 B	,0 B	0 B	0 B	2	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EK0163	150	0,00 B	20	35	,0 B	0 B	0 B	1	0,0 B	15	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EK0171	100	0,00 B	130	50	,0 B	0 B	0 B	1	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EK0172	100	0,00 B	140	45	,0 B	0 B	0 B	2	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EK0173	150	0,00 B	100	35	,0 B	0 B	0 B	1	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
ES0018	150	0,00 B	0 B	0 B	,0 B	0 B	0 B	2	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
ES0020	150	0,00 B	0 B	0 B	,0 B	0 B	0 B	1 L	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
ES0022	70	0,00 B	0 B	0 B	,0 B	0 B	0 B	1 L	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
ES0023	150	0,00 B	0 B	0 B	,0 B	0 B	0 B	1 L	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
ES0098	100	0,00 B	10	40	,0 B	0 B	0 B	2	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
ES0244	70	0,00 B	20	35	,0 B	0 B	0 B	1 L	0,0 B	25	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
ROCK SAMPLES - PADDY-GO-EASY PASS - AREA 5																
EG1124	70	0,00 B	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG1448	10 N	1,00	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG1448A	10 N	30,00	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG1449	10 N	0,05	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG1449A	10 N	0,05 L	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG1451	10 N	70,00	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG1451A	10 N	0,10	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG1451C	10 N	0,15	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG1451D	10 N	2,00	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG1453	10	1,50	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG1453A	10 N	9,00	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EK0474	70	0,00 B	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EK0474A	10	0,06	2000	0 B	,0 B	0 B	0 B	0 B	1,0 L	2 L	,007	,005	,002 N	,1 N	,05 N	0 B
ES1110	10 N	2,00	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
ES1111	10 L	48,00	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
STREAM-SEDIMENT SAMPLE - PADDY-GO-EASY PASS - AREA 5																
ET0421	50	0,00 B	35	60	,0 B	0 B	0 B	3	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
ROCK SAMPLES - VAN EPPS PASS - AREA 6																
EG1059	10 N	0,05 L	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B

TABLE 18.—*Analytical results of anomalous samples from anomalous areas in the Alpine Lakes area and additions*—Continued

SAMPLE	S-FE%	S-MG%	S-CA%	S-TI%	S-MN	S-AG	S-AS	S-AU	S-B	S-BA	S-BE	S-BI	S-CD	S-CO
ROCK SAMPLES = VAN EPPS PASS = AREA 6														
EG1059A	2.00	0,20	0,05 L	.007	20	20,0	200 N	10 N	10 N	20	1,0 L	10 L	20 N	15
EG1060	3.00	0.50	0,05	.200	20	0,7	200 N	10 N	10	700	1,0 L	10 L	20 N	5
EG1061	20,00	0,70	0,07	.002	50	100,0	200 N	10 N	30	20 L	1,0 N	10	20 N	150
EG1063	20,00 G	1.50	0,05 L	.005	70	15,0	200 N	10 N	50	20 L	1,0 N	10 N	20 N	2000
EG1063A	15,00	0,70	0,20	.005	300	70,0	500	10 N	10	20 L	1,0 L	70	500 G	100
EG1063B	20,00 G	1,50	0,05 L	,003	100	15,0	200 N	10 N	30	20 L	1,0 L	10 N	20 N	300
EG1063C	7.00	10,00 G	3,00	,002	1000	1,5	200 N	10 N	10 L	20 L	1,0 L	10 L	20 N	70
EG1068	7.00	3.00	0,70	,050	300	7,0	200 N	10 N	10 N	20 L	1,0 N	10 N	20 N	100
EG1068A	15,00	7,00	0,07	.200	200	3,0	200 N	10 N	10 L	50	1,0 N	10 N	20 N	300
EG1076	3.00	3,00	1,50	.500	200	0,5 N	200 N	10 N	10	500	1,0 L	10 N	20 N	20
EG1096	5.00	0,70	0,05 L	.300	300	10,0	300	10 N	50	70	1,0 L	10 N	20 N	5
EG1108	15.00	7.00	0,05 L	.010	50	0,5 L	200 N	10 N	15	20 L	1,0 N	10 L	20 N	70
EG1109A	2.00	1.50	3,00	.300	1000	0,5 N	200 N	10 N	10 N	300	1,0	10 N	20 N	10
EG1114	0,15	0,50	0,20	,002	100	3,0	200 N	10 N	10 N	20	1,0 N	10 N	20 N	5
EG1454	7,00	2.00	3,00	.300	700	2,0	700	10 N	10	300	1,0 N	10 N	20 N	10
EG1454A	3,00	2,00	3,00	.150	1500	0,7	200 N	10 N	10	500	1,0 L	10 N	20 N	10
EG1454B	20,00	3,00	0,15	,030	200	10,0	200 N	10 N	10	20 L	1,0 N	10 N	20 N	1500
EG1454C	3,00	1.50	5,00	,200	1000	0,5 N	200 N	10 N	15	200	1,0 L	10 N	20 N	10
EG1454D	20,00	1,00	0,05 L	,015	20	2,0	200 N	10 N	10 L	20	1,0 N	10 N	20 N	300
EG1455	5,00	3,00	0,05 L	,500	200	0,5	200 N	10 N	10 N	150	1,0 N	10 N	20 N	7
EG1458	3,00	10,00 G	0,07	,002	500	0,5 N	200 N	10 N	10	20 L	1,0 N	10 N	20 N	150
EG2306	2,00	2,00	2,00	,200	70	0,7	200 N	10 N	10 L	70	1,0 L	10 N	20 N	5 N
EK0153A	7,00	7,00	7,00	,500	1500	0,5 N	200 N	10 N	10 L	300	1,0 L	10 N	20 N	30
EK0153D	5,00	5,00	5,00	,300	700	0,5 N	200 N	10 N	10 L	200	1,0 L	10 N	20 N	20
EK0482	3,00	10,00 G	20,00	,015	2000	0,5 N	200 N	10 N	10	30	1,0 N	10 N	20 N	30
EK0484	15,00	1,50	0,07	,002 L	70	20,0	200 N	10 N	15	20 L	1,0 L	10 N	20 N	100
EP2147A	15,00	5,00	0,10	,030	150	30,0	200 N	10 N	10 N	20 L	1,0 N	10 N	20 N	50
ES1112	3.00	3.00	1,50	.200	300	0.5 N	700	10 N	10 N	500	1.0 L	10 L	20 N	7
ES1113	3,00	2,00	3,00	,200	200	0,5 L	200 N	10 N	10 N	500	1,0 L	10 N	20 N	7
STREAM-SEDIMENT SAMPLES = VAN EPPS PASS = AREA 6														
EG1064	3,00	3,00	1,00	,150	1000	0,5 N	200 N	10 N	10 L	100	1,0 L	10 N	20 N	70
EG1065	5,00	3,00	0,70	,300	2000	0,5	200 N	10 N	10	70	1,0 L	10 N	20 N	70
EG1066	7,00	3,00	1,00	,700	1500	0,5 N	200 N	10 N	10 L	100	1,0 L	10 L	20 N	50
EG1067	3,00	3,00	1,00	,500	2000	0,5 N	200 N	10 N	10 L	200	1,0 L	10 N	20 N	70
EG1069	3,00	10,00	0,70	,200	1500	0,5 N	200 N	10 N	10 L	70	1,0 L	10 N	20 N	70
EG1097	7,00	5,00	1,50	,500	1000	0,5 N	200 N	10 N	10 L	100	1,0 L	10 N	20 N	70
EG1100	7,00	7,00	1,50	,700	1000	0,5 N	200 N	10 N	10 L	100	1,0 N	10 N	20 N	70
EG1107	3,00	3,00	0,70	,200	700	0,5 N	200 N	10 N	10 L	100	1,0 L	10 N	20 N	100
EK0153	2,00	2,00	1,50	,200	300	0,5 N	200 N	10 N	10 L	150	1,0 L	10 N	20 N	7
EK0154	3,00	3,00	3,00	,300	1000	0,5 N	200 N	10 N	10 L	200	1,0 L	10 N	20 N	30

TABLE 18.—*Analytical results of anomalous samples from anomalous areas in the Alpine Lakes area and additions*—Continued

SAMPLE	S-CR	S-CU	S-LA	S-MO	S-NB	S-NI	S-PB	S-SB	S-SC	S-SN	S-SR	S-V	S-W	S-Y	S-ZN
ROCK SAMPLES = VAN EPPS PASS = AREA 6															
EG1059A	10	5000	20 N	5 N	10 N	70	10 L	100 N	5 N	10 N	100 N	10 L	50 N	10 L	200 N
EG1060	300	50	20 L	5 N	10 N	20	10	100 N	15	10	100 N	70	50 N	10	200 N
EG1061	2000	20000 G	20 N	30	10 N	1000	10 L	100 N	10	100	100 N	100	50 N	10	1500
EG1063	3000	700	20 N	30	10 N	2000	10 N	100 N	5 N	10 N	100 N	50	50 N	10	300
EG1063A	1000	5000	20 N	5 N	20 N	1500	5000	100 N	5	10 N	100 N	50	50 N	10 N	10000 G
EG1063B	2000	7000	20 N	150	20 N	1000	50	100 N	5	10 N	100 N	70	50 N	10 L	500
EG1063C	2000	1500	20 N	5 N	20 N	1500	15	100 N	10	10 N	100 N	30	50 N	10 N	700
EG1068	3000	15000	20 N	500	10 N	1000	10 L	100 N	10	10 L	100 N	100	50 N	10	200 N
EG1068A	150	10000	20 N	50	10 N	2000	10 N	100 N	15	10 N	100 N	150	50 N	10 L	200 N
EG1076	150	100	20 L	5 N	10 N	30	10 L	100 N	20	10 N	300	100	50 N	15	200 N
EG1096	500	30	20 N	5 N	10 N	100	100	100 N	15	10 N	100 N	150	50 N	10	200
EG1108	2000	10	20 N	5 N	10 N	1500	10 N	100 N	7	10 N	100 N	70	50 N	10 N	200
EG1109A	30	100	20 N	5 N	10 N	50	10	100 N	10	10 N	700	70	50 N	10	200 L
EG1114	20	20	20 N	5 N	10 N	30	200	100 N	5 N	10 N	100 N	10 L	50 N	10 N	200 N
EG1454	30	700	20 N	5 N	20 N	30	10 L	100 N	15	10 N	500	70	50 N	10	200 L
EG1454A	20	100	20 N	5 N	20 N	50	20	100 N	10	10 N	300	50	50 N	10 L	300
EG1454B	3000	5000	20 N	20	20 N	1500	10 N	100 N	5	10 N	100 N	50	50 N	10 L	200
EG1454C	50	500	20 N	5 N	20 N	20	10 L	100 N	15	10 N	300	70	50 N	10	200 N
EG1454D	500	30	20 N	15	20 N	700	10 N	100 N	5 L	10 N	100 N	15	50 N	70	200
EG1455	300	50	20 N	5 N	20 N	100	10 N	100 N	20	10 N	100 N	150	50 N	10	200 L
EG1458	3000	150	20 N	5 N	20 N	3000	10 N	100 N	10	10 N	100 N	20	50 N	10 N	200 L
EG2306	10 L	70	20 N	5 L	20 L	15	10 N	100 N	7	10 N	300	30	50 N	10 L	200 N
EK0153A	500	200	20 N	5 N	10 N	100	10 N	100 N	30	10 N	500	150	50 N	15	200 L
EK0153D	500	150	20 N	5 N	10 N	70	10 L	100 N	20	10 N	500	150	50 N	10	200 L
EK0482	1500	5	20 N	5 N	10 N	700	50	100 N	10	10 N	700	10	50 N	10	200 N
EK0484	700	7000	20 N	10	10 N	200	10 N	100 N	5	70	100 N	50	50 N	10 N	200
EP2147A	700	10000	20 N	7	20 L	200	10 L	100 N	7	10 N	100 N	50	50 N	10 N	300
ES1112	1000	150	20 N	5 N	20 N	150	10 N	300	10	10 N	500	70	50 N	10 L	200 L
ES1113	20	200	20 N	7	20 N	20	10 N	100 N	10	10 N	300	50	50 N	10 L	200 N
STREAM-SEDIMENT SAMPLES - VAN EPPS PASS - AREA 6															
EG1064	700	700	20 N	20	10 N	300	10	100 N	10	10 N	200	70	50 N	10	200 N
EG1065	700	1000	20 N	30	10 N	700	30	100 N	10	10 N	150	100	50 N	10	200
EG1066	3000	200	20 N	10	10 N	300	15	100 N	15	10 N	200	150	50 N	10	500
EG1067	1000	70	20 N	15	10 N	700	10 L	100 N	15	10 N	300	100	50 N	10	200
EG1069	1500	500	20 N	5 N	10 N	1000	10 L	100 N	15	10 N	150	70	50 N	10	200
EG1097	1500	50	20 N	5 N	10 N	700	50	100 N	30	10 N	300	150	50 N	10	300
EG1100	3000	50	20 N	5 N	10 N	700	10 L	100 N	30	10 N	300	150	50 N	15	200
EG1107	500	30	20 N	5 N	10 N	500	15	100 N	10	10 N	150	70	50 N	10 L	200 L
EK0153	300	15	20 N	5	10 N	150	10	100 N	7	10 N	100	50	50 N	10 L	200 N
EK0154	300	30	20 N	5	10 N	200	10 L	100 N	15	10 N	200	100	50 N	15	200 N

TABLE 18.—*Analytical results of anomalous samples from anomalous areas in the Alpine Lakes area and additions*—Continued

SAMPLE	S-ZR	AA-AU-P	AA-CU-P	AA-ZN-P	AA-AG-P	AA-CO-P	AA-NI-P	CM=CXHM	CM-SB	CM-MO	AS-PT	AS-PD	AS-RH	AS-RU	AS-IR	EU
ROCK SAMPLES = VAN EPPS PASS = AREA 6																
EG1059A	10 N	0.10	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG1060	70	0.05 N	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG1061	10	0.45	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG1063	10	0.05 L	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG1063A	10 N	0.10	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG1063B	10 N	0.20	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG1063C	10 N	0.05 L	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG1068	10 N	0.30	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG1068A	70	0.20	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG1076	100	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG1096	70	0.60	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG1108	10 L	0.05 N	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG1109A	100	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG1114	10 N	2.00	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG1454	50	0.05 L	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG1454A	70	0.05 N	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG1454B	10 N	0.20	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG1454C	100	0.05 N	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG1454D	10	0.05 N	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG1455	70	0.05 N	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG1458	10 N	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2306	50	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EK0153A	10	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EK0153D	10	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EK0482	10 L	0.02 N	5	0 B	.0 B	0 B	0 B	0 B	25.0	2 L	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EK0484	10	0.15	7900	0 B	.0 B	0 B	0 B	0 B	1.0 L	15	.005	.007	.002 N	.1 N	.05 N	0 B
EP2147A	10 L	0.00 B	0 B	270	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ES1112	70	0.05	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ES1113	70	0.05 L	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
STREAM-SEDIMENT SAMPLES - VAN EPPS PASS - AREA 6																
EG1064	50	0.05 N	570	120	.0 B	0 B	0 B	40	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG1065	70	0.05 N	1300	150	.0 B	0 B	0 B	160	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG1066	100	0.05 N	150	140	.0 B	0 B	0 B	16	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG1067	100	0.00 B	110	95	.0 B	0 B	0 B	4	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG1069	50	0.05 L	440	90	.0 B	0 B	0 B	20	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG1097	70	0.05	30	300	.0 B	0 B	0 B	20	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG1100	100	0.00 B	15	45	.0 B	0 B	0 B	1	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG1107	70	0.05 N	45	110	.0 B	0 B	0 B	18	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EK0153	30	0.00 B	15	40	.0 B	0 B	0 B	1	5.0	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EK0154	70	0.00 B	20	45	.0 B	0 B	0 B	2	5.0	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B

TABLE 18.—*Analytical results of anomalous samples from anomalous areas in the Alpine Lakes area and additions*—Continued

SAMPLE	S-FE%	S-MG%	S-CA%	S-TI%	S-MN	S-AG	S-AS	S-AU	S-B	S-BA	S-BE	S-BI	S-CD	S-CO
STREAM-SEDIMENT SAMPLES = VAN EPPS PASS = AREA 6														
EK0155	3.00	1.50	2.00	.200	1500	0.5 N	200 N	10 N	10	200	1.0 L	10 N	20 N	20
EK0358	7.00	7.00	1.50	.300	1000	0.5	200 N	10 N	10 L	150	1.0 L	10 N	20 N	50
EP2142	3.00	5.00	1.50	.150	700	0.5 L	200 N	10 N	70	150	1.0 L	10 N	20 N	70
EP2144	7.00	3.00	0.50	.150	300	2.0	200 N	10 N	15	100	1.0 N	10 N	20 N	20
EP2148	7.00	5.00	3.00	.300	1000	0.5 L	200 N	10 N	30	150	1.0 L	10 N	20 N	70
ET0304	3.00	7.00	1.50	.200	700	1.0	200 N	10 N	10 L	200	1.0 L	10 N	20 N	50
ET0306	5.00	7.00	1.50	.200	1000	0.5	200 N	10 N	10 L	200	1.0 L	10 N	20 N	50
SOIL SAMPLES = VAN EPPS PASS = AREA 6														
EP2145	7.00	3.00	1.50	.300	1500	0.7	200 N	10 N	15	200	1.0 L	10 N	20 N	15
EP2146	10.00	2.00	3.00	.700	1000	1.5	200 N	10 N	20	300	1.0 L	10 N	20 N	10
EP2147	15.00	5.00	0.50	.200	300	10.0	200 N	10 N	10 L	50	1.0 N	10 N	20 N	30
EP2149	7.00	5.00	1.50	.300	500	0.5 L	200 N	10 N	10 L	70	1.0 N	10 N	20 N	50
EP2154	10.00	3.00	0.50	.300	150	1.0	200 N	10 N	10	100	1.0 N	10 N	20 N	15
EP2155	5.00	2.00	1.00	.200	200	0.7	200 N	10 N	10 L	70	1.0 L	10 N	20 N	7
EP2156	5.00	2.00	0.70	.150	150	0.7	200 N	10 N	10	70	1.0 L	10 N	20 N	7
EP2157	5.00	2.00	0.70	.150	150	0.7	200 N	10 N	10	70	1.0 L	10 N	20 N	7
EP2158	7.00	3.00	1.50	.200	200	0.7	200 N	10 N	10	100	1.0 L	10 N	20 N	7
EP2159	7.00	3.00	1.00	.200	200	0.7	200 N	10 N	15	70	1.0 L	10 N	20 N	7
EP2160	7.00	2.00	0.50	.150	150	0.7	200 N	10 N	10	70	1.0 L	10 N	20 N	7
EP2161	7.00	2.00	2.00	.700	1000	0.7	200 N	10 N	15	300	1.0 L	10 N	20 N	15
EP2162	15.00	10.00	1.50	.300	1000	0.7	200 N	10 N	10	150	1.0 L	10 N	20 N	70
EP2163	15.00	5.00	5.00	.700	1500	0.5 N	200 N	10 N	15	300	1.0 L	10 N	20 N	50
ROCK SAMPLES = ESMERELDA PEAKS = AREA 7														
EG1070	15.00	1.50	0.05 L	.010	70	3.0	1000	15	10	20 L	1.0 N	10 N	20 N	200
EG1070A	3.00	1.00	3.00	.005	300	0.5 N	200 L	10 N	10 N	20 L	1.0 N	10 N	20 N	20
EG1080	5.00	3.00	7.00	.500	1500	0.5 N	200 N	10 N	10 L	20 L	1.0 N	10 N	20 N	50
EG1081	5.00	5.00	7.00	.700	2000	0.5 N	200 N	10 N	10 L	30	1.0 N	10 N	20 N	50
EG1081A	15.00	7.00	7.00	.300	2000	2.0	200 N	10 N	10	20 L	1.0 N	10 N	20 N	150
EG1081B	10.00	10.00	7.00	.070	1000	0.5 N	200 N	10 N	10 L	20 L	1.0 N	10 N	20 N	150
EK0114D	1.50	0.20	0.15	.002	50	1.5	200 N	10 N	10 N	20	1.0 N	10 N	20 N	10
STREAM-SEDIMENT SAMPLES = ESMERELDA PEAKS = AREA 7														
EG1071	7.00	10.00	3.00	1.000	2000	0.5 N	200 N	10 N	10 L	100	1.0 N	10 N	20 N	70
EK0119	7.00	7.00	2.00	.300	1500	0.5 N	200 N	10 N	10 L	150	1.0 L	10 N	20 N	100
ROCK SAMPLES = GOLD CREEK = DELATE CREEK = MINERAL CREEK = AREA 8														
EG0537	3.00	0.70	1.50	.150	700	1.0	200 N	10 N	10 L	500	1.0	10 N	20 N	7
EG0541	2.00	1.00	1.50	.150	500	0.5 N	200 N	10 N	10 L	300	1.0	10 N	20 N	5
EG0606	2.00	0.70	0.70	.200	1000	1.5	200 N	10 N	10 N	700	1.0 L	10 N	20 N	7

TABLE 18.—*Analytical results of anomalous samples from anomalous areas in the Alpine Lakes area and additions*—Continued

SAMPLE	S-CR	S-CU	S-LA	S-MO	S-NB	S-NI	S-PB	S-SB	S-SC	S-SN	S-SR	S-V	S-W	S-Y	S-ZN
STREAM-SEDIMENT SAMPLES = VAN EPPS PASS = AREA 6															
EK0155	200	10	20 N	5	10 N	150	10 L	100 N	10	10 N	200	70	50 N	10	200 N
EK0358	3000	300	20 N	7	10 N	1000	30	100 N	15	10 N	200	150	50 N	10	200
EP2142	500	200	20 N	5 L	20 L	700	50	100 N	10	10 N	150	70	50 N	10 L	500
EP2144	300	300	20 L	5	20 L	200	50	100 N	7	10 N	100 L	30	50 N	10 L	200
EP2148	700	70	20 N	5 L	20 L	300	30	100 N	15	10 N	300	100	50 N	10 L	200
ET0304	2000	30	20 N	5 N	10 N	1500	20	100 N	15	10 N	300	70	50 N	10	200 N
ET0306	3000	70	20 N	5 N	10 N	1500	30	100 N	15	10 N	200	70	50 N	10	200
SOIL SAMPLES = VAN EPPS PASS = AREA 6															
EP2145	300	200	20 N	5 L	20 L	150	30	100 N	7	10 N	300	70	50 N	10	200 N
EP2146	150	70	20 N	5 L	20 L	30	30	100 N	15	10 N	300	100	50 N	10	200 N
EP2147	700	1500	20 N	30	20 L	300	20	100 N	10	10 N	100	70	50 N	10 L	200 L
EP2149	700	70	20 N	5 L	20 L	300	30	100 N	10	10 N	150	70	50 N	10 L	200 L
EP2154	300	200	20 N	5 L	20 L	150	10 L	100 N	7	10 N	100	50	50 N	10 L	200 N
EP2155	50	300	20 N	70	20 L	150	10	100 N	7	10 N	150	50	50 N	10 L	200 N
EP2156	100	1000	20 N	15	20 L	100	10	100 N	7	10 N	100	50	50 N	10 L	200 N
EP2157	100	700	20 N	10	20 L	100	10	100 N	5	10 N	100	50	50 N	10 L	200 N
EP2158	150	1000	20 N	15	20 L	100	10	100 N	7	10 N	150	50	50 N	10 L	200 N
EP2159	150	1500	20 N	20	20 L	150	10	100 N	7	10 N	150	50	50 N	10 L	200 N
EP2160	150	1500	20 N	15	20 L	150	10	100 N	7	10 N	100	50	50 N	10 L	200 N
EP2161	200	150	20 N	5	20 L	50	20	100 N	15	10 N	300	100	50 N	10	200 N
EP2162	1500	1500	20 N	7	20 L	1000	50	100 N	15	10 N	150	70	50 N	10 L	200 N
EP2163	1000	300	20 N	7	20 L	300	20	100 N	15	10 N	500	150	50 N	10	200 N
ROCK SAMPLES = ESMERELDA PEAKS = AREA 7															
EG1070	3000	3000	20 N	5 N	10 N	3000	15	100 N	10	10 N	100 N	50	50 N	10 L	300
EG1070A	700	500	20 N	5 N	10 N	300	10 L	100 N	5 N	10 N	100 N	10	50 N	10 N	3000
EG1080	200	100	20 N	5 N	10 N	50	10 L	100 N	50	10 N	100	200	50 N	20	200 L
EG1081	300	300	20 N	5 N	10 N	100	10 N	100 N	50	10 N	300	300	50 N	30	200 N
EG1081A	700	20000 G	20 N	30	10 N	500	10 N	100 N	7	10 N	100 N	20	50 N	10 N	500
EG1081B	1500	10000	20 N	5 N	10 N	700	10 N	100 N	15	10 N	100 N	50	50 N	10 L	200
EK0114D	10 L	200	20 N	5 N	10 N	20	10 N	100 N	5 L	10 N	100 N	10	50 N	10 L	200 N
STREAM-SEDIMENT SAMPLES = ESMERELDA PEAKS = AREA 7															
EG1071	3000	30	20 N	5 N	10 N	700	15	100 N	20	10 N	300	150	50 N	15	200
EK0119	1000	50	20 N	5 N	10 N	1500	10 L	100 N	15	10 N	200	100	50 N	10 L	200 N
ROCK SAMPLES = GOLD CREEK = DELATE CREEK = MINERAL CREEK = AREA 8															
EG0537	20	150	20 N	5 N	10 N	5	10 L	100 N	10	10 N	100	50	50 N	10	200 N
EG0541	10 L	150	20 N	5 N	10 N	5 L	10 L	100 N	7	10 N	300	50	50 N	10 L	200 N
EG0606	10 L	70	20 L	5 N	10 N	5	70	100 N	7	10	300	70	50 N	10	500

TABLE 18.—*Analytical results of anomalous samples from anomalous areas in the Alpine Lakes area and additions*—Continued

SAMPLE	S-ZR	AA-AU-P	AA-CU-P	AA-ZN-P	AA-AG-P	AA-CO-P	AA-NI-P	CM=CXHM	CM-SB	CM-MO	AS-PT	AS-PD	AS-RH	AS-RU	AS-IR	EU
STREAM-SEDIMENT SAMPLES = VAN EPPS PASS = AREA 6																
EK0155	30	0.00 B	15	35	.0 B	0 B	0 B	3	3.0	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EK0358	150	0.15	340	95	.0 B	0 B	0 B	6	0.5	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2142	30	0.00 B	210	440	.0 B	0 B	0 B	60	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2144	30	0.00 B	400	250	.0 B	0 B	0 B	25	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2148	70	0.00 B	90	140	.0 B	0 B	0 B	30	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ET0304	70	0.02 L	25	50	.0 B	0 B	0 B	2	1.0	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ET0306	70	0.02	50	190	.0 B	0 B	0 B	8	2.0	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
SOIL SAMPLES = VAN EPPS PASS = AREA 6																
EP2145	150	0.00 B	180	45	.0 B	0 B	0 B	4	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2146	200	0.00 B	30	35	.0 B	0 B	0 B	1	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2147	150	0.00 B	1000	210	.0 B	0 B	0 B	250	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2149	70	0.00 B	90	220	.0 B	0 B	0 B	30	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2154	70	0.00 B	440	65	.0 B	0 B	0 B	16	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2155	30	0.00 B	520	40	.0 B	0 B	0 B	6	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2156	30	0.00 B	1700	55	.0 B	0 B	0 B	6	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2157	30	0.00 B	1700	55	.0 B	0 B	0 B	6	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2158	30	0.00 B	1700	60	.0 B	0 B	0 B	8	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2159	50	0.00 B	1800	60	.0 B	0 B	0 B	4	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2160	30	0.00 B	1800	60	.0 B	0 B	0 B	2	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2161	200	0.00 B	100	30	.0 B	0 B	0 B	1 L	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2162	100	0.00 B	1200	95	.0 B	0 B	0 B	2	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2163	150	0.00 B	160	35	.0 B	0 B	0 B	2	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ROCK SAMPLES = ESMERELDA PEAKS = AREA 7																
EG1070	10	16.00	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG1070A	10	2.50	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG1080	70	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG1081	70	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG1081A	10 N	0.05 N	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG1081B	10 N	0.05 N	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EK0114D	10 L	0.02 N	360	0 B	.0 B	0 B	0 B	0 B	1.0 L	4	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
STREAM-SEDIMENT SAMPLES = ESMERELDA PEAKS = AREA 7																
EG1071	70	0.05 N	30	70	.0 B	0 B	0 B	3	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EK0119	70	0.00 B	50	120	.0 B	0 B	0 B	12	0.5 L	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ROCK SAMPLES = GOLD CREEK = DELATE CREEK = MINERAL CREEK = AREA 8																
EG0537	70	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG0541	30	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG0606	70	0.02 N	120	0 B	.0 B	0 B	0 B	0 B	1.0 L	2 L	.000 B	.000 B	.000 B	.0 B	.00 B	0 B

TABLE 18.—*Analytical results of anomalous samples from anomalous areas in the Alpine Lakes area and additions*—Continued

SAMPLE	S-FE%	S-MG%	S-CA%	S-TI%	S-MN	S-AG	S-AS	S-AU	S-B	S-BA	S-BE	S-BI	S-CD	S-CO
ROCK SAMPLES = GOLD CREEK-DELATE CREEK-MINERAL CREEK = AREA 8														
EG1308	7.00	3.00	5.00	1.000	700	0.5 N	200 N	10 N	10 L	20 L	1.0 N	10 N	20 N	70
EG1309	10.00	3.00	7.00	1.000 G	1000	0.5 N	200 N	10 N	10 L	20 L	1.0 N	10 N	20 N	70
EG1332	10.00	0.10	0.30	.500	5000 G	3.0	200 L	10 N	10	300	1.0	10 N	30	15
EG1349	5.00	3.00	5.00	1.000	1000	0.5 N	200 N	10 N	10 N	150	1.0 L	10 N	20 N	30
EG1373	7.00	3.00	5.00	.500	1500	0.5 N	200 N	10 N	10 L	200	1.0 N	10 N	20 N	15
EG1383	5.00	3.00	5.00	1.000 G	500	0.5 N	200 N	10 N	10 L	150	1.0 L	10 N	20 N	50
EG1384	5.00	2.00	3.00	1.000	700	0.5 L	200 N	10 N	10 L	100	1.0	10 N	20 N	10
EG1385	7.00	3.00	5.00	1.000	700	0.5 N	200 N	10 N	10	300	1.0 L	10 N	20 N	30
EG1388	5.00	1.50	3.00	.700	700	0.5	200 N	10 N	10 L	200	1.0 L	10 N	20 N	15
EG1390	3.00	0.50	0.70	.700	100	0.5 L	200 N	10 N	10	500	1.0	10 N	20 N	10
EG1393	3.00	1.00	1.50	.300	150	0.5 N	200 N	10 N	10 N	300	1.0	10 N	20 N	5
EG1394	3.00	1.00	1.50	1.000	300	0.5 N	200 N	10 N	10 L	100	1.0 L	10 N	20 N	20
EG1396	3.00	0.30	0.50	.150	1000	70.0	7000	10 N	10	50	1.0 L	10 L	150	5
EG1396A	3.00	1.00	2.00	.200	2000	15.0	1000	10 N	10	150	1.0	10 N	20 N	15
EG1396B	3.00	0.30	1.50	.150	300	70.0	2000	10 N	10	50	1.0 L	10	70	10
EG2413	1.50	1.00	1.50	.150	200	0.5 N	200 N	10 N	15	150	1.0	10 N	20 N	5 L
EG2420	7.00	2.00	0.20	.300	200	0.5 N	200 N	10 N	10	200	1.0	10 N	20 N	7
EG2420A	15.00	1.00	0.05 L	.150	70	0.5 N	200 N	10 N	10	150	1.0	10 N	20 N	5
EG2421	7.00	2.00	0.10	.300	300	0.5 N	200 N	10 N	20	500	1.0 L	10 N	20 N	5 L
EG2425	7.00	3.00	5.00	.300	500	0.5 N	200 N	10 N	10 N	70	1.0 N	10 N	20 N	10
EG2426	10.00	1.50	3.00	.300	150	0.5 L	200 N	10 N	10 N	70	1.0 N	10 N	20 N	15
EG2430A	5.00	1.50	2.00	.150	70	0.5 N	200 N	10 N	10 L	150	1.0 L	10 N	20 N	7
EG2431	3.00	0.70	1.50	.200	70	0.5	200 N	10 N	10	50	1.0 L	10 N	20 N	7
EG2431A	7.00	1.50	1.50	.300	70	2.0	200 N	10 N	10 L	30	1.0 N	10 N	20 N	30
EG2431B	3.00	1.50	1.50	.150	70	0.7	200 N	10 N	10 L	100	1.0 L	10 N	20 N	7
EG2431C	5.00	1.50	1.50	.150	70	1.0	200 N	10 N	10 L	300	1.0 N	10 N	20 N	7
EG2432	3.00	1.00	0.05 L	.500	70	0.5 N	200 N	10 N	10	300	1.0 L	10 N	20 N	5 L
EG2441	2.00	0.70	0.70	.150	150	0.5 N	200 N	10 N	10 L	300	1.0	10 N	20 N	5 N
EG2460	1.50	0.70	1.50	.100	50	0.5 N	200 N	10 N	10 L	150	1.0 L	10 N	20 N	5 L
EG2464A	10.00	3.00	5.00	.700	700	0.5 N	200 N	10 N	10 N	70	1.0 N	10 N	20 N	5 L
EG2485B	10.00	3.00	10.00	1.000 G	1500	0.5 N	200 N	10 N	10 N	300	1.0 L	10 N	20 N	30
EG2486A	10.00	3.00	5.00	1.000	1000	0.5 N	200 N	10 N	10 N	200	1.0 L	10 N	20 N	20
EG2784A	7.00	3.00	1.00	.700	500	0.5 N	200 N	10 N	30	700	1.0 L	10 N	20 N	15
EG2784B	3.00	0.70	0.10	.500	150	0.5 N	200 N	10 N	15	700	1.0	10 N	20 N	5 L
ES0165A	5.00	2.00	5.00	.300	500	1.0	200 N	10 N	10 N	200	1.0	10	20 N	10
ES0166	7.00	2.00	3.00	.300	700	1.5	200 N	10 N	10 N	300	1.0	10 N	20 N	30
ES0166A	20.00 G	0.30	0.30	.100	50	0.5 N	200 N	10 N	10 L	700	1.0 L	10 N	20 N	50
ES0166B	7.00	1.50	2.00	.700	300	1.0	200 N	10 N	10 L	200	1.0 L	10 N	20 N	50
ES0166C	2.00	0.30	1.00	.300	70	0.5 N	200 N	10 N	10 L	700	1.0 L	10 N	20 N	10
ES0169B	2.00	1.00	3.00	.150	300	0.5 N	200 N	10 N	10 N	300	1.0	10 N	20 N	5
ES0190B	3.00	0.70	0.70	.200	70	0.5 N	200 N	10 N	10 N	700	1.0	10 N	20 N	30

TABLE 18.—*Analytical results of anomalous samples from anomalous areas in the Alpine Lakes area and additions*—Continued

SAMPLE	S-CR	S-CU	S-LA	S-MO	S-NB	S-NI	S-PB	S-SB	S-SC	S-SN	S-SR	S-V	S-W	S-Y	S-ZN
ROCK SAMPLES = GOLD CREEK-DELATE CREEK-MINERAL CREEK = AREA 8															
EG1308	200	50	20 N	5 N	20 N	70	10 N	100 N	70	10 N	200	300	50 N	50	200
EG1309	200	30	20 N	5 N	20 N	70	10 N	100 N	50	10 N	150	300	50 N	50	200
EG1332	20	30	20 L	5 N	20 L	50	500	100 L	20	10 N	100 N	150	50	30	7000
EG1349	150	20	20 L	5 N	20 N	70	10 L	100 N	30	10 N	300	200	50 N	30	200
EG1373	100	15	20 L	5 N	20 N	70	10 L	100 N	20	10 N	300	150	50 N	15	300
EG1383	300	100	20	5 N	20	150	10 N	100 N	15	10 N	500	200	50 N	30	200 L
EG1384	50	50	20 L	7	20	20	15	100 N	20	10 N	300	150	50 N	20	200 L
EG1385	150	100	20 L	5 N	20 L	150	10 L	100 N	30	10 N	300	150	50 N	20	200 L
EG1388	20	30	20 L	5 N	20 N	10	30	100 N	20	10 N	200	100	50 N	30	200
EG1390	30	30	20 L	10	20	7	30	100 N	15	10 N	200	100	50 N	30	200 N
EG1393	10 L	20	20 L	5	20 L	5 N	10 L	100 N	15	10 N	200	50	50 N	20	200 N
EG1394	70	150	20 N	5 N	20 N	50	10 L	100 N	30	10 N	100 L	150	50 N	20	200 L
EG1396	10 L	1500	20 N	5	20 N	5 L	2000	300	5	15	100 N	30	50 N	10 L	10000 G
EG1396A	10 L	2000	20 N	5 N	20 N	5	150	100 L	10	10	100 L	70	70	10	700
EG1396B	10 L	700	20 N	5 L	20 N	5	500	100 N	7	20	100 N	50	50 L	10 L	10000
EG2413	20	10	20 L	5	20 N	10	15	100 N	5	10 N	200	30	50 N	10	200 N
EG2420	50	20	20 L	5 L	20 L	50	10 N	100 N	10	10 N	100 L	100	50 N	10	300
EG2420A	30	200	20 L	5 L	20 L	20	10 N	100 N	7	10 N	100 N	70	50 N	15	200
EG2421	70	50	20 L	10	20 L	20	10 L	100 N	15	10 N	100 L	150	50 N	15	200 N
EG2425	70	30	20 L	5	20 L	50	10 N	100 N	15	10 N	150	150	50 N	15	200 N
EG2426	10 L	700	20 N	5 L	20 L	5	10 N	100 N	15	10 N	100	150	50 N	10	200 N
EG2430A	10 L	300	20 N	5 N	20 L	5 L	10 N	100 N	7	10 N	200	50	50 N	10 L	200 N
EG2431	10	700	20 N	7	20 L	5	10 N	100 N	7	10 N	150	20	50 N	10 N	200 N
EG2431A	30	2000	20 N	300	20 L	5 L	10 N	100 N	15	10 L	150	50	50 N	10 L	200 N
EG2431B	10	500	20 N	5 L	20 L	5 L	10 N	100 N	7	10 N	200	30	50 N	10 L	200 N
EG2431C	10 L	700	20 N	5 L	20 L	5 L	10 N	100 N	7	10 N	150	30	50 N	10 L	200 N
EG2432	70	150	20	5 N	20 N	30	10 N	100 N	15	10 N	100 L	100	50 N	15	200 N
EG2441	10 N	7	30	5	20 L	5 N	10	100 N	7	10 N	150	15	50 N	15	200 N
EG2460	10 N	10	20 N	15	20 L	5 L	10 L	100 N	5 L	10 N	150	15	50 N	10 L	200 N
EG2464A	150	70	20 L	7	20 L	100	10 N	100 N	20	10 N	200	150	50 N	15	200 N
EG2485B	70	150	30	5 L	20 L	30	10 N	100 N	30	10 N	300	200	50 N	70	200 N
EG2486A	150	70	20	15	20 L	100	10 N	100 N	20	10 N	300	200	50 N	30	200 N
EG2784A	200	100	30	5 L	20 L	70	10 N	100 N	30	10 N	300	200	50 N	30	200 N
EG2784B	100	150	20	5 N	20 L	30	10 N	100 N	15	10 N	100 L	100	50 N	30	200 N
ES0165A	20	150	20 N	5 N	10 N	15	50	100 N	15	10 N	300	70	50 N	10	200 L
ES0166	30	1000	20 N	5 N	10 N	15	10	100 N	15	10 N	700	100	50 N	10	700
ES0166A	20	200	20 N	50	10 N	15	10 N	100 N	7	10 N	100 N	50	50 N	20	200 N
ES0166B	70	1500	20 L	5 N	10 N	30	10 N	100 N	30	10 N	100	150	50 N	50	200 N
ES0166C	20	150	30	15	10 L	10	10 N	100 N	15	10	100 N	50	50 N	50	200 N
ES0169B	20	200	20 N	15	10 N	5	10 L	100 N	7	10 N	500	70	50 N	10	200 N
ES0190B	10 L	70	30	20	10 L	20	10 N	100 N	7	10 L	100 L	50	50 N	30	200 N

