METAL MINES OF WASHINGTON —

PRELIMINARY REPORT

by

ROBERT E. DERKEY

NANCY L. JOSEPH

and

RAYMOND LASMANIS

WASHINGTON DIVISION OF GEOLOGY AND EARTH RESOURCES

OPEN FILE REPORT 90-18

NOVEMBER 1990

WASHINGTON STATE DEPARTMENT OF
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Division of Geology and Earth Resources
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CONTENTS

Metal Mines of Washington—Preliminary Report

by Robert E. Derkey, Nancy L. Joseph, and Raymond Lasmanis

This report is a preliminary compilation that summarizes the geology and related features of 541 metal mines in Washington. This volume is an updated revision of producing mining properties described by Huntting (1956) in "Inventory of Washington Minerals—Part II, Metallic Minerals". For a mine to be included in this data set, it should have produced about $1,000 worth of ore. Much of the production information included here is from Huntting (1956); however, production statistics, which are commonly incomplete in Huntting, are not significantly improved in this report.

In essence, this is a working document; the database will be continuously updated as new information is received. If a mine in which you are interested has produced metal(s) worth at least $1,000 but is not included here, please let us know. If you can supply appropriate production data for this mine, we will include the mine in the database and future versions of this report. In addition, if you find errors in this report or have new information about any included mine, please contact us. Send your comments or additions to:

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The information in this report can be made available on disc. Contact R. E. Derkey for more information.

EXPLANATION OF INFORMATION

This inventory of Washington mines is a collection of geologic and mineral deposit information that has been entered into a computer database program called GSMODS (Johnson, 1987). All accumulated information for a single mine constitutes one record in the database. A category within a record, such as "ore controls", is termed a field. Two types of fields make up each record. The first type requires entry of names or abbreviations, such as for "ore minerals" or "commodities", and results in a listing. The other type of field allows insertion of an unlimited amount of text or data, including pertinent information from literature sources, the reference, and pages cited.

Each mine or occurrence (record) in the database is intended to stand alone with respect to its content. Consequently, some fields in a record contain the same data as those fields for other nearby mines. The repeated data normally pertain to or describe the geology of the area as a whole. For example, the text of "tectonic setting" may be the same for all mines in a given mining district.

We have attempted to make individual category/field entries as complete as possible. However, where information is unavailable, the field is left blank. For some mines, information from literature sources is entered as a direct quotation, especially in unlimited-length text fields.

Site Name - The first entry of a site's record is the best known or most recent name of the mine, mineral deposit, or mining district. This is referred to tas the primary site name. Sites are presented in alphabetical order by primary site name within each county (also presented in alphabetical order). The primary site name is accompanied by a unique site number which will be used to identify mines on map plots of this inventory data set.

Alternate Names - All other names by which the mine has been known. See the Appendix at the back of this report for a listing of these alternate names, along with the primary site name, site numer and county.

District - The mining district(s) in which the mine is situated

County - The county in which the mine is located (See Fig. 1.)

Primary Quad - The 7.5- and/or 15-minute quadrangle(s) in which the mine is located

Scale - Map scales for the primary quadrangles, presented in the same order as the primary quadrangles, that is, the first map scale listed is that for the first primary quadrangle in the list

½° x 1° Quad - The ½ x 1 degree quadrangle in which the mine is located

1° x 2° Quad - The 1 x 2 degree quadrangle in which the mine is located

Latitude - The latitude of the mine location. This information is generally obtained by digitizing from the primary quadrangle(s).

Longitude - The longitude of the mine location. This information is generally obtained by digitizing from the primary quadrangle(s).

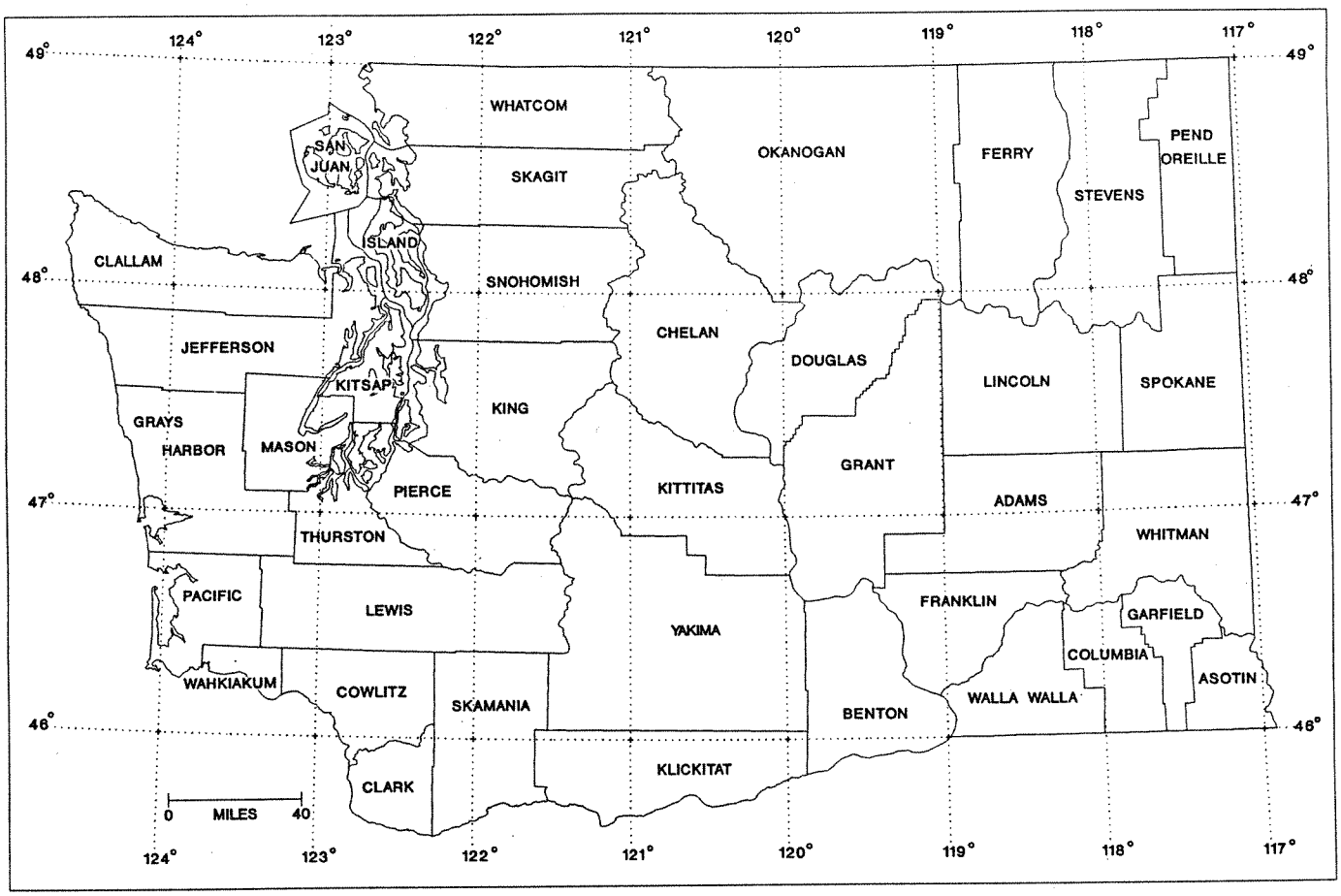

Figure 1. The counties of Washington.

Section, Township, and Range - The section, township, and range location for each mine. For many mines, the point selected is the center of a cluster of adits and/or shafts. If the location of a principal adit or shaft is known, that point is entered. If a mine portal is distant from an underground deposit, then a point directly over the deposit is selected.

Location - Any information that will assist in location of the mine. Some of this information may refer to features that are not shown of a topographic map but that may be helpful.

Host Rock: Name - The geological units, sequences, or formations in which the mineralization occurs. This information is generally taken from available geologic maps.

Lithology - The host rock lithology. This is given in the same order as that for the host rock names. The lithology, if taken from the explanation of a geologic map, may differ from lithologies given in the Ore Controls field for a mine. The lithology as recorded in Ore Controls is commonly from an individual description of the mine, whereas the description of the host formation lithology is commonly a general description from a geologic map.

Age - Host rock age. Entries here correspond sequentially to the listing of host rock names.

Associated Igneous Rock: Description - A brief description of igneous rocks genetically associated with the mineralization. Because the age of relation of igneous rock to mineralization at a mine is not always known, all igneous rock near a mine site may be included in this entry. This entry is a list if two or more igneous units are associated with the mineralization.

Age - The age of the associated igneous rock(s). This may be a listing, corresponding sequentially to the listing of the associated igneous rocks.

Commodities - The known commodities at the mine. The chemical symbols for elements and acronyms for commodities are listed at the top of the facing page.

Ore Minerals - All ore minerals known to occur at the mine. The minerals are listed in generally decreasing order of

Commodity symbols and acronym

Ag - silver	Ni - nickel
As - arsenic	Os - osmium
Au - gold	P - phosphorus
Be - berryllium	Pb - lead
Bi - bismith	PGE - platinum group elements
Cd - cadmium	Pt - platinum
Ce - cerium	S - sulfur
Co - cobalt	Sb - antimony
Cr - chromium	Se - selenium
Cu - copper	Sn - tin
Fe - iron	Te - tellurium
Ga - gallium	Th - thorium
Ge - germanium	Ti - titanium
Ir - iridium	U - uranium
Hg - mercury	V - vanadium
Mg - magnesium	W - tungsten
Mn - manganese	Zn - zinc
Mo - molybdenum	

abundance. This listing may be incomplete even though the commodities are known.

Non-Ore Minerals - A brief listing of the types of hydrothermal alteration. gangue minerals, and other non-ore minerals associated with mineralization at the mine.

Deposit Type - Concise labels that describe the type(s) of mineral deposit(s) at the site

Mineralization Age -The age of the mineralization

Production - The production history of the mine from various published sources, including Huntting (1956). This information is incomplete, but for many deposits, it is the best currently available.

Tectonic Setting - A brief description of the tectonic setting or geologic conditions at the time mineral deposition took place. In many instances, a general tectonic history of an area is included because the age of mineralization is unknown.

Ore Controls - A description of the factors controlling mineralization, including structural, stratigraphic, chemical, or other controls.

Geologic Setting - The general geology of the mine. This information is expanded from the host rock description and is commonly taken from geologic maps. Map scale and detail vary, and the data in this entry for some mines is very general.

Comments - A field for entry of miscellaneous information that does not conveniently fit another field. Some development history and property characteristics are included here.

Unpublished Information - A notation of informal, unpublished information in the Division of Geology and Earth Resources (DGER) files or library is given here.

References - Selected literature used as sources from which to compile the data for the mine, as well as other information that may be of interest to the user. Acronyms used in some entries for "Production" and references: USGS, U.S. Geological Survey; MRDS, Mineral Resource Data System, a national database of the USGS.

ACKNOWLEDGMENTS

The authors appreciate the numerous discussions with colleagues concerning the geology of areas surrounding the mineral deposits. We also gratefully acknowledge reviews by William Phillips, Hank Schasse, Eric Schuster, and Kieth Stoffel of DGER. The illustration was prepared by David Clark.

REFERENCES CITED

Huntting, M. T., 1956, Inventory of Washington Minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Johnson, B. R., 1987, GSMODS - A personal mineral occurrence database system; Reference manual, Version 1.01: U.S. Geological Survey Open-File Report 87-636, 225 p.

Berrian Island placer (303)

ALTERNATE NAMES		DISTRICT	COUNTY
Goody placer			Benton
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Umatilla	1:24,000		Pendleton
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
45° 56′ 49.00″ N	119° 15′ 21.53″ W	sec. 1, 5N, 28E, and sec. 6, 5N, 29E	

LOCATION: on the north bank of the Columbia River, elev. 300 ft

HOST ROCK: NAME	LITHOLOGY	AGE
Quaternary alluvium	sand and gravel	Quaternary

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au	gold	sand and gravel

DEPOSIT TYPE	MINERALIZATION AGE
placer	Quaternary

PRODUCTION: The plant operated for 6 weeks, and concentrate was shipped to the Tacoma smelter in 1949 (Huntting, 1956, p. 181).

TECTONIC SETTING: Deposition of heavy minerals in river gravels.

ORE CONTROLS: Heavy-mineral concentration by stream action.

REFERENCE

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Gone Busted placer (304)

ALTERNATE NAMES		DISTRICT	COUNTY
			Benton
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Blalock Island	1:24,000		Pendleton
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
45° 53′ 29.19″ N	119° 39′ 16.29″ W		

LOCATION: on Blalock Island in the Columbia River near Patterson

HOST ROCK: NAME	LITHOLOGY	AGE
Quaternary alluvium	sand and gravel	Quaternary

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au	gold	sand and gravel

DEPOSIT TYPE	MINERALIZATION AGE
placer	Quaternary

PRODUCTION: A dry-land washing plant operated from 1938 to 1940 (Huntting, 1956, p. 181).

TECTONIC SETTING: Deposition of heavy minerals in river gravels.

ORE CONTROLS: Heavy-mineral concentration by stream action.

REFERENCE

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Blewett Iron (562)

ALTERNATE NAMES	DISTRICT	COUNTY
Blewett Washington Nickel	Blewett	Chelan

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Blewett	1:24,000	Wenatchee	Wenatchee

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
47° 23′ 32.52″ N	120° 39′ 29.46″ W	secs. 13 and 14, 22N, 17E

LOCATION: on a prominent ridge north of Shaser Creek at its junction with Peshastin Creek

HOST ROCK: NAME	LITHOLOGY	AGE
Ingalls Complex	serpentinite	Jurassic

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Fe	hematite	serpentine, clay-rich residuum of laterites
Ni	magnetite	
Cr	chromite	
	nickel silicates	

DEPOSIT TYPE	MINERALIZATION AGE
laterite residual concentration	

PRODUCTION: The Blewett Iron deposit has not produced but has been extensively evaluated as an iron resource (Huntting, 1956, p. 194).

TECTONIC SETTING: Several iron-nickel-chromite lateritic deposits overlie serpentinized ultramafic rocks (Broughton, 1943, p. 9-13) of the Ingalls Complex, a Jurassic ophiolite complex (Miller, 1985, p. 27; Tabor and others, 1982, p. 5-6).

ORE CONTROLS: The Blewett iron deposits are laterite deposits. Many of the laterite deposits were eroded from their nearby source area and deposited to form a sequence of conglomerates and fine-grained, iron-rich beds. The iron and chromium were from iron in silicate minerals, magnetite-hematite, and chromite weathered from the serpentinite. Nickel is from silicates released during laterization (deep weathering) of the serpentinite (Broughton, 1943, p. 10).

GEOLOGIC SETTING: The laterites were transported and deposited beneath or as basal beds of the Eocene Swauk Formation. Lamey (1950, p. 1) tentatively interprets the conglomeratic iron beds as landslide debris or mudflow deposits.

COMMENTS: Iron deposits of the Blewett area were evaluated in the 1940s by the Washington Division of Geology. This was followed by extensive drilling by the U.S. Bureau of Mines (10 holes, 2,395 ft) and metallurgical testing. (See references for specific reports.) This evaluation showed reserves of 46,000 tons at a grade of 0.88% Ni, 2.5% Cr_2O_3, 32% Fe, and 8,000,000 tons at a grade of 0.39% Ni, 0.85% Cr_2O_3, and 11.53% Fe (Huntting, 1956, p. 194).

REFERENCES

Broughton, W. A., 1943, The Blewett iron deposit, Chelan County, Washington (with preliminary tonnage estimates): Washington Division of Geology Report of Investigations 10, 17 p., 1 pl.

Broughton, W. A., 1944, Economic aspects of the Blewett-Cle Elum iron ore zone, Chelan and Kittitas Counties, Washington: Washington Division of Geology Report of Investigations 12, 42 p., 7 pl.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Lamey, C. A., 1950, The Blewett iron-nickel deposit, Chelan County, Washington: U.S. Geological Survey Bulletin 969-D, p. 87-103, 2 pl.

Lupher, R. L., 1944, Stratigraphic aspects of the Blewett-Cle Elum iron ore zone, Chelan and Kittitas Counties, Washington: Washington Division of Geology Report of Investigations 11, 63 p., 2 pl.

Miller, R. B., 1985, The ophiolitic Ingalls Complex, north-central Cascade mountains, Washington: Geological Society of America Bulletin, v. 96, no. 1, p. 27-42.

Tabor, R. W.; Waitt, R. B.; Frizzell, V. A., Jr.; Swanson, D. A.; Byerly, G. R.; Bentley, R. D., 1982, Geologic map of the Wenatchee 1:100,000 quadrangle, central Washington: U.S. Geological Survey Miscellaneous Investigations Series Map I-1311, 1 sheet, scale 1:100,000, with 26 p. text.

Blewett camp (557)

ALTERNATE NAMES	DISTRICT	COUNTY
Blewett, Peshastin, Culver, Alta Vista, Black Jack, La Rica, Manistee, Phipps, Pole Pick #1, Prospect, Wilder, Blue Bell, Eureka, Fraction, Lucky Queen, Golden Eagle, Hummingbird, North Star, Olden, Sandell, Tip Top	Blewett	Chelan

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Blewett	1:24,000	Wenatchee	Wenatchee

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
47° 25′ 29.46″ N	120° 39′ 35.02″ W	SW¼ sec. 1, 22N, 17E

LOCATION: near Peshastin Creek

HOST ROCK: NAME	LITHOLOGY	AGE
Ingalls Complex	serpentinite	Jurassic

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au -	native gold	pyrite, arsenopyrite, quartz, calcite
Ag	native copper	
Hg	chalcopyrite	
Cu	malachite	
	galena	
	stibnite	
	cinnabar	
	magnetite	
	hematite	
	chromite	

DEPOSIT TYPE	MINERALIZATION AGE
vein	

PRODUCTION: Production records for the various mines of the Blewett camp are incomplete; however, the value of production totals several hundred thousand dollars. Many of the mines have some recorded production, but a production figure for the entire camp is not available (Huntting, 1943, p. 9-14; 1956, p. 109-117).

TECTONIC SETTING: The Jurassic Ingalls Complex, the host rocks of the Blewett Camp deposits, is a disrupted, Late Jurassic ophiolite complex. Igneous activity in the area includes the Late Cretaceous Mount Stuart batholith and intrusive rocks of early magmatic activity of the Cascades magmatic arc (Miller, 1985, p. 27; Tabor and others, 1982, p. 5-6).

ORE CONTROLS: Where the veins cut gneissic rocks, the gangue is chiefly quartz with minor amounts of calcite, but where the veins cut serpentinite, the amount of calcite increases relative to quartz. The most productive veins are in Culver Gulch and trend N75W. The ore is generally of low grade. Most production was from high-grade ore shoots (Huntting, 1943, p. 8).

GEOLOGIC SETTING: Most of the mineralization of the Blewett Camp is in veins cutting serpentinite of the Ingalls Complex (Hawkins Formation in Weaver, 1911, p. 31-34). Other veins are in metasedimentary and metavolcanic rocks of the Complex; however, veins in the serpentinite are generally more productive than those in the other rocks (Weaver, 1911, p. 29-33).

COMMENTS: Mines of the Culver Gulch area are here combined into a single entry called the Blewett Camp deposit.

REFERENCES

Huntting, M. T., 1943, Inventory of mineral properties in Chelan County, Washington: Washington Division of Geology Report of Investigations 9, 63 p., 1 pl.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Miller, R. B., 1985, The ophiolitic Ingalls Complex, north-central Cascade mountains, Washington: Geological Society of America Bulletin, v. 96, no. 1, p. 27-42.

Tabor, R. W.; Waitt, R. B.; Frizzell, V. A., Jr.; Swanson, D. A.; Byerly, G. R.; Bentley, R. D., 1982, Geologic map of the Wenatchee 1:100,000 quadrangle, central Washington: U.S. Geological Survey Miscellaneous Investigations Series Map I-1311, 1 sheet, scale 1:100,000, with 26 p. text.

Weaver, C. E., 1911, Geology and ore deposits of the Blewett mining district: Washington Geological Survey Bulletin 6, 104 p.

Cannon (558)

ALTERNATE NAMES		DISTRICT	COUNTY
		Wenatchee	Chelan
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Wenatchee	1:24,000	Wenatchee	Wenatchee

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
47° 23′ 44.24″ N	120° 19′ 30.55″ W	NE¼SW¼ sec. 22, 22N, 20E

LOCATION: on the west side of Squillchuck Creek.

HOST ROCK: NAME	LITHOLOGY	AGE
Chumstick Formation	conglomerate, sandstone, siltstone	middle Eocene
unnamed sedimentary rocks	sandstone, mudstone, siltstone, conglomerate	Eocene?

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
porphyry of Wenatchee dome	Eocene
and Rooster Comb, a flow-layered rhyodacite dome	
Saddle Rock andesite	Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au	electrum	pyrite, arsenopyrite, marcasite, quartz, chalcedony, adularia, calcite. Hydrothermal alteration, particularly silicification is important in ore localization. Other alteration minerals include sericite, argillic minerals, potassium silicates, and chlorite. Mineralization is found in zones of pervasive and vein-controlled silicification and potassium silicate alteration. Intermediate argillic alteration zones cap the mineralization. Mixed layer illite/smectite grades outward into smectite.
Ag	gold	
	pyrargyrite	
	naumannite	
	acanthite	
	aguilarite	
	chalcopyrite	
	stibnite	
	sphalerite	
	galena	
	hessite	

DEPOSIT TYPE	MINERALIZATION AGE
vein	Tertiary
stockwork	
disseminated	

PRODUCTION: The Cannon mine began production in the mid 1980s and is producing at the present time (1990). Production for 1989 was 150,420 oz of Au and 302,731 oz of Ag (Joseph, 1990, p. 19).

TECTONIC SETTING: The Cannon mine is situated in the Chiwakum graben (Eocene), a north-northwest-trending right-lateral, strike-slip graben bounded by the Entiat fault zone on the east and the Leavenworth fault zone on the west (Ott and others, 1986, p. 426).

ORE CONTROLS: Mineralization consists of widely spaced veins, veinlets (stockworks), and disseminated minerals in brecciated rocks. By far the most abundant ore mineral is electrum. The highest ore grades are in quartz-chalcedony-adularia-calcite veins. Two sets of fractures control vein mineralization: early veins in fractures radial to fold hinges, and veins in faults that cut the earlier radial faults-veins (Ott and others, 1986, p. 425, 432). Electrum in banded veins is found near the vein margin, and pyrite, where present, is found near the center of the vein. The mineralization occurs in sandstone and siltstone beds that were silicified prior to brecciation and deposition of quartz veins and veinlets. The quartz veins range to as much as 4 ft wide and are irregular and discontinuous. Most veinlets are less than 1 in. wide.

GEOLOGIC SETTING: An unnamed sandstone unit and the overlying Eocene Chumstick Formation host mineralization at the Cannon mine. Mineralization occurs in favorably altered (commonly silicified) horizons of these Tertiary (Eocene?) arkosic sandstone units (Ott, 1988, p. 20-23). Ore bodies extend from the surface to depths of more than 900 ft.

COMMENTS: This deposit is currently (1990) being mined as a joint venture project of Asamera Minerals Inc. and Breakwater Resources Ltd.

UNPUBLISHED INFORMATION: Information gained from a tour of the Cannon mine lead by mine geologist M. Mehlhorn on July 25, 1990, is supplemented the published accounts of the Cannon mine geology.

REFERENCES

Gresens, R. L., 1983, Geology of the Wenatchee and Monitor quadrangles, Chelan and Douglas Counties, Washington: Washington Division of Geology and Earth Resources Bulletin 75, 75 p., 3 pl.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Joseph, N. L., 1990, Mineral industry news notes: Washington Geologic Newsletter, v. 18, no. 2, p. 19-20.

Ott, L. E., 1988, Economic geology of the Wenatchee mining district, Chelan County, Washington: University of Idaho Doctor of Philosophy thesis, 270 p., 2 pl.

Ott, L. E.; Groody, Diane; Follis, E. L.; Siems, P. L., 1986, Stratigraphy, structural geology, ore mineralogy and hydrothermal alteration at the Cannon mine, Chelan County, Washington, U.S.A. *In* McDonald, A. J., editor, Gold '86—An international symposium on the geology of gold deposits—Proceedings volume: Gold '86 [Toronto, Ont.], p. 425-435.

Patton, T. C.; Cheney, E. S., 1971, L-D gold mine, Wenatchee, Washington—New structural interpretation and its utilization in future exploration: Society of Mining Engineers of AIME Transactions, v. 250, no. 1, p. 6-11.

Crown Point (564)

ALTERNATE NAMES	DISTRICT	COUNTY
Aurelia Crown Crown Power	Railroad Creek	Chelan

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Suiattle Pass	1:24,000	Twisp	Concrete

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 12′ 6.97″ N	120° 53′ 46.03″ W	NE¼ sec. 8, 31N, 16E

LOCATION: at the head of the cirque basin southwest of Hart Lake at the head of Railroad Creek

HOST ROCK: NAME	LITHOLOGY	AGE
Cloudy Pass pluton	laboradorite granodiorite	early Miocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Mo	molybdenite	pyrite, quartz
Cu	chalcopyrite	

DEPOSIT TYPE	MINERALIZATION AGE
vein	

PRODUCTION: Produced from 1897 to 1902, 10 tons in 1901 and 12 tons in 1902 (Huntting, 1956, p. 268).

TECTONIC SETTING: The Cloudy Pass pluton was emplaced during early Miocene igneous activity of the Cascades magmatic arc.

ORE CONTROLS: Molybdenite occurs as large crystals in a flat-lying quartz vein which ranges from 3 in. to 3 ft thick (Huntting, 1956, p. 268).

GEOLOGIC SETTING: The quartz vein occurs in laboradorite granodiorite of the early Miocene Cloudy Pass Pluton (Cater and Crowder, 1967, geol. map).

REFERENCES

Cater, F. W.; Crowder, D. F., 1967, Geologic map of the Holden quadrangle, Snohomish and Chelan Counties, Washington: U.S. Geological Survey Geologic Quadrangle Map GQ-646, 1 sheet, scale 1:62,500.

Huntting, M. T., 1943, Inventory of mineral properties in Chelan County, Washington: Washington Division of Geology Report of Investigations 9, 63 p., 1 pl.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Dick (565)

ALTERNATE NAMES	DISTRICT	COUNTY
Chelan Winesap	Entiat	Chelan

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Winesap	1:24,000	Chelan	Wenatchee

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
47° 46′ 11.86″ N	120° 12′ 23.36″ W	S½NE¼ sec. 9 26N, 21E

LOCATION: Oklahoma Gulch area

HOST ROCK: NAME	LITHOLOGY	AGE
unnamed peridotite	peridotite	pre-Jurassic

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Ni Cu	pyrrhotite pentlandite chalcopyrite malachite nickel sulfate	peridotite

DEPOSIT TYPE	MINERALIZATION AGE
magmatic segregation	pre-Jurassic

PRODUCTION: Four short adits on the property and seven drill holes totaling 1,016 ft were completed by the USBM (Huntting, 1956, p. 275).

TECTONIC SETTING: The area is underlain by migmatite of the Chelan Complex (Tabor and others, 1987, geol. map).

ORE CONTROLS: Disseminated and massive sulfide segregations in peridotite (Huntting, 1956, p. 275; 1943, p. 25-26). Oxidation extends to about 40 ft depth. The peridotite body is about 400 ft long and 100 ft wide at the surface (Huntting, 1956, p. 275).

GEOLOGIC SETTING: Creasey and Storch (1945, geol. map) show the Dick deposit in a peridotite body between a quartz diorite dike and granite gneiss complex.

REFERENCES

Creasey, S. C.; Storch, H. H., 1945, Winesap nickel prospect, Chelan County, Washington: U.S. Geological Survey Open-File Report, 10 sheets.

Huntting, M. T., 1943, Inventory of mineral properties in Chelan County, Washington: Washington Division of Geology Report of Investigations 9, 63 p., 1 pl.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Tabor, R. W.; Frizzell, V. A., Jr.; Whetten, J. T.; Waitt, R. B.; Swanson, D. A.; Byerly, G. R.; Booth, D. B.; Hetherington, M. J.; Zartman, R. E., 1987, Geologic map of the Chelan 30-minute by 60-minute quadrangle, Washington: U.S. Geological Survey Miscellaneous Investigations Series Map I-1661, 1 sheet, scale 1:100,000, with 29 p. text.

Holden (555)

ALTERNATE NAMES	DISTRICT	COUNTY
Howe Sound Irene		Chelan

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Holden	1:24,000	Twisp	Concrete

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 11′ 47.50″ N	120° 46′ 48.58″ W	secs. 18 and 19, 31N, 17E; secs. 12 and 13, 31N, 16E

LOCATION: near the town of Holden on Railroad Creek

HOST ROCK: NAME	LITHOLOGY	AGE
rocks of the Napeequa River area	hornblende schist and gneiss, sericite-quartz schist	Late Paleozoic

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Cu Au Zn Ag	chalcopyrite sphalerite gold galena molybdenite	pyrite, pyrrhotite, magnetite, arsenopyrite, quartz, sericite

DEPOSIT TYPE	MINERALIZATION AGE
metamorphosed massive sulfide	Permian

PRODUCTION: From 1938 through 1957 a total of more than 212 million lb of Cu, 40 million lb of Zn, 2 million oz of Ag, and 600,000 oz of Au were obtained from 10 million tons of ore (McWilliams, 1958, p. 3).

TECTONIC SETTING: The deposit formed in an island arc to back arc basin environment with deposition of both mafic and siliceous volcanic rocks. Nonvolcanic rocks, including marble, are also prevalent near the mine (Nold, 1983, p. 945-948).

ORE CONTROLS: The orebody is lens shaped and has a length downdip of about 2,000 ft and a thickness of as much as 100 ft. The zoned orebody ranges from a zinc-rich footwall to a copper-rich hanging wall, indicating the orebody is overturned. Foliation of the schist parallels bedding (Nold, 1983, p. 945-948).

GEOLOGIC SETTING: The mine occurs within a series of schists, gneisses, and amphibolites, which are part of Cater and Crowder's (1967, geol. map; Cater, 1982, p. 6-7) Late Paleozoic "rocks of the Napeequa River area". The orebody is surrounded by sericite-quartz schist occurring within the shists, gneisses, and amphibolite sequence (Nold, 1983, p. 944-948). The Holden mine is believed to be Kuroko-type, volcanogenic massive sulfide deposit (R. E. Derkey). Kuroko-type features include the zoned, massive-sulfide orebody (zoned with copper-rich base and zinc-rich top) conformable with bedding, enclosure in sericite schist (altered felsic tuffs), and presence of anhydrite.

REFERENCES

Cater, F. W., 1982, Intrusive rocks of the Holden and Lucerne quadrangles, Washington—The relation of depth zones, composition, textures, and emplacement of plutons: U.S. Geological Survey Professional Paper 1220, 108 p.

Cater, F. W.; Crowder, D. F., 1967, Geologic map of the Holden quadrangle, Snohomish and Chelan Counties, Washington: U.S. Geological Survey Geologic Quadrangle Map GQ-646, 1 sheet, scale 1:62,500.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

McWilliams, J. R., 1958, Mining methods and costs at the Holden mine, Chelan Division, Howe Sound Co., Chelan County, Wash.: U.S. Bureau of Mines Information Circular 7870, 44 p.

Nold, J. L., 1983, The Holden mine, a metamorphosed volcanogenic deposit in the Cascade Range of Washington: Economic Geology, v. 78, no. 5, p. 944-953.

Youngberg, E. A.; Wilson, T. L., 1952, The geology of the Holden mine: Economic Geology, v. 47, no. 1, p. 1-12.

Lovitt (566)

ALTERNATE NAMES	DISTRICT	COUNTY
Golden King Wenatchee Squillchuck Gold King L-D	Wenatchee	Chelan

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Wenatchee	1:24,000	Wenatchee	Wenatchee

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
47° 22′ 55.43″ N	120° 18′ 54.75″ W	NE¼SW¼ sec. 22, 22N, 20E

LOCATION: on the west side of Squillchuck Creek

HOST ROCK: NAME	LITHOLOGY	AGE
Chumstick Formation	conglomerate, sandstone, and siltstone	middle Eocene
unnamed unit	sandstone, mudstone, siltstone, conglomerate	Eocene?

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
porphyry of Wenatchee dome and Rooster Comb, a flow-layered rhyodacite dome	Eocene
Saddle Rock andesite	Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au Ag	electrum native gold pyrargyrite naumannite acanthite aguilarite chalcopyrite stibnite sphalerite galena hessite	pyrite, arsenopyrite, marcasite, quartz, chalcedony, adularia, calcite, siderite. Hydrothermal alteration, particularly silicification, is important in ore localization. Other alteration minerals include sericite, argillic minerals, potassium silicates, and chlorite.

DEPOSIT TYPE	MINERALIZATION AGE
vein stockwork disseminated	Tertiary

PRODUCTION: Production in 1894, 1910, 1938-39 and 1944-46 (Huntting, 1956, p. 113). Continuous production from 1949 to 1967, when 1,036,572 tons of ore yielded 410,482 oz Au (0.396 oz/ton) and 625,849 oz Ag (0.60 oz/ton) (Ott, 1988, p. 10).

TECTONIC SETTING: The Lovitt mine is in the Chiwakum graben (Eocene), a north-northwest-trending right-lateral, strike-slip graben bounded by the Entiat fault zone on the east and the Leavenworth fault zone on the west (Ott and others, 1986, p. 426).

ORE CONTROLS: Mineralization is disseminated and in stockworks in pervasively altered and silicified sandstone and siltstone. Two sets of fractures control vein mineralization; early veins in fractures radial to fold hinges, and veins in faults that cut the earlier radial faults-veins (Ott and others, 1986, p. 425, 432).

GEOLOGIC SETTING: An unnamed sandstone unit and the overlying Eocene Chumstick Formation host mineralization at the Lovitt and nearby Cannon mines. Mineralization occurs in favorably altered (commonly silicified) horizons of these extensively deformed and brecciated arkosic sandstone units (Ott, 1988, p. 20-23).

COMMENTS: The Lovitt is part of the property controlled by the Cannon mine, which is currently (1990) being mined as a joint venture project of Asamera Minerals Inc. and Breakwater Resources Ltd.

REFERENCES

Gresens, R. L., 1983, Geology of the Wenatchee and Monitor quadrangles, Chelan and Douglas Counties, Washington: Washington Division of Geology and Earth Resources Bulletin 75, 75 p., 3 pl.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Lovitt, E. H.; Skerl, A. C., 1958, Geology of the Lovitt gold mine, Wenatchee, Wash.: Mining Engineering, v. 10, no. 9, p. 963-966.

Ott, L. E., 1988, Economic geology of the Wenatchee mining district, Chelan County, Washington: University of Idaho Doctor of Philosophy thesis, 270 p., 2 pl.

Ott, L. E.; Groody, Diane; Follis, E. L.; Siems, P. L., 1986, Stratigraphy, structural geology, ore mineralogy and hydrothermal alteration at the Cannon mine, Chelan County, Washington, U.S.A. *In* McDonald, A. J., editor, Gold '86—An international symposium on the geology of gold deposits—Proceedings volume: Gold '86 [Toronto, Ont.], p. 425-435.

Patton, T. C.; Cheney, E. S., 1971, L-D gold mine, Wenatchee, Washington—New structural interpretation and its utilization in future exploration: Society of Mining Engineers of AIME Transactions, v. 250, no. 1, p. 6-11.

Negro Creek Iron (563)

ALTERNATE NAMES		DISTRICT	COUNTY
Davenport		Blewett	Chelan
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Blewett	1:24,000	Wenatchee	Wenatchee
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
47° 24′ 27.60″ N	120° 44′ 20.76″ W	S½SW¼ and NE½SE¼ and NW¼ SW¼ sec. 8, 22N, 17E and SE¼SE¼ sec. 12, 22N, 16E	

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
Ingalls Complex	serpentinite	Jurassic

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Fe Ni Cr	magnetite chromite	serpentine, clay-rich residuum of laterites

DEPOSIT TYPE	MINERALIZATION AGE
laterite residual concentration	Eocene

PRODUCTION: Broughton (1943, p. 16-19) reports 59,850 tons of exposed, 45,720 tons of probable, and 435,850 tons of possible ore reserves in three areas.

TECTONIC SETTING: Iron-nickel-chromium deposits (residuum of weathering products) overlie serpentinized ultramafic rocks (Broughton, 1943, p. 9-13) of the Ingalls Complex, a Jurassic ophiolite complex (Miller, 1985, p. 27; Tabor and others, 1982, p. 5-6).

ORE CONTROLS: The Negro Creek Iron deposit is one of several Blewett-area iron deposits. These deposits are a residuum of weathering products developed over iron-, chromium-, and nickel-bearing serpentinized peridotite. Iron and chromium are found in the minerals magnetite, hematite, and chromite weathered from the serpentinite. Nickel silicates develop during laterization (extended weathering) of the serpentinite. The iron beds occur in a series of thick conglomerates and associated rocks (Broughton, 1943, p. 10).

GEOLOGIC SETTING: Some of the laterites were reworked prior to deposition of the Eocene Swauk Formation. Lamey (1950, p. 1) tentatively interprets the conglomeratic iron beds as landslide debris or a mudflow deposit.

REFERENCES

Broughton, W. A., 1943, The Blewett iron deposit, Chelan County, Washington (with preliminary tonnage estimates): Washington Division of Geology Report of Investigations 10, 17 p., 1 pl.

Broughton, W. A., 1944, Economic aspects of the Blewett-Cle Elum iron ore zone, Chelan and Kittitas Counties, Washington: Washington Division of Geology Report of Investigations 12, 42 p., 7 pl.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Lamey, C. A., 1950, The Blewett iron-nickel deposit, Chelan County, Washington: U.S. Geological Survey Bulletin 969-D, p. 87-103, 2 pl.

Miller, R. B., 1985, The ophiolitic Ingalls Complex, north-central Cascade mountains, Washington: Geological Society of America Bulletin, v. 96, no. 1, p. 27-42.

Tabor, R. W.; Waitt, R. B.; Frizzell, V. A., Jr.; Swanson, D. A.; Byerly, G. R.; Bentley, R. D., 1982, Geologic map of the Wenatchee 1:100,000 quadrangle, central Washington: U.S. Geological Survey Miscellaneous Investigations Series Map I-1311, 1 sheet, scale 1:100,000, with 26 p. text.

Negro Creek placers (560)

ALTERNATE NAMES		DISTRICT	COUNTY
		Blewett	Chelan
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Blewett	1:24,000	Wenatchee	Wenatchee

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
47° 26′ 34.77″ N	120° 39′ 55.74″ W	secs. 2 and 3, 22N, 17E

LOCATION: from the mouth of Negro Creek upstream for several miles

HOST ROCK: NAME	LITHOLOGY	AGE
Quaternary alluvium	sand and gravel	Quaternary

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au	native gold	sand and gravel
Cr	chromite	
Pt		

DEPOSIT TYPE	MINERALIZATION AGE
placer	Quaternary

PRODUCTION: Produced $100 prior to 1897 (Huntting, 1956, p. 181). Platinum was also found about 6 mi upstream from the mouth of Negro Creek. Only a small amount (reportedly) was produced (Huntting, 1956, p. 281).

TECTONIC SETTING: Alluvial deposits containing heavy minerals.

ORE CONTROLS: Heavy minerals were concentrated by stream action. Several pieces of nearly pure chromite weighing about 3 lb each were reported (Huntting, 1956, p. 37) from Negro Creek in the SW¼ sec. 12, 22N, 16E.

GEOLOGIC SETTING: Negro Creek drains an area containing several gold and chromite deposits of the Blewett Camp. Bedrock of the area includes ultramafic rocks of the Ingalls Complex (Tabor and others, 1982).

REFERENCES

Huntting, M. T., 1943, Inventory of mineral properties in Chelan County, Washington: Washington Division of Geology Report of Investigations 9, 63 p., 1 pl.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Tabor, R. W.; Waitt, R. B.; Frizzell, V. A., Jr.; Swanson, D. A.; Byerly, G. R.; Bentley, R. D., 1982, Geologic map of the Wenatchee 1:100,000 quadrangle, central Washington: U.S. Geological Survey Miscellaneous Investigations Series Map I-1311, 1 sheet, scale 1:100,000, with 26 p. text.

Peshastin Creek placers (561)

ALTERNATE NAMES		DISTRICT	COUNTY
		Blewett	Chelan

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Blewett	1:24,000	Wenatchee	Wenatchee

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
47° 24′ 20.72″ N	120° 39′ 24.98″ W	22N, 17E

LOCATION: on the upper reaches of Peshastin Creek.

HOST ROCK: NAME	LITHOLOGY	AGE
Quaternary alluvium	sand and gravel	Quaternary

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au	native gold	sand and gravel

DEPOSIT TYPE	MINERALIZATION AGE
placer	Quaternary

PRODUCTION: Huntting (1956, p. 181) reports the area has produced.

TECTONIC SETTING: Alluvial deposits containing heavy minerals.

ORE CONTROLS: Heavy-mineral concentration by stream action. Huntting (1956, p. 181) reports the gold is coarse.

GEOLOGIC SETTING: Division files contain a mineral examination report prepared for an application to patent placer claims in sec. 13, 22N, 17E. This property is near the mouth of Allen Creek, which appears to be the southern limit of placer gold on Peshastin Creek. The creek drains northward past several mines between Allen Creek and Negro Creek. This is the apparent extent of favorable ground for placer deposits on Peshastin Creek.

UNPUBLISHED INFORMATION: U.S. Forest Service, 1964, Report of Mineral Examination for claims on Peshastin Creek. This report is in DGER file - "Peshastin".

REFERENCES

Huntting, M. T., 1943, Inventory of mineral properties in Chelan County, Washington: Washington Division of Geology Report of Investigations 9, 63 p., 1 pl.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Red Mountain (556)

ALTERNATE NAMES		DISTRICT	COUNTY
Royal		Chiwawa	Chelan
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Trinity	1:24,000	Twisp	Concrete

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 4′ 31.83″ N	120° 50′ 55.75″ W	secs. 15 and 22, 30N, 16E

LOCATION: at the south end of Phelps Ridge

HOST ROCK: NAME	LITHOLOGY	AGE
Swakane Biotite Gneiss	biotite gneiss	Precambrian - Paleozoic
unnamed diorite	diorite	

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Cu	chalcopyrite	pyrrhotite, pyrite, arsenopyrite,
Ag	sphalerite	chlorite, quartz, calcite, biotite,
Au	galena	sericite
Zn	scheelite	
Pb		
W		

DEPOSIT TYPE	MINERALIZATION AGE
breccia zone	

PRODUCTION: Produced more than 15,000 tons of ore during intermittent periods from 1930 to 1940 (Huntting, 1956, p. 50).

TECTONIC SETTING: Ore at the Red Mountain mine was emplaced during or following major deformation and metamorphism of the host rocks. The extent of metamorphism of the orebody, if any, is not reported (Cater and Crowder, 1967, geol. map).

ORE CONTROLS: Mineralization is most extensive in the brecciated zone between Swakane Biotite Gneiss and diorite. Sulfide minerals are chiefly pyrrhotite and chalcopyrite. Scheelite occurs as disseminated grains, veinlets, and small masses in the sulfides (Culver and Broughton, 1945, p. 14-15).

GEOLOGIC SETTING: Radiometric ages on zircons from the Swakane Biotite Gneiss indicate an age for metamorphism of 415 m.y. and formation ages of 1,650 m.y. or more (Mattinson, 1972, p. 3773). The age and nature of the diorite are unknown.

REFERENCES

Cater, F. W., 1982, Intrusive rocks of the Holden and Lucerne quadrangles, Washington—The relation of depth zones, composition, textures, and emplacement of plutons: U.S. Geological Survey Professional Paper 1220, 108 p.

Cater, F. W.; Crowder, D. F., 1967, Geologic map of the Holden quadrangle, Snohomish and Chelan Counties, Washington: U.S. Geological Survey Geologic Quadrangle Map GQ-646, 1 sheet, scale 1:62,500.

Culver, H. E.; Broughton, W. A., 1945, Tungsten resources of Washington: Washington Division of Geology Bulletin 34, 89 p., 23 pl.

Huntting, M. T., 1943, Inventory of mineral properties in Chelan County, Washington: Washington Division of Geology Report of Investigations 9, 63 p., 1 pl.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Mattinson, J. M., 1972, Ages of zircons from the northern Cascade Mountains, Washington: Geological Society of America Bulletin, v. 83, no. 12, p. 3769-3783.

Rex (559)

ALTERNATE NAMES		DISTRICT	COUNTY
Rogers		Entiat	Chelan
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Ardenvoir	1:24,000	Chelan	Wenatchee

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
47° 42′ 53.05″ N	120° 16′ 19.86″ W	N½ sec. 36, 26N, 20E

LOCATION: in the drainage of Crum Canyon, a tributary to the Entiat River

HOST ROCK: NAME	LITHOLOGY	AGE
Chelan Complex	tonalite and tonalite gneiss	Cretaceous

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au Ag		quartz, pyrite

DEPOSIT TYPE	MINERALIZATION AGE
vein	

PRODUCTION: More than $170,000 by 1930 and small amounts in 1933, 1934, and 1940 (Huntting, 1956, p. 116).

TECTONIC SETTING: The Chelan Complex formed in Late Cretaceous and consists of high-grade metamorphic rocks that were intruded by numerous tonalitic plutons. These massive tonalite plutons were again metamorphosed in latest Cretaceous and earliest Tertiary time (Tabor and others, 1987, p. 5-6). The relation between metamorphism and emplacement of the quartz veins is unknown.

ORE CONTROLS: Two oxidized quartz veins, 3 to 12 in. in width, in decomposed gneiss (Huntting, 1956, p. 116).

GEOLOGIC SETTING: The rocks of the Chelan Complex (Hopson and Mattinson, 1971, p. 13; see also map of Tabor and others, 1987, p. 5-6) consist of massive and gneissic tonalite and migmatite near Chelan and along Lake Chelan and banded gneiss and banded migmatite gneiss along the Entiat River.

REFERENCES

Hopson, C. A.; Mattinson, J. M., 1971, Metamorphism and plutonism, Lake Chelan region, northern Cascades, Washington [abstract]: Geological Association of Canada, Cordilleran Section, Programme and Abstracts, p. 13.

Huntting, M. T., 1943, Inventory of mineral properties in Chelan County, Washington: Washington Division of Geology Report of Investigations 9, 63 p., 1 pl.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Tabor, R. W.; Frizzell, V. A., Jr.; Whetten, J. T.; Waitt, R. B.; Swanson, D. A.; Byerly, G. R.; Booth, D. B.; Hetherington, M. J.; Zartman, R. E., 1987, Geologic map of the Chelan 30-minute by 60-minute quadrangle, Washington: U.S. Geological Survey Miscellaneous Investigations Series Map I-1661, 1 sheet, scale 1:100,000, with 29 p. text.

Cedar Creek placer (615)

ALTERNATE NAMES		DISTRICT	COUNTY
Starbuck Placer			Clallam
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Allens Bay	1:24,000	Cape Flattery	Cape Flattery
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
48° 00′ 53″ N	124° 40′ 37″ W	E½ sec. 18, 29N, 15W	

LOCATION: 10 mi north of La Push, near the mouth of Cedar Creek by the beach

HOST ROCK: NAME	LITHOLOGY	AGE
beach sands	sand and gravel	Pleistocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au	gold	sand
Pt	platinum	
	ilmenite	
	magnetite	
	chromite	
	zircon	

DEPOSIT TYPE	MINERALIZATION AGE
marine placer	Pleistocene

PRODUCTION: Produced a reported $5,000 in gold and 5 oz of platinum prior to 1917 (Huntting, 1956, p. 182).

TECTONIC SETTING: Uplifted beach terrace.

ORE CONTROLS: Heavy-mineral concentration by wave action. Gold and platinum occur in a 2-15-in.-thick layer of sand on the surface of a wave-cut bench in clay (Huntting, 1956, p. 182).

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Crescent (607)

ALTERNATE NAMES	DISTRICT	COUNTY
		Clallam

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Mount Muller	1:24,000	Port Angeles	Victoria

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 04′ 38″ N	123° 56′ 33″ W	near the line between secs. 23 and 24, 30N, 10W

LOCATION: elev. 1,250 ft, about 1.25 mi west of Lake Crescent. The railroad crosses the property. Access to the property, about 0.5 mi north of US Highway 101, is by way of road beginning at the highway 1 mi east of Fairholm.

HOST ROCK: NAME	LITHOLOGY	AGE
Crescent Formation	basalt	Eocene
Crescent Formation	red limestone	Eocene

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
spilitic pillow basalts and associated pyroclastic rocks and volcanic breccias.	Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Mn	hausmannite	hematite
Fe	bementite	
Hg	neotocite	
S	braunite	
Cu	cinnabar	
Zn	native copper	
P		

DEPOSIT TYPE	MINERALIZATION AGE
replacement, disseminated exhalative/diagenetic	Eocene

PRODUCTION: Produced more than 50,000 tons between 1923 and 1954 (Huntting, 1956, p. 254).

TECTONIC SETTING: Host rocks of manganese deposits of the Olympic Peninsula formed at an ocean ridge or in a back arc basin at the active margin of the North American plate (Garrison, 1973; Snavely, 1987, p. 306-309).

ORE CONTROLS: Mineralization occurs in three lenses, and several reverse faults offset the ore bodies (data from USGS MRDS, 1990). Manganese deposits of the region are associated with spilites (Park, 1942, p. 311-312) and commonly are found with reddish pelagic limestone interbedded with the basalt. Manganese mineralization may have formed as disseminated bodies of replacement origin or as volcanogenic exhalative bodies (Sorem and Gunn, 1967).

GEOLOGIC SETTING: The Crescent Formation, which hosts manganese mineralization on the Olympic Peninsula, consists of Paleocene? and Eocene pillow basalts compositionally similar to ocean ridge basalts. Associated limestones were deposited in deep water (Snavely, 1987, p. 306-308).

REFERENCES

Brown, R. D., Jr.; Gower, H. D.; Snavely, P. D., Jr., 1960, Geology of the Port Angeles-Lake Crescent area, Clallam County, Washington: U.S. Geological Survey Oil and Gas Investigations Map OM-203, 1 sheet, scale 1:62,500.

Garrison, R. E., 1973, Space-time relations of pelagic limestones and volcanic rocks, Olympic Peninsula, Washington: Geological Society of America Bulletin, v. 84, no. 2, p. 583-594.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Magill, E. A., 1960, Manganese deposits of the Olympic Peninsula, Wash.: U.S. Bureau of Mines Report of Investigations 5530, 82 p.

Pardee, J. T., 1927, Manganese-bearing deposits near Lake Crescent and Humptulips, Washington. *In* Contributions to economic geology (short papers and preliminary reports), 1927; Part I-Metals and nonmetals except fuels: U.S. Geological Survey Bulletin 795-A, p. 1-24.

Park, C. F., Jr., 1942, Manganese resources of the Olympic Peninsula, Washington—A preliminary report: U.S. Geological Survey Bulletin 931-R, p. 435-457, 2 pl.

Snavely, P. D., Jr., 1987, Tertiary geologic framework, neotectonics, and petroleum potential of the Oregon-Washington continental margin. *In* Scholl, D. W.; Grantz, Arthur; Vedder, J. G., Geology and resources potential of the continental margin of western North America and adjacent ocean basins—Beaufort Sea to Baja California: Circum-Pacific Council for Energy and Mineral Resources Earth Science Series, v. 6, p. 305-335.

Sorem, R. K.; Gunn, D. W., 1967, Mineralogy of manganese deposits, Olympic Peninsula, Washington: Economic Geology, v. 62, no. 1, p. 22-56.

Helen (610)

ALTERNATE NAMES	DISTRICT	COUNTY
		Clallam

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Mount Muller	1:24,000	Port Angeles	Victoria

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48 05 35 N	123 59 56 W	near center, N½ sec. 21, 30N, 10W

LOCATION: elev. 1905 ft, about 8.2 mi west-northwest of Fairholm, about 0.8 mi north of US Highway 101.

HOST ROCK: NAME	LITHOLOGY	AGE
Crescent Formation	basalt	Eocene
Crescent Formation	limestone	Eocene

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
Crescent Formation volcanic rocks	Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Mn	bementite	

DEPOSIT TYPE	MINERALIZATION AGE
replacement, disseminated exhalative/diagenetic	Eocene

PRODUCTION: Produced a 10-ton shipment in 1952 and some production in 1954 (data from U.S.G.S. MRDS, 1990).

TECTONIC SETTING: Host rocks of manganese deposits of the Olympic Peninsula formed at an ocean ridge or in a back arc basin at the active margin of the North American plate (Garrison, 1973; Snavely, 1987, p. 306-309).

ORE CONTROLS: Mineralization occurs as lenses near the contact between basalt and limestone (data from U.S.G.S. MRDS, 1990). Manganese deposits of the region are associated with spilites (Park, 1942, p. 311-312) and commonly are found with reddish pelagic limestone interbedded with the basalt. Manganese mineralization may be either disseminated in replacement bodies or volcanogenic exhalative/diagenetic bodies (Sorem and Gunn, 1967).

GEOLOGIC SETTING: Red argillaceous limestone lenses occur enclosed in basalt of the Crescent Formation. Within the limestone lenses, boulder-like masses of brown to black manganiferous minerals are found associated with nodules of ferruginous quartz. Two bementite ore bodies are 30 ft x 6 ft and 23 ft x 6 ft (data from U.S.G.S. MRDS, 1990). The Crescent Formation, which hosts manganese mineralization on the Olympic Peninsula, consists of Paleocene? and Eocene pillow basalts compositionally similar to ocean ridge basalts. The basalts are associated with pelagic limestones, indicating deposition in deep water (Snavely, 1987, p. 306-308).

REFERENCES

Garrison, R. E., 1973, Space-time relations of pelagic limestones and volcanic rocks, Olympic Peninsula, Washington: Geological Society of America Bulletin, v. 84, no. 2, p. 583-594.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Magill, E. A., 1960, Manganese deposits of the Olympic Peninsula, Wash.: U.S. Bureau of Mines Report of Investigations 5530, 82 p.

Park, C. F., Jr., 1942, Manganese resources of the Olympic Peninsula, Washington—A preliminary report: U.S. Geological Survey Bulletin 931-R, p. 435-457, 2 pl.

Purdy, C. P., Jr., 1954, Directory of Washington mining operations, 1954: Washington Division of Mines and Geology Information Circular 23, 73 p.

Snavely, P. D., Jr., 1987, Tertiary geologic framework, neotectonics, and petroleum potential of the Oregon-Washington continental margin. *In* Scholl, D. W.; Grantz, Arthur; Vedder, J. G., Geology and resources potential of the continental margin of western North America and adjacent ocean basins—Beaufort Sea to Baja California: Circum-Pacific Council for Energy and Mineral Resources Earth Science Series, v. 6, p. 305-335.

Sorem, R. K.; Gunn, D. W., 1967, Mineralogy of manganese deposits, Olympic Peninsula, Washington: Economic Geology, v. 62, no. 1, p. 22-56.

Hurricane (608)

ALTERNATE NAMES	DISTRICT	COUNTY
		Clallam

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Elwha	1:24,000	Port Angeles	Cape Flattery

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 00′ 23″ N	123° 30′ 12″ W	

LOCATION: Unsurveyed, elev. 4,000 ft, about 2.7 mi east-southeast of Elwha ranger station and 0.3 mi east-northeast of Griff Peak

HOST ROCK: NAME	LITHOLOGY	AGE
Crescent Formation	limestone	Eocene
Crescent Formation	basalt (altered)	Eocene

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
Crescent Formation volcanic rocks	Eocene
basalt (altered)	Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Mn	hausmannite	hematite
Fe	bementite	
	neotocite	
	rhodonite	

DEPOSIT TYPE	MINERALIZATION AGE
replacement, disseminated exhalative/diagenetic	

PRODUCTION: Produced about 1,000 tons of ore (Huntting, 1956, p. 255).

TECTONIC SETTING: Host rocks of manganese deposits of the Olympic Peninsula formed at an ocean ridge or in a back arc basin at the active margin of the North American plate (Garrison, 1973; Snavely, 1987, p. 306-309).

ORE CONTROLS: Mineralization at the Hurricane deposit is found in lens-shaped bodies (data from USGS MRDS, 1990). Manganese deposits of the region are associated with spilites (Park, 1942, p. 311-312) and commonly are found with reddish pelagic limestone interbedded with basalt. Manganese mineralization may be either disseminated in replacement bodies or volcanogenic exhalative/diagenetic bodies (Sorem and Gunn, 1967).

GEOLOGIC SETTING: Area is underlain by highly altered basalt containing intercalated pods or lenses of red limestone (data from USGS MRDS, 1990). The Crescent Formation, which hosts manganese mineralization on the Olympic Peninsula, consists of Paleocene? and Eocene pillow basalts compositionally similar to ocean ridge basalts. Associated pelagic limestones indicate deposition in deep water (Snavely, 1987, p. 306-308).

REFERENCES

Garrison, R. E., 1973, Space-time relations of pelagic limestones and volcanic rocks, Olympic Peninsula, Washington: Geological Society of America Bulletin, v. 84, no. 2, p. 583-594.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Magill, E. A., 1960, Manganese deposits of the Olympic Peninsula, Wash.: U.S. Bureau of Mines Report of Investigations 5530, 82 p.

Snavely, P. D., Jr., 1987, Tertiary geologic framework, neotectonics, and petroleum potential of the Oregon-Washington continental margin. *In* Scholl, D. W.; Grantz, Arthur; Vedder, J. G., Geology and resources potential of the continental margin of western North America and adjacent ocean basins—Beaufort Sea to Baja California: Circum-Pacific Council for Energy and Mineral Resources Earth Science Series, v. 6, p. 305-335.

Sorem, R. K.; Gunn, D. W., 1967, Mineralogy of manganese deposits, Olympic Peninsula, Washington: Economic Geology, v. 62, no. 1, p. 22-56.

Littleton (611)

ALTERNATE NAMES	DISTRICT	COUNTY
Peacock Johnnie M		Clallam

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Snider Peak	1:24,000	Cape Flattery	Cape Flattery

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48 04 52 N	124 00 35 W	sec. 20, 30N, 10W

LOCATION: elev. 1,400 ft, 5.1 mi east-northeast of Snider ranger station, 500 ft west of Littleton Creek; part of the Littleton group of claims, probably on the border of sec. 20 and 21.

HOST ROCK: NAME	LITHOLOGY	AGE
Crescent Formation	basalt	Eocene
Crescent Formation	red limestone	Eocene

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
Crescent Formation volcanic rocks	Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Mn	bementite neotocite hausmannite	

DEPOSIT TYPE	MINERALIZATION AGE
replacement, disseminated exhalative/diagenetic	

PRODUCTION: Produced in 1952 and 1953 (Huntting, 1956, p. 256).

TECTONIC SETTING: Host rocks of manganese deposits of the Olympic Peninsula formed at an ocean ridge or in a back arc basin at the active margin of the North American plate (Garrison, 1973; Snavely, 1987, p. 306-309).

ORE CONTROLS: Ore bodies are lens shaped. Small faults offset the ore bodies. Manganese minerals occur as oxides and silicates in red limestone which is interbedded in basalt (data from USGS MRDS, 1990).

GEOLOGIC SETTING: Lenses of manganese oxides and silicates occur in red limestone, which is interbedded in basalt. Manganese deposits of the region are associated with spilites (Park, 1942, p. 311-312) and occur in reddish pelagic limestone interbedded with the basalt. Manganese mineralization may be either disseminated in replacement bodies or volcanogenic exhalative/diagenetic bodies (Sorem and Gunn, 1967).

REFERENCES

Garrison, R. E., 1973, Space-time relations of pelagic limestones and volcanic rocks, Olympic Peninsula, Washington: Geological Society of America Bulletin, v. 84, no. 2, p. 583-594.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Magill, E. A., 1960, Manganese deposits of the Olympic Peninsula, Wash.: U.S. Bureau of Mines Report of Investigations 5530, 82 p.

Park, C. F., Jr., 1942, Manganese resources of the Olympic Peninsula, Washington—A preliminary report: U.S. Geological Survey Bulletin 931-R, p. 435-457, 2 pl.

Snavely, P. D., Jr., 1987, Tertiary geologic framework, neotectonics, and petroleum potential of the Oregon-Washington continental margin. *In* Scholl, D. W.; Grantz, Arthur; Vedder, J. G., Geology and resources potential of the continental margin of western North America and adjacent ocean basins—Beaufort Sea to Baja California: Circum-Pacific Council for Energy and Mineral Resources Earth Science Series, v. 6, p. 305-335.

Sorem, R. K.; Gunn, D. W., 1967, Mineralogy of manganese deposits, Olympic Peninsula, Washington: Economic Geology, v. 62, no. 1, p. 22-56.

Ozette Beach placer (612)

ALTERNATE NAMES		DISTRICT	COUNTY
		Cape Flattery	Clallam
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Ozette	1:24,000	Cape Flattery	Cape Flattery

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 12′ 10″ N	124° 41′ 20″ W	sec. 12, 31N, 16W

LOCATION: 2 mi north of the mouth of the Ozette River

HOST ROCK: NAME	LITHOLOGY	AGE
beach sands	sand	Quaternary

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au	gold	sand
Pt	platinum	
PGE		

DEPOSIT TYPE	MINERALIZATION AGE
beach placer	Quaternary

PRODUCTION: Produced a small amount in the early 1900s (Pardee, 1929; Huntting, 1956, p. 183). Produced $15,000 from Ozette and Shi Shi placers prior to 1904 (Huntting, 1956, p. 182).

TECTONIC SETTING: Uplifted beach terraces.

ORE CONTROLS: Concentration of heavy minerals by wave action.

GEOLOGIC SETTING: Beach deposit of gold and platinum concentrated along the surface of a wave-cut terrace in sandstone (data from USGS MRDS, 1990).

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Mertie, J. B., Jr., 1969, Economic geology of the platinum metals: U.S. Geological Survey Professional Paper 630, 120 p., 1 pl.

Pardee, J. T., 1929, Platinum and black sand in Washington. *In* Contributions to economic geology (short papers and preliminary reports) 1928; Part I—Metals and nonmetals except fuels: U.S. Geological Survey Bulletin 805, p. 1-15.

Shi Shi Beach placer (613)

ALTERNATE NAMES		DISTRICT	COUNTY
Lovelace			Clallam
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Makah Bay	1:24,000	Cape Flattery	Cape Flattery
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
48° 15′ 25″ N	124° 41′ 03″ W	secs. 18, 19, and 30, 32N, 15W	

LOCATION: approximately 2.5 mi south of Portage Head, near mouth of Petroleum Creek

HOST ROCK: NAME	LITHOLOGY	AGE
bBeach sands	sand	Quaternary

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au	gold	sand
Pt	platinum	
Ir	magnetite	
Os	ilmenite	
	iridosmine	
	zircon	

DEPOSIT TYPE	MINERALIZATION AGE
marine placer	Quaternary

PRODUCTION: Produced before 1904 and, together with the Ozette placer, produced more than $15,000. Concentrate ran 1,120 lb of ilmenite, 96 lb of zircon, $558.09 per ton in gold, and $20.45 per ton in platinum (Huntting, 1956, p. 182).

TECTONIC SETTING: Uplifted beach terraces.

ORE CONTROLS: Heavy-mineral concentration by wave action. Grains of platinum only about a quarter the size of gold grains; about 1% of the platinum grains are ferromagnetic (data from USGS MRDS, 1990).

GEOLOGIC SETTING: Sand deposit on a wave-cut terrace in sandstone is covered by a thin layer of heavy mineral-rich black sand and a 1-3-ft-thick layer of gravel and sand. Gold and platinum are found in the thin heavy-mineral sand layer and in cracks in the underlying rock.

REFERENCES

Day, D. T.; Richards, R. H., 1906, Useful minerals in the black sands of the Pacific slope. *In* U.S. Geological Survey, Mineral resources of the United States, calendar year 1905: U.S. Geological Survey, p. 1175-1258.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Mertie, J. B., Jr., 1969, Economic geology of the platinum metals: U.S. Geological Survey Professional Paper 630, 120 p., 1 pl.

Pardee, J. T., 1929, Platinum and black sand in Washington. *In* Contributions to economic geology (short papers and preliminary reports) 1928; Part I—Metals and nonmetals except fuels: U.S. Geological Survey Bulletin 805, p. 1-15.

Sunset Creek placer (614)

ALTERNATE NAMES	DISTRICT	COUNTY
		Clallam

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
La Push	1:24,000	Forks	Cape Flattery

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
47° 59′ 20″ N	124° 40′ 17″ W	sec. 19, 29N, 15W

LOCATION: about 6 mi north of the mouth of the Quillayute River, near the mouth of Sunset Creek

HOST ROCK: NAME	LITHOLOGY	AGE
beach sands	sand	Quaternary

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au	gold	sand
Pt	platinum	
PGE		

DEPOSIT TYPE	MINERALIZATION AGE
marine placer	Pleistocene

PRODUCTION: Produced prior to 1917 (data from USGS MRDS, 1990).

TECTONIC SETTING: Uplifted beach terraces.

ORE CONTROLS: Heavy-mineral concentration by stream action. The metal-bearing part of the deposit is a thin layer of fine heavy-mineral sand composed chiefly of pink garnet and grains of ilmenite and magnetite. Minor amounts of chromite and some very small, clear crystals of zircon are also present (data from USGS MRDS, 1990).

GEOLOGIC SETTING: These Pleistocene deposits consist of stream gravel and drift. At this site the wave terrace is cut in a layer of indurated clay in the drift (data from USGS MRDS, 1990).

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Mertie, J. B., Jr., 1969, Economic geology of the platinum metals: U.S. Geological Survey Professional Paper 630, 120 p., 1 pl.

Pardee, J. T., 1929, Platinum and black sand in Washington. *In* Contributions to economic geology (short papers and preliminary reports) 1928; Part I—Metals and nonmetals except fuels: U.S. Geological Survey Bulletin 805, p. 1-15.

Victor (609)

ALTERNATE NAMES	DISTRICT	COUNTY
Bear Creek Victory Black Bear		Clallam

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Deadman Hill	1:24,000	Cape Flattery	Cape Flattery

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 05′ 36″ N	124° 11′ 31″ W	NW¼SW¼ sec. 24, 30N, 12W

LOCATION: elev. 1,800 ft, 2.25 mi northeast of Bear Creek (village). The Victor mine is on the steep southeast slope of Mount Muller Ridge; a 3.5-mi access road leads directly northward to the claims from Bear Creek on U.S. Highway 101.

HOST ROCK: NAME	LITHOLOGY	AGE
Crescent Formation volcanic rocks	altered basalt	Eocene

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
Crescent Formation volcanic rocks	Eocene
altered basalt	Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Mn	hausmannite bementite neotocite secondary manganese oxides	

DEPOSIT TYPE	MINERALIZATION AGE
replacement, disseminated exhalative/diagenetic	

PRODUCTION: Produced 50 tons or more in 1953 (Huntting, 1956, p. 257). A 102-ton shipment of ore from the property assayed 48% Mn and 15% combined SiO_2 and $Al2O_3$ (data from USGS MRDS, 1990).

TECTONIC SETTING: Host rocks of manganese deposits of the Olympic Peninsula formed at an ocean ridge or in a back arc basin at the active margin of the North American plate (Garrison, 1973; Snavely, 1987, p. 306-309).

ORE CONTROLS: The oOre body occurs in lenses in a shear zone (data from USGS MRDS, 1990). Manganese deposits of the region are associated with spilites (Park, 1942, p. 311-312) and commonly are found with reddish pelagic limestone interbedded with the basalt. Manganese mineralization may be either disseminated in replacement bodies or volcanogenic exhalative/diagenetic bodies (Sorem and Gunn, 1967).

GEOLOGIC SETTING: The Crescent Formation, which hosts manganese mineralization on the Olympic Peninsula, consists of Paleocene? and Eocene pillow basalts compositionally similar to ocean ridge basalts (Snavely, 1987, p. 306-308).

REFERENCES

Garrison, R. E., 1973, Space-time relations of pelagic limestones and volcanic rocks, Olympic Peninsula, Washington: Geological Society of America Bulletin, v. 84, no. 2, p. 583-594.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Magill, E. A., 1960, Manganese deposits of the Olympic Peninsula, Wash.: U.S. Bureau of Mines Report of Investigations 5530, 82 p.

Park, C. F., Jr., 1942, Manganese resources of the Olympic Peninsula, Washington—A preliminary report: U.S. Geological Survey Bulletin 931-R, p. 435-457, 2 pl.

Snavely, P. D., Jr., 1987, Tertiary geologic framework, neotectonics, and petroleum potential of the Oregon-Washington continental margin. *In* Scholl, D. W.; Grantz, Arthur; Vedder, J. G., Geology and resources potential of the continental margin of western North America and adjacent ocean basins—Beaufort Sea to Baja California: Circum-Pacific Council for Energy and Mineral Resources Earth Science Series, v. 6, p. 305-335.

Sorem, R. K.; Gunn, D. W., 1967, Mineralogy of manganese deposits, Olympic Peninsula, Washington: Economic Geology, v. 62, no. 1, p. 22-56.

Republic district (2)

ALTERNATE NAMES		DISTRICT	COUNTY
		Republic	Ferry
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Storm King Mountain	1:24,000	Republic	Okanogan
Republic	1:24,000		
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	

LOCATION: at the town of Republic

HOST ROCK: NAME	LITHOLOGY	AGE
Sanpoil Volcanics	dacite and andesite flows and flow breccias	Eocene

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
Scatter Creek Rhyodacite	Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au	gold	quartz, chalcedony
Ag		

DEPOSIT TYPE	MINERALIZATION AGE
vein	Eocene
hot springs	

PRODUCTION: See description for individual mines.

TECTONIC SETTING: The Republic district is in the Republic graben, a major intracratonic, volcano-tectonic depression in northeastern Washington. The graben contains a thick sequence of Eocene volcanic and volcaniclastic rocks.

ORE CONTROLS: A major hydrothermal system in the Republic district produced a series of epithermal veins capped by hot-spring (sinter) deposits. The hot-spring deposits formed at paleosurfaces in the Sanpoil Volcanics prior to deposition of the overlying Klondike Mountain Formation. The majority of the recovered gold and silver was from the epithermal veins. The veins exhibit features indicative of episodic vein sealing and overpressuring followed by flashing and precipitation of precious metals, thus forming the characteristic coloform bands. Geometrically, ore deposits in the Republic district extend from the paleosurface mineralization in hydrothermally altered rocks and sinter downward into epithermal stockworks and hydrothermal breccias, and farther downward into tightly confined, commonly coloform-banded veins (Muessig, 1967; Tschauder, 1989).

GEOLOGIC SETTING: Host rocks for gold deposits of the Republic district are dacite and andesite flows, flow breccias, tuffs and tuff breccias of the Eocene Sanpoil Volcanics (Muessig, 1967, p. 50-51; Tschauder, 1989, p. 242).

REFERENCES

Bancroft, Howland, 1914, The ore deposits of northeastern Washington: U.S. Geological Survey Bulletin 550, 215 p.

Full, R. P.; Grantham, R. M., 1968, Ore deposits of the Republic mining district, Ferry County, Washington. *In* Ridge, J. D., editor, Ore Deposits of the United States, 1933-1967; the Graton-Sales Volume: American Institute of Mining, Metallurgical, and Petroleum Engineers, v. 2, p. 1481-1494.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Muessig, Siegfried, 1967, Geology of the Republic quadrangle and a part of the Aeneas quadrangle, Ferry County, Washington: U.S. Geological Survey Bulletin 1216, 135 p., 1 pl.

Tschauder, R. J., 1989, Gold deposits in northern Ferry County, Washington. *In* Joseph, N. L. and others; editors, Geologic guidebook for Washington and adjacent areas: Washington Division of Geology and Earth Resources Information Circular 86, p. 241-253.

Umpleby, J. B., 1910, Geology and ore deposits of Republic mining district: Washington Geological Survey Bulletin 1, 65 p.

Addison (308)

ALTERNATE NAMES		DISTRICT	COUNTY
Pacific Mutual			Ferry
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Friedlander Meadows	1:24,000	Nespelem	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 3′ 2.34″ N	118° 34′ 51.73″ W	SE¼ sec. 36, 30N, 33E, SW¼ sec. 31, 30N, 34E, and NW¼ sec. 6, 29N, 34E

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
Covada Group	sandstone, greenstone, carbonate	Ordovician?

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
porphyritic granodiorite of Manila Creek	Eocene - Paleocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Cu	galena	pyrite, quartz
Pb	chalcopyrite	
Zn	chalcocite	
Ag	sphalerite	
Au	malachite	
W	azurite	
	scheelite	
	wolframite	
	lead carbonate	

DEPOSIT TYPE	MINERALIZATION AGE
vein	

PRODUCTION: Produced a small amount of lead, copper, zinc, silver, and gold in 1923 (Huntting, 1956, p. 51). Produced 1,500 tons of ore in 1973 (Moen, 1976, p. 100).

TECTONIC SETTING: Paleocene to Eocene granitic rocks intrude metamorphosed Ordovician? rocks (Joseph, 1990, geol. map).

ORE CONTROLS: Mineralization is in 4-6-ft-wide quartz veins in schist. The ore occurs as lenses in three of the exposed veins. One ore shoot is 50 ft long; another is 100 ft long (Huntting, 1956, p. 51).

GEOLOGIC SETTING: Ordovician? sedimentary rocks of the Covada Group host quartz veins at the Addison mine. The sedimentary rocks are near Paleocene to Eocene granodiorite. Numerous Eocene hypabyssal dikes are found in the area (Joseph, 1990, geol. map, p. 6-7).

REFERENCES

Culver, H. E.; Broughton, W. A., 1945, Tungsten resources of Washington: Washington Division of Geology Bulletin 34, 89 p., 23 pl.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Joseph, N. L., compiler, 1990, Geologic map of the Nespelem 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-16, 47 p., 1 pl.

Moen, W. S., 1976, Silver occurrences of Washington: Washington Division of Geology and Earth Resources Bulletin 69, 188 p.

Alva Stout placer (344)

ALTERNATE NAMES		DISTRICT	COUNTY
		Republic	Ferry
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Storm King Mountain	1:24,000	Republic	Okanogan
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
48° 38′ 55.70″ N	118° 46′ 29.58″ W	NW¼ sec. 2, 36N, 32E	

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
Quaternary alluvium	sand and gravel	Quaterna

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au	gold	sand and gravel

DEPOSIT TYPE	MINERALIZATION AGE
placer	Quaternary

PRODUCTION: Produced in 1934 (Huntting, 1956, p. 183).

TECTONIC SETTING: Deposition of heavy minerals in river gravels.

ORE CONTROLS: Heavy-mineral concentration by stream action.

REFERENCE

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Belcher (353)

ALTERNATE NAMES		DISTRICT	COUNTY
Blue Bell-Belcher		Belcher	Ferry
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Cooke Mountain	1:24,000	Republic	Okanogan
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
48° 43′ 26.36″ N	118° 32′ 46.02″ W	NW¼ sec. 8, 37N, 34E	

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
unnamed metasedimentary and metavolcanic rocks	graywacke, argillite, chert, limestone	Permian - Triassic

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
Scatter Creek Rhyodacite	Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Fe	pyrite	garnet, tremolite, epidote
Cu	magnetite	
Au	pyrrhotite	
	chalcopyrite	

DEPOSIT TYPE	MINERALIZATION AGE
contact metamorphic	

PRODUCTION: Considerable production in 1909-1911 and 1913-1917 (Huntting, 1956, p. 195).

TECTONIC SETTING: Eocene felsic rocks intruded Permian-Triassic metasedimentary and metavolcanic rocks of the Republic graben (Muessig, 1967, geol. map).

ORE CONTROLS: Two or three irregular replacement bodies are present in limestone in a sequence of contact-metamorphosed limestone and argillite cut by monzonite dikes. Iron sulfides are more abundant than magnetite (Huntting, 1956, p. 195).

GEOLOGIC SETTING: The Permian-Triassic rocks of the Belcher mine area are contact-metamorphosed limestone, dolomitic limestone, argillite, and graywacke. The ore bodies lie next to a network of dikes, sills, and intrusive bodies of Scatter Creek Rhyodacite (Muessig, 1967, p. 113).

REFERENCES

Bancroft, Howland, 1914, The ore deposits of northeastern Washington: U.S. Geological Survey Bulletin 550, 215 p.

Glover, S. L., 1942, Washington iron ores, a summary report: Washington Division of Mines and Mining Report of Investigations 2, 23 p.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Muessig, Siegfried, 1967, Geology of the Republic quadrangle and a part of the Aeneas quadrangle, Ferry County, Washington: U.S. Geological Survey Bulletin 1216, 135 p., 1 pl.

Shedd, Solon; Jenkins, O. P.; Cooper, H. H., 1922, Iron ores, fuels, and fluxes of Washington: Washington Division of Geology Bulletin 27, 160 p., 1 pl.

Ben Hur (314)

ALTERNATE NAMES		DISTRICT	COUNTY
		Republic	Ferry
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Storm King Mountain	1:24,000	Republic	Okanogan
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
48° 40′ 6.69″ N	118° 45′ 29.42″ W	center of line between secs. 34 and 27, 37N, 32E	

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
Sanpoil Volcanics	dacite and andesite flows and flow breccias	Eocene

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
Scatter Creek Rhyodacite	Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au Ag	gold	quartz, calcite, pyrite; hydrothermal alteration is low-sulfur adularia-sericite type

DEPOSIT TYPE	MINERALIZATION AGE
vein hot springs	Eocene

PRODUCTION: Produced $65,000 up to 1910; produced during 1909-1915, 1918, 1933, 1949, and 1950 (Huntting, 1956, p. 118).

TECTONIC SETTING: Epithermal deposits of the Republic district are found in the Eocene Sanpoil Volcanics. (See Republic district for additional details.)

ORE CONTROLS: Mineralization consists of a 4-ft-wide quartz vein in propylitic latite porphyry. The vein is composed of fine-grained banded quartz and 10%-30% calcite. The vein is said to extend the length of the claim (Huntting, 1956, p. 118). (See Republic district for additional details.)

GEOLOGIC SETTING: Host rocks for gold deposits of the Republic district are dacite and andesite flows, flow breccias, tuffs, and tuff breccias of the Eocene Sanpoil Volcanics (Muessig, 1967, p. 50-51; Tschauder, 1989, p. 242).

REFERENCES

Bancroft, Howland, 1914, The ore deposits of northeastern Washington: U.S. Geological Survey Bulletin 550, 215 p.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Muessig, Siegfried, 1967, Geology of the Republic quadrangle and a part of the Aeneas quadrangle, Ferry County, Washington: U.S. Geological Survey Bulletin 1216, 135 p., 1 pl.

Tschauder, R. J., 1989, Gold deposits in northern Ferry County, Washington. *In* Joseph, N. L. and others; editors, Geologic guidebook for Washington and adjacent areas: Washington Division of Geology and Earth Resources Information Circular 86, p. 241-253.

Umpleby, J. B., 1910, Geology and ore deposits of Republic mining district: Washington Geological Survey Bulletin 1, 65 p.

Black Tail (315)

ALTERNATE NAMES		DISTRICT	COUNTY
Hope		Republic	Ferry
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Republic	1:24,000	Republic	Okanogan
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
48° 39′ 48.02″.02 N	118° 44′ 51.36″ W	near E¼ corner, sec. 34, 37N, 32E	

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
Sanpoil Volcanics	dacite and andesite flows and flow breccias	Eocene
ASSOCIATED IGNEOUS ROCK: DESCRIPTION		AGE
Scatter Creek Rhyodacite		Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au Ag	gold	quartz; hydrothermal alteration is low-sulfur adularia-sericite type

DEPOSIT TYPE	MINERALIZATION AGE
vein hot springs	Eocene

PRODUCTION: Produced 300 tons prior to 1902; produced in 1909-1910 and 1912-1920 (Huntting, 1956, p. 118).

TECTONIC SETTING: Epithermal deposits of the Republic district are found in the Eocene Sanpoil Volcanics. (See Republic district for additional details.)

ORE CONTROLS: Mineralization occurs in several 2-6-ft-widequartz veins in quartz latite porphyry (dacite and andesite of recent authors) and propylitic andesite (Huntting, 1956, p. 118). (See Republic district for additional details.)

GEOLOGIC SETTING: Host rocks for gold deposits of the Republic district are dacite and andesite flows, flow breccias, tuffs, and tuff breccias of the Eocene Sanpoil Volcanics (Muessig, 1967, p. 50-51; Tschauder, 1989, p. 242).

REFERENCES

Bancroft, Howland, 1914, The ore deposits of northeastern Washington: U.S. Geological Survey Bulletin 550, 215 p.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Muessig, Siegfried, 1967, Geology of the Republic quadrangle and a part of the Aeneas quadrangle, Ferry County, Washington: U.S. Geological Survey Bulletin 1216, 135 p., 1 pl.

Patty, E. N., 1921, The metal mines of Washington: Washington Geological Survey Bulletin 23, 366 p.

Tschauder, R. J., 1989, Gold deposits in northern Ferry County, Washington. *In* Joseph, N. L. and others; editors, Geologic guidebook for Washington and adjacent areas: Washington Division of Geology and Earth Resources Information Circular 86, p. 241-253.

Umpleby, J. B., 1910, Geology and ore deposits of Republic mining district: Washington Geological Survey Bulletin 1, 65 p.

Blue Horse (359)

ALTERNATE NAMES	DISTRICT	COUNTY
		Ferry

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Edds Mountain	1:24,000	Republic	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 33′ 25.95″ N	118° 35′ 50.45″ W	sec. 6, 35N, 34E

LOCATION: on Iron Mountain

HOST ROCK: NAME	LITHOLOGY	AGE
unnamed metasedimentary and metavolcanic rocks	argillite, metawacke, greenstone	Permian - Triassic

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
diorite dike	pre-Tertiary

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Ag Au	arsenopyrite galena	pyrite, quartz

DEPOSIT TYPE	MINERALIZATION AGE
vein	

PRODUCTION: Produced prior to 1913 and in 1934 (Huntting, 1956, p. 288).

TECTONIC SETTING: Eocene felsic rocks intruded Permian-Triassic metasedimentary and metavolcanic rocks of the Republic graben (Muessig, 1967, geol. map).

ORE CONTROLS: A quartz vein roughly follows the contact between limestone-limy argillite and diorite (Huntting, 1956, p. 288).

GEOLOGIC SETTING: The Blue Horse mine is in a sequence of Permian-Triassic metasedimentary and metavolcanic rocks. Diorite adjacent to the vein contains thompsonite, which means it is probably pre-Tertiary in age (Muessig, 1967, geol. map, p. 17; Huntting, 1956, p. 288).

REFERENCES

Bancroft, Howland, 1914, The ore deposits of northeastern Washington: U.S. Geological Survey Bulletin 550, 215 p.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Muessig, Siegfried, 1967, Geology of the Republic quadrangle and a part of the Aeneas quadrangle, Ferry County, Washington: U.S. Geological Survey Bulletin 1216, 135 p., 1 pl.

Tschauder, R. J., 1989, Gold deposits in northern Ferry County, Washington. *In* Joseph, N. L. and others; editors, Geologic guidebook for Washington and adjacent areas: Washington Division of Geology and Earth Resources Information Circular 86, p. 241-253.

Boston & New York (360)

ALTERNATE NAMES		DISTRICT	COUNTY
Welcome		Curlew	Ferry
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Malo	1:24,000	Republic	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 51′ 50.56″ N	118° 34′ 52.28″ W	sec. 24, 39N, 33E

LOCATION: The default location is to the center of the section. The mine may be the shaft and prospects shown in the northeast corner of the section on the 7.5′ map.

HOST ROCK: NAME	LITHOLOGY	AGE
Scatter Creek Rhyodacite	rhyodacite	Eocene

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
diorite	

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Ag	galena	
Cu	chalcopyrite	
Pb		

DEPOSIT TYPE	MINERALIZATION AGE

PRODUCTION: Produced in 1916 and 1928 (Huntting, 1956, p. 288).

TECTONIC SETTING: Tertiary intrusive rocks of the Republic graben (Parker and Calkins, 1964, geol. map).

ORE CONTROLS: No deposit data are available for this mine. It has produced Ag, Cu, and Pb, and galena and chalcopyrite are assumed.

GEOLOGIC SETTING: The mine is in the Scatter Creek Rhyodacite (Parker and Calkins, 1964, geol. map).

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Parker, R. L.; Calkins, J. A., 1964, Geology of the Curlew quadrangle, Ferry County, Washington: U.S. Geological Survey Bulletin 1169, 95 p., 4 pl.

California (316)

ALTERNATE NAMES		DISTRICT	COUNTY
Apollo			Ferry
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Edds Mountain	1:24,000	Republic	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 36′ 9.61″ N	118° 34″ 54.48″ W	NW¼SW¼ sec. 20, 36N, 34E

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
unnamed metasedimentary and metavolcanic rocks	argillite, metawacke, greenstone	Permian - Triassic

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au Ag	galena chalcopyrite sphalerite malachite azurite	quartz

DEPOSIT TYPE	MINERALIZATION AGE
vein	

PRODUCTION: Produced in 1901-1902, 1908, 1914-1916, 1927-1929, and 1938-1939 (Huntting, 1956, p. 119).

TECTONIC SETTING: Eocene felsic rocks intruded Permian-Triassic metasedimentary and metavolcanic rocks of the area (Muessig, 1967, geol. map).

ORE CONTROLS: Mineralization is in a quartz vein along a fracture zone in greenstone and argillite (Huntting, 1956, p. 119).

GEOLOGIC SETTING: The California mine is in a sequence of Permian-Triassic rocks which are metasedimentary rocks near the deposit (Muessig, 1967, geol. map; Huntting, 1956, p. 119).

REFERENCES

Bancroft, Howland, 1914, The ore deposits of northeastern Washington: U.S. Geological Survey Bulletin 550, 215 p.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Muessig, Siegfried, 1967, Geology of the Republic quadrangle and a part of the Aeneas quadrangle, Ferry County, Washington: U.S. Geological Survey Bulletin 1216, 135 p., 1 pl.

Tschauder, R. J., 1989, Gold deposits in northern Ferry County, Washington. *In* Joseph, N. L. and others; editors, Geologic guidebook for Washington and adjacent areas: Washington Division of Geology and Earth Resources Information Circular 86, p. 241-253.

Dan Patch (361)

ALTERNATE NAMES		DISTRICT	COUNTY
			Ferry
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Inchelium	1:24,000	Nespelem	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 16′ 20.07″ N	118° 12′ 44.26″ W	near center, SW¼ sec. 13, 32N, 36E

LOCATION: near center, 3½ mi north of the Covada post office

HOST ROCK: NAME	LITHOLOGY	AGE
Covada Group	wacke and quartzite	Ordovician?

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Ag Pb Zn Au	galena sphalerite	pyrite, quartz

DEPOSIT TYPE	MINERALIZATION AGE
vein	

PRODUCTION: The mine produced in 1909.

TECTONIC SETTING: Metamorphosed Ordovician? rocks were intruded by Jurassic to Tertiary rocks (Joseph, 1990, geol. map, p. 21).

ORE CONTROLS: The deposit consists of three quartz veins cutting quartzite and slate. One vein is 16 in. wide and another 2 to 8 in. wide (Huntting, 1956, p. 289).

GEOLOGIC SETTING: The Dan Patch is in metamorphosed wacke and quartzite of the Ordovician? Covada Group (Joseph, 1990, geol. map, p. 21).

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Joseph, N. L., compiler, 1990, Geologic map of the Nespelem 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-16, 47 p., 1 pl.

Moen, W. S., 1976, Silver occurrences of Washington: Washington Division of Geology and Earth Resources Bulletin 69, 188 p.

Pardee, J. T., 1918, Geology and mineral deposits of the Colville Indian Reservation, Washington: U.S. Geological Survey Bulletin 677, 186 p., 1 pl.

Weaver, C. E., 1913, Geology and ore deposits of the Covada mining district: Washington Geological Survey Bulletin 16, 87 p.

El Caliph (317)

ALTERNATE NAMES		DISTRICT	COUNTY
		Republic	Ferry
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Storm King Mountain	1:24,000	Republic	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 39′ 16.52″ N	118° 45′ 36.44″ W	S½ sec. 34, 37N, 32E

LOCATION: just east of the Morning Glory property

HOST ROCK: NAME	LITHOLOGY	AGE
Sanpoil Volcanics	dacite and andesite flows and flow breccias	Eocene

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
Scatter Creek Rhyodacite	Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au Ag	gold	pyrite, quartz, calcite; hydrothermal alteration is low-sulfur adularia-sericite type

DEPOSIT TYPE	MINERALIZATION AGE
vein hot springs	Eocene

PRODUCTION: Estimated production of $15,000-$20,000 by the end of 1936; produced in 1916, 1933, 1934, and 1937-1939 (Huntting, 1956, p. 120).

TECTONIC SETTING: Epithermal deposits of the Republic district are found in the Eocene Sanpoil Volcanics. (See Republic district for additional details.)

ORE CONTROLS: Mineralization occurs in a 0.5-18-in.-wide vein cutting quartz latite and shale. The vein is displaced by minor faults (Huntting, 1956, p. 120). (See Republic district for additional details.)

GEOLOGIC SETTING: Host rocks for gold deposits of the Republic district are dacite and andesite flows, flow breccias, tuffs, and tuff breccias of the Eocene Sanpoil Volcanics (Muessig, 1967, p. 50-51; Tschauder, 1989, p. 242).

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Muessig, Siegfried, 1967, Geology of the Republic quadrangle and a part of the Aeneas quadrangle, Ferry County, Washington: U.S. Geological Survey Bulletin 1216, 135 p., 1 pl.

Tschauder, R. J., 1989, Gold deposits in northern Ferry County, Washington. *In* Joseph, N. L. and others; editors, Geologic guidebook for Washington and adjacent areas: Washington Division of Geology and Earth Resources Information Circular 86, p. 241-253.

Umpleby, J. B., 1910, Geology and ore deposits of Republic mining district: Washington Geological Survey Bulletin 1, 65 p.

Flag Hill (318)

ALTERNATE NAMES		DISTRICT	COUNTY
		Republic	Ferry
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Storm King Mountain	1:24,000	Republic	Okanogan
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
48° 39′ 7.59″ N	118° 45′ 16.89″ W	NW¼NW¼ sec. 1, 36N, 32E	

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
Sanpoil Volcanics	dacite and andesite flows and flow breccias	Eocene
ASSOCIATED IGNEOUS ROCK: DESCRIPTION		AGE
Scatter Creek Rhyodacite		Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au Ag Se	gold	quartz, calcite; hydrothermal alteration is low-sulfur adularia-sericite type

DEPOSIT TYPE	MINERALIZATION AGE
vein hot springs	Eocene

PRODUCTION: Said to have produced 400 tons prior to 1940 (Huntting, 1956, p. 120).

TECTONIC SETTING: Epithermal deposits of the Republic district are found in the Eocene Sanpoil Volcanics. (See Republic district for additional details.)

ORE CONTROLS: Vein reported to be 5 ft wide and have an estimated length of 1,500 ft (Huntting, 1956, p. 120). (See Republic district for additional details.)

GEOLOGIC SETTING: Host rocks for gold deposits of the Republic district are dacite and andesite flows, flow breccias, tuffs and tuff breccias of the Eocene Sanpoil Volcanics (Muessig, 1967, p. 50-51; Tschauder, 1989, p. 242).

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Muessig, Siegfried, 1967, Geology of the Republic quadrangle and a part of the Aeneas quadrangle, Ferry County, Washington: U.S. Geological Survey Bulletin 1216, 135 p., 1 pl.

Tschauder, R. J., 1989, Gold deposits in northern Ferry County, Washington. *In* Joseph, N. L. and others; editors, Geologic guidebook for Washington and adjacent areas: Washington Division of Geology and Earth Resources Information Circular 86, p. 241-253.

Golden Cord (362)

ALTERNATE NAMES		DISTRICT	COUNTY
		Keller	Ferry
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Friedlander Meadows	1:24,000	Nespelem	Okanogan
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
48° 3′ 15.87″ N	118° 35′ 59.09″ W	NW¼SE¼ sec. 36, 30N, 33E	

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
Covada Group	sandstone, greenstone, carbonate	Ordovician?
ASSOCIATED IGNEOUS ROCK: DESCRIPTION		AGE
porphyritic granodiorite of Manila Creek hypabyssal dacite dikes		Paleocene - Eocene Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Ag	chalcopyrite	pyrite, quartz, epidote, garnet
Cu	sphalerite	
Pb	galena	
Zn		

DEPOSIT TYPE — MINERALIZATION AGE

vein

PRODUCTION: Minor shipments were made in the early 1900s (Moen, 1976, p. 101).

TECTONIC SETTING: Paleocene to Eocene granitic rocks intrude metamorphosed Ordovician? rocks in the Keller graben (Joseph, 1990, geol. map, p. 12).

ORE CONTROLS: Mineralization is in silicified schist, which is cut by porphyry. Ore occurs as pockets and sparse disseminations in small quartz veinlets (Huntting, 1956, p. 290).

GEOLOGIC SETTING: Joseph (1990, geol. map) shows the mine is in porphyritic granodiorite of Manila Creek. Because Huntting (1956, p. 290) notes the mine is in schist, the area must be a small roof pendant in the Paleocene to Eocene granitic body. The area also contains numerous dacite dikes (Joseph, 1990, geol. map).

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Joseph, N. L., compiler, 1990, Geologic map of the Nespelem 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-16, 47 p., 1 pl.

Moen, W. S., 1976, Silver occurrences of Washington: Washington Division of Geology and Earth Resources Bulletin 69, 188 p.

Pardee, J. T., 1918, Geology and mineral deposits of the Colville Indian Reservation, Washington: U.S. Geological Survey Bulletin 677, 186 p., 1 pl.

Golden Harvest (319)

ALTERNATE NAMES		DISTRICT	COUNTY
			Ferry
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Bear Mountain	1:24,000	Republic	Okanogan
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
48° 34′ 39.01″ N	118° 44′ 54.26″ W	near center sec. 36, 36N, 32E	

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
Sanpoil Volcanics	porphyritic dacite, andesite, and trachyte flows	Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au Ag	gold	quartz

DEPOSIT TYPE	MINERALIZATION AGE
vein	Eocene

PRODUCTION: Produced 800 tons of ore in 1937-1938 (Huntting, 1956, p. 120).

TECTONIC SETTING: Epithermal gold deposits are found in Eocene volcanic rocks of the Republic graben (Tschauder, 1989).

ORE CONTROLS: Mineralization is said to be in a 2.5-ft-wide vein that has an estimated length of 150 ft (Huntting, 1956, p. 120). The deposit is similar to epithermal deposits in the nearby Republic district.

GEOLOGIC SETTING: Mineralization at the Golden Harvest deposit is in the Eocene Sanpoil Volcanics (Muessig, 1967, geol. map).

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Muessig, Siegfried, 1967, Geology of the Republic quadrangle and a part of the Aeneas quadrangle, Ferry County, Washington: U.S. Geological Survey Bulletin 1216, 135 p., 1 pl.

Tschauder, R. J., 1989, Gold deposits in northern Ferry County, Washington. *In* Joseph, N. L. and others; editors, Geologic guidebook for Washington and adjacent areas: Washington Division of Geology and Earth Resources Information Circular 86, p. 241-253.

Gray (363)

ALTERNATE NAMES		DISTRICT	COUNTY
			Ferry
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Friedlander Meadows	1:24,000	Nespelem	Okanōgan
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
48° 2′ 56.67″ N	118° 34 40.31 W	NW¼ sec. 6, 29N, 34E	

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
Covada Group	sandstone, greenstone, carbonate	Ordovician?
ASSOCIATED IGNEOUS ROCK: DESCRIPTION		AGE
porphyritic granodiorite of Manila Creek		Paleocene - Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Ag	galena	
Au	chalcopyrite	
Cu		

DEPOSIT TYPE	MINERALIZATION AGE
vein	

PRODUCTION: Reportedly produced 140 tons of ore prior to 1940 (Huntting, 1956, p. 290).

TECTONIC SETTING: Paleocene to Eocene granitic rocks intrude metamorphosed Ordovician? rocks in the Keller graben (Joseph, 1990, geol. map, p. 12).

ORE CONTROLS: The ore is said to be present in an 8-in.-wide vein exposed for 600 ft (Huntting, 1956, p. 290). No ore minerals are reported from the Gray mine; however, it is near the Addison mine, which contains galena and chalcopyrite.

GEOLOGIC SETTING: Ordovician? sedimentary rocks host quartz veins at the Gray deposit. The sedimentary rocks are near Paleocene to Eocene granodiorite. Numerous Eocene hypabyssal dikes are found in the area (Joseph, 1990, geol. map, p. 6-7).

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Joseph, N. L., compiler, 1990, Geologic map of the Nespelem 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-16, 47 p., 1 pl.

Gwin (364)

ALTERNATE NAMES	DISTRICT	COUNTY
Guinn Hall Creek		Ferry

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Inchelium	1:24,000	Nespelem	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 17′ 36.81″ N	118° 14′ 3.49″ W	NW¼ sec. 11, 32N, 36E

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
Covada Group	wacke and quartzite	Ordovician?

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Ag Cu Au Pb W	tetrahedrite galena wolframite tennantite enargite malachite azurite	pyrite, arsenopyrite, quartz

DEPOSIT TYPE	MINERALIZATION AGE
vein	

PRODUCTION: Produced silver and some tungsten during the First World War (Huntting, 1956, p. 290).

TECTONIC SETTING: Host rocks are metamorphosed Ordovician? rocks (Joseph, 1990, geol. map, p. 21).