TABLE 18.—*Analytical results of anomalous samples from anomalous areas in the Alpine Lakes area and additions*—Continued

SAMPLE	S-ZR	AA-AU-P	AA-CU-P	AA-ZN-P	AA-AG-P	AA-CO-P	AA-NI-P	CM=CXHM	CM-SB	CM-MO	AS-PT	AS-PD	AS-RH	AS-RU	AS-IR	EU
ROCK SAMPLES = GOLD CREEK-DELATE CREEK-MINERAL CREEK = AREA 8																
EG1308	70	0.05 N	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG1309	100	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG1332	100	0.05 N	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG1349	150	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG1373	100	0.05 N	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG1383	150	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG1384	150	0.05 N	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG1385	100	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG1388	100	0.05 N	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG1390	200	0.05 N	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG1393	200	0.05 N	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG1394	100	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG1396	70	2.00	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG1396A	70	0.45	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG1396B	70	0.50	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2413	100	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2420	150	0.00 B	0 B	220	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2420A	50	0.00 B	0 B	250	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2421	150	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2425	100	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2426	100	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2430A	70	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2431	70	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2431A	150	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2431B	30	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2431C	70	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2432	150	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2441	200	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2460	100	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2464A	150	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2485B	200	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2486A	200	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2784A	200	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2784B	300	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ES0165A	20	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ES0166	30	0.02 N	430	0 B	.0 B	0 B	0 B	0 B	1.0 L	4	.005 N	.002	.002 N	.1 N	.05 N	0 B
ES0166A	70	0.02 N	75	0 B	.0 B	0 B	0 B	0 B	1.0	60	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ES0166B	100	0.02 L	1800	0 B	.0 B	0 B	0 B	0 B	1.0	6	.005 N	.002	.002 N	.1 N	.05 N	0 B
ES0166C	200	0.02 N	300	0 B	.0 B	0 B	0 B	0 B	1.0 L	15	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ES0169B	100	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ES0190B	150	0.02 N	40	0 B	.0 B	0 B	0 B	0 B	1.0 L	25	.000 B	.000 B	.000 B	.0 B	.00 B	0 B

TABLE 18.—*Analytical results of anomalous samples from anomalous areas in the Alpine Lakes area and additions*—Continued

SAMPLE	S-FE%	S-MG%	S-CA%	S-TI%	S-MN	S-AG	S-AS	S-AU	S-B	S-BA	S-BE	S-BI	S-CD	S-CU
ROCK SAMPLES = GOLD CREEK-DELATE CREEK-MINERAL CREEK = AREA 8														
ES1080C	10,00	3,00	7,00	,700	700	0,5 N	200 N	10 N	10 L	70	1,0 L	10	20 N	30
ES1083	3,00	3,00	5,00	,700	700	0,5 N	200 N	10 N	10 L	100	1,0 N	10 N	20 N	50
ES1085	3,00	2,00	5,00	,500	700	1,5	200 N	10 N	10 N	150	1,0 L	10 N	20 N	10
ES1086	3,00	1,50	2,00	,500	500	0,7	200 N	10 N	10 L	300	1,0 L	10 N	20 N	10
ES1097	3,00	1,50	3,00	,500	700	1,0	200 N	10 N	10 L	200	1,0 L	10 N	20 N	15
ES1097A	3,00	0,50	0,20	,300	1500	30,0	700	10 N	10	70	1,0 L	10 N	20 N	10
ES1097B	3,00	0,10	0,07	,150	1500	200,0	1500	10 N	10 L	20	1,0 L	10	150	5
ES1097C	10,00	0,50	1,50	,070	5000 G	700,0	1500	10 N	10 L	20	1,0 L	10 N	150	5
ES1097D	7,00	0,30	0,50	,150	5000 G	150,0	1000	10 N	10 L	30	1,0 L	10 N	300	15
ES1098	3,00	1,50	3,00	,500	700	0,5 N	200 N	10 N	10 N	150	1,0	10 N	20 N	15
STREAM-SEDIMENT SAMPLES = GOLD CREEK = DELATE CREEK = MINERAL CREEK = AREA 8														
EG0527	5,00	0,70	1,50	,500	1500	2,0	200 N	10 N	10 L	300	1,0	10 N	20 N	15
EG0528	0,50	0,20	0,50	,100	2000	0,5 N	200 N	10 N	10	100	1,0	10 N	20 N	15
EG0529	5,00	1,00	1,50	,500	2000	1,5	200 N	10 N	10 L	300	1,0	10 N	20 N	15
EG0530	5,00	1,00	2,00	,500	1000	0,7	200 N	10 N	10 L	300	1,0	10 N	20 N	15
EG0531	3,00	0,70	1,50	,200	700	0,5 N	200 N	10 N	10 L	100	1,0	10 N	20 N	15
EG0532	3,00	1,00	1,50	,500	1000	0,5 N	200 N	10 N	10 L	150	1,0	10 N	20 N	15
EG0535	7,00	1,50	1,50	,500	1500	0,7	200 N	10 N	10	300	1,5	10 N	20 N	30
EG0538	2,00	0,70	1,50	,500	500	0,5	200 N	10 N	10 L	300	1,5	10 N	20 N	10
EG0539	5,00	0,70	1,00	,200	3000	0,5 L	200 N	10 N	10 L	300	1,5	10 N	20 N	20
EG0540	7,00	1,50	2,00	,700	1000	1,5	200 N	10 N	10	300	1,0	10 N	20 N	15
EG0545	5,00	1,00	1,50	,500	700	1,5	200 N	10 N	10 L	300	1,0	10 N	20 N	15
EG0546	7,00	1,00	2,00	,500	700	0,5	200 N	10 N	10 L	200	1,0 L	10 N	20 N	15
EG0549	3,00	1,00	1,00	,500	1500	0,5 N	200 N	10 N	15	300	1,5	10 N	20 N	30
EG0555	3,00	1,50	1,50	,300	700	1,0	200 N	10 N	10	300	1,5	10 N	20 N	15
EG0558	5,00	0,70	1,00	,500	1500	0,5 N	200 N	10 N	20	300	1,5	10 N	20 N	20
EG0566	1,50	0,30	0,50	,070	1500	0,5 N	200 N	10 N	10 L	50	1,0	10 N	20 N	15
EG0571	3,00	1,00	1,50	,300	700	0,5 N	200 N	10 N	10 L	100	1,0	10 N	20 N	10
EG0588	3,00	2,00	1,50	,700	700	0,5 N	200 N	10 N	10 L	200	1,5	10 N	20 N	15
EG0589	3,00	1,00	1,50	,200	1500	0,5 N	200 N	10 N	10 L	200	1,0	10 N	20 N	10
EG0600	2,00	0,30	0,50	,200	700	0,7	200 N	10 N	15	150	1,5	10 N	20 N	10
EG0602	3,00	1,00	1,00	,500	1000	0,7	200 N	10 N	15	200	1,5	10 N	20 N	15
EG0604	2,00	0,70	1,00	,150	1500	0,5 N	200 N	10 N	10 L	100	1,0	10 N	20 N	10
EG0641	3,00	0,70	1,50	,300	500	0,5 N	200 N	10 N	10 L	200	1,0	10 N	20 N	10
EG0644	3,00	1,50	1,50	,500	700	1,0	200 N	10 N	10 L	300	1,0	10 N	20 N	15
EG0665	3,00	0,70	1,50	,300	1500	0,5 N	200 N	10 N	10 L	100	1,0	10 N	20 N	15
EG1364	1,50	1,00	0,70	,200	1500	0,5 N	200 N	10 N	10	100	1,0	10 N	20 N	10
EG2032	7,00	1,50	1,00	,700	1500	0,5 N	200 N	10 N	100	500	1,5	10 N	20 N	30
EG2427	10,00	3,00	2,00	,500	700	0,5 N	200 N	10 N	10 L	100	1,0 L	10 N	20 N	10

TABLE 18.—*Analytical results of anomalous samples from anomalous areas in the Alpine Lakes area and additions*—Continued

SAMPLE	S-CR	S-CU	S-LA	S-MO	S-NB	S-NI	S-PB	S-SB	S-SC	S-SN	S-SR	S-V	S-W	S-Y	S-ZN
ROCK SAMPLES = GOLD CREEK-DELATE CREEK-MINERAL CREEK = AREA 8															
ES1080C	700	50	20 N	5 N	20 N	100	10 N	100 N	30	50	300	200	50 N	30	200
ES1083	70	150	20 L	5 N	20 N	70	10 N	100 N	30	10 N	300	150	50 N	20	200 N
ES1085	10 L	30	20	5 N	20 N	5	10	100 N	30	10 N	300	150	50 N	30	200 L
ES1086	20	100	20 N	5 N	20 N	5 L	10	100 N	20	10 N	200	100	50 N	20	200
ES1097	10 L	150	20 N	5 N	20 N	5	10	100 N	30	10 N	300	150	50 N	30	300
ES1097A	20	150	20 L	5 N	20 N	5 L	300	100 L	15	10 N	100 N	70	50 L	30	1000
ES1097B	10 L	300	20 N	5 N	20 N	5 L	1000	200	7	10 N	100 N	30	50 N	10 L	10000 G
ES1097C	20	1000	30	5 N	20 N	5 L	20000 G	500	5	10 N	100 N	50	70	10	10000
ES1097D	10 L	1000	20 N	15	20 N	5	1000	100 L	10	10 N	100 N	50	50	15	10000 G
ES1099	10 L	20	20 L	30	20 N	5 L	10 L	100 N	20	10 N	300	150	50 N	20	200 L
STREAM-SEDIMENT SAMPLES - GOLD CREEK - DELATE CREEK - MINERAL CREEK - AREA 8															
EG0527	20	150	20	15	10 N	10	70	100 N	15	10 N	200	150	50 N	20	200 N
EG0528	20	50	20 N	5 N	10 N	10	20	100 N	5	10 N	100	20	50 N	20	200 N
EG0529	20	150	20 L	10	10 N	10	50	100 N	15	10 N	300	100	50 N	15	200 N
EG0530	30	150	20 L	15	10 N	15	30	100 N	15	10 N	300	150	50 N	20	200 N
EG0531	50	150	20 L	5	10 N	20	30	100 N	10	10 N	100	70	50 N	15	200 N
EG0532	50	100	20 L	10	10 N	15	20	100 N	10	10 N	100	100	50 N	15	200 N
EG0535	50	100	20 L	5 N	10 N	30	100	100 N	15	10 N	200	150	50 N	15	200 N
EG0538	20	70	20 L	5 N	10 N	7	15	100 N	7	10 N	200	70	50 N	15	200 N
EG0539	30	150	20 N	5	10 N	15	50	100 N	7	10 N	100	70	50 N	15	200 N
EG0540	20	70	20 N	5 N	10 N	10	150	100 N	15	10 N	300	100	50 N	15	200 N
EG0545	30	100	20	5	10 N	15	30	100 N	15	10 N	200	150	50 N	15	200 N
EG0546	70	70	20 N	5 N	10 N	15	20	100 N	15	10 N	300	200	50 N	15	200 N
EG0549	70	70	20 N	5 N	10 N	30	30	100 N	15	10 N	100	100	50 N	15	200 N
EG0555	70	100	20 L	5 N	10 N	30	10	100 N	15	10 N	150	70	50 N	20	200 N
EG0558	70	100	30	5 N	10 N	30	30	100 N	15	10 N	100	70	50 N	20	200 N
EG0566	20	15	20 N	5 N	10 N	5	50	100 N	5 L	10 N	100 N	30	50 N	10 L	200 N
EG0571	50	100	20 N	5 N	10 N	15	10	100 N	10	10 N	150	100	50 N	10	200 N
EG0588	30	30	20 N	5 N	10 N	15	50	100 N	15	10 N	300	150	50 N	15	200 N
EG0589	50	15	20 N	5 N	10 N	10	50	100 N	7	10 N	300	70	50 N	15	200 N
EG0600	20	30	20 N	5 N	10 N	10	30	100 N	7	10 N	100 L	70	50 N	15	200 N
EG0602	20	100	20 N	5 N	10 N	15	20	100 N	15	10 N	150	100	50 N	20	200 N
EG0604	30	15	20 N	5 N	10 N	10	70	100 N	5	10 N	100	50	50 N	15	200 N
EG0641	20	20	20 L	5 N	10 N	15	50	100 N	7	10 N	300	70	50 N	10	200 N
EG0644	50	20	20 N	5 N	10 N	15	30	100 N	10	10 N	300	100	50 N	15	200 N
EG0665	20	15	20 N	5 N	10 N	7	50	100 N	7	10 N	150	70	50 N	15	200 N
EG1364	30	10	20 L	5 N	10 N	15	20	100 N	10	10 N	200	50	50 N	10	200 N
EG2032	150	100	20	5 N	20 L	100	70	100 N	30	10 N	150	200	50 N	30	500
EG2427	30	100	20 L	5	20 L	15	10	100 N	15	10 N	150	100	50 N	15	200 N

TABLE 18.—*Analytical results of anomalous samples from anomalous areas in the Alpine Lakes area and additions*—Continued

SAMPLE	S-ZR	AA-AU-P	AA-CU-P	AA-ZN-P	AA-AG-P	AA-CO-P	AA-NI-P	CM=CXHM	CM-SB	CM-MO	AS-PT	AS-PD	AS-RH	AS-RU	AS-IR	EU
ROCK SAMPLES = GOLD CREEK-DELATE CREEK-MINERAL CREEK = AREA 8																
ES1080C	70	0,05 L	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
ES1083	100	0,00 B	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
ES1085	150	0,05 N	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
ES1086	70	0,05 N	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
ES1097	100	0,05 N	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
ES1097A	150	0,20	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
ES1097B	70	3,00	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
ES1097C	30	0,95	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
ES1097D	70	1,00	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
ES1098	150	0,05 N	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
STREAM-SEDIMENT SAMPLES = GOLD CREEK = DELATE CREEK = MINERAL CREEK = AREA 8																
EG0527	150	0,02 N	180	180	,0 B	0 B	0 B	25	1,0	15	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG0528	20	0,00 B	0 B	0 B	,0 B	0 B	0 B	35	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG0529	150	0,00 B	150	90	,0 B	0 B	0 B	16	2,0	10	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG0530	150	0,02 L	140	55	,0 B	0 B	0 B	6	2,0	15	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG0531	70	0,00 B	100	75	,0 B	0 B	0 B	8	0,0 B	4	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG0532	100	0,00 B	140	90	,0 B	0 B	0 B	5	0,0 B	8	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG0535	150	0,04 N	100	280	,0 B	0 B	0 B	14	3,0	2	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG0538	100	0,00 B	130	45	,0 B	0 B	0 B	6	0,5 L	2	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG0539	100	0,04 N	280	110	,0 B	0 B	0 B	18	1,0	10	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG0540	150	0,00 B	55	160	,0 B	0 B	0 B	16	0,5	4	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG0545	100	0,02 L	110	120	,0 B	0 B	0 B	2	1,0	6	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG0546	150	0,02 L	40	30	,0 B	0 B	0 B	2	0,5 L	2 L	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG0549	100	0,00 B	55	100	,0 B	0 B	0 B	2	0,0 B	2 L	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG0555	100	0,00 B	160	75	,0 B	0 B	0 B	2	0,5 L	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG0558	150	0,00 B	100	190	,0 B	0 B	0 B	3	0,5	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG0566	20	0,00 B	30	25	,0 B	0 B	0 B	3	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG0571	70	0,00 B	30	45	,0 B	0 B	0 B	1 L	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG0588	150	0,00 B	35	75	,0 B	0 B	0 B	2	2,0	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG0589	70	0,00 B	20	55	,0 B	0 B	0 B	1	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG0600	70	0,00 B	35	95	,0 B	0 B	0 B	3	4,0	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG0602	150	0,04 N	150	100	,0 B	0 B	0 B	1 L	3,0	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG0604	70	0,00 B	0 B	0 B	,0 B	0 B	0 B	6	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG0641	70	0,00 B	20	20	,0 B	0 B	0 B	3	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG0644	150	0,02 N	15	65	,0 B	0 B	0 B	1	0,5 L	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG0665	50	0,00 B	25	80	,0 B	0 B	0 B	8	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG1364	70	0,00 B	20	85	,0 B	0 B	0 B	16	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG2032	150	0,00 B	100	390	,0 B	0 B	0 B	35	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG2427	150	0,00 B	140	90	,0 B	0 B	0 B	6	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B

TABLE 18.—*Analytical results of anomalous samples from anomalous areas in the Alpine Lakes area and additions*—Continued

SAMPLE	S-FE%	S-MG%	S-CA%	S-TI%	S-MN	S-AG	S-AS	S-AU	S-B	S-BA	S-BE	S-BI	S-CD	S-CL
			STREAM-SEDIMENT SAMPLES = GOLD CREEK-DELATE CREEK-MINERAL CREEK = AREA 8											
EG2428	5.00	1.50	2.00	.500	700	0.5 L	200 N	10 N	30	200	1.0	10 N	20 N	15
EG2430	10.00	2.00	2.00	.700	1000	0.5	200 N	10 N	10 L	200	1.0	10 N	20 N	70
EG2434	2.00	0.30	1.50	.150	5000 G	0.5 N	200 N	10 N	70	150	2.0	10 N	20 N	15
EG2464	5.00	1.50	1.50	.300	700	0.5 N	200 N	10 N	30	150	1.0	10 N	20 N	15
EG2486	15.00	1.00	1.50	.300	5000 G	0.5 N	200 N	10 N	70	150	1.5	10 N	20 N	200
ES0164	3.00	1.50	1.50	.500	3000	1.0	200 N	10 N	10 L	300	1.0	10 N	20 N	30
ES0167	3.00	1.00	2.00	.500	1000	2.0	200 N	10 N	10 L	200	1.0	10 N	20 N	7
ES0168	5.00	1.00	1.50	.500	700	0.5 N	200 N	10 N	10 L	200	1.0	10 N	20 N	10
ES0169	3.00	0.70	1.00	.200	700	0.5 N	200 N	10 N	10 L	200	1.0	10 N	20 N	15
ES0170	5.00	1.00	1.00	.300	1000	0.5 N	200 N	10 N	10 L	300	1.5	10 N	20 N	15
ES0171	5.00	1.00	1.50	.300	1000	0.5 N	200 N	10 N	10 L	300	1.0	10 N	20 N	15
ES0172	5.00	0.70	1.00	.200	700	0.5	200 N	10 N	10 L	200	1.0	10 N	20 N	15
ES0173	5.00	1.00	1.50	.300	700	1.5	200 N	10 N	10 L	200	1.0	10 N	20 N	15
ES0174	7.00	1.00	0.70	.500	1000	1.0	200 N	10 N	10	300	1.0	10 N	20 N	20
ES0175	5.00	1.50	3.00	.500	1000	1.0	200 N	10 N	10 L	300	1.0	10 N	20 N	15
ES0176	3.00	1.00	1.50	.300	700	0.5	200 N	10 N	10 L	200	1.0	10 N	20 N	10
ES0177	3.00	0.70	1.50	.300	2000	1.5	200 N	10 N	10 L	300	1.5	10 N	20 N	15
ES0178	5.00	1.00	1.50	.500	700	0.7	200 N	10 N	10 L	300	1.5	10 N	20 N	15
ES0182	3.00	0.70	1.50	.300	1000	0.5	200 N	10 N	20	200	1.5	10 N	20 N	20
ES0183	5.00	1.00	1.50	.500	1000	0.5 N	200 N	10 N	20	300	1.0	10 N	20 N	15
ES0184	5.00	2.00	1.50	.700	1500	0.7	200 N	10 N	100	300	1.5	10 N	20 N	20
ES0186	3.00	1.50	1.50	.500	1500	0.5 N	200 N	10 N	100	500	1.5	10 N	20 N	20
ES0187	5.00	1.00	0.70	.700	1500	0.5 N	200 N	10 N	100	700	1.5	10 N	20 N	20
ES0190	3.00	0.70	1.50	.200	300	0.5 N	200 N	10 N	10 L	100	1.0	10 N	20 N	10
ES0192	3.00	0.70	1.00	.200	300	0.5 N	200 N	10 N	10 L	100	1.0	10 N	20 N	15
ES0193	3.00	1.00	1.50	.300	500	0.5 N	200 N	10 N	10 L	150	1.0	10 N	20 N	15
ES0194	3.00	1.00	1.50	.300	700	1.5	200 N	10 N	10	300	1.0 L	10 N	20 N	20
			PANNED-CONCENTRATE SAMPLES = GOLD CREEK = DELATE CREEK = MINERAL CREEK = AREA 8											
ES1099	7.00	1.00	3.00	.500	700	1.5	200 N	10 N	10 L	150	1.0 L	20	20 N	10
EG2783	20.00	1.50	2.00	1.000 G	1500	0.7	200 N	10 N	10 N	150	1.0 N	10 N	20 N	70
			ROCK SAMPLES = LEMAH CREEK = MIDDLE FORK SNOQUALMIE RIVER = CRAWFORD CREEK = AREA 9											
EG0655A	5.00	3.00	7.00	1.000	1000	0.5 N	200 N	10 N	15	200	1.0 L	10 N	20 N	30
EG0657	5.00	3.00	5.00	1.000	1000	0.5 N	200 N	10 N	10 L	200	1.0 L	10 N	20 N	30
EG0671	5.00	1.50	2.00	.200	1000	0.5 N	200 N	10 N	10	500	1.0 L	10 N	20 N	10
EG0672	5.00	2.00	0.70	.500	1500	0.5 N	200 N	10 N	200	1000	1.5	10 N	20 N	7
EG0672A	5.00	3.00	0.50	.500	300	0.5 N	200 N	10 N	2000 G	50	1.5	10 N	20 N	10
EG0673	3.00	0.50	0.05	.200	70	1.5	200 N	10 N	20	700	1.0 L	10 N	20 N	30
EG0674	5.00	1.50	0.70	.500	500	0.5 N	200 N	10 N	100	700	1.5	10 N	20 N	15
EG0675	2.00	1.00	2.00	.150	1500	0.5 N	200 N	10 N	10 L	500	1.0	10 N	20 N	5

TABLE 18.—*Analytical results of anomalous samples from anomalous areas in the Alpine Lakes area and additions*—Continued

SAMPLE	S-CR	S-CU	S-LA	S-MO	S-NB	S-NI	S-PB	S-SB	S-SC	S-SN	S-SR	S-V	S-W	S-Y	S-ZN
STREAM-SEDIMENT SAMPLES = GOLD CREEK-DELATE CREEK-MINERAL CREEK = AREA 8															
EG2428	50	150	20 N	30	20 L	20	10	100 N	15	10 N	300	100	50 N	15	200 N
EG2430	70	700	20	20	20 L	30	30	100 N	20	10 N	200	150	50 N	30	200 N
EG2434	20	20	20 L	5 N	20 L	15	300	100 N	7	10 N	150	70	50 N	30	200 N
EG2464	70	150	20 N	5 L	20 L	30	15	100 N	20	10 N	150	150	50 N	15	200 N
EG2486	30	200	20 L	10	20 L	50	500	100 N	15	10 N	150	150	50 N	30	200 L
ES0164	20	100	30	5	10 N	15	100	100 N	15	10 N	200	100	50 N	30	200
ES0167	30	100	20 L	5	10 N	7	50	100 N	15	10 N	200	100	50 N	15	200 N
ES0168	30	150	20 L	15	10 N	10	20	100 N	15	10 N	200	100	50 N	15	200 N
ES0169	20	150	20	5	10 N	15	30	100 N	7	10 N	100	70	50 N	15	200 N
ES0170	30	150	20 L	10	10 N	15	50	100 N	10	10 N	150	70	50 N	20	200 L
ES0171	50	100	20 L	5	10 N	15	30	100 N	10	10 N	200	70	50 N	15	200 L
ES0172	20	100	20 N	10	10 N	10	30	100 N	7	10 N	150	70	50 N	20	200 N
ES0173	20	200	20 N	5	10 N	15	30	100 N	10	10 N	200	100	50 N	15	200 L
ES0174	30	70	20 L	5 L	10 N	15	70	100 N	15	10 N	100	150	50 N	20	200
ES0175	30	100	20 N	5 L	10 N	10	30	100 N	15	10 N	300	150	50 N	15	200 N
ES0176	50	70	20	5 L	10 N	15	30	100 N	15	10 N	200	100	50 N	20	200 N
ES0177	50	70	20 N	5 N	10 N	15	70	100 N	15	10 N	150	100	50 N	20	200 N
ES0178	70	150	20 N	5 N	10 N	15	30	100 N	15	10 N	300	150	50 N	20	200 L
ES0182	50	30	20 N	5 N	10 N	15	50	100 N	15	10 N	150	100	50 N	20	200 L
ES0183	30	50	20 L	5 N	10 N	15	50	100 N	15	10 N	150	150	50 N	20	200 L
ES0184	70	50	30	5 N	10 N	30	70	100 N	15	10 N	200	150	50 N	20	200
ES0186	150	70	30	5 N	10 N	50	30	100 N	20	10 N	200	150	50 N	30	200 L
ES0187	100	70	20	5 N	10 N	50	30	100 N	15	10 N	100	150	50 N	20	200 N
ES0190	10 L	70	20 N	5 N	10 N	10	30	100 N	7	10 N	150	50	50 N	10	200 N
ES0192	30	200	20 N	20	10 N	15	20	100 N	10	10 N	100	70	50 N	10	200 N
ES0193	50	50	20 L	15	10 N	20	10	100 N	15	10 N	200	100	50 N	15	200 N
ES0194	70	150	20 L	10	10 N	30	30	100 N	15	10 N	200	150	50 N	15	200 N
PANNED-CONCENTRATE SAMPLES = GOLD CREEK = DELATE CREEK = MINERAL CREEK = AREA 8															
ES1099	50	100	20 N	5 N	10 N	15	15	100 N	15	10 N	300	200	50 N	20	200 L
EG2783	150	700	20 N	5 L	20 L	50	10 L	100 N	30	10 N	200	300	50 N	30	200 N
ROCK SAMPLES = LEMAH CREEK = MIDDLE FORK SNOQUALMIE RIVER = CRAWFORD CREEK = AREA 9															
EG0655A	200	100	20 L	5 N	10 N	100	10	100 N	30	10 N	300	150	50 N	20	200 L
EG0657	300	150	20 L	5 N	10 N	100	10	100 N	20	10 N	500	150	50 N	20	200 L
EG0671	30	50	20 L	5 N	10 N	10	10	100 N	15	10 N	200	100	50 N	15	200
EG0672	150	50	20	5 N	10 N	70	15	100 N	20	10 N	100	150	50 N	30	200
EG0672A	200	30	70	10	10 L	30	10	100 N	30	50	100	150	50 N	30	200 N
EG0673	70	50	20 N	5 N	10 N	70	10 L	100 N	15	10 N	100 N	100	50 N	10 L	200 N
EG0674	100	100	20	5 N	10 N	70	15	100 N	15	10 N	150	150	50 N	20	200
EG0675	30	7	20 L	5 N	10 N	10	30	100 N	7	10 N	300	50	50 N	15	700

TABLE 18.—*Analytical results of anomalous samples from anomalous areas in the Alpine Lakes area and additions*—Continued

SAMPLE	S-ZR	AA-AU-P	AA-CU-P	AA-ZN-P	AA-AG-P	AA-CO-P	AA-NI-P	CM=CXHM	CM-SB	CM-MO	AS-PT	AS-PD	AS-RH	AS-RU	AS-IR	EU
STREAM-SEDIMENT SAMPLES = GOLD CREEK-DELATE CREEK-MINERAL CREEK = AREA 8																
EG2428	150	0.00 B	150	45	.0 B	0 B	0 B	8	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2430	150	0.00 B	590	80	.0 B	0 B	0 B	40	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2434	30	0.00 B	40	75	.0 B	0 B	0 B	20	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2464	70	0.00 B	0 B	0 B	.0 B	0 B	0 B	1	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2486	70	0.00 B	220	90	.0 B	0 B	0 B	30	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ES0164	150	0.00 B	120	350	.0 B	0 B	0 B	12	0.5	6	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ES0167	100	0.00 B	140	70	.0 B	0 B	0 B	2	0.5	6	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ES0168	150	0.00 B	160	95	.0 B	0 B	0 B	3	0.0 B	15	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ES0169	70	0.00 B	240	200	.0 B	0 B	0 B	10	0.0 B	8	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ES0170	150	0.00 B	230	220	.0 B	0 B	0 B	2	0.0 B	15	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ES0171	100	0.00 B	130	230	.0 B	0 B	0 B	6	0.0 B	10	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ES0172	100	0.00 B	220	95	.0 B	0 B	0 B	3	0.5	15	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ES0173	150	0.02 L	380	140	.0 B	0 B	0 B	20	2.0	10	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ES0174	150	0.02	95	270	.0 B	0 B	0 B	2	5.0	8	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ES0175	100	0.00 B	130	130	.0 B	0 B	0 B	6	1.0	15	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ES0176	100	0.00 B	70	110	.0 B	0 B	0 B	2	1.0	6	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ES0177	100	0.00 B	90	200	.0 B	0 B	0 B	5	3.0	6	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ES0178	150	0.02 N	55	110	.0 B	0 B	0 B	2	1.0	2	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ES0182	100	0.04 N	60	240	.0 B	0 B	0 B	12	8.0	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ES0183	150	0.00 B	50	190	.0 B	0 B	0 B	3	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ES0184	150	0.04 N	50	210	.0 B	0 B	0 B	3	20.0	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ES0186	150	0.00 B	85	190	.0 B	0 B	0 B	2	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ES0187	150	0.00 B	75	150	.0 B	0 B	0 B	3	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ES0190	70	0.00 B	140	20	.0 B	0 B	0 B	3	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ES0192	70	0.00 B	440	35	.0 B	0 B	0 B	18	0.0 B	60	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ES0193	150	0.00 B	55	30	.0 B	0 B	0 B	1 L	0.0 B	25	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ES0194	100	0.02 L	180	120	.0 B	0 B	0 B	3	6.0	8	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
PANNED-CONCENTRATE SAMPLES - GOLD CREEK - DELATE CREEK - MINERAL CREEK - AREA 8																
ES1099	100	0.10	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.010 N	.004 N	.004 N	.2 N	.20 N	0 B
EG2783	150	0.25	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ROCK SAMPLES - LEMAH CREEK - MIDDLE FORK SNOQUALMIE RIVER - CRAWFORD CREEK - AREA 9																
EG0655A	100	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG0657	100	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG0671	50	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG0672	150	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG0672A	150	0.02 N	10	0 B	.0 B	0 B	0 B	0 B	2.0	2	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG0673	100	0.02 N	55	0 B	.0 B	0 B	0 B	0 B	2.0	6	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG0674	150	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG0675	150	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B

TABLE 18.—*Analytical results of anomalous samples from anomalous areas in the Alpine Lakes area and additions*—Continued

SAMPLE	S-FE%	S-MG%	S-CA%	S-TI%	S-MN	S-AG	S-AS	S-AU	S-B	S-BA	S-BE	S-BI	S-CD	S-CU
STREAM-SEDIMENT SAMPLES =GOLD CREEK-DELATE CREEK-MINERAL CREEK = AREA 8														
EG0675A	3,00	1,00	3,00	,200	1500	2,0	200 N	10 N	20	700	1,0	10 N	20 N	15
EG0901	5,00	2,00	7,00	,500	700	0,5 N	200 N	10 N	10	700	1,0 L	10 N	20 N	20
EG1312A	10,00	3,00	5,00	,700	1000	0,5 N	200 N	10 N	10	100	1,0 N	10 N	20 N	70
EG1321	20,00	2,00	2,00	1,000 G	700	0,5 N	200 N	10 N	10	300	1,0 L	10 N	20 N	100
EG1321A	15,00	2,00	7,00	1,000 G	1500	0,5 N	200 N	10 N	10 L	200	1,0 N	10 N	20 N	70
EG1322	10,00	0,30	0,20	,200	5000 G	3,0	200 N	10 N	1000	500	1,0 L	10 N	20 N	5 N
EG1322A	5,00	0,30	0,20	,150	5000 G	30,0	200 N	10 N	200	500	1,0	10 N	20 N	7
EG1322B	20,00	1,00	0,30	,030	5000 G	70,0	300	10 N	10 L	20 L	1,0 L	70	20 N	20
EG1322C	5,00	2,00	2,00	,500	1500	0,7	200 N	10 N	100	500	1,0 L	10 N	20 N	10
EG1322D	20,00 G	0,70	0,10	,050	1500	300,0	300	10 N	15	20	1,0 L	300	70	200
EG1322E	20,00 G	0,10	0,05 L	,002	1000	70,0	200 N	10 N	10	20 L	1,0 N	20	500 G	100
EG1325	3,00	2,00	5,00	,500	700	0,7	200 N	10 N	10 L	700	1,0 L	10 N	20 N	10
EG1336	3,00	3,00	3,00	1,000	700	0,5 N	200 N	10 N	10 N	300	1,0 L	10 N	20 N	50
EG1339	5,00	2,00	5,00	1,000	500	0,5 N	200 N	10 N	10 N	500	1,0 L	10 N	20 N	15
EG1340	5,00	3,00	7,00	1,000	700	0,5 N	200 N	10 N	10 N	100	1,0 N	10 N	20 N	70
EG1340A	3,00	3,00	5,00	,700	700	0,5 N	200 N	10 N	10 N	70	1,0 N	10 N	20 N	30
EG1399	3,00	1,00	3,00	,200	3000	2,0	200 N	10 N	50	300	1,0	10 N	20 N	10
EG1400	2,00	2,00	2,00	,300	700	0,5 N	200 N	10 N	50	300	1,0 L	10 N	20 N	10
EG1400B	1,50	1,00	2,00	,200	300	0,5	200 N	10 N	20	300	1,0	10 N	20 N	15
EG1402	3,00	2,00	1,00	,500	300	0,5 N	200 N	10 N	10 L	200	1,0 L	10 N	20 N	15
EG1403	3,00	1,50	1,50	,300	300	0,7	200 N	10 N	20	200	1,0 L	10 N	20 N	10
EG1404	3,00	1,50	3,00	,300	500	0,5 N	200 N	10 N	10	300	1,0 L	10 N	20 N	10
EG2483	7,00	3,00	5,00	,300	700	0,5 N	200 N	10 N	10	500	1,0 N	10 N	20 N	10
EG2484	7,00	3,00	5,00	,300	700	0,5 N	200 N	10 N	15	300	1,0 N	10 N	20 N	10
ES0140	5,00	1,50	5,00	,500	700	0,5 N	200 N	10 N	15	700	1,0 L	10 N	20 N	15
ES1100	20,00	0,10	0,07	,005	1500	20,0	2000	10 N	10 N	20 L	1,0 L	10 N	150	15
ES1100A	20,00 G	0,15	0,10	,015	1500	30,0	7000	10 N	10 N	30	1,0 L	20	20 N	15
ES1100B	20,00	0,50	0,30	,100	5000 G	70,0	5000	10 N	10 N	20	1,0 L	100	200	20
STREAM-SEDIMENT SAMPLES - LEMAH CREEK - MIDDLE FORK SNOQUALMIE RIVER - CRAWFORD CREEK - AREA 9														
EG0479	3,00	1,00	2,00	,300	700	0,5 N	200 N	10 N	50	500	1,0	10 N	20 N	15
EG0485	5,00	1,50	2,00	,300	1500	1,5	300	10 N	100	500	1,0	10 N	20 N	15
EG0486	7,00	1,50	2,00	,500	1500	1,0	200	10 N	100	500	1,0	10 N	20 N	20
EG0487	5,00	1,00	2,00	,500	1000	0,5 N	200 N	10 N	30	300	1,0 L	10 N	20 N	15
EG0488	5,00	0,70	1,50	,300	500	0,5 N	200 N	10 N	10	200	1,0	10 N	20 N	10
EG0489	5,00	0,70	3,00	,500	1000	0,5 N	200 N	10 N	10 L	150	1,0 L	10 N	20 N	15
EG0497	3,00	1,00	2,00	,300	700	1,0	200 N	10 N	30	300	1,0	10 N	20 N	15
EG0498	3,00	2,00	3,00	,300	1000	1,5	200 N	10 N	30	500	1,0	10 N	20 N	15
EG0499	3,00	0,70	1,50	,150	700	1,0	200 N	10 N	20	300	1,0	10 N	20 N	10
EG0500	5,00	1,50	2,00	,300	700	0,5	200 N	10 N	50	700	1,0	10 N	20 N	15
EG0501	5,00	1,50	3,00	,200	700	0,5	200 N	10 N	20	500	1,0	10 N	20 N	20

TABLE 18.—*Analytical results of anomalous samples from anomalous areas in the Alpine Lakes area and additions*—Continued

SAMPLE	S-CR	S-CU	S-LA	S-MO	S-NB	S-NI	S-PB	S-SB	S-SC	S-SN	S-SR	S-V	S-W	S-Y	S-ZN
ROCK SAMPLES = LEMAH CREEK-MIDDLE FORK SNOQUALMIE RIVER-CRAWFORD CREEK = AREA 9															
EG0675A	50	30	20 N	5 N	10 N	15	70	100 N	15	10 N	150	70	50 N	100	300
EG0801	70	150	20 L	5	10 N	30	15	100 N	20	10 N	200	150	50 N	20	200 L
EG1312A	300	50	20 N	5 N	20 N	100	10 N	100 N	50	10 N	200	200	50 N	30	200
EG1321	50	100	30	5 N	20	30	10	100 N	70	10 N	100 L	300	50 N	100	300
EG1321A	70	70	20	5 N	20 L	30	10	100 N	50	10 N	150	200	50 N	70	200
EG1322	10 L	700	50	10	20 N	5	150	100 L	15	50	100 N	50	50 L	30	500
EG1322A	10 L	300	20	5 N	20 N	5	100	100	10	30	100 N	20	50 L	20	200
EG1322B	20	7000	20	5 N	20 N	10	10 N	100	5	10 N	100 N	20	70	20	700
EG1322C	70	50	20	5 N	20 N	30	20	100 N	20	10 N	300	150	50 N	20	200 L
EG1322D	10 L	10000	20 N	5 N	20 N	100	10	1500	5 L	10 N	100 N	10	50 L	10	10000 G
EG1322E	10 L	20000	20 N	5 N	20 N	50	10 L	200	5 N	10 N	100 N	10	50 N	10 L	10000 G
EG1325	70	50	20 N	5 N	20 N	30	10	100 N	15	10 N	1000	150	50 N	15	500
EG1336	300	70	20 N	5 N	20 N	70	10 N	100 N	50	10 N	500	200	50 N	30	200
EG1339	70	100	20	5 N	20 N	30	10 L	100 N	30	10 N	300	200	50 N	30	200 L
EG1340	300	70	20	5 N	20 N	100	10 N	100 N	30	10 N	500	300	50 N	30	200
EG1340A	200	300	20 L	5 N	20 N	100	10 N	100 N	30	10 N	300	150	50 N	15	200 N
EG1399	50	30	20 L	5 N	20 N	20	150	100 L	15	15	100	100	50 N	15	200
EG1400	500	20	20 N	5 N	20 N	150	50	100 N	15	10 N	100	100	50 N	10	200 N
EG1400B	50	7	20	5 N	20 N	20	10	100 N	7	10 N	300	70	50 N	10	200 N
EG1402	300	30	20 N	5 N	20 N	70	10	100 N	20	10 N	100	70	50 N	10	200
EG1403	100	15	20 L	5 N	20 N	30	20	100 N	15	10 N	200	100	50 N	15	200 N
EG1404	50	100	20 L	5 N	20 N	15	10	100 N	20	10 N	200	150	50 N	20	200 N
EG2483	50	100	20 L	5 N	20 L	15	10 L	100 N	15	10 N	200	150	50 N	15	200 N
EG2484	30	30	20 L	10	20 L	15	10	100 N	15	10 N	300	100	50 N	15	200 N
E80140	50	200	20 N	5 N	10 L	10	10 L	100 N	15	10 N	200	150	50 N	20	200 L
E81100	10 L	1500	20 N	5 N	20 N	30	150	200	5 N	10 N	100 N	10 L	50 N	10	10000 G
E81100A	10 L	2000	20 N	5 N	20 N	20	10 L	2000	5 L	10 N	100 N	10 L	50 N	10	1500
E81100B	20	2000	20 N	5 N	20 N	20	1500	300	5	10 N	100 N	20	50	10	10000 G
STREAM-SEDIMENT SAMPLES = LEMAH CREEK = MIDDLE FORK SNOQUALMIE RIVER = CRAWFORD CREEK = AREA 9															
EG0479	30	500	20 N	5 N	10 N	10	50	100 N	15	10 N	300	100	50 N	15	200 N
EG0485	50	100	20	5 L	10 N	20	100	100 N	15	15	300	100	50 N	15	300
EG0486	70	70	20	7	10 N	20	70	100 N	15	10	300	150	50 N	15	200
EG0487	30	30	20 N	10	10 N	15	30	100 N	15	10 N	200	100	50 N	15	200 N
EG0488	10 L	15	20 N	5	10 N	7	20	100 N	10	10 N	200	70	50 N	10	200 N
EG0489	10 L	7	20 N	5	10 N	7	15	100 N	7	10 N	200	70	50 N	10	200 N
EG0497	20	100	20 L	15	10 N	10	15	100 N	15	10 N	300	70	50 N	20	200 N
EG0498	50	70	20 L	5 L	10 N	15	50	100 N	20	10 N	200	150	50 N	20	200
EG0499	20	70	20 N	15	10 N	7	30	100 N	10	10 N	100	70	50 N	15	200 N
EG0500	50	150	20 L	15	10 N	10	30	100 N	15	10 N	150	150	50 N	20	200 L
EG0501	30	70	20 N	5 N	10 N	10	30	100 N	15	10 N	200	100	50 N	20	200 L