ORE CONTROLS: Quartz veins are as much as 4 ft wide and are parallel to the bedding in quartzite and argillite (Huntting, 1956, p. 290).

GEOLOGIC SETTING: The Gwin deposit is in wacke and sandstone of the Ordovician? Covada Group (Joseph, 1990, Geol. map, p. 21).

REFERENCES

Culver, H. E.; Broughton, W. A., 1945, Tungsten resources of Washington: Washington Division of Geology Bulletin 34, 89 p., 23 pl.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Joseph, N. L., compiler, 1990, Geologic map of the Nespelem 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-16, 47 p., 1 pl.

Moen, W. S., 1976, Silver occurrences of Washington: Washington Division of Geology and Earth Resources Bulletin 69, 188 p.

Pardee, J. T., 1918, Geology and mineral deposits of the Colville Indian Reservation, Washington: U.S. Geological Survey Bulletin 677, 186 p., 1 pl.

Weaver, C. E., 1913, Geology and ore deposits of the Covada mining district: Washington Geological Survey Bulletin 16, 87 p.

Hellgate Bar placer (345)

ALTERNATE NAMES		DISTRICT	COUNTY
			Ferry
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Whitestone Rock	1:24,000	Coulee Dam	Ritzville

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
47° 56′ .13″ N	118° 36′ 11.32″ W	lot 5, sec. 13, 28N, 33E

LOCATION: on the north side of the Columbia River

HOST ROCK: NAME	LITHOLOGY	AGE
Quaternary alluvium	sand and gravel	Quaternary

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au	gold	sand and gravel

DEPOSIT TYPE	MINERALIZATION AGE
placer	Quaternary

PRODUCTION: Produced a small amount in the early 1900s (Huntting, 1956, p. 183).

TECTONIC SETTING: Deposition of heavy minerals in river gravels.

ORE CONTROLS: Heavy-mineral concentration by stream action. A high bar contained gravel 2.5 to 3 ft thick showing values of 21.8 cents per cubic yard. A lower bar had 7 or 8 acres of gravel 2 to 3 ft thick averaging 27 cents per cubic yard. A low bench 2 mi long and 300 ft to 0.5 mi wide contained an iron-stained gold-bearing layer about 6 in. thick, 100 to 600 yd wide, and 2 mi long (Huntting, 1956, p. 183).

REFERENCES

Collier, A. J., 1907, Gold-bearing river sands of northeastern Washington. *In* Contributions to economic geology 1906; Part I—Metals and nonmetals, except fuels: U.S. Geological Survey Bulletin 315, p. 56-70.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Ida May (320)

ALTERNATE NAMES		DISTRICT	COUNTY
		Republic	Ferry
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Storm King Mountain	1:24,000	Republic	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 39′ 17.27″ N	118° 45′ 52.72″ W	SW¼ SW¼ sec. 34, 37N, 32E

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
Sanpoil Volcanics	dacite and andesite flows and flow breccias	Eocene

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
Scatter Creek Rhyodacite	Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au Ag	gold	quartz; hydrothermal alteration is low-sulfur adularia-sericite type

DEPOSIT TYPE	MINERALIZATION AGE
vein hot springs	Eocene

PRODUCTION: Produced in 1914 (Huntting, 1956, p. 120).

TECTONIC SETTING: Epithermal deposits of the Republic district are found in the Eocene Sanpoil Volcanics. (See Republic district for additional details.)

ORE CONTROLS: Similar to ore deposits of the Republic district. (See Republic district for additional details.)

GEOLOGIC SETTING: Host rocks for gold deposits of the Republic district are dacite and andesite flows, flow breccias, tuffs, and tuff breccias of the Eocene Sanpoil Volcanics (Muessig, 1967, p. 50-51; Tschauder, 1989, p. 242).

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Muessig, Siegfried, 1967, Geology of the Republic quadrangle and a part of the Aeneas quadrangle, Ferry County, Washington: U.S. Geological Survey Bulletin 1216, 135 p., 1 pl.

Tschauder, R. J., 1989, Gold deposits in northern Ferry County, Washington. *In* Joseph, N. L. and others; editors, Geologic guidebook for Washington and adjacent areas: Washington Division of Geology and Earth Resources Information Circular 86, p. 241-253.

Insurgent (321)

ALTERNATE NAMES		DISTRICT	COUNTY
		Republic	Ferry
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Republic	1:24,000	Republic	Okanogan
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
48° 40′ .82″ N	118° 44′ 46.16″ W	NW¼NW¼ sec. 35, 37N, 32E	

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
Sanpoil Volcanics	dacite and andesite flows and flow breccias	Eocene

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
Scatter Creek Rhyodacite	Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au Ag	gold	quartz, pyrite; hydrothermal alteration is low-sulfur adularia-sericite type

DEPOSIT TYPE	MINERALIZATION AGE
vein hot springs	Eocene

PRODUCTION: Produced in 1908-1912 and 1927 (Huntting, 1956, p. 121).

TECTONIC SETTING: Epithermal deposits of the Republic district are found in the Eocene Sanpoil Volcanics. (See Republic district for additional details.)

ORE CONTROLS: The vein is thought to be an offshoot of the Lone Pine vein and cuts propylitic andesite. The ore shoot, which was 30 ft long and 2.5 ft wide, is now stoped out (Huntting, 1956, p. 121). (See Republic district for additional details.)

GEOLOGIC SETTING: Host rocks for gold deposits of the Republic district are dacite and andesite flows, flow breccias, tuffs, and tuff breccias of the Eocene Sanpoil Volcanics (Muessig, 1967, p. 50-51; Tschauder, 1989, p. 242).

REFERENCES

Bancroft, Howland, 1914, The ore deposits of northeastern Washington: U.S. Geological Survey Bulletin 550, 215 p.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Muessig, Siegfried, 1967, Geology of the Republic quadrangle and a part of the Aeneas quadrangle, Ferry County, Washington: U.S. Geological Survey Bulletin 1216, 135 p., 1 pl.

Tschauder, R. J., 1989, Gold deposits in northern Ferry County, Washington. *In* Joseph, N. L. and others; editors, Geologic guidebook for Washington and adjacent areas: Washington Division of Geology and Earth Resources Information Circular 86, p. 241-253.

Jennie (322)

ALTERNATE NAMES	DISTRICT	COUNTY
Jenny Blue Mountain Patterson	Orient	Ferry

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Laurier	1:24,000	Republic	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 55′ 4.61″ N	118° 13′ 33.53″ W	S½ sec. 34, 40N, 36E

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
unnamed metamorphic rocks	schist, marble, quartzite	pre-Tertiary

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au Ag Cu Pb Zn	galena sphalerite	pyrite, quartz, gypsum

DEPOSIT TYPE	MINERALIZATION AGE
shear zone	

PRODUCTION: No large shipments were reported (Huntting, 1956, p. 121).

TECTONIC SETTING: The deposit is in the Kettle metamorphic core complex (Stoffel, 1990, p. 8).

ORE CONTROLS: Schist, marble, and quartzite intruded by lamprophyre dikes are traversed by a 35-ft-wide shear zone filled with brecciated country rock, gouge, quartz, and ore (Huntting, 1956, p. 121).

GEOLOGIC SETTING: The metamorphic rocks are part of the Kettle metamorphic core complex (Stoffel, 1990, p. 8).

REFERENCES

Bancroft, Howland, 1914, The ore deposits of northeastern Washington: U.S. Geological Survey Bulletin 550, 215 p.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Stoffel, K. L., compiler, 1990, Geologic map of the Republic 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-10, 62 p., 1 pl.

Johnson placer (346)

ALTERNATE NAMES		DISTRICT	COUNTY
			Ferry
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Inchelium	1:24,000	Nespelem	Okanogan
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
48° 17′ 36.90″ N	118° 9′ 40.92″ W	NE¼ sec. 8, 32N, 37E	

LOCATION: on the bank of the Columbia River

HOST ROCK: NAME	LITHOLOGY	AGE
Quaternary alluvium	sand and gravel	Quaternary

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au	gold	sand and gravel

DEPOSIT TYPE	MINERALIZATION AGE
placer	Quaternary

PRODUCTION: Reportedly produced $100 (Huntting, 1956, p. 183).

TECTONIC SETTING: Deposition of heavy minerals in river gravels.

ORE CONTROLS: Heavy-mineral concentration by stream action. The paystreak consists of 1-3 ft of medium- to fine-textured gravel beneath 4-8 ft of sand (Huntting, 1956, p. 183).

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Pardee, J. T., 1918, Geology and mineral deposits of the Colville Indian Reservation, Washington: U.S. Geological Survey Bulletin 677, 186 p., 1 pl.

Kelly Camp (368)

ALTERNATE NAMES		DISTRICT	COUNTY
			Ferry
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Bodie Mountain	1:24,000	Republic	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 48′ 10.99″ N	118° 47′ 21.73″ W	SW¼ sec. 9, 38N, 32E

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
metamorphic rocks of Tonata Creek	calc-silicate gneiss, schist, quartzite	pre-Tertiary

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
quartz monzonite, Herron Creek suite	Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
W	chalcopyrite	garnet, epidote, calcite
Cu	scheelite	
Mo	magnetite	
	molybdenite	

DEPOSIT TYPE	MINERALIZATION AGE
contact metamorphic	

PRODUCTION: Ten tons of ore were shipped for a mill test in 1951 (Huntting, 1956, p. 344).

TECTONIC SETTING: Eocene felsic rocks intruded pre-Tertiary metamorphic rocks adjacent to the Toroda Creek graben (Pearson, 1967, geol. map).

ORE CONTROLS: Mineralization is in a contact-metamorphic zone along the west side of a small roof pendant. The deposit contains a considerable amount of low-grade milling ore (Huntting, 1956, p. 344).

GEOLOGIC SETTING: Pre-Tertiary metamorphic rocks including calc-silicate gneiss, mica schist, and carbonaceous quartzite host contact metamorphic deposits of the Kelly Camp mine. These rocks are a roof pendant in quartz monzonite and monzonite of the Herron Creek suite (Pearson, 1967, geol. map, p. 3; Stoffel, 1990, geol. map)

REFERENCES

Culver, H. E.; Broughton, W. A., 1945, Tungsten resources of Washington: Washington Division of Geology Bulletin 34, 89 p., 23 pl.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Pearson, R. C., 1967, Geologic map of the Bodie Mountain quadrangle, Ferry and Okanogan Counties, Washington: U.S. Geological Survey Geologic Quadrangle Map GQ 636, 1 sheet, scale 1:62,500, with 4 p. text.

Stoffel, K. L., compiler, 1990, Geologic map of the Republic 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-10, 62 p., 1 pl.

Kettle (339)

ALTERNATE NAMES	DISTRICT	COUNTY
		Ferry

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Vulcan Mountain	1:24,000	Republic	Okanogan
Curlew	1:24,000		

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 52′ 43.51″ N	118° 37′ 31.54″ W	near center sec. 15, 39N, 33E

LOCATION: about 1.5 mi south of Curlew

HOST ROCK: NAME	LITHOLOGY	AGE
Sanpoil Volcanics	dacite and andesite flows and flow breccias	Eocene

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
Scatter Creek Rhyodacite	Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au Ag	pyrargyrite electrum gold	quartz, calcite, pyrite, chalcedony, sericitic, propylitic, argillic, and quartz alteration

DEPOSIT TYPE	MINERALIZATION AGE
vein hot springs	Eocene

PRODUCTION: The first gold-silver dore was poured (1990) from the jointly operated Overlook and Kettle mines. Anticipated production for the first year is 110,000 oz of Au, with the majority to come from the Overlook deposit (Joseph, 1990, p. 20).

TECTONIC SETTING: Epithermal deposits are found in the Sanpoil Volcanics and are similar to deposits of the Republic district.

ORE CONTROLS: The deposit exposed in the mine is in the zone just below the sinter zone of a typical hot-spring deposit. Veins are associated with some dikes (Walt Hunt, personal commun., 1990; Tschauder, 1989).

GEOLOGIC SETTING: Host rocks for the Kettle mine are the same as for deposits of the Republic district and are dacite and andesite flows, flow breccias, tuffs, and tuff breccias of the Eocene Sanpoil Volcanics (Muessig, 1967, p. 50-51; Tschauder, 1989, p. 242).

REFERENCES

Joseph, N. L., 1990, Mineral industry news notes: Washington Geologic Newsletter, v. 18, no. 2, p. 19-20.

Muessig, Siegfried, 1967, Geology of the Republic quadrangle and a part of the Aeneas quadrangle, Ferry County, Washington: U.S. Geological Survey Bulletin 1216, 135 p., 1 pl.

Parker, R. L.; Calkins, J. A., 1964, Geology of the Curlew quadrangle, Ferry County, Washington: U.S. Geological Survey Bulletin 1169, 95 p., 4 pl.

Stoffel, K. L., compiler, 1990, Geologic map of the Republic 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-10, 62 p., 1 pl.

Tschauder, R. J., 1989, Gold deposits in northern Ferry County, Washington. *In* Joseph, N. L. and others; editors, Geologic guidebook for Washington and adjacent areas: Washington Division of Geology and Earth Resources Information Circular 86, p. 241-253.

Key East (309)

ALTERNATE NAMES	DISTRICT	COUNTY
Copper Key	Belcher	Ferry

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Cooke Mountain	1:24,000	Republic	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 42′ 36.70″ N	118° 33′ 5.24″ W	NE¼ sec. 18, 37N, 34E

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
unnamed metasedimentary and metavolcanic rocks	graywacke, argillite, chert, limestone	Permian - Triassic

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
Scatter Creek Rhyodacite	Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au	pyrite	chlorite, sericite
Ag	pyrrhotite	
Cu	magnetite	
Fe	chalcopyrite	

DEPOSIT TYPE	MINERALIZATION AGE
manto-like massive replacement	

PRODUCTION: Shipped 3,249 tons of oxidized ore in 1907 and 7,000 tons of ore prior to 1940 (Huntting, 1956, p. 52).

TECTONIC SETTING: Permian-Triassic metasedimentary and metavolcanic rocks are preserved in the Republic graben east and northeast of Republic. They are locally cut by Eocene epizonal plutons and associated sills and dikes (Muessig, 1967, geol. map).

ORE CONTROLS: Iron-gold mineralization is manto-like and occurs as replacement bodies in limestone. One of these bodies is 100 ft long, 100 ft wide, and 25 ft thick. In places the ore bodies consist of nearly pure magnetite (Huntting, 1956, p. 52). Currently (1990), some of the iron bodies (magnetite, pyrite, pyrrhotite) are being mined for gold (Tschauder, 1989, p. 245).

GEOLOGIC SETTING: The Key East deposit is in Permian-Triassic limestone, dolomitic limestone, argillite, and graywacke. The ore bodies lie next to a network of dikes, sills, and intrusive bodies of the Scatter Creek Rhyodacite (Muessig, 1967, p. 113).

COMMENTS: The Key East deposit (formerly the Copper Key) and the nearby Key West deposit are identified areas that contain gold reserves. These deposits are about a mile northeast of the Overlook mine, which is now (1990) being mined by Echo Bay/Crown Resources.

REFERENCES

Bancroft, Howland, 1914, The ore deposits of northeastern Washington: U.S. Geological Survey Bulletin 550, 215 p.

Glover, S. L., 1942, Washington iron ores, a summary report: Washington Division of Mines and Mining Report of Investigations 2, 23 p.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Muessig, Siegfried, 1967, Geology of the Republic quadrangle and a part of the Aeneas quadrangle, Ferry County, Washington: U.S. Geological Survey Bulletin 1216, 135 p., 1 pl.

Shedd, Solon; Jenkins, O. P.; Cooper, H. H., 1922, Iron ores, fuels, and fluxes of Washington: Washington Division of Geology Bulletin 27, 160 p., 1 pl.

Tschauder, R. J., 1989, Gold deposits in northern Ferry County, Washington. *In* Joseph, N. L. and others; editors, Geologic guidebook for Washington and adjacent areas: Washington Division of Geology and Earth Resources Information Circular 86, p. 241-253.

Knob Hill (323)

ALTERNATE NAMES		DISTRICT	COUNTY
Golden Promise		Republic	Ferry
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Storm King Mountain	1:24,000	Republic	Okanogan
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
48° 40′ 24.41″ N	118° 45′ 28.15″ W	W½SE¼ sec. 27, 37N, 32E	

LOCATION: at the head of Eureka Gulch

HOST ROCK: NAME	LITHOLOGY	AGE
Sanpoil Volcanics	dacite and andesite flows and flow breccias	Eocene

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
Scatter Creek Rhyodacite	Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au Ag	gold electrum tellurides chalcopyrite stibnite realgar tetrahedrite polybasite pyrargyrite argentite umangite naumannite	quartz, chalcedony, pyrite, arsenopyrite, adularia, sericite, calcite, barite, graphite, marcasite; hydrothermal alteration is low-sulfur adularia-sericite type

DEPOSIT TYPE	MINERALIZATION AGE
vein hot springs	Eocene

PRODUCTION: Produced more than $10,000,000 by the end of 1951 (Huntting, 1956, p. 121). On June 24, 1989, Hecla Mining Company celebrated the production of the 2 millionth ounce of gold from the Knob Hill No. 2 shaft (Lasmanis, 1989, p. 9).

TECTONIC SETTING: Epithermal deposits of the Republic district are found in the Eocene Sanpoil Volcanics. (See Republic district for additional details.)

ORE CONTROLS: The deposit consists of several veins with mining widths of 5-15 ft (Huntting, 1956, p. 121). (See Republic district for additional details.)

GEOLOGIC SETTING: Host rocks for gold deposits of the Republic district are dacite and andesite flows, flow breccias, tuffs, and tuff breccias of the Eocene Sanpoil Volcanics (Muessig, 1967, p. 50-51; Tschauder, 1989, p. 242).

REFERENCES

Full, R. P.; Grantham, R. M., 1968, Ore deposits of the Republic mining district, Ferry County, Washington. *In* Ridge, J. D., editor, Ore Deposits of the United States, 1933-1967; the Graton-Sales Volume: American Institute of Mining, Metallurgical, and Petroleum Engineers, v. 2, p. 148°1-1494.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Lasmanis, Raymond, 1989, Knob Hill No. 2 shaft at the Republic Unit produces 2 millionth ounce of gold: Washington Geologic Newsletter, v. 17, no. 3, p. 9-11.

Lindgren, Waldemar; Bancroft, Howland, 1914, Republic (Eureka) district. *In* Bancroft, Howland, The ore deposits of northeastern Washington: U.S. Geological Survey Bulletin 550, p. 133-166.

Muessig, Siegfried, 1967, Geology of the Republic quadrangle and a part of the Aeneas quadrangle, Ferry County, Washington: U.S. Geological Survey Bulletin 1216, 135 p., 1 pl.

Patty, E. N., 1921, The metal mines of Washington: Washington Geological Survey Bulletin 23, 366 p.

Tschauder, R. J., 1989, Gold deposits in northern Ferry County, Washington. *In* Joseph, N. L. and others; editors, Geologic guidebook for Washington and adjacent areas: Washington Division of Geology and Earth Resources Information Circular 86, p. 241-253.

Umpleby, J. B., 1910, Geology and ore deposits of Republic mining district: Washington Geological Survey Bulletin 1, 65 p.

Lancaster (310)

ALTERNATE NAMES	DISTRICT	COUNTY
		Ferry

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Curlew	1:24,000	Republic	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 54′ 51.15″ N	118° 33′ 19.62″ W	secs. 5 and 6, 39N, 34E

LOCATION: 1 mi north of Curlew on the east bank of the Kettle River

HOST ROCK: NAME	LITHOLOGY	AGE
unnamed metasedimentary and metavolcanic rocks	argillite, siltstone, limestone	Permian - Triassic
unnamed quartz monzonite	quartz monzonite	Eocene
Scatter Creek Rhyodacite	rhyodacite	Eocene

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
quartz latite dikes	Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Cu	galena	pyrite, quartz, calc-silicates
Pb	sphalerite	
Zn	chalcopyrite	
Au		
Ag		

DEPOSIT TYPE	MINERALIZATION AGE
contact metamorphic disseminated	

PRODUCTION: Carload of 29 tons of hand-sorted ore shipped in 1929 (from open cuts) contained 1,651 lb Cu, 4,719 lb Pb, and 395 oz Ag (Parker and Calkins, 1964, p. 89).

TECTONIC SETTING: Eocene felsic rocks intruded Permian-Triassic metasedimentary and metavolcanic rocks of the area (Parker and Calkins, 1964, geol. map).

ORE CONTROLS: Chimney-like zones as much as 3 ft wide are present at the intersections of fractures in limestone at its contact with granite (Huntting, 1956, p. 54).

GEOLOGIC SETTING: A small body of Permian-Triassic, carbonate-bearing sedimentary rocks was intruded first by Eocene Scatter Creek Rhyodacite and then by Eocene quartz monzonite. All these rocks are cut by northeast-trending quartz latite dikes (Parker and Calkins, 1964, p. 89).

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Parker, R. L.; Calkins, J. A., 1964, Geology of the Curlew quadrangle, Ferry County, Washington: U.S. Geological Survey Bulletin 1169, 95 p., 4 pl.

Last Chance (324)

ALTERNATE NAMES		DISTRICT	COUNTY
		Republic	Ferry

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Republic	1:24,000	Republic	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 39′ 56.93″ N	118° 44′ 46.69″ W	W½NW¼ sec. 35, 37N, 32E

LOCATION: on the east side of Eureka Gulch

HOST ROCK: NAME	LITHOLOGY	AGE
Sanpoil Volcanics	dacite and andesite flows and flow breccias	Eocene

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
Scatter Creek Rhyodacite	Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au Ag	gold tetrahedrite	quartz, calcite, pyrite; hydrothermal alteration is low-sulfur adularia-sericite type

DEPOSIT TYPE	MINERALIZATION AGE
vein hot springs	Eocene

PRODUCTION: Produced $3,000,000 by the end of 1923; produced again in 1940 (Huntting, 1956, p. 122).

TECTONIC SETTING: Epithermal deposits of the Republic district are found in the Eocene Sanpoil Volcanics. (See Republic district for additional details.)

ORE CONTROLS: The vein in andesite flow breccia averages 8 ft in width. Vein filling consists of chalcedonic banded quartz, calcite, and fragments of country rock. Ore was largely removed above the 500-ft level (Huntting, 1956, p. 121). (See Republic district for additional details.)

GEOLOGIC SETTING: Host rocks for gold deposits of the Republic district are dacite and andesite flows, flow breccias, tuffs, and tuff breccias of the Eocene Sanpoil Volcanics (Muessig, 1967, p. 50-51; Tschauder, 1989, p. 242).

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Muessig, Siegfried, 1967, Geology of the Republic quadrangle and a part of the Aeneas quadrangle, Ferry County, Washington: U.S. Geological Survey Bulletin 1216, 135 p., 1 pl.

Patty, E. N., 1921, The metal mines of Washington: Washington Geological Survey Bulletin 23, 366 p.

Tschauder, R. J., 1989, Gold deposits in northern Ferry County, Washington. *In* Joseph, N. L. and others; editors, Geologic guidebook for Washington and adjacent areas: Washington Division of Geology and Earth Resources Information Circular 86, p. 241-253.

Little Cove (325)

ALTERNATE NAMES		DISTRICT	COUNTY
		Republic	Ferry

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Storm King Mountain	1:24,000	Republic	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 40′ 4.44″ N	118° 45′ 16.97″ W	NE¼NW¼ sec. 34, 37N, 32E

LOCATION: adjoins the Pearl on the north

HOST ROCK: NAME	LITHOLOGY	AGE
Sanpoil Volcanics	dacite and andesite flows and flow breccias	Eocene

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
Scatter Creek Rhyodacite	Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au Ag	gold	chalcedonic quartz, calcite; hydrothermal alteration is low-sulfur adularia-sericite type

DEPOSIT TYPE	MINERALIZATION AGE
vein hot springs	Eocene

PRODUCTION: Produced two carloads of ore valued at $1,450 prior to 1934; produced in 1934 and 1939-1940 (Huntting, 1956, p. 122).

TECTONIC SETTING: Epithermal deposits of the Republic district are found in the Eocene Sanpoil Volcanics. (See Republic district for additional details.)

ORE CONTROLS: The deposit is similar to other deposits of the Republic district. (See Republic district for additional details.)

GEOLOGIC SETTING: Host rocks for gold deposits of the Republic district are dacite and andesite flows, flow breccias, tuffs, and tuff breccias of the Eocene Sanpoil Volcanics (Muessig, 1967, p. 50-51; Tschauder, 1989, p. 242).

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Muessig, Siegfried, 1967, Geology of the Republic quadrangle and a part of the Aeneas quadrangle, Ferry County, Washington: U.S. Geological Survey Bulletin 1216, 135 p., 1 pl.

Tschauder, R. J., 1989, Gold deposits in northern Ferry County, Washington. *In* Joseph, N. L. and others; editors, Geologic guidebook for Washington and adjacent areas: Washington Division of Geology and Earth Resources Information Circular 86, p. 241-253.

Lone Pine (326)

ALTERNATE NAMES		DISTRICT	COUNTY
		Republic	Ferry
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Republic	1:24,000	Republic	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 39′ 56.00″ N	118° 44′ 58.46″ W	E½NE¼ sec. 34, 37N, 32E

LOCATION: on the east side of Eureka Gulch

HOST ROCK: NAME	LITHOLOGY	AGE
Sanpoil Volcanics	dacite and andesite flows and flow breccias	Eocene

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
Scatter Creek Rhyodacite	Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au Ag	gold	quartz, calcite; hydrothermal alteration is low-sulfur adularia-sericite type

DEPOSIT TYPE	MINERALIZATION AGE
vein hot springs	Eocene

PRODUCTION: Produced $137,000 worth of ore by 1910; produced again in 1935 (Huntting, 1956, p. 122).

TECTONIC SETTING: Epithermal deposits of the Republic district are found in the Eocene Sanpoil Volcanics. (See Republic district for additional details.)

ORE CONTROLS: Five veins in propylitically altered andesite are from 2 to 14 ft wide and consist of chalcedonic quartz traversed by narrow, black, crenulated ribbons. Most of the ore was above the 500-ft level and is stoped out (Huntting, 1956, p. 122). (See Republic district for additional details.)

GEOLOGIC SETTING: Host rocks for gold deposits of the Republic district are dacite and andesite flows, flow breccias, tuffs, and tuff breccias of the Eocene Sanpoil Volcanics (Muessig, 1967, p. 50-51; Tschauder, 1989, p. 242).

REFERENCES

Bancroft, Howland, 1914, The ore deposits of northeastern Washington: U.S. Geological Survey Bulletin 550, 215 p.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Muessig, Siegfried, 1967, Geology of the Republic quadrangle and a part of the Aeneas quadrangle, Ferry County, Washington: U.S. Geological Survey Bulletin 1216, 135 p., 1 pl.

Patty, E. N., 1921, The metal mines of Washington: Washington Geological Survey Bulletin 23, 366 p.

Tschauder, R. J., 1989, Gold deposits in northern Ferry County, Washington. *In* Joseph, N. L. and others; editors, Geologic guidebook for Washington and adjacent areas: Washington Division of Geology and Earth Resources Information Circular 86, p. 241-253.

Umpleby, J. B., 1910, Geology and ore deposits of Republic mining district: Washington Geological Survey Bulletin 1, 65 p.

Lone Star and Washington (311)

ALTERNATE NAMES		DISTRICT	COUNTY
Lone Star			Ferry
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Curlew	1:24,000	Republic	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 59′ 47.36″ N	118° 36′ 9.55″ W	SW¼NE¼ sec. 2, 40N, 33E

LOCATION: adjacent to the international boundary

HOST ROCK: NAME	LITHOLOGY	AGE
unnamed metasedimentary and metavolcanic rocks	graywacke, argillite, chert, limestone	Permian - Triassic

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
Scatter Creek Rhyodacite alkalic? dike	Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Cu Au Ag	chalcopyrite chalcocite malachite gold	pyrite, pyrrhotite, quartz, dolomite, calcite, sericite, chlorite, epidote, clinozoisite, serpentine, talc

DEPOSIT TYPE	MINERALIZATION AGE
disseminated and stockwork	

PRODUCTION: Produced in 1897 (1,700 tons) and in 1910-1917 (36,000 tons) (Huntting, 1956, p. 54).

TECTONIC SETTING: Eocene felsic rocks intruded Permian-Triassic metasedimentary and metavolcanic rocks of the area (Parker and Calkins, 1964, geol. map).

ORE CONTROLS: Chalcopyrite is present as disseminations and in veinlets along foliation in schistose, serpentinized dacite in a zone 50 ft wide in the hanging wall of an diabase dike dipping 30-50 degrees to the east and southeast. Company records indicated nearly 250,000 tons of ore containing 1.94% Cu, 0.047 oz/ton Au, 0.204 oz/ton Ag remained in the ground (Huntting, 1956, p. 54).

GEOLOGIC SETTING: The Lone Star and Washington mine is covered by a thick overburden of glacial debris, and few outcrops of Permian-Triassic greenstone, graywacke, argillite, and limestone can be found in the area. The diabase dike in the mine may be similar to alkalic rocks exposed on Shasket Creek (Parker and Calkins, 1964, p. 87).

REFERENCES

Bancroft, Howland, 1914, The ore deposits of northeastern Washington: U.S. Geological Survey Bulletin 550, 215 p.

Hodges, L. K., 1897, Mining in the Pacific Northwest: Seattle Post Intelligencer, 116 p. [Facsimile reprinted 1967 in two volumes, Mining in eastern and central Washington, and, Mining in western Washington: Shorey Book Store, Seattle, Washington.]

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Parker, R. L.; Calkins, J. A., 1964, Geology of the Curlew quadrangle, Ferry County, Washington: U.S. Geological Survey Bulletin 1169, 95 p., 4 pl.

Longstreet (305)

ALTERNATE NAMES	DISTRICT	COUNTY
	Covada Meteor	Ferry

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Cedonia	1:24,000	Nespelem	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 14′ 16.56″ N	118° 11′ 59.36″ W	NE¼NE¼ sec 36, 32N, 36E

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
granite to granodiorite near Meteor	granite and granodiorite	Jurassic - Cretaceous

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
alaskite dike	Cretaceous

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Ag	stibnite	quartz, pyrite, kaolinite
Sb	argentite	
Pb	galena	
Zn	tetrahedrite	
Cu	sphalerite	
Au	chalcopyrite	

DEPOSIT TYPE	MINERALIZATION AGE
breccia zone	

PRODUCTION: Produced at least 120 tons of ore. A handpicked ore shipment ran 25% Sb. Three carloads shipped ran 53-57 oz/ton Ag and about 0.2 oz/ton Au (Huntting, 1956, p. 291).

TECTONIC SETTING: Jurassic to Cretaceous granitic to granodioritic rocks intrude metamorphosed Ordovician? rocks (Joseph, 1990, geol. map, p. 34).

ORE CONTROLS: The deposit is a mineralized zone of silicified granodiorite breccia, 8 to 30 ft wide, that occurs adjacent to an alaskite dike. The breccia is cemented by quartz and ore minerals. Mineralization in the breccia zone is as much as 150 ft wide (Huntting, 1956, p. 291). Mineralization is accompanied by strong alteration and occurs on both sides of the alaskite dike. On the west side of the dike, mineralization is principally antimony and on the east side principally gold and silver (Purdy, 1951, p. 68-71).

GEOLOGIC SETTING: The Longstreet mine is in Jurassic to Cretaceous granite to granodiorite of the Meteor area (Joseph, 1990, geol. map, p. 34).

REFERENCES

Campbell, A. B.; Raup, O. B., 1964, Preliminary geologic map of the Hunters quadrangle, Stevens and Ferry Counties, Washington: U.S. Geological Survey Mineral Investigations Field Studies Map MF-276, 1 sheet, scale 1:48,000.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Joseph, N. L., compiler, 1990, Geologic map of the Nespelem 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-16, 47 p., 1 pl.

Moen, W. S., 1976, Silver occurrences of Washington: Washington Division of Geology and Earth Resources Bulletin 69, 188 p.

Purdy, C. P., Jr., 1951, Antimony occurrences of Washington: Washington Division of Mines and Geology Bulletin 39, 186 p.

Messenger (356)

ALTERNATE NAMES		DISTRICT	COUNTY
Big Joker		Covada	Ferry
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Cedonia	1:24,000	Nespelem	Okanogan
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
48° 13′ 38.73″ N	118° 12′ 12.72″ W	SE¼ sec. 36, 32N, 36E	

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
granite to granodiorite near Meteor	granite and granodiorite	Jurassic - Cretaceous

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Pb Ag	galena	pyrite, quartz

DEPOSIT TYPE	MINERALIZATION AGE
vein	

PRODUCTION: Produced in 1934 (Huntting, 1956, p. 212).

TECTONIC SETTING: Jurassic to Cretaceous granitic to granodioritic rocks intrude metamorphosed Ordovician? rocks (Joseph, 1990, geol. map, p. 34).

ORE CONTROLS: The ore is in several mineralized quartz veins from 12 to 26 in. wide in granodiorite near its contact with other rock (Huntting, 1956, p. 212).

GEOLOGIC SETTING: The granodiorite at the Messenger mine is Jurassic to Cretaceous and intrudes Ordovician? rocks of the Covada Group (Joseph, 1990).

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Joseph, N. L., compiler, 1990, Geologic map of the Nespelem 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-16, 47 p., 1 pl.

Pardee, J. T., 1918, Geology and mineral deposits of the Colville Indian Reservation, Washington: U.S. Geological Survey Bulletin 677, 186 p., 1 pl.

Weaver, C. E., 1913, Geology and ore deposits of the Covada mining district: Washington Geological Survey Bulletin 16, 87 p.

Meteor (365)

ALTERNATE NAMES		DISTRICT	COUNTY
			Ferry
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Kewa	1:24,000	Nespelem	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 13′ 43.73″ N	118° 16′ 45.56″ W	north of center SW¼ sec. 33, 32N, 36E

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
Covada Group	wacke and quartzite	Ordovician?

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Ag	galena	pyrite, quartz
Pb	sphalerite	
Au	rhodochrosite	
Cu	chalcopyrite	
Zn	cerargyrite	
	pyrargyrite	
	asrenopyrite	
	argentite	
	tetrahedrite	
	native silver	

DEPOSIT TYPE	MINERALIZATION AGE
vein	

PRODUCTION: Produced 20 tons of ore with a total gross value of $1,000 by 1918 (Huntting, 1956, p. 292).

TECTONIC SETTING: Jurassic to Cretaceous intrusive rocks intrude Ordovician? sedimentary rocks of the area (Joseph, 1990, geol map).

ORE CONTROLS: The ore is in a 1 in.-1.5-ft-wide quartz vein in a shear zone in metamorphic rocks (Huntting, 1956, p. 292).

GEOLOGIC SETTING: The host rocks at the Meteor mine are of the Ordovician? Covada Group; they are metamorphosed wacke and quartz sandstone with slaty interbeds (Joseph, 1990, geol. map, p. 21).

REFERENCES

Bancroft, Howland, 1914, The ore deposits of northeastern Washington: U.S. Geological Survey Bulletin 550, 215 p.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Joseph, N. L., compiler, 1990, Geologic map of the Nespelem 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-16, 47 p., 1 pl.

Pardee, J. T., 1918, Geology and mineral deposits of the Colville Indian Reservation, Washington: U.S. Geological Survey Bulletin 677, 186 p., 1 pl.

Patty, E. N., 1921, The metal mines of Washington: Washington Geological Survey Bulletin 23, 366 p.

Weaver, C. E., 1913, Geology and ore deposits of the Covada mining district: Washington Geological Survey Bulletin 16, 87 p.

Minnehaha (312)

ALTERNATE NAMES		DISTRICT	COUNTY
		Danville	Ferry
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Boundary Mtn	1:24,000	Republic	Okanogan
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
48° 56′ 39.96″ N	118° 27′ 42.96″ W	SE corner sec. 23, 40N, 34E	

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
Permian metasedimentary rocks	phyllite and argillite	Permian

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Cu	chalcopyrite	

DEPOSIT TYPE — MINERALIZATION AGE

PRODUCTION: Produced in 1903 and in 1924 (Huntting, 1956, p. 54).

TECTONIC SETTING: Permian metasedimentary rocks adjacent to rocks of the Republic graben (Stoffel, 1990, geol. map, p. 21).

ORE CONTROLS: No deposit data are available. Chalcopyrite is an assumed ore mineral because of the copper production.

GEOLOGIC SETTING: The Minnehaha deposit is in Permian phyllite and argillite. Eocene intrusive rocks crop out nearby (Stoffel, 1990, geol. map, p. 31).

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Stoffel, K. L., compiler, 1990, Geologic map of the Republic 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-10, 62 p., 1 pl.

Morning Glory (327)

ALTERNATE NAMES		DISTRICT	COUNTY
Old Glory		Republic	Ferry
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Storm King Mountain	1:24,000	Republic	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 39′ 17.99″ N	118° 45′ 45.65″ W	S½SW¼ sec. 34, 37N, 32E

LOCATION: on Flag Hill

HOST ROCK: NAME	LITHOLOGY	AGE
Sanpoil Volcanics	dacite and andesite flows and flow breccias	Eocene

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
Scatter Creek Rhyodacite	Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au Ag	gold tellurides	quartz, calcite, pyrite; hydrothermal alteration is low-sulfur adularia-sericite type

DEPOSIT TYPE	MINERALIZATION AGE
vein hot springs	Eocene

PRODUCTION: Produced $100,000 worth of ore prior to 1936; produced in 1937-1939 (Huntting, 1956, p. 122).

TECTONIC SETTING: Epithermal deposits of the Republic district are found in the Eocene Sanpoil Volcanics. (See Republic district for additional details.)

ORE CONTROLS: Vein of drusy banded quartz in quartz latite porphyry ranges from a few inches to 2 or 3 ft wide. Several rich pay shoots have been mined (Huntting, 1956, p. 122). (See Republic district for additional details.)

GEOLOGIC SETTING: Host rocks for gold deposits of the Republic district are dacite and andesite flows, flow breccias, tuffs, and tuff breccias of the Eocene Sanpoil Volcanics (Muessig, 1967, p. 50-51; Tschauder, 1989, p. 242).

REFERENCES

Bancroft, Howland, 1914, The ore deposits of northeastern Washington: U.S. Geological Survey Bulletin 550, 215 p.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Muessig, Siegfried, 1967, Geology of the Republic quadrangle and a part of the Aeneas quadrangle, Ferry County, Washington: U.S. Geological Survey Bulletin 1216, 135 p., 1 pl.

Tschauder, R. J., 1989, Gold deposits in northern Ferry County, Washington. *In* Joseph, N. L. and others; editors, Geologic guidebook for Washington and adjacent areas: Washington Division of Geology and Earth Resources Information Circular 86, p. 241-253.

Umpleby, J. B., 1910, Geology and ore deposits of Republic mining district: Washington Geological Survey Bulletin 1, 65 p.

Morning Star (328)

ALTERNATE NAMES	DISTRICT	COUNTY
Lucile Dreyfus Faithful Surprise Mineral Hill Virginia		Ferry

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Curlew	1:24,000	Republic	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 57′ 39.42″ N	118° 30′ 52.99″ W	W½ SW¼ SE¼ sec. 16, 40N, 34E

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
unnamed metavolcanic rocks	greenstone	Permian - Triassic

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au Ag Cu W	gold scheelite chalcopyrite	pyrite, pyrrhotite, quartz, serpentine

DEPOSIT TYPE	MINERALIZATION AGE
vein	

PRODUCTION: Produced $15,000 by 1910, $27,000 in 1917, and about $15,000 in 1935; also produced in 1936-1939 and 790 tons in 1940-1943 (Huntting, 1956, p. 122).

TECTONIC SETTING: Permian-Triassic rocks are in contact with serpentine (Parker and Calkins, 1964, geol. map).

ORE CONTROLS: The quartz veins cutting serpentine are said to average 2 ft in width (Huntting, 1956, p. 122). Veins are found in and near the sheared contact between greenstone and serpentinite. Gold-pyrite-quartz veins are prevalent in the greenstones, and pyrite-chalcopyrite-quartz veins are commonly found at the contact between serpentine and greenstone (Parker and Calkins, 1964, p. 89).

GEOLOGIC SETTING: Permian-Triassic greenstone is in sheared contact with serpentinite (Parker and Calkins, 1964, geol. map, p. 88-89).

REFERENCES

Bancroft, Howland, 1914, The ore deposits of northeastern Washington: U.S. Geological Survey Bulletin 550, 215 p.

Culver, H. E.; Broughton, W. A., 1945, Tungsten resources of Washington: Washington Division of Geology Bulletin 34, 89 p., 23 pl.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Parker, R. L.; Calkins, J. A., 1964, Geology of the Curlew quadrangle, Ferry County, Washington: U.S. Geological Survey Bulletin 1169, 95 p., 4 pl.

Patty, E. N., 1921, The metal mines of Washington: Washington Geological Survey Bulletin 23, 366 p.

Mount Tolman (307)

ALTERNATE NAMES		DISTRICT	COUNTY
		Sanpoil Keller	Ferry
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Keller	1:24,000	Nespelem	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 3′ 24.74″ N	118° 41′ 31.53″ W	secs. 31 and 32, 30N, 33E; N½ sec. 5 and NE¼ sec. 6, 29N, 33E

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
Keller Butte pluton border phase	granodiorite and quartz diorite	Paleocene - Eocene Paleocene -
Keller Butte pluton interior zone	quartz monzonite and granite	Eocene Paleocene - Eocene
Keller Butte pluton interior zone	quartz porphyry	

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
hypabyssal complex (rhyolite, rhyodacite, andesite, and diorite) post-ore dikes	47-53 m.y.

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Mo	molybdenite	pyrite, arsenopyrite, rhodochrosite, calcite, stilbite, laumontite, gypsum, limonite, quartz, sericite, muscovite, kaolinite, chlorite, K-spar, fluorite, topaz, garnet, magnetite, epidote, anhydrite
Cu	chalcopyrite	
Ti	rutile	
Ag	chalcocite	
	copper	
	galena	
	sphalerite	
	wolframite	
	scheelite	
	malachite	
	chrysocolla	

DEPOSIT TYPE	MINERALIZATION AGE
porphyry system fractures veins	50-60 m.y.

PRODUCTION: There was an unknown amount of Pb, Cu, and Ag production from the Meadow Creek (Mount Tolman) mine in 1935 and 1936. The Golden Cord and the Ophir mines also produced, but no records are available.

TECTONIC SETTING: The Keller Butte pluton, which hosts the Mount Tolman deposit, is situated on the northwest projection of the N65-80W-trending Lewis and Clark structure (Osborn fault in Idaho). Foliation and mineral grains in the pluton trend N65-75W. Emplacement of the multi-phased pluton in this N65-80W trend resulted in the Cu-Mo deposit being elongate N68W.

ORE CONTROLS: The Mount Tolman deposit is 1 mi wide in a north-south direction, 2 mi long, and 1,200 ft thick. During crystallization of the last phase of the interior zone of the host quartz porphyry, a minimum of five periods of fracturing and concurrent mineralization took place. Each period affected the same rocks, and each episode of mineralization added to the distinctive vertical zonation: quartz with molybdenite predominate in the center, while chalcopyrite, pyrite, and sphalerite increase away from the core. Post-stockwork veins surrounding the Mount Tolman deposit cut the molybdenite-bearing fractures. These veins contain galena, sphalerite, and chalcopyrite. Drilling, underground exploration, and bulk sampling have outlined proven and probable reserves of 2.4 billion tons of ore with an average grade of 0.093% MoS_2 and 0.09% Cu; the cutoff grade used was 0.048% MoS_2. Metallurgical testing resulted in recoveries of 85% of the molybdenite and 80% of the chalcopyrite. The deposit represents a recoverable reserve of 1.9 million tons of MoS_2 and 1.73 million tons of copper. A mine plan designed by AMAX would have recovered 727,260 tons of MoS_2 and 662,400 tons of copper. The AMAX plan was based on mining approximately 900 million tons of ore averaging 0.10% MoS_2 and 0.09% Cu and a waste to ore ratio of 0.83:1. This ranks the Mount Tolman deposit as the third or fourth largest molybdenum deposits in the world after Climax and Quartz Hill. Whole-rock analyses indicate the Mount Tolman rocks contain 0.3-0.5% TiO_2, and if recoverable, the deposit could produce titanium.

GEOLOGIC SETTING: The Mount Tolman deposit is in the Paleocene-Eocene Keller Butte pluton. Post-ore faults displaced the deposit and resulted in ore dilution. These faults strike N65W, N20E, N45E, and N35E. Post-ore dikes strike N60-75E and have steep northwest to vertical dips. Post-ore faulting and dike activity is probably related to development of the Republic graben.

COMMENTS: The Mount Tolman deposit is owned (1990) by the Colville Confederated Tribes. Prior to tribal acquisition of the land, numerous mines were developed in search of silver ore. Mine adits were driven by: Consolidated Mines and Smelting Co., Ltd. (adits include the Iconoclast, Golden Cord, Advance, Silver Ridge, California, Umatilla, Walla Walla, Jumper, Handspike, and Dewey); the Meadow Creek mine (adits include the Blue Bird, Abe Lincoln, King Richard, Blevins, and Sanpoil); the Rover-Bonanza group (adits include the Golden Rule, Golden Chariot, and North Star); and also the adits Bobbie Jay, Josie, Ophir, Byrne, Addie B, Humboldt, Pole Pick, and adits by Illinois Copper and Silver Mining and Milling Co. Bear Creek Mining Co. leased the property from the Colville Business Council in July of 1964. From 1964 to 1976 Bear Creek completed 45,000 ft of drilling and drove a 650-ft adit at elev. 3,000 ft. AMAX Exploration, Inc. signed an agreement in 1978 and undertook a major 2-year development program. They completed 386,827 ft of drilling, three adits totaling 2,160 ft, and metallurgical testing. Drilling costs alone from August 18, 1978, to December 1980 were $10,167,739. AMAX terminated its lease in 1982.

UNPUBLISHED INFORMATION: Utterback, W.C., 1983, Geology of the Mount Tolman molybdenum deposit. This private report is in DGER files.

REFERENCES

Colville Confederated Tribes Geology Department, 1984, Revised geology and mineral potential of the Colville Indian Reservation, Washington, 1984: Colville Confederated Tribes [Nespelem, Wash.], 2 v.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Pardee, J. T., 1918, Geology and mineral deposits of the Colville Indian Reservation, Washington: U.S. Geological Survey Bulletin 677, 186 p., 1 pl.

Mountain Lion (329)

ALTERNATE NAMES		DISTRICT	COUNTY
		Republic	Ferry
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Storm King Mountain	1:24,000	Republic	Okanogan
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
48° 40′ 47.16″ N	118° 46′ 2.49″ W	W½NW¼NW¼ sec. 27, 37N, 32E	

LOCATION: on the east side of the North Fork Granite Creek

HOST ROCK: NAME	LITHOLOGY	AGE
Sanpoil Volcanics	dacite and andesite flows and flow breccias	Eocene

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
Scatter Creek Rhyodacite	Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au Ag	gold	pyrite, quartz; hydrothermal alteration is low-sulfur adularia-sericite type

DEPOSIT TYPE	MINERALIZATION AGE
vein hot springs	Eocene

PRODUCTION: Produced ore worth $200,000 prior to 1910; produced in 1936-1938. Production after 1938 is included with production for the Knob Hill mine (Huntting, 1956, p. 122).

TECTONIC SETTING: Epithermal deposits of the Republic district are found in the Eocene Sanpoil Volcanics. (See Republic district for additional details.)

ORE CONTROLS: Mineralization is in three parallel veins of banded quartz in andesite flow breccia. The productive vein is 10-12 ft wide (Huntting, 1956, p. 122). (See Republic district for additional details.)

GEOLOGIC SETTING: Host rocks for gold deposits of the Republic district are dacite and andesite flows, flow breccias, tuffs, and tuff breccias of the Eocene Sanpoil Volcanics (Muessig, 1967, p. 50-51; Tschauder, 1989, p. 242).

REFERENCES

Bancroft, Howland, 1914, The ore deposits of northeastern Washington: U.S. Geological Survey Bulletin 550, 215 p.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Muessig, Siegfried, 1967, Geology of the Republic quadrangle and a part of the Aeneas quadrangle, Ferry County, Washington: U.S. Geological Survey Bulletin 1216, 135 p., 1 pl.

Purdy, C. P., Jr., 1952, Directory of Washington mining operations, 1952: Washington Division of Mines and Geology Information Circular 20, 75 p.

Tschauder, R. J., 1989, Gold deposits in northern Ferry County, Washington. *In* Joseph, N. L. and others; editors, Geologic guidebook for Washington and adjacent areas: Washington Division of Geology and Earth Resources Information Circular 86, p. 241-253.

Umpleby, J. B., 1910, Geology and ore deposits of Republic mining district: Washington Geological Survey Bulletin 1, 65 p.