TABLE 18.—*Analytical results of anomalous samples from anomalous areas in the Alpine Lakes area and additions*—Continued

SAMPLE	S-ZR	AA-AU-P	AA-CU-P	AA-ZN-P	AA-AG-P	AA-CO-P	AA-NI-P	CM=CXHM	CM-SB	CM-MO	AS-PT	AS-PD	AS-RH	AS-RU	AS-IR	EU
ROCK SAMPLES = LEMAH CREEK-MIDDLE FORK SNOQUALMIE RIVER-CRAWFORD CREEK = AREA 9																
EG0675A	70	0,00 B	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG0801	100	0,00 B	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG1312A	70	0,05 N	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG1321	200	0,05 N	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG1321A	200	0,05 N	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG1322	150	0,05 N	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG1322A	150	0,05 N	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG1322B	70	0,15	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG1322C	100	0,05 N	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG1322D	10 L	1,00	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG1322E	10	0,05	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG1325	50	0,05 N	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG1336	100	0,00 B	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG1339	150	0,00 B	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG1340	100	0,00 B	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG1340A	70	0,05 N	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG1399	100	0,05 N	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG1400	70	0,00 B	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG1400B	100	0,05 N	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG1402	150	0,00 B	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG1403	150	0,05 N	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG1404	70	0,00 B	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG2483	50	0,00 B	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG2484	100	0,00 B	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
ES0140	100	0,00 B	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
ES1100	20	0,15	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
ES1100A	10	0,20	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
ES1100B	50	2,00	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
STREAM-SEDIMENT SAMPLES = LEMAH CREEK = MIDDLE FORK SNOQUALMIE RIVER = CRAWFORD CREEK = AREA 9																
EG0479	100	0,00 B	440	45	,0 B	0 B	0 B	50	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG0485	100	0,02 L	90	290	,0 B	0 B	0 B	20	8,0	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG0486	70	0,02 N	85	350	,0 B	0 B	0 B	14	10,0	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG0487	100	0,00 B	40	75	,0 B	0 B	0 B	5	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG0488	100	0,00 B	15	30	,0 B	0 B	0 B	3	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG0489	70	0,00 B	10	20	,0 B	0 B	0 B	2	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG0497	100	0,04 L	95	100	,0 B	0 B	0 B	16	0,5	25	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG0498	100	0,02 N	90	160	,0 B	0 B	0 B	5	1,0	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG0499	150	0,00 B	130	85	,0 B	0 B	0 B	8	2,0	15	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG0500	150	0,02 N	100	100	,0 B	0 B	0 B	5	1,0	15	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG0501	70	0,02 N	95	140	,0 B	0 B	0 B	10	0,5 L	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B

TABLE 18.—*Analytical results of anomalous samples from anomalous areas in the Alpine Lakes area and additions*—Continued

SAMPLE	S-FE%	S-MG%	S-CA%	S-TI%	S-MN	S-AG	S-AS	S-AU	S-B	S-BA	S-BE	S-BI	S-CD	S-CO
STREAM-SEDIMENT SAMPLES = LEMAH CREEK-MIDDLE FORK SNOQUALMIE RIVER-CRAWFORD CREEK = AREA 9														
EG0502	7.00	2.00	5.00	.500	1000	0.5 N	200 N	10 N	20	500	1.0 L	10 N	20 N	15
EG0503	5.00	0.70	1.50	.200	700	0.5 N	200 N	10 N	20	300	1.0	10 N	20 N	15
EG0504	5.00	1.50	3.00	.300	700	0.5 N	200 N	10 N	20	500	1.0	10 N	20 N	15
EG0505	1.50	0.50	0.70	.100	700	3.0	200 N	10 N	10 L	70	1.0	10 N	20 N	10
EG0507	2.00	0.70	1.00	.150	700	0.5 N	200 N	10 N	15	300	1.0 L	10 N	20 N	15
EG0637	3.00	2.00	1.50	.500	1000	0.5 N	200 N	10 N	50	300	1.5	10 N	20 N	20
EG0638	5.00	3.00	5.00	.700	1000	0.5 N	200 N	10 N	30	300	1.0	10 N	20 N	30
EG0646	3.00	1.50	1.00	.300	700	0.5 N	200 N	10 N	10	300	1.5	10 N	20 N	20
EG0823	3.00	1.00	2.00	.300	700	0.5 N	200 N	10 N	150	500	1.5	10 N	20 N	10
EG0825	3.00	1.50	2.00	.500	700	0.5 N	200 N	10 N	70	700	1.0	10 N	20 N	15
EG1272	3.00	1.50	2.00	.700	700	0.5 N	200 N	10 N	10 L	200	1.0	10 N	20 N	10
EG1324	3.00	1.50	2.00	.300	1500	1.0	500	10 N	100	300	1.0	10 N	20 N	20
EK0400	3.00	1.00	2.00	.500	700	0.7	200 N	10 N	10 L	300	1.0	10 N	20 N	15
ES0129	3.00	0.70	1.50	.200	700	0.5 N	200 N	10 N	50	300	1.0	10 N	20 N	15
ES0130	3.00	1.00	2.00	.300	700	0.5 N	200 N	10 N	50	300	1.0 L	10 N	20 N	5
ES0133	3.00	1.50	3.00	.300	700	0.5 N	200 N	10 N	20	300	1.0	10 N	20 N	15
ES0137	5.00	2.00	2.00	.500	1500	0.5 N	200 N	10 N	10	300	1.0	10 N	20 N	15
ES0138	3.00	1.00	1.50	.150	1000	1.5	200 N	10 N	200	500	1.0	10 N	20 N	15
ES0139	3.00	1.50	1.50	.150	1500	0.7	200 N	10 N	300	700	1.0 L	10 N	20 N	15
ES0141	5.00	1.50	2.00	.300	700	0.5 N	200 N	10 N	100	300	1.0 L	10 N	20 N	15
ES0142	3.00	2.00	3.00	.300	1000	0.5 N	200 N	10 N	10	300	1.0	10 N	20 N	15
ES0147	3.00	1.00	3.00	.300	700	0.5 N	200 N	10 N	10	300	1.0	10 N	20 N	15
ES0148	10.00	1.00	2.00	.700	700	0.5 N	200 N	10 N	10	300	1.0	10 N	20 N	15
ES0149	3.00	1.00	1.50	.300	700	0.5	200 N	10 N	10 L	300	1.0	10 N	20 N	15
ES0151	3.00	1.50	1.50	.700	700	0.5 N	200 N	10 N	10 L	300	1.0	10 N	20 N	15
ES0200	7.00	2.00	3.00	.700	700	0.7	200 N	10 N	10	300	1.0 L	10 N	20 N	30
ES0314	1.50	0.50	0.50	.100	500	0.5 N	200 N	10 N	150	300	1.0	10 N	20 N	10
ET0341	3.00	1.50	2.00	.500	700	0.5	200 N	10 N	10 L	300	1.0	10 N	20 N	15
PANNED-CONCENTRATE SAMPLE - LEMAH CREEK - MIDDLE FORK SNOQUALMIE RIVER - CRAWFORD CREEK - AREA 9														
EG1428	7.00	1.50	3.00	.500	700	0.5 N	200 N	10 N	100	300	1.0 L	10 N	20 N	15
ROCK SAMPLE - BURNTBOOT CREEK - AREA 10														
EG2467	3.00	1.50	1.50	.150	700	0.5 L	200 N	10 N	10	150	1.0 L	10 N	20 N	7
STREAM-SEDIMENT SAMPLES - BURNTBOOT CREEK - AREA 10														
EG2465	7.00	2.00	1.50	.500	500	0.5 N	200 N	10 N	10	150	1.0	10 N	20 N	15
EP2278	10.00	3.00	3.00	.700	700	0.5 N	200 N	10 N	20	150	1.0	10 N	20 N	15
EP2279	7.00	3.00	3.00	.700	1500	0.5 L	200 N	10 N	30	150	1.0 L	10 N	20 N	20
EP2280	3.00	1.00	5.00	.500	700	0.5 L	200 N	10 N	70	150	1.0 L	10 N	20 N	7
EP2283	3.00	1.50	3.00	.500	1500	1.0	200 N	10 N	30	150	1.5	10 N	20 N	10

TABLE 18.—*Analytical results of anomalous samples from anomalous areas in the Alpine Lakes area and additions*—Continued

SAMPLE	S-CR	S-CU	S-LA	S-MO	S-NB	S-NI	S-PB	S-SB	S-SC	S-SN	S-SR	S-V	S-W	S-Y	S-ZN
STREAM-SEDIMENT SAMPLES = LEMAH CREEK-MIDDLE FORK SNOQUALMIE RIVER-CRAWFORD CREEK = AREA 9															
EG0502	50	70	20	5 N	10 N	10	50	100 N	20	10 N	300	150	50 N	30	200 L
EG0503	50	50	20 N	5 N	10 N	5	30	100 N	15	10 N	100	150	50 N	20	200 N
EG0504	50	70	20 N	5 N	10 N	15	50	100 N	15	10 N	200	100	50 N	20	200 L
EG0505	20	70	20 L	5 N	10 N	5 L	20	100 N	5	10 N	100 N	20	50 N	10	200 N
EG0507	20	50	20 N	5 N	10 N	7	30	100 N	10	10 N	100 L	70	50 N	10	200 N
EG0637	70	150	20	5 N	10 N	50	30	100 N	15	10 N	200	150	50 N	30	200 N
EG0638	200	100	20 L	5 N	10 N	100	30	100 N	20	10 N	300	150	50 N	30	200 N
EG0646	70	100	20 N	5 N	10 N	50	50	100 N	15	10 N	100	100	50 N	15	200 N
EG0823	30	70	20 N	5 L	10 N	15	30	100 N	15	10 N	200	70	50 N	20	200 N
EG0825	70	70	20	5 N	10 N	20	50	100 N	10	10 N	300	100	50 N	15	200 N
EG1272	30	15	20 L	5 N	10 N	20	150	100 N	15	10 N	300	100	50 N	10	200 N
EG1324	70	70	20	5 N	10 N	50	150	100 N	20	10	300	150	50 N	20	200
EK0400	30	70	20 N	5 N	10 N	15	70	100 N	10	10 N	300	100	50 N	15	200 N
ES0129	30	300	20 N	5 N	10 N	7	30	100 N	15	10 N	200	100	50 N	15	200 N
ES0130	20	15	20 N	5	10 N	10	20	100 N	15	10 N	300	100	50 N	15	200 N
ES0133	30	50	20 N	10	10 N	15	15	100 N	15	10 N	200	100	50 N	20	200 N
ES0137	30	50	20 N	5	10 N	7	20	100 N	20	10 N	300	100	50 N	20	200 N
ES0138	20	300	20 N	20	10 N	10	150	100 N	10	10 N	150	70	50 N	15	200 L
ES0139	20	200	20 N	5 N	10 N	10	50	100 N	15	10 N	150	70	50 N	15	200 L
ES0141	30	100	20 L	15	10 N	15	20	100 N	15	10 N	150	150	50 N	30	200 N
ES0142	20	30	20 N	5	10 N	10	20	100 N	15	10 N	300	70	50 N	15	200 N
ES0147	30	100	20 N	15	10 N	15	20	100 N	15	10 N	200	100	50 N	15	200 N
ES0148	30	150	20 N	15	10 N	15	20	100 N	15	10 N	200	150	50 N	15	200 N
ES0149	20	200	20 N	10	10 N	10	15	100 N	15	10 N	300	70	50 N	15	200 N
ES0151	30	50	20 N	5	10 N	15	10	100 N	15	10 N	300	100	50 N	10	200 N
ES0200	150	70	20	5 N	15	70	30	100 N	20	10 N	200	150	50 N	30	200 N
ES0314	20	70	20 N	5 N	10 N	7	50	100 N	7	10 N	100 N	70	50 N	15	200 N
ET0341	30	70	20	5 L	10 N	15	70	100 N	15	10 N	500	100	50 N	15	200 N
PANNED-CONCENTRATE SAMPLE = LEMAH CREEK = MIDDLE FORK SNOQUALMIE RIVER = CRAWFORD CREEK = AREA 9															
EG1428	150	50	20 N	5 L	10 N	30	10	100 N	20	10 N	300	200	50	20	200 L
ROCK SAMPLE = BURNTBOOT CREEK = AREA 10															
EG2467	10	15	20 L	5 N	20 L	5	100	100 N	10	10 N	100	50	50 N	10	200 L
STREAM-SEDIMENT SAMPLES = BURNTBOOT CREEK = AREA 10															
EG2465	70	100	20 L	5 N	20 L	70	30	100 N	15	10 N	150	150	50 N	15	200 N
EP2275	150	100	20 L	5 L	20 L	70	30	100 N	20	10 N	300	200	50 N	20	200 N
EP2279	100	70	20 N	5 L	20 L	70	50	100 N	20	10 N	200	150	50 N	20	200 N
EP2280	30	20	20 N	5 N	20 L	15	50	100 N	15	10 N	200	70	50 N	15	200 N
EP2283	30	30	20	5 N	20 L	20	70	100 N	15	10 N	200	100	50 N	30	200 L

TABLE 18.—*Analytical results of anomalous samples from anomalous areas in the Alpine Lakes area and additions*—Continued

SAMPLE	S-ZR	AA-AU-P	AA-CU-P	AA-ZN-P	AA-AG-P	AA-CO-P	AA-NI-P	CM=CXHM	CM-SB	CM-MO	AS-PT	AS-PD	AS-RH	AS-RU	AS-IR	EU
STREAM-SEDIMENT SAMPLES = LEMAH CREEK-MIDDLE FORK SNOQUALMIE RIVER-CRAWFORD CREEK = AREA 9																
EG0502	200	0,00 B	50	130	,0 B	0 B	0 B	6	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG0503	200	0,00 B	65	120	,0 B	0 B	0 B	12	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG0504	100	0,00 B	45	110	,0 B	0 B	0 B	5	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG0505	70	0,04 N	140	60	,0 B	0 B	0 B	16	0,5 L	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG0507	70	0,00 B	45	100	,0 B	0 B	0 B	14	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG0637	150	0,00 B	95	85	,0 B	0 B	0 B	2	1,0	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG0638	150	0,00 B	95	70	,0 B	0 B	0 B	2	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG0646	70	0,00 B	190	130	,0 B	0 B	0 B	5	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG0823	150	0,00 B	120	50	,0 B	0 B	0 B	3	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG0825	70	0,00 B	50	55	,0 B	0 B	0 B	2	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG1272	100	0,05 N	15	25	,0 B	0 B	0 B	2	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG1324	100	0,05 N	85	250	,0 B	0 B	0 B	12	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EK0400	100	0,02 N	100	150	,0 B	0 B	0 B	3	0,5	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
ES0129	150	0,00 B	460	50	,0 B	0 B	0 B	35	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
ES0130	200	0,00 B	20	40	,0 B	0 B	0 B	2	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
ES0133	100	0,00 B	45	35	,0 B	0 B	0 B	1 L	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
ES0137	150	0,00 B	35	60	,0 B	0 B	0 B	2	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
ES0138	100	0,00 B	340	190	,0 B	0 B	0 B	25	3,0	25	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
ES0139	30	0,02 N	190	140	,0 B	0 B	0 B	30	3,0	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
ES0141	200	0,00 B	90	55	,0 B	0 B	0 B	16	0,0 B	8	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
ES0142	100	0,00 B	15	20	,0 B	0 B	0 B	1	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
ES0147	150	0,00 B	120	50	,0 B	0 B	0 B	6	0,0 B	15	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
ES0148	150	0,00 B	140	40	,0 B	0 B	0 B	6	0,0 B	20	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
ES0149	70	0,02 N	280	30	,0 B	0 B	0 B	25	0,5	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
ES0151	150	0,00 B	50	25	,0 B	0 B	0 B	2	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
ES0200	150	0,02 N	80	120	,0 B	0 B	0 B	1	0,5	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
ES0314	100	0,00 B	160	130	,0 B	0 B	0 B	6	15,0	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
ET0341	100	0,02 N	110	30	,0 B	0 B	0 B	8	0,5 L	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
PANNED-CONCENTRATE SAMPLE - LEMAH CREEK - MIDDLE FORK SNOQUALMIE RIVER - CRAWFORD CREEK - AREA 9																
EG1428	150	0,05 N	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,005 N	,002 N	,002 N	,1 N	,10 N	0 B
ROCK SAMPLE - BURNTBOOT CREEK - AREA 10																
EG2467	100	0,00 B	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
STREAM-SEDIMENT SAMPLES - BURNTBOOT CREEK - AREA 10																
EG2465	70	0,00 B	180	100	,0 B	0 B	0 B	4	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EP2275	70	0,00 B	0 B	0 B	,0 B	0 B	0 B	1	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EP2279	150	0,00 B	0 B	0 B	,0 B	0 B	0 B	1 L	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
Ep2280	70	0,00 B	0 B	0 B	,0 B	0 B	0 B	1	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EP2283	100	0,00 B	40	85	,0 B	0 B	0 B	4	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B

TABLE 18.—*Analytical results of anomalous samples from anomalous areas in the Alpine Lakes area and additions*—Continued

SAMPLE	S-FE%	S-MG%	S-CA%	S-TI%	S-MN	S-AG	S-AS	S-AU	S-B	S-BA	S-BE	S-BI	S-CD	S-CU
STREAM-SEDIMENT SAMPLE = BURNTBOOT CREEK = AREA 10														
EP2286	7.00	2.00	2.00	.300	700	0.5 N	200 N	10 N	20	200	1.0	10 N	20 N	15
ROCK SAMPLES = LAKE LILLIAN = AREA 11														
EG2446	15.00	3.00	3.00	1.000	700	0.5 N	200 N	10 N	10 N	500	1.0 L	10 N	20 N	20
EG2449	7.00	1.50	5.00	1.000	700	0.5 N	200 N	10 N	10 L	20	1.5	10 N	20 N	10
EP2251	7.00	3.00	3.00	.300	700	0.5 N	200 N	10 N	10 L	100	1.0 N	10 N	20 N	10
STREAM-SEDIMENT SAMPLES = LAKE LILLIAN = AREA 11														
EG2445	10.00	3.00	5.00	1.000	1000	0.5 N	200 N	10 N	10 L	150	1.0 L	10 N	20 N	15
EP2249	7.00	2.00	3.00	.700	1000	0.5 N	200 N	10 N	30	200	1.0 L	10 N	20 N	15
EP2257	3.00	1.00	3.00	.300	1500	0.5 N	200 N	10 N	70	150	1.0	10 N	20 N	7
ROCK SAMPLES = RED MOUNTAIN = AREA 12														
EG2458A	10.00	3.00	5.00	.500	500	0.5 N	200 N	10 N	10 L	150	1.0 L	10 N	20 N	20
EG2542	7.00	1.50	0.15	.500	500	0.5 N	200 N	10 N	70	700	1.5	10 N	20 N	10
EP2261	2.00	1.00	1.50	.200	150	0.5 N	200 N	10 N	30	200	1.5	10 N	20 N	30
STREAM-SEDIMENT SAMPLES = RED MOUNTAIN = AREA 12														
EG2459	5.00	1.50	0.15	.150	200	0.5 N	200 N	10 N	15	200	1.5	10 N	20 N	7
EP2262	5.00	1.50	3.00	.200	200	0.5 N	200 N	10 N	30	150	1.0	10 N	20 N	5
EP2263	3.00	1.00	1.50	.300	200	0.5 N	200 N	10 N	30	150	1.0	10 N	20 N	7
EP2264	3.00	1.00	1.50	.300	200	0.5 N	200 N	10 N	10	150	1.0 L	10 N	20 N	5 L
EP2265	5.00	1.50	2.00	.300	300	0.5 N	200 N	10 N	70	300	1.0	10 N	20 N	10
EP2267	3.00	1.00	2.00	.300	300	0.5 N	200 N	10 N	50	300	1.0	10 N	20 N	7
EP2269	3.00	1.50	2.00	.300	1500	0.5 N	200 N	10 N	300	300	1.5	10 N	20 N	15
ROCK SAMPLE = THUNDER CREEK = AREA 13														
EG2574	5.00	1.00	1.00	.200	300	0.5 N	200 N	10 N	10 L	100	1.0 N	10 N	20 N	5 L
STREAM-SEDIMENT SAMPLES = THUNDER CREEK = AREA 13														
EG2472	3.00	1.50	3.00	.500	1500	0.7	200 N	10 N	30	300	1.0	10 N	20 N	10
EG2473	5.00	2.00	2.00	.500	1000	0.5 N	200 N	10 N	20	500	1.0	10 N	20 N	15
EG2474	3.00	2.00	3.00	.700	700	0.5 L	200 N	10 N	15	300	1.0	10 N	20 N	10
EG2475	5.00	2.00	2.00	.500	1500	1.0	200 N	10 N	30	500	1.0 L	10 N	20 N	15
EP2290	3.00	1.50	3.00	.300	1500	1.5	200 N	10 N	20	300	1.0 L	10 N	20 N	10
EP2317	1.50	0.70	2.00	.300	500	0.5 L	200 N	10 N	10 L	150	1.0 L	10 N	20 N	5 L
EP2319	3.00	0.70	1.50	.300	1500	0.5 L	200 N	10 N	70	300	1.5	10 N	20 N	7
EP2320	1.50	0.50	7.00	.150	1000	0.7	200 N	10 N	50	150	1.5	10 N	20 N	5 L

TABLE 18.—*Analytical results of anomalous samples from anomalous areas in the Alpine Lakes area and additions*—Continued

SAMPLE	S-CR	S-CU	S-LA	S-MO	S-NB	S-NI	S-PB	S-SB	S-SC	S-SN	S-SR	S-V	S-W	S-Y	S-ZN
STREAM-SEDIMENT SAMPLE = BURNTBOOT CREEK = AREA 10															
EP2286	30	150	20 L	7	20 L	30	20	100 N	15	10 N	200	100	50 N	15	200 N
ROCK SAMPLES - LAKE LILLIAN - AREA 11															
EG2446	70	50	30	5	20 L	50	10 N	100 N	20	10 N	150	150	50 N	50	200 N
EG2449	50	300	30	15	20 L	30	30	100 N	15	10 N	150	150	50 N	30	200 N
EP2251	30	70	20 N	5	20 L	15	10 N	100 N	20	10 N	100	150	50 N	15	200 N
STREAM-SEDIMENT SAMPLES - LAKE LILLIAN - AREA 11															
EG2445	15	30	20 L	5 L	20 L	15	30	100 N	15	10 N	300	150	50 N	15	200 N
EP2249	70	50	20 N	5 N	20 L	20	70	100 N	20	10 N	300	150	50 N	20	200 N
EP2257	20	30	20 L	5 N	20 L	10	200	100 N	15	10 N	300	70	50 N	30	200 N
ROCK SAMPLES - RED MOUNTAIN - AREA 12															
EG2458A	70	150	20 L	5 L	20 L	20	10 N	100 N	20	10 N	150	150	50 N	15	200 N
EG2542	70	100	20	5 L	20 L	50	10 N	100 N	20	10 N	100 L	200	50 N	20	200 N
EP2261	30	100	20	5 N	20 L	15	10 N	100 N	10	10 N	150	50	50 N	15	200 N
STREAM-SEDIMENT SAMPLES - RED MOUNTAIN - AREA 12															
EG2459	30	1500	20 L	5 L	20 L	70	15	100 N	7	10 N	100 L	70	50 N	10 L	200 N
EP2262	15	150	30	5 L	20 L	10	10 N	100 N	7	10 N	200	70	50 N	10	200 N
EP2263	15	300	20 L	5	20 L	7	10	100 N	10	10 N	300	70	50 N	10 L	200 N
EP2264	10	50	20 L	5	20 L	5 L	10 L	100 N	5	10 N	150	50	50 N	10 L	200 N
EP2266	20	500	30	7	20 L	15	15	100 N	15	10 N	300	100	50 N	15	200 N
EP2267	20	200	20 N	5 L	20 L	15	10 N	100 N	10	10 N	300	70	50 N	10	200 N
EP2269	70	70	20	5 N	20 L	30	30	100 N	15	10 N	200	100	50 N	30	200
ROCK SAMPLE - THUNDER CREEK - AREA 13															
EG2574	30	30	20	5 N	20 N	15	10 N	100 N	15	10 N	150	70	70	15	200 N
STREAM-SEDIMENT SAMPLES - THUNDER CREEK - AREA 13															
EG2472	50	100	20 L	5 L	20 L	15	15	100 N	15	10 N	300	100	50 N	15	200 N
EG2473	70	100	20 L	5 L	20 L	20	15	100 N	20	10 N	150	100	50 N	20	200 N
EG2474	30	70	20 L	15	20 L	10	15	100 N	20	10 N	300	100	50 N	15	200 N
EG2475	50	70	30	5 N	20 L	15	70	100 N	15	10 N	150	100	50 N	30	200 L
EP2290	20	70	20 N	5 L	20 L	10	100	100 N	15	10 N	150	100	50 N	15	200
EP2317	20	15	20 L	100	20 L	5 L	10 L	100 N	7	10 N	150	50	50 N	10	200 N
EP2319	30	70	20 L	5 N	20 L	15	30	100 N	10	10 N	150	70	50 N	30	200
EP2320	15	10	30	5 L	20 L	7	30	100 N	7	10 N	300	50	50 N	30	200 N

TABLE 18.—*Analytical results of anomalous samples from anomalous areas in the Alpine Lakes area and additions*—Continued

SAMPLE	S-ZR	AA-AU-P	AA-CU-P	AA-ZN-P	AA-AG-P	AA-CO-P	AA-NI-P	CM=CXHM	CM-SB	CM-MO	AS-PT	AS-PD	AS-RH	AS-RU	AS-IR	EU
STREAM-SEDIMENT SAMPLE = BURNTBOOT CREEK = AREA 10																
EP2286	70	0.00 B	180	70	.0 B	0 B	0 B	6	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ROCK SAMPLES - LAKE LILLIAN - AREA 11																
EG2446	200	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2449	200	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2251	100	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
STREAM-SEDIMENT SAMPLES - LAKE LILLIAN - AREA 11																
EG2445	500	0.00 B	10	45	.0 B	0 B	0 B	10	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2249	150	0.00 B	0 B	0 B	.0 B	0 B	0 B	1 L	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2257	70	0.00 B	25	35	.0 B	0 B	0 B	4	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ROCK SAMPLES - RED MOUNTAIN - AREA 12																
EG2458A	150	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2542	100	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2261	150	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
STREAM-SEDIMENT SAMPLES - RED MOUNTAIN - AREA 12																
EG2459	50	0.00 B	1700	120	.0 B	0 B	0 B	300	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2262	100	0.00 B	220	25	.0 B	0 B	0 B	10	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2263	70	0.00 B	450	20	.0 B	0 B	0 B	14	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2264	100	0.00 B	0 B	0 B	.0 B	0 B	0 B	1	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2265	70	0.00 B	440	25	.0 B	0 B	0 B	10	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2267	70	0.00 B	220	25	.0 B	0 B	0 B	6	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2269	150	0.00 B	50	140	.0 B	0 B	0 B	4	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ROCK SAMPLE - THUNDER CREEK - AREA 13																
EG2574	30	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
STREAM-SEDIMENT SAMPLES - THUNDER CREEK - AREA 13																
EG2472	200	0.00 B	0 B	0 B	.0 B	0 B	0 B	1	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2473	300	0.00 B	0 B	0 B	.0 B	0 B	0 B	2	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2474	150	0.00 B	0 B	0 B	.0 B	0 B	0 B	1 N	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2475	300	0.00 B	35	100	.0 B	0 B	0 B	12	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2290	70	0.00 B	40	170	.0 B	0 B	0 B	16	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2317	300	0.00 B	0 B	0 B	.0 B	0 B	0 B	1 N	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2319	50	0.00 B	70	180	.0 B	0 B	0 B	14	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2320	30	0.00 B	0 B	0 B	.0 B	0 B	0 B	1 N	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B

TABLE 18.—*Analytical results of anomalous samples from anomalous areas in the Alpine Lakes area and additions*—Continued

SAMPLE	S-FE%	S-MG%	S-CA%	S-TI%	S-MN	S-AG	S-AS	S-AU	S-B	S-BA	S-BE	S-BI	S-CD	S-CO
ROCK SAMPLES - MELAWKWA PASS - AREA 14														
EG2543	3.00	1.50	0.70	.150	1000	0.5 L	200 N	10 N	10 L	300	1.0 N	10 N	20 N	7
EG2545	5.00	3.00	10.00	.300	1500	0.5 L	200 N	10 N	10	1500	1.0 N	10 N	20 N	7
EG2545A	10.00	2.00	10.00	.700	2000	0.5 N	200 N	10 N	10 L	70	1.0 N	10 N	20 N	20
EG2547	2.00	0.50	0.07	.200	150	0.5 N	200 N	10 N	15	200	1.0 N	10 N	20 N	7
EG2550	10.00	1.50	3.00	.700	2000	0.5 N	200 N	10 N	10 L	300	1.0	10	20 N	15
EP2417	3.00	2.00	1.00	.300	700	0.5 N	200 N	10 N	10 L	500	1.0 L	10 N	20 N	10
EP2480	10.00	2.00	7.00	.300	5000	0.5 N	200 N	10 N	10 L	100	3.0	10 N	20 N	15
STREAM-SEDIMENT SAMPLES - MELAWKWA PASS - AREA 14														
EP2303	5.00	2.00	3.00	.500	1500	1.0	200 N	10 N	50	300	1.5	10 N	20 N	15
EP2304	5.00	1.50	2.00	.500	700	0.5 N	200 N	10 N	10 L	200	1.0 L	10 N	20 N	10
EP2309	7.00	1.50	2.00	.500	700	0.5 N	200 N	10 N	10	200	1.0	10 N	20 N	10
EP2310	5.00	2.00	3.00	.700	1000	0.5	200 N	10 N	20	150	1.0 L	10 N	20 N	10
EP2311	3.00	1.50	2.00	.300	1000	0.5 L	200 N	10 N	30	200	1.0	10 N	20 N	7
EP2413A	5.00	1.50	1.00	.300	700	0.5 N	200 N	10 N	10	200	1.0 L	10 N	20 N	15
EP2414	3.00	1.00	1.50	.300	1500	0.7	200 N	10 N	50	150	1.5	10 N	20 N	50
EP2419	2.00	0.70	1.50	.150	1000	0.5 L	200 N	10 N	20	150	1.0 L	10 N	20 N	15
EP2420	3.00	2.00	3.00	.500	700	0.7	200 N	10 N	20	300	1.0	10 N	20 N	15
EP2483	7.00	2.00	1.00	.500	1000	0.5 N	200 N	10 N	10	500	1.0	10 N	20 N	15
ROCK SAMPLE - TUSCOHATCHIE LAKE - AREA 15														
ES2002	5.00	2.00	3.00	.300	500	0.5 N	200 N	10 N	10	500	1.0 L	10 N	20 N	10
STREAM-SEDIMENT SAMPLES - TUSCOHATCHIE LAKE - AREA 15														
EG2496	7.00	2.00	3.00	.700	1000	0.5 N	200 N	10 N	10	200	1.0	10 N	20 N	15
EG2497	5.00	1.50	3.00	.300	1000	0.5	200 N	10 N	30	200	1.0	10 N	20 N	15
EG2498	5.00	2.00	3.00	.300	1500	0.5 N	200 N	10 N	10 L	300	1.0	10 N	20 N	15
EP2384	2.00	0.70	1.00	.200	1500	0.5 L	200 N	10 N	50	150	1.5	10 N	20 N	15
EP2387	3.00	0.70	5.00	.200	500	0.5 N	200 N	10 N	20	200	1.0	10 N	20 N	7
EP2388	3.00	1.50	3.00	.500	500	0.5 N	200 N	10 N	30	200	1.0	10 N	20 N	7
ES2004	7.00	2.00	2.00	.700	700	0.5 N	200 N	10 N	10 L	150	1.0 L	10 N	20 N	15
ES2008	7.00	2.00	3.00	.500	700	0.5 N	200 N	10 N	10 L	300	1.0	10 N	20 N	15
ES2009	5.00	2.00	3.00	.500	500	0.5 N	200 N	10 N	10 L	150	1.0 L	10 N	20 N	10
ES2011	5.00	1.50	2.00	.200	5000 G	0.5 N	200 N	10 N	20	200	1.5	10 N	20 N	70
STREAM-SEDIMENT SAMPLES - TALAPUS LAKE - AREA 16														
ES2022	10.00	3.00	2.00	1.000	1000	0.5 N	200 N	10 N	10 L	200	1.0 L	10 N	20 N	15
ES2023	7.00	2.00	1.00	.300	1500	1.5	200 N	10 N	10 L	200	1.0	10 N	20 N	30
ES2024	5.00	2.00	3.00	.500	700	0.5 N	200 N	10 N	10 L	150	1.0	10 N	20 N	10
ES2026	3.00	0.70	2.00	.200	1500	0.5 N	200 N	10 N	10 L	150	1.0 L	10 N	20 N	10

TABLE 18.—*Analytical results of anomalous samples from anomalous areas in the Alpine Lakes area and additions*—Continued

SAMPLE	S-CR	S-CU	S-LA	S-MO	S-NB	S-NI	S-PB	S-SB	S-SC	S-SN	S-SR	S-V	S-W	S-Y	S-ZN
ROCK SAMPLES - MELAWKWA PASS - AREA 14															
EG2543	20	100	20 L	7	20 L	30	10 N	100 N	7	10 N	100 L	70	50 N	15	500
EG2545	100	30	20 N	5 N	20 L	30	70	100 N	20	10 N	200	100	50 N	15	200 N
EG2545A	150	20	20 L	5 L	20 L	70	50	100 N	20	10 N	300	150	50 N	20	200
EG2547	30	7	20 L	10	20 N	30	10 N	100 N	7	10 N	100 L	70	50 N	10	200 N
EG2550	20	50	20 L	5 N	20 L	15	50	100 N	20	10 N	300	70	50 N	30	300
EP2417	50	100	20	5 L	20 N	50	30	100 N	15	10 N	100	100	50 N	20	200 N
EP2480	70	70	20	7	20 N	50	50	100 N	15	10 N	100	100	50 N	20	700
STREAM-SEDIMENT SAMPLES - MELAWKWA PASS - AREA 14															
EP2303	150	100	20 N	5 L	20 L	30	150	100 N	15	10 N	200	100	50 N	30	500
EP2304	50	150	20 L	5 N	20 L	20	70	100 N	10	10 N	150	100	50 N	20	200 N
EP2309	30	20	20 L	7	20 L	15	150	100 N	10	30	300	70	50 N	10	200 N
EP2310	15	50	20 N	5 L	20 L	15	20	100 N	15	10 N	500	100	50 N	10	200 N
EP2311	20	30	20 N	5 N	20 L	15	300	100 N	10	10 N	300	70	50 N	15	200 N
EP2413A	30	100	20 L	5 N	20 L	30	30	100 N	10	10 N	150	70	50 N	15	200 N
EP2414	30	100	20 N	5 L	20 N	30	300	100 N	15	10	200	100	50 N	20	200 N
EP2419	15	30	20 N	5 N	20 N	15	150	100 N	7	10 N	100	70	50 N	10	200 N
EP2420	50	100	20 N	5 N	20 N	50	200	100 N	15	10 N	150	100	50 N	30	300
EP2483	100	100	20	5 N	20 N	50	70	100 N	15	10 N	150	150	50 N	15	200 L
ROCK SAMPLE - TUSCOHATCHIE LAKE - AREA 15															
ES2002	30	5	20 L	50	20 L	20	10 N	100 N	15	10 N	300	70	50 N	15	200 N
STREAM-SEDIMENT SAMPLES - TUSCOHATCHIE LAKE - AREA 15															
EG2496	30	30	20 L	7	20 L	15	50	100 N	15	10 N	300	100	50 N	15	200 N
EG2497	50	20	20 N	5 L	20 L	15	30	100 N	15	10 N	300	100	50 N	15	200 N
EG2498	30	20	20 L	7	20 L	10	15	100 N	15	10 N	300	100	50 N	15	200 N
EP2384	30	30	20 N	5 L	20 L	10	70	100 N	7	10 N	200	70	50 N	15	200 N
EP2387	15	20	20 N	7	20 L	7	70	100 N	7	10 N	200	70	50 N	15	200 N
EP2388	30	30	20 N	5	20 L	15	30	100 N	15	10 N	200	100	50 N	15	200 N
ES2004	20	15	20 L	7	20 L	20	30	100 N	15	10 N	300	70	50 N	10	200 N
ES2008	30	20	20 L	5 L	20 L	20	50	100 N	15	10 N	300	100	50 N	15	200 N
ES2009	30	20	20 L	10	20 L	15	20	100 N	15	10 N	300	70	50 N	10	200 N
ES2011	30	50	20 N	5 L	20 N	20	300	100 N	15	150	200	100	50 N	15	200 N
STREAM-SEDIMENT SAMPLES - TALAPUS LAKE - AREA 16															
ES2022	30	20	20 L	5	20 L	30	10	100 N	15	10 N	300	150	50 N	15	200 N
ES2023	20	150	20 L	7	20 L	20	30	100 N	15	10 L	300	70	50 N	15	200 N
ES2024	20	20	20 L	15	20 L	20	10	100 N	15	10 N	300	70	50 N	20	200 N
ES2026	20	15	20 L	5	20 L	10	30	100 N	7	10 N	100	70	50 N	10	200 N

TABLE 18.—*Analytical results of anomalous samples from anomalous areas in the Alpine Lakes area and additions*—Continued