North San Poil Fraction (330)

ALTERNATE NAMES		DISTRICT	COUNTY
		Republic	Ferry

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Storm King Mountain	1:24,000	Republic	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 40′ .10″ N	118° 45′ 31.38″ W	near west line NW¼NE¼ sec. 34, 37N, 32E

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
Sanpoil Volcanics	dacite and andesite flows and flow breccias	Eocene

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
Scatter Creek Rhyodacite	Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au Ag	gold	quartz; hydrothermal alteration is low-sulfur adularia-sericite type

DEPOSIT TYPE	MINERALIZATION AGE
vein hot springs	Eocene

PRODUCTION: Produced in 1911 (Huntting, 1956, p. 123).

TECTONIC SETTING: Epithermal deposits of the Republic district are found in the Eocene Sanpoil Volcanics. (See Republic district for additional details.)

ORE CONTROLS: This deposit is similar to other deposits of the Republic district. (See Republic district for additional details.)

GEOLOGIC SETTING: Host rocks for gold deposits of the Republic district are dacite and andesite flows, flow breccias, tuffs, and tuff breccias of the Eocene Sanpoil Volcanics (Muessig, 1967, p. 50-51; Tschauder, 1989, p. 242).

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Muessig, Siegfried, 1967, Geology of the Republic quadrangle and a part of the Aeneas quadrangle, Ferry County, Washington: U.S. Geological Survey Bulletin 1216, 135 p., 1 pl.

Tschauder, R. J., 1989, Gold deposits in northern Ferry County, Washington. *In* Joseph, N. L. and others; editors, Geologic guidebook for Washington and adjacent areas: Washington Division of Geology and Earth Resources Information Circular 86, p. 241-253.

Old Hickory (331)

ALTERNATE NAMES		DISTRICT	COUNTY
		Republic	Ferry

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Republic	1:24,000	Republic	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 38′ 20.83″ N	118° 44′ 33.79″ W	N½ NE¼ sec. 12, 36N, 32E

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
Sanpoil Volcanics	dacite and andesite flows and flow breccias	Eocene

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
Scatter Creek Rhyodacite	Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au	gold	quartz; hydrothermal alteration is low-sulfur adularia-sericite type

DEPOSIT TYPE	MINERALIZATION AGE
vein hot springs	Eocene

PRODUCTION: Produced in 1918 and 1931 (Huntting, 1956, p. 123).

TECTONIC SETTING: Epithermal deposits of the Republic district are found in the Eocene Sanpoil Volcanics. (See Republic district for additional details.)

ORE CONTROLS: This deposit is similar to other deposits of the Republic district. (See Republic district for additional details.)

GEOLOGIC SETTING: Host rocks for gold deposits of the Republic district are dacite and andesite flows, flow breccias, tuffs and tuff breccias of the Eocene Sanpoil Volcanics (Muessig, 1967, p. 50-51; Tschauder, 1989, p. 242).

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Muessig, Siegfried, 1967, Geology of the Republic quadrangle and a part of the Aeneas quadrangle, Ferry County, Washington: U.S. Geological Survey Bulletin 1216, 135 p., 1 pl.

Tschauder, R. J., 1989, Gold deposits in northern Ferry County, Washington. *In* Joseph, N. L. and others; editors, Geologic guidebook for Washington and adjacent areas: Washington Division of Geology and Earth Resources Information Circular 86, p. 241-253.

Overlook (355)

ALTERNATE NAMES		DISTRICT	COUNTY
		Belcher	Ferry

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Cooke Mountain	1:24,000	Republic	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 41′ 56.32″ N	118° 34′ 8.00″ W	NW¼ sec. 18, 37N, 34E

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
unnamed metasedimentary and metavolcanic rocks	graywacke, argillite, chert, limestone	Permian - Triassic

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
Scatter Creek Rhyodacite	Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au	pyrite	chlorite, sericite
Ag	pyrrhotite	
Cu	magnetite	
Fe	chalcopyrite	

DEPOSIT TYPE	MINERALIZATION AGE
manto-like massive replacement stockwork and disseminated	

PRODUCTION: The first gold-silver dore was poured (1990) from the jointly operated Overlook and Kettle mines. Anticipated production for the first year is 110,000 oz; the majority will be from the Overlook deposit (Joseph, 1990. p. 20).

TECTONIC SETTING: Eocene felsic rocks intruded Permian-Triassic metasedimentary and metavolcanic rocks of the Republic graben (Muessig, 1967, geol. map).

ORE CONTROLS: Gold and silver mineralization at the Overlook deposit occurs in manto-like replacement bodies of magnetite, pyrite, and pyrrhotite in limestone and as disseminated and stockwork bodies overlying the massive, iron-rich horizon in the limestone. Currently (1990), this deposit is being mined for its gold-silver mineralization (Tschauder, 1989, p. 245).

GEOLOGIC SETTING: The Overlook deposit is in Permian-Triassic limestone, dolomitic limestone, argillite, and graywacke. The ore bodies lie next to a network of dikes, sills, and intrusive bodies of the Scatter Creek Rhyodacite (Muessig, 1967, p. 113).

REFERENCES

Bancroft, Howland, 1914, The ore deposits of northeastern Washington: U.S. Geological Survey Bulletin 550, 215 p.

Glover, S. L., 1942, Washington iron ores, a summary report: Washington Division of Mines and Mining Report of Investigations 2, 23 p.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Joseph, N. L., 1990, Mineral industry news notes: Washington Geologic Newsletter, v. 18, no. 2, p. 19-20.

Muessig, Siegfried, 1967, Geology of the Republic quadrangle and a part of the Aeneas quadrangle, Ferry County, Washington: U.S. Geological Survey Bulletin 1216, 135 p., 1 pl.

Shedd, Solon; Jenkins, O. P.; Cooper, H. H., 1922, Iron ores, fuels, and fluxes of Washington: Washington Division of Geology Bulletin 27, 160 p., 1 pl.

Tschauder, R. J., 1989, Gold deposits in northern Ferry County, Washington. *In* Joseph, N. L. and others; editors, Geologic guidebook for Washington and adjacent areas: Washington Division of Geology and Earth Resources Information Circular 86, p. 241-253.

Oversight (354)

ALTERNATE NAMES		DISTRICT	COUNTY
		Belcher	Ferry
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Cooke Mountain	1:24,000	Republic	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 42′ 27.80″ N	118° 33′ 13.87″ W	near center E½ sec. 18, 37N, 34E

LOCATION: on the southeast side of Cooke Mountain

HOST ROCK: NAME	LITHOLOGY	AGE
unnamed metasedimentary and metavolcanic rocks	graywacke, argillite, chert, limestone	Permian - Triassic

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
Scatter Creek Rhyodacite	Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Fe	pyrite	
Cu	pyrrhotite	
Au	magnetite	
	chalcopyrite	

DEPOSIT TYPE	MINERALIZATION AGE
manto-like massive replacement	

PRODUCTION: Produced in 1934 (Huntting, 1956, p. 195).

TECTONIC SETTING: Eocene felsic rocks intruded Permian-Triassic metasedimentary and metavolcanic rocks of the Republic graben (Muessig, 1967, geol. map).

ORE CONTROLS: Ore minerals occur in a lenticular body replacing limestone. Some ore is nearly pure magnetite (Huntting, 1956, p. 195).

GEOLOGIC SETTING: A massive replacement lens in Permian-Triassic limestone (Muessig, 1967, geol. map).

REFERENCES

Bancroft, Howland, 1914, The ore deposits of northeastern Washington: U.S. Geological Survey Bulletin 550, 215 p.

Glover, S. L., 1942, Washington iron ores, a summary report: Washington Division of Mines and Mining Report of Investigations 2, 23 p.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Muessig, Siegfried, 1967, Geology of the Republic quadrangle and a part of the Aeneas quadrangle, Ferry County, Washington: U.S. Geological Survey Bulletin 1216, 135 p., 1 pl.

Shedd, Solon; Jenkins, O. P.; Cooper, H. H., 1922, Iron ores, fuels, and fluxes of Washington: Washington Division of Geology Bulletin 27, 160 p., 1 pl.

Pearl (332)

ALTERNATE NAMES		DISTRICT	COUNTY
		Republic	Ferry
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Storm King Mountain	1:24,000	Republic	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 39′ 53.89″ N	118° 45′ 9.97″ W	near center NE¼ sec. 34, 37N, 32E

LOCATION: adjoining the Surprise claim on the north

HOST ROCK: NAME	LITHOLOGY	AGE
Sanpoil Volcanics	dacite and andesite flows and flow breccias	Eocene

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
Scatter Creek Rhyodacite	Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au Ag	gold	quartz; hydrothermal alteration is low-sulfur adularia-sericite type

DEPOSIT TYPE	MINERALIZATION AGE
vein hot springs	Eocene

PRODUCTION: Produced from 1909 to 1922 (Huntting, 1956, p. 123).

TECTONIC SETTING: Epithermal deposits of the Republic district are found in the Eocene Sanpoil Volcanics. (See Republic district for additional details.)

ORE CONTROLS: A 12-ft-wide vein (Surprise) continues through the entire length of the claim (1,500 ft). Wall rock is propylitic quartz latite porphyry (Huntting, 1956, p. 123). (See Republic district for additional details.)

GEOLOGIC SETTING: Host rocks for gold deposits of the Republic district are dacite and andesite flows, flow breccias, tuffs and tuff breccias of the Eocene Sanpoil Volcanics (Muessig, 1967, p. 50-51; Tschauder, 1989, p. 242).

REFERENCES

Bancroft, Howland, 1914, The ore deposits of northeastern Washington: U.S. Geological Survey Bulletin 550, 215 p.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Muessig, Siegfried, 1967, Geology of the Republic quadrangle and a part of the Aeneas quadrangle, Ferry County, Washington: U.S. Geological Survey Bulletin 1216, 135 p., 1 pl.

Patty, E. N., 1921, The metal mines of Washington: Washington Geological Survey Bulletin 23, 366 p.

Tschauder, R. J., 1989, Gold deposits in northern Ferry County, Washington. *In* Joseph, N. L. and others; editors, Geologic guidebook for Washington and adjacent areas: Washington Division of Geology and Earth Resources Information Circular 86, p. 241-253.

Plum Bar placer (347)

ALTERNATE NAMES		DISTRICT	COUNTY
			Ferry
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Mica Mountain	1:24,000	Coulee Dam	Ritzville

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
47° 55′ 46.71″ N	118° 48′ 57.81″ W	lots 7 and 8, sec. 17, 28N, 32E

LOCATION: about 6 mi up the Columbia River from Grand Coulee Dam, on the north side of the river

HOST ROCK: NAME	LITHOLOGY	AGE
Quaternary alluvium	sand and gravel	Quaternary

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au	gold	sand and gravel

DEPOSIT TYPE	MINERALIZATION AGE
placer	Quaternary

PRODUCTION: J. H. Collins washed 700-800 yd^3/day in 1934. Also produced in 1938-1939 (Huntting, 1956, p. 184).

TECTONIC SETTING: Deposition of heavy minerals in river gravels.

ORE CONTROLS: Heavy-mineral concentration by stream action.

REFERENCE

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Princess Maude (333)

ALTERNATE NAMES		DISTRICT	COUNTY
Southern Republic		Republic	Ferry
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Republic	1:24,000	Republic	Okanogan
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
48° 38′ 4.50″ N	118° 44′ 51.08″ W	near center sec. 12, 36N, 32E, near the base of the east slope of Copper Mountain	

LOCATION: near center sec. 12, 36N, 32E, near the base of the east slope of Copper Mountain

HOST ROCK: NAME	LITHOLOGY	AGE
Sanpoil Volcanics	dacite and andesite flows and flow breccias	Eocene
ASSOCIATED IGNEOUS ROCK: DESCRIPTION		AGE
Scatter Creek Rhyodacite		Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au Ag	gold	quartz, calcite, laumontite, pyrite; hydrothermal alteration is low-sulfur adularia-sericite type

DEPOSIT TYPE	MINERALIZATION AGE
vein hot springs	Eocene

PRODUCTION: The mine has produced (Huntting, 1956, p. 123).

TECTONIC SETTING: Epithermal deposits of the Republic district are found in the Eocene Sanpoil Volcanics. (See Republic district for additional details.)

ORE CONTROLS: Mineralization is in a 2-4-ft wide vein in propylitic andesite. The vein consists of vitreous white quartz that shows lines of crustification parallel to the walls (Huntting, 1956, p. 123). (See Republic district for additional details.)

GEOLOGIC SETTING: Host rocks for gold deposits of the Republic district are dacite and andesite flows, flow breccias, tuffs, and tuff breccias of the Eocene Sanpoil Volcanics (Muessig, 1967, p. 50-51; Tschauder, 1989, p. 242).

REFERENCES

Bancroft, Howland, 1914, The ore deposits of northeastern Washington: U.S. Geological Survey Bulletin 550, 215 p.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Muessig, Siegfried, 1967, Geology of the Republic quadrangle and a part of the Aeneas quadrangle, Ferry County, Washington: U.S. Geological Survey Bulletin 1216, 135 p., 1 pl.

Tschauder, R. J., 1989, Gold deposits in northern Ferry County, Washington. *In* Joseph, N. L. and others; editors, Geologic guidebook for Washington and adjacent areas: Washington Division of Geology and Earth Resources Information Circular 86, p. 241-253.

Umpleby, J. B., 1910, Geology and ore deposits of Republic mining district: Washington Geological Survey Bulletin 1, 65 p.

Quilp (334)

ALTERNATE NAMES	DISTRICT	COUNTY
Imperator Eureka	Republic	Ferry

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Republic	1:24,000	Republic	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 39′ 32.76″ N	118° 44′ 41.07″ W	NW¼SW¼ sec. 35, 37N, 32E

LOCATION: on the east side of Eureka Gulch

HOST ROCK: NAME	LITHOLOGY	AGE
Sanpoil Volcanics	dacite and andesite flows and flow breccias	Eocene

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
Scatter Creek Rhyodacite	Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au Ag	gold chalcopyrite silver	quartz, pyrite; hydrothermal alteration is low-sulfur adularia-sericite type

DEPOSIT TYPE	MINERALIZATION AGE
vein hot springs	Eocene

PRODUCTION: Total production of $720,938.70 worth of ore to the end of 1920; produced in 1936, 1937 (22,402 tons), 1938 (9,828 tons), and in 1939-1940 (Huntting, 1956, p. 123).

TECTONIC SETTING: Epithermal deposits of the Republic district are found in the Eocene Sanpoil Volcanics. (See Republic district for additional details.)

ORE CONTROLS: The vein of chalcedonic banded quartz is 7-8 ft wide and cuts propylitic andesite (Huntting, 1956, p. 123). (See Republic district for additional details.)

GEOLOGIC SETTING: Host rocks for gold deposits of the Republic district are dacite and andesite flows, flow breccias, tuffs and tuff breccias of the Eocene Sanpoil Volcanics (Muessig, 1967, p. 50-51; Tschauder, 1989, p. 242).

REFERENCES

Bancroft, Howland, 1914, The ore deposits of northeastern Washington: U.S. Geological Survey Bulletin 550, 215 p.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Muessig, Siegfried, 1967, Geology of the Republic quadrangle and a part of the Aeneas quadrangle, Ferry County, Washington: U.S. Geological Survey Bulletin 1216, 135 p., 1 pl.

Patty, E. N., 1921, The metal mines of Washington: Washington Geological Survey Bulletin 23, 366 p.

Tschauder, R. J., 1989, Gold deposits in northern Ferry County, Washington. *In* Joseph, N. L. and others; editors, Geologic guidebook for Washington and adjacent areas: Washington Division of Geology and Earth Resources Information Circular 86, p. 241-253.

Umpleby, J. B., 1910, Geology and ore deposits of Republic mining district: Washington Geological Survey Bulletin 1, 65 p.

Republic (335)

ALTERNATE NAMES		DISTRICT	COUNTY
Blaine Republic		Republic	Ferry
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Republic	1:24,000	Republic	Okanogan
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
48° 38′ 14.52″ N	118° 44′ 43.40″ W	W½NE¼ sec. 12, 36N, 32E	

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
Sanpoil Volcanics	dacite and andesite flows and flow breccias	Eocene
ASSOCIATED IGNEOUS ROCK: DESCRIPTION		AGE
Scatter Creek Rhyodacite		Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au Ag Se	gold	quartz, calcite, pyrite; hydrothermal alteration is low-sulfur adularia-sericite type

DEPOSIT TYPE	MINERALIZATION AGE
vein hot springs	Eocene

PRODUCTION: Estimated production of $1,400,000 prior to 1910; shipped 2,757 tons of ore to a smelter in 1937; shipped in 1933-1946 (Huntting, 1956, p. 124).

TECTONIC SETTING: Epithermal deposits of the Republic district are found in the Eocene Sanpoil Volcanics. (See Republic district for additional details.)

ORE CONTROLS: The vein is as much as 10 ft wide, but averages about 3 ft. The vein is composed principally of chalcedonic quartz and is concentrically crustified. Crustifications are marked by dark, crenulated bands (Huntting, 1956, p. 124). (See Republic district for additional details.)

GEOLOGIC SETTING: Host rocks for gold deposits of the Republic district are dacite and andesite flows, flow breccias, tuffs and tuff breccias of the Eocene Sanpoil Volcanics (Muessig, 1967, p. 50-51; Tschauder, 1989, p. 242).

REFERENCES

Bancroft, Howland, 1914, The ore deposits of northeastern Washington: U.S. Geological Survey Bulletin 550, 215 p.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Jonte, J. H., 1942, The relationship of selenium and gold in ores from the Republic district: State College of Washington Master of Science thesis, 33 p.

Muessig, Siegfried, 1967, Geology of the Republic quadrangle and a part of the Aeneas quadrangle, Ferry County, Washington: U.S. Geological Survey Bulletin 1216, 135 p., 1 pl.

Tschauder, R. J., 1989, Gold deposits in northern Ferry County, Washington. *In* Joseph, N. L. and others; editors, Geologic guidebook for Washington and adjacent areas: Washington Division of Geology and Earth Resources Information Circular 86, p. 241-253.

Umpleby, J. B., 1910, Geology and ore deposits of Republic mining district: Washington Geological Survey Bulletin 1, 65 p.

Rogers Bar placer (348)

ALTERNATE NAMES		DISTRICT	COUNTY
			Ferry
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Hunters	1:24,000	Nespelem	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 5′ 19.79″ N	118° 14′ 11.92″ W	sec. 23, 30N, 36E

LOCATION: on the west bank of the Columbia River, 2 mi downstream of the town of Hunters

HOST ROCK: NAME	LITHOLOGY	AGE
Quaternary alluvium	sand and gravel	Quaternary

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au Pt	gold	sand and gravel

DEPOSIT TYPE	MINERALIZATION AGE
placer	Quaternary

PRODUCTION: Four operators were working and apparently producing in 1934 (Huntting, 1956, p. 184).

TECTONIC SETTING: Deposition of heavy minerals in river gravels.

ORE CONTROLS: Heavy-mineral concentration by stream action. Deposits consist of three bars, 30, 75, and 100 ft above the river. Property includes 1,500 acres of land. The best pay gravel is found in bars exposed only at low water (Huntting, 1956, p. 184).

REFERENCES

Collier, A. J., 1907, Gold-bearing river sands of northeastern Washington. *In* Contributions to economic geology 1906; Part I—Metals and nonmetals, except fuels: U.S. Geological Survey Bulletin 315, p. 56-70.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

San Poil (336)

ALTERNATE NAMES		DISTRICT	COUNTY
		Republic	Ferry
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Storm King Mountain	1:24,000	Republic	Okanogan
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
48° 39′ 53.32″ N	118° 45′ 20.63″ W	W½NE¼ sec. 34, 37N, 32E	

LOCATION: on the west side of Eureka Gulch

HOST ROCK: NAME	LITHOLOGY	AGE
Sanpoil Volcanics	dacite and andesite flows and flow breccias	Eocene

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
Scatter Creek Rhyodacite	Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au Ag	gold	quartz, calcite; hydrothermal alteration is low-sulfur adularia-sericite type

DEPOSIT TYPE	MINERALIZATION AGE
vein hot springs	Eocene

PRODUCTION: Produced in 1909-1921, 1931, and 1935; 200 tons of ore were produced prior to 1902 (Huntting, 1956, p. 124).

TECTONIC SETTING: Epithermal deposits of the Republic district are found in the Eocene Sanpoil Volcanics. (See Republic district for additional details.)

ORE CONTROLS: Latite porphyry is cut by a quartz-calcite vein thought to be the southward extension of the Ben Hur vein. The vein is cut by several faults. Ore occurs in lenses as much as 8 ft thick (Huntting, 1956, p. 124). (See Republic district for additional details.)

GEOLOGIC SETTING: Host rocks for gold deposits of the Republic district are dacite and andesite flows, flow breccias, tuffs and tuff breccias of the Eocene Sanpoil Volcanics (Muessig, 1967, p. 50-51; Tschauder, 1989, p. 242).

REFERENCES

Bancroft, Howland, 1914, The ore deposits of northeastern Washington: U.S. Geological Survey Bulletin 550, 215 p.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Muessig, Siegfried, 1967, Geology of the Republic quadrangle and a part of the Aeneas quadrangle, Ferry County, Washington: U.S. Geological Survey Bulletin 1216, 135 p., 1 pl.

Patty, E. N., 1921, The metal mines of Washington: Washington Geological Survey Bulletin 23, 366 p.

Tschauder, R. J., 1989, Gold deposits in northern Ferry County, Washington. *In* Joseph, N. L. and others; editors, Geologic guidebook for Washington and adjacent areas: Washington Division of Geology and Earth Resources Information Circular 86, p. 241-253.

Umpleby, J. B., 1910, Geology and ore deposits of Republic mining district: Washington Geological Survey Bulletin 1, 65 p.

Seattle (337)

ALTERNATE NAMES		DISTRICT	COUNTY
		Republic	Ferry
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Storm King Mountain	1:24,000	Republic	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 39′ 53.64″ N	118° 45′ 58.26″ W	W½ NW¼ sec. 34, 37N, 32E

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
Sanpoil Volcanics	dacite and andesite flows and flow breccias	Eocene

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
Scatter Creek Rhyodacite	Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au Ag	gold	quartz; hydrothermal alteration is low-sulfur adularia-sericite type

DEPOSIT TYPE	MINERALIZATION AGE
vein hot springs	Eocene

PRODUCTION: Produced in 1938 and in 1939 (Huntting, 1956, p. 124).

TECTONIC SETTING: Epithermal deposits of the Republic district are found in the Eocene Sanpoil Volcanics. (See Republic district for additional details.)

ORE CONTROLS: The deposit is similar to other deposits of the Republic district. (See Republic district for additional details.)

GEOLOGIC SETTING: Host rocks for gold deposits of the Republic district are dacite and andesite flows, flow breccias, tuffs, and tuff breccias of the Eocene Sanpoil Volcanics (Muessig, 1967, p. 50-51; Tschauder, 1989, p. 242).

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Muessig, Siegfried, 1967, Geology of the Republic quadrangle and a part of the Aeneas quadrangle, Ferry County, Washington: U.S. Geological Survey Bulletin 1216, 135 p., 1 pl.

Tschauder, R. J., 1989, Gold deposits in northern Ferry County, Washington. *In* Joseph, N. L. and others; editors, Geologic guidebook for Washington and adjacent areas: Washington Division of Geology and Earth Resources Information Circular 86, p. 241-253.

Shamrock (358)

ALTERNATE NAMES		DISTRICT	COUNTY
Iron Creek			Ferry
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Louie Creek	1:24,000	Nespelem	Okanogan
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
48° 8′ 46.21″ N	118° 37′ 34.18″ W	sec. 2, 30N, 33E, and secs. 26, 27, 34, and 35, 31N, 33E	

LOCATION: 12.5 mi northeast of Keller

HOST ROCK: NAME	LITHOLOGY	AGE
Covada Group	limestone, dolomite, impure marble	Ordovician?
ASSOCIATED IGNEOUS ROCK: DESCRIPTION		AGE
granodiorite		Paleocene - Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Ag	galena	limestone
Au	malachite	
Pb	cerussite	
Zn	lead oxide	
Cu		
Ni		

DEPOSIT TYPE: shear zone

MINERALIZATION AGE:

PRODUCTION: Produced in 1914 (50 tons), in 1922 (3,500 oz Ag), and in 1926 (Huntting, 1956, p. 277). Total silver production around 7,000 oz (Moen, 1976, p. 102).

TECTONIC SETTING: Paleocene to Eocene granitic rocks intrude metamorphosed Ordovician? rocks (Joseph, 1990, geol. map, p. 12).

ORE CONTROLS: Mineralization is in silicified limestone block surrounded by granodiorite. Silver-lead ore (vein) is 8 in.-8 ft wide and 700 ft long. Nickel occurs in a mineralized zone 100 ft wide in which there is a high-grade ore zone 55 ft wide (Huntting, 1956, p. 277).

GEOLOGIC SETTING: Granodiorite (the Paleocene to Eocene granodiorite of Manila Creek) intrudes carbonate rocks of the Ordovician? Covada Group at the Shamrock mine (Huntting, 1956, p. 277; Joseph, 1990, geol. map, p. 21).

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Joseph, N. L., compiler, 1990, Geologic map of the Nespelem 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-16, 47 p., 1 pl.

Moen, W. S., 1976, Silver occurrences of Washington: Washington Division of Geology and Earth Resources Bulletin 69, 188 p.

Pardee, J. T., 1918, Geology and mineral deposits of the Colville Indian Reservation, Washington: U.S. Geological Survey Bulletin 677, 186 p., 1 pl.

Patty, E. N., 1921, The metal mines of Washington: Washington Geological Survey Bulletin 23, 366 p.

Silver Bell (357)

ALTERNATE NAMES		DISTRICT	COUNTY
		Covada	Ferry
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Cedonia	1:24,000	Nespelem	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 14′ 14.77″ N	118° 10′ 45.47″ W	near NE corner sec. 31, 32N, 37E

LOCATION: near the end of a southeast spur of Rattlesnake Mountain

HOST ROCK: NAME	LITHOLOGY	AGE
Covada Group	argillite and wacke	Ordovician??

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
granite and granodiorite near Meteor	Jurassic - Cretaceous

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Pb Zn Au Ag Cu	galena sphalerite	pyrite, hornstone

DEPOSIT TYPE	MINERALIZATION AGE
vein	

PRODUCTION: Produced 29 tons in 1940 and 84 tons in 1941 (Huntting, 1956, p. 214).

TECTONIC SETTING: Jurassic to Cretaceous granitic to granodioritic rocks intrude metamorphosed Ordovician? rocks (Joseph, 1990, geol. map, p. 34).

ORE CONTROLS: The vein is in hornstone that weathers rusty and is irregularly mineralized. An exposed vein width of at least 1 ft contained a "fair proportion" of galena (Huntting, 1956, p. 214).

GEOLOGIC SETTING: The Silver Bell mine is in hornstone which probably is contact metamorphosed Covada Group (Ordovician?) argillite adjacent to Jurassic to Cretaceous granite to granodiorite of Meteor (Joseph, 1990, geol. map).

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Joseph, N. L., 1990, Mineral industry news notes: Washington Geologic Newsletter, v. 18, no. 2, p. 19-20.

Pardee, J. T., 1918, Geology and mineral deposits of the Colville Indian Reservation, Washington: U.S. Geological Survey Bulletin 677, 186 p., 1 pl.

Silver Leaf (306)

ALTERNATE NAMES		DISTRICT	COUNTY
		Covada Meteor	Ferry
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Cedonia	1:24,000	Nespelem	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 14′ 17.87″ N	118° 11′ 17.29″ W	center of north line, sec. 31, 32N, 37E

LOCATION: on the south slope of Rattlesnake Mountain

HOST ROCK: NAME	LITHOLOGY	AGE
Covada Group	wacke and quartzite	Ordovician?

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
granite and granodiorite near Meteor	Jurassic - Cretaceous

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Ag	tetrahedrite	quartz, pyrite
Pb	chalcopyrite	
Zn	sphalerite	
W	galena	
Sb	stibnite	
	scheelite	
	silver	
	pyrargyrite	
	wolframite	

DEPOSIT TYPE	MINERALIZATION AGE
vein	

PRODUCTION: Produced in 1911, 1912, 1915, 1916, and 1935. Produced a small amount of tungsten in 1915 (Huntting, 1956, p. 294). According to Moen (1976, p. 98), the mine probably produced about 2,000 oz of Ag from a small total tonnage.

TECTONIC SETTING: Jurassic to Cretaceous granitic to granodioritic rocks intrude metamorphosed Ordovician? rocks (Joseph, 1990, geol. map, p. 34).

ORE CONTROLS: Mineralization is in quartz lenses in a 50-ft-wide shear zone in limestone, schist, and argillite (Moen, 1976, p. 98).

GEOLOGIC SETTING: The Silver Leaf deposit is in limestone, schist, and argillite of the Ordovician? Covada Group (Joseph, 1990, geol. map; Moen, 1976, p. 98).

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Joseph, N. L., compiler, 1990, Geologic map of the Nespelem 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-16, 47 p., 1 pl.

Moen, W. S., 1976, Silver occurrences of Washington: Washington Division of Geology and Earth Resources Bulletin 69, 188 p.

Purdy, C. P., Jr., 1951, Antimony occurrences of Washington: Washington Division of Mines and Geology Bulletin 39, 186 p.

Singer placer (349)

ALTERNATE NAMES		DISTRICT	COUNTY
		Danville	Ferry
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Curlew	1:24,000	Republic	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 59′ 45.96″ N	118° 31′ 50.75″ W	secs. 4 and 5, 40N, 34E

LOCATION: on Fourth of July Creek

HOST ROCK: NAME	LITHOLOGY	AGE
Quaternary alluvium	sand and gravel	Quaternary

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au	gold	sand and gravel

DEPOSIT TYPE	MINERALIZATION AGE
placer	Quaternary

PRODUCTION: Produced in 1934 (Huntting, 1956, p. 184).

TECTONIC SETTING: Deposition of heavy minerals in river gravels.

ORE CONTROLS: Heavy-mineral concentration by stream action.

REFERENCE

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

South Penn (338)

ALTERNATE NAMES		DISTRICT	COUNTY
		Republic	Ferry
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Storm King Mountain	1:24,000	Republic	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 41′ 24.62″ N	118° 45′ 20.69″ W	sec. 22, 37N, 32E

LOCATION: A default location is selected at the center of section 22.

HOST ROCK: NAME	LITHOLOGY	AGE
Sanpoil Volcanics	dacite and andesite flows and flow breccias	Eocene

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
Scatter Creek Rhyodacite	Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au Ag	gold	quartz; hydrothermal alteration is low-sulfur adularia-sericite type

DEPOSIT TYPE	MINERALIZATION AGE
vein hot springs	Eocene

PRODUCTION: Produced between 1941 and 1949; 172 tons in 1945 yielded $2,168 (Huntting, 1956, p. 125).

TECTONIC SETTING: Epithermal deposits of the Republic district are found in the Eocene Sanpoil Volcanics. (See Republic district for additional details.)

ORE CONTROLS: This deposit is similar to other deposits of the Republic district. (See Republic district for additional details.)

GEOLOGIC SETTING: Host rocks for gold deposits of the Republic district are dacite and andesite flows, flow breccias, tuffs, and tuff breccias of the Eocene Sanpoil Volcanics (Muessig, 1967, p. 50-51; Tschauder, 1989, p. 242).

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Muessig, Siegfried, 1967, Geology of the Republic quadrangle and a part of the Aeneas quadrangle, Ferry County, Washington: U.S. Geological Survey Bulletin 1216, 135 p., 1 pl.

Tschauder, R. J., 1989, Gold deposits in northern Ferry County, Washington. *In* Joseph, N. L. and others; editors, Geologic guidebook for Washington and adjacent areas: Washington Division of Geology and Earth Resources Information Circular 86, p. 241-253.

Stray Dog (366)

ALTERNATE NAMES		DISTRICT	COUNTY
			Ferry
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Kewa	1:24,000	Nespelem	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 14′ 43.27″ N	118° 15′ 24.42″ W	SW¼ NW¼ sec. 27, 32N, 36E

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
granite to granodiorite near Meteor	granite and granodiorite	Jurassic - Cretaceous

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Ag	chalcopyrite	pyrite, quartz
Pb	sphalerite	
Cu	galena	
Zn	tetrahedrite	
Au	pyrargyrite	
	argentite	
	arsenopyrite	
	native silver	

DEPOSIT TYPE	MINERALIZATION AGE
vein	

PRODUCTION: Two shipments of 20 tons each reported prior to 1910 (Huntting, 1956, p. 294).

TECTONIC SETTING: Jurassic to Cretaceous intrusive rocks intrude Ordovician? sedimentary rocks of the area (Joseph, 1990, geol map).

ORE CONTROLS: The ore is in a sparsely mineralized quartz vein that ranges from a stringer to 2 ft wide and occupies a shear zone in quartz monzonite porphyry (Huntting, 1956, p. 294).

GEOLOGIC SETTING: The Stray Dog deposit is in Jurassic to Cretaceous granitic to granodioritic rocks (Joseph, 1990, geol. map, p. 34).

REFERENCES

Bancroft, Howland, 1914, The ore deposits of northeastern Washington: U.S. Geological Survey Bulletin 550, 215 p.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Joseph, N. L., compiler, 1990, Geologic map of the Nespelem 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-16, 47 p., 1 pl.

Pardee, J. T., 1918, Geology and mineral deposits of the Colville Indian Reservation, Washington: U.S. Geological Survey Bulletin 677, 186 p., 1 pl.

Patty, E. N., 1921, The metal mines of Washington: Washington Geological Survey Bulletin 23, 366 p.

Weaver, C. E., 1913, Geology and ore deposits of the Covada mining district: Washington Geological Survey Bulletin 16, 87 p.

Surprise (340)

ALTERNATE NAMES		DISTRICT	COUNTY
		Republic	Ferry

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Republic	1:24,000	Republic	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 39′ 39.00″ N	118° 44′ 57.13″ W	SE¼NE¼ and NE¼SE¼ sec. 34, 37N, 32E

LOCATION: on the east side of Eureka Gulch

HOST ROCK: NAME	LITHOLOGY	AGE
Sanpoil Volcanics	dacite and andesite flows and flow breccias	Eocene

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
Scatter Creek Rhyodacite	Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au Ag	gold	quartz, pyrite; hydrothermal alteration is low-sulfur adularia-sericite type

DEPOSIT TYPE	MINERALIZATION AGE
vein hot springs	Eocene

PRODUCTION: Production exceeded $1,000,000; produced in 1910-1923, 1934, 1938, and 1947-1950 (Huntting, 1956, p. 125).

TECTONIC SETTING: Epithermal deposits of the Republic district are found in the Eocene Sanpoil Volcanics. (See Republic district for additional details.)

ORE CONTROLS: Mineralization is present in a 4-8-ft-wide vein in propylitic quartz latite. The vein consists of banded quartz and includes fragments of country rock (Huntting, 1956, p. 125). (See Republic district for additional details.)

GEOLOGIC SETTING: Host rocks for gold deposits of the Republic district are dacite and andesite flows, flow breccias, tuffs, and tuff breccias of the Eocene Sanpoil Volcanics (Muessig, 1967, p. 50-51; Tschauder, 1989, p. 242).

REFERENCES

Bancroft, Howland, 1914, The ore deposits of northeastern Washington: U.S. Geological Survey Bulletin 550, 215 p.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Muessig, Siegfried, 1967, Geology of the Republic quadrangle and a part of the Aeneas quadrangle, Ferry County, Washington: U.S. Geological Survey Bulletin 1216, 135 p., 1 pl.

Patty, E. N., 1921, The metal mines of Washington: Washington Geological Survey Bulletin 23, 366 p.

Tschauder, R. J., 1989, Gold deposits in northern Ferry County, Washington. *In* Joseph, N. L. and others; editors, Geologic guidebook for Washington and adjacent areas: Washington Division of Geology and Earth Resources Information Circular 86, p. 241-253.

Umpleby, J. B., 1910, Geology and ore deposits of Republic mining district: Washington Geological Survey Bulletin 1, 65 p.

Talisman (313)

ALTERNATE NAMES		DISTRICT	COUNTY
Laurier			Ferry
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Independent Mtn	1:24,000	Republic	Okanogan
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
48° 59′ .70″ N	118° 16′ 14.13″ W	sec. 4, 40N, 36E	

LOCATION: on the east slopes of Owl Mountain, 1 mi south of the international border

HOST ROCK: NAME	LITHOLOGY	AGE
unnamed paragneiss	gneiss	pre-Tertiary
unnamed amphibolite	amphibolite	pre-Tertiary

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Cu	chalcopyrite	pyrite, magnetite, epidote, garnet, zoisite
Au	sphalerite	
Ag	galena	
Pb	scheelite	
W		
Cd		
Bi		

DEPOSIT TYPE	MINERALIZATION AGE
contact metamorphic	

PRODUCTION: Produced in 1915 ($15,000), 1916 ($36,000), 1946, 1947, 1948, (54 tons of concentrates), 1949 (37 tons of concentrates), and 1950 (18 tons of Zn concentrates) (Huntting, 1956, p. 55).

TECTONIC SETTING: Part of the suite of metamorphic rocks of the Kettle metamorphic core complex (Stoffel, 1990, geol. map).

ORE CONTROLS: Shallowly dipping contact-metamorphic deposit in schist. The ore body is 1-12 ft thick (Huntting, 1956, p. 55).

GEOLOGIC SETTING: The deposit is in paragneiss near the contact with amphibolite. The metamorphic rocks are part of the Kettle metamorphic core complex (Stoffel, 1990, geol. map, p. 45-47).

REFERENCES

Bancroft, Howland, 1914, The ore deposits of northeastern Washington: U.S. Geological Survey Bulletin 550, 215 p.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Purdy, C. P., Jr., 1952, Directory of Washington mining operations, 1952: Washington Division of Mines and Geology Information Circular 20, 75 p.

Stoffel, K. L., compiler, 1990, Geologic map of the Republic 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-10, 62 p., 1 pl.

Threemile placer (350)

ALTERNATE NAMES		DISTRICT	COUNTY
			Ferry
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Fort Spokane	1:24,000	Coulee Dam	Ritzville
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
47° 56′ 35.12″ N	118° 21′ 32.92″ W	sec. 11, 28N, 35E, on the Columbia river	

LOCATION: on the Columbia river, 3 mi above the mouth of the Spokane River

HOST ROCK: NAME	LITHOLOGY	AGE
Quaternary alluvium	sand and gravel	Quaternary

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au	gold	sand and gravel

DEPOSIT TYPE	MINERALIZATION AGE
placer	Quaternary

PRODUCTION: Worked by the Chinese prior to 1910 (Huntting, 1956, p. 184).

TECTONIC SETTING: Deposition of heavy minerals in river gravels.

ORE CONTROLS: Heavy-mineral concentration by stream action. Gold occurs in large, thin flakes worth about 0.01 cents each and as flour gold. The bench is 20 ft above the river and contains large angular boulders. Pay gravels occupied the spaces between boulders (Huntting, 1956, p. 184).

REFERENCES

Collier, A. J., 1907, Gold-bearing river sands of northeastern Washington. *In* Contributions to economic geology 1906; Part I—Metals and nonmetals, except fuels: U.S. Geological Survey Bulletin 315, p. 56-70.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Tom Thumb (341)

ALTERNATE NAMES		DISTRICT	COUNTY
		Republic	Ferry
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Storm King Mountain	1:24,000	Republic	Okanogan
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
48° 41′ 45.87″ N	118° 45′ 25.51″ W	S½SE¼ sec. 15, and N½N½ sec. 22, 37N, 32E	

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
Sanpoil Volcanics	dacite and andesite flows and flow breccias	Eocene
ASSOCIATED IGNEOUS ROCK: DESCRIPTION		AGE
Scatter Creek Rhyodacite		Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au Ag	gold	quartz; hydrothermal alteration is low-sulfur adularia-sericite type

DEPOSIT TYPE	MINERALIZATION AGE
vein hot springs	Eocene

PRODUCTION: Produced in 1908-1910, 1915, 1916, 1934, and 1938 (Huntting, 1956, p. 125).

TECTONIC SETTING: Epithermal deposits of the Republic district are found in the Eocene Sanpoil Volcanics. (See Republic district for additional details.)

ORE CONTROLS: Quartz is spread widely through bedded tuff. Lodes are not well defined. One 8-ft-wide vein is present in andesite (Huntting, 1956, p. 125). (See Republic district for additional details.)

GEOLOGIC SETTING: Host rocks for gold deposits of the Republic district are dacite and andesite flows, flow breccias, tuffs, and tuff breccias of the Eocene Sanpoil Volcanics (Muessig, 1967, p. 50-51; Tschauder, 1989, p. 242).

REFERENCES

Bancroft, Howland, 1914, The ore deposits of northeastern Washington: U.S. Geological Survey Bulletin 550, 215 p.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Muessig, Siegfried, 1967, Geology of the Republic quadrangle and a part of the Aeneas quadrangle, Ferry County, Washington: U.S. Geological Survey Bulletin 1216, 135 p., 1 pl.

Tschauder, R. J., 1989, Gold deposits in northern Ferry County, Washington. *In* Joseph, N. L. and others; editors, Geologic guidebook for Washington and adjacent areas: Washington Division of Geology and Earth Resources Information Circular 86, p. 241-253.

Umpleby, J. B., 1910, Geology and ore deposits of Republic mining district: Washington Geological Survey Bulletin 1, 65 p.

Trade Dollar (342)

ALTERNATE NAMES		DISTRICT	COUNTY
		Republic	Ferry
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Storm King Mountain	1:24,000	Republic	Okanogan
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
48° 40′ 20.52″ N	118° 45′ 39.07″ W	E½ SW¼ sec. 27, 37N, 32E	

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
Sanpoil Volcanics	dacite and andesite flows and flow breccias	Eocene

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
Scatter Creek Rhyodacite	Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au Ag	gold	quartz; hydrothermal alteration is low-sulfur adularia-sericite type

DEPOSIT TYPE	MINERALIZATION AGE
vein hot springs	Eocene

PRODUCTION: Produced about $25,000 worth of ore by 1934 (Huntting, 1956, p. 125).

TECTONIC SETTING: Epithermal deposits of the Republic district are found in the Eocene Sanpoil Volcanics. (See Republic district for additional details.)

ORE CONTROLS: Quartz vein varies from 20 in. to 13 ft wide (Huntting, 1956, p. 125). (See Republic district for additional details.)

GEOLOGIC SETTING: Host rocks for gold deposits of the Republic district are dacite and andesite flows, flow breccias, tuffs, and tuff breccias of the Eocene Sanpoil Volcanics (Muessig, 1967, p. 50-51; Tschauder, 1989, p. 242).

REFERENCES

Bancroft, Howland, 1914, The ore deposits of northeastern Washington: U.S. Geological Survey Bulletin 550, 215 p.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Muessig, Siegfried, 1967, Geology of the Republic quadrangle and a part of the Aeneas quadrangle, Ferry County, Washington: U.S. Geological Survey Bulletin 1216, 135 p., 1 pl.

Tschauder, R. J., 1989, Gold deposits in northern Ferry County, Washington. *In* Joseph, N. L. and others; editors, Geologic guidebook for Washington and adjacent areas: Washington Division of Geology and Earth Resources Information Circular 86, p. 241-253.

Valley (343)

ALTERNATE NAMES	DISTRICT	COUNTY
Golden Valley Lame Foot		Ferry

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Republic	1:24,000	Republic	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 44′ 3.76″ N	118° 41′ 10.06″ W	E½ sec. 6, 37N, 33E

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
Scatter Creek Rhyodacite	porphyritic dacite	Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au Ag Se	auriferous selenide tetrahedrite	quartz, calcite, pyrite

DEPOSIT TYPE	MINERALIZATION AGE
vein	Eocene

PRODUCTION: Produced 1,994 tons prior to 1941, 5,800 tons in 1942, 1,302 tons in 1943, and in 1950 (Huntting, 1956, p. 125).

TECTONIC SETTING: Eocene volcanic rocks host mineral deposits in the Republic graben.

ORE CONTROLS: The vein is in andesite and is estimated to average 7 ft wide and 1,200 ft long (Huntting, 1956, p. 125).

GEOLOGIC SETTING: Host rocks for gold deposits of the Republic district are dacite and andesite flows, flow breccias, tuffs, and tuff breccias of the Eocene Sanpoil Volcanics and subvolcanic intrusions of the Scatter Creek Rhyodacite (Muessig, 1967, p. 54-58).

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Jonte, J. H., 1942, The relationship of selenium and gold in ores from the Republic district: State College of Washington Master of Science thesis, 33 p.

Muessig, Siegfried, 1967, Geology of the Republic quadrangle and a part of the Aeneas quadrangle, Ferry County, Washington: U.S. Geological Survey Bulletin 1216, 135 p., 1 pl.

Tschauder, R. J., 1989, Gold deposits in northern Ferry County, Washington. *In* Joseph, N. L. and others; editors, Geologic guidebook for Washington and adjacent areas: Washington Division of Geology and Earth Resources Information Circular 86, p. 241-253.

Whitestone placer (351)

ALTERNATE NAMES		DISTRICT	COUNTY
			Ferry
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Whitestone Rock	1:24,000	Coulee Dam	Ritzville
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
47° 55′ 23.25″ N	118° 32′ 17.77″ W	sec. 16, 28N, 34E	

LOCATION: along the Columbia River

HOST ROCK: NAME	LITHOLOGY	AGE
Quaternary alluvium	sand and gravel	Quaternary

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au	gold	sand and gravel

DEPOSIT TYPE	MINERALIZATION AGE
placer	Quaternary

PRODUCTION: Produced in 1933 (Huntting, 1956, p. 184).

TECTONIC SETTING: Deposition of heavy minerals in river gravels.

ORE CONTROLS: Heavy-mineral concentration by stream action.

REFERENCE

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Wilmont Bar placer (352)

ALTERNATE NAMES		DISTRICT	COUNTY
			Ferry
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Miller Mtn	1:24,000	Nespelem	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 2′ 55.39″ N	118° 16′ 17.97″ W	lot 6, sec. 4, 29N, 36E

LOCATION: on the north bank of the Columbia River, opposite the Gerome post office

HOST ROCK: NAME	LITHOLOGY	AGE
Quaternary alluvium	sand and gravel	Quaternary

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au	gold	sand and gravel
Ce	monazite	
Th	magnetite	
	ilmenite	
	zircon	

DEPOSIT TYPE	MINERALIZATION AGE
placer	Quaternary

PRODUCTION: Produced in 1934 (Huntting, 1956, p. 184).

TECTONIC SETTING: Deposition of heavy minerals in river gravels.

ORE CONTROLS: Heavy-mineral concentration by stream action. The deposit consists of two terraces, one 20 ft and the other 100 ft above the Columbia River. In the lower terrace, gold occurs in the uppermost 1-5 ft of material (Huntting, 1956, p. 184).

REFERENCES

Collier, A. J., 1907, Gold-bearing river sands of northeastern Washington. *In* Contributions to economic geology 1906; Part I—Metals and nonmetals, except fuels: U.S. Geological Survey Bulletin 315, p. 56-70.

Day, D. T.; Richards, R. H., 1906, Useful minerals in the black sands of the Pacific slope. *In* U.S. Geological Survey, Mineral resources of the United States, calendar year 1905: U.S. Geological Survey, p. 1175-1258.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Pardee, J. T., 1929, Platinum and black sand in Washington. *In* Contributions to economic geology (short papers and preliminary reports) 1928; Part I—Metals and nonmetals except fuels: U.S. Geological Survey Bulletin 805, p. 1-15.

Zalla M (367)

ALTERNATE NAMES		DISTRICT	COUNTY
		Sheridan	Ferry
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Bodie Mountain	1:24,000	Republic	Okanogan
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
48° 45′ 40.64″ N	118° 50′ .37″ W	W½ sec. 30, 38N, 32E	

LOCATION: a few hundred yards east of the Ferry-Okanogan County boundary line

HOST ROCK: NAME	LITHOLOGY	AGE
Klondike Mountain Formation	rhyolite flows and pyroclastic breccias	Eocene

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
phonolite	

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Ag Cu Au	chalcopyrite galena fluorite hessite krennerite	pyrite, quartz, calcite, chlorite, epidote, zoisite, sericite

DEPOSIT TYPE	MINERALIZATION AGE
vein	

PRODUCTION: Produced $40,000 worth of ore prior to 1903; ore was shipped from the dump in 1935 (Huntting, 1956, p. 295).

TECTONIC SETTING: Sequence of Eocene volcanic rocks in the Toroda Creek graben (Pearson, 1967, geol. map).

ORE CONTROLS: Mineralization is in a well-defined 1-6-ft-wide quartz vein filling an irregular fracture in phonolite. The vein is sparsely mineralized and low grade except in the zone of secondary enrichment, which extends from the surface to a depth of about 150 ft (Huntting, 1956, p. 295). Wall rock adjacent to the vein is brecciated and sheared, and the breccia is cemented by quartz, chlorite, and fluorite. Ore was mined from ore shoots in the zone of secondary enrichment (Moen, 1980, p. 70).