SAMPLE	S-ZR	AA-AU-P	AA-CU-P	AA-ZN-P	AA-AG-P	AA-CO-P	AA-NI-P	CM=CXHM	CM-SB	CM-MO	AS-PT	AS-PD	AS-RH	AS-RU	AS-IR	EU
ROCK SAMPLES - MELAWKWA PASS - AREA 14																
EG2543	70	0.05 N	0 B	370	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2545	50	0.05 N	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2545A	70	0.05 L	0 B	190	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2547	50	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2550	200	0.05 L	0 B	260	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2417	100	0.05 N	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2480	70	0.00 B	0 B	440	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
STREAM-SEDIMENT SAMPLES - MELAWKWA PASS - AREA 14																
EP2303	100	0.00 B	0 B	0 B	.0 B	0 B	0 B	1	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2304	100	0.00 B	170	55	.0 B	0 B	0 B	12	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2309	70	0.00 B	35	35	.0 B	0 B	0 B	10	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2310	150	0.00 B	0 B	0 B	.0 B	0 B	0 B	1 L	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2311	100	0.00 B	0 B	0 B	.0 B	0 B	0 B	2	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2413A	70	0.05 N	130	150	.0 B	0 B	0 B	4	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2414	70	0.55	80	65	.0 B	0 B	0 B	6	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2419	30	0.20 N	0 B	0 B	.0 B	0 B	0 B	1 L	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2420	70	0.10 N	0 B	0 B	.0 B	0 B	0 B	1 L	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2483	100	0.00 B	0 B	0 B	.0 B	0 B	0 B	1	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ROCK SAMPLE - TUSCOHATCHIE LAKE - AREA 15																
ES2002	150	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
STREAM-SEDIMENT SAMPLES - TUSCOHATCHIE LAKE - AREA 15																
EG2496	300	0.00 B	35	65	.0 B	0 B	0 B	4	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2497	300	0.00 B	0 B	0 B	.0 B	0 B	0 B	2	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2498	150	0.00 B	0 B	0 B	.0 B	0 B	0 B	2	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2384	70	0.00 B	0 B	0 B	.0 B	0 B	0 B	1	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2387	150	0.00 B	0 B	0 B	.0 B	0 B	0 B	1 L	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2388	150	0.00 B	0 B	0 B	.0 B	0 B	0 B	1 L	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ES2004	150	0.00 B	0 B	0 B	.0 B	0 B	0 B	1 N	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ES2008	100	0.00 B	0 B	0 B	.0 B	0 B	0 B	1 L	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ES2009	200	0.00 B	0 B	0 B	.0 B	0 B	0 B	1 N	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ES2011	70	0.00 B	35	110	.0 B	0 B	0 B	8	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
STREAM-SEDIMENT SAMPLES - TALAPUS LAKE - AREA 16																
ES2022	150	0.00 B	0 B	0 B	.0 B	0 B	0 B	1 N	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ES2023	300	0.00 B	260	40	.0 B	0 B	0 B	8	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ES2024	150	0.00 B	0 B	0 B	.0 B	0 B	0 B	1 N	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ES2026	70	0.00 B	0 B	0 B	.0 B	0 B	0 B	1	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B

TABLE 18.—*Analytical results of anomalous samples from anomalous areas in the Alpine Lakes area and additions*—Continued

SAMPLE	S-FE%	S-MG%	S-CA%	S-TI%	S-MN	S-AG	S-AS	S-AU	S-B	S-BA	S-BE	S-BI	S-CD	S-CO
ROCK SAMPLES - LAKE KULLA KULLA - AREA 17														
ES2028	5.00	2.00	2.00	.200	700	0.5 N	200 N	10 N	10 L	300	1.0 N	10 N	20 N	7
ES2030	5.00	2.00	2.00	.200	300	0.5 N	200 N	10 N	10 L	300	1.0 N	10 N	20 N	7
STREAM-SEDIMENT SAMPLES - LAKE KULLA KULLA - AREA 17														
EP2396	3.00	2.00	1.50	.500	500	0.5 N	200 N	10 N	20	300	1.0	10 N	20 N	15
EP2397	0.70	0.30	2.00	.150	150	0.5 L	200 N	10 N	70	150	1.0 L	10 N	20 N	5 N
EP2398	1.50	0.70	2.00	.200	300	0.5 N	200 N	10 N	50	150	1.0 L	10 N	20 N	7
Ep2400	1.00	0.10	1.00	.100	70	0.5 L	200 N	10 N	50	150	1.5	10 N	20 N	5 N
ES2015	3.00	1.50	3.00	.300	2000	0.5 L	200 N	10 N	15	200	1.0	10 N	20 N	20
ROCK SAMPLES - DERRICK LAKE - AREA 18														
EG2562	1.00	0.03	0.70	.070	150	0.5 N	200 N	10 N	10 L	700	1.0 N	10 N	20 N	5 N
EG2583	3.00	0.10	0.70	.050	70	0.5 N	200 N	10 N	30	1000	1.0	10 N	20 N	7
EG2586A	0.07	0.02	0.05 L	.007	10 N	0.5 N	200 N	10 N	10	20	1.0 N	10 N	20 N	5 N
EG2622	2.00	0.10	0.70	.100	300	0.5 N	200 N	10 N	10 L	700	1.0 L	10 N	20 N	5 N
ES2058	15.00	0.30	0.07	.100	5000 G	0.5 N	200 N	10 N	20	300	1.0	10 N	20 N	5 N
Es2076	15.00	0.30	2.00	.070	5000 G	0.5 N	200 N	10 N	300	100	1.0 L	10 N	20 N	5
STREAM-SEDIMENT SAMPLES - DERRICK LAKE - AREA 18														
EG2588	3.00	1.50	2.00	.300	1000	0.5 N	200 N	10 N	10 L	150	1.0 L	10 N	20 N	15
EP2312	3.00	1.50	3.00	.300	2000	0.7	200 N	10 N	100	150	1.5	10 N	20 N	15
EP2315	7.00	3.00	3.00	1.000	700	0.5 N	200 N	10 N	10 L	200	1.0 N	10 N	20 N	10
ES2055	5.00	0.50	1.50	.150	3000	0.5 N	200 N	10 N	15	300	1.5	10 N	20 N	15
Es2060	7.00	2.00	3.00	.700	700	0.5 N	200 N	10 N	15	150	1.0 L	10 N	20 N	20
ES2061	3.00	0.70	1.50	.300	700	0.5 N	200 N	10 N	10 L	200	1.0	10 N	20 N	5
ES2064	7.00	1.50	3.00	1.000 G	700	0.5 N	200 N	10 N	10 L	70	1.0 L	10 N	20 N	15
ES2066	3.00	0.70	1.50	.300	500	0.5 N	200 N	10 N	10	150	1.0	10 N	20 N	5
Es2067	10.00	2.00	5.00	1.000	1000	0.5 N	200 N	10 N	10	150	1.0	10 N	20 N	20
ES2070	3.00	1.50	1.00	.300	300	0.5 N	200 N	10 N	20	100	1.0	10 N	20 N	5
ES2071	3.00	0.50	1.50	.200	1000	0.5 N	200 N	10 N	300	700	1.0	10 N	20 N	5 L
ES2072	3.00	0.50	1.50	.200	1000	0.5 N	200 N	10 N	1000	300	1.0 L	10 N	20 N	7
ROCK SAMPLES - MIDDLE FORK SNOQUALMIE RIVER - HARDSCRABBLE CREEK - AREA 19														
EG1407	3.00	1.50	2.00	.200	300	0.5 N	200 N	10 N	10 L	200	1.0 L	10 N	20 N	5
EG1408	3.00	1.50	0.10	.300	500	1.0	200 N	10 N	30	300	1.0 L	10 N	20 N	10
EG1408A	0.50	0.10	0.05 L	.020	100	0.7	200 N	10 N	10 N	50	1.0 L	10 N	20 N	5
EG1409	3.00	0.50	0.05	.300	1000	7.0	200 N	10 N	50	300	1.0 L	10 N	20 N	100
EG1410	5.00	1.50	0.20	.300	200	15.0	200 N	10 N	10 L	500	1.0 L	10 N	20 N	15
EG1410A	3.00	1.50	0.07	.300	100	2.0	200 N	10 N	10 L	700	1.0 N	10 N	20 N	10

TABLE 18.—*Analytical results of anomalous samples from anomalous areas in the Alpine Lakes area and additions*—Continued

SAMPLE	S-CR	S-CU	S-LA	S-MO	S-NB	S-NI	S-PB	S-SB	S-SC	S-SN	S-SR	S-V	S-W	S-Y	S-ZN
ROCK SAMPLES - LAKE KULLA KULLA - AREA 17															
ES2028	10 N	100	20 L	5 N	20 N	10	10 L	100 N	15	10 N	300	100	50 N	10	200 N
ES2030	20	150	20 L	5 N	20 N	15	10 N	100 N	15	10 N	200	100	50 N	15	200 N
STREAM-SEDIMENT SAMPLES - LAKE KULLA KULLA - AREA 17															
EP2396	30	20	20 N	7	20 L	15	10	100 N	15	10 N	300	100	50 N	15	200 N
EP2397	10	15	20 N	5 N	20 L	7	70	100 N	5	10 N	200	30	50 N	10	200 N
EP2398	15	50	20 N	5 L	20 L	7	100	100 N	10	10 N	150	50	50 N	15	200 N
EP2400	10 L	7	20 N	5 N	20 L	5 L	70	100 N	5 L	10 N	150	20	50 N	10	200 N
ES2015	20	50	20 N	7	20 N	15	100	100 N	15	10 N	300	70	50 N	20	200 N
ROCK SAMPLES - DERRICK LAKE - AREA 18															
EG2562	10 N	50	20 L	5 N	20 N	5 N	300	100 N	5 L	10 N	100 L	10 L	50 N	15	200 N
EG2583	10 N	20	20 N	200	20 N	5	10	100 N	5 N	10 N	200	30	50 N	10 N	200 N
EG2586A	10 N	5	20 N	15	20 N	5	10 N	100 N	5 N	10 N	100 N	10	50 N	10 N	200 N
EG2622	10 N	30	20 L	5 N	20 N	5 N	20	100 N	5 L	10 N	100	10	50 N	10	200
ES2058	10 N	5	70	5 N	20 N	5 N	10	100 N	10	70	100 N	20	50 N	30	1500
ES2076	10 N	5	20	5 N	20 N	5 N	30	100 N	7	30	100 N	15	70	70	1000
STREAM-SEDIMENT SAMPLES - DERRICK LAKE - AREA 18															
EG2588	15	70	20 L	7	20 L	7	100	100 N	10	10 N	200	50	50 N	15	200 N
EP2312	15	30	20 L	10	20 L	10	30	100 N	10	10 N	300	70	50 N	20	200 N
EP2315	30	10	20 L	30	20 L	15	15	100 N	15	10 N	300	100	50 N	15	200 N
ES2055	15	30	20 N	30	20 N	10	150	100 N	7	10 N	150	50	50 N	20	200 L
ES2060	30	30	20 L	5	20 L	30	15	100 N	30	10 N	300	100	50 N	20	200 N
ES2061	10 L	15	20 L	10	20 L	7	30	100 N	7	10 N	150	50	50 N	15	200 N
ES2064	30	30	20 L	7	20 L	15	10	100 N	10	10 N	300	100	50 N	15	200 N
ES2066	15	7	20 L	10	20 L	15	30	100 N	7	10 N	200	70	50 N	10	200 N
ES2067	30	30	20 L	5	20 L	30	10	100 N	15	10 N	300	200	50 N	15	200 N
ES2070	15	10	20 L	5 N	20 L	10	70	100 N	7	10 N	200	70	50 N	10	200 N
ES2071	10 L	20	20 N	5 L	20 N	5 L	70	100 N	7	10 N	150	30	50 N	20	200 N
ES2072	10 L	7	20 L	7	20 L	5 L	30	100 N	5	10 N	100	50	50 N	15	200 N
ROCK SAMPLES - MIDDLE FORK SNOQUALMIE RIVER - HARDSCRABBLE CREEK - AREA 19															
EG1407	30	150	20 L	5 N	20 N	10	10 L	100 N	10	10 N	300	100	50 N	15	200 L
EG1408	30	500	20 L	5 N	20 N	10	100	100 N	15	10 N	100 L	150	50 N	15	300
EG1408A	10 L	30	20 N	5 N	20 N	5	10 L	100 N	5 L	10 N	100 N	10	50 N	10 L	200 N
EG1409	30	10000	20 L	5 N	20 N	15	10	100 N	15	10 L	100 N	150	50 L	20	300
EG1410	50	15000	20 N	10	20 N	15	10 L	100 N	15	15	100 N	150	50 L	20	300
EG1410A	30	2000	20 N	50	20 N	5	10 L	100 N	15	15	100 N	150	50 L	20	200

TABLE 18.—*Analytical results of anomalous samples from anomalous areas in the Alpine Lakes area and additions*—Continued

SAMPLE	S-ZR	AA-AU-P	AA-CU-P	AA-ZN-P	AA-AG-P	AA-CO-P	AA-NI-P	CM-CXHM	CM-SB	CM-MO	AS-PT	AS-PD	AS-RH	AS-RU	AS-IR	EU
ROCK SAMPLES - LAKE KULLA KULLA - AREA 17																
ES2028	30	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ES2030	70	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
STREAM-SEDIMENT SAMPLES - LAKE KULLA KULLA - AREA 17																
EP2396	150	0.00 B	0 B	0 B	.0 B	0 B	0 B	1 N	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2397	30	0.00 B	0 B	0 B	.0 B	0 B	0 B	1 N	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2398	300	0.00 B	0 B	0 B	.0 B	0 B	0 B	1 L	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2400	30	0.00 B	0 B	0 B	.0 B	0 B	0 B	1	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ES2015	150	0.00 B	0 B	0 B	.0 B	0 B	0 B	1 L	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ROCK SAMPLES - DERRICK LAKE - AREA 18																
EG2562	70	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	40
EG2583	70	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2586A	10 N	0.05 N	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2622	70	0.00 B	0 B	200	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ES2058	100	0.00 B	0 B	430	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ES2076	70	0.00 B	0 B	1600	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
STREAM-SEDIMENT SAMPLES - DERRICK LAKE - AREA 18																
EG2588	150	0.00 B	130	25	.0 B	0 B	0 B	6	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2312	150	0.00 B	35	45	.0 B	0 B	0 B	8	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2315	150	0.00 B	0 B	0 B	.0 B	0 B	0 B	1 N	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ES2055	300	0.00 B	0 B	0 B	.0 B	0 B	0 B	1	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ES2060	300	0.00 B	0 B	0 B	.0 B	0 B	0 B	1 N	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ES2061	100	0.00 B	0 B	0 B	.0 B	0 B	0 B	1 N	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ES2064	150	0.00 B	0 B	0 B	.0 B	0 B	0 B	1 N	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ES2066	100	0.00 B	0 B	0 B	.0 B	0 B	0 B	1 N	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ES2067	300	0.00 B	0 B	0 B	.0 B	0 B	0 B	1 N	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ES2070	100	0.00 B	0 B	0 B	.0 B	0 B	0 B	1 N	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ES2071	300	0.00 B	0 B	0 B	.0 B	0 B	0 B	1 N	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ES2072	70	0.00 B	0 B	0 B	.0 B	0 B	0 B	1	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ROCK SAMPLES - MIDDLE FORK SNOQUALMIE RIVER - HARDSCRABBLE CREEK - AREA 19																
EG1407	70	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG1408	70	0.05 N	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG1408A	50	0.05 N	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG1409	70	0.05 L	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG1410	100	0.05 N	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG1410A	150	0.05 N	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B

TABLE 18.—*Analytical results of anomalous samples from anomalous areas in the Alpine Lakes area and additions*—Continued

SAMPLE	S-FE%	S-MG%	S-CA%	S-TI%	S-MN	S-AG	S-AS	S-AU	S-B	S-BA	S-BE	S-BI	S-CD	S-CO
ROCK SAMPLES = MIDDLE FORK SNOQUALMIE RIVER-HARDSCRABBLE CREEK = AREA 19														
EG1411	2.00	0.50	0.05 L	.200	20	0.5 N	200 N	10 N	10	300	1.0 L	10 N	20 N	5 N
EG1411A	3.00	1.50	1.50	.300	300	1.5	200 N	10 N	10 L	200	1.0 L	10 N	20 N	5
EG2471A	7.00	2.00	5.00	.500	700	0.7	200 N	10 N	10 L	300	1.0 N	10 N	20 N	10
EG2500A	5.00	2.00	5.00	.300	300	1.5	200 N	10 N	10 L	300	1.0 N	10 N	20 N	7
EG2500B	7.00	3.00	2.00	.300	200	1.5	200 N	10 N	10 L	200	1.0 N	10 N	20 N	10
EG2568	5.00	2.00	3.00	.300	1500	7.0	200 N	10 N	30	300	1.0 N	10 N	20 N	5
EG2569	7.00	3.00	0.07	.300	300	0.7	200 N	10 N	10	1500	1.0 N	10 N	20 N	5 N
EG2569A	5.00	0.70	0.05 L	.300	70	7.0	200 N	10 N	10	1000	1.0 N	10 N	20 N	5 N
EG2570	7.00	2.00	2.00	.300	500	1.0	200 N	10 N	30	500	1.0 N	10	20 N	5 L
EG2570A	10.00	3.00	0.05 L	.500	700	3.0	200 N	10 N	30	500	1.0 N	10 N	20 N	20
EG2571	10.00	2.00	1.50	.500	700	1.0	200 N	10 N	15	500	1.0 N	10 N	20 N	10
EG2571A	10.00	1.50	0.05 L	.300	300	5.0	200 N	10 N	20	500	1.0 N	10 N	20 N	5 N
EG2572	10.00	2.00	3.00	.300	500	0.5 N	200 N	10 N	10	200	1.0 N	10 N	20 N	5
EG2572A	10.00	3.00	3.00	.300	500	0.5 N	200 N	10 N	10	200	1.0 N	10 N	20 N	10
EG2573	7.00	3.00	5.00	.300	300	0.5 N	200 N	10 N	10	200	1.0 N	10 N	20 N	5 L
EK0392	3.00	1.00	3.00	.200	700	0.7	200 N	10 N	10	500	1.0 L	10 N	20 N	15
EK0398	5.00	1.50	7.00	.300	1000	0.5 L	200 N	10 N	10	500	1.0 L	10 N	20 N	20
EK0398B	5.00	2.00	1.50	.200	1000	7.0	200 N	10 N	10	1000	1.0 L	10	20 N	30
EP2288	5.00	2.00	5.00	.300	500	0.5 N	200 N	10 N	10 L	300	1.0 L	10 N	20 N	5
ES1101A	5.00	1.50	1.00	.200	700	200.0	200 N	10 N	10	300	1.0 L	300	20 N	15
ES1102	2.00	1.50	1.50	.200	300	3.0	200 N	10 N	10	300	1.0 L	10 N	20 N	10
ET0340	5.00	1.50	5.00	.200	700	0.5 N	200 N	10 N	10 L	200	1.0 L	10 N	20 N	15
ET0340A	2.00	0.50	0.05 L	.200	30	1.0	200 N	10 N	10 L	300	1.0	10	20 N	5 L
STREAM-SEDIMENT SAMPLES - MIDDLE FORK SNOQUALMIE RIVER - HARDSCRABBLE CREEK - AREA 19														
EG2500	7.00	1.50	3.00	.500	700	0.5 N	200 N	10 N	10 L	200	1.0 L	10 N	20 N	15
EG2502	10.00	1.50	1.00	.300	700	3.0	200 N	10 N	10	300	1.5	15	20 N	30
EG2504	5.00	2.00	3.00	.500	700	0.5 L	200 N	10 N	30	300	1.0 L	10 N	20 N	10
EG2505	10.00	2.00	2.00	.500	1000	3.0	200 N	10 N	20	300	1.0	10 N	20 N	20
EG2506	7.00	1.50	2.00	.500	5000	0.5 N	200 N	10 N	30	300	1.0	10 N	20 N	30
EG2508	7.00	2.00	1.50	.500	700	0.5 N	200 N	10 N	10	300	1.0 L	10 N	20 N	10
EG2509	7.00	2.00	3.00	.300	700	0.5 N	200 N	10 N	10	300	1.0 L	10 N	20 N	7
EG2510	10.00	3.00	3.00	.300	1000	0.7	200 N	10 N	30	300	1.0 L	10 N	20 N	15
EG2511	7.00	2.00	1.50	.300	500	1.5	200 N	10 N	10	300	1.0 L	10 L	20 N	30
EK0388	2.00	0.70	1.50	.150	500	0.5	200 N	10 N	10 L	500	1.0	10 N	20 N	7
EK0390	3.00	1.00	1.50	.300	700	1.5	200 N	10 N	10 L	300	1.0	10 N	20 N	10
EK0393	5.00	1.50	3.00	.200	700	1.0	200 N	10 N	20	300	1.0 L	10 N	20 N	20
EK0394	3.00	1.50	1.50	.500	700	0.5 N	200 N	10 N	10	500	1.0 L	10 N	20 N	15
EK0396	1.50	0.50	0.70	.150	500	0.5 N	200 N	10 N	10 L	100	1.0	10 N	20 N	7
EK0397	3.00	1.50	1.50	.500	700	1.5	200 N	10 N	10	300	1.0	10 N	20 N	10
EP2287	10.00	2.00	2.00	.300	700	0.5 N	200 N	10 N	10	300	1.0	10 N	20 N	10
EP2289	7.00	1.50	3.00	.300	700	0.7	200 N	10 N	10	300	1.0	10 N	20 N	10

TABLE 18.—*Analytical results of anomalous samples from anomalous areas in the Alpine Lakes area and additions*—Continued

SAMPLE	S-CR	S-CU	S-LA	S-MO	S-NB	S-NI	S-PB	S-SB	S-SC	S-SN	S-SR	S-V	S-W	S-Y	S-ZN
ROCK SAMPLES = MIDDLE FORK SNOQUALMIE RIVER-HARDSCRABBLE CREEK = AREA 19															
EG1411	20	30	20 L	5 N	20 N	5 L	10 L	100 N	15	20	100 N	100	50 N	15	200 N
EG1411A	30	100	20 N	5 N	20 N	5	10 L	100 N	15	10 N	200	100	50 N	15	200 N
EG2471A	50	150	20 L	5 N	20 L	10	10 N	100 N	20	10 N	300	150	50 N	15	200 N
EG2500A	30	1500	20 L	5 N	20 L	10	10 N	100 N	15	10 N	200	150	50 N	15	200 N
EG2500B	150	1500	20 L	5 L	20 L	30	10 N	100 N	20	10 N	150	150	50 N	15	200 N
EG2568	20	20	20 L	5 N	20 L	10	5000	100 N	15	10 N	150	100	50 N	15	300
EG2569	30	300	20 L	10	20 L	5 N	20	100 N	15	10	100 L	150	50 N	20	200 N
EG2569A	20	150	20 L	70	20 L	5 L	10 L	100 N	15	10	100 L	100	50 N	10 L	200 N
EG2570	20	300	20 L	5 N	20 L	5 L	20	100 N	15	10 L	200	150	50 N	10	200 N
EG2570A	30	700	20 L	15	20 L	5 L	10 L	100 N	15	10 L	100 L	150	50 N	15	200 N
EG2571	50	300	20 L	5 L	20 L	15	10 N	100 N	20	10 N	150	150	50 N	10	200 N
EG2571A	20	500	20 L	50	20 L	5 N	10 N	100 N	15	10	100 L	100	50 N	10	200 N
EG2572	30	150	20 L	5 L	20 L	10	10 N	100 N	15	10 N	150	150	50 N	10	200 N
EG2572A	30	150	20 L	5 N	20 L	15	10 N	100 N	20	10 N	150	150	50 N	15	200 N
EG2573	20	200	20 L	5 L	20 L	5 L	10 N	100 N	15	10 N	200	150	50 N	15	200 N
EK0392	20	70	20 L	5 N	10 N	10	20	100 N	15	10 N	200	100	50 N	20	200 L
EK0398	50	70	20 L	5 N	10 N	20	70	100 N	15	10 N	300	100	50 N	20	200 L
EK0398B	50	2000	20 L	5 N	10 N	15	300	100 N	15	10 N	150	100	70	15	200 L
EP2288	15	100	20	5 N	20 L	5 L	10 N	100 N	10	10 N	700	70	70	10	200 N
ES1101A	30	1500	20 N	30	20 N	10	10000	100 N	15	20	150	100	50 N	20	200 L
ES1102	30	50	20 N	5 N	20 N	10	50	100 N	15	10 N	150	100	50 N	10	200 N
ET0340	30	100	20 L	5 N	10 N	15	10 L	100 N	15	10 N	200	150	50 N	15	200 L
ET0340A	20	100	20 L	5 N	10 N	5 L	10	100 N	15	30	100 N	70	50 N	15	200 N
STREAM-SEDIMENT SAMPLES = MIDDLE FORK SNOQUALMIE RIVER = HARDSCRABBLE CREEK = AREA 19															
EG2500	50	150	20 L	5	20 L	30	10 L	100 N	15	10 N	300	150	50 N	15	200 N
EG2502	20	3000	20 L	70	20 L	15	15	100 N	15	10 N	100 L	100	50	20	200 N
EG2504	50	150	20 L	10	20 L	30	30	100 N	15	10 N	200	100	50 N	15	200 N
EG2505	70	700	20 L	15	20 L	30	30	100 N	15	10 N	200	150	50 N	30	200 N
EG2506	30	30	20 L	5	20 L	15	30	100 N	15	10 N	200	150	50 N	15	200 N
EG2508	30	70	20 L	15	20 L	15	20	100 N	15	10 N	150	150	50	15	200 N
EG2509	30	300	20 L	5 L	20 L	10	15	100 N	15	10 N	200	100	50 N	15	200 N
EG2510	50	300	20 N	7	20 L	15	70	100 N	30	10 N	200	200	50 N	30	200 N
EG2511	30	2000	20 L	50	20 L	15	15	100 N	15	10 N	100	150	50 L	15	200 N
EK0388	20	30	20	5	10 N	5	70	100 N	10	10 N	150	50	50 N	15	200 N
EK0390	30	150	20 N	15	10 N	15	100	100 N	10	15	300	70	50 N	15	200 N
EK0393	30	300	20	5 L	10 N	15	70	100 N	15	10 N	200	100	50 N	20	200 N
EK0394	50	50	20 L	5 N	10 N	15	50	100 N	15	10 N	300	100	50 N	15	200 N
EK0396	20	70	20 N	5 N	10 N	7	70	100 N	5	10 N	100	30	50 N	10	200 N
EK0397	30	70	20 N	5 N	10 N	10	30	100 N	15	10 N	200	100	50 N	15	200 N
EP2287	30	100	20 L	50	20 L	10	30	100 N	15	10 L	200	150	50 N	20	200 N
EP2289	30	70	20 L	7	20 L	10	20	100 N	15	10 N	200	100	50 N	15	200 N

TABLE 18.—*Analytical results of anomalous samples from anomalous areas in the Alpine Lakes area and additions*—Continued

SAMPLE	S-ZR	AA-AU-P	AA-CU-P	AA-ZN-P	AA-AG-P	AA-CO-P	AA-NI-P	CM=CXHM	CM-SB	CM-MO	AS-PT	AS-PD	AS-RH	AS-RU	AS-IR	EU
ROCK SAMPLES = MIDDLE FORK SNOQUALMIE RIVER-HARDSCRABBLE CREEK = AREA 19																
EG1411	150	0,05 N	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG1411A	70	0,05 N	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG2471A	30	0,00 B	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG2500A	70	0,00 B	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG2500B	100	0,00 B	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG2568	100	0,00 B	0 B	200	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG2569	150	0,00 B	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG2569A	30	0,00 B	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG2570	30	0,00 B	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG2570A	200	0,00 B	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG2571	70	0,00 B	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG2571A	50	0,00 B	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG2572	70	0,00 B	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG2572A	10 L	0,00 B	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG2573	70	0,00 B	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EK0392	70	0,00 B	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EK0398	100	0,00 B	65	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EK0398B	30	0,02 L	1900	0 B	,0 B	0 B	0 B	0 B	1,0 L	6	,010 N	,004	,004 N	,2 N	,10 N	0 B
EP2288	70	0,00 B	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
ES1101A	50	0,40	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
ES1102	100	0,05 N	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
ET0340	150	0,00 B	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
ET0340A	50	0,02 N	150	0 B	,0 B	0 B	0 B	0 B	1,0 L	6	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
STREAM-SEDIMENT SAMPLES - MIDDLE FORK SNOQUALMIE RIVER - HARDSCRABBLE CREEK - AREA 19																
EG2500	100	0,00 B	0 B	0 B	,0 B	0 B	0 B	1	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG2502	700	0,00 B	4700	140	,0 B	0 B	0 B	300	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG2504	100	0,00 B	0 B	0 B	,0 B	0 B	0 B	2	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG2505	700	0,00 B	530	220	,0 B	0 B	0 B	8	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG2506	150	0,00 B	25	70	,0 B	0 B	0 B	4	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG2508	100	0,00 B	0 B	0 B	,0 B	0 B	0 B	1 L	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG2509	300	0,00 B	0 B	0 B	,0 B	0 B	0 B	1 N	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG2510	500	0,00 B	0 B	0 B	,0 B	0 B	0 B	1 N	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG2511	100	0,00 B	2200	70	,0 B	0 B	0 B	60	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EK0388	150	0,02 N	35	60	,0 B	0 B	0 B	2	0,5 L	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EK0390	100	0,04 N	140	35	,0 B	0 B	0 B	6	0,5 L	25	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EK0393	150	0,02 L	390	110	,0 B	0 B	0 B	10	0,5 L	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EK0394	70	0,00 B	40	60	,0 B	0 B	0 B	3	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EK0396	30	0,00 B	0 B	0 B	,0 B	0 B	0 B	1 L	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EK0397	200	0,02 N	68	40	,0 B	0 B	0 B	1 L	0,5 L	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EP2287	150	0,00 B	90	50	,0 B	0 B	0 B	4	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EP2289	150	0,00 B	0 B	0 B	,0 B	0 B	0 B	1 L	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B

TABLE 18.—*Analytical results of anomalous samples from anomalous areas in the Alpine Lakes area and additions*—Continued

SAMPLE	S-FE%	S-MG%	S-CA%	S-TI%	S-MN	S-AG	S-AS	S-AU	S-B	S-BA	S-BE	S-BI	S-CD	S-CO
STREAM-SEDIMENT SAMPLES = MIDDLE FORK SNOQUALMIE RIVER-HARDSCRABBLE CREEK = AREA 19														
ET0333	2.00	0.70	1.00	.150	500	0.7	200 N	10 N	10 L	300	1.0	10 N	20 N	5
ET0334	3.00	0.70	1.50	.150	700	0.7	200 N	10 N	10 L	500	1.5	10 N	20 N	10
STREAM-SEDIMENT SAMPLES = HESTER LAKE = AREA 20														
EG2633	3.00	1.00	1.00	.300	700	0.5 N	200 N	10 N	10 L	200	1.0	10 N	20 N	7
EG2635	2.00	1.00	1.00	.200	1500	0.5 N	200 N	10 N	10 L	100	1.0	10 N	20 N	7
EG2652	5.00	1.00	1.00	.200	500	0.5 N	200 N	10 N	10 L	200	1.0	10 N	20 N	7
EG2654	5.00	2.00	1.00	.300	700	0.5 N	200 N	10 N	50	500	1.0	10 N	20 N	7
EG2655	5.00	1.00	1.00	.200	1000	0.5 N	200 N	10 N	10	300	1.0	10 N	20 N	7
ROCK SAMPLE = DINGFORD CREEK = AREA 21														
EG2650	3.00	1.00	0.70	.200	300	0.5 N	200 N	10 N	10 L	300	1.0 N	10 N	20 N	5 L
STREAM-SEDIMENT SAMPLES = DINGFORD CREEK = AREA 21														
EC2015	2.00	0.70	1.00	.300	500	0.5 N	200 N	10 N	10 L	200	2.0	10 N	20 N	5
EG2646	3.00	0.30	0.70	.150	700	1.5	200 N	10 N	20	150	1.0	10 N	20 N	7
EG2649	2.00	0.30	0.70	.100	300	0.5 N	200 N	10 N	10 L	100	1.0	10 N	20 N	5
EP2468	3.00	1.50	2.00	.500	500	0.7	200 N	10 N	15	300	1.0	10 N	20 N	7
ROCK SAMPLE = GREEN RIDGE LAKE = AREA 22														
EC2039	15.00	0.20	0.05 L	.070	70	2.0	200 N	10 N	50	700	1.0 L	10 N	20 N	30
STREAM-SEDIMENT SAMPLE = GREEN RIDGE LAKE = AREA 22														
EC2027	2.00	0.70	1.50	.300	500	0.7	200 N	10 N	30	300	2.0	10 N	20 N	7
ROCK SAMPLES = GARFIELD MOUNTAIN LAKES = AREA 23														
EG2682A	3.00	0.30	0.70	.200	300	0.5 N	200 N	10 N	10 L	500	1.0	10 N	20 N	5 N
EG2683	7.00	1.00	2.00	.300	500	1.0	200 N	10 N	10 L	500	1.0 N	10 N	20 N	7
EG2684B	3.00	1.00	0.20	.200	1000	1.0	200 N	10 N	70	500	1.0	10 N	20 N	15
EG2691A	10.00	2.00	2.00	.300	300	0.5 N	200 N	10 N	10	150	1.0 L	10 N	20 N	15
STREAM-SEDIMENT SAMPLES = GARFIELD MOUNTAIN LAKES = AREA 23														
EG2684	5.00	1.00	1.00	.300	1000	0.5 N	200 N	10 N	10 L	300	1.0	10 N	20 N	7
EG2685	3.00	0.50	0.70	.200	1000	0.5 N	200 N	10 N	10 L	150	1.0	10 N	20 N	7
ROCK SAMPLES = SNOQUALMIE LAKES POTHOLES = AREA 24														
EG2662	1.00	0.10	0.05 L	.070	10 L	1.5	200 N	10 N	70	150	1.0	10 L	20 N	5 N
EG2664	2.00	0.70	1.00	.200	300	0.5 N	200 N	10 N	10 L	200	1.0 N	10 N	20 N	5 L
EG2666	3.00	1.00	0.70	.200	500	0.5 N	200 N	10 N	100	300	2.0	10 N	20 N	5
EG2667	5.00	1.00	1.00	.200	500	0.5 N	200 N	10 N	10 L	500	1.0 N	10 N	20 N	5
EG2668	3.00	1.00	1.00	.200	300	0.5 N	200 N	10 N	10 L	500	1.0 L	10 N	20 N	5

TABLE 18.—*Analytical results of anomalous samples from anomalous areas in the Alpine Lakes area and additions*—Continued

SAMPLE	S-CR	S-CU	S-LA	S-MO	S-NB	S-NI	S-PB	S-SB	S-SC	S-SN	S-SR	S-V	S-W	S-Y	S-ZN
STREAM-SEDIMENT SAMPLES = MIDDLE FORK SNOQUALMIE RIVER-HARDSCRABBLE CREEK = AREA 19															
ET0333	20	20	50	5 N	10 N	5	50	100 N	7	10 N	100	50	50 N	30	200 N
ET0334	20	30	50	10	10 N	7	70	100 N	15	10 N	100	70	50 N	20	200 N
STREAM-SEDIMENT SAMPLES = HESTER LAKE = AREA 20															
EG2633	10 N	20	30	5 N	20 N	10	70	100 N	10	10 N	150	70	50 N	30	200 N
EG2635	10 N	15	20	5 N	20 N	7	70	100 N	5	10 N	100	70	50 N	10	200 N
EG2652	10 N	50	50	7	20 N	5	20	100 N	7	10 N	150	100	50 N	15	200 N
EG2654	20	70	20	7	20 N	10	30	100 N	10	10 N	100	100	50 N	15	200 N
EG2655	15	70	20	7	20 N	7	20	100 N	10	10 N	100	70	50 N	15	200 N
ROCK SAMPLE = DINGFORD CREEK = AREA 21															
EG2650	10 N	150	20	5 N	20 N	5	10 L	100 N	5	10 N	100	70	70	10	200 N
STREAM-SEDIMENT SAMPLES = DINGFORD CREEK = AREA 21															
EC2015	20	10	70	7	20 N	7	30	100 N	7	10 N	100	70	50 N	10	200 N
EG2646	10	100	20 L	5	20 N	7	150	100 N	7	10 N	150	50	50 N	15	200 N
EG2649	10 N	50	30	5	20 N	7	10	100 N	5	10 N	100 N	50	50 N	10	200 N
EP2468	15	70	20 L	5 L	20 N	10	20	100 N	15	10 N	300	70	50 N	15	200 N
ROCK SAMPLE = GREEN RIDGE LAKE = AREA 22															
EC2039	10 N	100	20 L	30	20 N	5	70	100 N	5 L	10 N	100 N	30	50 N	20	300
STREAM-SEDIMENT SAMPLE = GREEN RIDGE LAKE = AREA 22															
EC2027	10	30	70	5 N	20 N	7	30	100 N	15	10 N	200	50	50 N	70	200 N
ROCK SAMPLES = GARFIELD MOUNTAIN LAKES = AREA 23															
EG2682A	10 N	100	20	5 N	20 N	5 L	15	100 N	15	10 N	100	10	50 N	30	200 N
EG2683	10 N	100	30	5 N	20 N	15	10	100 N	20	10 N	150	100	50 N	50	200 N
EG2684B	30	200	20	5 N	20 N	70	10	100 N	15	10 N	100 N	100	50 N	15	200 N
EG2691A	30	70	30	7	20 N	20	10	100 N	30	10 N	150	100	50 N	50	200 N
STREAM-SEDIMENT SAMPLES = GARFIELD MOUNTAIN LAKES = AREA 23															
EG2684	50	70	20	5 N	20 N	30	50	100 N	10	10 N	200	70	50 N	15	200 N
EG2685	20	20	20	5 N	20 N	7	70	100 N	7	10 N	100	70	50 N	15	200 N
ROCK SAMPLES = SNOQUALMIE LAKES POTHOLES = AREA 24															
EG2662	10 N	20	20 N	5 N	20 N	5 N	30	100 N	5 N	30	100 N	20	50 N	10 N	200 N
EG2664	10 N	30	20 N	5	20 N	5	10 L	100 N	7	10 N	100	70	50 N	10	200 N
EG2666	20	1000	20	5 N	20 N	10	10 L	100 N	15	10 N	100 N	100	50 N	15	200 N
EG2667	20	100	50	5 N	20 N	7	10	100 N	15	10 N	150	100	50 N	20	200 N
EG2668	10 N	150	20	5 N	20 N	5	10	100 N	10	10 N	150	70	50 N	10	200 N

TABLE 18.—*Analytical results of anomalous samples from anomalous areas in the Alpine Lakes area and additions*—Continued

SAMPLE	S-ZR	AA-AU-P	AA-CU-P	AA-ZN-P	AA-AG-P	AA-CO-P	AA-NI-P	CM=CXHM	CM-SB	CM-MO	AS-PT	AS-PD	AS-RH	AS-RU	AS-IR	EU
STREAM-SEDIMENT SAMPLES = MIDDLE FORK SNOQUALMIE RIVER-HARDSCRABBLE CREEK = AREA 19																
ET0333	150	0.02 L	40	40	.0 B	0 B	0 B	3	2.0	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ET0334	150	0.02 L	50	70	.0 B	0 B	0 B	3	0.5 L	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
STREAM-SEDIMENT SAMPLES - HESTER LAKE - AREA 20																
EG2633	500	0.00 B	0 B	0 B	.0 B	0 B	0 B	1	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2635	150	0.00 B	0 B	0 B	.0 B	0 B	0 B	1	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2652	500	0.00 B	0 B	0 B	.0 B	0 B	0 B	1 N	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2654	100	0.00 B	0 B	0 B	.0 B	0 B	0 B	1 N	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2655	300	0.00 B	0 B	0 B	.0 B	0 B	0 B	1 L	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ROCK SAMPLE - DINGFORD CREEK - AREA 21																
EG2650	50	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
STREAM-SEDIMENT SAMPLES - DINGFORD CREEK - AREA 21																
EC2015	300	0.00 B	0 B	0 B	.0 B	0 B	0 B	1 L	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2646	70	0.00 B	0 B	0 B	.0 B	0 B	0 B	2	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2649	200	0.00 B	0 B	0 B	.0 B	0 B	0 B	1 L	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2468	200	0.00 B	0 B	0 B	.0 B	0 B	0 B	1 L	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ROCK SAMPLE - GREEN RIDGE LAKE - AREA 22																
EC2039	150	0.00 B	0 B	190	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
STREAM-SEDIMENT SAMPLE - GREEN RIDGE LAKE - AREA 22																
EC2027	150	0.00 B	0 B	0 B	.0 B	0 B	0 B	1 N	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ROCK SAMPLES - GARFIELD MOUNTAIN LAKES - AREA 23																
EG2682A	300	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2683	200	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2684B	100	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2691A	200	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
STREAM-SEDIMENT SAMPLES - GARFIELD MOUNTAIN LAKES - AREA 23																
EG2684	70	0.00 B	0 B	0 B	.0 B	0 B	0 B	1 N	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2685	70	0.00 B	0 B	0 B	.0 B	0 B	0 B	1 L	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ROCK SAMPLES - SNOQUALMIE LAKES POTHOLES - AREA 24																
EG2662	50	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2664	70	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2666	70	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2667	70	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2668	100	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B

TABLE 18.—*Analytical results of anomalous samples from anomalous areas in the Alpine Lakes area and additions*—Continued