GEOLOGIC SETTING: The Zalla M is in flows and breccias of the Eocene Klondike Mountain Formation. The rocks appear to be rhyolitic in composition, but on close examination, outlines of what appear to be pyroxene phenocrysts are found. This suggests the rocks are probably altered andesite (Stoffel, 1990, geol. map, p. 11; Pearson, 1967, geol. map).

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Moen, W. S., 1980, Myers Creek and Wauconda mining districts of northeastern Okanogan County, Washington: Washington Division of Geology and Earth Resources Bulletin 73, 96 p., 6 pl.

Patty, E. N., 1921, The metal mines of Washington: Washington Geological Survey Bulletin 23, 366 p.

Pearson, R. C., 1967, Geologic map of the Bodie Mountain quadrangle, Ferry and Okanogan Counties, Washington: U.S. Geological Survey Geologic Quadrangle Map GQ 636, 1 sheet, scale 1:62,500, with 4 p. text.

Stoffel, K. L., compiler, 1990, Geologic map of the Republic 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-10, 62 p., 1 pl.

Chinaman Bar placer (302)

ALTERNATE NAMES		DISTRICT	COUNTY
			Grant
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Priest Rapids NE	1:24,000		Walla Walla
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
46° 38′ 14.17″ N	119° 46′ 6.26″ W	secs. 10 and 11, 13N, 24E	

LOCATION: at Chinaman Bar on the Columbia River, 4 mi east of Priest Rapids

HOST ROCK: NAME	LITHOLOGY	AGE
Quaternary alluvium	sand and gravel	Quaternary

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au	gold	sand and gravel

DEPOSIT TYPE	MINERALIZATION AGE
placer	Quaternary

PRODUCTION: Produced from 1939 to 1941 (Huntting, 1956, p. 185).

TECTONIC SETTING: Deposition of heavy minerals in river gravels.

ORE CONTROLS: Heavy-mineral concentration by stream action.

REFERENCES

Carithers, Ward, 1943, Directory of Washington mining operations: Washington Division of Mines and Mining Information Circular 8, 36 p.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Burnt Peak (624)

ALTERNATE NAMES	DISTRICT	COUNTY
Burnt Mountain Burnt Hill		Grays Harbor

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Quinault Lake	1:62,500	Shelton	Seattle

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
47° 19′ 36″ N	123° 52′ 22″ W	SE¼ sec. 7, 21N, 9W

LOCATION: elev. 800 ft, approximately 0.25 mi west of the Burnt Hill lookout station. The property is reached from Amanda Park on Lake Quinault by following US Highway 101 south 10 mi to the Burnt Hill road, thence east 1.2 mi to its junction with the Newbury Creek road, thence by the right branch 0.7 mi uphill to the mine road, then 0.5 mi along the mine road.

HOST ROCK: NAME	LITHOLOGY	AGE
Crescent Formation	basalt	Eocene
Crescent Formation	red limy argillite	Eocene

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
Crescent Formation volcanic rocks	Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Mn	bementite hausmannite	jasper

DEPOSIT TYPE	MINERALIZATION AGE
replacement, disseminated exhalative/diagenetic	Eocene

PRODUCTION: Produced approximately 80 tons of ore (Huntting, 1956, p. 258).

TECTONIC SETTING: Host rocks of manganese deposits of the Olympic Peninsula formed at an ocean ridge or in a back arc basin at the active margin of the North American plate (Garrison, 1973; Snavely, 1987, p. 306-309).

ORE CONTROLS: Manganese occurs in discontinuous pods. The mineralization is in a highly siliceous ferruginous rock, which on a fractured surface shows small veinlets of clear to milky, crystalline quartz (data from USGS MRDS, 1990). Manganese deposits of the region are associated with spilites (Park, 1942, p. 311-312) and commonly are found with reddish pelagic limestone interbedded with the basalt. Manganese mineralization may be either disseminated in replacement bodies or volcanogenic exhalative/diagenetic bodies (Sorem and Gunn, 1967).

GEOLOGIC SETTING: Altered basalt is the principal country rock for the Burnt Hill deposit. Superficial weathering gives the basalt a yellowish to light-brown color; however, megascopic examination of a newly fractured surface reveals fine-grained, greenish-gray material (data from USGS MRDS, 1990). The Crescent Formation, which hosts manganese mineralization on the Olympic Peninsula, consists of Paleocene? and Eocene pillow basalts compositionally similar to ocean ridge basalts. Associated pelagic limestones were deposited in deep water (Snavely, 1987, p. 306-308).

REFERENCES

Garrison, R. E., 1973, Space-time relations of pelagic limestones and volcanic rocks, Olympic Peninsula, Washington: Geological Society of America Bulletin, v. 84, no. 2, p. 583-594.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Magill, E. A., 1960, Manganese deposits of the Olympic Peninsula, Wash.: U.S. Bureau of Mines Report of Investigations 5530, 82 p.

Park, C. F., Jr., 1942, Manganese resources of the Olympic Peninsula, Washington—A preliminary report: U.S. Geological Survey Bulletin 931-R, p. 435-457, 2 pl.

Snavely, P. D., Jr., 1987, Tertiary geologic framework, neotectonics, and petroleum potential of the Oregon-Washington continental margin. *In* Scholl, D. W.; Grantz, Arthur; Vedder, J. G., Geology and resources potential of the continental margin of western North America and adjacent ocean basins—Beaufort Sea to Baja California: Circum-Pacific Council for Energy and Mineral Resources Earth Science Series, v. 6, p. 305-335.

Sorem, R. K.; Gunn, D. W., 1967, Mineralogy of manganese deposits, Olympic Peninsula, Washington: Economic Geology, v. 62, no. 1, p. 22-56.

Egge (620)

ALTERNATE NAMES		DISTRICT	COUNTY
Quinault			Grays Harbor
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Quinault Lake	1:62,500	Shelton	Seattle
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
47° 22′ 31″ N	123° 51′ 40″ W	secs. 19, 20, and 30, 22N, 9W	

LOCATION: about 6.3 mi south of Quinault. Claims cover approximately 3 mi^2 on Quinault Ridge at the headwaters of Cook, Skunk, and Stevens Creeks

HOST ROCK: NAME	LITHOLOGY	AGE
Crescent Formation	basalt	Eocene
Crescent Formation	red limy argillite	Eocene

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
Crescent Formation volcanic rocks	Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Mn	bementite	

DEPOSIT TYPE	MINERALIZATION AGE
replacement, disseminated exhalative/diagenetic	Eocene

PRODUCTION: Minor production in 1941 and 1952 (Huntting, 1956, p. 258).

TECTONIC SETTING: Host rocks of manganese deposits of the Olympic Peninsula formed at an ocean ridge or in a back arc basin at the active margin of the North American plate (Garrison, 1973; Snavely, 1987, p. 306-309).

ORE CONTROLS: Manganese deposits of the region are associated with spilites (Park, 1942, p. 311-312) and commonly are found with reddish pelagic limestone interbedded with the basalt. Manganese mineralization may be either disseminated in replacement bodies or volcanogenic exhalative/diagenetic bodies (Sorem and Gunn, 1967).

GEOLOGIC SETTING: The Crescent Formation, which hosts manganese mineralization on the Olympic Peninsula, consists of Paleocene? and Eocene pillow basalts compositionally similar to ocean ridge basalts. Associated pelagic limestones were deposited in deep water (Snavely, 1987, p. 306-308).

COMMENTS: Nearby claims include: Black Wonder (produced 5 tons in 1936), Antlers, Pioneer, Lizard (small amount produced in 1916), and Stevens Creek (produced 5 tons in 1941, 1952) (Huntting, 1956, p. 257);

REFERENCES

Garrison, R. E., 1973, Space-time relations of pelagic limestones and volcanic rocks, Olympic Peninsula, Washington: Geological Society of America Bulletin, v. 84, no. 2, p. 583-594.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Magill, E. A., 1960, Manganese deposits of the Olympic Peninsula, Wash.: U.S. Bureau of Mines Report of Investigations 5530, 82 p.

Park, C. F., Jr., 1942, Manganese resources of the Olympic Peninsula, Washington—A preliminary report: U.S. Geological Survey Bulletin 931-R, p. 435-457, 2 pl.

Snavely, P. D., Jr., 1987, Tertiary geologic framework, neotectonics, and petroleum potential of the Oregon-Washington continental margin. *In* Scholl, D. W.; Grantz, Arthur; Vedder, J. G., Geology and resources potential of the continental margin of western North America and adjacent ocean basins—Beaufort Sea to Baja California: Circum-Pacific Council for Energy and Mineral Resources Earth Science Series, v. 6, p. 305-335.

Sorem, R. K.; Gunn, D. W., 1967, Mineralogy of manganese deposits, Olympic Peninsula, Washington: Economic Geology, v. 62, no. 1, p. 22-56.

Elma (623)

ALTERNATE NAMES		DISTRICT	COUNTY
Dennis			Grays Harbor
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
McCleary	1:24,000	Shelton	Seattle
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
47° 00′ 49″ N	123° 18′ 45″ W	S½SE¼ sec. 28, 18N, 5W	

LOCATION: elev. 200 ft, 3.5 mi east of the railroad at Elma. Southeast part of the county; 2.75 mi off the Olympic highway

HOST ROCK: NAME	LITHOLOGY	AGE
Lincoln Creek Formation	sandstone	Eocene - Oligocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Fe	ilmenite	
Ti	magnetite	
	titaniferous magnetite	

DEPOSIT TYPE	MINERALIZATION AGE
fossil placer	Eocene - Oligocene

PRODUCTION: Produced 1 carload and a 1,000-lb shipment for testing purposes (Huntting, 1956, p. 196).

TECTONIC SETTING: Forearc volcaniclastic basin that grades eastward into nonmarine volcaniclastic rocks associated with the Cascade magmatic arc (Logan, 1987, geol. map, p. 8).

ORE CONTROLS: This fossil heavy-mineral deposit occurs as a 1-4-ft-thick bed of stratified, weakly consolidated black sand that covers 2-3 acres (Huntting, 1956, p. 196). A specimen of the ore, studied under a hand lens, appears to be made up of small, well-rounded grains of magnetite and ilmenite, which are firmly cemented together (data from USGS MRDS, 1990).

GEOLOGIC SETTING: The Lincoln Creek Formation is a marine, poorly bedded to massive, dominantly siltstone unit of predominantly basaltic and andesitic source-rock composition (Logan, 1987, p. 8).

REFERENCES

Logan, R. L., compiler, 1987, Geologic map of the south half of the Shelton and south half of the Copalis Beach quadrangles, Washington: Washington Division of Geology and Earth Resources Open File Report 87-9, 15 p., 1 pl.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Shedd, Solon; Jenkins, O. P.; Cooper, H. H., 1922, Iron ores, fuels, and fluxes of Washington: Washington Division of Geology Bulletin 27, 160 p., 1 pl.

Esther-Irene (621)

ALTERNATE NAMES	DISTRICT	COUNTY
		Grays Harbor

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Quinault Lake	1:62,500	Shelton	Seattle

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
47° 22′ 55″ N	123° 52′ 47″ W	SW¼NW¼ sec. 19, 22N, 9W

LOCATION: elev. 1,265 ft, about 3.9 mi north-northwest of Burnt Hill lookout, at the head of Phillips Creek

HOST ROCK: NAME	LITHOLOGY	AGE
Crescent Formation	altered greenstone	Eocene
Crescent Formation	red limy argillite	Eocene

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
Crescent Formation volcanic rocks	Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Mn	bementite neotocite manganite psilomelane	

DEPOSIT TYPE	MINERALIZATION AGE
replacement, disseminated exhalative/diagenetic	Eocene

PRODUCTION: Produced at least 75 tons of ore (Huntting, 1956, p. 258).

TECTONIC SETTING: Host rocks of manganese deposits of the Olympic Peninsula formed at an ocean ridge or in a back arc basin at the active margin of the North American plate (Garrison, 1973; Snavely, 1987, p. 306-309).

ORE CONTROLS: Minor faults and fractures occur in the greenstone. At the mine two small manganiferous ore bodies are present in siliceous zones in altered basalt. In the upper siliceous zone, the manganiferous area is 6 ft by 30 ft, and the lower area is 6 ft wide and 22 ft long. The siliceous zone of the lower manganese area is about 10 ft by 70 ft. Manganese is present as silicates and, in minor amounts, as secondary oxides (data from USGS MRDS, 1990). Manganese deposits of the region are associated with spilites (Park, 1942, p. 311-312) and commonly are found with reddish pelagic limestone interbedded with the basalt. Manganese mineralization may be either disseminated in replacement bodies or volcanogenic exhalative/diagenetic bodies (Sorem and Gunn, 1967).

GEOLOGIC SETTING: The host basalt of the Crescent Formation is somewhat bleached at the Esther-Irene deposit (data from USGS MRDS, 1990). Paleocene and Eocene pillow basalts are compositionally similar to ocean ridge basalts. Associated pelagic limestones were deposited in deep water (Snavely, 1987, p. 306-308).

REFERENCES

Garrison, R. E., 1973, Space-time relations of pelagic limestones and volcanic rocks, Olympic Peninsula, Washington: Geological Society of America Bulletin, v. 84, no. 2, p. 583-594.

Green, S. H., 1945, Manganese deposits of the Olympic Peninsula, Washington: Washington Division of Mines and Mining Report of Investigations 7, 45 p., 1 pl.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Magill, E. A., 1960, Manganese deposits of the Olympic Peninsula, Wash.: U.S. Bureau of Mines Report of Investigations 5530, 82 p.

Park, C. F., Jr., 1942, Manganese resources of the Olympic Peninsula, Washington—A preliminary report: U.S. Geological Survey Bulletin 931-R, p. 435-457, 2 pl.

Snavely, P. D., Jr., 1987, Tertiary geologic framework, neotectonics, and petroleum potential of the Oregon-Washington continental margin. *In* Scholl, D. W.; Grantz, Arthur; Vedder, J. G., Geology and resources potential of the continental margin of western North America and adjacent ocean basins—Beaufort Sea to Baja California: Circum-Pacific Council for Energy and Mineral Resources Earth Science Series, v. 6, p. 305-335.

Sorem, R. K.; Gunn, D. W., 1967, Mineralogy of manganese deposits, Olympic Peninsula, Washington: Economic Geology, v. 62, no. 1, p. 22-56.

Skunk Creek No. 19 (622)

ALTERNATE NAMES	DISTRICT	COUNTY
		Grays Harbor

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Quinault Lake	1:62,500	Shelton	Seattle

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
47° 22′ 21″ N	123° 52′ 37″ W	sec. 30, 22N, 9W (probable location)

LOCATION: about 3.3 mi north-northwest of Burnt Hill lookout. Access to the Skunk Creek No. 19 mine is by way of the Quinault Ridge Road northeasterly about 1.75 mi to an unmarked road junction; from the junction the easterly branch extends 1 mi to the workings.

HOST ROCK: NAME	LITHOLOGY	AGE
Crescent Formation	basalt	Eocene
Crescent Formation	red limy argillite	Eocene

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
Crescent Formation volcanic rocks	Eocene Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Mn	bementite neotocite pyrolusite rhodonite goethite hematite	manganocalcite, quartz, limonite, goethite, hematite, spessartite garnet, chlorite, and pyrite.

DEPOSIT TYPE	MINERALIZATION AGE
replacement, disseminated exhalative/diagenetic	Eocene

PRODUCTION: Produced 150 tons that averaged 19.5% Mn; shipped to Provo, Utah, steel mill in 1952 (Magill, 1952, p. 71). In 1953, a 45-ton test shipment was sent to the U.S. Bureau of Mines in Albany, Oregon (data from USGS MRDS, 1990).

TECTONIC SETTING: Host rocks of manganese deposits of the Olympic Peninsula formed at an ocean ridge or in a back arc basin at the active margin of the North American plate (Garrison, 1973; Snavely, 1987, p. 306-309).

ORE CONTROLS: The deposit is lens shaped. Limestone, so prevalent in deposits of the area, is present only in small quantities at the Skunk Creek No. 1 deposit (data from USGS MRDS, 1990). Manganese deposits of the region are associated with spilites (Park, 1942, p. 311-312) and commonly are found with reddish pelagic limestone interbedded with the basalt. Manganese mineralization may be either disseminated in replacement bodies or volcanogenic exhalative/diagenetic bodies (Sorem and Gunn, 1967).

GEOLOGIC SETTING: The Crescent Formation, which hosts manganese mineralization on the Olympic Peninsula, consists of Paleocene? and Eocene pillow basalts compositionally similar to ocean ridge basalts. Associated pelagic limestones were deposited in deep water (Snavely, 1987, p. 306-308).

REFERENCES

Garrison, R. E., 1973, Space-time relations of pelagic limestones and volcanic rocks, Olympic Peninsula, Washington: Geological Society of America Bulletin, v. 84, no. 2, p. 583-594.

Magill, E. A., 1960, Manganese deposits of the Olympic Peninsula, Wash.: U.S. Bureau of Mines Report of Investigations 5530, 82 p.

Park, C. F., Jr., 1942, Manganese resources of the Olympic Peninsula, Washington—A preliminary report: U.S. Geological Survey Bulletin 931-R, p. 435-457, 2 pl.

Snavely, P. D., Jr., 1987, Tertiary geologic framework, neotectonics, and petroleum potential of the Oregon-Washington continental margin. *In* Scholl, D. W.; Grantz, Arthur; Vedder, J. G., Geology and resources potential of the continental margin of western North America and adjacent ocean basins—Beaufort Sea to Baja California: Circum-Pacific Council for Energy and Mineral Resources Earth Science Series, v. 6, p. 305-335.

Sorem, R. K.; Gunn, D. W., 1967, Mineralogy of manganese deposits, Olympic Peninsula, Washington: Economic Geology, v. 62, no. 1, p. 22-56.

Elkhorn (616)

ALTERNATE NAMES		DISTRICT	COUNTY
Karnes			Jefferson
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Mt Jupiter	1:24,000	Mt Olympus	Seattle
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
47° 44′ 18″ N	123° 00′ 00″ W	secs. 13 and 24, 26N, 3W	

LOCATION: about 3.5 mi northeast of the Mt. Jupiter lookout. The Elkhorn group of claims is on the south slope of Mount Constance. The claims are bounded by Bull Elk Creek on the west, Miner's Creek on the east, and the Dosewallips River on the south. The property is reached from Brinnon on US Highway 101 by following the road along the Dosewallips River westerly for about 13 mi. The main workings range in elev. from 1,200 to 4,200 ft.

HOST ROCK: NAME	LITHOLOGY	AGE
Crescent Formation	red limestone	Eocene
Crescent Formation	basalt	Eocene

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
Crescent Formation volcanic rocks	Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Mn	bementite	hematite
Fe	neotocite	

DEPOSIT TYPE	MINERALIZATION AGE
replacement, disseminated exhalative/diagenetic	Eocene

PRODUCTION: Produced in the 1940s (data from USGS MRDS, 1990).

TECTONIC SETTING: Host rocks of manganese deposits of the Olympic Peninsula formed at an ocean ridge or in a back arc basin at the active margin of the North American plate (Garrison, 1973; Snavely, 1987, p. 306-309).

ORE CONTROLS: Basalt in the mine area is locally highly fractured and cut by many minor faults. Manganese deposits of the region are associated with spilites (Park, 1942, p. 311-312) and commonly are found with reddish pelagic limestone interbedded with the basalt. Manganese mineralization may be either disseminated in replacement bodies or volcanogenic exhalative/diagenetic bodies (Sorem and Gunn, 1967).

GEOLOGIC SETTING: The area is underlain by basalt lava flows and intercalated tuff and red argillaceous limestone; much of the basalt is altered. Pillow basalt is exposed in places. The basaltic flows generally trend north and stand nearly vertical; locally, they are greatly deformed and fractured. Three red limestone beds and intercalated basalts form three or more distinct parallel ridges extending from the Dosewallips River northward to the top of the divide. Three limestone interbeds in basalt contain lenses of manganese ore, some as much as 25 ft thick. The Crescent Formation, which hosts manganese mineralization on the Olympic Peninsula, consists of Paleocene? and Eocene pillow basalts compositionally similar to ocean ridge basalts. Associated pelagic limestones were deposited in deep water (Snavely, 1987, p. 306-308).

REFERENCES

Garrison, R. E., 1973, Space-time relations of pelagic limestones and volcanic rocks, Olympic Peninsula, Washington: Geological Society of America Bulletin, v. 84, no. 2, p. 583-594.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Magill, E. A., 1960, Manganese deposits of the Olympic Peninsula, Wash.: U.S. Bureau of Mines Report of Investigations 5530, 82 p.

Park, C. F., Jr., 1942, Manganese resources of the Olympic Peninsula, Washington—A preliminary report: U.S. Geological Survey Bulletin 931-R, p. 435-457, 2 pl.

Snavely, P. D., Jr., 1987, Tertiary geologic framework, neotectonics, and petroleum potential of the Oregon-Washington continental margin. *In* Scholl, D. W.; Grantz, Arthur; Vedder, J. G., Geology and resources potential of the continental margin of western North America and adjacent ocean basins—Beaufort Sea to Baja California: Circum-Pacific Council for Energy and Mineral Resources Earth Science Series, v. 6, p. 305-335.

Sorem, R. K.; Gunn, D. W., 1967, Mineralogy of manganese deposits, Olympic Peninsula, Washington: Economic Geology, v. 62, no. 1, p. 22-56.

Anderson (600)

ALTERNATE NAMES		DISTRICT	COUNTY
Baring		Miller River	King
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Index	1:24,000	Skykomish River	Wenatchee

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
47° 45′ 17.70″ N	121° 30′ 19.24″ W	S½ sec. 10 and near SE corner sec. 11, 26N, 10E

LOCATION: about 0.75 to 1 mi from Baring

HOST ROCK: NAME	LITHOLOGY	AGE
Index batholith	granodiorite and tonalite	Oligocene
unnamed sedimentary rocks	limy quartzite	

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Fe	magnetite	amphibole
Pb	galena	
Zn	sphalerite	
Ag		
Au		
Cu		

DEPOSIT TYPE	MINERALIZATION AGE
contact metamorphic	Oligocene

PRODUCTION: One carload shipped (Huntting, 1956, p. 196).

TECTONIC SETTING: The Snoqualmie batholith is part of early magmatism of the Cascade magmatic arc.

ORE CONTROLS: Ore body is in limy quartzite and is presumably a contact metamorphic deposit. The exposed portion is a lenticular mass that is 25-30 ft high and 15 ft wide and that exposed approximately 2,000 tons (Huntting, 1956, p. 196). Shedd (1924, p. 66) reports the presence of titanium in assays from the Anderson property.

GEOLOGIC SETTING: Tabor and others (1982) map the area as all within granodiorite and tonalite of the Index batholith. The mineralization presumably occurs in a small roof pendant or included block.

REFERENCES

Glover, S. L., 1942, Washington iron ores, a summary report: Washington Division of Mines and Mining Report of Investigations 2, 23 p.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Tabor, R. W.; Frizzell, V. A., Jr.; Booth, D. B.; Whetten, J. T.; Waitt, R. B.; Zartman, R. E., 1982, Preliminary geologic map of the Skykomish River 1:100,000 quadrangle, Washington: U.S. Geological Survey Open-File Report 82-747, 31 p., 1 pl.

Shedd, Solon, 1924, The mineral resources of Washington with statistics for 1922; with an article on coal and coke, by G. W. Evans: Washington Division of Geology Bulletin 30, 224 p.

Shedd, Solon; Jenkins, O. P.; Cooper, H. H., 1922, Iron ores, fuels, and fluxes of Washington: Washington Division of Geology Bulletin 27, 160 p., 1 pl.

Apex (595)

ALTERNATE NAMES	DISTRICT	COUNTY
Bondholders Syndicate Apex Gold National Gold	Miller River Money Creek	King

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Mount Si	1:62,500	Skykomish River	Wenatchee

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
47° 41′ 42.00″ N	121° 30′ 44.13″ W	SW¼ sec. 34, 26N, 10E

LOCATION: near the headwaters of Money Creek

HOST ROCK: NAME	LITHOLOGY	AGE
Snoqualmie batholith	tonalite and granodiorite	Miocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au Ag Cu Pb	chalcopyrite galena sphalerite tetrahedrite stibnite(?)	pyrite, arsenopyrite, arsenolite, quartz, tourmaline, calcite

DEPOSIT TYPE	MINERALIZATION AGE
vein	

PRODUCTION: Produced 300 tons worth $80,000 prior to 1901. Also produced ore worth a total of $300,000 from mining in 1905, 1908, 1910, 1912, 1913, 1916-1920, 1926, 1928, and1936-1943 (Huntting, 1956, p. 126). Production from 1905 to 1940 was valued at $220,000 (Moen, 1976, p. 166). Shipments in 1921 averaged between 21% and 26% As, 18 and 20 oz/ton Ag, 1.5 and 2.5 oz/ton Au, and 4.5 and 6% Pb (Livingston, 1971, p. 163).

TECTONIC SETTING: The Snoqualmie batholith is part of early magmatism of the Cascade magmatic arc.

ORE CONTROLS: Mineralization is in a quartz vein 2-6 ft wide which follows a continuous fissure in granodiorite. High-grade ore occurs in shoots in the vein (Huntting, 1956, p. 126). The paragenetic sequence is quartz and tourmaline followed by pyrite and quartz, then quartz and stibnite(?), sphalerite, quartz, tetrahedrite and galena, chalcopyrite, and calcite (Coats, 1932, p. 19). Arsenolite (a secondary arsenic mineral) is found in the mine workings (Coats, 1932, p. 17).

GEOLOGIC SETTING: The Apex mine occurs in rocks of the Snoqualmie batholith, northern phase, which consists of granodiorite and tonalite and is light colored, medium crystalline, and mostly equigranular and has hypidiomorphic texture. The rocks are coarsely jointed and contain biotite and hornblende and locally clinopyroxene. Age of the northern phase is about 25 m.y. based on interpretation of numerous discordant K-Ar ages of both hornblende and biotite (Tabor and others, 1982, p. 8).

REFERENCES

Coats, R. R., 1932, The ore deposits of the Apex gold mine, Money Creek, King County, Washington: University of Washington Master of Science thesis, 48 p., 2 pl.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Livingston, V. E., Jr., 1971, Geology and mineral resources of King County, Washington: Washington Division of Mines and Geology Bulletin 63, 200 p., 8 pl.

Moen, W. S., 1976, Silver occurrences of Washington: Washington Division of Geology and Earth Resources Bulletin 69, 188 p.

Patty, E. N., 1921, The metal mines of Washington: Washington Geological Survey Bulletin 23, 366 p.

Tabor, R. W.; Frizzell, V. A., Jr.; Booth, D. B.; Whetten, J. T.; Waitt, R. B.; Zartman, R. E., 1982, Preliminary geologic map of the Skykomish River 1:100,000 quadrangle, Washington: U.S. Geological Survey Open-File Report 82-747, 31 p., 1 pl.

Carmack (597)

ALTERNATE NAMES		DISTRICT	COUNTY
		Snoqualmie	King

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Snoqualmie Pass	1:62,500	Snoqualmie Pass	Wenatchee

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
47 24 2.52 N	121 27 11.71 W	N½ sec. 7 and S ½ sec. 18, 22N, 11E

LOCATION: on the South Fork Snoqualmie River near Snoqualmie Pass

HOST ROCK: NAME	LITHOLOGY	AGE
Snoqualmie batholith	tonalite and granodiorite	Miocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au	chalcopyrite	
Ag	galena	
Pb		
Cu		

DEPOSIT TYPE	MINERALIZATION AGE
vein	

PRODUCTION: Shipped 20 tons of ore prior to 1901 (Huntting, 1956, p. 127).

TECTONIC SETTING: The Snoqualmie batholith is part of early magmatism of the Cascade magmatic arc.

ORE CONTROLS: Gold, silver, lead, and copper ore is found in three veins which are 12 ft, 2.5 ft and 1 ft wide (Huntting, 1956, p. 127).

GEOLOGIC SETTING: The Carmack mine is in rocks of the Snoqualmie batholith, northern phase, which consists of granodiorite and tonalite and is light colored, medium crystalline, and mostly equigranular, and has hypidiomorphic texture. The rocks are coarsely jointed and contain biotite and hornblende and, locally, clinopyroxene. The age of the northern phase is about 25 m.y. based on interpretation of numerous discordant K-Ar ages of both hornblende and biotite (Frizzell and others, 1984, p. 17).

REFERENCES

Frizzell, V. A., Jr.; Tabor, R. W.; Booth, D. B.; Ort, K. M.; Waitt, R. B., 1984, Preliminary geologic map of the Snoqualmie Pass 1:100,000 quadrangle, Washington: U.S. Geological Survey Open-File Report 84-693, 42 p., 1 pl.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Livingston, V. E., Jr., 1971, Geology and mineral resources of King County, Washington: Washington Division of Mines and Geology Bulletin 63, 200 p., 8 pl.

Cleopatra group (602)

ALTERNATE NAMES	DISTRICT	COUNTY
Cleopatra Aces Up	Miller River	King

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Grotto	1:24,000	Skykomish River	Wenatchee

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
47° 38′ 7.97″ N	121° 27′ 31.79″ W	SE¼ sec. 24, 25N, 10E and SW¼ sec. 30, 25N, 11E

LOCATION: The Cleopatra is in sec. 24, and the Aces Up is in sec. 30.

HOST ROCK: NAME	LITHOLOGY	AGE
Snoqualmie batholith	tonalite and granodiorite	Miocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Ag	argentiferous galena	pyrite, arsenopyrite, quartz, kaolinite, sericite
Pb	chalcopyrite	
Cu	tetrahedrite	
Zn	sphalerite	
Sb	jamesonite	
Au	dyscrasite(?)	

DEPOSIT TYPE	MINERALIZATION AGE
mineralized shear zone vein	

PRODUCTION: Intermittent prior to 1914. Produced in 1938, 1940, and 1941 (Huntting, 1956, p. 296). The mine was shut down in 1941 under the war powers act when it was classified a nonessential mine (Livingston, 1971, p. 139).

TECTONIC SETTING: The Snoqualmie batholith is part of early magmatism of the Cascade magmatic arc.

ORE CONTROLS: Livingston (1971, p. 140) notes two mineralized zones. The country rock along both zones was altered to kaolinite and locally sericite. Argentiferous galena and chalcopyrite are the principal ore minerals; pyrite is abundant. Huntting (1956, p. 296) reports the alteration and mineralization lie along joints in the granodiorite. The two main zones are each about 2.5 ft wide.

GEOLOGIC SETTING: The Cleopatra Group of deposits is in rocks of the Snoqualmie batholith, northern phase, which consists of granodiorite and tonalite and is light colored, medium crystalline, and mostly equigranular and has hypidiomorphic texture. The rocks are coarsely jointed and contain biotite and hornblende and locally clinopyroxene. The northern phase is about 25 m.y. old based on interpretation of numerous discordant K-Ar ages of both hornblende and biotite (Tabor and others, 1982, p. 8).

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Livingston, V. E., Jr., 1971, Geology and mineral resources of King County, Washington: Washington Division of Mines and Geology Bulletin 63, 200 p., 8 pl.

Moen, W. S., 1976, Silver occurrences of Washington: Washington Division of Geology and Earth Resources Bulletin 69, 188 p.

Purdy, C. P., Jr., 1951, Antimony occurrences of Washington: Washington Division of Mines and Geology Bulletin 39, 186 p.

Tabor, R. W.; Frizzell, V. A., Jr.; Booth, D. B.; Whetten, J. T.; Waitt, R. B.; Zartman, R. E., 1982, Preliminary geologic map of the Skykomish River 1:100,000 quadrangle, Washington: U.S. Geological Survey Open-File Report 82-747, 31 p., 1 pl.

Clipper (605)

ALTERNATE NAMES	DISTRICT	COUNTY
Snoqualmie Copper Katie Belle	Snoqualmie Burns Miller River	King

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Big Snow Mtn	1:24,000	Skykomish River	Wenatchee

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
47° 31′ 5.46″ N	121° 20′ 39.67″ W	N½, sec. 1, 23N, 11E; NW¼NW ¼, sec. 3, 23N, 12E; S½, sec. 36, 24N, 11E; SW¼, sec. 34, 24N, 12E.

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
Snoqualmie batholith, northern phase	granodiorite and tonalite	Miocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Cu Au Mo	chalcopyrite molybdenite galena	quartz, pyrite, siderite, pyrrhotite, arsenopyrite, chlorite; potassic alteration, silicification

DEPOSIT TYPE	MINERALIZATION AGE
veins fractures porphyry system	

PRODUCTION: Test stope 25 ft by 35 ft long; ore stockpiled on dump.

TECTONIC SETTING: Part of a northeast-trending belt of en echelon (NW-striking) faults, fractures, and breccia pipes defining a porphyry copper system.

ORE CONTROLS: The Clipper group consists of seven zones, the Clipper, Pedro, Katie Belle, Hawk, Three Brothers, Red Face, and Crawford Creek. The group is in a large area of mineralization in which five narrow structures of higher grade mineralization have been indicated. The mineralization is in shear zones, along fractures, and in veins. One structure, explored by drilling and an adit, was centered on a surface exposure of mineralization that was 40 ft by 800 ft. Samples collected on the surface there had assay values ranging from 0.52% Cu to 1.2% Cu and 0.2% MoS_2. One drill hole had a 69-ft intercept averaging 0.73% Cu. Copper content of some underground samples ranged from 0.31%-0.98%. Two samples on the J.T. Claim show copper and assay 0.015 oz/ton Au, and 0.040 oz/ton Au (see report in the Clipper file). Inferred reserves of 226,800 tons of 0.9 % Cu are reported in Gualtieri and others (1975) for the Clipper zone. Potential reserves from drilling in the Three Brothers zone are 1.8 million tons averaging 0.7%-0.9% Cu.

GEOLOGIC SETTING: The Clipper deposit is in the Snoqualmie batholith, northern phase granodiorite and tonalite with biotite and hornblende; locally it contains clinopyroxene. The rocks are light colored, medium crystalline, mostly equigranular with hypidiomorphic texture, and are coarsely jointed. The northern phase is about 25 m.y. old, on the basis of interpretation of numerous discordant K-Ar ages of both hornblende and biotite (Frizzell and others, 1984, p. 18).

COMMENTS: On the Last Chance claim, a 390-ft adit bearing N40W intersects mineralization from 265 to 310 ft; the area was stoped. On the Pedro claim, a 10-ft adit was driven in a 50-ft-wide mineralized zone. On the Katie Bell and Tracy claims, a 15-ft adit and a 100-plus-ft adit were driven. Both the patented and unpatented claims are owned (1990) by United Cascade Mining Company, Inc. Companies who have explored the deposit include Anaconda Copper Co., Howe Sound Co., Climax Molybdenum Corp., Anaconda Co., Bear Creek Mining Co., Cities Services Minerals Corp., Westland Mines Ltd., Natural Resources Development Corp., Houston Oil and Minerals, and Electras Resources.

UNPUBLISHED INFORMATION: Melrose, J. W., 1941, Mineralization of the area to be served by the Middle Fork of Snoqualmie River road. Carithers, Ward, 1942, Memorandum to Sheldon L. Glover. These reports are in DGER files.

REFERENCES

Frizzell, V. A., Jr.; Tabor, R. W.; Booth, D. B.; Ort, K. M.; Waitt, R. B., 1984, Preliminary geologic map of the Snoqualmie Pass 1:100,000 quadrangle, Washington: U.S. Geological Survey Open-File Report 84-693, 42 p., 1 pl.

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.

Gualtieri, J. L.; Thurber, H. K.; Miller, M. S.; McMahan, A. B.; Federspiel, F. F., 1975, Mineral resources of additions to the Alpine Lakes study area, Chelan, King, and Kittitas Counties, Washington: U.S. Geological Survey Open-File Report 75-3, 161 p., 2 pl.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Livingston, V. E., Jr., 1971, Geology and mineral resources of King County, Washington: Washington Division of Mines and Geology Bulletin 63, 200 p., 8 pl.

McIntyre, A. W., 1907, Copper deposits of Washington: American Mining Congress, 9th Annual Session, Report of Proceedings, p. 238-250.

Purdy, C. P., Jr., 1954, Molybdenum occurrences of Washington: Washington Division of Mines and Geology Report of Investigations 18, 118 p., 6 pl.

Western Miner, 1967, Westland Mines Ltd.: p. 128.

Condor-Hemlock (606)

ALTERNATE NAMES	DISTRICT	COUNTY
Condor Hemlock	Snoqualmie Burns	King

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Snoqualmie Pass Big Snow Mtn	1:62500 1:24,000	Snoqualmie Pass	Wenatchee

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
47° 29′ 48.08″ N	121° 21′ 36.74″ W	sec. 11, 23N, 11E

LOCATION: sec. 11, 23N, 11E

HOST ROCK: NAME	LITHOLOGY	AGE
Snoqualmie batholith, northern phase	granodiorite and tonalite	Miocene
Snoqualmie batholith	monzonite dike	Miocene

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
hypabyssal andesite dikes and plugs both pre- and post-ore	Tertiary

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Cu	chalcopyrite	quartz, pyrite, pyrrhotite,
Mo	molybdenite	chlorite; potassic alteration, silicification,
Au	covellite	sericite.
Ag	chalcocite	

DEPOSIT TYPE	MINERALIZATION AGE
veins fractures breccia pipe porphyry system	

PRODUCTION: No production has been recorded.

TECTONIC SETTING: Part of a northeast-trending belt of en echelon (NW-striking) faults, fractures, and breccia pipes defining a porphyry copper system.

ORE CONTROLS: The Condor-Hemlock is in a northwest-trending mineralized zone. The Condor is located at the center of the zone, and the Hemlock is located at the southeast end of the zone. The mineralization is in shear zones, along fractures, and in veins in granodiorite and tonalite. Hydrothermal alteration grades from propylitic at the surface to quartz-sericite-chlorite to K-feldspar predominating at depth. Pyrrhotite increases and pyrite decreases with depth. Secondary enrichment of covellite and chalcocite was found in a drill hole when the West Condor fault was intercepted between 151 ft and 203 ft. This 52-ft intercept averaged 1.66 % Cu, more than 1.0 oz/ton Ag, and $0.75 gold per ton (November 15, 1965 prices). The mineralized zone has a strike length of 1,000 feet, a thickness of 400 feet, and a depth of more than 400 feet. The Condor portion of the zone has potential reserves of 25-30 million tons averaging 0.616 % Cu and 0.032 % MoS2. Gold and silver values range from $0.40 to $1.25 per ton (October 1967 prices). The Hemlock zone (including part of another zone called the Porter and some adjacent zones) has been tested by 23 drill holes (total footage unknown) and three adits totalling 3,200 ft. By 1975, potential reserves of 91 million tons averaging 0.6-0.8% Cu and 0.02-0.05% MoS_2 in the combined Porter and Hemlock zones was indicated (Gualtieri and others, 1975).

GEOLOGIC SETTING: Of the numerous mineralized zones in the Middle Fork Snoqualmie system (Livingston, 1971, p. 152-153), the Condor-Hemlock contains the best demonstrated reserves. The deposit is open at depth (below 1,495 ft). The Condor-Hemlock zone is in the Snoqualmie batholith, northern phase granodiorite and tonalite that contains biotite and hornblende; locally it contains clinopyroxene. The rocks are light colored, medium crystalline, mostly equigranular with hypidiomorphic texture, and coarsely jointed. The northern phase is about 25 m.y. old, on the basis of interpretation of numerous discordant K-Ar ages of both hornblende and biotite (Frizzell and others, 1984, p. 18).

COMMENTS: Both patented and unpatented claims are owned (1990) by United Cascade Mining Company, Inc. The deposit was explored by Anaconda Copper Co., Howe Sound Co., Climax Molybdenum Corp., Anaconda Co., Bear Creek Mining Co., Cities Services Minerals Corp., Westland Mines Ltd., Natural Resources Development Corp., Houston Oil and Minerals, and Electras Resources.

UNPUBLISHED INFORMATION: Grant, Alan R., 1965, Preliminary report Middle Fork Snoqualmie area, eastern King County, Washington. This report is in DGER files.

REFERENCES

Frizzell, V. A., Jr.; Tabor, R. W.; Booth, D. B.; Ort, K. M.; Waitt, R. B., 1984, Preliminary geologic map of the Snoqualmie Pass 1:100,000 quadrangle, Washington: U.S. Geological Survey Open-File Report 84-693, 42 p., 1 pl.

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.

Gualtieri, J. L.; Thurber, H. K.; Miller, M. S.; McMahan, A. B.; Federspiel, F. F., 1975, Mineral resources of additions to the Alpine Lakes study area, Chelan, King, and Kittitas Counties, Washington: U.S. Geological Survey Open-File Report 75-3, 161 p., 2 pl.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Livingston, V. E., Jr., 1971, Geology and mineral resources of King County, Washington: Washington Division of Mines and Geology Bulletin 63, 200 p., 8 pl.

McIntyre, A. W., 1907, Copper deposits of Washington: American Mining Congress, 9th Annual Session, Report of Proceedings, p. 238-250.

Purdy, C. P., Jr., 1954, Molybdenum occurrences of Washington: Washington Division of Mines and Geology Report of Investigations 18, 118 p., 6 pl.

Western Miner, 1967, Westland Mines Ltd.: p. 128.

Coney Basin (598)

ALTERNATE NAMES		DISTRICT	COUNTY
		Miller River	King

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Grotto	1:24,000	Skykomish River	Wenatchee

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
47° 39′ 7.63″ N	121° 27′ 41.94″ W	N½ sec. 13, 25N, 10E and S½ sec. 19, 25N, 11E

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
Snoqualmie batholith	tonalite and granodiorite	Miocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au	chalcopyrite	pyrite, quartz, arsenopyrite
Ag	galena	
Cu	sphalerite	
Zn	tetrahedrite	
Pb	bournonite	

DEPOSIT TYPE	MINERALIZATION AGE
vein stockwork	

PRODUCTION: Produced 40 tons in 1895; also produced in 1934, 1937-39, and 1941 (Huntting, 1956, p. 127).

TECTONIC SETTING: The Snoqualmie batholith is part of early magmatism of the Cascade magmatic arc.

ORE CONTROLS: The deposit consists of small persistent quartz veinlets along joint planes in granodiorite. A silicified and mineralized zoneas much as 15 ft wide was also noted (Huntting, 1956, p. 127; Livingston, 1971, p. 164). Purdy (1951, p. 87), on the basis of the presence of antimony in an assay result, suggests that the probable antimony mineral is jamesonite, which is typical of other deposits in the area.

GEOLOGIC SETTING: The Coney Basin deposit is in rocks of the Snoqualmie batholith, northern phase, which consists of granodiorite and tonalite and is light colored, medium crystalline, and mostly equigranular and has hypidiomorphic texture. The rocks are coarsely jointed and contain biotite and hornblende and locally clinopyroxene. Age of the northern phase is about 25 m.y., based on interpretation of numerous discordant K-Ar ages of both hornblende and biotite (Tabor and others, 1982, p. 8).

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Purdy, C. P., Jr., 1951, Antimony occurrences of Washington: Washington Division of Mines and Geology Bulletin 39, 186 p.

Livingston, V. E., Jr., 1971, Geology and mineral resources of King County, Washington: Washington Division of Mines and Geology Bulletin 63, 200 p., 8 pl.

Moen, W. S., 1976, Silver occurrences of Washington: Washington Division of Geology and Earth Resources Bulletin 69, 188 p.

Tabor, R. W.; Frizzell, V. A., Jr.; Booth, D. B.; Whetten, J. T.; Waitt, R. B.; Zartman, R. E., 1982, Preliminary geologic map of the Skykomish River 1:100,000 quadrangle, Washington: U.S. Geological Survey Open-File Report 82-747, 31 p., 1 pl.

Damon and Pythias (596)

ALTERNATE NAMES		DISTRICT	COUNTY
Damon Pythias		Miller River Money Creek	King
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Mount Si	1:62,500	Skykomish River	Wenatchee

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
47° 41′ 54.21″ N	121° 31′ 33.79″ W	near center sec. 33, 26N, 10E

LOCATION: at the head of Money Creek

HOST ROCK: NAME	LITHOLOGY	AGE
Snoqualmie batholith	tonalite and granodiorite	Miocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au Ag Pb Cu Zn	chalcopyrite galena sphalerite tetrahedrite	arsenopyrite, pyrite, quartz, tourmaline, calcite

DEPOSIT TYPE	MINERALIZATION AGE
vein	

PRODUCTION: Shipped 23 tons prior to 1940 (Huntting, 1956, p. 127). Ore shipped averaged 0.87 oz/ton Au, 9 oz/ton Ag, and 4% Pb (Moen, 1976, p. 167).

TECTONIC SETTING: The Snoqualmie batholith is part of early magmatism of the Cascade magmatic arc.

ORE CONTROLS: Similar to the Apex mine. Consists of two veins, one averaging 3 ft wide over a distance of 900 ft (Huntting, 1956, p. 127).

GEOLOGIC SETTING: The Damon and Pythias mines are in rocks of the Snoqualmie batholith, northern phase, which consists of granodiorite and tonalite and is light colored, medium crystalline, and mostly equigranular and has hypidiomorphic texture. The rocks are coarsely jointed and contain biotite and hornblende and, locally, clinopyroxene. The age of the northern phase is about 25 m.y., based on interpretation of numerous discordant K-Ar ages of both hornblende and biotite (Tabor and others, 1982, p. 8).

COMMENTS: This property is adjacent to the Apex property. Coats (1932, p. 17-19) describes the geology of the veins in both mines. Because the mines were operated by the same company at the time of Coats' study, some production from the Damon may be included in Apex production figures.

REFERENCES

Coats, R. R., 1932, The ore deposits of the Apex gold mine, Money Creek, King County, Washington: University of Washington Master of Science thesis, 48 p., 2 pl.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Livingston, V. E., Jr., 1971, Geology and mineral resources of King County, Washington: Washington Division of Mines and Geology Bulletin 63, 200 p., 8 pl.

Moen, W. S., 1976, Silver occurrences of Washington: Washington Division of Geology and Earth Resources Bulletin 69, 188 p.

Patty, E. N., 1921, The metal mines of Washington: Washington Geological Survey Bulletin 23, 366 p.

Tabor, R. W.; Frizzell, V. A., Jr.; Booth, D. B.; Whetten, J. T.; Waitt, R. B.; Zartman, R. E., 1982, Preliminary geologic map of the Skykomish River 1:100,000 quadrangle, Washington: U.S. Geological Survey Open-File Report 82-747, 31 p., 1 pl.

Dutch Miller (592)

ALTERNATE NAMES		DISTRICT	COUNTY
		Snoqualmie	King
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Mount Daniel	1:24,000	Skykomish River	Wenatchee

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
47° 33′ 32.65″ N	121° 14′ 19.34″ W	NE¼ sec. 20, 24N, 13E

LOCATION: at the head of the Middle Fork Snoqualmie River

HOST ROCK: NAME	LITHOLOGY	AGE
Snoqualmie batholith	tonalite and granodiorite	Miocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Cu Au Ag	chalcopyrite tetrahedrite galena sphalerite	arsenopyrite, pyrite, quartz, tourmaline, siderite, pink chlorite

DEPOSIT TYPE	MINERALIZATION AGE
vein breccia zone porphyry system	

PRODUCTION: Several shipments prior to 1901 (Huntting, 1956, p. 57).

TECTONIC SETTING: The Snoqualmie batholith is part of early magmatism of the Cascade magmatic arc.

ORE CONTROLS: Consists of three parallel, en echelon veins in granodiorite (Huntting, 1956, p. 57). Landes and others (1902, p. 86) report the ore vein has a maximum width of 18½ ft. The presence of tourmaline and the proximity to an area of extensively explored porphyry copper mineralization (Clipper zone about 5 mi to the southwest) suggest this may be similar mineralization.

GEOLOGIC SETTING: The Snoqualmie batholith, northern phase, consists of granodiorite and tonalite with biotite and hornblende: it is medium crystalline and mostly equigranular and has hypidiomorphic texture. It locally contains clinopyroxene It is light-colored, coarsely jointed rock. The age of the northern phase is about 25 m.y., based on interpretation of numerous discordant K-Ar ages of both hornblende and biotite (Tabor and others, 1982, p. 8).

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 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.

Landes, Henry; Thyng, W. S.; Lyon, D. A.; Roberts, Milnor, 1902, Annual report for 1901, in six parts; Part II-The metalliferous resources of Washington, except iron: Washington Geological Survey, 123 p.

Livingston, V. E., Jr., 1971, Geology and mineral resources of King County, Washington: Washington Division of Mines and Geology Bulletin 63, 200 p., 8 pl.

Tabor, R. W.; Frizzell, V. A., Jr.; Booth, D. B.; Whetten, J. T.; Waitt, R. B.; Zartman, R. E., 1982, Preliminary geologic map of the Skykomish River 1:100,000 quadrangle, Washington: U.S. Geological Survey Open-File Report 82-747, 31 p., 1 pl.