SAMPLE	S-FE%	S-MG%	S-CA%	S-TI%	S-MN	S-AG	S-AS	S-AU	S-B	S-BA	S-BE	S-BI	S-CD	S-CU
STREAM-SEDIMENT SAMPLES - SNOQUALMIE LAKES POTHOLES - AREA 24														
EC2028	5.00	1.00	1.00	.300	700	0.5 N	200 N	10 N	10	200	1.0	10 N	20 N	7
EC2030	3.00	1.00	2.00	.300	500	0.7	200 N	10 N	30	500	1.5	10 N	20 N	7
EG2669	5.00	1.00	1.00	.300	700	0.5 N	200 N	10 N	10 L	150	1.0	10 N	20 N	7
EG2670	7.00	2.00	1.00	.500	1500	0.5 L	200 N	10 N	10 L	100	1.0 L	10 N	20 N	7
EG2671	5.00	2.00	2.00	.500	1500	1.0	200 N	10 N	20	500	1.0	10 N	20 N	15
EP2462	3.00	0.30	1.00	.150	700	1.5	200 N	10 N	70	150	1.5	10 N	20 N	7
EP2463	5.00	1.00	1.00	.300	1000	0.5 N	200 N	10 N	10	300	1.0	10 N	20 N	7
ROCK SAMPLES = LAKE DOROTHY-CAMP ROBBER CREEK-FOSS RIVER = AREA 25														
EG1431	2.00	1.50	3.00	.200	500	0.5 N	200 N	10 N	100	300	1.0	10 N	20 N	10
EG2108	5.00	2.00	2.00	.500	700	0.5	200 N	10 N	50	700	1.0 L	10 N	20 N	30
EG2711	7.00	2.00	2.00	.200	500	2.0	200 N	10 N	10	300	1.0 L	10 N	20 N	10
ET0348	5.00	2.00	2.00	.300	700	0.5 N	200 N	10 N	150	700	1.0 L	10 N	20 N	10
STREAM-SEDIMENT SAMPLES = LAKE DOROTHY-CAMP ROBBER CREEK-FOSS RIVER = AREA 25														
EG0647	2.00	0.50	0.50	.100	3000	0.5	200 N	10 N	10 L	100	1.0	10 N	20 N	15
EG0649	7.00	1.50	2.00	.700	1000	0.5 N	200 N	10 N	70	300	1.0	10 N	20 N	20
EG0652	3.00	1.00	2.00	.300	700	0.5 N	200 N	10 N	10	300	1.0	10 N	20 N	10
EG0691	3.00	1.00	1.50	.300	1000	0.5 N	200 N	10 N	50	500	1.0	10 N	20 N	15
EG0692	3.00	0.70	1.50	.500	700	1.0	200 N	10 N	10	300	1.0	10 N	20 N	10
EG2698	1.50	0.15	0.70	.100	1500	0.5 L	200 N	10 N	50	150	1.5	10 N	20 N	15
EG2699	5.00	1.00	1.00	.300	700	0.5 N	200 N	10 N	10	200	1.0	10 N	20 N	7
EG2701	3.00	1.00	1.00	.300	500	0.5 N	200 N	10 N	10 L	100	1.0	10 N	20 N	7
EG2702	5.00	0.70	1.50	.150	2000	0.7	200 N	10 N	30	300	1.5	10 N	20 N	20
EG2707	5.00	1.00	1.00	.200	700	0.5 N	200 N	10 N	10 L	100	1.0	10 N	20 N	7
EK0324	2.00	1.00	1.50	.200	700	0.5 N	200 N	10 N	10	150	1.0	10 N	20 N	10
EK0326	3.00	1.00	1.00	.150	500	0.5 N	200 N	10 N	30	300	1.0	10 N	20 N	10
EK0327	1.00	0.50	0.70	.070	700	0.5 N	200 N	10 N	15	70	1.0	10 N	20 N	7
EK0329	2.00	1.00	2.00	.150	700	0.5 N	200 N	10 N	30	300	1.5	10 N	20 N	10
EK0330	3.00	2.00	5.00	.500	1000	0.5 N	200 N	10 N	15	300	1.0 L	10 N	20 N	15
EK0331	3.00	2.00	7.00	.500	700	0.5 N	200 N	10 N	30	500	1.0	10 N	20 N	15
EK0332	3.00	1.50	2.00	.200	700	0.5 N	200 N	10 N	50	300	1.0	10 N	20 N	15
EK0333	3.00	0.70	1.50	.200	700	0.5 N	200 N	10 N	20	200	1.0	10 N	20 N	15
EK0334	3.00	0.70	1.50	.300	1000	0.5 N	200 N	10 N	20	200	1.0	10 N	20 N	20
EK0337	3.00	1.00	1.50	.300	700	0.5 N	200 N	10 N	70	300	1.5	10 N	20 N	15
EK0339	3.00	0.70	1.50	.150	1000	0.5 N	200 N	10 N	70	300	1.5	10 N	20 N	10
EK0401	0.50	0.20	0.70	.070	1000	0.5 N	200 N	10 N	10 L	150	1.5	10 N	20 N	5
EK0402	2.00	1.00	1.50	.300	1500	0.5 N	200 N	10 N	15	300	1.0	10 N	20 N	10
EK0403	3.00	1.50	2.00	.500	700	0.5 N	200 N	10 N	15	300	1.0	10 N	20 N	15
EK0404	3.00	2.00	2.00	.500	1000	0.5 N	200 N	10 N	10	300	1.0	10 N	20 N	15

TABLE 18.—*Analytical results of anomalous samples from anomalous areas in the Alpine Lakes area and additions*—Continued

SAMPLE	S-CR	S-CU	S-LA	S-MO	S-NB	S-NI	S-PB	S-SB	S-SC	S-SN	S-SR	S-V	S-W	S-Y	S-ZN
STREAM-SEDIMENT SAMPLES = SNOQUALMIE LAKES POTHOLES = AREA 24															
EC2028	10 N	30	20	5 N	20 N	10	50	100 N	15	10 N	150	100	50 N	15	200 N
EC2030	15	150	20 N	20	20 N	7	30	100 N	10	10 N	200	70	50 L	15	200 N
EG2669	10 N	150	20	15	20 N	7	20	100 N	5	10 N	150	70	50 N	10	200 N
EG2670	10 N	70	20	10	20 N	10	10	100 N	10	10 N	200	100	50 N	10	200 N
EG2671	20	150	20 L	20	20 N	15	50	100 N	15	10 N	300	100	50 L	20	200 N
EP2462	10 L	70	20 L	5	20 N	10	100	100 N	7	10 N	150	70	50 N	15	200 N
EP2463	30	70	20	5	20 N	15	20	100 N	15	10 L	150	100	50 N	20	200 N
ROCK SAMPLES = LAKE DOROTHY-CAMP ROBBER CREEK-FOSS RIVER = AREA 25															
EG1431	20	100	20 N	5 N	20 N	7	10	100 N	15	10 N	200	100	50 N	20	200 N
EG2108	150	150	20 L	5 N	20 N	50	50	100 N	30	10 N	300	200	50 N	50	200
EG2711	30	500	20	5 N	20 N	10	10	100 N	15	10 N	150	200	100	30	200 N
ET0348	10	100	30	5 N	10 N	7	10 L	100 N	15	10 N	150	100	50 N	20	200 N
STREAM-SEDIMENT SAMPLES = LAKE DOROTHY-CAMP ROBBER CREEK-FOSS RIVER = AREA 25															
EG0647	20	70	20 L	5 N	10 N	5	70	100 N	7	10 N	100	50	50 N	10	200 N
EG0649	50	150	20 L	5 N	10 N	15	50	100 N	15	10 N	300	150	50 N	20	200 N
EG0652	20	30	20 N	5 N	10 N	7	70	100 N	10	10 N	300	70	50 N	15	200 N
EG0691	30	100	20	5 N	10 N	10	50	100 N	15	10 N	150	150	50 N	30	200 N
EG0692	20	70	20 N	5 N	10 N	10	30	100 N	15	10 N	200	70	50 N	15	200 N
EG2698	10	10	20 N	5 L	20 N	5	100	100 N	5	10 N	100 N	30	50 N	15	200 N
EG2699	10	100	20	5	20 N	10	50	100 N	10	10 N	150	100	50 N	15	200 N
EG2701	10 N	50	20	7	20 N	10	15	100 N	10	10 N	150	70	50 N	15	200 N
EG2702	30	70	20 N	7	20 L	7	30	100 N	15	10 N	150	100	50 N	15	200 N
EG2707	10 N	50	20	7	20 N	10	10	100 N	10	10 N	150	70	50 N	15	200 N
EK0324	10 L	10	20 N	5	10 N	10	15	100 N	10	10 N	200	70	50 N	15	200 N
EK0326	20	70	20 N	30	10 N	7	70	100 N	10	10 N	150	70	50 N	10	200 N
EK0327	20	70	20 N	5	10 N	5	50	100 N	5	10 N	100	30	50 N	10 L	200 N
EK0329	20	100	20	5 N	10 N	7	30	100 N	10	10 N	150	70	50 N	15	200 N
EK0330	30	30	30	10	10 N	7	15	100 N	20	10 N	200	100	50 N	30	200 N
EK0331	30	100	20 L	10	10 N	10	30	100 N	15	10 N	300	100	50 N	30	200 N
EK0332	30	150	20 N	5	10 N	15	30	100 N	15	10 N	150	100	50 N	15	200 N
EK0333	20	100	20 L	5 L	10 N	10	30	100 N	15	10 N	300	100	50 N	15	200 N
EK0334	30	150	20 N	7	10 N	10	20	100 N	10	10 N	200	150	50 N	15	200 N
EK0337	50	50	20 L	7	10 N	15	30	100 N	15	10 N	150	150	50 N	20	200 N
EK0339	30	30	20 N	5	10 N	15	30	100 N	15	10 N	100	70	50 N	30	200 N
EK0401	20	10	20 N	5 N	10 N	5	50	100 N	5	10 N	100	20	50 N	10	200 N
EK0402	30	70	20 N	15	10 N	10	70	100 N	15	10 N	150	100	50 N	20	200 N
EK0403	30	70	20	5 N	10 N	15	70	100 N	15	10 N	200	100	50 N	20	200 N
EK0404	30	50	20 N	5	10 N	15	50	100 N	15	10 N	300	150	50 N	20	200 N

TABLE 18.—*Analytical results of anomalous samples from anomalous areas in the Alpine Lakes area and additions*—Continued

SAMPLE	S-ZR	AA-AU-P	AA-CU-P	AA-ZN-P	AA-AG-P	AA-CO-P	AA-NI-P	CM=CXHM	CM-SB	CM-MO	AS-PT	AS-PD	AS-RH	AS-RU	AS-IR	EU
STREAM-SEDIMENT SAMPLES - SNOQUALMIE LAKES POTHOLES - AREA 24																
EC2028	200	0.00 B	0 B	0 B	.0 B	0 B	0 B	1 N	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EC2030	300	0.00 B	0 B	0 B	.0 B	0 B	0 B	1 L	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2669	70	0.00 B	0 B	0 B	.0 B	0 B	0 B	1	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2670	70	0.00 B	0 B	0 B	.0 B	0 B	0 B	1 L	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2671	300	0.00 B	0 B	0 B	.0 B	0 B	0 B	1	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2462	70	0.00 B	0 B	0 B	.0 B	0 B	0 B	1	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2463	300	0.00 B	0 B	0 B	.0 B	0 B	0 B	1 N	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ROCK SAMPLES = LAKE DOROTHY-CAMP ROBBER CREEK-FOSS RIVER = AREA 25																
EG1431	70	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2108	150	0.00 B	0 B	210	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2711	200	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ET0348	150	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
STREAM-SEDIMENT SAMPLES = LAKE DOROTHY-CAMP ROBBER CREEK-FOSS RIVER = AREA 25																
EG0647	20	0.04 N	0 B	0 B	.0 B	0 B	0 B	2	2.0	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG0649	150	0.00 B	160	35	.0 B	0 B	0 B	6	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG0652	70	0.00 B	0 B	0 B	.0 B	0 B	0 B	3	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG0691	150	0.00 B	100	75	.0 B	0 B	0 B	8	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG0692	70	0.00 B	40	20	.0 B	0 B	0 B	2	0.5 L	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2698	30	0.00 B	0 B	0 B	.0 B	0 B	0 B	1 L	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2699	300	0.00 B	0 B	0 B	.0 B	0 B	0 B	2	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2701	300	0.00 B	0 B	0 B	.0 B	0 B	0 B	1 N	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2702	200	0.00 B	0 B	0 B	.0 B	0 B	0 B	1 N	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2707	200	0.00 B	0 B	0 B	.0 B	0 B	0 B	1 L	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EK0324	70	0.00 B	0 B	0 B	.0 B	0 B	0 B	1	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EK0326	70	0.00 B	100	30	.0 B	0 B	0 B	5	0.0 B	60	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EK0327	20	0.00 B	150	85	.0 B	0 B	0 B	6	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EK0329	150	0.00 B	160	40	.0 B	0 B	0 B	5	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EK0330	500	0.00 B	0 B	0 B	.0 B	0 B	0 B	1	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EK0331	100	0.00 B	100	45	.0 B	0 B	0 B	2	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EK0332	150	0.00 B	270	45	.0 B	0 B	0 B	3	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EK0333	70	0.00 B	140	30	.0 B	0 B	0 B	3	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EK0334	100	0.00 B	170	40	.0 B	0 B	0 B	3	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EK0337	150	0.00 B	0 B	0 B	.0 B	0 B	0 B	1	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EK0339	150	0.00 B	0 B	0 B	.0 B	0 B	0 B	2	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EK0401	50	0.00 B	0 B	0 B	.0 B	0 B	0 B	5	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EK0402	150	0.00 B	95	55	.0 B	0 B	0 B	5	0.0 B	15	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EK0403	300	0.00 B	65	40	.0 B	0 B	0 B	3	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EK0404	150	0.00 B	25	35	.0 B	0 B	0 B	1	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B

TABLE 18.—*Analytical results of anomalous samples from anomalous areas in the Alpine Lakes area and additions*—Continued

SAMPLE	S-FE%	S-MG%	S-CA%	S-TI%	S-MN	S-AG	S-AS	S-AU	S-B	S-BA	S-BE	S-BI	S-CD	S-CO
STREAM-SEDIMENT SAMPLES = LAKE DOROTHY-CAMP ROBBER CREEK-FOSS RIVER = AREA 25														
EK0405	3.00	1.00	1.50	.200	1000	0.5 N	200 N	10 N	10	300	1.0	10 N	20 N	10
ES0207	3.00	0.70	2.00	.500	1000	0.5 N	200 N	10 N	10 L	300	1.0 L	10 N	20 N	15
ES0209	7.00	1.50	3.00	.700	700	0.5 N	200 N	10 N	30	300	1.0	10 N	20 N	15
ES0210	7.00	1.50	2.00	1.000	700	0.5 N	200 N	10 N	10	300	1.0 L	10 N	20 N	20
ES0211	5.00	1.50	3.00	.500	1000	0.7	200 N	10 N	10	300	1.0 L	10 N	20 N	15
ES0215	7.00	2.00	3.00	.700	1000	0.5 N	200 N	10 N	50	300	1.0 L	10 N	20 N	20
ES0216	5.00	1.00	2.00	.300	700	0.5 N	200 N	10 N	30	300	1.0	10 N	20 N	10
ET0273	2.00	0.70	1.50	.200	500	0.7	200 N	10 N	20	300	1.0	10 N	20 N	5
ET0277	1.50	0.70	1.50	.150	500	0.5 N	200 N	10 N	10 L	150	1.0	10 N	20 N	10
ET0279	1.00	0.50	1.50	.100	300	0.5 N	200 N	10 N	10 L	200	1.5	10 N	20 N	5
ET0286	1.00	0.30	1.00	.100	300	0.5 N	200 N	10 N	10	70	1.0	10 N	20 N	7
ET0290	3.00	1.00	2.00	.200	1000	0.5 N	200 N	10 N	30	300	1.0	10 N	20 N	15
ET0291	3.00	1.00	1.50	.300	700	0.5 N	200 N	10 N	100	300	1.5	10 N	20 N	10
ET0293	3.00	0.70	1.50	.150	700	0.5 N	200 N	10 N	100	300	1.5	10 N	20 N	7
ET0344	3.00	2.00	1.50	.300	700	0.5 N	200 N	10 N	100	300	1.0	10 N	20 N	10
ET0349	2.00	0.50	1.00	.200	150	0.5 N	200 N	10 N	10 L	200	1.0	10 N	20 N	5
ET0350	3.00	0.70	1.50	.300	1500	0.5 N	200 N	10 N	10	200	1.5	10 N	20 N	10
ROCK SAMPLES - CHAIN LAKES - AREA 26														
EG1229	3.00	2.00	0.30	.500	200	0.5 N	200	10 N	2000 G	20 L	1.0	10 L	20 N	7
EG1229A	3.00	2.00	0.30	.150	150	0.7	300	10 N	2000 G	20 L	1.0	10 L	20 N	7
EG1229B	15.00	1.00	0.10	.300	70	200.0	10000 G	10 N	2000 G	20 L	1.0 L	20	500 G	100
EG1229C	20.00	0.20	0.07	.002 L	5000 G	500.0	10000 G	10 N	30	20 L	1.0 N	10 N	500	150
EG1229D	2.00	1.00	0.20	.700	200	3.0	700	10 N	2000 G	1000	1.0	10 L	20 N	7
EG1229E	20.00 G	0.20	0.05	.150	70	7.0	10000 G	10 N	2000 G	20 L	1.0 L	30	50	200
EG1229F	3.00	1.50	2.00	.300	500	0.5	700	10 N	20	700	1.0 L	10 L	20 L	10
EG1229G	20.00 G	0.15	0.05	.002 L	2000	300.0	10000 G	10 N	50	20 L	1.0 L	70	150	200
EG1229H	3.00	2.00	0.20	.500	200	0.7	500	10 N	2000 G	50	1.5	10 N	20 N	5
EG1229J	10.00	0.30	0.30	.300	300	1.5	5000	10 N	2000 G	20	1.0 L	10 N	20 N	20
EG1229K	5.00	0.50	0.05 L	.150	30	1.5	3000	10 N	70	500	1.0 N	10 N	20 N	5 N
EG1229M	20.00 G	0.02 L	0.05 L	.002 L	150	300.0	10000 G	10 N	10 N	20 L	1.0 N	10 N	300	30
EG1229N	20.00 G	0.10	0.05 L	.002 L	1500	200.0	10000 G	10 N	10 N	20 L	1.0 N	10 N	200	70
STREAM-SEDIMENT SAMPLE - CHAIN LAKES - AREA 26														
EG1229L	15.00	3.00	5.00	.700	700	0.5 L	200 N	10 N	20	150	1.0 N	10 N	20 N	20
ROCK SAMPLES - NECKLACE VALLY - AREA 27														
EG0470A	1.00	0.10	0.70	.070	150	0.5 N	200 N	10 N	10	500	1.0 L	10 N	20 N	5 N
EG0470B	7.00	2.00	7.00	.300	1500	0.5 N	200 N	10 N	10	200	1.0 L	10 N	20 N	20

TABLE 18.—*Analytical results of anomalous samples from anomalous areas in the Alpine Lakes area and additions*—Continued

SAMPLE	S-CR	S-CU	S-LA	S-MO	S-NB	S-NI	S-PB	S-SB	S-SC	S-SN	S-SR	S-V	S-W	S-Y	S-ZN
STREAM-SEDIMENT SAMPLES = LAKE DOROTHY-CAMP ROBBER CREEK-FOSS RIVER = AREA 25															
EK0405	30	70	20 L	5 L	10 N	7	50	100 N	10	10 N	200	70	50 N	15	200 N
ES0207	20	70	20 L	5 N	10 N	15	150	100 N	15	10 N	300	70	50 N	15	200 N
ES0209	30	70	20 N	5 N	10 N	15	70	100 N	15	10 N	300	150	50 N	15	200 N
ES0210	30	150	20 N	5 N	10 N	15	30	100 N	15	10 N	300	150	50 N	20	200 N
ES0211	30	150	20 L	5 N	10 N	15	70	100 N	15	10 N	300	150	50 N	20	200 N
ES0215	50	150	20 L	5 N	10 N	15	30	100 N	20	10 N	300	150	50 N	30	200 N
ES0216	20	150	20 L	5 N	10 N	10	50	100 N	15	10 N	300	100	50 N	15	200 N
ET0273	10 L	70	20 N	5 N	10 N	5	30	100 N	10	10 N	200	70	50 N	15	200 N
ET0277	10 L	30	20 N	5 N	10 N	5	30	100 N	5	10 N	200	50	50 N	10	200 N
ET0279	10 L	30	20 N	5 N	10 N	7	70	100 N	5	10 N	100	20	50 N	10	200 N
ET0286	10 L	50	20 N	5 N	10 N	5 L	20	100 N	5	10 N	100 N	30	50 N	10 L	200 N
ET0290	20	30	20 N	10	10 N	7	20	100 N	15	10 N	200	70	50 N	20	200 N
ET0291	30	50	20 N	5 N	10 N	15	50	100 N	15	10 N	100	100	50 N	30	200 N
ET0293	30	50	20 N	5 N	10 N	10	30	100 N	10	10 N	100 L	70	50 N	20	200 N
ET0344	20	10	20 N	5 N	10 N	15	30	100 N	10	50	300	70	50 N	10	200 N
ET0349	20	20	20 N	5 N	10 N	5	50	100 N	7	10 N	150	50	50 N	10	200 N
ET0350	20	50	20 N	5 N	10 N	10	50	100 N	10	10 N	200	100	50 N	15	200 N
ROCK SAMPLES = CHAIN LAKES = AREA 26															
EG1229	70	30	20 N	15	20 N	5 L	300	100 N	20	30	100 N	150	50	20	200 L
EG1229A	30	30	20 N	5 L	20 N	5 L	300	100 N	20	20	100 N	150	50 N	15	200 L
EG1229B	10 L	20000 G	20 N	150	20 N	70	3000	10000 G	15	20	100 N	70	70	50	10000 G
EG1229C	20	20000 G	20 N	20	20 N	100	7000	7000	5 L	15	100 N	10	50 L	10	10000 G
EG1229D	70	300	50	5	20 N	5 N	300	1000	15	30	100 N	100	50	50	200 L
EG1229E	20	700	20 N	20	20 N	5	7000	1500	5	10 L	100 N	50	50	15	2000
EG1229F	20	70	20 N	5 N	20 N	7	150	100 N	15	10 L	200	100	50 N	20	200 L
EG1229G	10 L	20000 G	20 N	20	20 N	100	5000	5000	5 N	20	100 N	10	50 N	10	10000
EG1229H	50	150	20 N	15	20 N	5 L	100	100 L	30	20	100	200	300	100	200 L
EG1229J	15	200	20 L	70	20 L	7	700	150	30	50	100 L	200	50	50	700
EG1229K	10 L	500	20 N	5	20 L	5 N	1500	300	7	15	100 N	30	50 L	10 L	1000
EG1229M	10 L	20000 G	20 N	10	20 L	30	7000	10000 G	5 N	30	100 N	10 L	50 N	10 N	10000 G
EG1229N	10 L	20000 G	20 N	10	20 L	150	3000	2000	5 N	15	100 N	10 L	50 N	10 N	10000 G
STREAM-SEDIMENT SAMPLE = CHAIN LAKES = AREA 26															
EG1229L	30	70	30	5 L	20 L	20	70	100 N	15	10 N	300	200	50 N	10	200 N
ROCK SAMPLES = NECKLACE VALLY = AREA 27															
EG0470A	20	150	20 N	5 N	10 N	5	20	100 N	5 N	10 N	100 L	10	50 N	10	200 N
EG0470B	200	100	20 L	5 N	10 N	50	10	100 N	20	10 N	150	200	50 N	20	200 L

TABLE 18.—*Analytical results of anomalous samples from anomalous areas in the Alpine Lakes area and additions*—Continued

SAMPLE	S-ZR	AA-AU-P	AA-CU-P	AA-ZN-P	AA-AG-P	AA-CO-P	AA-NI-P	CM=CXHM	CM-SB	CM-MO	AS-PT	AS-PD	AS-RH	AS-RU	AS-IR	EU
STREAM-SEDIMENT SAMPLES = LAKE DOROTHY-CAMP ROBBER CREEK-FOSS RIVER = AREA 25																
EK0405	150	0.00 B	45	50	.0 B	0 B	0 B	1	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ES0207	150	0.00 B	70	45	.0 B	0 B	0 B	5	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ES0209	150	0.00 B	70	45	.0 B	0 B	0 B	2	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ES0210	150	0.00 B	130	35	.0 B	0 B	0 B	3	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ES0211	100	0.04	140	60	.0 B	0 B	0 B	3	0.5 L	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ES0215	150	0.00 B	170	50	.0 B	0 B	0 B	6	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ES0216	100	0.00 B	180	45	.0 B	0 B	0 B	5	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ET0273	70	0.02 N	85	40	.0 B	0 B	0 B	5	0.5 L	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ET0277	100	0.00 B	40	30	.0 B	0 B	0 B	20	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ET0279	30	0.00 B	55	30	.0 B	0 B	0 B	2	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ET0286	20	0.00 B	150	25	.0 B	0 B	0 B	12	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ET0290	100	0.00 B	30	50	.0 B	0 B	0 B	2	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ET0291	150	0.00 B	55	95	.0 B	0 B	0 B	3	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ET0293	70	0.00 B	65	110	.0 B	0 B	0 B	3	3.0	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ET0344	70	0.00 B	0 B	0 B	.0 B	0 B	0 B	2	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ET0349	100	0.00 B	25	25	.0 B	0 B	0 B	3	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ET0350	150	0.00 B	50	35	.0 B	0 B	0 B	2	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ROCK SAMPLES - CHAIN LAKES - AREA 26																
EG1229	300	0.05 N	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG1229A	50	0.05 N	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG1229B	500	1.50	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG1229C	10 N	0.35	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG1229D	200	0.05 N	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG1229E	70	2.00	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG1229F	150	0.05 N	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG1229G	10	0.10	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG1229H	150	0.05 N	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG1229J	300	0.00 B	0 B	550	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG1229K	30	0.00 B	0 B	1600	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG1229M	10 N	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG1229N	10 N	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
STREAM-SEDIMENT SAMPLE - CHAIN LAKES - AREA 26																
EG1229L	150	0.00 B	0 B	0 B	.0 B	0 B	0 B	1 L	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ROCK SAMPLES - NECKLACE VALLY - AREA 27																
EG0470A	50	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG0470B	70	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B

TABLE 18.—*Analytical results of anomalous samples from anomalous areas in the Alpine Lakes area and additions*—Continued

SAMPLE	S-FE%	S-MG%	S-CA%	S-TI%	S-MN	S-AG	S-AS	S-AU	S-B	S-BA	S-BE	S-BI	S-CD	S-CU
STREAM-SEDIMENT SAMPLES = NECKLACE VALLY = AREA 27														
EG0459	3,00	1,00	1,50	,500	1500	0,5 N	200 N	10 N	20	300	1,0	10 N	20 N	15
EG0464	5,00	1,00	2,00	,300	1500	0,5 N	200 N	10 N	100	700	1,5	10 N	20 N	20
EG0465	2,00	0,70	1,50	,500	500	0,5 N	200 N	10 N	10	500	1,5	10 N	20 N	7
EG0468	1,50	0,30	1,00	,100	1500	0,5 N	200 N	10 N	10 L	100	1,0	10 N	20 N	7
EG0478	3,00	1,00	2,00	,500	700	0,5 N	200 N	10 N	10	300	1,0	10 N	20 N	15
EG0678	7,00	1,50	2,00	,700	700	0,5 N	200 N	10 N	10	300	1,0	10 N	20 N	15
EK0407	5,00	1,00	1,50	,700	700	0,5 N	200 N	10 N	30	300	1,0	10 N	20 N	15
EK0408	2,00	1,00	1,50	,200	700	0,5 N	200 N	10 N	10	300	1,0	10 N	20 N	7
ES0123	2,00	0,50	0,70	,150	700	0,5 N	200 N	10 N	70	200	1,0	10 N	20 N	10
ES0125	3,00	1,50	5,00	,500	700	0,5 N	200 N	10 N	10 L	300	1,0	10 N	20 N	10
ES0128	2,00	0,50	1,50	,150	500	0,5 N	200 N	10 N	10	200	1,0	10 N	20 N	5
ROCK SAMPLE = LAKE DOROTHY = AREA 28														
EG2827A	3,00	0,70	1,50	,150	300	0,5 N	200 L	10 N	10	700	1,0 L	10 N	20 N	5
STREAM-SEDIMENT SAMPLES = LAKE DOROTHY = AREA 28														
EG2595	10,00	2,00	2,00	,700	1500	0,5 N	200 N	10 N	10	200	1,0 L	10 N	20 N	15
EG2596	15,00	2,00	3,00	,500	1500	0,5 N	200 N	10 N	100	300	1,0 L	10 N	20 N	15
EG2597	10,00	2,00	1,00	,300	1000	0,5 N	200 N	10 N	70	300	1,0	10 N	20 N	15
EG2610	5,00	2,00	2,00	,500	1000	0,5 N	200 N	10 N	15	200	1,0 L	10 N	20 N	7
EG2611	5,00	1,00	1,00	,200	3000	0,5 N	200 N	10 N	10	300	1,0	10 N	20 N	15
EG2612	5,00	1,00	1,00	,300	1000	0,5 N	200 N	10 N	10	300	1,0 N	10 N	20 N	7
EG2827	3,00	1,50	2,00	,300	700	0,5 N	200 N	10 N	15	300	1,0 L	10 N	20 N	7
ROCK SAMPLE = TAYLOR RIVER = AREA 29														
EG2694	2,00	1,00	0,20	,300	50	0,5 N	700	10 N	200	200	2,0	10 N	20 N	20
STREAM-SEDIMENT SAMPLES = TAYLOR RIVER = AREA 29														
EG2363	2,00	0,70	3,00	,200	300	0,5 N	200 N	10 N	15	150	1,0 L	10 N	20 N	7
EG2366	5,00	1,50	3,00	,300	1500	0,5	200 N	10 N	50	150	1,0 L	10 N	20 N	15
EG2370	7,00	1,50	2,00	,500	700	0,5 N	200 N	10 N	70	200	1,0 L	10 N	20 N	5
EG2371	5,00	1,50	1,50	,300	700	0,5	200 N	10 N	20	300	1,0	10 N	20 N	15
STREAM-SEDIMENT SAMPLES = BIG CREEK = AREA 30														
EG2720	7,00	2,00	2,00	,200	1000	0,5 N	200 N	10 N	200	300	1,0	10 L	20 N	15
EG2722	5,00	2,00	1,00	,300	700	0,5 N	200	10 N	10	300	1,0	10 L	20 N	15
EG2723	5,00	2,00	2,00	,300	700	0,5	300	10 N	10	200	1,0 L	10 N	20 N	7
EG2724	7,00	2,00	2,00	,300	1000	0,5 N	200 N	10 N	10	300	1,0	10 N	20 N	10

TABLE 18.—*Analytical results of anomalous samples from anomalous areas in the Alpine Lakes area and additions*—Continued

SAMPLE	S-CR	S-CU	S-LA	S-MO	S-NB	S-NI	S-PB	S-SB	S-SC	S-SN	S-SR	S-V	S-W	S-Y	S-ZN
STREAM-SEDIMENT SAMPLES = NECKLACE VALLY = AREA 27															
EG0459	20	10	20 N	5 N	10 N	7	50	100 N	10	10 N	300	70	50 N	10	200 N
EG0464	30	30	20	10	10 N	15	50	100 N	15	10 N	150	100	50 N	20	200 N
EG0465	20	10	20 N	10	10 N	5	20	100 N	10	10 N	300	70	50 N	15	200 N
EG0468	10 L	30	20 N	5 N	10 N	10	50	100 N	7	10 N	100	30	50 N	10	200 N
EG0478	20	10	20 N	5	10 N	10	20	100 N	15	10 N	500	50	50 N	15	200 N
EG0678	30	30	20 N	5 N	10 N	15	50	100 N	15	10 N	500	100	50 N	15	200 N
EK0407	50	30	20 L	5 N	10 N	15	50	100 N	15	10 N	300	150	50 N	15	200 N
EK0408	20	50	20 N	5 N	10 N	10	100	100 N	10	10 N	300	70	50 N	15	200 N
ES0123	20	30	20 N	5 N	10 N	5	15	100 N	7	10 N	100 L	70	50 N	10	200 N
ES0125	20	7	20 N	10	10 N	7	15	100 N	10	10 N	500	70	50 N	15	200 N
ES0128	20	7	20 N	15	10 N	5	10 L	100 N	7	10 N	150	70	50 N	10	200 N
ROCK SAMPLE = LAKE DOROTHY = AREA 28															
EG2827A	10	15	20 N	5 N	20 L	5	15	100 N	7	10 N	150	50	50 N	20	200 N
STREAM-SEDIMENT SAMPLES = LAKE DOROTHY = AREA 28															
EG2595	30	70	20	10	20 N	20	20	100 N	20	10 N	300	150	50 N	20	200 N
EG2596	70	100	20	5 N	20 N	20	50	100 N	30	10 N	150	200	50 N	50	200 N
EG2597	100	100	20	15	20 N	70	20	100 N	20	10 N	150	150	50 N	20	200 N
EG2610	15	20	20	7	20 N	10	20	100 N	15	10 N	300	100	50 L	15	200 N
EG2611	20	70	20	7	20 N	10	100	100 N	15	10 N	100	100	50 L	20	200 N
EG2612	50	70	30	7	20 N	10	10 L	100 N	15	10 N	150	100	50	20	200 N
EG2827	30	10	20 L	5 L	20 L	7	50	100 N	15	10 N	200	100	50 N	20	200 N
ROCK SAMPLE = TAYLOR RIVER = AREA 29															
EG2694	10 N	10	20 L	5 N	20 N	15	10 N	100 N	30	15	100 N	70	50 N	50	200 N
STREAM-SEDIMENT SAMPLES = TAYLOR RIVER = AREA 29															
EG2363	15	15	20	5 N	20 N	5	70	100 N	15	10 N	150	70	50 N	15	200 N
EG2366	20	30	20 N	5 N	20 N	10	70	100 N	15	10 N	200	100	50 N	15	200 N
EG2370	30	30	20 N	5	20 N	5	30	100 N	15	10 N	150	150	50 N	20	200 N
EG2371	70	30	20 N	5 L	20 N	30	15	100 N	15	10 N	150	100	50 N	15	200 N
STREAM-SEDIMENT SAMPLES = BIG CREEK = AREA 30															
EG2720	30	70	20	5 N	20 N	10	30	100 N	20	15	200	150	50 N	20	200 N
EG2722	50	200	20	7	20 N	20	10	100 N	30	10 N	150	150	70	20	200 N
EG2723	50	50	50	7	20 N	15	10 L	100 N	20	10 N	200	150	70	20	200 N
EG2724	50	30	20	5	20 N	15	10 L	100 N	30	10 N	200	200	70	20	200 N

TABLE 18.—*Analytical results of anomalous samples from anomalous areas in the Alpine Lakes area and additions*—Continued

SAMPLE	S-ZR	AA-AU-P	AA-CU-P	AA-ZN-P	AA-AG-P	AA-CO-P	AA-NI-P	CM=CXHM	CM-SB	CM-MO	AS-PT	AS-PD	AS-RH	AS-RU	AS-IR	EU
STREAM-SEDIMENT SAMPLES - NECKLACE VALLY - AREA 27																
EG0459	100	0,00 B	10	25	,0 B	0 B	0 B	8	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG0464	70	0,00 B	35	65	,0 B	0 B	0 B	3	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG0465	150	0,00 B	10	10	,0 B	0 B	0 B	1 L	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG0468	100	0,00 B	50	55	,0 B	0 B	0 B	8	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG0478	100	0,00 B	5	10	,0 B	0 B	0 B	1	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG0678	150	0,00 B	30	30	,0 B	0 B	0 B	2	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EK0407	200	0,00 B	15	45	,0 B	0 B	0 B	1	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EK0408	100	0,00 B	50	30	,0 B	0 B	0 B	3	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
ES0123	20	0,00 B	55	110	,0 B	0 B	0 B	1	3,0	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
ES0125	150	0,00 B	5	30	,0 B	0 B	0 B	2	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
ES0128	100	0,00 B	20	45	,0 B	0 B	0 B	1	0,0 B	35	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
ROCK SAMPLE = LAKE DOROTHY = AREA 28																
EG2827A	200	3,50	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
STREAM-SEDIMENT SAMPLES = LAKE DOROTHY = AREA 28																
EG2595	200	0,00 B	0 B	0 B	,0 B	0 B	0 B	1 N	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG2596	300	0,00 B	0 B	0 B	,0 B	0 B	0 B	1 L	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG2597	300	0,00 B	0 B	0 B	,0 B	0 B	0 B	1 N	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG2610	200	0,00 B	0 B	0 B	,0 B	0 B	0 B	1 L	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG2611	200	0,00 B	0 B	0 B	,0 B	0 B	0 B	2	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG2612	300	0,00 B	0 B	0 B	,0 B	0 B	0 B	1 N	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG2827	300	0,00 B	0 B	0 B	,0 B	0 B	0 B	1	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
ROCK SAMPLE - TAYLOR RIVER - AREA 29																
EG2694	300	0,00 B	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
STREAM-SEDIMENT SAMPLES - TAYLOR RIVER - AREA 29																
EG2363	30	0,00 B	0 B	0 B	,0 B	0 B	0 B	1	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG2366	100	0,00 B	0 B	0 B	,0 B	0 B	0 B	1	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG2370	150	0,00 B	0 B	0 B	,0 B	0 B	0 B	1	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG2371	150	0,00 B	0 B	0 B	,0 B	0 B	0 B	2	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
STREAM-SEDIMENT SAMPLES - BIG CREEK - AREA 30																
EG2720	70	0,00 B	0 B	0 B	,0 B	0 B	0 B	1 N	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG2722	150	0,00 B	0 B	0 B	,0 B	0 B	0 B	1 N	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG2723	300	0,00 B	0 B	0 B	,0 B	0 B	0 B	1 N	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG2724	300	0,00 B	0 B	0 B	,0 B	0 B	0 B	1 N	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B

TABLE 18.—*Analytical results of anomalous samples from anomalous areas in the Alpine Lakes area and additions*—Continued

SAMPLE	S-FE%	S-MG%	S-CA%	S-TI%	S-MN	S-AG	S-AS	S-AU	S-B	S-BA	S-BE	S-BI	S-CD	S-CO
ROCK SAMPLES - MARTEN LAKE - AREA 31														
FG2726	5.00	1.00	2.00	.300	700	0.5 N	200 N	10 N	10 L	300	1.0 L	10 N	20 N	7
EG2729A	7.00	1.00	2.00	.200	700	0.5 N	200 N	10 N	10 L	300	1.0 L	10 N	20 N	7
STREAM-SEDIMENT SAMPLES - MARTEN LAKE - AREA 31														
EG2728	10.00	2.00	2.00	.500	1000	0.5 N	200 N	10 N	10	300	1.0	10 N	20 N	10
EP2221	3.00	2.00	3.00	.150	300	0.5 N	200 N	10 N	10	200	1.0 L	10 N	20 N	7
EP2222	5.00	1.50	3.00	.300	1500	0.5 N	200 N	10 N	20	300	1.0 L	10 N	20 N	15
ROCK SAMPLE - LAKE ISABELLA - AREA 32														
EC2119	10.00	3.00	2.00	.500	2000	0.5 N	200 N	10 N	10 L	150	1.0	10 N	20 N	10
STREAM-SEDIMENT SAMPLES - LAKE ISABELLA - AREA 32														
EC2105	7.00	0.50	1.00	.200	150	0.5 N	200 N	10 N	10 L	100	1.0	10 N	20 N	5
EC2107	7.00	1.00	2.00	.300	1000	0.5	200 N	10 N	10	200	1.0	10 N	20 N	15
EC2108	7.00	1.00	2.00	.300	500	0.5 N	200 N	10 N	10	300	1.0	10 N	20 N	7
EC2112	5.00	1.00	1.00	.300	300	0.5 N	200 N	10 N	10 L	300	1.0 L	10 N	20 N	7
EC2113	3.00	0.70	2.00	.300	500	0.5 N	200 N	10 N	50	200	1.0	10 N	20 N	7
ROCK SAMPLES - SUNDAY CREEK - AREA 33														
EG2535	7.00	1.50	3.00	.300	1000	10.0	300	10 N	10 L	200	1.0 L	15	20 N	15
EG2536	7.00	2.00	1.00	.300	700	0.5 N	200 N	10 N	10 L	150	1.0 N	10 N	20 N	15
EG2536A	5.00	2.00	2.00	.300	300	0.7	200 N	10 N	500	200	1.0 L	10 N	20 N	5 L
STREAM-SEDIMENT SAMPLES - SUNDAY CREEK - AREA 33														
EC2115	5.00	2.00	5.00	.300	1500	0.7	200 N	10 N	30	200	1.0 L	10 N	20 N	15
EC2116	10.00	1.00	2.00	.500	700	0.5 N	200 N	10 N	10 L	150	1.0	10 N	20 N	10
EG2538	5.00	1.50	2.00	.300	700	1.5	500	10 N	30	300	1.5	10 N	20 N	20
EG2766	5.00	1.00	1.50	.300	1500	0.5 N	200 N	10 N	10	300	1.0	10 N	20 N	15
ROCK SAMPLES - GOUGING LAKE - AREA 34														
EC2093	7.00	2.00	2.00	.300	500	0.5 N	200 N	10 N	10 L	300	1.0 L	10 N	20 N	10
EC2097A	15.00	0.50	0.07	.200	70	5.0	10000 G	10 N	100	500	1.0 N	700	20 N	5 N
EC2098	7.00	2.00	2.00	.300	1500	0.5 N	200 N	10 N	10	500	1.0 L	10 N	20 N	7
STREAM-SEDIMENT SAMPLES - GOUGING LAKE - AREA 34														
EC2078	3.00	0.70	1.50	.150	700	0.5 L	200 N	10 N	70	150	1.5	10 N	20 N	7
EC2080	7.00	1.00	1.00	.300	700	0.5 N	200 N	10 N	10	200	1.0	10 N	20 N	10
EC2096	7.00	1.00	1.00	.300	700	0.5 N	200 N	10 N	20	200	1.0 L	10 N	20 N	7

TABLE 18.—*Analytical results of anomalous samples from anomalous areas in the Alpine Lakes area and additions*—Continued

SAMPLE	S-CR	S-CU	S-LA	S-MO	S-NB	S-NI	S-PB	S-SB	S-SC	S-SN	S-SR	S-V	S-W	S-Y	S-ZN
					ROCK SAMPLES - MARTEN LAKE - AREA 31										
EG2726	10 N	100	20	5	20 N	10	10 L	100 N	10	10 N	150	100	50 N	15	200 N
EG2729A	10 N	300	20	5 N	20 N	10	10 L	100 N	10	10 N	200	100	50 N	15	200 N
					STREAM-SEDIMENT SAMPLES - MARTEN LAKE - AREA 31										
EG2728	30	70	20	5	20 N	15	15	100 N	30	10 N	200	150	50 N	30	200 N
EP2221	10	15	30	10	20 L	5 L	15	100 N	10	10 N	150	50	50 N	15	200 N
EP2222	30	70	70	5 L	20 N	7	30	100 N	20	10 N	150	150	50 N	30	200 N
					ROCK SAMPLE - LAKE ISABELLA - AREA 32										
EC2119	30	10	20	5 N	20 N	30	10 L	100 N	20	10 N	200	200	50 N	50	200
					STREAM-SEDIMENT SAMPLES - LAKE ISABELLA - AREA 32										
EC2105	15	100	20	7	20 N	5	10 L	100 N	10	10 N	100	70	50 N	15	200 N
EC2107	30	70	30	5 N	20 N	10	70	100 N	20	10 N	150	150	50 L	30	200 N
EC2108	30	70	20	7	20 N	10	20	100 N	15	10 N	150	150	50 L	20	200 N
EC2112	10 N	30	20	5 N	20 N	7	50	100 N	15	10 N	150	150	50 N	15	200 N
EC2113	30	20	20	5 N	20 L	15	50	100 N	15	10 N	200	100	50 N	15	200 N
					ROCK SAMPLES - SUNDAY CREEK - AREA 33										
EG2535	10 N	150	20 N	5 L	20 L	7	200	100 N	10	10 N	300	100	50 N	15	300
EG2536	150	100	20 N	5 N	20 L	70	10	100 N	15	10 N	200	150	50 N	15	200 N
EG2536A	150	150	20 N	5 N	20 L	5	70	100 N	20	15	300	200	50 N	15	200 N
					STREAM-SEDIMENT SAMPLES - SUNDAY CREEK - AREA 33										
EC2115	30	70	20 L	7	20 L	20	100	100 N	15	10 N	500	150	50 N	20	200 L
EC2116	30	70	50	5 N	20 N	30	50	100 N	15	10 N	150	100	50 N	20	200 L
EG2538	70	200	30	7	20 L	50	100	100 N	15	10 N	100	100	70	20	300
EG2766	70	30	20	5 L	20 L	30	30	100 N	15	10 N	150	100	50 N	20	200 N
					ROCK SAMPLES - GOUGING LAKE - AREA 34										
EC2093	30	200	20 L	5 N	20 N	10	10 L	100 N	20	10 N	150	100	50 N	20	200 N
EC2097A	10 N	1000	20 L	70	20 N	5	150	100 N	7	15	100 N	70	50	10	200 N
EC2098	15	50	20 L	5 N	20 N	10	30	100 N	15	10 N	150	150	50 N	15	700
					STREAM-SEDIMENT SAMPLES - GOUGING LAKE - AREA 34										
EC2078	15	15	30	5 L	20 L	10	150	100 N	10	10 N	150	70	50 N	15	200 N
EC2080	10 N	30	20	5 N	20 N	10	70	100 N	10	10 N	150	100	50 N	15	200 N
EC2096	20	70	20	5 N	20 N	10	70	100 N	15	10 N	150	150	50 N	15	200 N

TABLE 18.—*Analytical results of anomalous samples from anomalous areas in the Alpine Lakes area and additions*—Continued

SAMPLE	S-ZR	AA-AU-P	AA-CU-P	AA-ZN-P	AA-AG-P	AA-CO-P	AA-NI-P	CM=CXHM	CM-SB	CM-MO	AS-PT	AS-PD	AS-RH	AS-RU	AS-IR	EU
ROCK SAMPLES - MARTEN LAKE - AREA 31																
EG2726	70	0,00 B	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG2729A	50	0,00 B	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
STREAM-SEDIMENT SAMPLES - MARTEN LAKE - AREA 31																
EG2728	300	0,00 B	0 B	0 B	,0 B	0 B	0 B	1 N	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EP2221	70	0,00 B	0 B	0 B	,0 B	0 B	0 B	1 N	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EP2222	150	0,00 B	70	45	,0 B	0 B	0 B	10	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
ROCK SAMPLE - LAKE ISABELLA - AREA 32																
EC2119	150	0,00 B	0 B	50	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
STREAM-SEDIMENT SAMPLES - LAKE ISABELLA - AREA 32																
EC2105	70	0,00 B	0 B	0 B	,0 B	0 B	0 B	1 N	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EC2107	300	0,00 B	0 B	0 B	,0 B	0 B	0 B	1 L	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EC2108	300	0,00 B	0 B	0 B	,0 B	0 B	0 B	1 N	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EC2112	100	0,00 B	0 B	0 B	,0 B	0 B	0 B	1 N	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EC2113	70	0,00 B	0 B	0 B	,0 B	0 B	0 B	1	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
ROCK SAMPLES - SUNDAY CREEK - AREA 33																
EG2535	150	0,00 B	0 B	190	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG2536	70	0,00 B	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG2536A	150	0,00 B	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
STREAM-SEDIMENT SAMPLES - SUNDAY CREEK - AREA 33																
EC2115	100	0,00 B	80	140	,0 B	0 B	0 B	16	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EC2116	100	0,00 B	0 B	0 B	,0 B	0 B	0 B	1 L	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG2538	200	0,00 B	0 B	0 B	,0 B	0 B	0 B	1 N	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG2766	300	0,00 B	50	140	,0 B	0 B	0 B	4	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
ROCK SAMPLES - GOUGING LAKE - AREA 34																
EC2093	70	0,00 B	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EC2097A	30	0,00 B	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EC2098	70	0,00 B	0 B	800	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
STREAM-SEDIMENT SAMPLES - GOUGING LAKE - AREA 34																
EC2078	70	0,00 B	0 B	0 B	,0 B	0 B	0 B	1 L	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EC2080	100	0,00 B	0 B	0 B	,0 B	0 B	0 B	1 N	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EC2096	150	0,00 B	0 B	0 B	,0 B	0 B	0 B	1 L	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B

TABLE 18.—*Analytical results of anomalous samples from anomalous areas in the Alpine Lakes area and additions*—Continued

SAMPLE	S-FE%	S-MG%	S-CA%	S-TI%	S-MN	S-AG	S-AS	S-AU	S-B	S-BA	S-BE	S-BI	S-CD	S-CO
ROCK SAMPLES - LENNOX CREEK - AREA 35														
EG2518A	0,20	0,03	0,05 L	.007	15	0,5 N	200 N	10 N	10 N	30	1,0 N	10 N	20 N	5 N
EG2519A	0,05 L	0,02 L	0,05 L	.005	10 L	0,5 N	200 N	10 N	10 N	20	1,0 N	10 N	20 N	5 N
EG2519B	5,00	1,50	3,00	.200	500	0,5 N	200 N	10 N	10 L	700	1,0 L	10 N	20 N	5
EG2521	5,00	1,50	3,00	.200	300	0,5 N	200 N	10 N	10 L	500	1,0 L	10 N	20 N	5
EG2524	5,00	0,70	1,50	.200	700	30,0	200 N	10 N	50	300	1,0 L	10 N	20 N	7
EG2524A	7,00	1,50	7,00	.100	1000	20,0	1500	10 N	15	200	1,0 N	20	20 N	15
EG2524B	3,00	0,70	2,00	.200	100	0,5 N	300	10 N	20	500	1,0 N	10 L	20 N	5 L
EG2529	10,00	5,00	5,00	.500	1000	0,5 N	200 N	10 N	10 L	150	1,0 N	10 N	20 N	30
EG2738	15,00	1,00	0,05 L	.300	1500	5,0	1500	10 N	70	500	1,0	10 N	20 N	5
EG2738A	15,00	0,20	0,05 L	.100	150	50,0	10000 G	10 N	70	100	1,0 L	150	20 N	5 N
EG2738B	10,00	2,00	2,00	.300	500	0,5	1000	10 N	20	300	1,0 L	10 N	20 N	15
EG2761	2,00	0,50	1,50	.050	5000 G	7,0	10000	10 N	30	20 L	1,0 L	10 N	20 N	5 N
EG2761A	3,00	0,70	1,00	.150	5000 G	20,0	3000	10 N	70	70	1,0 L	10 N	20 N	5
EG2761B	3,00	0,70	3,00	.030	5000 G	300,0	10000	10 N	30	300	1,0 L	10 N	20 N	5 N
EG2762	3,00	0,15	0,05 L	.030	150	1,5	200 N	10 N	30	200	1,0 L	10 N	20 N	7
EG2762A	3,00	0,15	0,05 L	.030	70	1,5	200 N	10 N	50	200	1,0 L	15	20 N	7
EG2762B	3,00	0,10	0,05 L	.030	30	20,0	3000	10 N	50	150	1,0 L	30	20 N	7
EG2763	3,00	0,15	0,05 L	.030	15	0,5 L	200 N	10 N	30	150	1,0 L	10 N	20 N	5 L
EG2763A	0,70	0,10	0,30	.050	30	0,5 N	200 N	10 N	10 L	300	1,0	10 N	20 N	5 N
EP2368A	10,00	3,00	5,00	.300	1500	1,0	200 N	10 N	10 L	300	1,0 N	10 N	20 N	10
EP2368E	15,00	3,00	5,00	.700	1500	0,5 N	200 N	10 N	10 L	200	1,0 N	10 N	20 N	30
EP2368F	20,00	3,00	1,50	.100	5000	0,5 L	200 N	10 N	10 N	30	1,0 N	10 N	20 N	30
EP2368G	20,00	1,00	1,50	.070	1000	7,0	200 N	10 N	10 N	20 L	1,0 N	10 N	20 N	300
EP2368H	15,00	3,00	2,00	.200	3000	0,5 N	200 N	10 N	10 N	300	1,0 N	10 N	20 N	15
EP2373	10,00	3,00	5,00	.500	700	0,5 N	200 N	10 N	10 L	150	1,0 N	10 N	20 N	20
STREAM-SEDIMENT SAMPLES - LENNOX CREEK - AREA 35														
EC2124	5,00	1,00	1,00	.200	300	0,5 N	300	10 N	20	200	1,0	10 N	20 N	7
EG2513	3,00	1,00	1,50	.300	500	0,5 N	200 N	10 N	10	200	1,0 L	10 N	20 N	7
EG2514	5,00	1,50	1,50	.500	500	0,5 N	200 N	10 N	10	200	1,0 L	10	20 N	7
EG2518	3,00	1,00	1,50	.300	500	0,5 N	200 N	10 N	15	300	1,0 L	10 N	20 N	7
EG2519	5,00	1,00	0,70	.300	700	0,5 L	200 N	10 N	50	300	1,5	10 N	20 N	7
EG2520	7,00	1,50	2,00	.300	700	0,5 N	200 N	10 N	10	300	1,0	10 N	20 N	7
EG2522	5,00	1,50	2,00	.500	700	0,5 N	200 N	10 N	15	200	1,0	10 N	20 N	7
EG2523	5,00	1,00	2,00	.300	700	0,5 N	200 N	10 N	10	300	1,0	10 N	20 N	7
EG2528	5,00	1,50	3,00	.500	700	0,5 N	200 N	10 N	10	200	1,0 L	10 N	20 N	7
EG2531	5,00	1,50	3,00	.500	700	0,5 N	200 N	10 N	10 L	200	1,0 N	10 N	20 N	7
EG2532	7,00	2,00	3,00	.500	700	0,5 N	200 N	10 N	15	200	1,0 L	10 N	20 N	7
EG2533	7,00	2,00	5,00	.500	1000	0,5 N	200 N	10 N	10	100	1,0 N	10 N	20 N	15
EG2534	7,00	1,50	2,00	.500	700	1,5	1500	10 N	30	150	1,0 L	10 N	20 N	20
EG2731	1,50	0,30	1,00	.100	300	1,5	200 N	10 N	30	150	1,5	10 N	20 N	7

TABLE 18.—*Analytical results of anomalous samples from anomalous areas in the Alpine Lakes area and additions*—Continued

SAMPLE	S-CR	S-CU	S-LA	S-MO	S-NB	S-NI	S-PB	S-SB	S-SC	S-SN	S-SR	S-V	S-W	S-Y	S-ZN
ROCK SAMPLES - LENNOX CREEK - AREA 35															
EG2518A	10 N	5 L	20 N	700	20 N	5 N	10 N	100 N	5 N	10 N	100 N	10 L	50 N	10 N	200 N
EG2519A	10 N	5	20 N	1000	20 N	5 N	10 N	100 N	5 N	10 N	100 N	10 L	50 N	10 N	200 N
EG2519B	15	70	20	15	20 L	5 L	30	100 N	10	10 N	200	70	50 N	10	200 N
EG2521	15	200	20 L	15	20 L	5 L	10	100 N	10	10 N	150	70	50 N	15	200 N
EG2524	20	10000	20 L	5 L	20 L	5 N	30	100 N	10	30	100 N	70	50 N	15	1500
EG2524A	10 L	7000	20 L	300	20 L	7	100	100 N	5 N	30	100 N	20	50 N	15	300
EG2524B	15	150	20 L	5	20 L	5 L	10	100 N	10	30	100 N	70	70	10 L	200 N
EG2529	300	150	20 N	70	20 L	70	10 N	100 N	20	10 N	300	200	50 N	15	200 N
EG2738	20	150	20 L	5 N	20 N	5 N	700	100 N	15	10 N	100 N	200	50 N	20	700
EG2738A	10 N	1000	20 L	5	20 N	5 N	700	100 L	10	30	100 N	100	50 N	10 N	200 N
EG2738B	30	30	30	5 N	20 N	10	20	100 N	20	10 N	150	200	50 N	30	200 N
EG2761	10 N	7	20 N	5 N	20 L	5 L	200	500	5 N	10 N	100 N	20	50 N	10 N	500
EG2761A	15	30	20 N	30	20 L	5	20	150	7	15	100 N	50	50 N	10 N	200 N
EG2761B	10 N	700	20 N	5 N	20 L	5 L	1500	3000	5 N	300	100 N	30	50 N	10 N	7000
EG2762	10 N	70	20 N	7	20 L	5	10	100 N	5 N	70	100 N	10 L	50 N	10 L	200 N
EG2762A	10 N	150	20 N	5 N	20 L	5	30	100 N	5 N	50	100 N	10 L	50 N	10 N	200 N
EG2762B	10 N	15000	20 N	7	20 L	5	70	100 L	5 N	15	100 N	10 L	50 N	10 N	200 N
EG2763	10 N	70	20 N	5 N	20 L	5	10 N	100 L	5 N	50	100 N	10	50 N	10 N	200 N
EG2763A	10 N	20	20 N	7	20 L	5 L	15	100 N	5 L	10 N	100 L	10 L	50 N	10 L	200 N
EP2368A	10 L	15	20 L	5 N	20 L	5 L	10	100 N	20	10 N	300	200	50 N	15	200 N
EP2368E	15	200	20 N	5 L	20 L	15	70	100 N	30	10 N	300	200	50 N	20	200 N
EP2368F	10	500	20 N	5 L	20 L	5	10 L	100 N	30	10 N	100 L	200	50 N	30	2000
EP2368G	10 N	3000	20 N	5 L	20 L	70	10 N	100 N	10	10 N	100	70	50 N	15	500
EP2368H	10 L	15	20 N	5 L	20 L	5	10	100 N	20	10 N	150	150	50 N	20	500
EP2373	70	150	20 N	5 N	20 L	30	10 N	100 N	20	10 N	300	200	50 N	15	200 N
STREAM-SEDIMENT SAMPLES - LENNOX CREEK - AREA 35															
EC2124	10 N	70	20	5 N	20 N	7	30	100 N	7	10 N	150	70	50 L	10	200 N
EG2513	20	70	20 L	5	20 L	10	20	100 N	10	10 N	100	70	50 N	10	200 N
EG2514	20	50	50	5	20 L	5 L	10	100 N	15	10 N	150	100	50 N	15	200 N
EG2518	20	70	20 L	15	20 L	5 L	20	100 N	10	10 N	100	70	50 L	10	200 N
EG2519	20	150	20 L	20	20 L	5	20	100 N	10	10 L	100	100	50 L	20	200 N
EG2520	20	70	20 L	5	20 L	5	20	100 N	15	10 N	200	100	50 L	15	200 N
EG2522	15	30	20 L	30	20 L	5	15	100 N	15	10 N	200	100	50 L	20	200 N
EG2523	20	70	20 L	30	20 L	5	30	100 N	10	10 N	200	100	50 N	15	200 N
EG2528	15	7	20 L	5 L	20 L	7	10	100 N	15	10 N	200	70	100	15	200 N
EG2531	30	20	20 L	15	20 L	7	10	100 N	20	10 N	200	150	50 N	20	200 N
EG2532	30	30	70	7	20 L	15	10	100 N	20	10 N	200	150	50 N	20	200 N
EG2533	70	50	20 L	5 L	20 L	30	70	100 N	20	10 N	200	150	50 N	15	200 L
EG2534	30	150	20	5 L	20 L	30	150	100 N	15	10 N	150	100	50 N	20	200
EG2731	15	300	20 N	5 L	20 N	5	300	100 N	7	10 N	150	30	50 N	10	200 N

TABLE 18.—*Analytical results of anomalous samples from anomalous areas in the Alpine Lakes area and additions*—Continued

SAMPLE	S-ZR	AA-AU-P	AA-CU-P	AA-ZN-P	AA-AG-P	AA-CO-P	AA-NI-P	CM=CXHM	CM-SB	CM-MO	AS-PT	AS-PD	AS-RH	AS-RU	AS-IR	EU
ROCK SAMPLES - LENNOX CREEK - AREA 35																
EG2518A	10 N	0.05 L	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2519A	10 N	0.05 N	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2519B	100	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2521	100	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2524	50	0.00 B	0 B	1400	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2524A	30	0.00 B	0 B	400	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2524B	150	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2529	50	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2738	150	0.00 B	0 B	650	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2738A	50	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2738B	70	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2761	10 L	0.30	0 B	85	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2761A	70	0.50	0 B	130	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2761B	10 L	0.80	0 B	10000	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2762	50	0.05 L	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2762A	70	0.05 L	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2762B	70	0.05	0 B	160	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2763	30	0.05	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2763A	30	0.05 N	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2368A	10 L	0.05 N	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2368E	50	0.00 B	210	180	.0 B	0 B	0 B	10	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2368F	10 N	0.05 L	0 B	1800	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2368G	10 N	0.20	0 B	320	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2368H	50	0.05 N	0 B	180	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2373	50	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
STREAM-SEDIMENT SAMPLES - LENNOX CREEK - AREA 35																
EC2124	70	0.00 B	0 B	0 B	.0 B	0 B	0 B	1 L	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2513	70	0.00 B	0 B	0 B	.0 B	0 B	0 B	1 L	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2514	300	0.00 B	0 B	0 B	.0 B	0 B	0 B	1	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2518	70	0.00 B	0 B	0 B	.0 B	0 B	0 B	1	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2519	300	0.00 B	220	110	.0 B	0 B	0 B	6	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2520	100	0.00 B	0 B	0 B	.0 B	0 B	0 B	1	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2522	150	0.00 B	0 B	0 B	.0 B	0 B	0 B	1	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2523	100	0.00 B	0 B	0 B	.0 B	0 B	0 B	1	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2528	300	0.00 B	0 B	0 B	.0 B	0 B	0 B	1 N	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2531	700	0.00 B	0 B	0 B	.0 B	0 B	0 B	1 N	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2532	300	0.00 B	0 B	0 B	.0 B	0 B	0 B	1 N	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2533	100	0.00 B	95	200	.0 B	0 B	0 B	6	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2534	100	0.00 B	220	390	.0 B	0 B	0 B	35	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2731	100	0.00 B	400	25	.0 B	0 B	0 B	12	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B

TABLE 18.—*Analytical results of anomalous samples from anomalous areas in the Alpine Lakes area and additions*—Continued

SAMPLE	S-FE%	S-MG%	S-CA%	S-TI%	S-MN	S-AG	S-AS	S-AU	S-B	S-BA	S-BE	S-BI	S-CD	S-CO
STREAM-SEDIMENT SAMPLES = LENNOX CREEK = AREA 35														
EG2736	7,00	3,00	2,00	,500	3000	0,5 N	200 N	10 N	10 L	200	1,0 L	10 N	20 N	20
EG2737	7,00	5,00	1,00	,300	700	0,5 N	200 N	10 N	10	500	1,0 L	10 N	20 N	20
EG2740	5,00	0,70	1,00	,300	300	0,5 N	200 N	10 N	10	300	2,0	10 N	20 N	7
EG2746	3,00	1,00	2,00	,700	700	0,7	200 N	10 N	20	300	2,0	10 N	20 N	10
EG2755	3,00	0,70	1,50	,200	700	3,0	200 N	10 N	20	300	1,0	10 N	20 N	7
EG2756	3,00	0,70	1,50	,300	1000	0,7	200 N	10 N	30	300	1,5	10 N	20 N	7
EG2757	3,00	1,00	2,00	,300	700	0,5 L	200 N	10 N	20	300	1,5	10 N	20 N	7
EG2758	3,00	0,70	1,50	,300	1000	0,5 N	200 N	10 N	15	300	1,0	10 N	20 N	7
EG2760	5,00	1,50	2,00	,500	700	1,0	200 N	10 N	20	300	1,0	10 N	20 N	7
EG2769	3,00	1,50	2,00	,300	700	0,5 N	300	10 N	15	300	1,0	10 N	20 N	7
EP2326	7,00	2,00	1,50	,500	700	0,5 N	200 N	10 N	10	300	1,0 L	10 N	20 N	7
EP2332	5,00	2,00	2,00	,200	700	0,5	200 N	10 N	10	300	1,0	10 N	20 N	7
EP2333	3,00	1,00	1,50	,300	500	3,0	200 N	10 N	15	300	1,0	10 N	20 N	5 L
EP2336	7,00	1,50	2,00	,300	700	0,5 N	200 N	10 N	10	300	1,0 L	10 N	20 N	10
Ep2342	20,00	0,70	1,50	,150	5000	0,5 N	700	10 N	20	300	1,0 L	10 N	20 N	20
EP2343	5,00	1,50	2,00	,700	700	1,5	200 N	10 N	15	300	1,0 L	10 N	20 N	7
EP2346	5,00	2,00	3,00	,700	500	0,5 N	200 N	10 N	10	300	1,0 N	10 N	20 N	7
EP2347	5,00	1,00	1,50	,300	700	0,7	200 N	10 N	10	300	1,0 L	10 N	20 N	7
EP2349	7,00	1,50	1,50	,700	1000	0,5 N	200 N	10 N	10	150	1,0 L	10 N	20 N	10
EP2352	3,00	1,50	2,00	,300	700	0,5 N	200 N	10 N	20	300	1,0 L	10 N	20 N	10
EP2353	5,00	2,00	2,00	,500	500	0,5	200	10 N	30	300	1,0	10 N	20 N	10
EP2354	5,00	1,50	3,00	,300	700	0,5 N	200 N	10 N	30	200	1,0 L	10 N	20 N	7
Ep2355	5,00	1,00	2,00	,300	700	0,5 N	200 N	10 N	10	150	1,0	10 N	20 N	10
Ep2359	5,00	1,00	1,00	,500	500	0,5 N	200 N	10 N	15	150	1,0 L	10 N	20 N	5
EP2365	5,00	1,00	1,50	,500	500	0,5 N	200 N	10 N	10 L	150	1,0 N	10 N	20 N	7
EP2366	7,00	1,50	3,00	,500	700	0,5 N	200 N	10 N	10 L	200	1,0 L	10 N	20 N	7
EP2368	10,00	1,50	2,00	,300	1000	0,5 N	500	10 N	10 L	150	1,0 N	10 N	20 N	15
EP2375	5,00	1,50	1,50	,300	500	0,5 N	200 N	10 N	15	300	1,0 L	10 N	20 N	7
Ep2377	5,00	1,00	3,00	,200	300	0,5 N	300	10 N	10 L	300	1,0	10 N	20 N	5
EP2378	7,00	1,50	3,00	,500	500	0,5 N	200 N	10 N	10	200	1,0	10 N	20 N	7
EP2379	5,00	1,00	2,00	,300	300	0,5 N	200	10 N	10	200	1,0	10 N	20 N	7
EP2381	5,00	2,00	3,00	,500	700	0,5 N	200 N	10 N	10	300	1,0 L	10 N	20 N	15
Ep2382	7,00	1,50	2,00	,500	700	0,5	300	10 N	15	200	1,0 L	10 N	20 N	7
EP2383	3,00	1,50	1,50	,300	500	0,5	200 N	10 N	10	70	1,0 L	10 N	20 N	7
ROCK SAMPLE = EAST FORK MILLER RIVER = AREA 36														
EG2601	3,00	0,10	2,00	,200	500	0,5 N	200 N	10 N	200	20	1,0 N	10 N	20 N	5 N
STREAM-SEDIMENT SAMPLES = EAST FORK MILLER RIVER = AREA 36														
EG2602	10,00	2,00	2,00	,500	2000	0,5 N	200 N	10 N	100	300	1,0 L	10 N	20 N	20

TABLE 18.—*Analytical results of anomalous samples from anomalous areas in the Alpine Lakes area and additions*—Continued

SAMPLE	S-CR	S-CU	S-LA	S-MO	S-NB	S-NI	S-PB	S-SB	S-SC	S-SN	S-SR	S-V	S-W	S-Y	S-ZN
STREAM-SEDIMENT SAMPLES = LENNOX CREEK = AREA 35															
EG2736	30	30	20	5	20 N	30	30	100 N	20	10 N	300	100	50 N	15	200 N
EG2737	150	100	20	5 N	20 N	150	30	100 N	30	10 N	200	200	50 N	30	200 L
EG2740	10 N	30	20	5 N	20 N	7	70	100 N	10	10 N	200	100	50 N	15	200 N
EG2746	30	100	20 L	10	20 L	15	300	100 N	15	10 N	300	150	50 N	15	200 N
EG2755	10	15	20 L	5 N	20 L	5	30	100 N	7	10 N	200	50	50 N	10	200 N
EG2756	15	30	20	5	20 L	7	70	100 N	10	10 N	200	70	50 N	15	200 N
EG2757	20	15	50	5	20 L	7	30	100 N	10	10 N	300	70	50 N	15	200 N
EG2758	15	50	20 L	5 L	20 L	5	50	100 N	10	10 N	200	70	50 N	15	200 N
EG2760	30	30	20 N	7	20 L	10	50	100 N	15	10 N	300	100	50 N	15	200 N
EG2769	15	10	20	5 L	20 L	15	15	100 N	15	10 N	200	70	50 N	15	200 N
EP2326	30	30	20 L	5 L	20 L	7	100	100 N	15	10 N	150	150	50 N	15	200 N
EP2332	20	20	20	15	20 L	10	10	100 N	15	10 N	150	100	50 N	10	200 N
EP2333	15	10	50	5 L	20 N	5 L	10 L	100 N	10	10 N	100	70	50 N	15	200 N
EP2336	30	500	20 L	10	20 L	20	10	100 N	15	10 N	200	100	50 N	15	200 N
EP2342	15	30	20 N	5	20 L	5	20	100 N	10	10 N	150	70	50 N	15	200
EP2343	15	10	20 L	5 N	20 L	5	15	100 N	15	10 N	200	70	50 N	15	200 N
EP2346	150	20	20 L	10	20 L	30	15	100 N	15	10 N	300	100	50 N	15	200 N
EP2347	20	15	20 L	15	20 L	5 L	30	100 N	10	10 N	150	70	50 N	15	200 N
EP2349	30	20	20	15	20 L	15	15	100 N	15	10 N	200	150	50 N	15	200 N
EP2352	150	30	30	5	20 L	20	20	100 N	15	10 N	300	100	50 N	15	200 N
EP2353	150	30	20 N	30	20 L	70	30	100 N	20	10 N	150	150	70	20	200 N
EP2354	150	15	20 L	5	20 L	70	15	100 N	15	10 N	200	100	50 N	20	200 N
EP2355	50	15	20 L	15	20 L	30	10	100 N	10	10 N	150	100	50 N	15	200 N
EP2358	30	15	20 L	10	20 L	20	10 L	100 N	10	10 N	150	100	50 N	10	200 N
EP2365	200	15	20 L	7	20 L	15	10	100 N	10	10 N	150	100	50 N	10	200 N
EP2366	30	15	20	5 L	20 L	10	10	100 N	15	10 N	200	100	100	20	200 N
EP2368	20	500	20 L	7	20 L	10	70	100 N	15	10 N	150	150	50 N	10	1000
EP2375	70	30	20 L	10	20 L	30	10	100 N	10	10 N	200	70	50 N	10	200 N
EP2377	20	30	20	5	20 L	7	20	100 N	10	10 N	150	100	50 N	10	200 N
EP2378	20	10	20 L	5	20 L	7	20	100 N	15	10 N	200	150	50 N	15	200 N
EP2379	30	50	20 L	5 L	20 L	10	20	100 N	15	10 N	150	100	50 N	15	200 N
EP2381	100	30	20 L	5	20 L	30	20	100 N	20	10 N	300	100	50 N	20	200 N
EP2382	30	15	20 L	5 L	20 L	15	30	100 N	15	10 N	200	150	50 N	15	200 N
EP2383	30	70	20 L	5 N	20 L	20	20	100 N	15	10 N	100	100	50 N	10	200 N
ROCK SAMPLE - EAST FORK MILLER RIVER - AREA 36															
EG2601	10 N	10	20	5 N	20 N	5 L	10 L	100	15	10 N	150	70	50 N	15	200 N
STREAM-SEDIMENT SAMPLES - EAST FORK MILLER RIVER - AREA 36															
EG2602	70	70	20	5 N	20 N	20	50	100 N	20	10 N	150	200	50 N	20	200 N

TABLE 18.—*Analytical results of anomalous samples from anomalous areas in the Alpine Lakes area and additions*—Continued

SAMPLE	S-ZR	AA-AU-P	AA-CU-P	AA-ZN-P	AA-AG-P	AA-CO-P	AA-NI-P	CM=CXHM	CM-SB	CM-MO	AS-PT	AS-PD	AS-RH	AS-RU	AS-IR	EU
STREAM-SEDIMENT SAMPLES = LENNOX CREEK = AREA 35																
EG2736	70	0.00 B	0 B	0 B	.0 B	0 B	0 B	1 N	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2737	70	0.00 B	0 B	0 B	.0 B	0 B	0 B	1 N	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2740	200	0.00 B	0 B	0 B	.0 B	0 B	0 B	1 N	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2746	100	0.00 B	0 B	0 B	.0 B	0 B	0 B	1 L	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2755	200	0.00 B	40	55	.0 B	0 B	0 B	10	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2756	70	0.00 B	0 B	0 B	.0 B	0 B	0 B	1	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2757	200	0.00 B	0 B	0 B	.0 B	0 B	0 B	1	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2758	300	0.00 B	0 B	0 B	.0 B	0 B	0 B	2	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2760	150	0.00 B	0 B	0 B	.0 B	0 B	0 B	1 L	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EG2769	200	0.00 B	0 B	0 B	.0 B	0 B	0 B	1 L	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2326	200	0.00 B	0 B	0 B	.0 B	0 B	0 B	1 N	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2332	200	0.00 B	0 B	0 B	.0 B	0 B	0 B	1	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2333	70	0.00 B	0 B	0 B	.0 B	0 B	0 B	1 L	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2336	200	0.00 B	0 B	0 B	.0 B	0 B	0 B	1 L	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2342	150	0.00 B	0 B	0 B	.0 B	0 B	0 B	1	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2343	150	0.00 B	0 B	0 B	.0 B	0 B	0 B	1	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2346	100	0.00 B	0 B	0 B	.0 B	0 B	0 B	1 N	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2347	200	0.00 B	0 B	0 B	.0 B	0 B	0 B	1 N	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2349	200	0.00 B	0 B	0 B	.0 B	0 B	0 B	1 L	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2352	70	0.00 B	0 B	0 B	.0 B	0 B	0 B	1 N	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2353	150	0.00 B	0 B	0 B	.0 B	0 B	0 B	1 N	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2354	300	0.00 B	0 B	0 B	.0 B	0 B	0 B	1 N	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2355	70	0.00 B	0 B	0 B	.0 B	0 B	0 B	1 N	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2358	100	0.00 B	0 B	0 B	.0 B	0 B	0 B	1 N	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2365	150	0.00 B	0 B	0 B	.0 B	0 B	0 B	1	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2366	200	0.00 B	0 B	0 B	.0 B	0 B	0 B	2	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2368	50	0.00 B	620	1700	.0 B	0 B	0 B	40	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2375	70	0.00 B	0 B	0 B	.0 B	0 B	0 B	1 N	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2377	150	0.00 B	0 B	0 B	.0 B	0 B	0 B	1 N	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2378	200	0.00 B	0 B	0 B	.0 B	0 B	0 B	1 N	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2379	150	0.00 B	0 B	0 B	.0 B	0 B	0 B	1 N	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2381	300	0.00 B	0 B	0 B	.0 B	0 B	0 B	1 N	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2382	200	0.00 B	0 B	0 B	.0 B	0 B	0 B	1 N	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
EP2383	70	0.00 B	0 B	0 B	.0 B	0 B	0 B	1 N	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
ROCK SAMPLE - EAST FORK MILLER RIVER - AREA 36																
EG2601	70	0.00 B	0 B	0 B	.0 B	0 B	0 B	0 B	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B
STREAM-SEDIMENT SAMPLES - EAST FORK MILLER RIVER - AREA 36																
EG2602	200	0.00 B	0 B	0 B	.0 B	0 B	0 B	1 N	0.0 B	0 B	.000 B	.000 B	.000 B	.0 B	.00 B	0 B

TABLE 18.—*Analytical results of anomalous samples from anomalous areas in the Alpine Lakes area and additions*—Continued

SAMPLE	S-FE%	S-MG%	S-CA%	S-TI%	S-MN	S-AG	S-AS	S-AU	S-B	S-BA	S-BE	S-BI	S-CD	S-CO
STREAM-SEDIMENT SAMPLES = EAST FORK MILLER RIVER = AREA 36														
EG2603	10.00	2.00	5.00	.300	2000	0.5 N	200 N	10 N	100	500	1.0 L	10 N	20 N	15
EG2606	10.00	2.00	1.00	.300	1000	0.5 N	200 N	10 N	30	300	1.0 N	10 N	20 N	10
EG2614	10.00	2.00	2.00	.300	1000	0.5 N	200 N	10 N	50	300	1.0 N	10 N	20 N	10
EP2426	5.00	1.00	1.00	.200	500	0.5 N	200 N	10 N	30	300	1.0 L	10 N	20 N	7
EP2430	7.00	1.00	1.00	.300	500	0.5 N	200 N	10 N	15	200	1.0 L	10 N	20 N	7
EP2433	5.00	1.00	1.00	.500	1000	0.5 N	200 N	10 N	10	300	2.0	10 N	20 N	15
EP2436	5.00	1.00	0.70	.300	1000	0.5 N	200 N	10 N	20	300	1.0	10 N	20 N	7
EP2440	5.00	1.00	0.70	.300	700	0.5 N	200 N	10 N	10	300	1.0	10 N	20 N	7
EP2443	5.00	0.50	1.00	.500	500	0.5 N	200 N	10 N	10	300	1.0 L	10 N	20 N	5
EP2447	10.00	2.00	2.00	.300	1500	0.5 N	200 N	10 N	50	300	1.0 N	10 L	20 N	15
EP2448	5.00	1.00	1.00	.300	1000	0.5 N	200 N	10 N	50	200	1.0 N	10 N	20 N	7
ROCK SAMPLES = WEST FORK MILLER RIVER = AREA 37														
EG2834	2.00	0.70	20.00	.015	5000 G	0.5 N	1500	10 N	10 N	20 N	1.0 N	10 N	20 N	5 N
EG2834A	1.50	0.30	0.30	.100	300	0.5 N	3000	10 N	30	70	1.0 L	10 N	20 N	5 N
EG2834B	2.00	0.70	0.30	.150	500	0.5 N	3000	10 N	50	100	1.0 L	10 N	20 N	5 N
EG2834C	3.00	1.00	2.00	.150	3000	0.5 N	3000	10 N	70	150	1.0 L	10 N	20 N	10
EG2835	3.00	0.50	0.15	.150	500	7.0	10000	10 N	50	150	1.0 L	10 N	20 N	7
ES2092	5.00	0.30	0.05 L	.300	3000	0.5 N	1000	10 N	200	150	1.0 L	10 N	20 N	10
STREAM-SEDIMENT SAMPLES = WEST FORK MILLER RIVER = AREA 37														
EC2134	5.00	1.50	1.50	.300	700	0.5 N	200 N	10 N	30	300	1.0	10 N	20 N	15
EG2616	3.00	1.00	1.00	.300	700	0.5 N	200 N	10 N	10	300	1.0	10 N	20 N	7
EG2618	5.00	1.00	1.00	.300	1000	0.5 N	200 N	10 N	20	200	1.0 L	10 N	20 N	10
EG2817	7.00	2.00	3.00	.700	1500	0.5 N	200 N	10 N	30	300	1.0 L	10 N	20 N	15
EG2818	7.00	2.00	2.00	.500	700	0.5 N	200 N	10 N	30	300	1.0 L	10 N	20 N	15
EG2819	7.00	1.50	2.00	.500	1500	0.5 N	200 N	10 N	50	300	1.0 L	10 N	20 N	20
EG2821	7.00	1.50	2.00	.500	1000	0.5 N	200 N	10 N	30	300	1.0 L	10 N	20 N	15
EP2451	3.00	1.00	1.00	.500	700	0.5	200 N	10 N	10	300	1.0	10 N	20 N	7
EP2452	5.00	1.00	1.00	.300	1000	7.0	1000	10 N	50	300	1.0	10 L	20 N	7
EP2453	7.00	2.00	1.00	.300	1000	1.5	200 N	10 N	50	300	1.0	10 N	20 N	10
EP2454	7.00	2.00	1.00	.500	1000	0.5 N	200 N	10 N	20	300	1.0	10 N	20 N	10
EP2456	5.00	1.00	1.00	.300	1000	7.0	300	10 N	20	300	1.0	10 N	20 N	7
EP2457	5.00	1.00	1.00	.300	1000	0.5 N	200 N	10 N	30	300	1.0	10 N	20 N	7
EP2458	10.00	2.00	1.00	1.000	1000	0.5 N	200 N	10 N	50	300	1.0 L	10 N	20 N	15
EP2460	10.00	2.00	1.00	.300	1000	3.0	1000	10 N	200	300	1.0 L	10 L	20 N	15
ES2085	5.00	0.50	0.70	.300	2000	0.5 N	200 N	10 N	70	300	2.0	10 N	20 N	7
ES2089	7.00	1.00	1.00	.500	1000	0.5 N	200 N	10 N	100	300	1.0 L	10 N	20 N	7
ES2091	3.00	1.00	1.00	.200	700	1.5	300	10 N	20	200	1.0	10 N	20 N	7
ES2093	5.00	1.00	2.00	.200	700	1.0	200	10 N	20	300	1.0	10 N	20 N	7