Grand Central (590)

ALTERNATE NAMES		DISTRICT	COUNTY
		Money Creek	King

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Grotto	1:24,000	Skykomish River	Wenatchee

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
47° 42′ 26.67″ N	121° 25′ 43.09″ W	sec. 29, 26N, 11E

LOCATION: south of Money Creek. A more exact location is not available; however, the Grand Central may be part of a block of patented claims in the SW¼SW¼ sec. 29; SE¼ sec. 30; E½ sec. 31; W½ sec. 32.

HOST ROCK: NAME	LITHOLOGY	AGE
Swauk Formation, Silver Pass Volcanic member	andesitic breccia	Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Sb Au	stibnite	pyrite, calcite, quartz

DEPOSIT TYPE	MINERALIZATION AGE
vein	

PRODUCTION: Produced in 1908 (Huntting, 1956, p. 17).

TECTONIC SETTING: The Grand Central mine is located in a volcanic member of the Swauk Formation, which is early Eocene (52 m.y.) and pre-Cascade arc magmatism (Tabor 1982, geol. map, p. 13).

ORE CONTROLS: Stibnite is present in the upper workings of the mine. Narrow veinlets of quartz, pyrite, and calcite were observed on the lower level of the mine (Smith, 1915, p. 171, 185). These veinlets occur in a 40-ft-wide zone in andesite (Livingston, 1971, p. 157).

GEOLOGIC SETTING: The mine is in andesite of the Silver Pass Volcanic member of the Swauk Formation (Tabor and others, 1982, geol. map, p. 13). It is also at the contact between shales and andesite (Smith, 1913, p. 32-33).

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Livingston, V. E., Jr., 1971, Geology and mineral resources of King County, Washington: Washington Division of Mines and Geology Bulletin 63, 200 p., 8 pl.

Smith, W. S., 1913, The geology and mineral resources of north-eastern King County, Washington: Columbia University Master of Arts thesis, 35 p., 1 pl.

Smith, W. S., 1915, Petrology and economic geology of the Skykomish Basin, Washington: Columbia University School of Mines Quarterly, v. 36, no. 2, p. 154-185.

Tabor, R. W.; Frizzell, V. A., Jr.; Booth, D. B.; Whetten, J. T.; Waitt, R. B.; Zartman, R. E., 1982, Preliminary geologic map of the Skykomish River 1:100,000 quadrangle, Washington: U.S. Geological Survey Open-File Report 82-747, 31 p., 1 pl.

Great Republic (591)

ALTERNATE NAMES		DISTRICT	COUNTY
Happy Thought		Miller River	King
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Grotto	1:24,000	Skykomish River	Wenatchee

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
47° 41′ 54.75″ N	121° 24′ .10″ W	N½SW¼ sec. 33, 26N, 11E

LOCATION: at the first falls on Happy Thought Creek about one-half mi from the Miller River

HOST ROCK: NAME	LITHOLOGY	AGE
Swauk Formation, Silver Pass Volcanic member	andesitic breccia	Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Sb Au Ag	stibnite	pyrite, quartz, calcite, sericite, kaolinite, argillic alteration minerals

DEPOSIT TYPE	MINERALIZATION AGE
vein	

PRODUCTION: Produced 1938-1941 (Huntting, 1956, p. 17).

TECTONIC SETTING: The Great Republic mine is in a volcanic member of the Swauk Formation, which is early Eocene (52 m.y.) and pre-Cascade magmatic arc (Tabor and others, 1982, geol. map, p. 13).

ORE CONTROLS: The best mineralization occurs along a gently dipping fault in andesite (Purdy, 1951, p. 75). Stibnite and pyrite are present in a quartz, calcite, and andesite gangue (Livingston, 1971, p. 157).

GEOLOGIC SETTING: Mineralization occurs in the Silver Pass Volcanic member of the Swauk Formation. The volcanic member consists of rhyolitic to andesitic breccia and feldspar porphyry (Tabor and others, 1982, p. 13).

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Livingston, V. E., Jr., 1971, Geology and mineral resources of King County, Washington: Washington Division of Mines and Geology Bulletin 63, 200 p., 8 pl.

Purdy, C. P., Jr., 1951, Antimony occurrences of Washington: Washington Division of Mines and Geology Bulletin 39, 186 p.

Tabor, R. W.; Frizzell, V. A., Jr.; Booth, D. B.; Whetten, J. T.; Waitt, R. B.; Zartman, R. E., 1982, Preliminary geologic map of the Skykomish River 1:100,000 quadrangle, Washington: U.S. Geological Survey Open-File Report 82-747, 31 p., 1 pl.

Guye (601)

ALTERNATE NAMES	DISTRICT	COUNTY
Mt. Logan Summit	Snoqualmie	King

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Snoqualmie Pass	62500	Snoqualmie Pass	Wenatchee

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
47° 26′ 45.10″ N	121° 25′ 11.57″ W	secs. 28, 32, and 33, 23N, 11E

LOCATION: about a mile north of Snoqualmie Pass

HOST ROCK: NAME	LITHOLOGY	AGE
Naches Formation, Guye Sedimentary Member	sandstone, shale, and conglomerate	Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Fe	magnetite	pyrite, garnet
Pb	galena	
Zn	sphalerite	
Ag		
Au		

DEPOSIT TYPE	MINERALIZATION AGE
contact metamorphic	

PRODUCTION: Deposit has been extensively explored (Huntting, 1956, p. 196).

TECTONIC SETTING: The Snoqualmie batholith complex is part of early magmatism of the Cascade magmatic arc. Mineralization probably occurred during emplacement of a later phase of the batholith.

ORE CONTROLS: Where granodiorite is in contact with limestone, the limestone is recrystallized to marble and partially replaced by garnet and magnetite (Shedd and others, 1922, p. 90-92). A vein near the center of one of the claims, reported to be 6 ft wide, contains abundant galena and sphalerite (Huntting, 1956, p. 196).

GEOLOGIC SETTING: At the Guye mine, limestone and conglomerate of the Guye Sedimentary Member of the Naches Formation (Frizzell and others, 1984, geol. map) was intruded by granodiorite of the Snoqualmie batholith (Shedd and others, 1922, p. 90-92).

REFERENCES

Frizzell, V. A., Jr.; Tabor, R. W.; Booth, D. B.; Ort, K. M.; Waitt, R. B., 1984, Preliminary geologic map of the Snoqualmie Pass 1:100,000 quadrangle, Washington: U.S. Geological Survey Open-File Report 84-693, 42 p., 1 pl.

Glover, S. L., 1942, Washington iron ores, a summary report: Washington Division of Mines and Mining Report of Investigations 2, 23 p. Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Shedd, Solon, 1924, The mineral resources of Washington with statistics for 1922; with an article on coal and coke, by G. W. Evans: Washington Division of Geology Bulletin 30, 224 p.

Shedd, Solon; Jenkins, O. P.; Cooper, H. H., 1922, Iron ores, fuels, and fluxes of Washington: Washington Division of Geology Bulletin 27, 160 p., 1 pl.

Quartz Creek (599)

ALTERNATE NAMES	DISTRICT	COUNTY
Rainy Western States Copper	Taylor River Snoqualmie	King

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Mount Si	1:62,500	Skykomish River	Wenatchee

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
47° 34′ 14.34″ N	121° 33′ 15.86″ W	NW¼ sec. 16, SW¼ sec. 9, 24N, 10E

LOCATION: on Quartz Creek

HOST ROCK: NAME	LITHOLOGY	AGE
Snoqualmie batholith	tonalite and granodiorite	Miocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Cu Mo Au Ag	chalcopyrite brannerite molybdenite scheelite	pyrite, pyrrhotite, arsenopyrite, quartz, tourmaline

DEPOSIT TYPE	MINERALIZATION AGE
breccia pipe stockwork porphyry copper	

PRODUCTION: One load of concentrates shipped to Tacoma in 1952. Also produced 1953-1955 (Huntting, 1956, p. 129). Concentrates shipped to smelter in 1942 (Livingston, 1971, p. 161). Reportedly produced 2,000 tons of ore between 1951 and 1957 and a flotation mill was constructed on the property (Report of Mineral Examination for 28 unpatented mineral claims of the Rainy property)

TECTONIC SETTING: The Snoqualmie batholith is part of early magmatism of the Cascade magmatic arc.

ORE CONTROLS: The property consists of two mineralized breccia pipes, called the east and west areas. The west pipe is the area of the old Rainy mine, and the east pipe is located about 800 ft to the east (Grant, 1969, p. 79-81). Grant also reports (p. 81) two rocks types are directly related to zones with proportionately higher contents of sulfide minerals, biotite-quartz diorite replacement breccias, and a syenite-quartz monzonite-granite complex. He believes the replacement breccias are products of deuteric alteration and the syenite-quartz monzonite-granite complex rocks occur as matrix material within breccia blocks. The following description of the ore bodies is from Livingston (1971, p. 149, as obtained by personal commun. with A. R. Grant). The east pipe's surface dimension is about 300 by 600 ft, and it consists of fragments of quartz diorite that contain secondary biotite and a matrix of quartz and minor sulfide. The breccia is composed of angular fragments that range from a few inches to several feet long. The sulfides are scattered in breccia fragments and along fractures, and sulfides are generally finely divided in less mineralized parts of the pipe. Vugs range up to 2 in. and are lined with quartz. Quartz is much less abundant in more sulfide-rich parts of the pipe. The west zone is a zone of shattering and contains quartz veins along west-trending fractures. Sulfides are present in the quartz veins and as disseminations in the country rock.

GEOLOGIC SETTING: The Quartz Creek deposit is in rocks of the Snoqualmie batholith, northern phase, which consists of granodiorite and tonalite and is light colored, medium crystalline, and mostly equigranular and has hypidiomorphic texture. The rocks are coarsely jointed and contain biotite and hornblende and, locally, clinopyroxene. The age of the northern phase is about 25 m.y., based on interpretation of numerous discordant K-Ar ages of both hornblende and biotite (Tabor and others, 1982, p. 8).

COMMENTS: An annual report for Inland Copper Ltd. reports the Quartz Creek property has an indicated reserve of 56,000 tons grading 5.5% Cu and 2.5 oz/ton Ag, or 905,000 tons of material averaging 1.1% Cu.

REFERENCES

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.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Livingston, V. E., Jr., 1971, Geology and mineral resources of King County, Washington: Washington Division of Mines and Geology Bulletin 63, 200 p., 8 pl.

Royal Reward (604)

ALTERNATE NAMES		DISTRICT	COUNTY
			King
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Cumberland	1:24,000	Snoqualmie Pass	Wenatchee

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
47° 19′ .83″ N	121° 55′ 54.77″ W	NW¼SW¼SW¼ sec. 9, or SE¼ SE¼ sec. 8, 21N, 7E

LOCATION: on a small terrace on the south bank of the Green River

HOST ROCK: NAME	LITHOLOGY	AGE
Puget Group	sandstone, carbonaceous shale, coal	Eocene

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
andesite dike	

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Hg	cinnabar	There are no reported alteration or gangue minerals.
As	orpiment	
Sb	realgar	
	stibnite	

DEPOSIT TYPE	MINERALIZATION AGE
vein disseminated	

PRODUCTION: The property produced about 20 flasks of mercury (Livingston, 1971, p. 154).

TECTONIC SETTING: The Eocene rocks were extensively folded and faulted prior to deposition of the cinnabar (Livingston, 1971, 153-154).

ORE CONTROLS: Two sets of faults cut the folded rocks; mineralization is present along both sets of faults. Cinnabar mineralization occurs in pods and disseminations in the fault breccia. Stibnite is common in the nearby Cardinal Reward property (Rice, 1962, private report in DGER files).

GEOLOGIC SETTING: The Puget Group consists of predominantly fluvial and some nearshore marine sandstone, siltstone, claystone, and coal (Frizzell and others, 1984, p. 26). Much of the mineralization occurs at the contact between sandstone and carbonaceous claystone (Rice, 1962, private report).

UNPUBLISHED INFORMATION: Rice, W. L., 1962, Summary of the geology and mineralization of the Cardinal Reward and Royal Reward mines, King County, Washington: Private Report for Northern Pacific Railway Company, 3 p. Livingston, V. E., 1957, Memorandum report on the 1957 examination of the Royal Reward mine, 3 p. These reports are in DGER files.

REFERENCES

Frizzell, V. A., Jr.; Tabor, R. W.; Booth, D. B.; Ort, K. M.; Waitt, R. B., 1984, Preliminary geologic map of the Snoqualmie Pass 1:100,000 quadrangle, Washington: U.S. Geological Survey Open-File Report 84-693, 42 p., 1 pl.

Livingston, V. E., Jr., 1971, Geology and mineral resources of King County, Washington: Washington Division of Mines and Geology Bulletin 63, 200 p., 8 pl.

Seattle-Cascade (603)

ALTERNATE NAMES	DISTRICT	COUNTY
Triple S Silver Dollar Copper Plate Silver Dollar and Copper Plate	Miller River	King

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Grotto	1:24,000	Skykomish River	Wenatchee

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
47° 40′ 5.85″ N	121° 25′ 5.50″ W	center of the N½ sec. 17, 25N, 11E

LOCATION: west of the Miller River

HOST ROCK: NAME	LITHOLOGY	AGE
Snoqualmie batholith	tonalite and granodiorite	Miocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Ag Pb Zn Cu Au	galena sphalerite chalcopyrite	pyrite, arsenopyrite, quartz

DEPOSIT TYPE	MINERALIZATION AGE
mineralized shear zone vein	

PRODUCTION: Minor production prior to 1900; produced again in 1940 (Huntting, 1956, p. 297).

TECTONIC SETTING: The Snoqualmie batholith is part of early magmatism of the Cascade magmatic arc.

ORE CONTROLS: Mineralization occurs in a 1.5-ft-wide shear zone in granodiorite, in bands as much as 8 in. thick and which assay as much as 30 oz/ton Ag (Moen, 1976, p. 167).

GEOLOGIC SETTING: The Seattle-Cascade mine is in rocks of the Snoqualmie batholith, northern phase, which consists of granodiorite and tonalite and is light colored, medium crystalline, and mostly equigranular and has hypidiomorphic texture. The rocks are coarsely jointed and contain biotite and hornblende and, locally, clinopyroxene. The age of the northern phase is about 25 m.y. ,based on interpretation of numerous discordant K-Ar ages of both hornblende and biotite (Tabor and others, 1982, p. 8).

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Livingston, V. E., Jr., 1971, Geology and mineral resources of King County, Washington: Washington Division of Mines and Geology Bulletin 63, 200 p., 8 pl.

Moen, W. S., 1976, Silver occurrences of Washington: Washington Division of Geology and Earth Resources Bulletin 69, 188 p.

Tabor, R. W.; Frizzell, V. A., Jr.; Booth, D. B.; Whetten, J. T.; Waitt, R. B.; Zartman, R. E., 1982, Preliminary geologic map of the Skykomish River 1:100,000 quadrangle, Washington: U.S. Geological Survey Open-File Report 82-747, 31 p., 1 pl.

Snoqualmie (593)

ALTERNATE NAMES		DISTRICT	COUNTY
		Miller River	King
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Grotto	1:24,000	Skykomish River	Wenatchee

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
47° 38′ 40.73″ N	121° 29′ 17.61″ W	secs. 14 and 23, 25N, 10E

LOCATION: topographic map shows mines in the SE¼ sec. 14 and the NE¼ sec. 23. Location selected is the two portals in sec. 14

HOST ROCK: NAME	LITHOLOGY	AGE
Snoqualmie batholith	tonalite and granodiorite	Miocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Cu	chalcopyrite	pyrite

DEPOSIT TYPE	MINERALIZATION AGE
vein	

PRODUCTION: Produced in 1925 (Huntting, 1956, p. 59).

TECTONIC SETTING: The Snoqualmie batholith is part of early magmatism of the Cascade magmatic arc.

ORE CONTROLS: Gash veins are present in granodiorite. Some high-grade ore came from the No. 6 vein (Huntting, 1956, p. 59).

GEOLOGIC SETTING: The Snoqualmie batholith, northern phase, is granodiorite and tonalite with biotite and hornblende. It is medium crystalline, mostly equigranular, and hypidiomorphic. It locally contains clinopyroxene. It is light-colored, coarsely jointed rock. The age of the northern phase is about 25 m. y., based on interpretation of numerous discordant K-Ar ages of both hornblende and biotite (Tabor and others, 1982, p. 8).

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Livingston, V. E., Jr., 1971, Geology and mineral resources of King County, Washington: Washington Division of Mines and Geology Bulletin 63, 200 p., 8 pl.

Tabor, R. W.; Frizzell, V. A., Jr.; Booth, D. B.; Whetten, J. T.; Waitt, R. B.; Zartman, R. E., 1982, Preliminary geologic map of the Skykomish River 1:100,000 quadrangle, Washington: U.S. Geological Survey Open-File Report 82-747, 31 p., 1 pl.

Una (567)

ALTERNATE NAMES	DISTRICT	COUNTY
John Stevens Little Una	Miller River	King

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Grotto	1:24,000	Skykomish River	Wenatchee

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
47° 39′ 32.44″ N	121° 24′ 51.54″ W	SE¼ sec. 17, 25N, 11E

LOCATION: on the West Fork Miller River

HOST ROCK: NAME	LITHOLOGY	AGE
Snoqualmie batholith	tonalite and granodiorite	Miocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Cu Ag Au	malachite chalcopyrite	tourmaline

DEPOSIT TYPE	MINERALIZATION AGE
vein breccia pipe	

PRODUCTION: Produced in 1908 (Huntting, 1956, p. 59).

TECTONIC SETTING: The Snoqualmie batholith is part of early magmatism of the Cascade magmatic arc.

ORE CONTROLS: A 20-ft body of tourmaline at the Una mine is described by Smith (1915, p. 184-185). The brief description suggests the tourmaline is massive crystalline, but may also be a portion of a breccia pipe.

GEOLOGIC SETTING: The Una mine is in rocks of the Snoqualmie batholith, northern phase, which consists of granodiorite and tonalite and is light colored, medium crystalline, and mostly equigranular and has hypidiomorphic texture. The rocks are coarsely jointed and contain biotite and hornblende and, locally, clinopyroxene. The age of the northern phase is about 25 m.y., based on interpretation of numerous discordant K-Ar ages of both hornblende and biotite (Tabor and others, 1982, p. 8).

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Livingston, V. E., Jr., 1971, Geology and mineral resources of King County, Washington: Washington Division of Mines and Geology Bulletin 63, 200 p., 8 pl.

Smith, W. S., 1915, Petrology and economic geology of the Skykomish Basin, Washington: Columbia University School of Mines Quarterly, v. 36, no. 2, p. 154-185.

Tabor, R. W.; Frizzell, V. A., Jr.; Booth, D. B.; Whetten, J. T.; Waitt, R. B.; Zartman, R. E., 1982, Preliminary geologic map of the Skykomish River 1:100,000 quadrangle, Washington: U.S. Geological Survey Open-File Report 82-747, 31 p., 1 pl.

Boulder Creek (567)

ALTERNATE NAMES		DISTRICT	COUNTY
Burke			Kittitas
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Kachess Lake	1:62,500	Snoqualmie Pass	Wenatchee
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
47° 26′ 18.00″ N	121° 2′ 31.22″ W	SE¼NE¼ sec 35, 23N, 14E	

LOCATION: on the west slope of Mt. Hawkins

HOST ROCK: NAME	LITHOLOGY	AGE
Ingalls Complex	serpentinite	Jurassic

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Cr	chromite	serpentine

DEPOSIT TYPE	MINERALIZATION AGE
podiform chromite	Jurassic

PRODUCTION: Together with ore from the Mount Hawkins mine, one carload of ore was shipped (Huntting, 1956, p. 37).

TECTONIC SETTING: The Ingalls Complex is an ophiolite complex (Miller, 1985, p. 27).

ORE CONTROLS: Chromite is present as small lenses in serpentinized peridotite (Huntting, 1956, p. 37). The chromite originated as a magmatic segregation in peridotite.

GEOLOGIC SETTING: The Ingalls Complex is an ophiolite complex of Middle to Late Jurassic age (Miller, 1985, p. 27-42).

REFERENCES

Frizzell, V. A., Jr.; Tabor, R. W.; Booth, D. B.; Ort, K. M.; Waitt, R. B., 1984, Preliminary geologic map of the Snoqualmie Pass 1:100,000 quadrangle, Washington: U.S. Geological Survey Open-File Report 84-693, 42 p., 1 pl.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Miller, R. B., 1985, The ophiolitic Ingalls Complex, north-central Cascade mountains, Washington: Geological Society of America Bulletin, v. 96, no. 1, p. 27-42.

Boulder Creek placer (584)

ALTERNATE NAMES		DISTRICT	COUNTY
		Swauk	Kittitas
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Liberty	1:24,000	Wenatchee	Wenatchee

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
47° 15′ 16.15″ N	120° 39′ 27.21″ W	sec. 1, 20N, 17E

LOCATION: at the junction of Boulder and Williams Creeks

HOST ROCK: NAME	LITHOLOGY	AGE
Quaternary alluvium	sand and gravel	Quaternary

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au	gold	sand and gravel.

DEPOSIT TYPE	MINERALIZATION AGE
placer	Quaternary

PRODUCTION: Considerable production (Huntting, 1956, p. 185).

TECTONIC SETTING: Deposition of heavy minerals in river gravels.

ORE CONTROLS: Heavy-mineral concentration by stream action.

REFERENCE

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Cascade Chief (572)

ALTERNATE NAMES	DISTRICT	COUNTY
Morrison First of August Gladstone	Swauk	Kittitas

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Liberty	1:24,000	Wenātchee	Wenatchee

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
47° 16′ 52.98″ N	120° 38′ 18.14″ W	SE¼SW¼ sec. 26, 21N, 17E

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
Swauk Formation	feldspathic to lithofeldspathic sandstone	Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au	gold	quartz, calcite, talcose mineral

DEPOSIT TYPE	MINERALIZATION AGE
mineralized shear zones vein	

PRODUCTION: Produced in 1911, 1938, and 1939 (Huntting, 1956, p. 131).

TECTONIC SETTING: Quartz veins of the Swauk district are subparallel to north-northeast-trending basalt dikes in the area. The veins also cut some basalt dikes (Smith, 1904, p. 9).

ORE CONTROLS: Gold-quartz veins in the Swauk district are subparallel to numerous basalt dikes of the region (Smith, 1903, p. 80). At the Cascade Chief mine, stringers of mineralized quartz occur in three shear zones that average 4 ft wide in sandstone (Huntting, 1956, p. 131).

GEOLOGIC SETTING: Eocene sandstone of the Swauk Formation is cut by numerous basalt dikes and gold-quartz veins. The gold-quartz veins appear to be localized along the same fracture system as the dikes.

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Smith, G. O., 1903, Gold mining in central Washington. *In* Contributions to economic geology, 1902: U.S. Geological Survey Bulletin 213, p. 76-80.

Smith, G. O., 1904, Geological atlas of the United States—Mount Stuart folio, Washington: U.S. Geological Survey Geologic Folio 106, 10 p.

Tabor, R. W.; Waitt, R. B.; Frizzell, V. A., Jr.; Swanson, D. A.; Byerly, G. R.; Bentley, R. D., 1982, Geologic map of the Wenatchee 1:100,000 quadrangle, central Washington: U.S. Geological Survey Miscellaneous Investigations Series Map I-1311, 1 sheet, scale 1:100,000, with 26 p. text.

Clarence Jordin (573)

ALTERNATE NAMES		DISTRICT	COUNTY
Gold King		Swauk	Kittitas
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Liberty	1:24,000	Wenatchee	Wenatchee
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
47° 15′ 21.92″ N	120° 38′ 42.08″ W	sec. 2, 20N, 17E	

LOCATION: on Snowshoe Ridge

HOST ROCK: NAME	LITHOLOGY	AGE
Swauk Formation	feldspathic to lithofeldspathic sandstone	Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au	gold	quartz, calcite

DEPOSIT TYPE: vein

MINERALIZATION AGE

PRODUCTION: Reported $35,000 production. Produced from the Ace of Diamonds claim in 1952 (Huntting, 1956, p. 131).

TECTONIC SETTING: Quartz veins of the Swauk district are subparallel to north-northeast-trending basalt dikes in the area. The veins also cut some basalt dikes (Smith, 1904, p. 9).

ORE CONTROLS: Gold-quartz veins in the Swauk district are subparallel to numerous basalt dikes of the region (Smith, 1903, p. 80).

GEOLOGIC SETTING: Eocene sandstone of the Swauk Formation is cut by numerous basalt dikes and gold-quartz veins. The gold-quartz veins appear to be localized along the same fracture system as the dikes.

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Smith, G. O., 1903, Gold mining in central Washington. *In* Contributions to economic geology, 1902: U.S. Geological Survey Bulletin 213, p. 76-80.

Smith, G. O., 1904, Geological atlas of the United States—Mount Stuart folio, Washington: U.S. Geological Survey Geologic Folio 106, 10 p.

Tabor, R. W.; Waitt, R. B.; Frizzell, V. A., Jr.; Swanson, D. A.; Byerly, G. R.; Bentley, R. D., 1982, Geologic map of the Wenatchee 1:100,000 quadrangle, central Washington: U.S. Geological Survey Miscellaneous Investigations Series Map I-1311, 1 sheet, scale 1:100,000, with 26 p. text.

Cle Elum River Iron (581)

ALTERNATE NAMES	DISTRICT	COUNTY
Cle Elum River, north deposit Cle Elum River, south deposit Balfour Guthrie		Kittitas

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Kachess Lake	1:62,500	Snoqualmie Pass	Wenatchee

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
47° 25′ 53.42″ N	121° 3′ 16.25″ W	secs. 26, 34, and 35, 23N, 14E and SE¼ and NW¼ sec. 1; N½ sec. 2; and E½ sec. 3, 22N, 14E

LOCATION: on both sides of the Cle Elum River

HOST ROCK: NAME	LITHOLOGY	AGE
Ingalls Complex	serpentinite	Jurassic
Swauk Formation	sandstone and shale	Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Fe	magnetite	serpentine and other weathered residuum from serpentinized peridotite
Ni	hematite	
Cr	millerite	
	chrome spinel	
	garnierite	

DEPOSIT TYPE	MINERALIZATION AGE
residual deposit	

PRODUCTION: There is no recorded production, but drilling (average from 52 holes) indicates a reserve of 6.25 million tons of 40.82% Fe, 0.83% Ni, and 2.4% Cr_2O_3 (Huntting, 1956, p. 197).

TECTONIC SETTING: The Eocene Swauk Formation was deposited on tectonically emplaced, serpentinized Ingalls Complex.

ORE CONTROLS: Weathering of serpentinized peridotite prior to deposition of the Eocene Swauk Formation. The iron minerals derived from the peridotite remain in the residuum on the peridotite and in the basal beds of the Swauk Formation overlying and flanking the peridotite (Shedd and others, 1922, p. 77-79).

GEOLOGIC SETTING: Iron minerals are concentrated at the serpentinized peridotite-Swauk Formation contact.

REFERENCES

Broughton, W. A., 1944, Economic aspects of the Blewett-Cle Elum iron ore zone, Chelan and Kittitas Counties, Washington: Washington Division of Geology Report of Investigations 12, 42 p., 7 pl.

Frizzell, V. A., Jr.; Tabor, R. W.; Booth, D. B.; Ort, K. M.; Waitt, R. B., 1984, Preliminary geologic map of the Snoqualmie Pass 1:100,000 quadrangle, Washington: U.S. Geological Survey Open-File Report 84-693, 42 p., 1 pl.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Shedd, Solon; Jenkins, O. P.; Cooper, H. H., 1922, Iron ores, fuels, and fluxes of Washington: Washington Division of Geology Bulletin 27, 160 p., 1 pl.

Dolphin (570)

ALTERNATE NAMES		DISTRICT	COUNTY
Bonanza			Kittitas
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Mount Stuart	1:24,000	Wenatchee	Wenatchee

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
47° 26′ 41.54″ N	120° 58′ 40.52″ W	sec. 33, 23N, 13E

LOCATION: on the southeast slope of Hawkins Mountain. The adit shown on the topographic map in the N½ of the section is assumed to be the location of the mine.

HOST ROCK: NAME	LITHOLOGY	AGE
Ingalls Complex	serpentinite	Jurassic

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Cu Ag Au Co	chalcopyrite	pyrite, serpentine, quartz

DEPOSIT TYPE	MINERALIZATION AGE
silicified zone	

PRODUCTION: Produced in 1905 and again in 1907 about 5 tons of ore (Huntting, 1956, p. 60).

TECTONIC SETTING: The Ingalls Complex was accreted to the North American continent in the late Mesozoic (Miller, 1985, p. 27-42).

ORE CONTROLS: The deposit consists of a silicified zone as much as 50 ft wide in serpentinite (Huntting, 1956, p. 60). The deposit consists of copper and iron sulfides and could be a magmatic segregation deposit.

GEOLOGIC SETTING: The Ingalls Complex is an ophiolite complex of Middle to Late Jurassic age (Miller, 1985, p. 27-42).

REFERENCES

Frizzell, V. A., Jr.; Tabor, R. W.; Booth, D. B.; Ort, K. M.; Waitt, R. B., 1984, Preliminary geologic map of the Snoqualmie Pass 1:100,000 quadrangle, Washington: U.S. Geological Survey Open-File Report 84-693, 42 p., 1 pl.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Miller, R. B., 1985, The ophiolitic Ingalls Complex, north-central Cascade mountains, Washington: Geological Society of America Bulletin, v. 96, no. 1, p. 27-42.

Esther and Louisa (583)

ALTERNATE NAMES		DISTRICT	COUNTY
		Gold Creek	Kittitas
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Snoqualmie Pass	1:62,500	Snoqualmie Pass	Wenatchee
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
47° 27′ 38.69″ N	121° 19′ 16.51″ W	N½NE¼ sec. 27, 23N, 12E	

LOCATION: on the east side of a cirque at the head of Gold Creek

HOST ROCK: NAME	LITHOLOGY	AGE
Naches Formation	andesite flows	Eocene
ASSOCIATED IGNEOUS ROCK: DESCRIPTION		AGE
granodiorite		Miocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Ag	pyrargyrite	pyrite, quartz
Au	galena	
Pb	sphalerite	
Zn		

DEPOSIT TYPE	MINERALIZATION AGE
vein	

PRODUCTION: Produced about $1,000 in 1896 (Huntting, 1956, p. 298).

TECTONIC SETTING: The Miocene igneous activity is part of the initial stages of Cascade magmatic arc development.

ORE CONTROLS: Ore is sporadically distributed but is locally of high grade in the vein (Huntting, 1956, p. 298; Moen, 1976, p. 142-143).

GEOLOGIC SETTING: The vein occurs near a wide granodiorite dike (Huntting, 1956, p. 298), which probably is part of the nearby Snoqualmie batholith (Tabor and others, 1982, geol. map).

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Moen, W. S., 1976, Silver occurrences of Washington: Washington Division of Geology and Earth Resources Bulletin 69, 188 p.

Tabor, R. W.; Waitt, R. B.; Frizzell, V. A., Jr.; Swanson, D. A.; Byerly, G. R.; Bentley, R. D., 1982, Geologic map of the Wenatchee 1:100,000 quadrangle, central Washington: U.S. Geological Survey Miscellaneous Investigations Series Map I-1311, 1 sheet, scale 1:100,000, with 26 p. text.

Flodine (576)

ALTERNATE NAMES		DISTRICT	COUNTY
		Swauk	Kittitas
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Liberty	1:24,000	Wenatchee	Wenatchee
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
47° 16′ 52.88″ N	120° 38′ 21.59″ W	sec. 25, 21N, 17E, and sec. 30, 21N, 18E	

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
Swauk Formation	feldspathic to lithofeldspathic sandstone	Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au	gold	pyrite, quartz

DEPOSIT TYPE	MINERALIZATION AGE
fissure zone vein	

PRODUCTION: Produced several thousand dollars of gold from the oxidized zone prior to 1928 (Huntting, 1956, p. 132).

TECTONIC SETTING: Quartz veins of the Swauk district are subparallel to north-northeast-trending basalt dikes in the area. The veins also cut some basalt dikes (Smith, 1904, p. 9).

ORE CONTROLS: Gold-quartz veins in the Swauk district are subparallel to numerous basalt dikes of the region (Smith, 1903, p. 80). Mineralization at the Flodine deposit is in a fissure zone (Huntting, 1956, p. 132).

GEOLOGIC SETTING: Eocene sandstone of the Swauk Formation is cut by numerous dikes and gold-quartz veins. The gold-quartz veins appear to be localized along the same fracture system as the dikes.

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Smith, G. O., 1903, Gold mining in central Washington. *In* Contributions to economic geology, 1902: U.S. Geological Survey Bulletin 213, p. 76-80.

Smith, G. O., 1904, Geological atlas of the United States—Mount Stuart folio, Washington: U.S. Geological Survey Geologic Folio 106, 10 p.

Tabor, R. W.; Waitt, R. B.; Frizzell, V. A., Jr.; Swanson, D. A.; Byerly, G. R.; Bentley, R. D., 1982, Geologic map of the Wenatchee 1:100,000 quadrangle, central Washington: U.S. Geological Survey Miscellaneous Investigations Series Map I-1311, 1 sheet, scale 1:100,000, with 26 p. text.

Francis Virdin Park (588)

ALTERNATE NAMES		DISTRICT	COUNTY
		Swauk	Kittitas

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Swauk Pass	1:24,000	Wenatchee	Wenatchee

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
47° 16′ 11.50″ N	120° 36′ 37.47″ W	NW¼ sec. 32, 21N, 18E

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
Swauk Formation	feldspathic to lithofeldspathic sandstone	Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au Ag	gold	quartz, calcite

DEPOSIT TYPE	MINERALIZATION AGE
silicified zone vein	

PRODUCTION: A small washing plant is currently (1990) operating. The operator is also recovering leaf-type gold specimens. The specimen gold is very light yellow and probably has a fairly high silver content.

TECTONIC SETTING: Quartz veins of the Swauk district are subparallel to north-northeast-trending basalt dikes in the area. The veins also cut some basalt dikes (Smith, 1904, p. 9).

ORE CONTROLS: Gold occurs at the center of quartz-calcite veinlets. Paragenetically, the gold is younger than the quartz and calcite.

GEOLOGIC SETTING: Eocene sandstone of the Swauk Formation is cut by numerous basalt dikes and gold-quartz veins. The gold-quartz veins appear to be localized along the same fracture system as the dikes.

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Smith, G. O., 1903, Gold mining in central Washington. *In* Contributions to economic geology, 1902: U.S. Geological Survey Bulletin 213, p. 76-80.

Smith, G. O., 1904, Geological atlas of the United States—Mount Stuart folio, Washington: U.S. Geological Survey Geologic Folio 106, 10 p.

Tabor, R. W.; Waitt, R. B.; Frizzell, V. A., Jr.; Swanson, D. A.; Byerly, G. R.; Bentley, R. D., 1982, Geologic map of the Wenatchee 1:100,000 quadrangle, central Washington: U.S. Geological Survey Miscellaneous Investigations Series Map I-1311, 1 sheet, scale 1:100,000, with 26 p. text.

Golden Fleece (577)

ALTERNATE NAMES		DISTRICT	COUNTY
Mercer T-Bone		Swauk	Kittitas
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Liberty	1:24,000	Wenatchee	Wenatchee

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
47° 18′ 28.51″ N	120° 39′ 19.73″ W	NE¼SW¼ sec. 13, 21N, 17E

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
Swauk Formation	feldspathic to lithofeldspathic sandstone	Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au Ag	gold	pyrite, quartz, calcite

DEPOSIT TYPE	MINERALIZATION AGE
mineralized shear zone vein	

PRODUCTION: Reported production totals $30,000 (Huntting, 1956, p. 132).

TECTONIC SETTING: Quartz veins of the Swauk district are subparallel to north-northeast-trending basalt dikes in the area. The veins also cut some basalt dikes (Smith, 1904, p. 9).

ORE CONTROLS: Gold-quartz veins in the Swauk district are subparallel to numerous basalt dikes of the region (Smith, 1903, p. 80). At the Golden Fleece mine, a mineralized shear zone about 4 in. wide cuts beds of carbonaceous shale (Huntting, 1956, p. 132).

GEOLOGIC SETTING: Eocene sandstone of the Swauk Formation is cut by numerous basalt dikes and gold-quartz veins. The gold-quartz veins appear to be localized along the same fracture system as the dikes.

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Smith, G. O., 1903, Gold mining in central Washington. *In* Contributions to economic geology, 1902: U.S. Geological Survey Bulletin 213, p. 76-80.

Smith, G. O., 1904, Geological atlas of the United States—Mount Stuart folio, Washington: U.S. Geological Survey Geologic Folio 106, 10 p.

Tabor, R. W.; Waitt, R. B.; Frizzell, V. A., Jr.; Swanson, D. A.; Byerly, G. R.; Bentley, R. D., 1982, Geologic map of the Wenatchee 1:100,000 quadrangle, central Washington: U.S. Geological Survey Miscellaneous Investigations Series Map I-1311, 1 sheet, scale 1:100,000, with 26 p. text.

H-O-M-E (582)

ALTERNATE NAMES	DISTRICT	COUNTY
Home		Kittitas

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Frost Mtn	1:24,000	Chelan	Wenatchee

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
47° 6′ 13.05″ N	120° 57′ 25.05″ W	secs. 26, 27, 28, and 34, 19N, 15E

LOCATION: near the junction of Frosty and Taneum Creeks

HOST ROCK: NAME	LITHOLOGY	AGE
pre-Jurassic phyllite (Easton Schist) Manastash Formation	carbonaceous phyllite sandstone, shale, and conglomerate	pre-Jurassic Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Hg	cinnabar mercury (quicksilver)	

DEPOSIT TYPE	MINERALIZATION AGE
vein shear zone	

PRODUCTION: This deposit has produced a reported 9.5 tons of ore (Huntting, 1956, p. 264).

TECTONIC SETTING: Mineralization probably took place following deformation of metamorphic rocks and deposition of the overlying Eocene rocks.

ORE CONTROLS: Cinnabar occurs in faults and fracture zones near the contact between carbonaceous phyllite and highly altered calcareous sedimentary rocks (Huntting, 1956, p. 264).

GEOLOGIC SETTING: Mineralization occurs scattered through older (pre-Jurassic) phyllite and calcareous sandstone of the Manastash Formation (Tabor and others, 1982, geol. map, p. 10).

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Tabor, R. W.; Waitt, R. B.; Frizzell, V. A., Jr.; Swanson, D. A.; Byerly, G. R.; Bentley, R. D., 1982, Geologic map of the Wenatchee 1:100,000 quadrangle, central Washington: U.S. Geological Survey Miscellaneous Investigations Series Map I-1311, 1 sheet, scale 1:100,000, with 26 p. text.

Huckleberry (569)

ALTERNATE NAMES		DISTRICT	COUNTY
			Kittitas
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Kachess Lake	1:62,500	Snoqualmie Pass	Wenatchee
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
47° 27′ 41.39″ N	121° 2′ 21.39″ W	secs. 24 and 26, 23N, 14E	

LOCATION: on the northwest flank of Huckleberry Mountain

HOST ROCK: NAME	LITHOLOGY	AGE
Ingalls Complex	diabase and gabbro	Jurassic

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Cu Ag Au	chalcopyrite	quartz

DEPOSIT TYPE	MINERALIZATION AGE
vein	

PRODUCTION: Four carloads of ore reported shipped to Tacoma prior to 1935 (Huntting, 1956, p. 60).

TECTONIC SETTING: The Ingalls Complex was accreted to the North American continent in the late Mesozoic (Miller, 1985, p. 27-42).

ORE CONTROLS: The deposit is said to be a vein that ranges from 8 in. to 4 ft wide (Huntting, 1956, p. 60).

GEOLOGIC SETTING: The mineralization is hosted in diabase and gabbro of the Ingalls Complex.

REFERENCES

Frizzell, V. A., Jr.; Tabor, R. W.; Booth, D. B.; Ort, K. M.; Waitt, R. B., 1984, Preliminary geologic map of the Snoqualmie Pass 1:100,000 quadrangle, Washington: U.S. Geological Survey Open-File Report 84-693, 42 p., 1 pl.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Miller, R. B., 1985, The ophiolitic Ingalls Complex, north-central Cascade mountains, Washington: Geological Society of America Bulletin, v. 96, no. 1, p. 27-42.

Liberty (575)

ALTERNATE NAMES		DISTRICT	COUNTY
		Swauk	Kittitas
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Liberty	1:24,000	Wenatchee	Wenatchee
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
47° 17′ 49.37″ N	120° 38′ 25.68″ W	NW¼NE¼ sec. 25, 21N, 17E, and sec. 19, 21N, 18E	

LOCATION: in Lyons Gulch

HOST ROCK: NAME	LITHOLOGY	AGE
Swauk Formation	feldspathic to lithofeldspathic sandstone	Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au	gold	pyrite, quartz, calcite

DEPOSIT TYPE	MINERALIZATION AGE
silicified zone vein	

PRODUCTION: Produced in 1935 and 1936 (Huntting, 1956, p. 132).

TECTONIC SETTING: Quartz veins of the Swauk district are subparallel to north-northeast-trending basalt dikes in the area. The veins also cut some basalt dikes (Smith, 1904, p. 9).

ORE CONTROLS: Gold-quartz veins in the Swauk district are subparallel to numerous basalt dikes of the region (Smith, 1903, p. 80). At the Liberty deposit, a 4-ft-wide shear zone in carbonaceous shale contains stringers of quartz and calcite (Huntting, 1956, p. 132).

GEOLOGIC SETTING: Eocene sandstone of the Swauk Formation is cut by numerous basalt dikes and gold-quartz veins. The gold-quartz veins appear to be localized along the same fracture system as the dikes.

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Smith, G. O., 1903, Gold mining in central Washington. *In* Contributions to economic geology, 1902: U.S. Geological Survey Bulletin 213, p. 76-80.

Smith, G. O., 1904, Geological atlas of the United States—Mount Stuart folio, Washington: U.S. Geological Survey Geologic Folio 106, 10 p.

Tabor, R. W.; Waitt, R. B.; Frizzell, V. A., Jr.; Swanson, D. A.; Byerly, G. R.; Bentley, R. D., 1982, Geologic map of the Wenatchee 1:100,000 quadrangle, central Washington: U.S. Geological Survey Miscellaneous Investigations Series Map I-1311, 1 sheet, scale 1:100,000, with 26 p. text.

Mineral Creek (571)

ALTERNATE NAMES	DISTRICT	COUNTY
Durrwachter Liberty Lode		Kittitas

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Snoqualmie Pass	1:62,500	Snoqualmie Pass	Wenatchee

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
47° 25′ 29.40″ N	121° 15′ 15.71″ W	SE¼ sec. 6, 22N, 13E

LOCATION: on Mineral Creek 2 mi above Little Kachess Lake

HOST ROCK: NAME	LITHOLOGY	AGE
Naches Formation Easton schist	sandstone and volcanic rocks phyllite	Eocene Cretaceous

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
granodiorite dike (Snoqualmie batholith?)	Miocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Cu Au Ag Mo	chalcopyrite bornite molybdenite	pyrite, pyrrhotite, quartz

DEPOSIT TYPE	MINERALIZATION AGE
shear zone disseminated	

PRODUCTION: 20 tons shipped to the Tacoma smelter prior to 1920 (Huntting, 1956, p. 60).

TECTONIC SETTING: Mineralization occurs in shear zones, along joint planes, and in a brecciated zone, which suggests mineralization took place following deformation of metamorphic rocks and deposition of the overlying Eocene rocks (Frizzell and others, 1984, geol. map; Huntting, 1956, p. 60).

ORE CONTROLS: Mineralization occurs in a narrow shear zone and in joint planes in a 20-40-ft-wide brecciated zone in a granodiorite dike (Patty, 1921, p. 277), and a breccia zone as much as 500 ft wide between rhyolite and basalt is mineralized (Huntting, 1956, p. 60).

GEOLOGIC SETTING: Host rocks for the deposit include a granodiorite dike probably related to the Snoqualmie batholith (Patty, 1921, p. 277-278) and rhyolitic and basaltic rocks probably of the Naches Formation (Frizzell, and others, 1984, geol. map).

REFERENCES

Frizzell, V. A., Jr.; Tabor, R. W.; Booth, D. B.; Ort, K. M.; Waitt, R. B., 1984, Preliminary geologic map of the Snoqualmie Pass 1:100,000 quadrangle, Washington: U.S. Geological Survey Open-File Report 84-693, 42 p., 1 pl.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Miller, R. B., 1985, The ophiolitic Ingalls Complex, north-central Cascade mountains, Washington: Geological Society of America Bulletin, v. 96, no. 1, p. 27-42.

Patty, E. N., 1921, The metal mines of Washington: Washington Geological Survey Bulletin 23, 366 p.

Mount Hawkins (568)

ALTERNATE NAMES	DISTRICT	COUNTY
Crowe Gallagher Head Skipper		Kittitas

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Mount Stuart	1:24,000	Wenatchee	Wenatchee

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
47° 26′ 30.20″ N	120° 58′ 56.88″ W	SW¼NW¼ sec. 33, 23N, 15E

LOCATION: in Drew Creek drainage on the southeast slope of Hawkins Mountain, near a small lake

HOST ROCK: NAME	LITHOLOGY	AGE
Ingalls Complex	serpentinite	Jurassic

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Cr	chromite	serpentine

DEPOSIT TYPE	MINERALIZATION AGE
podiform chromite	Jurassic

PRODUCTION: The Mount Hawkins produced about 15 tons of ore during World War II (Huntting, 1956, p. 37-38).

TECTONIC SETTING: The Ingalls Complex is an ophiolite complex (Miller, 1985, p. 27). Chromite occurs in the ultramafic rocks.

ORE CONTROLS: Chromite is present as small lenses in serpentinized peridotite (Huntting, 1956, p. 37). The chromite originated as a magmatic segregation in peridotite.

GEOLOGIC SETTING: The Ingalls Complex is an ophiolite complex of Middle to Late Jurassic age (Miller, 1985, p. 27-42).

REFERENCES

Frizzell, V. A., Jr.; Tabor, R. W.; Booth, D. B.; Ort, K. M.; Waitt, R. B., 1984, Preliminary geologic map of the Snoqualmie Pass 1:100,000 quadrangle, Washington: U.S. Geological Survey Open-File Report 84-693, 42 p., 1 pl.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Miller, R. B., 1985, The ophiolitic Ingalls Complex, north-central Cascade mountains, Washington: Geological Society of America Bulletin, v. 96, no. 1, p. 27-42.

Mountain Daisy (579)

ALTERNATE NAMES		DISTRICT	COUNTY
		Swauk	Kittitas
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Liberty	1:24,000	Wenatchee	Wenatchee

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
47° 15′ 26.59″ N	120° 38′ 44.78″ W	sec. 1, 20N, 17E and sec. 6, 20N, 18E

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
Swauk Formation	feldspathic to lithofeldspathic sandstone	Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au	gold	quartz

DEPOSIT TYPE	MINERALIZATION AGE
vein	

PRODUCTION: Produced from 1934 to 1938 (Huntting, 1956, p. 133).

TECTONIC SETTING: Quartz veins of the Swauk district are subparallel to north-northeast-trending basalt dikes in the area. The veins also cut some basalt dikes (Smith, 1904, p. 9).

ORE CONTROLS: Gold-quartz veins in the Swauk district are subparallel to numerous basalt dikes of the region (Smith, 1903, p. 80).

GEOLOGIC SETTING: Eocene sandstone of the Swauk Formation is cut by numerous basalt dikes and gold-quartz veins. The gold-quartz veins appear to be localized along the same fracture system as the dikes.

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Smith, G. O., 1903, Gold mining in central Washington. *In* Contributions to economic geology, 1902: U.S. Geological Survey Bulletin 213, p. 76-80.

Smith, G. O., 1904, Geological atlas of the United States—Mount Stuart folio, Washington: U.S. Geological Survey Geologic Folio 106, 10 p.

Tabor, R. W.; Waitt, R. B.; Frizzell, V. A., Jr.; Swanson, D. A.; Byerly, G. R.; Bentley, R. D., 1982, Geologic map of the Wenatchee 1:100,000 quadrangle, central Washington: U.S. Geological Survey Miscellaneous Investigations Series Map I-1311, 1 sheet, scale 1:100,000, with 26 p. text.

Old Bigney placer (585)

ALTERNATE NAMES		DISTRICT	COUNTY
		Swauk	Kittitas
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Liberty	1:24,000	Wenatchee	Wenatchee

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
47° 15′ 10.85″ N	120° 39′ 59.06″ W	W½ sec. 1, 20N, 17E

LOCATION: near Liberty

HOST ROCK: NAME	LITHOLOGY	AGE
Quaternary alluvium	sand and gravel	Quaternary

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au	gold	sand and gravel

DEPOSIT TYPE	MINERALIZATION AGE
placer	Quaternary

PRODUCTION: More than $200,000 prior to 1903; production reported for 1908, 1915, 1916, and 1923 (Huntting, 1956, p. 186).