TABLE 18.—*Analytical results of anomalous samples from anomalous areas in the Alpine Lakes area and additions*—Continued

SAMPLE	S-CR	S-CU	S-LA	S-MO	S-NB	S-NI	S-PB	S-SB	S-SC	S-SN	S-SR	S-V	S-W	S-Y	S-ZN
STREAM-SEDIMENT SAMPLES = EAST FORK MILLER RIVER = AREA 36															
EG2603	20	70	20	5 N	20 N	15	50	100 N	30	10 N	300	100	50 N	20	200 L
EG2606	50	70	20	5 N	20 N	15	50	100 N	15	10 N	150	200	50 N	15	200 N
EG2614	30	70	20	7	20 N	15	20	100 N	20	10 N	150	150	50 L	20	200 N
EP2426	50	100	20	15	20 N	20	30	100 N	15	10 N	100	150	50 N	15	200 N
EP2430	50	50	20	7	20 N	20	30	100 N	15	10 N	150	100	50 N	15	200 N
EP2433	30	70	20	5	20 N	20	70	100 N	15	10 N	150	100	50 N	20	200 N
EP2436	30	100	20	5 N	20 N	10	10	100 N	10	10 N	100	70	50 N	15	200 N
EP2440	70	30	20	5	20 N	70	10 L	100 N	10	10 N	100	70	50 N	10	200 N
EP2443	10 N	30	20	7	20 N	7	10	100 N	15	10 N	100	70	50 N	15	200 N
EP2447	30	70	20	5 N	20 N	15	70	100 N	20	10 N	100	150	50 N	20	200 L
EP2448	30	70	20	5 N	20 N	10	50	100 N	15	10 N	100	150	50 N	20	200 L
ROCK SAMPLES = WEST FORK MILLER RIVER = AREA 37															
EG2834	10 N	5	20 N	5 N	20 N	5 N	15	100 N	5 N	10 N	300	15	50 N	10	200 N
EG2834A	10	5	20 N	5 N	20 L	5 L	10 N	100 N	7	10	100 N	50	50 N	10 N	200 N
EG2834B	20	5	20 N	5 N	20 L	7	10 N	100 N	10	20	100 N	70	50 N	10 N	200 N
EG2834C	20	10	20 N	5 N	20 L	7	10 L	100 L	15	15	100 N	70	50 N	15	200 N
EG2835	15	50	20 N	5 N	20 L	5	2000	1500	10	30	100 N	70	50 N	10 L	200 N
ES2092	30	15	20	5 L	20 N	5	10 L	100	15	10 N	100 N	150	50 N	10	200 N
STREAM-SEDIMENT SAMPLES = WEST FORK MILLER RIVER = AREA 37															
EC2134	30	30	20 N	5 L	20 L	15	70	100 N	20	10 N	200	150	50 N	15	200 N
EG2616	30	70	20	5 N	20 N	10	50	100 N	10	10 N	100	150	50 L	20	200 N
EG2618	30	70	20	5 N	20 N	15	50	100 N	10	10 N	100	150	70	20	200 N
EG2817	30	20	20 N	5	20 L	15	15	100 N	20	10 N	300	150	50 N	20	200 N
EG2818	50	70	20 N	5	20 L	15	20	100 N	20	10 N	150	150	50 N	30	200 N
EG2819	50	70	20 N	5	20 L	15	30	100 N	20	10 N	150	150	50 N	30	200 N
EG2821	30	50	20 L	5	20 L	15	70	100 N	15	10 N	150	150	50 N	20	200 N
EP2451	70	50	20	5 N	20 N	5	30	100 N	15	10 N	150	100	50 N	15	200 N
EP2452	20	100	20	5 N	20 N	5	70	100 N	15	10 N	100	100	50 N	15	200 L
EP2453	50	70	20	5 N	20 N	15	30	100 N	20	10 N	150	150	50 N	20	200 N
EP2454	20	50	20	7	20 N	15	20	100 N	15	10 N	150	150	50 N	20	200 N
EP2456	70	100	30	5 N	20 N	7	70	100 N	15	10 N	100	100	50 L	20	200 L
EP2457	30	70	20	5 N	20 N	15	70	100 N	15	10 N	150	100	50 N	20	200 L
EP2458	50	70	70	5 N	20 N	15	30	100 N	20	10	150	200	50 L	30	200 N
EP2460	20	200	20	5 N	20 N	20	300	100 N	20	10 N	100	150	50 N	20	500
ES2085	30	50	20	7	20 N	15	30	100 N	10	10 N	100	70	50 N	50	200 N
ES2089	10 N	70	20	5 N	20 N	15	50	100 N	15	10 N	150	200	50 N	30	200 N
ES2091	15	70	20	5 N	20 N	7	20	100 N	15	10 N	100	70	50 N	15	200 N
ES2093	10 N	50	20	5 N	20 N	7	30	100 N	15	10 N	150	100	50 N	20	200 N

TABLE 18.—*Analytical results of anomalous samples from anomalous areas in the Alpine Lakes area and additions*—Continued

SAMPLE	S-ZR	AA-AU-P	AA-CU-P	AA-ZN-P	AA-AG-P	AA-CO-P	AA-NI-P	CM=CXHM	CM-SB	CM-MO	AS-PT	AS-PD	AS-RH	AS-RU	AS-IR	EU
STREAM-SEDIMENT SAMPLES = EAST FORK MILLER RIVER = AREA 36																
EG2603	100	0,00 B	0 B	0 B	,0 B	0 B	0 B	1 N	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG2606	70	0,00 B	0 B	0 B	,0 B	0 B	0 B	1 L	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG2614	200	0,00 B	0 B	0 B	,0 B	0 B	0 B	1 N	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EP2426	200	0,00 B	0 B	0 B	,0 B	0 B	0 B	1 N	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EP2430	70	0,00 B	0 B	0 B	,0 B	0 B	0 B	1 N	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EP2433	150	0,00 B	0 B	0 B	,0 B	0 B	0 B	1 N	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EP2436	100	0,00 B	0 B	0 B	,0 B	0 B	0 B	1 N	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EP2440	70	0,00 B	0 B	0 B	,0 B	0 B	0 B	1 N	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EP2443	200	0,00 B	0 B	0 B	,0 B	0 B	0 B	1	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EP2447	100	0,00 B	0 B	0 B	,0 B	0 B	0 B	1 L	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EP2448	70	0,00 B	0 B	0 B	,0 B	0 B	0 B	1 L	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
ROCK SAMPLES - WEST FORK MILLER RIVER - AREA 37																
EG2834	10 N	0,00 B	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG2834A	30	0,10	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG2834B	30	0,10	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG2834C	200	0,10	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG2835	50	0,25	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
ES2092	70	0,00 B	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
STREAM-SEDIMENT SAMPLES - WEST FORK MILLER RIVER - AREA 37																
EC2134	100	0,00 B	0 B	0 B	,0 B	0 B	0 B	1 N	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG2616	200	0,00 B	0 B	0 B	,0 B	0 B	0 B	1	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG2618	70	0,00 B	0 B	0 B	,0 B	0 B	0 B	1 L	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG2817	200	0,00 B	0 B	0 B	,0 B	0 B	0 B	2	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG2818	200	0,00 B	0 B	0 B	,0 B	0 B	0 B	1	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG2819	200	0,00 B	0 B	0 B	,0 B	0 B	0 B	2	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG2821	70	0,00 B	0 B	0 B	,0 B	0 B	0 B	1	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EP2451	500	0,00 B	0 B	0 B	,0 B	0 B	0 B	2	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EP2452	100	0,00 B	0 B	0 B	,0 B	0 B	0 B	1 N	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EP2453	300	0,00 B	0 B	0 B	,0 B	0 B	0 B	1 N	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EP2454	300	0,00 B	0 B	0 B	,0 B	0 B	0 B	1	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EP2456	70	0,00 B	0 B	0 B	,0 B	0 B	0 B	1 N	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EP2457	300	0,00 B	140	270	,0 B	0 B	0 B	18	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EP2458	500	0,00 B	0 B	0 B	,0 B	0 B	0 B	1 N	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EP2460	70	0,00 B	0 B	0 B	,0 B	0 B	0 B	1	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
ES2085	200	0,00 B	0 B	0 B	,0 B	0 B	0 B	1 N	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
ES2089	300	0,00 B	0 B	0 B	,0 B	0 B	0 B	1 N	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
ES2091	70	0,00 B	100	50	,0 B	0 B	0 B	4	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
ES2093	200	0,00 B	0 B	0 B	,0 B	0 B	0 B	1 L	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B

TABLE 18.—*Analytical results of anomalous samples from anomalous areas in the Alpine Lakes area and additions*—Continued

SAMPLE	S-FE%	S-MG%	S-CA%	S-TI%	S-MN	S-AG	S-AS	S-AU	S-B	S-BA	S-BE	S-BI	S-CD	S-CO
ROCK SAMPLE - GOAT CREEK - AREA 38														
EG2824	7,00	0,03	0,05 L	,015	10 L	1,5	10000 G	10 N	10 L	50	1,0 N	10 N	20 N	7
STREAM-SEDIMENT SAMPLES - GOAT CREEK - AREA 38														
EC2137	5,00	1,00	2,00	,300	300	0,5 N	200 N	10 N	10	200	1,0 L	10 N	20 N	10
EG2822	7,00	1,50	2,00	,300	1000	0,7	300	10 N	30	300	1,0 L	10 N	20 N	20
EG2823	5,00	1,50	2,00	,300	1000	0,5 L	700	10 N	30	300	1,0 L	10 N	20 N	15

SAMPLE	S-CR	S-CU	S-LA	S-MO	S-NB	S-NI	S-PB	S-SB	S-SC	S-SN	S-SR	S-V	S-W	S-Y	S-ZN
ROCK SAMPLE - GOAT CREEK - AREA 38															
EG2824	10 L	30	20 N	5 L	20 L	5	70	300	5 N	10 N	100 N	10 L	50 N	10 N	200 N
STREAM-SEDIMENT SAMPLES - GOAT CREEK - AREA 38															
EC2137	30	70	20	7	20 N	20	50	100 N	15	10 N	200	150	50 N	15	200 N
EG2822	50	30	20 N	5	20 L	15	200	100 N	20	10 N	150	200	50 N	30	200 N
EG2823	50	30	20 N	5 L	20 L	15	100	100 N	20	10 N	150	150	50 N	30	200 N

SAMPLE	S-ZR	AA-AU-P	AA-CU-P	AA-ZN-P	AA-AG-P	AA-CO-P	AA-NI-P	CM=CXHM	CM-SB	CM-MO	AS-PT	AS-PD	AS-RH	AS-RU	AS-IR	EU
ROCK SAMPLE - GOAT CREEK - AREA 38																
EG2824	10 L	0,00 B	0 B	0 B	,0 B	0 B	0 B	0 B	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
STREAM-SEDIMENT SAMPLES - GOAT CREEK - AREA 38																
EC2137	150	0,00 B	0 B	0 B	,0 B	0 B	0 B	1 N	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG2822	300	0,00 B	45	120	,0 B	0 B	0 B	8	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B
EG2823	200	0,00 B	50	100	,0 B	0 B	0 B	6	0,0 B	0 B	,000 B	,000 B	,000 B	,0 B	,00 B	0 B

TABLE 19

[Analytical data are separated into categories on the basis of type of sample taken: stream sediment, soil, panned concentrate, and rock. Table 19 shows no classification by area.

Letter symbols at heads of columns of analytical data are the following: S, six-step semiquantitative spectrographic analysis; AA, atomic absorption analysis; P, partial digestion; CM-CX-HM, citrate-soluble heavy-metals colorimetric test; CM, colorimetric test; AS, fire assay-spectrographic analysis; and EU, radiometric uranium. Letter symbols at right of analytical data are these: N, looked for but not detected; L, detected but below limit-of-determination value shown; G, detected in quantities greater than value shown; B, not determined. Elements determined are reported to the nearest number in the series 1, 0.7, 0.5, 0.3, 0.2, 0.15, 0.1, and so forth.

All elements are reported in parts per million, except iron, magnesium, calcium, and titanium, which are reported in percent. Citrate-soluble heavy metals are reported in parts per million.

This table is a high-speed computer printout obtained after extensive program manipulation of a large Rock Analysis Storage System data file. Though legibility, style, and format do not meet customary U.S. Geological Survey standards, they are as close as time and the data body allowed]

TABLE 19.—*Analytical results of anomalous samples from other parts of the Alpine Lakes area and additions*

SAMPLE	S-FE%	S-MG%	S-CA%	S-TI%	S-MN	S-AG	S-AS	S-AU	S-B	S-BA	S-BE	S-BI	S-CD	S-CO
ROCK SAMPLES														
EC2051A	5.0	1.00	1.00	.200	200	0.5 N	200 N	10 N	10 L	300	1.0 L	10 N	20 N	5
EG0092A	5.0	2.00	1.50	.500	700	0.5 N	200 N	10 N	100	700	1.0	10 N	20 N	10
EG0607	5.0	1.50	5.00	.300	1500	0.5 N	200 N	10 N	10 L	150	1.0	10 N	20 N	20
EG0609	5.0	2.00	3.00	.500	700	0.5 N	200 N	10 N	20	500	1.5	10 N	20 N	10
EG0611	5.0	2.00	1.00	.500	700	0.5 N	200 N	10 N	100	700	1.5	10 N	20 N	15
EG0614	3.0	2.00	5.00	.300	1000	0.5 N	200 N	10 N	10 N	300	1.0	10 N	20 N	7
EG0621	3.0	2.00	1.50	.300	700	0.5 N	200 N	10 N	10 N	500	1.0 L	10 N	20 N	7
EG0625A	0.3	0.20	1.00	.015	30	0.5 N	200 N	10 N	300	700	1.5	10 N	20 N	5 N
EG0630A	5.0	5.00	7.00	.300	1000	0.5 N	200 N	10 N	10	1500	1.0 L	10 N	20 N	15
EG0711A	5.0	3.00	7.00	.700	1500	0.5 N	200 N	10 N	10	700	1.0 L	10 N	20 N	15
EG0784	5.0	3.00	5.00	.500	700	0.5 N	200 N	10 N	20	500	1.0 L	10 N	20 N	10
EG0785	7.0	3.00	7.00	.700	1000	0.5 N	200 N	10 N	50	700	1.0	10 N	20 N	30
EG0787A	1.0	0.70	1.00	.150	100	0.5	200 N	10 N	10	300	1.0 L	10 N	20 N	10
EG0797	7.0	5.00	15.00	.700	1500	0.5 N	200 N	10 N	10 L	150	1.0 L	10 N	20 N	30
EG1042	10.0	2.00	3.00	1.000 G	1500	0.5 N	200 N	10 N	10 L	200	1.0	10 N	20 N	20
EG1044	5.0	10.00 G	1.50	.015	1000	3.0	200 N	10 N	10	20 L	1.0 N	10 N	20 N	150
EG1149A	10.0	3.00	1.50	.700	700	0.5 N	200 N	10 N	70	700	1.0	10 N	20 N	15
EG1249B	1.5	0.03	0.10	.300	300	0.5	200 N	10 N	70	50	1.0 L	10 L	20 N	15
EG1264	5.0	2.00	1.50	.500	2000	0.5 N	200 N	10 N	15	1500	1.0 L	10 N	20 N	15
EG1266	7.0	2.00	5.00	.700	1000	0.5 N	200 N	10 N	10	1000	1.0 L	10 N	20 N	15
EG1284	2.0	0.20	0.20	.150	1000	0.5 N	200 N	10 N	30	700	1.0	10 N	20 N	5
EG1302	10.0	3.00	7.00	.500	1500	0.5 N	200 N	10 N	10 L	100	1.0 N	10 N	20 N	70
EG1302B	15.0	3.00	5.00	.700	700	0.5 N	200 N	10 N	10 L	70	1.0 N	10 N	20 N	100
EG1469	3.0	2.00	3.00	.002 L	1000	0.5 N	1000	10 N	10	700	1.0 L	10 N	20 N	100
EG1469B	5.0	1.00	0.30	.500	700	0.5 N	200 N	10 N	200	300	1.0	10 N	20 N	20
EG1469C	0.2	0.02	0.05	.050	30	3.0	200 N	10 N	20	200	1.0 L	10 N	20 N	5 N
EG2007B	20.0 G	1.00	0.05 L	.100	1500	0.5 N	200 N	10 N	10 N	20 L	1.0 N	10 N	20 N	1500
EG2008	20.0 G	1.00	0.05 L	.015	500	0.5 N	200 N	10 N	10 N	30	1.5	10 N	20 N	500
EG2019A	10.0	5.00	7.00	.500	700	0.5 N	200 N	10 N	10 L	100	1.0 N	10 N	20 N	30
EG2055	10.0	3.00	2.00	.700	700	0.5 N	200 N	10 N	10	700	1.0	10 N	20 N	20
EG2057	10.0	5.00	10.00	.700	1000	0.5 N	200 N	10 N	10 L	100	1.0 N	10 N	20 N	70
EG2061	7.0	1.50	0.70	.700	500	0.5 N	200 N	10 N	100	500	1.0	10 N	20 N	20
EG2079	7.0	3.00	5.00	.700	700	0.5 N	200 N	10 N	15	300	1.0 L	10 N	20 N	20
EG2114	10.0	10.00 G	10.00	.500	700	0.5 N	200 N	10 N	10 L	20	1.0 N	10 N	20 N	7
EG2262A	0.3	0.70	0.15	.007	10 L	0.5 N	200 N	10 N	10 N	200	1.0 N	30	20 N	5 N
EG2268	5.0	2.00	3.00	.200	500	0.5 N	200 N	10 N	10 L	50	1.0 L	10 N	20 N	7
EG2269	3.0	1.00	0.30	.200	150	0.5 N	200 N	10 N	15	150	1.0 L	10 N	20 N	5 L
EG2279A	1.5	0.70	1.50	.100	100	0.5 N	200 N	10 N	10 L	300	1.0	10 N	20 N	5 N
EG2335	1.0	0.15	0.70	.070	100	0.5 N	200 N	10 N	15	500	1.0 L	10 N	20 N	5 N
EG2349	5.0	2.00	1.50	.300	300	0.5 N	200 N	10 N	10 L	500	1.0	10 N	20 N	7

TABLE 19.—*Analytical results of anomalous samples from other parts of the Alpine Lakes area and additions*—Continued

SAMPLE	S-CR	S-CU	S-LA	S-MO	S-NB	S-NI	S-PB	S-SB	S-SC	S-SN	S-SR	S-V	S-W	S-Y	S-ZN	S-ZR
ROCK SAMPLES																
EC2051A	10 N	5	20 L	5 N	20 N	7	10 L	100 N	7	10 N	150	100	100	15	200 N	70
EG0092A	150	100	20 N	5 L	10 N	50	10	100 N	15	10 N	200	150	50 N	20	200 L	100
EG0607	100	100	20 N	5 N	10 N	100	10 L	100 N	15	10 N	150	150	50 N	20	200 L	70
EG0609	100	50	30	5 N	10 N	50	15	100 N	15	10 N	300	150	50 N	15	200	100
EG0611	300	50	20	5 N	10 N	70	15	100 N	20	10 N	200	150	50 N	20	200	100
EG0614	70	150	20 L	5 N	10 N	30	15	100 N	15	10 N	300	100	50 N	10	200 N	70
EG0621	50	100	20 N	5 N	10 N	10	10	100 N	15	10 N	200	150	50 N	15	200 L	70
EG0625A	10 L	5 L	20 N	5 N	10 N	5 L	50	100 N	5 N	10 N	300	10	50 N	10 L	200 N	15
EG0630A	500	200	20 N	5 N	10 N	100	20	100 N	20	10 N	500	150	50 N	20	200 L	70
EG0711A	50	70	20 N	5 N	10 N	10	15	100 N	15	10 N	200	150	50 N	20	200	100
EG0784	100	150	20 N	5 N	10 N	50	10	100 N	10	10 N	500	150	50 N	10	200 L	20
EG0785	150	100	20 L	5 N	10 N	70	10	100 N	20	10 N	700	200	50 N	15	200 L	70
EG0787A	70	300	20 N	5 N	10 N	15	10 L	100 N	5 L	10	300	50	50 N	10 L	200 N	70
EG0797	700	100	20 N	5 N	10 N	150	10 N	100 N	30	10 N	200	200	50 N	20	200 L	70
EG1042	50	50	20 L	5 N	10 N	10	10	100 N	50	10 N	150	100	50 N	50	200	100
EG1044	3000	10000	20 N	5 N	10 N	2000	10 N	100 N	10	10 N	100 N	50	50 N	10 N	200 L	10 N
EG1149A	200	30	30	5 N	10 N	30	15	100 N	30	10 N	200	200	50 N	20	200	150
EG1249B	20	50	20 N	5 N	20 N	5	10 L	100 N	10	10 N	100 N	70	50 N	10 L	200 N	70
EG1264	300	50	20 L	5 N	20 N	150	15	100 N	15	10 N	300	150	50 N	30	200	150
EG1266	50	30	20 N	5 N	20 N	5 L	10	100 N	30	10 N	500	300	50 N	20	200	70
EG1284	10 L	30	20 N	5 N	20 N	5 L	15	100 N	5	10 N	100	20	50 N	15	200	70
EG1302	150	70	20 N	5 N	20 N	70	10 L	100 N	50	10 N	200	200	50 N	50	200	100
EG1302B	300	150	20 N	5 N	20 N	150	10 N	100 N	70	10 N	100	300	50 N	50	200	100
EG1469	1500	10	20 N	5 N	20 N	1500	10 L	100 N	5	10 N	300	20	50 N	10 N	200 L	10 L
EG1469B	150	20	50	5 N	20 N	100	20	200	20	10 N	100	70	50 N	30	200 N	200
EG1469C	10 N	50	20 N	5 N	20 N	5 L	100	10000 G	5 L	10 N	100 L	10 L	50 N	15	200 N	100
EG2007B	5000 G	150	20 N	5 N	20 N	5000	10 N	100 N	70	10 N	200	200	50 N	20	500	50
EG2008	5000 G	30	20 N	5 N	20 L	5000	10 N	100 N	50	10 N	100 N	150	50 N	15	300	10 N
EG2019A	70	100	20 N	5 N	20 L	30	10 N	100 N	30	10 N	150	150	50 N	20	200 N	70
EG2055	300	100	50	5 N	20 N	50	20	100 N	30	10 N	200	200	50 N	30	200 L	200
EG2057	1000	100	20 L	5 N	20 N	150	10 L	100 N	100	10 N	700	300	50 N	20	200 N	50
EG2061	200	100	50	5 N	20 N	50	20	100 N	30	10 N	200	200	50 N	30	200 L	200
EG2079	300	200	20 N	5 N	20 N	50	20	100 N	20	10 N	700	150	50 N	15	200 L	100
EG2114	700	100	20 N	5 N	20 L	200	10 N	100 N	20	10 N	100	100	50 N	15	200 N	50
EG2262A	10 N	10	20 N	7	20 N	5 N	10 N	100 N	5 N	10 N	100	10 L	50 N	10 N	200 N	10 N
EG2268	100	20	20 L	5	20 L	70	10 L	100 N	10	10 N	200	100	50 N	15	200 N	200
EG2269	30	7	20 N	50	20 L	15	10 N	100 N	7	10 N	100	70	50 N	10 L	200 N	100
EG2279A	10 N	5	20 L	5	20 N	5 L	15	100 N	5 L	10 N	200	15	50 N	10 N	200 N	50
EG2335	10 N	5 L	20 L	100	20 N	5 N	10	100 N	5 N	10 N	100	10 L	50 N	10	200 N	100
EG2349	50	15	20 L	5	20 L	50	10	100 N	10	10 N	300	70	50 N	10	200 N	100

TABLE 19.—*Analytical results of anomalous samples from other parts of the Alpine Lakes area and additions*—Continued

SAMPLE	AA-AU-P	AA-CU-P	AA-ZN-P	AA-AG-P	AA-CD-P	AA-NI-P	CM-CX-HM	CM-SB	CM-MO	AS-PT	AS-PD	AS-RH	AS-RU	AS-IR	EU
ROCK SAMPLES															
EC2051A	0.00 B	0 B	0 B	0 B	0 B	0 B	0 B	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG0092A	0.00 B	0 B	0 B	0 B	0 B	0 B	0 B	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG0607	0.00 B	0 B	0 B	0 B	0 B	0 B	0 B	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG0609	0.00 B	0 B	0 B	0 B	0 B	0 B	0 B	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG0611	0.00 B	0 B	0 B	0 B	0 B	0 B	0 B	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG0614	0.00 B	0 B	0 B	0 B	0 B	0 B	0 B	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG0621	0.00 B	0 B	0 B	0 B	0 B	0 B	0 B	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG0625A	0.02 N	5	0 B	0 B	0 B	0 B	0 B	1.0 L	2 L	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG0630A	0.00 B	0 B	0 B	0 B	0 B	0 B	0 B	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG0711A	0.00 B	0 B	0 B	0 B	0 B	0 B	0 B	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG0784	0.00 B	0 B	0 B	0 B	0 B	0 B	0 B	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG0785	0.00 B	0 B	0 B	0 B	0 B	0 B	0 B	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG0787A	0.02 N	10	0 B	0 B	0 B	0 B	0 B	1.0 L	2 L	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG0797	0.00 B	0 B	0 B	0 B	0 B	0 B	0 B	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG1042	0.00 B	0 B	0 B	0 B	0 B	0 B	0 B	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG1044	0.20	0 B	0 B	0 B	0 B	0 B	0 B	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG1149A	0.00 B	0 B	0 B	0 B	0 B	0 B	0 B	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG1249B	0.05 N	0 B	0 B	0 B	0 B	0 B	0 B	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG1264	0.05 N	0 B	0 B	0 B	0 B	0 B	0 B	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG1266	0.00 B	0 B	0 B	0 B	0 B	0 B	0 B	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG1284	0.00 B	0 B	0 B	0 B	0 B	0 B	0 B	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG1302	0.05 N	0 B	0 B	0 B	0 B	0 B	0 B	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG1302B	0.05 N	0 B	0 B	0 B	0 B	0 B	0 B	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG1469	0.05 N	0 B	0 B	0 B	0 B	0 B	0 B	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG1469B	0.00 B	0 B	0 B	0 B	0 B	0 B	0 B	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG1469C	0.05	0 B	0 B	0 B	0 B	0 B	0 B	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG2007B	0.00 B	0 B	110	0 B	0 B	0 B	0 B	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG2008	0.00 B	0 B	110	0 B	0 B	0 B	0 B	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG2019A	0.00 B	0 B	0 B	0 B	0 B	0 B	0 B	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG2055	0.00 B	0 B	0 B	0 B	0 B	0 B	0 B	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG2057	0.00 B	0 B	0 B	0 B	0 B	0 B	0 B	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG2061	0.00 B	0 B	0 B	0 B	0 B	0 B	0 B	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG2079	0.00 B	0 B	0 B	0 B	0 B	0 B	0 B	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG2114	0.00 B	0 B	0 B	0 B	0 B	0 B	0 B	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG2262A	0.00 B	0 B	0 B	0 B	0 B	0 B	0 B	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG2268	0.00 B	0 B	0 B	0 B	0 B	0 B	0 B	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG2269	0.00 B	0 B	0 B	0 B	0 B	0 B	0 B	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG2279A	0.00 B	0 B	0 B	0 B	0 B	0 B	0 B	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG2335	0.00 B	0 B	0 B	0 B	0 B	0 B	0 B	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG2349	0.00 B	0 B	0 B	0 B	0 B	0 B	0 B	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B

TABLE 19.—*Analytical results of anomalous samples from other parts of the Alpine Lakes area and additions*—Continued

SAMPLE	S-FE%	S-MG%	S-CA%	S-TI%	S-MN	S-AG	S-AS	S-AU	S-B	S-BA	S-BE	S-BI	S-CD	S-CO
ROCK SAMPLES														
EG2386	7.0	2.00	1.50	.200	500	0.5 N	200 N	10 N	2000	200	1.0 L	10 N	20 N	15
EG2382A	3.0	0.70	0.70	.200	500	0.5 N	200 N	10 N	10	70	1.0 L	10 N	20 N	5 L
EG2553	7.0	5.00	5.00	.700	1000	0.5 N	200 N	10 N	10 L	300	1.0 N	10 N	20 N	20
EG2780	15.0	3.00	7.00	.300	1000	0.5 N	200 N	10 N	10 N	70	1.0 N	10 N	20 N	50
EG2807	20.0 G	0.70	0.05 L	.150	5000 G	0.5 N	200 N	10 N	10 L	20 L	1.0 L	10 N	20 N	1000
EG2809	15.0	2.00	0.20	.003	150	30.0	10000 G	30	10 N	20 N	1.0 N	100	20 N	20
EG2809A	20.0 G	1.50	0.30	.020	200	5.0	10000 G	30	10 N	20 N	1.0 N	50	20 N	30
EG2810	3.0	2.00	1.50	.150	700	0.5 N	1500	10 N	50	500	1.0 L	10 N	20 N	7
EG2813	1.5	0.20	1.00	.100	300	0.5 N	700	10 N	20	500	1.0 L	10 N	20 N	5 N
EK0077B	5.0	2.00	3.00	.300	700	0.5 N	200 N	10 N	10 L	500	1.0 L	10 N	20 N	15
EK0255	7.0	3.00	1.50	.500	1500	0.5 N	200 N	10 N	10 L	700	1.0 L	10 N	20 N	15
EK0372	3.0	2.00	5.00	.500	1000	0.5 N	200 N	10 N	10 L	500	1.0 L	10 N	20 N	10
EK0383	0.5	0.02	0.50	.010	150	0.5 N	200 N	10 N	50	20 L	1.5	10 N	20 N	5
EK0386A	7.0	1.50	1.00	.200	5000 G	0.5 N	200 N	10 N	10 L	1000	1.0	10 N	20 N	30
EK0387	7.0	3.00	15.00	.500	1500	0.5 N	200 N	10 N	10 L	150	1.0 L	10 N	20 N	30
EK0428	7.0	2.00	1.00	.500	1000	0.5 N	200 N	10 N	500	700	1.5	10 N	20 N	10
EP2013	7.0	2.00	3.00	.700	1000	0.5 N	200 N	10 N	10 N	500	1.0 L	10 N	20 N	50
EP2080	15.0	2.00	1.50	.200	5000 G	0.5 N	200 N	10 N	10 L	20 L	1.0 N	10 N	20 N	30
EP2131	7.0	3.00	3.00	.700	500	0.5 N	200 N	10 N	10 L	200	1.0 N	10 N	20 N	7
EP2175	10.0	2.00	2.00	.700	700	0.5 N	200 N	10 N	10 N	500	1.0 N	10 N	20 N	15
EP2211	5.0	0.70	2.00	.150	300	0.5 N	200 N	10 N	10	200	1.0 L	10 N	20 N	5
EP2215	7.0	2.00	1.50	.200	300	0.5 N	200 N	10 N	15	150	1.0 L	10 N	20 N	7
EP2224	7.0	2.00	2.00	.500	700	0.5 N	200 N	10 N	10 L	150	1.0 N	10 N	20 N	7
EP2234	3.0	1.50	1.50	.150	300	0.5 N	200 N	10 N	10	200	1.0 L	10 N	20 N	7
EP2236	5.0	3.00	1.50	.300	500	0.5 N	200 N	10 N	10	200	1.0 L	10 N	20 N	7
ES0225	3.0	1.50	5.00	.200	700	0.5 N	200 N	10 N	10 L	300	1.0	10 N	20 N	10
ES0302	0.5	0.10	0.30	.015	70	0.5 N	200 N	10 N	10 N	1000	1.0 N	10 N	20 N	5 N
ES1001	10.0	3.00	5.00	.700	1500	0.5 N	200 N	10 N	10 L	20 L	1.0 N	10 N	20 N	30
ES1042	7.0	3.00	3.00	.700	2000	0.5 N	200 N	10 N	10 L	1500	1.0 L	10 N	20 N	30
ES1071	10.0	0.70	2.00	.150	300	0.5 N	200 N	10 N	10 L	200	1.0 L	10 N	20 N	7
ET0002	7.0	3.00	1.50	.700	1500	0.5 N	200 N	10 N	10 L	1000	1.0	10 N	20 N	20
ET0009	7.0	5.00	1.50	.500	500	0.5 N	200 N	10 N	10 L	2000	1.0 L	10 N	20 N	20
ET0100	3.0	2.00	2.00	.300	1000	0.5 N	200 N	10 N	10	500	1.0	10 N	20 N	5
ET0242	2.0	0.70	0.70	.150	700	1.0	200 N	10 N	10 N	300	1.0 L	10 N	20 N	5
ET0266A	2.0	1.00	1.50	.150	300	0.5 N	200 N	10 N	10 N	700	1.0	10 N	20 N	5
ET0328	7.0	3.00	5.00	.300	2000	0.5 N	200 N	10 N	10 L	700	1.0 L	10 N	20 N	20
ET0386	5.0	1.50	1.00	.300	700	0.5 N	200 N	10 N	10 L	500	1.0	10 N	20 N	10
STREAM-SEDIMENT SAMPLES														
EC2009	3.0	1.00	1.00	.200	200	0.5	200 N	10 N	10	200	1.0	10 N	20 N	5 L
EC2020	7.0	2.00	1.00	.500	1000	0.5 N	200 N	10 N	10 L	200	1.0	10 N	20 N	10

TABLE 19.—*Analytical results of anomalous samples from other parts of the Alpine Lakes area and additions*—Continued

SAMPLE	S-CR	S-CU	S-LA	S-MO	S-NB	S-NI	S-PB	S-SB	S-SC	S-SN	S-SR	S-V	S-W	S-Y	S-ZN	S-ZR
ROCK SAMPLES																
EG2356	10	10	20 L	5	20 L	10	10 N	100 N	15	10 N	200	70	50 N	15	200 N	100
EG2382A	10 N	7	20 L	15	20 N	5 L	10 L	100 N	10	10 N	100	20	50 N	15	200 N	150
EG2553	200	100	20 L	5 N	20 L	50	70	100 N	20	10 N	300	150	50 N	15	200 N	70
EG2780	1500	300	20 N	5 L	20 L	70	10 N	100 N	30	10 N	300	150	50 N	15	200 N	30
EG2807	5000 G	100	20 N	5 L	20 L	5000	10 L	100 N	50	15	100 N	150	50 N	10 N	200 N	50
EG2809	300	7000	20 N	5 L	20 L	150	30	500	5 L	15	100 N	15	50 N	10 N	300	10 N
EG2809A	500	300	20 N	5	20 L	100	10 L	500	5 N	10 N	100 N	15	50 N	10 N	200 N	10 N
EG2810	70	10	20 N	5 N	20 N	30	10 N	100 N	7	10 N	500	70	50 N	10 L	200 N	100
EG2813	15	7	20 N	5 N	20 L	7	10	100 N	7	10 N	150	20	50 N	10 L	200 N	50
EK0077B	10 L	150	20 N	5 N	10 N	10	10 L	100 N	15	10 N	300	150	50 N	15	200 L	70
EK0255	150	100	20 N	5 N	10 N	70	10	100 N	20	10 N	200	200	50 N	30	200 L	100
EK0372	10 L	100	20 N	5 N	10 N	7	10	100 N	10	10 N	700	100	50 N	15	200 L	100
EK0383	20	5 L	20 N	5 N	10 N	5	50	100 N	5 L	10 N	100 N	10 L	50 N	10	200 N	20
EK0386A	70	100	20	5 N	10 N	70	10	100 N	15	10 N	100 L	300	50 N	30	200	100
EK0387	300	150	20 N	5 N	10 N	70	10 L	100 N	30	10 N	500	200	50 N	15	200 L	30
EK0428	150	100	20	5 N	10 N	30	15	100 N	20	10 N	200	150	50 N	20	200	150
EP2013	200	300	20	5 N	20 N	100	20	100 N	20	10 N	300	150	50 N	20	200 N	100
EP2080	20	150	20	5 L	20 L	70	10 N	100 N	15	10 N	100 L	150	50 N	30	200 N	150
EP2131	100	100	20 L	5 N	20 L	20	10 N	100 N	15	15	150	150	50 N	15	200 N	200
EP2175	15	30	20 N	5	20 L	15	10 L	100 N	20	10 N	150	100	50 N	30	200 N	100
EP2211	10 N	10	20 L	5	20 L	5 L	10 L	100 N	10	10 N	150	30	50 N	15	200 N	100
EP2215	70	15	20 L	7	20 L	70	10	100 N	10	10 N	200	70	50 N	10	200 N	70
EP2224	10 N	7	20 L	10	20 L	5 N	10 N	100 N	15	10 N	150	70	50 N	15	200 N	70
EP2234	30	5	20 L	7	20 L	30	10 L	100 N	7	10 N	300	50	50 N	10 L	200 N	50
EP2236	70	7	20 L	7	20 L	70	10 L	100 N	10	10 N	300	100	50 N	10	200 N	70
ES0225	70	100	20 N	5 N	10 N	30	10 L	100 N	10	10 N	200	70	50 N	10	200 L	70
ES0302	10 L	100	20 N	5 N	10 N	5 L	30	100 N	5 L	10 N	100 L	10 L	50 N	10	200 N	20
ES1001	200	100	20 N	5 N	10 N	70	10 L	100 N	50	10 N	200	200	50 N	30	200 N	70
ES1042	300	150	20 N	5 N	10 N	70	15	100 N	50	10 N	300	200	50 N	30	200	150
ES1071	10 L	30	20 N	10	20 N	5	10 L	100 N	10	10 N	200	70	50 N	10	200 L	70
ET0002	150	150	20	5 N	10 N	100	10	100 N	20	10 N	200	200	50 N	15	200	100
ET0009	300	150	20 L	5 N	10 N	100	15	100 N	20	10 N	300	200	50 N	20	200	100
ET0100	70	100	20 N	5 N	10 N	10	15	100 N	15	10 N	300	100	50 N	20	200 L	70
ET0242	70	15	20 N	5 N	10 N	7	10 L	100 N	10	10 N	100	70	50 N	10	200 N	30
ET0266A	50	100	20 N	5 N	10 N	7	15	100 N	5 N	10 N	300	20	50 N	10	200 N	70
ET0328	100	150	20	5 N	10 N	30	10 L	100 N	15	10 N	200	150	50 N	20	200 L	70
ET0386	150	100	20 N	5 N	10 N	20	15	100 N	15	10 N	150	100	50 N	20	200 L	70
STREAM-SEDIMENT SAMPLES																
EC2009	10 N	50	30	5	20 N	7	20	100 N	7	10 N	150	70	50 N	15	200 N	150
EC2020	20	20	20	5 N	20 N	15	70	100 N	15	10 N	200	150	50 N	15	200 N	500

TABLE 19.—*Analytical results of anomaıous samples from other parts of the Alpine Lakes area and additions*—Continued