TECTONIC SETTING: Deposition of heavy minerals in river gravels.

ORE CONTROLS: Heavy-mineral concentration by stream action.

UNPUBLISHED INFORMATION:

REFERENCE

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Ollie Jordin (574)

ALTERNATE NAMES		DISTRICT	COUNTY
		Swauk	Kittitas

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Liberty	1:24,000	Wenatchee	Wenatchee

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
47° 15′ 30.95″ N	120° 39′ 2.36″ W	sec. 2, 20N, 17E

LOCATION: about 0.75 mi up Williams Creek from Liberty

HOST ROCK: NAME	LITHOLOGY	AGE
Swauk Formation	feldspathic to lithofeldspathic sandstone	Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au	gold	quartz, calcite

DEPOSIT TYPE	MINERALIZATION AGE
silicified zone vein	

PRODUCTION: Produced a total of about $20,000 in gold during 2 years prior to 1920 (Huntting, 1956, p. 133)

TECTONIC SETTING: Quartz veins of the Swauk district are subparallel to north-northeast-trending basalt dikes in the area. The veins also cut some basalt dikes (Smith, 1904, p. 9).

ORE CONTROLS: Gold-quartz veins in the Swauk district are subparallel to numerous basalt dikes of the region (Smith, 1903, p. 80). At the Ollie Jordin mine, mineralization is present in a silicified zone that is 4 ft wide. Wire gold is found at the deposit (Huntting, 1956, p. 133).

GEOLOGIC SETTING: Eocene sandstone of the Swauk Formation is cut by numerous basalt dikes and gold-quartz veins. The gold-quartz veins appear to be localized along the same fracture system as the dikes.

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Smith, G. O., 1903, Gold mining in central Washington. *In* Contributions to economic geology, 1902: U.S. Geological Survey Bulletin 213, p. 76-80.

Smith, G. O., 1904, Geological atlas of the United States—Mount Stuart folio, Washington: U.S. Geological Survey Geologic Folio 106, 10 p.

Tabor, R. W.; Waitt, R. B.; Frizzell, V. A., Jr.; Swanson, D. A.; Byerly, G. R.; Bentley, R. D., 1982, Geologic map of the Wenatchee 1:100,000 quadrangle, central Washington: U.S. Geological Survey Miscellaneous Investigations Series Map I-1311, 1 sheet, scale 1:100,000, with 26 p. text.

Silver Creek (580)

ALTERNATE NAMES		DISTRICT	COUNTY
			Kittitas
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Kachess Lake	1:62,500	Snoqualmie Pass	Wenatchee
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
47° 29′ 37.67″ N	121° 1′ 45.38″ W	sec. 12, 23N, 14E	

LOCATION: in the Fish Lake area

HOST ROCK: NAME	LITHOLOGY	AGE
Ingalls Complex	serpentinite	Jurassic

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au	gold	quartz
Ag		

DEPOSIT TYPE	MINERALIZATION AGE
vein	

PRODUCTION: Produced in 1937 and 1938 (Huntting, 1956, p. 134).

TECTONIC SETTING: The Ingalls Complex was accreted to the North American continent in the late Mesozoic (Miller, 1985, p. 27-42).

ORE CONTROLS: Mineralization is irregularly distributed in a 15-20-ft wide quartz vein (Huntting, 1956, p. 133-134).

GEOLOGIC SETTING: The Ingalls Complex is an ophiolite complex of Middle to Late Jurassic age (Miller, 1985, p. 27-42).

REFERENCES

Frizzell, V. A., Jr.; Tabor, R. W.; Booth, D. B.; Ort, K. M.; Waitt, R. B., 1984, Preliminary geologic map of the Snoqualmie Pass 1:100,000 quadrangle, Washington: U.S. Geological Survey Open-File Report 84-693, 42 p., 1 pl.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Miller, R. B., 1985, The ophiolitic Ingalls Complex, north-central Cascade mountains, Washington: Geological Society of America Bulletin, v. 96, no. 1, p. 27-42.

Silver Tip (589)

ALTERNATE NAMES	DISTRICT	COUNTY
		Kittitas

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Frost Mtn	1:24,000	Chelan	Wenatchee

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
47° 6′ 15.22″ N	120° 57′ 57.91″ W	SE¼ sec. 28, 19N, 15E

LOCATION: near the junction of Frosty and Taneum Creeks

HOST ROCK: NAME	LITHOLOGY	AGE
pre-Jurassic phyllite (Easton Schist) Manastash Formation	carbonaceous phyllite sandstone, shale, and conglomerate	pre-Jurassic Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Hg	cinnabar mercury (quicksilver)	

DEPOSIT TYPE	MINERALIZATION AGE
vein shear zone	

PRODUCTION: Deposit has reported production of 5 tons of ore (Huntting, 1956, p. 264).

TECTONIC SETTING: Mineralization probably occurred following deformation of metamorphic rocks and deposition of overlying Eocene rocks.

ORE CONTROLS: Cinnabar occurs in faults and fracture zones near the contact between carbonaceous phyllite and highly altered calcareous sedimentary rocks. At the Silver Tip, the shear zone is about 12 ft wide at the contact between the phyllite and sandstone; mineralization consists of small specks and thin seams of cinnabar (Huntting, 1956, p. 264).

GEOLOGIC SETTING: Mineralization occurs scattered through older (pre-Jurassic) phyllite and calcareous sandstone of the Manastash Formation (Tabor and others, 1982, geol. map, p. 10).

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Tabor, R. W.; Waitt, R. B.; Frizzell, V. A., Jr.; Swanson, D. A.; Byerly, G. R.; Bentley, R. D., 1982, Geologic map of the Wenatchee 1:100,000 quadrangle, central Washington: U.S. Geological Survey Miscellaneous Investigations Series Map I-1311, 1 sheet, scale 1:100,000, with 26 p. text.

Swauk Creek placers (586)

ALTERNATE NAMES		DISTRICT	COUNTY
		Swauk	Kittitas

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Swauk Prairie	1:24,000	Wenatchee	Wenatchee

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
47° 12′ 49.17″ N	120° 41′ 58.58″ W	

LOCATION: Huntting (1956, p. 187) reports the Swauk Creek placers are along Swauk Creek between the mouths of Baker and First Creeks. Only Baker Creek is identified on the topographic map; consequently, the Swauk placers are placed just south of the mouth of Baker Creek.

HOST ROCK: NAME	LITHOLOGY	AGE
Quaternary alluvium	sand and gravel	Quaternary

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au	gold	sand and gravel

DEPOSIT TYPE	MINERALIZATION AGE
placer	Quaternary

PRODUCTION: Considerable production (Huntting, 1956, p. 187).

TECTONIC SETTING: Deposition of heavy minerals in river gravels.

ORE CONTROLS: Heavy-mineral concentration by stream action.

REFERENCE

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Wall Street (578)

ALTERNATE NAMES		DISTRICT	COUNTY
		Swauk	Kittitas
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Swauk Pass	1:24,000	Wenatchee	Wenatchee
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
47° 17′ 19.28″ N	120° 37′ 28.49″ W	sec. 30, 21N, 17E	

LOCATION: 5.5 mi up Cougar Gulch from Liberty; the last 1.5 mi is by trail.

HOST ROCK: NAME	LITHOLOGY	AGE
Swauk Formation	feldspathic to lithofeldspathic sandstone	Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au	gold	quartz

DEPOSIT TYPE	MINERALIZATION AGE
silicified fracture zone vein	

PRODUCTION: Produced $50,000 worth of ore prior to 1935; also produced in 1938 (Huntting, 1956, p. 134).

TECTONIC SETTING: Quartz veins of the Swauk district are subparallel to north-northeast-trending basalt dikes in the area. The veins also cut some basalt dikes (Smith, 1904, p. 9).

ORE CONTROLS: Gold-quartz veins in the Swauk district are subparallel to numerous basalt dikes of the region (Smith, 1903, p. 80). At the Wall Street mine, gold mineralization is present in silicified fracture zones in sandstone (Huntting, 1956, p. 134).

GEOLOGIC SETTING: Eocene sandstone of the Swauk Formation is cut by numerous basalt dikes and gold-quartz veins. The gold-quartz veins appear to be localized along the same fracture system as the dikes.

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Smith, G. O., 1903, Gold mining in central Washington. *In* Contributions to economic geology, 1902: U.S. Geological Survey Bulletin 213, p. 76-80.

Smith, G. O., 1904, Geological atlas of the United States—Mount Stuart folio, Washington: U.S. Geological Survey Geologic Folio 106, 10 p.

Tabor, R. W.; Waitt, R. B.; Frizzell, V. A., Jr.; Swanson, D. A.; Byerly, G. R.; Bentley, R. D., 1982, Geologic map of the Wenatchee 1:100,000 quadrangle, central Washington: U.S. Geological Survey Miscellaneous Investigations Series Map I-1311, 1 sheet, scale 1:100,000, with 26 p. text.

Williams Creek placers (587)

ALTERNATE NAMES		DISTRICT	COUNTY
		Swauk	Kittitas
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Swauk Prairie	1:24,000	Wenatchee	Wenatchee
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
47° 14′ 45.58″ N	120° 40′ 55.61″ W	secs. 2, 10, and 11, 20N, 17E	

LOCATION: along Williams Creek between the junction with Swauk Creek and Liberty

HOST ROCK: NAME	LITHOLOGY	AGE
Quaternary alluvium	sand and gravel	Quaternary

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au	gold	sand and gravel

DEPOSIT TYPE	MINERALIZATION AGE
placer	Quaternary

PRODUCTION: Considerable production (Huntting, 1956, p. 187).

TECTONIC SETTING: Deposition of heavy minerals in river gravels.

ORE CONTROLS: Heavy-mineral concentration by stream action.

REFERENCE

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Barnum-McDonnell (632)

ALTERNATE NAMES		DISTRICT	COUNTY
		Morton	Lewis
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Glenoma	1:24,000	Centralia	Hoquiam
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
46° 32′ 46.69″ N	122° 13′ 59.87″ W	N½NW¼ sec. 7, 12N, 5E	

LOCATION: about 2.25 mi southeast of Morton

HOST ROCK: NAME	LITHOLOGY	AGE
Puget Group	shale, siltstone, sandstone	Eocene
Puget Group	basic dikes and sills	Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Hg	cinnabar	

DEPOSIT TYPE	MINERALIZATION AGE
shear zone	
vein and veinlet	

PRODUCTION: Produced 75 flasks of mercury in 1916, 489 flasks in 1926, 1,265 flasks 1926-1929, and 441 flasks in 1931 (Huntting, 1956, p. 265).

TECTONIC SETTING: Deltaic deposits of the Eocene Puget Group were folded and faulted during the Tertiary (Gard, 1968, p. 27-29). Mineralization probably took place during or shortly after deformation.

ORE CONTROLS: Cinnabar occurs in fractures and breccia along fault zones in sandstone, shale, and siltstone of the Puget Group. Mafic rocks intruded the sediments, and all were subjected to folding and faulting prior to mineralization (Mackin, 1944, p. 8). The shear zone that localizes mineralization at the Barnum-McDonnell deposit has a maximum thickness of 10 ft. The best ore is in tuffaceous sandstone (Huntting, 1956, p. 265).

GEOLOGIC SETTING: The sedimentary rocks of the Puget Group contain coal, and fossils suggest brackish water and estuarine depositional conditions (Mackin, 1944, p. 7).

REFERENCES

Gard, L. M., Jr., 1968, Bedrock geology of the Lake Tapps quadrangle, Pierce County, Washington: U.S. Geological Survey Professional Paper 388-B, 33 p., 2 pl.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Mackin, J. H., 1944, Relation of geology to mineralization in the Morton cinnabar district, Lewis County, Washington: Washington Division of Mines and Mining Report of Investigations 6, 47 p., 2 pl.

Schasse, H. W., compiler, 1987, Geologic map of the Centralia quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 87-11, 28 p., 1 pl.

Eagle Peak (631)

ALTERNATE NAMES		DISTRICT	COUNTY
			Lewis
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Mt Rainier West	1:24,000	Mt Rainer	Yakima

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
46° 45′ 20.96″ N	121° 46′ 48.47″ W	near the NW corner sec. 27, 15N, 8E

LOCATION: on the west slope of Eagle Peak in the Mt. Rainier area

HOST ROCK: NAME	LITHOLOGY	AGE
Stevens Ridge Formation	rhyodacite ash-flow tuff and volcaniclastic rocks	Oligocene - Miocene

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
undifferentiated felsic rocks related to the Tatoosh pluton	Miocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Cu	chalcopyrite	pyrite, arsenopyrite
Au	bornite	
Ag	covellite	
Co	scheelite	
U	molybdenite	
W	sphalerite	
	linnaeite	

DEPOSIT TYPE	MINERALIZATION AGE
vein and veinlet	

PRODUCTION: Produced 100 tons in 1919; also produced in 1925 and 1928, but total production does not exceed 200 tons. An 18-ton shipment yielded 8.05% Cu and 0.09 oz/ton Au. Reported 1% to 5% Co in some samples (Huntting, 1956, p. 61).

TECTONIC SETTING: Rocks are part of the Cascade magmatic arc.

ORE CONTROLS: Mineralization occurs along joints or slip planes in granite. The ore zone ranges from 0.5 to 5 ft in width; the zone carries a streak of high-grade ore that is 1 to 14 in. wide. Gold values are associated with the arsenopyrite. The ore from near the portal of an old drift about 15 ft above the present drift was slightly radioactive (Huntting, 1956, p. 61).

GEOLOGIC SETTING: Mineralization occurs in granite (Huntting, 1956, p. 61) and would appear to be in dikes emanating from the Tatoosh pluton (Schasse, 1987, p. 29).

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Schasse, H. W., compiler, 1987, Geologic map of the Mount Rainier quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 87-16, 43 p., 1 pl.

Lytle-Lynch (634)

ALTERNATE NAMES	DISTRICT	COUNTY
Charlotte Ann Kropolis	Morton	Lewis

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Glenoma	1:24,000	Centralia	Hoquiam

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
46° 33′ 32.18″ N	122° 14′ 3.39″ W	NW¼ and N½NE¼ sec. 6, 12N, 5E

LOCATION: about 0.75 mi north of the Roy and Barnum-McDonnell mines

HOST ROCK: NAME	LITHOLOGY	AGE
Puget Group	shale, siltstone, sandstone	Eocene
Puget Group	basic dikes and sills and porphyry	Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Hg	cinnabar	pyrite or marcasite

DEPOSIT TYPE	MINERALIZATION AGE
fault breccia vein and veinlet	

PRODUCTION: Produced from 1930 to 1932 (Huntting, 1956, p. 265).

TECTONIC SETTING: Deltaic deposits of the Eocene Puget Group were folded and faulted during the Tertiary (Gard, 1968, p. 27-29). Mineralization probably took place during or shortly after deformation.

ORE CONTROLS: Cinnabar is present in fractures and breccia along fault zones in sandstone, shale, and siltstone of the Puget Group. Mafic rocks intrude the sedimentary rocks, and all were subjected to folding and faulting prior to mineralization (Mackin, 1944, p. 8).

GEOLOGIC SETTING: The sedimentary rocks of the Puget Group contain coal and fossils that suggest brackish water and estuarine depositional conditions (Mackin, 1944, p. 7). At the Lytle-Lynch the country rocks are shale, sandstone, coal, and porphyry (Huntting, 1956, p. 265).

REFERENCES

Gard, L. M., Jr., 1968, Bedrock geology of the Lake Tapps quadrangle, Pierce County, Washington: U.S. Geological Survey Professional Paper 388-B, 33 p., 2 pl.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Mackin, J. H., 1944, Relation of geology to mineralization in the Morton cinnabar district, Lewis County, Washington: Washington Division of Mines and Mining Report of Investigations 6, 47 p., 2 pl.

Schasse, H. W., compiler, 1987, Geologic map of the Centralia quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 87-11, 28 p., 1 pl.

Mineral Creek (635)

ALTERNATE NAMES		DISTRICT	COUNTY
			Lewis
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Anderson Lake	1:24,000	Centralia	Hoquiam

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
46° 39′ 59.89″ N	122° 6′ 1.92″ W	SW¼ sec. 30, 14 N, 6E

LOCATION: on Mineral Creek

HOST ROCK: NAME	LITHOLOGY	AGE
unnamed	basaltic andesite and andesite flows	Eocene - Oligocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
As	sphalerite	
Zn	galena	
Pb	realgar	
Ag		

DEPOSIT TYPE	MINERALIZATION AGE
hydrothermal	

PRODUCTION: Reportedly 1,000 tons of arsenic ore produced in 1903 and some production in 1904 and 1905. A sample said to come from a 300-ft face assayed 3.8% Zn, 3.6% Pb, and 2.56 oz/ton Ag (Huntting, 1956, p. 363).

TECTONIC SETTING: Rocks of the Mineral Creek mine area are the earliest stages of Cascade magmatic arc volcanism (Walsh and others, 1987, correlation diagram; Swanson and others, 1989, p. 5-7).

GEOLOGIC SETTING: Host rocks at the Mineral Creek deposit are in a sequence of Eocene to Oligocene basaltic andesite and andesite flows (Schasse, 1987, geol. map).

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Schasse, H. W., compiler, 1987, Geologic map of the Centralia quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 87-11, 28 p., 1 pl.

Swanson, D. A.; Cameron, K. A.; Evarts, R. C.; Pringle, P. T.; Vance, J. A., 1989, Excursion 1A—Cenozoic volcanism in the Cascade Range and Columbia Plateau, southern Washington and northernmost Oregon. *In* Chapin, C. E.; Zidek, Jiri, editors, Field excursions to volcanic terranes in the western United States, Volume II—Cascades and intermountain west: New Mexico Bureau of Mines and Mineral Resources Memoir 47, p. 1-50.

Walsh, T. J.; Korosec, M. Ā.; Phillips, W. M.; Logan, R. L.; Schasse, H. W., 1987, Geologic map of Washington—Southwest quadrant: Washington Division of Geology and Earth Resources Geologic Map GM-34, 2 sheets, scale 1:250,000, with 28 p. text.

Roy (633)

ALTERNATE NAMES	DISTRICT	COUNTY
Fisher Morton Gillispie	Morton	Lewis

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Glenoma	1:24,000	Centralia	Hoquiam

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
46° 32′ 52.90″ N	122° 13′ 57.88″ W	S½SW¼ and NW¼SW¼ sec. 6, 12N, 5E

LOCATION: 2 mi southeast of Morton

HOST ROCK: NAME	LITHOLOGY	AGE
Puget Group	shale, siltstone, sandstone	Eocene
Puget Group	basic dikes and sills	Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Hg	cinnabar	pyrite, calcite

DEPOSIT TYPE	MINERALIZATION AGE
vein and veinlet breccia zones	

PRODUCTION: Produced about 2,500 flasks in 1928-1929, 1,079 flasks in 1930, 1,581 tons of ore in 1931, and recovered 65 flasks of mercury from 1,000 tons of ore in 1940. Also produced in 1941 (Huntting, 1956, p. 265).

TECTONIC SETTING: Deltaic deposits of the Eocene Puget Group were folded and faulted during the Tertiary (Gard, 1968, p. 27-29). Mineralization probably took place during or shortly after deformation.

ORE CONTROLS: Cinnabar occurs in fractures and breccia along fault zones in sandstone, shale, and siltstone of the Puget Group. Mafic rocks intruded the sedimentary rocks, and all were subjected to folding and faulting prior to mineralization (Mackin, 1944, p. 8). The shear zone has a maximum probable thickness of 10 ft (Huntting, 1956, p. 265).

GEOLOGIC SETTING: The sedimentary rocks of the Puget Group contain coal and fossils that suggest brackish water and estuarine depositional conditions (Mackin, 1944, p. 7).

REFERENCES

Gard, L. M., Jr., 1968, Bedrock geology of the Lake Tapps quadrangle, Pierce County, Washington: U.S. Geological Survey Professional Paper 388-B, 33 p., 2 pl.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Mackin, J. H., 1944, Relation of geology to mineralization in the Morton cinnabar district, Lewis County, Washington: Washington Division of Mines and Mining Report of Investigations 6, 47 p., 2 pl.

Schasse, H. W., compiler, 1987, Geologic map of the Centralia quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 87-11, 28 p., 1 pl.

Barnell placer (298)

ALTERNATE NAMES		DISTRICT	COUNTY
			Lincoln
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Keller Ferry	1:24,000	Coulee Dam	Ritzville
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
47° 56′ 3.10″ N	118° 42′ 4.85″ W	sec. 7, 28N, 33E	

LOCATION: in Swawilla basin, near Plum, 0.5 mi below the ferry

HOST ROCK: NAME	LITHOLOGY	AGE
Quaternary alluvium	sand and gravel	Quaternary

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au	gold	sand and gravel

DEPOSIT TYPE	MINERALIZATION AGE
placer	Quaternary

PRODUCTION: Produced $200-$400 per week in 1938 (Huntting, 1956, p. 187).

TECTONIC SETTING: Deposition of heavy minerals in river gravels.

ORE CONTROLS: Heavy-mineral concentration by stream action.

REFERENCE

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

China Bar placer (299)

ALTERNATE NAMES		DISTRICT	COUNTY
			Lincoln
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Olsen Canyon	1:24,000	Coulee Dam	Ritzville
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
47° 50′ 48.20″ N	118° 21′ 6.08″ W	secs. 12 and 13, 27N, 35E	

LOCATION: on the east side of the Columbia River

HOST ROCK: NAME	LITHOLOGY	AGE
Quaternary alluvium	sand and gravel	Quaternary

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au	gold	sand and gravel

DEPOSIT TYPE	MINERALIZATION AGE
placer	Quaternary

PRODUCTION: Produced in 1928. Said to have been worked out by Chinese miners (Huntting, 1956, p. 187).

TECTONIC SETTING: Deposition of heavy minerals in river gravels.

ORE CONTROLS: Heavy-mineral concentration by stream action.

REFERENCES

Collier, A. J., 1907, Gold-bearing river sands of northeastern Washington. *In* Contributions to economic geology 1906; Part I—Metals and nonmetals, except fuels: U.S. Geological Survey Bulletin 315, p. 56-70.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Clark placer (300)

ALTERNATE NAMES		DISTRICT	COUNTY
			Lincoln
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Keller Ferry	1:24,000	Coulee Dam	Ritzville
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
47° 56′ 28.61″ N	118° 40′ 52.21″ W	SE¼NE¼ sec. 8, 28N, 33E	

LOCATION: along the Columbia River

HOST ROCK: NAME	LITHOLOGY	AGE
Quaternary alluvium	sand and gravel	Quaternary

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au	gold	sand and gravel

DEPOSIT TYPE	MINERALIZATION AGE
placer	Quaternary

PRODUCTION: Produced $4,657 in 1933, and $8,243 from 19,700 yards of gravel in 1934 (Huntting, 1956, p. 187).

TECTONIC SETTING: Deposition of heavy minerals in river gravels.

ORE CONTROLS: Heavy-mineral concentration by stream action.

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Keller Ferry placer (301)

ALTERNATE NAMES		DISTRICT	COUNTY
Angle Placer			Lincoln
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Keller Ferry	1:24,000	Coulee Dam	Ritzville
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
47° 56′ 8.70″ N	118° 40′ 51.57″ W	E½ sec. 8, 28N, 33E	

LOCATION: opposite the mouth of the Sanpoil River

HOST ROCK: NAME	LITHOLOGY	AGE
Quaternary alluvium	sand and gravel	Quaternary

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au	gold	sand and gravel

DEPOSIT TYPE	MINERALIZATION AGE
placer	Quaternary

PRODUCTION: Produced in 1932, and 186.8 oz of Au from 11,628 yd^3 of gravel in 1933-1934 (Huntting, 1956, p. 187).

TECTONIC SETTING: Deposition of heavy minerals in river gravels.

ORE CONTROLS: Heavy-mineral concentration by stream action.

REFERENCE

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Spokane Molybdenum (297)

ALTERNATE NAMES	DISTRICT	COUNTY
Pitney Butte Egypt	Deer Trail Cedar Canyon	Lincoln

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
McCoy Lake	1:24,000	Coulee Dam	Ritzville

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
47° 52′ 51.56″ N	118° 9′ 50.56″ W	NE¼SE¼ sec. 32, 28N, 37E

LOCATION: on the northeast side of Pitney Butte

HOST ROCK: NAME	LITHOLOGY	AGE
granite of Pitney Butte	monzogranite	Cretaceous

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
andesite dike of Sanpoil Volcanics	Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Mo Au Ag	molybdenite chalcopyrite sphalerite pitchblende	quartz, pyrite

DEPOSIT TYPE	MINERALIZATION AGE
vein	

PRODUCTION: Produced in 1941 (Huntting, 1956, p. 269).

TECTONIC SETTING: Cretaceous granitic rocks intrude rocks of the Kootenay arc and adjacent terranes in northeastern Washington (Rhodes and Hyndman, 1988).

ORE CONTROLS: Quartz that is found in muscovite-rich pegmatite veins is of two types: (1) milky white quartz and (2) gray, massive quartz in segregations. Both types of quartz contain sparse flakes of molybdenite (Becraft and Weis, 1963, p. 67-68). A cross fracture in the main vein contains lenses of black radioactive material (Huntting, 1956, p. 269).

GEOLOGIC SETTING: At the Spokane Molybdenum mine the Cretaceous, fine-grained monzogranite is cut by a dike of the Sanpoil Volcanics (Becraft and Weis, 1963, p. 67).

REFERENCES

Becraft, G. E.; Weis, P. L., 1963, Geology and mineral deposits of the Turtle Lake quadrangle, Washington: U.S. Geological Survey Bulletin 1131, 73 p., 6 pl.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Purdy, C. P., Jr., 1954, Molybdenum occurrences of Washington: Washington Division of Mines and Geology Report of Investigations 18, 118 p., 6 pl.

Rhodes, B. P.; Hyndman, D. W., 1988, Regional metamorphism, structure, and tectonics of northeastern Washington and northern Idaho. *In* Ernst, W. G., editor, Metamorphism and crustal evolution of the western United States: Prentice-Hall [Englewood Cliffs, N.J.], Rubey Volume VII, p. 271-295.

Black Hump (619)

ALTERNATE NAMES		DISTRICT	COUNTY
			Mason
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Mt Steel	1:62,500	Mt. Olympus	Seattle

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
47° 31′ 51″ N	123° 19′ 41″ W	N½N½ sec. 33, 24N, 5W

LOCATION: about 1 mi north of the Lincoln guard station, 2 mi by trail north of Staircase Resort at the head of Lake Cushman

HOST ROCK: NAME	LITHOLOGY	AGE
Needles-Gray Wolf lithic assemblage	micaceous sandstone	Eocene
unnamed basalt	basalt	Eocene - Oligocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Mn	bementite	

DEPOSIT TYPE	MINERALIZATION AGE
replacement, disseminated exhalative/diagenetic	Eocene - Oligocene

PRODUCTION: Some production prior to 1924 (Huntting, 1956, p. 260).

TECTONIC SETTING: Host rocks of manganese deposits of the Olympic Peninsula formed at an ocean ridge or in a back arc basin at the active margin of the North American plate (Garrison, 1973; Snavely, 1987, p. 306-309).

ORE CONTROLS: Manganese deposits of the region are associated with spilites (Park, 1942, p. 311-312). Manganese mineralization may be either disseminated in replacement bodies or volcanogenic exhalative/diagenetic bodies (Sorem and Gunn, 1967).

GEOLOGIC SETTING: The Crescent Formation on the Olympic Peninsula consists of Paleocene? and Eocene pillow basalts compositionally similar to ocean ridge basalts (Snavely, 1987, p. 306-308). Clastic rocks and associated basalts overlie the Crescent Formation host manganese mineralization at the Black Hump deposit (Tabor and Cady, 1978, geol. map).

REFERENCES

Garrison, R. E., 1973, Space-time relations of pelagic limestones and volcanic rocks, Olympic Peninsula, Washington: Geological Society of America Bulletin, v. 84, no. 2, p. 583-594.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Park, C. F., Jr., 1942, Manganese resources of the Olympic Peninsula, Washington—A preliminary report: U.S. Geological Survey Bulletin 931-R, p. 435-457, 2 pl.

Snavely, P. D., Jr., 1987, Tertiary geologic framework, neotectonics, and petroleum potential of the Oregon-Washington continental margin. *In* Scholl, D. W.; Grantz, Arthur; Vedder, J. G., Geology and resources potential of the continental margin of western North America and adjacent ocean basins—Beaufort Sea to Baja California: Circum-Pacific Council for Energy and Mineral Resources Earth Science Series, v. 6, p. 305-335.

Sorem, R. K.; Gunn, D. W., 1967, Mineralogy of manganese deposits, Olympic Peninsula, Washington: Economic Geology, v. 62, no. 1, p. 22-56.

Tabor, R. W.; Cady W. M., 1978, Geologic map of the Olympic Peninsula, Washington: U.S. Geological Survey Miscellaneous Investigations Series Map I-994, 2 sheets, scale 1:125,000.

Black and White (617)

ALTERNATE NAMES		DISTRICT	COUNTY
Three Friends			Mason
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Mt Steel	1:62,500	Mt. Olympus	Seattle
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
47° 34′ 31″ N	123° 20′ 40″ W	sec. 17 or NW¼ sec. 21, 24N, 5W	

LOCATION: elev. 4,250 ft, by Black and White Lakes. On the west slope of Mount Gladys, an access road from the Lincoln guard station follows the east side of the North Fork Skokomish River for 3.7 mi. A good pack trail continues 5 mi from the end of the road to the deposit

HOST ROCK: NAME	LITHOLOGY	AGE
unnamed unit	foliated sandstone and semischist	Eocene - Oligocene
unnamed basalt	altered basalt	Eocene - Oligocene

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
altered basalt	Eocene - Oligocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Cu	copper	jasper
Mn	cuprite	
Ag	chalcocite	
Cu	chalcotrichite	
Ni	malachite	
Mg	azurite	
	bementite	
	neotocite	
	rhodonite	
	rhodochrosite	
	manganocalcite	

DEPOSIT TYPE	MINERALIZATION AGE
replacement, disseminated exhalative/diagenetic	Eocene - Oligocene

PRODUCTION: Produced 5 tons of ore in 1915 containing 0.40 oz/ton Ag, 7.85% Cu, 3.2% Fe, and 65% insoluble (Huntting, 1956, p. 62).

TECTONIC SETTING: Host rocks of manganese deposits of the Olympic Peninsula formed at an ocean ridge or in a back arc basin at the active margin of the North American plate (Garrison, 1973; Snavely, 1987, p. 306-309).

ORE CONTROLS: Mineralization occurs along the contact between altered basalt and foliated sandstone-semischist (data from USGS MRDS, 1990; Tabor and Cady, 1978, geol. map). The deposit is in lenses that pinch and swell. Its maximum width is 8 ft, and the thickness is 50 ft. Lenticular bodies of manganese silicates occur conformably along the eastward or upper contacts of the basalt members at elevations approaching 4,400 ft. A manganiferous lens at the collar of the shaft pinches and swells along strike and down dip. No red limestone was exposed near the lens, but the limestone is found in the same stratigraphic horizon as the mineralization a short distance to the northeast. Manganese minerals are largely buff, tan, and gray bementites; also present are several thin veinlets of neotocite (data from USGS MRDS, 1990).

GEOLOGIC SETTING: The principal country rocks in the area are altered basalts and argillite, graywacke, limestone, and some phyllite. Near Kidney (Black and White) Lakes, they trend approximately N20E and dip steeply eastward.

REFERENCES

Garrison, R. E., 1973, Space-time relations of pelagic limestones and volcanic rocks, Olympic Peninsula, Washington: Geological Society of America Bulletin, v. 84, no. 2, p. 583-594.

Green, S. H., 1945, Manganese deposits of the Olympic Peninsula, Washington: Washington Division of Mines and Mining Report of Investigations 7, 45 p., 1 pl.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Magill, E. A., 1960, Manganese deposits of the Olympic Peninsula, Wash.: U.S. Bureau of Mines Report of Investigations 5530, 82 p.

Sorem, R. K.; Gunn, D. W., 1967, Mineralogy of manganese deposits, Olympic Peninsula, Washington: Economic Geology, v. 62, no. 1, p. 22-56.

Tabor, R. W.; Cady W. M., 1978, Geologic map of the Olympic Peninsula, Washington: U.S. Geological Survey Miscellaneous Investigations Series Map I-994, 2 sheets, scale 1:125,000.

Triple Trip (618)

ALTERNATE NAMES	DISTRICT	COUNTY
Brown Mule McKean		Mason

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Mt. Steel	1:62,500	Mt. Olympus	Seattle

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
47° 30′ 14″ N	123° 19′ 12″ W	secs. 4 and 9 23N, 5W

LOCATION: elev. 1,000 ft, 1 mi from Lincoln guard station along Apex trail, 0.25 mi up Copper Creek from the North Fork Skokomish River; on the north bank of Copper (Boulder) Creek; near the northwest corner of Lake Cushman.

HOST ROCK: NAME	LITHOLOGY	AGE
Crescent Formation	red limestone	Eocene
Crescent Formation	basalt	Eocene

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
Crescent Formation volcanic rocks	Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Mn	bementite	
Fe	manganiferous magnetite	

DEPOSIT TYPE	MINERALIZATION AGE
replacement, disseminated exhalative/diagenetic	Eocene

PRODUCTION: A carload of ore produced during World War I ran 35% to 45% Mn and 17% to 30% SiO_2 (Huntting, 1956, p. 261).

TECTONIC SETTING: Host rocks of manganese deposits of the Olympic Peninsula formed at an ocean ridge or in a back arc basin at the active margin of the North American plate (Garrison, 1973; Snavely, 1987, p. 306-309).

ORE CONTROLS: Lens-shaped ore body occurs in red limestone about 1 ft from its contact with basalt (data from U.S.G.S. MRDS, 1990; Huntting, 1956, p. 261). Manganese mineralization consists of a tabular body of bementite about 1.5 ft wide, 70 ft long, and 30 ft thick. Small amounts of secondary manganese oxides and jasper are associated with the bementite. Other small masses of manganese mineralization were found along Copper Creek to the southwest (data from USGS MRDS, 1990). Manganese deposits of the region are associated with spilites (Park, 1942, p. 311-312) and commonly are found with reddish pelagic limestone interbedded with the basalt. Manganese mineralization may be either disseminated in replacement bodies or volcanogenic exhalative/diagenetic bodies (Sorem and Gunn, 1967).

GEOLOGIC SETTING: The Crescent Formation, which hosts manganese mineralization on the Olympic Peninsula, consists of Paleocene? and Eocene pillow basalts compositionally similar to ocean ridge basalts. Associated pelagic limestones were deposited in deep water (Snavely, 1987, p. 306-308).

REFERENCES

Garrison, R. E., 1973, Space-time relations of pelagic limestones and volcanic rocks, Olympic Peninsula, Washington: Geological Society of America Bulletin, v. 84, no. 2, p. 583-594.

Green, S. H., 1945, Manganese deposits of the Olympic Peninsula, Washington: Washington Division of Mines and Mining Report of Investigations 7, 45 p., 1 pl.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Magill, E. A., 1960, Manganese deposits of the Olympic Peninsula, Wash.: U.S. Bureau of Mines Report of Investigations 5530, 82 p.

Park, C. F., Jr., 1942, Manganese resources of the Olympic Peninsula, Washington—A preliminary report: U.S. Geological Survey Bulletin 931-R, p. 435-457, 2 pl.

Snavely, P. D., Jr., 1987, Tertiary geologic framework, neotectonics, and petroleum potential of the Oregon-Washington continental margin. *In* Scholl, D. W.; Grantz, Arthur; Vedder, J. G., Geology and resources potential of the continental margin of western North America and adjacent ocean basins—Beaufort Sea to Baja California: Circum-Pacific Council for Energy and Mineral Resources Earth Science Series, v. 6, p. 305-335.

Sorem, R. K.; Gunn, D. W., 1967, Mineralogy of manganese deposits, Olympic Peninsula, Washington: Economic Geology, v. 62, no. 1, p. 22-56.

49th Parallel (369)

ALTERNATE NAMES		DISTRICT	COUNTY
			Okanogan
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Oroville	1:24,000	Oroville	Okanogan
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
48° 59′ 45.89″ N	119° 29′ .30″ W	NE¼ sec. 6, 40N, 27E	

LOCATION: 1,500 ft northwest of the O.K. copper mine

HOST ROCK: NAME	LITHOLOGY	AGE
Kobau Formation (?)	greenstone	Permian or Triassic (?)
ASSOCIATED IGNEOUS ROCK: DESCRIPTION		AGE
Silver Nail Lake pluton		Jurassic - Cretaceous (?)

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Cu	chalcopyrite	pyrite, quartz
Au	bornite	
W	scheelite	

DEPOSIT TYPE: porphyry vein

MINERALIZATION AGE:

PRODUCTION: Gold-copper ore in 1914 (Huntting, 1956, p. 65).

TECTONIC SETTING: The Kobau Formation was deposited along an active continental margin proximal to an island arc.

ORE CONTROLS: The 49th Parallel deposit is in the chlorite alteration zone of the Kelsey porphyry copper-molybdenum deposit (Roper, 1973).

GEOLOGIC SETTING: The 49th Parallel mine is in greenstone tentatively identified as the Permian or Triassic (?) Kobau Formation and also is adjacent to an altered quartz diorite phase of the Jurassic-Cretaceous (?) Silver Nail Lake pluton (Roper, 1973).

COMMENTS: Part of the Kelsey porphyry copper-molybdenum deposit (Roper, 1973).

REFERENCES

Culver, H. E.; Broughton, W. A., 1945, Tungsten resources of Washington: Washington Division of Geology Bulletin 34, 89 p., 23 pl.

Horton, F. W., 1916, Molybdenum, its ores and their concentration, with discussion of markets, prices, and uses: U.S. Bureau of Mines Bulletin 111, 132 p.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Patty, E. N., 1921, The metal mines of Washington: Washington Geological Survey Bulletin 23, 366 p.

Roper, M. W., 1973, Geology of the Kelsey copper-molybdenum property, Okanogan County, Washington: Montana State University Master of Science thesis, 97 p., 5 pl.

Umpleby, J. B., 1911, Part I. Geology and ore deposits of the Myers Creek mining district; Part II—Geology and ore deposits of the Oroville-Nighthawk mining district: Washington Geological Survey Bulletin 5, 111 p.

Adelia (375)

ALTERNATE NAMES		DISTRICT	COUNTY
			Okanogan
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Enterprise	1:24,000	Oroville	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 52′ 24.05″ N	119° 34′ .26″ W	SE¼ sec. 16, 39N, 26E

LOCATION: on Palmer Mountain east of the Ivanhoe property

HOST ROCK: NAME	LITHOLOGY	AGE
Spectacle Formation of the Anarchist Group	slate	Permian

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au	gold	quartz
Ag		

DEPOSIT TYPE	MINERALIZATION AGE
vein	

PRODUCTION: Several shipments prior to 1902 (Huntting, 1956, p. 135).

TECTONIC SETTING: Late Paleozoic sedimentary rocks were deposited along an active continental margin.

ORE CONTROLS: A vein about 5 ft wide in slate was said to carry good values in gold and silver (Huntting, 1956, p. 135).

GEOLOGIC SETTING: Vein in fine-grained metasedimentary rocks of the Permian Spectacle Formation of the Anarchist Group (Rinehart and Fox, 1972, geol. map).

REFERENCES

Bethune, G. A., 1892, Mines and minerals of Washington—Second annual report of G. A. Bethune, state geologist: Washington State Printer, 183 p.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Rinehart, C. D; Fox, K. F., Jr., 1972, Geology and mineral deposits of the Loomis quadrangle, Okanogan County, Washington: Washington Division of Mines and Geology Bulletin 64, 124 p., 3 pl.

Alder (452)

ALTERNATE NAMES		DISTRICT	COUNTY
		Twisp	Okanogan
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Twisp West	1:24,000	Twisp	Concrete
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
48° 19′ 19.46″ N	120° 9′ 28.72″ W	secs. 25, 26, 35, and 36, 33N, 21E	

LOCATION: elev. 3,600 ft

HOST ROCK: NAME	LITHOLOGY	AGE
Newby Group	dacite and rhyolite breccia	Jurassic - Cretaceous

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au	chalcopyrite	pyrrhotite; silicification, chloritization, sericitization
Ag	gold	
Cu	copper	
Zn	sphalerite	
	chalcocite	
	galena	
	malachite	
	azurite	

DEPOSIT TYPE	MINERALIZATION AGE
massive sulfide vein	Jurassic - Cretaceous (?)

PRODUCTION: Production includes 6,831 tons shipped in 1939 that averaged 0.55 oz/ton Au, about 0.50 oz/ton Ag, and 0.16% to 0.55% Cu (Huntting, 1956). Approximately 9,000 tons of ore were shipped in 1940 and 4,000 tons in 1942; 1,899 tons of concentrate were shipped in 1950 (Burnet, 1976). In 1951, 1,546 tons of copper concentrate yielded 268,202 lb Cu, and 2,072 oz Au. Shipments were also made in 1952-1953 (Huntting, 1956, p. 135).

TECTONIC SETTING: Newby Group rocks were probably deposited along or proximal to an island arc.

ORE CONTROLS: Sulfide deposits in the Alder mine are concordant with bedding in the host rocks and are strata-bound; hydrothermal alteration at the mine is also strata-bound. Sulfide minerals, including pyrite, sphalerite, chalcopyrite, and galena, are found in veins. These veins are generally small, have no relation to the Alder stock that intrudes volcanic rocks near the mine, and have a random orientation (Burnet, 1976; Bunning, 1990).

GEOLOGIC SETTING: Dacitic breccias of the Jurassic-Cretaceous Newby Group are host to volcanogenic massive sulfide mineralization at the Alder mine. The Newby Group was intruded by the Alder Creek stock, which has been dated at 137 ± 3.4 m.y. (Burnet, 1976; Bunning, 1990).

COMMENTS: The deposit was developed by three adits that total several hundred feet and a large open pit mine. A 300-ton/day flotation mill was built at the site (Huntting, 1956).

REFERENCES

Barksdale, J. D, 1948, Stratigraphy in the Methow quadrangle, Washington: Northwest Science, v. 22, no. 4, p. 164-176.

Bunning, B. B., compiler, 1990, Geologic map of the east half of the Twisp 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-9, 51 p, 1 pl.

Burnet, F. W., 1976, Felsic volcanic rocks and mineral deposits in the Buck Mountain Formation andesites, Okanogan County, Washington: University of Washington Master of Science thesis, 26 p., 1 pl.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

McFarland, C. R.; McLucas, G. B.; Rigby, J. G.; Stoffel, K. L., 1979, Directory of Washington mining operations, 1979: Washington Division of Geology and Earth Resources Information Circular 69, 100 p.

Purdy, C. P., Jr., 1952, Directory of Washington mining operations, 1952: Washington Division of Mines and Geology Information Circular 20, 75 p.

American Flag (376)

ALTERNATE NAMES		DISTRICT	COUNTY
		Wauconda	Okanogan
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Bodie Mountain	1:24,000	Republic	Okanogan
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
48° 45′ 13.28″ N	118° 50′ 43.10″ W	NE¼ sec. 36, 38N, 31E	

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
Klondike Mountain Formation	trachyte	Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au	chalcopyrite	quartz, fluorite, sanidine
Cu	bornite	
Zn	sphalerite	
Ag	galena	
	gold	
	pyrite	

DEPOSIT TYPE	MINERALIZATION AGE
vein	Eocene

PRODUCTION: Two 30-ton shipments of copper ore made in 1918-1919 (Moen, 1980, p. 69).

TECTONIC SETTING: East-west extension during the Eocene resulted in formation of the Toroda Creek graben and other structures in which a thick section of volcanic and sedimentary rocks was deposited and preserved (Holder and others, 1989).

ORE CONTROLS: The main mineralized structure is a 2-8-ft-wide silicified shear zone that strikes N45E and dips 50NW. Brecciated and sheared volcanic rock is cemented by quartz and sanidine and as much as 5% fluorite. The silicified and fluoritized breccia body exposed on the surface above the adit is as much as 250 ft in diameter. The American Flag is the southernmost property of the Zalla M-Silver Bell mineralized belt that is about 1 mi long and several hundred feet wide (Moen, 1980, p. 69).

GEOLOGIC SETTING: Volcanic rocks in this part of the Toroda Creek graben plot as rhyolite on a TAS diagram, but they contain sparse plagioclase and mafic phenocrysts in an aphanitic groundmass that contains abundant plagioclase microlites. Plagioclase phenocrysts are commonly strongly sericitized, and mafic minerals are generally replaced by some combination of chlorite, calcite, epidote, and sphene; shapes of altered mafic minerals suggest that they were originally pyroxene. The presence of silica stringers and veinlets in some of these rocks suggests that silica was introduced during alteration (Stoffel, 1990, p. 11).

COMMENTS: The main adit is 97 ft long and trends N45E along a mineralized shear zone. Several small prospect pits were present. Dump samples collected by Moen (1980, p. 69) contained a trace to 12.5 oz/ton Ag.

REFERENCES

Dorisy, C. E., 1937, Index of mineral occurrences in the state of Washington (revised edition): Washington State Planning Council Research Publication 3, 47 p.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Moen, W. S., 1980, Myers Creek and Wauconda mining districts of northeastern Okanogan County, Washington: Washington Division of Geology and Earth Resources Bulletin 73, 96 p., 6 pl.

Stoffel, K. L., compiler, 1990, Geologic map of the Republic 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-10, 62 p., 1 pl.

American Flag (446)

ALTERNATE NAMES		DISTRICT	COUNTY
Oriental and Central			Okanogan
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Mazama	1:62,500	Robinson Mountain	Concrete
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
48° 35′ 35.36″ N	120° 23′ 9.08″ W	SE¼ sec. 30, 36N, 20E	

LOCATION: on a cliff about 1 mi northeast of Mazama

HOST ROCK: NAME	LITHOLOGY	AGE
Fawn Peak stock	diorite to quartz diorite	Cretaceous

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Cu	chalcopyrite	quartz, calcite, pyrite, tourmaline, sericite
Ag	arsenopyrite	
Au	sphalerite	
Zn		
Pb		

DEPOSIT TYPE	MINERALIZATION AGE
breccia pipe	

PRODUCTION: Produced a few hundred tons before 1910; had a small amount of production in 1940 (Huntting, 1956, p. 135).

TECTONIC SETTING: Magmatic arc rocks of the area include the Fawn Peak stock, which is probably the intrusive equivalent of the volcanic member of the Midnight Peak Formation. The stock was probably the intrusive rock core of an island arc (Riedell, 1979). The unit has yielded K-Ar magmatic biotite ages of approximately 88 m.y. (Stoffel, 1990, p. 28).

ORE CONTROLS: The deposit is in a breccia pipe. Strongly brecciated and partially rotated fragments of quartz diorite as much as 3 cm long are in a matrix of quartz, tourmaline, calcite, pyrite, and chalcopyrite. The American Flag deposit is part of the Mazama porphyry copper-molybdenum system (Riedell, 1979).

GEOLOGIC SETTING: The American Flag deposit is in a breccia pipe of the Fawn Peak stock of Cretaceous age. It is an elongate, northwest-trending intrusion along the northeast side of the Methow River valley; it is situated along the axis of the Goat Peak syncline (Stoffel and McGroder, 1990).

COMMENTS: The American Flag deposit is part of the Mazama porphyry copper-molybdenum deposit (Riedell, 1979).

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Riedell, K. B., 1979, Geology and porphyry copper mineralization of the Fawn Peak intrusive complex, Methow Valley, Washington: University of Washington Master of Science thesis, 52 p., 4 pl.

Stoffel, K. L.; McGroder, M. F., compilers, 1990, Geologic map of the Robinson Mtn. 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-5, 39 p., 1 pl.

American Rand (407)

ALTERNATE NAMES		DISTRICT	COUNTY
Spokane			Okanogan
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Bullfrog Mtn	1:24,000	Oroville	Okanogan
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
48° 53′ 40.39″ N	119° 32′ 13.61″ W	W¼ corner sec. 11, 39N, 26E	

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
Spectacle Formation of the Anarchist Group	quartzite, argillite	Permian

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
Whisky Mountain pluton	Jurassic - Cretaceous

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Mo	molybdenite	quartz
Au	chalcopyrite	
Ag	gold	
Cu	galena	
	pyrite	

DEPOSIT TYPE	MINERALIZATION AGE
vein	

PRODUCTION: Produced in 1916-1918 and 1935-1938 (Huntting, 1956, p. 149).

TECTONIC SETTING: Late Paleozoic marine sedimentary rocks were deposited along an active continental margin.

ORE CONTROLS: A 15-in.-wide, north-trending, 20-40E-dipping, quartz vein in argillite a short distance above the contact with a pluton (Umpleby, 1911, p. 98).

GEOLOGIC SETTING: The vein is in metasedimentary rocks of the Spectacle Formation approximately 75 ft above the contact with the Whisky Mountain pluton (Umpleby, 1911, p. 98; Rinehart and Fox, 1972, geol. map).