SAMPLE	AA-AU-P	AA-CU-P	AA-ZN-P	AA-AG-P	AA-CO-P	AA-NI-P	CM-CX-HM	CM-SB	CM-MO	AS-PT	AS-PD	AS-RH	AS-RU	AS-IR	EU
ROCK SAMPLES															
EG2356	0.00 B	0 B	0 B	0 B	0 B	0 B	0 B	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG2362A	0.00 B	0 B	0 B	0 B	0 B	0 B	0 B	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG2553	0.00 B	0 B	0 B	0 B	0 B	0 B	0 B	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG2780	0.00 B	0 B	0 B	0 B	0 B	0 B	0 B	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG2807	0.00 B	0 B	0 B	0 B	0 B	0 B	0 B	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG2809	18.00	0 B	250	0 B	0 B	0 B	0 B	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG2809A	32.00	0 B	0 B	0 B	0 B	0 B	0 B	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG2810	0.00 B	0 B	0 B	0 B	0 B	0 B	0 B	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG2813	0.00 B	0 B	0 B	0 B	0 B	0 B	0 B	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EK0077B	0.00 B	0 B	0 B	0 B	0 B	0 B	0 B	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EK0255	0.00 B	0 B	0 B	0 B	0 B	0 B	0 B	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EK0372	0.00 B	0 B	0 B	0 B	0 B	0 B	0 B	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EK0383	0.02 N	5 L	0 B	0 B	0 B	0 B	0 B	1.0 L	2 L	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EK0366A	0.00 B	0 B	0 B	0 B	0 B	0 B	0 B	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EK0387	0.00 B	0 B	0 B	0 B	0 B	0 B	0 B	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EK0428	0.00 B	0 B	0 B	0 B	0 B	0 B	0 B	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EP2013	0.00 B	0 B	0 B	0 B	0 B	0 B	0 B	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EP2080	0.00 B	0 B	0 B	0 B	0 B	0 B	0 B	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EP2131	0.00 B	0 B	0 B	0 B	0 B	0 B	0 B	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
Ep2175	0.00 B	0 B	0 B	0 B	0 B	0 B	0 B	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EP2211	0.00 B	0 B	0 B	0 B	0 B	0 B	0 B	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EP2215	0.00 B	0 B	0 B	0 B	0 B	0 B	0 B	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EP2224	0.00 B	0 B	0 B	0 B	0 B	0 B	0 B	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EP2234	0.00 B	0 B	0 B	0 B	0 B	0 B	0 B	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EP2236	0.00 B	0 B	0 B	0 B	0 B	0 B	0 B	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
ES0225	0.00 B	0 B	0 B	0 B	0 B	0 B	0 B	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
ES0302	0.02 N	230	0 B	0 B	0 B	0 B	0 B	1.0 L	2 L	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
Es1001	0.00 B	0 B	0 B	0 B	0 B	0 B	0 B	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
ES1042	0.05 N	0 B	0 B	0 B	0 B	0 B	0 B	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
ES1071	0.05 N	0 B	0 B	0 B	0 B	0 B	0 B	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
ET0002	0.00 B	0 B	0 B	0 B	0 B	0 B	0 B	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
ET0009	0.00 B	0 B	0 B	0 B	0 B	0 B	0 B	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
ET0100	0.00 B	0 B	0 B	0 B	0 B	0 B	0 B	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
ET0242	0.02 N	15	0 B	0 B	0 B	0 B	0 B	1.0 L	2	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
ET0266A	0.00 B	100	0 B	0 B	0 B	0 B	0 B	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
ET0328	0.00 B	0 B	0 B	0 B	0 B	0 B	0 B	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
ET0386	0.00 B	0 B	0 B	0 B	0 B	0 B	0 B	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
STREAM-SEDIMENT SAMPLES															
EC2009	0.00 B	0 B	0 B	0 B	0 B	0 B	1 N	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EC2020	0.00 B	0 B	0 B	0 B	0 B	0 B	1 N	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B

TABLE 19.—*Analytical results of anomalous samples from other parts of the Alpine Lakes area and additions*—Continued

SAMPLE	S-FE%	S-MG%	S-CA%	S-TI%	S-MN	S-AG	S-AS	S-AU	S-B	S-BA	S-BE	S-BI	S-CD	S-CU
STREAM-SEDIMENT SAMPLES														
EC2023	3.0	0.70	1.50	.300	1500	0.5 L	200 N	10 N	30	300	2.0	10 N	20 N	15
EC2047	5.0	2.00	2.00	.500	1000	0.5	200 N	10 N	20	150	1.0	10 N	20 N	10
EC2051	3.0	1.50	2.00	.300	700	0.5	200 N	10 N	20	300	1.0 L	10 N	20 N	7
EC2056	5.0	1.00	1.00	.200	700	0.5 N	200 N	10 N	20	150	1.0	10 N	20 N	7
EC2066	10.0	2.00	2.00	.500	1000	0.5 N	200 N	10 N	15	150	1.0 L	10 N	20 N	15
EC2083	7.0	1.00	1.00	.300	1000	0.5 N	200 N	10 N	30	200	1.0 L	10 N	20 N	7
EC2136	7.0	1.00	2.00	.700	500	0.5 N	200 N	10 N	10 L	200	1.0	10 N	20 N	7
EG0034	10.0	7.00	3.00	.700	1500	0.5 N	200 N	10 N	10 L	150	1.0 N	10 N	20 N	70
EG0043	7.0	5.00	2.00	.500	1000	0.5 N	200 N	10 N	10 L	300	1.0 L	10 N	20 N	70
EG0064	5.0	3.00	3.00	.700	1500	0.5 N	200 N	10 N	10 L	500	1.0 L	10 N	20 N	15
EG0065	3.0	1.50	2.00	.500	1000	0.5 N	200 N	10 N	10 L	300	1.0	10 N	20 N	10
EG0071	5.0	2.00	2.00	.700	1500	0.5 N	200 N	10 N	10	300	1.0	10 N	20 N	30
EG0073	7.0	3.00	2.00	.700	700	0.5 N	200 N	10 N	50	300	1.0	10 N	20 N	30
EG0140	7.0	1.50	2.00	.500	700	0.5 N	200 N	10 N	10	300	1.0 L	10 N	20 N	20
EG0289	3.0	1.50	2.00	.500	1000	0.5 N	200 N	10 N	10 L	500	1.0	10 N	20 N	10
EG0290	2.0	0.70	1.50	.300	5000	0.5 N	200 N	10 N	10 L	300	1.5	10 N	20 N	15
EG0335	5.0	2.00	3.00	.500	1000	0.5 N	200 N	10 N	10 L	200	1.0 L	10 N	20 N	10
EG0338	2.0	1.00	1.50	.200	700	0.5 N	200 N	10 N	10 L	150	1.0 L	10 N	20 N	7
EG0339	3.0	1.50	3.00	.500	1000	0.5 N	200 N	10 N	10 L	200	1.0	10 N	20 N	15
EG0391	2.0	1.00	0.70	.300	300	0.5 N	200 N	10 N	10	500	1.5	10 N	20 N	10
EG0393	2.0	0.70	1.50	.200	500	0.5 N	200 N	10 N	10 L	500	1.0	10 N	20 N	7
EG0394	1.5	0.70	0.70	.150	300	0.5 N	200 N	10 N	10	500	1.0	10 N	20 N	5
EG0440	2.0	1.00	1.50	.300	300	0.5 N	200 N	10 N	70	500	1.0 L	10 N	20 N	10
EG0442	3.0	1.50	2.00	.300	700	0.5 N	200 N	10 N	30	500	1.0	10 N	20 N	15
EG0697	5.0	1.00	1.50	.500	3000	0.5 N	200 N	10 N	10 L	300	1.0	10 N	20 N	15
EG0698	3.0	0.70	1.50	.300	700	0.5 N	200 N	10 N	10	300	1.5	10 N	20 N	10
EG0699	3.0	0.70	1.50	.300	2000	0.5 N	200 N	10 N	10 L	300	1.5	10 N	20 N	10
EG0705	7.0	3.00	3.00	.700	1500	0.5 N	200 N	10 N	10 L	200	1.0 L	10 N	20 N	20
EG0706	7.0	2.00	1.50	.500	700	0.5 N	200 N	10 N	50	300	1.0	10 N	20 N	20
EG0708	7.0	1.50	2.00	1.000	1500	0.5 N	200 N	10 N	200	500	1.0 L	10 N	20 N	15
EG0717	3.0	1.50	1.50	.300	700	0.5 N	200 N	10 N	10 L	300	1.0	10 N	20 N	10
EG0718	3.0	1.50	2.00	.300	3000	0.5 N	200 N	10 N	10	500	1.0	10 N	20 N	20
EG0723	5.0	2.00	2.00	.300	700	0.5 N	200 N	10 N	10 L	300	1.0	10 N	20 N	15
EG0740	3.0	1.50	1.50	.300	700	0.5 N	200 N	10 N	10	300	1.0	10 N	20 N	10
EG0770	3.0	1.50	1.50	.300	1000	0.5 N	200 N	10 N	10 L	500	1.0	10 N	20 N	10
EG0775	2.0	0.70	0.70	.200	700	0.5 N	200 N	10 N	10	100	1.0	10 N	20 N	10
EG0802	3.0	3.00	3.00	.700	700	0.5 N	200 N	10 N	10	300	1.0	10 N	20 N	15
EG0810	3.0	1.00	1.50	.500	2000	0.5 N	200 N	10 N	10	300	1.0	10 N	20 N	15
EG0812	3.0	0.70	0.70	.300	700	0.5 N	200 N	10 N	20	300	1.0	10 N	20 N	15
EG0820	3.0	1.00	1.50	.300	3000	0.5 N	200 N	10 N	70	500	1.5	10 N	20 N	30
EG0822	7.0	1.50	3.00	1.000	1500	0.5 N	200 N	10 N	50	500	1.0	10 N	20 N	15

TABLE 19.—*Analytical results of anomalous samples from other parts of the Alpine Lakes area and additions*—Continued

SAMPLE	S-CR	S-CU	S-LA	S-MO	S-NB	S-NI	S-PB	S-SB	S-SC	S-SN	S-SR	S-V	S-W	S-Y	S-ZN	S-ZR
					STREAM-SEDIMENT SAMPLES											
EC2023	15	30	20 L	5 L	20 N	10	70	100 N	10	10 N	200	70	50 N	20	200 N	150
EC2047	30	70	20	5	20 N	10	15	100 N	15	10 N	200	100	50 N	20	200 N	500
EC2051	15	30	20 L	5 L	20 L	7	30	100 N	15	10 N	300	70	50 N	10	200 N	150
EC2056	10 N	50	20	5 N	20 N	7	50	100 N	15	10 N	200	100	50 N	15	200 N	150
EC2066	30	100	30	5 N	20 N	15	30	100 N	20	10 N	200	100	50 N	20	200 N	300
EC2083	30	70	20	5 N	20 N	7	50	100 N	15	10 N	150	200	50 N	20	200 N	300
EC2136	20	50	20	5 N	20 N	20	50	100 N	10	10 N	300	150	50 N	15	200 N	200
EG0034	3000	7	20 N	5 N	10 N	1500	10	100 N	15	10 N	200	100	50 N	10 L	200 N	100
EG0043	2000	50	20 N	5 N	10 N	1000	10	100 N	15	10 N	200	150	50 N	10	200 N	70
EG0064	150	20	20 N	5 N	10 N	50	100	100 N	20	10 N	300	100	50 N	30	200 N	100
EG0065	100	10	20 N	5 N	10 N	30	50	100 N	20	10 N	200	100	50 N	20	200 N	200
EG0071	300	30	20 L	10	10 N	150	15	100 N	15	10 N	300	150	50 N	20	200 N	150
EG0073	300	70	20 L	5 N	10 N	100	15	100 N	30	10 N	300	200	50 N	20	200 N	150
EG0140	150	150	20 L	5 N	10 N	50	20	100 N	20	10 N	200	150	50 N	30	200 N	100
EG0289	70	15	20 N	5	10 N	15	15	100 N	15	10 N	300	100	50 N	15	200 N	70
EG0290	30	20	20 L	5	10 N	10	20	100 N	5	10 N	200	70	50 N	15	200 N	70
EG0335	150	20	20 L	5	10 N	30	15	100 N	15	10 N	300	100	50 N	15	200 N	70
EG0338	50	15	20 L	5	10 N	15	15	100 N	7	10 N	300	70	50 N	15	200 N	50
EG0339	100	30	20 N	10	10 N	20	10	100 N	20	10 N	500	150	50 N	30	200 N	700
EG0391	100	100	30	5 N	10 N	50	20	100 N	15	10 N	150	70	50 N	20	200 N	150
EG0393	70	20	20 N	5	10 N	15	15	100 N	7	10 N	300	70	50 N	10	200 N	150
EG0394	70	30	20 N	7	10 N	15	15	100 N	10	10 N	200	70	50 N	10	200 N	150
EG0440	30	30	50	5	10 N	10	20	100 N	15	10 N	200	70	50 N	15	200 N	150
EG0442	30	7	20	5	10 N	15	20	100 N	15	10 N	200	100	50 N	30	200 N	100
EG0697	30	70	20 L	5 N	10 N	15	200	100 N	15	10 N	300	100	50 N	20	200 N	150
EG0698	30	20	20	5 N	10 N	15	150	100 N	15	10 N	200	70	50 N	20	200 N	150
EG0699	30	20	20 N	5 N	10 N	10	70	100 N	10	10 N	200	70	50 N	20	200 N	100
EG0705	70	15	20 N	5 N	10 N	30	50	100 N	15	10 N	300	150	50 N	15	200 N	100
EG0706	200	100	20 N	5 N	10 N	50	30	100 N	15	10 N	200	150	50 N	15	200 N	150
EG0708	100	100	20	5 N	10 N	10	15	100 N	15	10 N	200	200	50 N	30	200 N	200
EG0717	50	15	20 N	5 N	10 N	15	50	100 N	15	10 N	300	70	50 N	15	200 N	150
EG0718	70	15	20 N	5 N	10 N	20	200	100 N	15	10 N	300	100	50 N	20	200 N	100
EG0723	100	20	20 N	5 N	10 N	30	50	100 N	15	10 N	300	150	50 N	20	200 N	150
EG0740	50	20	20	5 N	10 N	15	70	100 N	15	10 N	300	100	50 N	15	200 N	70
EG0770	50	30	20 L	5 N	10 N	15	200	100 N	15	10 N	300	100	50 N	15	200 N	150
EG0775	20	30	20 N	5 N	10 N	10	70	100 N	5	10 N	100	50	50 N	10 L	200 N	150
EG0802	70	50	20 L	5 N	10 N	30	70	100 N	15	10 N	300	100	50 N	15	200 N	150
EG0810	50	20	20	5 N	10 N	20	50	100 N	15	10 N	200	70	50 N	15	200 N	70
EG0812	50	150	20 L	5 N	10 N	15	30	100 N	15	10 N	200	100	50 N	15	200 N	200
EG0820	100	70	20 L	10	10 N	30	50	100 N	15	10 N	200	150	50 N	30	200 N	70
EG0822	100	50	20 N	5	10 N	15	30	100 N	15	10 N	200	200	50 N	30	200 N	200

TABLE 19.—*Analytical results of anomalous samples from other parts of the Alpine Lakes area and additions*—Continued

SAMPLE	AA-AU-P	AA-CU-P	AA-ZN-P	AA-AG-P	AA-CO-P	AA-NI-P	CM-CX-HM	CM-SB	CM-MO	AS-PT	AS-PD	AS-RH	AS-RU	AS-IR	EU
					STREAM-SEDIMENT SAMPLES										
EC2023	0.00 B	0 B	0 B	0 B	0 B	0 B	1 N	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EC2047	0.00 B	0 B	0 B	0 B	0 B	0 B	1 N	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EC2051	0.00 B	0 B	0 B	0 B	0 B	0 B	1 N	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EC2056	0.00 B	0 B	0 B	0 B	0 B	0 B	1 N	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EC2066	0.00 B	0 B	0 B	0 B	0 B	0 B	1 N	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EC2083	0.00 B	0 B	0 B	0 B	0 B	0 B	1 L	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EC2136	0.00 B	0 B	0 B	0 B	0 B	0 B	1 N	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG0034	0.00 B	10	45	0 B	0 B	0 B	10	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG0043	0.00 B	20	40	0 B	0 B	0 B	10	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG0064	0.00 B	15	60	0 B	0 B	0 B	5	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG0065	0.00 B	10	45	0 B	0 B	0 B	3	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG0071	0.00 B	10	45	0 B	0 B	0 B	3	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG0073	0.00 B	45	135	0 B	0 B	0 B	5	.5 L	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG0140	0.00 B	40	60	0 B	0 B	0 B	2	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG0289	0.00 B	0 B	0 B	0 B	0 B	0 B	1	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG0290	0.00 B	15	30	0 B	0 B	0 B	5	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG0335	0.00 B	20	35	0 B	0 B	0 B	3	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG0338	0.00 B	0 B	0 B	0 B	0 B	0 B	2	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG0339	0.00 B	0 B	0 B	0 B	0 B	0 B	2	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG0391	0.00 B	95	40	0 B	0 B	0 B	1 L	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG0393	0.00 B	0 B	0 B	0 B	0 B	0 B	1 L	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG0394	0.00 B	0 B	0 B	0 B	0 B	0 B	1 L	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG0440	0.00 B	0 B	0 B	0 B	0 B	0 B	1 L	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG0442	0.00 B	0 B	0 B	0 B	0 B	0 B	1 L	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG0697	0.00 B	20	55	0 B	0 B	0 B	2	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG0698	0.00 B	25	65	0 B	0 B	0 B	2	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG0699	0.00 B	10	30	0 B	0 B	0 B	2	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG0705	0.00 B	15	30	0 B	0 B	0 B	2	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG0706	0.00 B	0 B	0 B	0 B	0 B	0 B	2	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG0708	0.00 B	30	20	0 B	0 B	0 B	1 L	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG0717	0.00 B	15	35	0 B	0 B	0 B	3	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG0718	0.00 B	15	100	0 B	0 B	0 B	25	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG0723	0.00 B	20	60	0 B	0 B	0 B	2	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG0740	0.00 B	10	40	0 B	0 B	0 B	1	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG0770	0.00 B	30	55	0 B	0 B	0 B	3	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG0775	0.00 B	0 B	0 B	0 B	0 B	0 B	6	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG0802	0.00 B	20	35	0 B	0 B	0 B	2	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG0810	0.00 B	0 B	0 B	0 B	0 B	0 B	2	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG0812	0.00 B	20	70	0 B	0 B	0 B	2	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG0820	0.00 B	80	110	0 B	0 B	0 B	3	2.0	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG0822	0.00 B	0 B	0 B	0 B	0 B	0 B	2	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B

TABLE 19.—*Analytical results of anomalous samples from other parts of the Alpine Lakes area and additions*—Continued

SAMPLE	S-FE%	S-MG%	S-CA%	S-TI%	S-MN	S-AG	S-AS	S-AU	S-B	S-BA	S-BE	S-BI	S-CD	S-CO
STREAM-SEDIMENT SAMPLES														
EG0831	3.0	0,70	1,00	.500	1500	0,5 N	200 N	10 N	50	700	1,5	10 N	20 N	15
EG1162	3.0	1,00	0,70	.300	500	0,5 N	200 N	10 N	20	200	1,0	10 N	20 N	15
EG2084	10.0	3,00	3,00	.700	1500	0,5 N	200 N	10 N	10	150	1,0 L	10 N	20 N	30
EG2092	10.0	5,00	5,00	1,000 G	1500	0,5 N	200 N	10 N	10	150	1,0 L	10 N	20 N	50
EG2137	5.0	2,00	3,00	.300	1000	0,5 N	200 N	10 N	30	150	1,0 L	10 N	20 N	10
EG2152	5.0	3,00	1,50	.500	500	0,5 N	200 N	10 N	15	150	1,0 N	10 N	20 N	10
EG2167	3.0	1,50	3,00	.500	1500	0,5 N	200 N	10 N	30	300	1,0 L	10 N	20 N	15
EG2212	5.0	1,00	1,50	.300	3000	0,5 N	200 N	10 N	50	300	1,0	10 N	20 N	70
EG2214	7.0	3,00	3,00	.500	1500	0,5 N	200 N	10 N	10	150	1,0 L	10 N	20 N	70
EG2280	3.0	1,50	1,50	.500	300	1,0	200 N	10 N	15	100	1,0 L	10 N	20 N	7
EG2321	7.0	1,50	1,50	.500	700	0,5 N	200 N	10 N	10	150	1,0 N	10 N	20 N	7
EG2341	7.0	3,00	3,00	.700	1500	0,5 N	200 N	10 N	10	150	1,0 L	10 N	20 N	15
EG2360	5.0	1,50	3,00	.300	1000	0,5 N	200 N	10 N	10	150	1,0	10 N	20 N	7
EG2373	5.0	1,50	2,00	.500	1500	0,5 N	200 N	10 N	15	300	1,0	10 N	20 N	15
EG2499	7.0	1,50	3,00	.500	1000	0,5 N	200 N	10 N	10 L	300	1,0 L	10 N	20 N	15
EG2644	3.0	1,00	1,00	.200	500	0,5 N	200 N	10 N	10	200	1,0	10 N	20 N	7
EG2717	3.0	1,00	1,00	.200	1500	0,5 N	200 N	10 N	10	100	1,0	10 N	20 N	15
EG2748	7.0	1,00	1,00	.300	700	0,5 N	200 N	10 N	20	200	1,0	10 N	20 N	10
EG2750	7.0	2,00	2,00	.500	5000	0,5 N	200 N	10 N	10	200	1,0	10 N	20 N	15
EK0058	1.0	0,70	1,00	.070	700	0,5 N	200 N	10 N	10	100	1,0 N	10 N	20 N	5
EK0220	3.0	1,50	1,50	.300	700	0,5 N	200 N	10 N	10 L	300	1,0 L	10 N	20 N	15
EK0282	3.0	1,50	2,00	1,000	700	0,5 N	200 N	10 N	10	300	1,0 L	10 N	20 N	15
EK0285	3.0	1,50	2,00	.500	700	0,5 N	200 N	10 N	10	300	1,5	10 N	20 N	15
EK0312	3.0	1,50	2,00	.500	1500	0,5 N	200 N	10 N	10	500	1,5	10 N	20 N	15
EK0315	3.0	1,50	3,00	.200	500	0,5 N	200 N	10 N	10	200	1,0	10 N	20 N	10
EK0414	0.7	0,30	1,50	.070	500	0,5 N	200 N	10 N	10 L	70	1,0	10 N	20 N	5
EK0444	2.0	1,00	1,50	.150	5000	0,5 N	200 N	10 N	10	200	1,5	10 N	20 N	20
EK0451	3.0	0,70	1,50	.200	700	0,5 N	200 N	10 N	10	150	1,0	10 N	20 N	10
EK0492	2.0	0,70	1,00	.200	1000	0,5 N	200 N	10 N	10 L	200	1,0	10 N	20 N	7
EP2017	10.0	2,00	2,00	.500	700	0,5 N	200 N	10 N	10	300	1,0	10 N	20 N	20
EP2028	15.0	3,00	3,00	1,000 G	1500	0,5 N	200 N	10 N	20	150	1,0 N	10 N	20 N	50
EP2270	5.0	1,00	2,00	.300	500	0,5 N	200 N	10 N	50	200	1,5	10 N	20 N	10
EP2274	10.0	1,50	3,00	.300	700	0,5 N	200 N	10 N	50	200	1,0	10 N	20 N	10
EP2293	3.0	1,50	2,00	.200	700	0,5 N	200 N	10 N	15	300	1,0	10 N	20 N	7
EP2295	5.0	0,70	1,50	.200	700	0,5 N	200 N	10 N	10 L	300	1,0	10 N	20 N	5 L
EP2322	3.0	0,70	2,00	.200	1500	0,5	200 N	10 N	30	300	1,5	10 N	20 N	7
EP2325	3.0	1,00	1,50	.200	700	0,5 N	200 N	10 N	20	150	1,0 L	10 N	20 N	5 L
EP2394	1.5	0.20	3.00	.100	500	0,7	200 N	10 N	30	150	1.0 L	10 N	20 N	5 L
Ep2408	2.0	0,70	2,00	.300	1500	0,5 L	200 N	10 N	50	150	1,0	10 N	20 N	7
EP2474	5.0	1,00	1,00	.200	1500	0,5 N	200 N	10 N	10 L	200	1,0	10 N	20 N	7
ES0080	3.0	1,00	1,50	.300	1500	0,5 N	200 N	10 N	10	300	1,0	10 N	20 N	15

TABLE 19.—*Analytical results of anomalous samples from other parts of the Alpine Lakes area and additions*—Continued

SAMPLE	S-CR	S-CU	S-LA	S-MO	S-NB	S-NI	S-PB	S-SB	S-SC	S-SN	S-SR	S-V	S-W	S-Y	S-ZN	S-ZR
STREAM-SEDIMENT SAMPLES																
EG0831	70	30	20	5 N	10 N	20	50	100 N	15	10 N	200	70	50 N	30	200 N	150
EG1162	100	30	20 N	5 N	10 N	50	10	100 N	15	10 N	150	100	50 N	10	200 N	70
EG2084	300	30	20 N	5 N	20 N	70	15	100 N	30	10 N	300	300	50 N	20	200	70
EG2092	700	20	20	5 N	20 N	150	10	100 N	30	10 N	500	200	50 N	30	200	150
EG2137	70	7	20 N	5	20 N	20	15	100 N	10	10 N	300	70	50 N	10	200 N	30
EG2152	100	20	20 N	5 N	20 L	70	10 L	100 N	10	10 N	150	100	100	10	200 N	70
EG2167	70	30	20 N	5	20 N	30	15	100 N	15	10 N	300	100	50 N	15	200 N	70
EG2212	70	50	20	5 L	20 L	70	70	100 N	15	10 N	150	100	50 N	15	200 N	50
EG2214	150	70	20 N	5 L	20 L	30	15	100 N	20	10 N	300	150	50 N	15	200 N	150
EG2280	20	10	20 L	5 L	20 L	10	10 L	100 N	10	10 N	200	50	50 N	10	200 N	150
EG2321	15	10	20 L	7	20 L	7	10	100 N	15	10 N	150	70	50 N	15	200 N	150
EG2341	15	30	20 N	5 L	20 N	15	50	100 N	15	10 N	500	70	50 N	15	200 N	150
EG2360	15	15	20 L	5 L	20 L	5 L	30	100 N	10	10 N	150	70	50 N	10	200 N	100
EG2373	50	70	20 N	5 L	20 N	20	70	100 N	15	10 N	150	100	50 N	30	200	150
EG2499	30	50	20 L	5 L	20 L	15	50	100 N	15	10 N	200	100	50 N	20	200 N	100
EG2644	10 N	70	20	5	20 N	7	30	100 N	10	10 N	100	70	50 N	15	200 N	200
EG2717	20	50	20	5 L	20 N	10	70	100 N	15	10 N	100	70	50 N	15	200 N	70
EG2748	30	70	20	5 N	20 N	30	150	100 N	15	10 N	300	100	50 N	20	200 N	200
EG2750	30	30	50	5 N	20 N	30	50	100 N	15	10 N	300	150	50 N	50	200	100
EK0058	50	1500	20 N	5 N	10 N	15	10	100 N	5	200	100 N	20	50 N	10 L	200 N	10
EK0220	50	10	20 L	5	10 N	15	10	100 N	10	10 N	300	70	50 N	10	200 N	70
EK0282	70	30	20	5	10 N	20	10	100 N	15	10 N	300	100	50 N	30	200 N	150
EK0285	50	10	20	5	10 N	15	20	100 N	10	10 N	300	70	50 N	15	200 N	150
EK0312	70	30	20 L	5	10 N	20	50	100 N	15	10 N	300	100	50 N	15	200 N	150
EK0315	70	15	20 N	5	10 N	20	20	100 N	15	10 N	300	150	50 N	15	200 N	150
EK0414	20	7	20 N	5 N	10 N	5	30	100 N	5	10 N	150	15	50 N	10	200 N	10
EK0444	70	15	20 N	5 N	10 N	15	70	100 N	10	10 N	150	100	50 N	10	200 N	30
EK0451	20	30	20 N	5 N	10 N	10	50	100 N	7	10 N	150	50	50 N	15	200 N	150
EK0492	20	15	20 N	5 N	10 N	5	50	100 N	7	10 N	200	70	50 N	15	200 N	70
EP2017	150	30	20 L	10	20 N	70	50	100 N	15	10 N	300	150	50 N	15	200 L	150
EP2028	700	30	20 N	5 N	20 N	200	15	100 N	30	10 N	500	200	50 N	30	200	1000 G
EP2270	30	150	20 L	5 L	20 L	30	20	100 N	10	10 N	200	70	50 N	15	200 N	50
EP2274	30	70	20 L	5	20 L	15	30	100 N	15	10 N	200	150	50 N	15	200 N	70
EP2293	30	70	20 N	5 N	20 L	15	100	100 N	15	10 N	150	70	50 N	15	200 N	70
EP2295	15	10	20 L	30	20 L	7	30	100 N	7	10 N	100	50	50 N	70	200 N	200
EP2322	15	50	20 L	5 L	20 L	10	30	100 N	10	10 N	150	70	50 N	20	200 L	150
EP2325	20	30	20 L	7	20 L	5 L	10	100 N	10	10 N	100	70	50 N	10	200 N	300
EP2394	10	15	20 N	5 L	20 L	5	100	100 N	5	30	150	50	50 N	10	200 N	30
EP2408	10	100	20 N	5	20 N	10	70	100 N	10	10 N	200	50	50 N	15	200 N	70
EP2474	10 N	20	20	5 N	20 N	7	50	100 N	10	10 N	100	100	50 N	15	200 N	300
ES0080	50	20	20 N	5 N	10 N	20	10	100 N	10	10 N	300	100	50 N	20	200 N	100

TABLE 19.—*Analytical results of anomalous samples from other parts of the Alpine Lakes area and additions*—Continued

SAMPLE	AA-AU-P	AA-CU-P	AA-ZN-P	AA-AG-P	AA-CO-P	AA-NI-P	CM-CX-HM	CM-SB	CM-MO	AS-PT	AS-PD	AS-RH	AS-RU	AS-IR	EU
						STREAM-SEDIMENT SAMPLES									
EG0831	0.00 B	15	70	0 B	0 B	0 B	2	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG1162	0.00 B	30	100	0 B	0 B	0 B	2	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG2084	0.00 B	0 B	0 B	0 B	0 B	0 B	2	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG2092	0.00 B	0 B	0 B	0 B	0 B	0 B	1 L	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG2137	0.00 B	15	30	0 B	0 B	0 B	4	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG2152	0.00 B	0 B	0 B	0 B	0 B	0 B	1	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG2167	0.00 B	0 B	0 B	0 B	0 B	0 B	2	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG2212	0.00 B	30	55	0 B	0 B	0 B	10	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG2214	0.00 B	20	30	0 B	0 B	0 B	12	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG2280	0.00 B	0 B	0 B	0 B	0 B	0 B	1	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG2321	0.00 B	0 B	0 B	0 B	0 B	0 B	1	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG2341	0.00 B	0 B	0 B	0 B	0 B	0 B	1	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG2360	0.00 B	35	80	0 B	0 B	0 B	16	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG2373	0.00 B	0 B	0 B	0 B	0 B	0 B	1	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG2499	0.00 B	0 B	0 B	0 B	0 B	0 B	1	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG2644	0.00 B	0 B	0 B	0 B	0 B	0 B	1	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG2717	0.00 B	0 B	0 B	0 B	0 B	0 B	1 N	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG2748	0.00 B	0 B	0 B	0 B	0 B	0 B	1	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EG2750	0.00 B	0 B	0 B	0 B	0 B	0 B	1 L	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EK0058	0.00 B	0 B	0 B	0 B	0 B	0 B	2	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EK0220	0.00 B	0 B	0 B	0 B	0 B	0 B	1	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EK0282	0.00 B	0 B	0 B	0 B	0 B	0 B	1 L	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EK0285	0.00 B	0 B	0 B	0 B	0 B	0 B	2	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EK0312	0.00 B	15	55	0 B	0 B	0 B	1	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EK0315	0.00 B	0 B	0 B	0 B	0 B	0 B	1	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EK0414	0.00 B	15	45	0 B	0 B	0 B	10	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EK0444	0.00 B	0 B	0 B	0 B	0 B	0 B	1 L	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EK0451	0.00 B	0 B	0 B	0 B	0 B	0 B	1	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EK0492	0.00 B	0 B	0 B	0 B	0 B	0 B	5	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EP2017	0.00 B	0 B	0 B	0 B	0 B	0 B	2	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EP2028	0.00 B	0 B	0 B	0 B	0 B	0 B	1 L	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EP2270	0.00 B	150	65	0 B	0 B	0 B	10	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EP2274	0.00 B	0 B	0 B	0 B	0 B	0 B	1	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EP2293	0.00 B	0 B	0 B	0 B	0 B	0 B	1	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EP2295	0.00 B	0 B	0 B	0 B	0 B	0 B	1	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EP2322	0.00 B	0 B	0 B	0 B	0 B	0 B	1	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EP2325	0.00 B	0 B	0 B	0 B	0 B	0 B	1	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EP2394	0.00 B	0 B	0 B	0 B	0 B	0 B	1 L	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EP2408	0.00 B	0 B	0 B	0 B	0 B	0 B	1 N	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
EP2474	0.00 B	0 B	0 B	0 B	0 B	0 B	1 N	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
ES0080	0.00 B	10	120	0 B	0 B	0 B	12	.5 L	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B

TABLE 19.—*Analytical results of anomalous samples from other parts of the Alpine Lakes area and additions*—Continued

SAMPLE	S-FE%	S-MG%	S-CA%	S-TI%	S-MN	S-AG	S-AS	S-AU	S-B	S-BA	S-BE	S-BI	S-CD	S-CO
					STREAM-SEDIMENT SAMPLES									
ES0241	3.0	1.50	1.50	.300	700	0.5 N	200 N	10 N	10	300	1.0	10 N	20 N	15
ES2043	7.0	2.00	3.00	.500	1000	0.5 N	200 N	10 N	10 L	150	1.0 L	10 N	20 N	15
ES2078	5.0	1.00	1.00	.500	700	0.5 N	200 N	10 N	70	300	1.0 L	10 N	20 N	7
ET0035	5.0	3.00	3.00	.500	2000	0.5 N	200 N	10 N	10	300	1.0 L	10 N	20 N	15
ET0098	7.0	3.00	2.00	.700	1000	0.5 N	200 N	10 N	70	500	1.0 L	10 N	20 N	70
ET0104	5.0	3.00	3.00	.500	1500	0.5 N	200 N	10 N	10	500	1.0 L	10 N	20 N	30
ET0137	5.0	1.50	2.00	.700	1000	0.5 N	200 N	10 N	10 L	300	1.0	10 N	20 N	15
ET0170	7.0	2.00	3.00	.500	1500	0.5 N	200 N	10 N	10	300	1.0 L	10 N	20 N	15
ET0171	3.0	1.00	2.00	.300	1500	0.5 N	200 N	10 N	10 L	200	1.0 L	10 N	20 N	7
ET0219	1.5	0.50	1.00	.150	500	0.5 N	200 N	10 N	10	300	1.0	10 N	20 N	10
ET0230	1.0	0.20	0.70	.070	3000	0.5 N	200 N	10 N	10 L	70	1.0	10 N	20 N	10
ET0271	3.0	3.00	3.00	.300	1000	0.5 N	200 N	10 N	10 L	300	1.0	10 N	20 N	15
ET0296	5.0	0.70	2.00	.500	1000	0.5 N	200 N	10 N	10	300	1.0	10 N	20 N	10
ET0302	3.0	0.70	0.70	.300	1500	0.5 N	200 N	10 N	70	500	1.0	10 N	20 N	15
ET0371	3.0	0.70	1.50	.700	700	0.5 N	200 N	10 N	10	300	1.0	10 N	20 N	10
ET0387	3.0	0.70	1.50	.300	700	0.5 N	200 N	10 N	10 L	300	1.0	10 N	20 N	10
					PANNED-CONCENTRATE SAMPLE									
EG1459	10.0	5.00	3.00	.700	1000	0.5 N	200 N	10 N	10	100	1.0 N	10 N	20 N	50

TABLE 19.—*Analytical results of anomalous samples from other parts of the Alpine Lakes area and additions*—Continued

SAMPLE	S-CR	S-CU	S-LA	S-MO	S-NB	S-NI	S-PB	S-SB	S-SC	S-SN	S-SR	S-V	S-W	S-Y	S-ZN	S-ZR
STREAM-SEDIMENT SAMPLES																
ES0241	50	7	20 N	5 N	10 N	15	70	100 N	10	10 N	300	70	50 N	10	200 N	150
ES2043	20	70	20 L	7	20 L	15	70	100 N	15	10 N	200	100	50 N	20	200 N	200
ES2078	30	20	20	10	20 N	30	10 L	100 N	15	10 N	150	70	50 N	15	200 N	150
ET0035	150	1500	20 N	5 N	10 N	50	20	100 N	20	200	700	100	50 N	15	200 L	70
ET0098	300	100	20 L	5 N	10 N	150	15	100 N	30	10 N	200	300	50 N	30	200 N	150
ET0104	200	30	20 N	5	10 N	70	15	100 N	30	10 N	300	300	50 N	15	200 N	100
ET0137	70	15	20	15	10 N	30	10	100 N	20	10 N	500	150	50 N	20	200 N	200
ET0170	150	20	20 N	5 N	10 N	50	50	100 N	20	10 N	500	200	50 N	15	200 N	70
ET0171	50	15	20	5 N	10 N	20	50	100 N	10	10 N	300	100	50 N	10	200 N	70
ET0219	20	30	20 N	5 N	10 N	5	30	100 N	7	10 N	200	50	50 N	10	200 N	70
ET0230	10 L	7	20 N	5 N	10 N	5	50	100 N	5	10 N	100 L	20	50 N	10	200 N	10
ET0271	150	30	20 N	5 N	10 N	70	50	100 N	15	10 N	500	100	50 N	15	200 N	70
ET0296	20	20	20 N	5 N	10 N	10	50	100 N	15	10 N	200	70	50 N	20	200 N	100
ET0302	30	30	30	5 N	10 N	15	50	100 N	15	10 N	200	100	50 N	50	200 N	150
ET0371	30	20	20 N	5 N	10 N	15	100	100 N	10	10 N	200	70	50 N	15	200 N	100
ET0387	20	10	20 N	5 N	10 N	10	70	100 N	7	10 N	200	70	50 N	10	200 N	150
PANNED-CONCENTRATE SAMPLE																
EG1459	5000 G	15	20 N	5 N	20 N	500	10 L	100 N	20	10 N	200	150	50 N	20	200	100

TABLE 19.—*Analytical results of anomalous samples from other parts of the Alpine Lakes area and additions*—Continued

SAMPLE	AA-AU-P	AA-CU-P	AA-ZN-P	AA-AG-P	AA-CO-P	AA-NI-P	CM-CX-HM	CM-SB	CM-MO	AS-PT	AS-PD	AS-RH	AS-RU	AS-IR	EU
					STREAM-SEDIMENT SAMPLES										
ES0241	0.00 B	15	55	0 B	0 B	0 B	3	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
ES2043	0.00 B	0 B	0 B	0 B	0 B	0 B	2	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
ES2078	0.00 B	0 B	0 B	0 B	0 B	0 B	1 H	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
ET0035	0.00 B	0 B	0 B	0 B	0 B	0 B	3	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
ET0098	0.00 B	0 B	0 B	0 B	0 B	0 B	1 L	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
ET0104	0.00 B	0 B	0 B	0 B	0 B	0 B	1	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
ET0137	0.00 B	10	35	0 B	0 B	0 B	1 L	.0 B	15	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
ET0170	0.00 B	15	40	0 B	0 B	0 B	2	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
ET0171	0.00 B	10	45	0 B	0 B	0 B	3	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
ET0219	0.00 B	25	140	0 B	0 B	0 B	20	.5	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
ET0230	0.00 B	0 B	0 B	0 B	0 B	0 B	3	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
ET0271	0.00 B	30	70	0 B	0 B	0 B	3	.5	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
ET0296	0.00 B	20	110	0 B	0 B	0 B	2	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
ET0302	0.00 B	20	80	0 B	0 B	0 B	1 L	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
ET0371	0.00 B	20	60	0 B	0 B	0 B	6	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
ET0387	0.00 B	10	20	0 B	0 B	0 B	3	.0 B	0 B	.00 B	.000 B	.000 B	.0 B	.0 B	0 B
					PANNED-CONCENTRATE SAMPLE										
EG1459	0.05 N	0 B	0 B	0 B	0 B	0 B	0 B	.0 B	0 B	.01 N	.004 N	.004 N	.2 N	.2 N	0 B

☆ U.S. GOVERNMENT PRINTING OFFICE: 1989—674-406