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Rinehart, C. D; Fox, K. F., Jr., 1972, Geology and mineral deposits of the Loomis quadrangle, Okanogan County, Washington: Washington Division of Mines and Geology Bulletin 64, 124 p., 3 pl.

Umpleby, J. B., 1911, Part I. Geology and ore deposits of the Myers Creek mining district; Part II—Geology and ore deposits of the Oroville-Nighthawk mining district: Washington Geological Survey Bulletin 5, 111 p.

Andy O'Neil (473)

ALTERNATE NAMES		DISTRICT	COUNTY
Andy O.		Nespelem	Okanogan
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Armstrong Creek	1:24,000	Oroville	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 9′ 53.75″ N	119° 1′ 37.09″ W	N¼ sec.27, T 31N., R 30E

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
porphyritic granodiorite of Manila Creek	granite, granodiorite	(Paleocene ?) - Eocene
unnamed quartzite	quartzite, limestone	Paleozoic

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Ag	galena	pyrite, marcasite, quartz, calcite
Pb	chalcopyrite	
Zn	tetrahedrite	
Cu	bornite	

DEPOSIT TYPE	MINERALIZATION AGE
vein	Eocene - (Paleocene?)

PRODUCTION: A test shipment was made prior to 1940 (Huntting, 1956, p. 300).

TECTONIC SETTING: The porphyritic granodiorite of Manila Creek is part of the Keller Butte suite of Holder and Holder (1988). Keller Butte suite rocks were emplaced contemporaneously with ductile deformation associated with the formation of the metamorphic core complexes (Holder and Holder, 1988).

ORE CONTROLS: The deposit consists of fissure veins and breccia in granodiorite at and near its contact with quartzite and limestone. The vein that contains the ore-rich horizon is in a cross shear that intersects the main vein, which strikes N68W and dips 40NE. Sulfide minerals are crudely zoned in the vein; pyrite is more abundant at the walls, and galena, sphalerite, and chalcopyrite are more abundant at the center of the vein. The hanging wall has a gradational contact with the host rock, whereas the contact at the foot wall is sharp (Broch, 1979, p. 139).

GEOLOGIC SETTING: The deposit is in the (Paleocene?)-Eocene- porphyritic granodiorite of Manila Creek (Gulick and Korosec, 1990, geol. map).

COMMENTS: The main level crosscut intersects the main vein at approximately 150 ft. Two drifts were driven along the vein (Broch, 1979).

REFERENCES

Broch, M. J., 1979, Igneous and metamorphic petrology, structure, and mineral deposits of the Mineral Ridge area (Moses mining district), Colville Indian Reservation, Washington: Washington State University Master of Science thesis, 204 p., 1 pl.

Gulick, C. W.; Korosec, M. A., compilers, 1990, Geologic map of the Omak 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-12, 52 p., 1 pl.

Holder, R. W.; Holder, G. A. M., 1988, The Colville batholith—Tertiary plutonism in northeast Washington associated with graben and core complex (gneiss dome) formation: Geological Society of America Bulletin, v. 100, no. 12, p. 1971-1980.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Moen, W. S., 1976, Silver occurrences of Washington: Washington Division of Geology and Earth Resources Bulletin 69, 188 p.

Patty, E. N., 1921, The metal mines of Washington: Washington Geological Survey Bulletin 23, 366 p.

Antimony Bell (441)

ALTERNATE NAMES		DISTRICT	COUNTY
Antimony Belle			Okanogan
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Hungry Mtn	1:24,000	Twisp	Concrete

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 9′ 20.97″ N	120° 8′ 43.58″ W	NE¼SE¼ sec. 25, 31N, 21E

LOCATION: on a hill southeast of the South Fork Gold Creek

HOST ROCK: NAME	LITHOLOGY	AGE
Newby Group	greenstone	Jurassic - Cretaceous

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Sb	stibnite stibiconite	calcite, breccia, antigorite

DEPOSIT TYPE	MINERALIZATION AGE
shear zone	

PRODUCTION: In 1940, 1,300 lb of stibnite ore were shipped (Huntting, 1956, p. 18).

TECTONIC SETTING: The Newby Group was deposited in an active margin setting, along or near an island arc.

ORE CONTROLS: Stibnite occurs along a shear zone in greenstone. The shear zone is 3-10 in. wide, strikes S66E, dips nearly vertical, and has been exposed at intervals over a 200-ft length (Huntting, 1956, p. 18).

GEOLOGIC SETTING: The mineralized shear zone is in the Jurassic-Cretaceous Newby Group (Bunning, 1990, geol. map).

COMMENTS: The deposit is developed by a 32-ft shaft and several adits (Huntting, 1956).

REFERENCES

Bunning, B. B., compiler, 1990, Geologic map of the east half of the Twisp 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-9, 51 p, 1 pl.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Purdy, C. P., Jr., 1951, Antimony occurrences of Washington: Washington Division of Mines and Geology Bulletin 39, 186 p.

Antimony Queen (442)

ALTERNATE NAMES	DISTRICT	COUNTY
New Deal Dixie Queen Reedy Silver Seal	Gold Creek area	Okanogan

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Hungry Mtn	1:24,000	Twisp	Concrete

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 12′ 4.30″ N	120° 10′ 47.20″ W	SW¼NW¼ sec. 11, 31N, 21E

LOCATION: elev. 2,000 ft, 10 mi northwest of Methow, 4.5 mi up Copper Creek from the Methow highway

HOST ROCK: NAME	LITHOLOGY	AGE
Newby Group	argillite, graywacke	Jurassic - Cretaceous

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Sb Au Pb Zn W Ag	stibnite jamesonite arsenopyrite chalcopyrite pyrite galena sphalerite scheelite	calcite, pyrite, and pyrrhotite

DEPOSIT TYPE	MINERALIZATION AGE
shear zone	

PRODUCTION: A small amount of ore was extracted and may have been shipped in 1906. About 10 years later, 1,000 tons of stibnite ore and several hundred tons of antimony oxide, which had been manufactured in a small plant near the mine, were shipped. About 2/3 of a carload of ore was shipped in 1941 (Purdy, 1951, p. 109).

TECTONIC SETTING: The Newby Group was deposited in an active margin setting, along or near an island arc.

ORE CONTROLS: The host rocks of the deposit strike N30-40W and dip 50-80W. The dip of shear fractures containing fine stringer veins is at a lower angle than that of the bedding. Alteration, while extensive, is limited to a small area around the vein (Purdy, 1951).

GEOLOGIC SETTING: Mineralization is in veins in the graywacke and argillite of the Jurassic-Cretaceous Newby Group (Bunning, 1990).

COMMENTS: The mine was developed by three main adits and about 1,000 ft of workings (Huntting, 1956 p. 18).

REFERENCES

Barksdale, J. D, 1948, Stratigraphy in the Methow quadrangle, Washington: Northwest Science, v. 22, no. 4, p. 164-176.

Bunning, B. B., compiler, 1990, Geologic map of the east half of the Twisp 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-9, 51 p, 1 pl.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Purdy, C. P., Jr., 1951, Antimony occurrences of Washington: Washington Division of Mines and Geology Bulletin 39, 186 p.

Apache (474)

ALTERNATE NAMES		DISTRICT	COUNTY
		Nespelem	Okanogan
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Armstrong Creek	1:24,000	Oroville	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 9′ 28.47″ N	119° 1′ 11.66″ W	center E½ sec. 27, 31N, 30E

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
porphyritic granodiorite of Manila Creek	granite, granodiorite	(Paleocene?) -Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Ag	stephanite	quartz, rhodocrosite
Au	argentite	
Pb	silver	
Mn	tetrahedrite	
Zn	galena	
Cu	stephanite	
	pyrargyrite	
	chalcopyrite	
	sphalerite	
	chalcopyrite	

DEPOSIT TYPE	MINERALIZATION AGE
shear zone	(Paleocene?) - Eocene

PRODUCTION: Estimated production from 1911 to 1940 was about $250,000 in Ag, and $20,000 in Au. Shipments to the Tacoma smelter in 1911 contained about $350/ton Au and Ag. Small hand-sorted, high-grade shipments contained as much as 2,444 oz/ton Ag. The bulk of the ore averaged 10-20 oz/ton Ag and was concentrated at the Great Metals mill near Nespelem Falls prior to shipment to the smelter (Moen, 1976, p. 129).

TECTONIC SETTING: This epizonal pluton is part of the Keller Butte suite. Intrusion of the granodiorite was contemporaneous with deformation associated with the metamorphic core complexes (Holder and Holder, 1988).

ORE CONTROLS: The average strike of the vein is N45W, and the dip is northeast. Mineralization is a stockwork of veins that are 0.2-1.2 in. wide; the ore zone at the Apache is 1.25 ft wide. The veins pinch and swell and have sharp contacts with the host rock. Economic mineralization occurs as lenticular or tabular lenses and pods distributed along single veins. Ore shoots are complexly brecciated and contain angular fragments of broken wall rock and vein quartz. Open-space filling is exhibited by such features as euhedral quartz crystals. A wide alteration halo surrounds the veins at the surface (Broch, 1979).

GEOLOGIC SETTING: The veins are in a shear zone in the (Paleocene?)-Eocene porphyritic granodiorite of Manila Creek.

COMMENTS: The vein was accessed by several adits (Broch, 1979).

REFERENCES

Broch, M. J., 1979, Igneous and metamorphic petrology, structure, and mineral deposits of the Mineral Ridge area (Moses mining district), Colville Indian Reservation, Washington: Washington State University Master of Science thesis, 204 p., 1 pl.

Gulick, C. W.; Korosec, M. A., compilers, 1990, Geologic map of the Omak 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-12, 52 p., 1 pl.

Holder, R. W.; Holder, G. A. M., 1988, The Colville batholith—Tertiary plutonism in northeast Washington associated with graben and core complex (gneiss dome) formation: Geological Society of America Bulletin, v. 100, no. 12, p. 1971-1980.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Moen, W. S., 1976, Silver occurrences of Washington: Washington Division of Geology and Earth Resources Bulletin 69, 188 p.

Pardee, J. T., 1918, Geology and mineral deposits of the Colville Indian Reservation, Washington: U.S. Geological Survey Bulletin 677, 186 p., 1 pl.

Arlington (420)

ALTERNATE NAMES	DISTRICT	COUNTY
	Conconully Ruby Hill area	Okanogan

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Ruby Hill	1:24,000	Omak	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 28′ 19.65″ N	119° 44′ 7.02″ W	NE¼SE¼ sec. 6, 34N, 25E

LOCATION: elev. 4,080 ft

HOST ROCK: NAME	LITHOLOGY	AGE
Conconully pluton	granodiorite	Cretaceous
metamorphic complex of Conconully	gneiss	pre-Jurassic

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Ag	galena	quartz
Cu	tetrahedrite	
Pb	pyrargyrite	
Au	chalcopyrite	
Zn	sphalerite	

DEPOSIT TYPE	MINERALIZATION AGE
vein	Cretaceous?

PRODUCTION: The Arlington vein was one of the first deposits to be discovered on Ruby Hill. One thousand tons of silver ore, which had a net value of $25,000, were mined by the summer of 1893 and concentrated at a mill in Ruby City. Between 1914 and 1921, several thousand tons of ore which contained 66.6 oz/ton Ag were mined at a net profit of $31,000. A 50-ton/day flotation mill was erected in 1937. Between 1938 and 1939, 5,700 tons of ore that had a net value of $71,683 were concentrated in the mill. Mining and milling operations ceased early in 1940 (Moen, 1973, p. 12).

TECTONIC SETTING: The Conconully pluton is a directionless, post-tectonic plutonic rock that was intruded into a major structural zone (Stoffel, K. L., DGER, 1990, oral commun.).

ORE CONTROLS: The Arlington vein is 1-6 ft thick, strikes north, and dips 70W. The vein for the most part occurs along the contact between the Conconully pluton and gneiss. Transverse faults offset the vein as much as 10 ft, whereas faults that parallel the vein have drawn the ore minerals out into thin dark-gray bands (Moen, 1973, p. 12).

GEOLOGIC SETTING: The Arlington vein occurs in the Conconully pluton of Cretaceous age near the contact with gneiss of the metamorphic complex of Conconully (Moen, 1973; Rinehart, 1981; Stoffel, 1990).

COMMENTS: Underground workings consisted of shafts, drifts, and crosscuts that have a total length of 4,500 ft. The workings exposed the vein on four levels for a total vertical distance of 540 ft (Moen, 1973, p. 12).

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Moen, W. S., 1976, Silver occurrences of Washington: Washington Division of Geology and Earth Resources Bulletin 69, 188 p.

Moen, W. S., 1973, Conconully mining district of Okanogan County, Washington: Washington Division of Mines and Geology Information Circular 49, 42 p.

Patty, E. N., 1921, The metal mines of Washington: Washington Geological Survey Bulletin 23, 366 p.

Rinehart, C. D, 1981, Reconnaissance geochemical survey of gully and stream sediments, and geologic summary, in part of the Okanogan Range, Okanogan County, Washington: Washington Division of Geology and Earth Resources Bulletin 74, 24 p., 3 pl.

Stoffel, K. L., compiler, 1990, Geologic map of the Oroville 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-11, 58 p., 1 pl.

Bales (443)

ALTERNATE NAMES		DISTRICT	COUNTY
		Carlton-Gold Creek area	Okanogan
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Twisp East	1:24,000	Twisp	Concrete

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 16′ 41.15″ N	120° 6′ 25.60″ W	W½NE¼ sec. 17, 32N, 22E

LOCATION: elev. 3,000 ft

HOST ROCK: NAME	LITHOLOGY	AGE
Twisp Valley Schist	amphibolite, greenschist	pre-Cretaceous

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Sb	stibnite	quartz
As	stibiconite	
Ni	As mineral?	
	Ni mineral?	

DEPOSIT TYPE	MINERALIZATION AGE
vein shear zone	

PRODUCTION: Mining in 1951-52 yielded an estimated 100 tons of ore (Huntting, 1956, p. 18).

TECTONIC SETTING: The metasedimentary rocks were originally deposits in an active margin environment; the interleaving of metaperidotite with supracrustal rocks suggests that significant tectonic mixing predated the complicated folding and metamorphic history of the Twisp Valley Schist (Bunning, 1990).

ORE CONTROLS: The mineralized zone consists of three elements: intensely hydrothermally altered wall rock, quartz, and lenticular masses of stibnite. The altered rock that encloses the veinlets and irregular masses of stibnite is composed of erratically distributed, alternating iron-oxide stained and bleached rock that is composed of quartz, sericite, and minor amounts of kaolin. Crisscrossing the altered rock are veinlets and microveinlets of stibiconite. The contact between the wall rock and the lenticular masses of stibnite is characterized by the presence of quartz, especially drusy quartz in the vugs. The vein or mineralized zone strikes about N47E and dips 80SE. The zone containing stibnite ranges from several inches to 5 ft in width (Purdy, 1951, p. 122-123).

GEOLOGIC SETTING: The mineralized system is within hornblende-quartz diorite of the Twisp Valley Schist (Purdy, 1951; Bunning, 1990, geol. map).

COMMENTS: Only surface work has been done at this property (Purdy, 1951).

REFERENCES

Bunning, B. B., compiler, 1990, Geologic map of the east half of the Twisp 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-9, 51 p, 1 pl.

Barksdale, J. D, 1948, Stratigraphy in the Methow quadrangle, Washington: Northwest Science, v. 22, no. 4, p. 164-176.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Purdy, C. P., Jr., 1951, Antimony occurrences of Washington: Washington Division of Mines and Geology Bulletin 39, 186 p.

Purdy, C. P., Jr., 1952, Directory of Washington mining operations, 1952: Washington Division of Mines and Geology Information Circular 20, 75 p.

Bellevue (377)

ALTERNATE NAMES		DISTRICT	COUNTY
Bellview		Wannacut Lake	Okanogan
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Bullfrog Mtn	1:24,000	Oroville	Okanogan
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
48° 54′ 49.07″ N	119° 34′ 2.51″ W	N½ sec. 4, 39N, 26E	

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
Spectacle Formation of the Anarchist Group	slate	Permian

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
metagabbro, metadiorite	Permian - Triassic

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au	chalcopyrite	quartz, arsenopyrite, pyrite
Ag	pyrargyrite	
Cu	stephanite	
	silver	
	gold	
	gold-silver telluride	

DEPOSIT TYPE	MINERALIZATION AGE
vein	

PRODUCTION: A test shipment of 1,000 lb gave returns of $75 in Au and Ag; gold represented a little over half the total return (Umpleby, 1911).

TECTONIC SETTING: Late Paleozoic sediments were deposited along an active continental margin.

ORE CONTROLS: The N29E-trending, 45-66SE-dipping quartz vein is from 10 in. to 3 ft wide. The upper part of the vein is in slate, and limestone is present in the lower part (Huntting, 1956, p. 136; Rinehart and Fox, 1972, p. 78).

GEOLOGIC SETTING: The vein is in the slate, argillite, and limestone of the Spectacle Formation of the Anarchist Group of Permian age. The Spectacle Formation is intruded by gabbro and/or diorite of Permian-Triassic age.

COMMENTS: A small shaft was dug and 250-ft of development work was done on the property (Rinehart and Fox, 1972)

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Hodges, L. K., 1897, Mining in the Pacific Northwest: Seattle Post Intelligencer, 116 p. [Facsimile reprinted 1967 in two volumes, Mining in eastern and central Washington, and, Mining in western Washington: Shorey Book Store, Seattle, Washington.]

Rinehart, C. D; Fox, K. F., Jr., 1972, Geology and mineral deposits of the Loomis quadrangle, Okanogan County, Washington: Washington Division of Mines and Geology Bulletin 64, 124 p., 3 pl.

Umpleby, J. B., 1911, Part I. Geology and ore deposits of the Myers Creek mining district; Part II—Geology and ore deposits of the Oroville-Nighthawk mining district: Washington Geological Survey Bulletin 5, 111 p.

Bi-Metallic (472)

ALTERNATE NAMES	DISTRICT	COUNTY
	Myers Creek Buckhorn Mtn area	Okanogan

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Havillah	1:24,000	Oroville	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 50′ 59.02″ N	119° 8′ 32.60″ W	NW¼ sec. 26 SE¼ sec. 27, 39N, 29E

LOCATION: 3 mi northeast of Havillah

HOST ROCK: NAME	LITHOLOGY	AGE
alkalic complex at Bimetallic Mountain	alaskite, aplite, monzonite	Cretaceous or Tertiary

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Mo	molybdenite	pyrite; sericitic and kaolinitic alteration
Cu	chalcopyrite	
Ag	powellite	
Au	scheelite	
W		

DEPOSIT TYPE	MINERALIZATION AGE
shear zone porphyry ?	

PRODUCTION: High-grade copper ore was shipped from one of the shafts in 1918 (Moen, 1980, p.57).

TECTONIC SETTING: Deposit is in an alkalic intrusive complex.

ORE CONTROLS: Mineralization is contained in several undulating shear zones in hydrothermally altered alaskite, aplite, and monzonite (Purdy, 1954, p. 34-44). Shear zones do not appear to continue for more than 30 ft. Sericite, kaolinite, and disseminated ore minerals are present in the shear zones. Ore minerals are localized in small ore shoots.

GEOLOGIC SETTING: The deposit is within the alkalic complex of Bimetallic Mountain, which is of Cretaceous or Tertiary age. The monzonite, which is brecciated and locally includes shonkinite, is intruded by hydrothermally altered, fine-grained, alaskite dikes. The rocks intrude metasedimentary rocks of the Spectacle Formation of the Permian Anarchist Group, which are locally hornfelsed (Stoffel, 1990).

COMMENTS: Development consists of several shafts and two adits. A total of 2,200 ft of linear trenching was done by the U.S. Bureau of Mines (USBM) in 1945 to determine the extent of mineralization; no significant mineralization was found. Assays of samples from the adit by the USBM ranged from 2.20 to 3.87% Mo and 0.03 to 0.32% Cu and showed traces of Au and Ag. Samples taken from the trench averaged 0.32% Cu; trace amounts of Au and Ag were found in some samples. Sampling suggests that the better copper values are found in samples from near the surface, whereas the higher molybdenum values are from samples collected at deeper levels in the mineralized system (Moen, 1980, p. 57).

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Moen, W. S., 1980, Myers Creek and Wauconda mining districts of northeastern Okanogan County, Washington: Washington Division of Geology and Earth Resources Bulletin 73, 96 p., 6 pl.

Purdy, C. P., Jr., 1952, Directory of Washington mining operations, 1952: Washington Division of Mines and Geology Information Circular 20, 75 p.

Purdy, C. P., Jr., 1954, Molybdenum occurrences of Washington: Washington Division of Mines and Geology Report of Investigations 18, 118 p., 6 pl.

Stoffel, K. L., compiler, 1990, Geologic map of the Oroville 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-11, 58 p., 1 pl.

Black Bear (378)

ALTERNATE NAMES	DISTRICT	COUNTY
	Palmer Mtn Alice Property area	Okanogan

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Loomis	1:24,000	Oroville	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 50′ 16.30″ N	119° 37′ 37.85″ W	NE¼ sec. 36, T39N, R25E

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
Palmer Mountain Greenstone	greenstone	Permian - Triassic

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
granitic rocks, felsic to intermediate	Jurassic - Cretaceous

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au Ag Cu	gold chalcopyrite (?)	quartz

DEPOSIT TYPE	MINERALIZATION AGE
vein	

PRODUCTION: Produced $150,000 prior to 1902; produced 77 tons in 1947 (Huntting, 1956, p. 81).

TECTONIC SETTING: The greenstones were deposited along an active continental margin proximal to an island arc.

ORE CONTROLS: The 4-ft wide, N65W-trending and 75NE-dipping quartz vein is in banded greenstone (Rinehart and Fox, 1972, p. 80).

GEOLOGIC SETTING: Veins are in banded and schistose greenstone of the Permian-Triassic Palmer Mountain Greenstone; greenstone was intruded by felsic to intermediate rocks of probable Jurassic-Cretaceous age (Rinehart and Fox, 1972, geol. map).

COMMENTS: Developed by 2,500 ft of workings and a 300-ft shaft (Rinehart and Fox, 1972).

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Landes, Henry; Thyng, W. S.; Lyon, D A.; Roberts, Milnor, 1902, Annual report for 1901, in six parts; Part II-The metalliferous resources of Washington, except iron: Washington Geological Survey, 123 p.

Rinehart, C. D; Fox, K. F., Jr., 1972, Geology and mineral deposits of the Loomis quadrangle, Okanogan County, Washington: Washington Division of Mines and Geology Bulletin 64, 124 p., 3 pl.

Blue Lake (447)

ALTERNATE NAMES		DISTRICT	COUNTY
			Okanogan
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Blue Goat Mtn	1:24,000	Oroville	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 41′ 14.46″ N	119° 42′ 20.29″ W	SW¼ sec. 21, 37N, 25E

LOCATION: on the east side of a northward-trending ridge from Goat Mountain

HOST ROCK: NAME	LITHOLOGY	AGE
Blue Goat pluton	granodiorite	(Triassic?) - Jurassic-

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Cu	chalcopyrite	quartz
Au	gold	

DEPOSIT TYPE	MINERALIZATION AGE
vein	

PRODUCTION: About 5,000 tons of ore were taken out in 1901 (Huntting, 1956, p. 63).

TECTONIC SETTING: The Blue Goat pluton is a elongate pluton that is roughly concordant with the regional foliation in the local metamorphic rocks, but contacts are locally sharp and discordant. The country rock was probably deformed and metamorphosed prior to the emplacement of the pluton (Rinehart and Fox, 1976, p. 32).

ORE CONTROLS: Mineralization consists of several small quartz stringers in granodiorite; these contain a little chalcopyrite (Huntting, 1956, p. 63).

GEOLOGIC SETTING: Veins at the Blue Lake property are in the directionless, sub-porphyritic granodiorite of the (Triassic?)-Jurassic Blue Goat pluton (Stoffel, 1990, p. 33).

COMMENTS: The property was developed by a 300-ft adit (Huntting, 1956, p. 63).

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Jones, E. L., Jr., 1917, Reconnaissance of the Conconully and Ruby mining districts, Washington. *In* Contributions to economic geology (short papers and preliminary reports), 1916-Part I, metals and nonmetals except fuels: U.S. Geological Survey Bulletin 640, p. 11-36.

Landes, Henry; Thyng, W. S.; Lyon, D A.; Roberts, Milnor, 1902, Annual report for 1901, in six parts; Part II-The metalliferous resources of Washington, except iron: Washington Geological Survey, 123 p.

Rinehart, C. D; Fox, K. F., Jr., 1976, Bedrock geology of the Conconully Quadrangle, Okanogan County, Washington: U.S. Geological Survey Bulletin 1402, 58 p., 1 pl.

Stoffel, K. L., compiler, 1990, Geologic map of the Oroville 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-11, 58 p., 1 pl.

Bodie (379)

ALTERNATE NAMES		DISTRICT	COUNTY
Northern Gold		Wauconda	Okanogan
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Bodie	1:24,000	Republic	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 49′ 50.05″ N	118° 53′ 25.99″ W	SW¼ sec. 3, 38N, 31E, and sec. 34, 39N, 31E

LOCATION: elev. 3,000 ft

HOST ROCK: NAME	LITHOLOGY	AGE
Klondike Mountain Formation	andesite, dacite	Eocene
Klondike Mountain Formation	tuff	Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au	gold	pyrite, pyrrhotite, magnetite, quartz, chalcedonic quartz, calcite
Ag	chalcopyrite	
Fe	pyrite	
	pyrrhotite	
	magnetite	

DEPOSIT TYPE	MINERALIZATION AGE
vein, epithermal breccia	Eocene

PRODUCTION: A 10-stamp amalgamation-cyanide mill processed approximately 15,000 tons of gold ore from 1902 to 1916. In 1930 a 70-ton/day mill was built to recover free gold and low-grade ore that contained about 0.65 oz/ton Au and 0.60 oz/ton Ag. In 1938, the capacity of the mill was increased to 125 tons/day, and cyanidation and flotation circuits were added. Mining and milling were carried out until 1944, with as many as 40 miners working three shifts and producing as much as $1,500 of Au and Ag a day. From 1930 to 1944, about 50,000 tons of ore valued at about $280,000 was mined.

TECTONIC SETTING: These rocks were deposited in the Toroda Creek graben, a volcano-tectonic depression that was the result of east-west extension in the Eocene (Holder and others, 1989).

ORE CONTROLS: The Bodie vein is 2-22 ft wide and consists of many, parallel, closely spaced quartz veins. The individual veins are several inches to 5 ft in width and strike north to N16E and dip 60-80W. Vein quartz is white to light gray, fine grained, and commonly chalcedonic and colloform. Prospects pits have exposed the vein for about 6,000 ft; underground workings indicate the vein extends in excess of 500 ft along its dip. Gold is rarely visible; sulfides and magnetite are fine grained and disseminated in the quartz. The black streaks that parallel the walls contain dustlike particles of sulfides and gold and are the richest part of the vein. The gold grade in protore diminishes with depth from about 0.15 to 0.002 oz/ton; ore from the surface to the 100 level averaged about 1 oz/ton Au. The silver to gold ratio is 1:1. In addition to the veins, gold occurs in breccia in volcanic rocks that adjoin the Bodie vein on the west. The breccia strikes north and dips 35-45W. In the upper workings of the mine the breccia forms the hanging wall of the vein. The breccia extends below the 700 level to an undetermined depth. Clasts of the breccia are highly to moderately altered volcanic rocks and are cemented by crypotocrystalline silica and gouge (Moen, 1980, p. 73).

GEOLOGIC SETTING: The deposit is in the Klondike Mountain Formation. Whole-rock geochemistry suggests that the rock is a rhyolite; however, thin section work by Stoffel (1990) suggests that altered mafic minerals were originally pyroxenes and that the high silica content of the rock may be due to the addition of silica in the form of stringers and veinlets.

COMMENTS: Most of the mining took place on the Bodie No. 1 claim. At least 10,000 ft of underground work on five main crosscut adits penetrate the breccia and intersect the vein. A glory hole mined rich parts of the Bodie vein at the surface (Moen, 1980, p. 74).

REFERENCES

Washington Division of Mines and Mining, 1941, Directory of Washington metallic mining properties: Washington Division of Mines and Mining Information Circular 7, 74 p.

Holder, R. W.; Gaylord, D R.; Holder, G. A. M., 1989, Plutonism, volcanism, and sedimentation associated with core complex and graben development in the central Okanogan Highlands, Washington. IN Joseph, N. L.; and others, editors, 1989, Geologic guidebook for Washington and adjacent areas: Washington Division of Geology and Earth Resources Information Circular 86, p. 187-200.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

McFarland, C. R.; McLucas, G. B.; Rigby, J. G.; Stoffel, K. L., 1979, Directory of Washington mining operations, 1979: Washington Division of Geology and Earth Resources Information Circular 69, 100 p.

Moen, W. S., 1980, Myers Creek and Wauconda mining districts of northeastern Okanogan County, Washington: Washington Division of Geology and Earth Resources Bulletin 73, 96 p., 6 pl.

Stoffel, K. L., compiler, 1990, Geologic map of the Republic 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-10, 62 p., 1 pl.

Bullfrog (380)

ALTERNATE NAMES		DISTRICT	COUNTY
		Palmer Mtn	Okanogan
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Bullfrog Mtn	1:24,000	Oroville	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 54′ 58.42″ N	119° 34′ 29.35″ W	S½SW¼ sec. 33, 40N, 26E

LOCATION: elev. 3,560 ft

HOST ROCK: NAME	LITHOLOGY	AGE
Bullfrog Mountain Formation	schistose quartzite, sericite schist	Permian

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
felsic dike	Jurassic - Cretaceous

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au Ag	black metallic sulfide pyrite	quartz

DEPOSIT TYPE	MINERALIZATION AGE
vein	

PRODUCTION: Shipped 4,600 lb of ore (Huntting, 1956, p. 137).

TECTONIC SETTING: Late Paleozoic sediments were deposited along a convergent continental margin.

ORE CONTROLS: Reportedly, a 7-ft-wide quartz vein in quartzite and sericitic schist was traceable for 3,000 ft (Huntting, 1956, p. 137).

GEOLOGIC SETTING: The vein is in sericitic schist and schistose quartzite of the Permian Bullfrog Mountain Formation (Rinehart and Fox, 1972).

COMMENTS: There is an adit and two shafts at property.

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Rinehart, C. D; Fox, K. F., Jr., 1972, Geology and mineral deposits of the Loomis quadrangle, Okanogan County, Washington: Washington Division of Mines and Geology Bulletin 64, 124 p., 3 pl.

Umpleby, J. B., 1911, Part I. Geology and ore deposits of the Myers Creek mining district; Part II—Geology and ore deposits of the Oroville-Nighthawk mining district: Washington Geological Survey Bulletin 5, 111 p.

Bunker Hill (381)

ALTERNATE NAMES	DISTRICT	COUNTY
		Okanogan

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Loomis	1:24,000	Oroville	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 50′ 39.25″ N	119° 38′ 3.74″ W	approximately sec. 25, 39N, 25E

LOCATION: on the west slope of Palmer Mountain at elev. 3,500 ft

HOST ROCK: NAME	LITHOLOGY	AGE
Palmer Mountain Greenstone	greenstone, metagabbro	Permian - Triassic

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au	gold	quartz

DEPOSIT TYPE	MINERALIZATION AGE
vein	

PRODUCTION: Produced 5 tons of high-grade gold ore prior to 1890 (Bethune, 1891, p. 64).

TECTONIC SETTING: The greenstones were deposited along a convergent continental margin proximal to an island arc.

ORE CONTROLS: A 20-in.-wide (on the surface) vertical vein trends northeast and is exposed on the surface for more than 300 ft (Huntting, 1956, p. 137).

GEOLOGIC SETTING: The vein is in greenstone and metagabbro of the Permian-Triassic Palmer Mountain Greenstone (Rinehart and Fox, 1972, geol. map).

COMMENTS: The property was developed by two adits (Bethune, 1991).

REFERENCES

Bethune, G. A., 1891, Mines and minerals of Washington—Annual report of G. A. Bethune, first state geologist: Washington State Printer, 122 p.

Bethune, G. A., 1892, Mines and minerals of Washington—Second annual report of G. A. Bethune, state geologist: Washington State Printer, 183 p.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Rinehart, C. D; Fox, K. F., Jr., 1972, Geology and mineral deposits of the Loomis quadrangle, Okanogan County, Washington: Washington Division of Mines and Geology Bulletin 64, 124 p., 3 pl.

Butcher Boy (382)

ALTERNATE NAMES		DISTRICT	COUNTY
		Myers Creek Chesaw area	Okanogan

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Chesaw	1:24,000	Oroville	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 57′ 12.36″ N	119° 2′ 59.61″ W	N½NW¼ sec. 21, 40N, 30E

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
Kobau Formation?	greenstone, metadiorite	Permian or Triassic (?)

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au	pyrrhotite	quartz, pyrite, pyrrhotite
Ag	sphalerite	
Zn	galena	
Pb	gold	

DEPOSIT TYPE	MINERALIZATION AGE
vein	

PRODUCTION: Eleven carloads of gold ore were shipped in 1907 (Huntting, 1956, p. 137). One carload was shipped in 1908; it averaged 4 oz/ton Au. Production ended in 1909 (Moen, 1973).

TECTONIC SETTING: Greenstone was deposited along a convergent continental margin proximal to an island arc.

ORE CONTROLS: A quartz fissure vein in greenstone that varies in width from 1 in. to as much as 6 ft. The vein trends N50W and dips 74NE. Gold is rarely visible, except in high-grade ore shoots (Moen, 1980, p. 33). Gold is associated with pyrite-rich parts of the vein, which contain as much as 5 oz/ton Au (Umpleby, 1911, p. 50).

GEOLOGIC SETTING: The vein is in greenstone and metadiorite of the Permian or Triassic (?) Kobau Formation (Moen, 1980).

COMMENTS: Development work consists of a 326-ft adit, a shaft 150 ft west of and 50 ft higher in elevation than the portal that contained high-grade-gold ore that was mined in the early 1900s. The shaft does not connect with the adit (Moen, 1980, p. 33).

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Moen, W. S., 1980, Myers Creek and Wauconda mining districts of northeastern Okanogan County, Washington: Washington Division of Geology and Earth Resources Bulletin 73, 96 p., 6 pl.

Umpleby, J. B., 1911, Part I. Geology and ore deposits of the Myers Creek mining district; Part II—Geology and ore deposits of the Oroville-Nighthawk mining district: Washington Geological Survey Bulletin 5, 111 p.

Caribou (383)

ALTERNATE NAMES		DISTRICT	COUNTY
		Myers Creek Buckhorn Mtn Area	Okanogan

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Buckhorn Mountain	1:24,000	Republic	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 57′ 52.93″ N	118° 59′ 26.54″ W	SW¼SW¼ sec. 13, T40N, R30E

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
Spectacle Formation of the Anarchist Group	quartzite, argillite	Permian

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
Buckhorn Mountain pluton	Jurassic - Cretaceous

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au Ag Cu Fe	pyrite magnetite chalcopyrite malachite	pyrrhotite, skarn, and tactite minerals

DEPOSIT TYPE	MINERALIZATION AGE
contact metasomatic	

PRODUCTION: Between 1908 and 1916, the mine was operated by British Columbia Copper Co., and eight carloads of gold-silver-copper ore were shipped to smelters in British Columbia (Moen, 1980, p. 43).

TECTONIC SETTING: The Spectacle Formation was deposited along an active continental margin.

ORE CONTROLS: Contact metamorphic deposit at the contact of metasedimentary rocks and biotite-hornblende granodiorite (Moen, 1980, p. 43).

GEOLOGIC SETTING: The contact metamorphic deposit is found at the contact of Permian metasedimentary rocks and the Jurassic-Cretaceous granodiorite of the Buckhorn Mountain pluton (Moen, 1980, p. 43; Stoffel, 1990, p.29).

COMMENTS: This deposit appears to be a northwesterly extension of the ore bodies at the Magnetic mine. Shafts, adits, prospect pits, and trenches are on the property. A core hole drilled by Granby Consolidated Mining, Smelting & Power Co. contained intercepts of 0.2-4.3% Cu within 112 ft of the surface.

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Moen, W. S., 1980, Myers Creek and Wauconda mining districts of northeastern Okanogan County, Washington: Washington Division of Geology and Earth Resources Bulletin 73, 96 p., 6 pl.

Stoffel, K. L., compiler, 1990, Geologic map of the Oroville 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-11, 58 p., 1 pl.

Cassimer Bar placer (487)

ALTERNATE NAMES		DISTRICT	COUNTY
			Okanogan
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Bridgeport	1:24,000	Omak	Okanogan
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
48° 5′ 56.99″ N	119° 43′ 4.83″ W	sec. 17, 30N, 25E	

LOCATION: at the mouth of the Okanogan River

HOST ROCK: NAME	LITHOLOGY	AGE
Quaternary alluvium	sand and gravel	Quaternary

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au	gold	sand and gravel

DEPOSIT TYPE	MINERALIZATION AGE
placer	Quaternary

PRODUCTION: Considerable production was reported for 1860 to 1890 (Huntting, 1956, p. 187).

TECTONIC SETTING: Deposition of heavy minerals in river gravels.

ORE CONTROLS: Heavy-mineral concentration by stream action.

REFERENCES

Bethune, G. A., 1891, Mines and minerals of Washington—Annual report of G. A. Bethune, first state geologist: Washington State Printer, 122 p.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Castle Creek (466)

ALTERNATE NAMES		DISTRICT	COUNTY
		Park City	Okanogan
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Bald Knob	1:24,000	Nespelem	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 22′ 55.98″ N	118° 51′ 22.41″ W	secs. 1, 11, and 12, 33N, 31E

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
unnamed argillite and shale unit	argillite, shale	Paleozoic

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
granite of Moses Mountain	Paleocene - Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Pb Ag Au Cu Zn	galena sphalerite chalcopyrite tetrahedrite	pyrite, marcasite, quartz

DEPOSIT TYPE	MINERALIZATION AGE
veins	

PRODUCTION: Produced an unknown amount of ore in 1906, 1918, and 1920 (Huntting, 1956, p. 217).

TECTONIC SETTING: The granite of Moses Mountain is part of the Keller Butte suite of Holder and Holder (1988). Rocks of the Keller Butte suite were emplaced during regional ductile stretching associated with deformation in the metamorphic core complexes (Holder and Holder, 1988).

ORE CONTROLS: Mineralization consists of lenticular quartz masses containing scattered patches of ore in a series of metamorphic rocks intruded by granitic dikes (Huntting, 1956, p. 217).

GEOLOGIC SETTING: At the Castle Creek mine, Paleozoic black shale containing hematitic, brown siltstone interbeds is intruded by dikes of the Paleocene-Eocene granite of Moses Mountain (Joseph, 1990, geol. map).

REFERENCES

Bancroft, Howland, 1914, The ore deposits of northeastern Washington: U.S. Geological Survey Bulletin 550, 215 p.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Joseph, N. L., compiler, 1990, Geologic map of the Nespelem 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-16, 47 p., 1 pl.

Pardee, J. T., 1918, Geology and mineral deposits of the Colville Indian Reservation, Washington: U.S. Geological Survey Bulletin 677, 186 p., 1 pl.

Patty, E. N., 1921, The metal mines of Washington: Washington Geological Survey Bulletin 23, 366 p.

Washington Division of Mines and Mining, 1941, Directory of Washington metallic mining properties: Washington Division of Mines and Mining Information Circular 7, 74 p.

Central (475)

ALTERNATE NAMES		DISTRICT	COUNTY
Trinidad			Okanogan
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Aeneas Lake	1:24,000	Oroville	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 37′ 59.07″ N	119° 33′ 23.86″ W	W½ sec. 10, 36N, 26E

LOCATION: elev. 2,000 ft, 8.5 mi southwest of Tonasket; by the south shore of Turtle Lake

HOST ROCK: NAME	LITHOLOGY	AGE
unnamed hypabyssal intrusive rocks	dacite	Eocene
unnamed crystal tuff	crystal-lithic and crystal tuff	Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Ag	chalcopyrite	pyrite
Pb	galena	
Au	sphalerite	
Cu	gold	
Zn		

DEPOSIT TYPE	MINERALIZATION AGE
volcanic-plutonic	Eocene

PRODUCTION: In 1918, 30 tons of ore that averaged $12/ton Ag and Au were shipped from the 32-ft level of the shaft (Moen, 1973).

TECTONIC SETTING: Eocene volcano-tectonic depressions formed as the result of regional east-west extension (Holder and others, 1989).

ORE CONTROLS: According to Moen (1973), the deposit is in brecciated and silicifed black argillite that has been intruded by an north-trending aplite porphyry dike, which appears to be several hundred feet wide. Parts of the dike contain pods of galena and pyrite that are accompanied by minor chalcopyrite and sphalerite (Moen, 1973, p. 37). Rinehart and Fox (1976) indicate the deposit is in a Tertiary crystal tuff intruded by a Tertiary dike.

GEOLOGIC SETTING: According to Rinehart and Fox (1976) and Stoffel (1990), the deposit is within crystal-lithic and crystal tuff of Eocene age intruded by a northwest-trending dacitic dike.

COMMENTS: A shaft has been sunk 50 ft on the dike, and drifts were driven at 32 and 50 ft below the collar of the shaft (Moen, 1973, p. 37).

REFERENCES

Holder, R. W.; Gaylord, D R.; Holder, G. A. M., 1989, Plutonism, volcanism, and sedimentation associated with core complex and graben development in the central Okanogan Highlands, Washington. IN Joseph, N. L.; and others, editors, 1989, Geologic guidebook for Washington and adjacent areas: Washington Division of Geology and Earth Resources Information Circular 86, p. 187-200.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Moen, W. S., 1973, Conconully mining district of Okanogan County, Washington: Washington Division of Mines and Geology Information Circular 49, 42 p.

Rinehart, C. D; Fox, K. F., Jr., 1976, Bedrock geology of the Conconully Quadrangle, Okanogan County, Washington: U.S. Geological Survey Bulletin 1402, 58 p., 1 pl.

Stoffel, K. L., compiler, 1990, Geologic map of the Oroville 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-11, 58 p., 1 pl.

Chicago (384)

ALTERNATE NAMES		DISTRICT	COUNTY
		Squaw Creek	Okanogan
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Cooper Mtn	1:24,000	Twisp	Concrete

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 6′ 41.51″ N	120° 3′ 43.65″ W	sec. 10, T30N, R22E

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
Methow gneiss	tonalitic gneiss	pre-Cretaceous

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au	gold	quartz
Cu	chalcopyrite?	
Zn		
Fe		

DEPOSIT TYPE	MINERALIZATION AGE
vein	

PRODUCTION: 3 tons prior to 1897 (Huntting, 1956, p. 137).

TECTONIC SETTING: Intrusion of the Methow Gneiss (orthogneiss) during the Cretaceous probably took place at moderate crustal levels and was later metamorphosed to lower amphibolite facies (Bunning, 1990).

ORE CONTROLS: An 18-in. vein is traceable for 300 ft (Huntting, 1956, p. 137).

GEOLOGIC SETTING: The vein is in the Methow Gneiss (Bunning, 1990, geol. map).

REFERENCES

Bunning, B. B., compiler, 1990, Geologic map of the east half of the Twisp 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-9, 51 p, 1 pl.

Hodges, L. K., 1897, Mining in the Pacific Northwest: Seattle Post Intelligencer, 116 p. [Facsimile reprinted 1967 in two volumes, Mining in eastern and central Washington, and, Mining in western Washington: Shorey Book Store, Seattle, Washington.]

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Chloride Queen (385)

ALTERNATE NAMES		DISTRICT	COUNTY
		Nighthawk	Okanogan
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Nighthawk	1:24,000	Oroville	Okanogan
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
48° 55′ 13.89″ N	119° 37′ 36.02″ W	NE¼SE¼ sec. 36, 40N, 25E	

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
Kobau Formation	argillite, greenstone	Permian or Triassic (?)

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au	gold	pyrite

DEPOSIT TYPE: vein

MINERALIZATION AGE:

PRODUCTION: Produced in 1936 and 1937 (Huntting, 1956, p. 137).

TECTONIC SETTING: Greenstones were deposited along a convergent continental margin proximal to an island arc.

ORE CONTROLS: A 1-4-ft wide, iron-stained quartz vein in metasedimentary and metavolcanic rocks is sparsely mineralized with pyrite and free gold (Huntting, 1956, p. 137).

GEOLOGIC SETTING: In greenstone, argillite, and quartzite (metachert) of the Permian or Triassic Kobau Formation (Rinehart and Fox, 1972, geol. map).

COMMENTS: Developed by 50-ft inclined shaft (Huntting, 1956, p. 137), although Rinehart and Fox (1972) report no workings were present at this location and suggest that the deposit may be mislocated.

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Rinehart, C. D; Fox, K. F., Jr., 1972, Geology and mineral deposits of the Loomis quadrangle, Okanogan County, Washington: Washington Division of Mines and Geology Bulletin 64, 124 p., 3 pl.

Copper Glance (448)

ALTERNATE NAMES		DISTRICT	COUNTY
		Methow Valley Mining Eightmile Creek area	Okanogan

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Billy Goat Mtn	1:24,000	Robinson Mountain	Concrete

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 45′ 7.74″ N	120° 18′ 7.99″ W	NE¼ sec. 35, 38N, 20E

LOCATION: elev. 5,600 ft

HOST ROCK: NAME	LITHOLOGY	AGE
andesite of Isabella Ridge	andesite	Cretaceous?

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
plagioclase porphyry dikes	

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Cu	chalcopyrite	pyrite, hematite, quartz, calcite, barite
Au	chalcocite	
Ag	gold	
Fe	tetrahedrite	

DEPOSIT TYPE	MINERALIZATION AGE
shear zone	Cretaceous?

PRODUCTION: Two tons of hand-sorted ore were shipped in 1914 (Huntting, 1956, p. 63).

TECTONIC SETTING: The andesite of Isabella Ridge was deposited in an island arc setting during the Cretaceous.

ORE CONTROLS: A fracture zone in andesite 80-100 ft wide contains locally distributed copper and a minor amounts of gold and silver (Huntting, 1956, p. 63). Mineralization occurs in many small shears in shattered andesitic pyroclastic rocks that are cut by several plagioclase porphyry dikes.

GEOLOGIC SETTING: The deposit is in andesite of Isabella Ridge, which is of probable Cretaceous age (Stoffel and McGroder, 1990).

COMMENTS: The property was developed by a 200-ft adit, a 50-ft adit, and several open cuts (Huntting, 1956, p. 63).

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Staatz, M. H.; Weis, P. L.; Tabor, R. W.; Robertson, J. F.; Van Noy, R. M.; Pattee, E. C.; Holt, D C., 1971, Mineral resources of the Pasayten Wilderness Area, Washington: U.S. Geological Survey Bulletin 1325, 255 p., 3 pl.

Stoffel, K. L.; McGroder, M. F., compilers, 1990, Geologic map of the Robinson Mtn. 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-5, 39 p., 1 pl.

Copper World Extension (449)

ALTERNATE NAMES	DISTRICT	COUNTY
Iron Mask Iron Master (?)	Palmer Mtn	Okanogan

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Enterprise	1:24,000	Oroville	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 51′ 25.34″ N	119° 35′ 34.98″ W	S½ sec. 20 and N½ sec. 29, 39N, 26E

LOCATION: elev. 3,940 ft

HOST ROCK: NAME	LITHOLOGY	AGE
Palmer Mountain Greenstone	andesite	Permian - Triassic

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
altered greenstone, metadiabase	

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Cu Au Ag W Zn Fe	chalcopyrite azurite malachite gold sphalerite bornite pyrite	pyrite, pyrrhotite, arsenopyrite, magnetite, marcasite, and quartz; augite extensively replaced by secondary epidote, calcite, quartz, and chlorite

DEPOSIT TYPE	MINERALIZATION AGE
massive sulfide	

PRODUCTION: Produced an unknown amount of ore prior to 1911. Produced 3,486 tons of ore in 1918-1919, which averaged 3.147% Cu, 0.42 oz/ton Ag, and 0.03 oz/ton Au (Huntting, 1956, p. 64).

TECTONIC SETTING: Rocks of the Palmer Mountain Greenstone were probably deposited proximal to island arcs.

ORE CONTROLS: The mineralized zone trends N85W, dips 40SW, and contains massive sulfides in en echelon pods in schistose andesite. Hanging wall andesite is highly silicified. A fault is probably present between the mineralization and the silicified andesite; talc and serpentine developed between the mineralized zones. The andesite is altered, and thin sections show that plagioclase and augite are extensively replaced by secondary epidote, calcite, quartz, and chlorite (Patty, 1921, p. 242-243; Rinehart and Fox, 1972, p. 84).

GEOLOGIC SETTING: Ore is in en echelon tabular lenses in altered andesite of the Permian-Triassic Palmer Mountain Greenstone (Patty, 1921, p. 241; Rinehart and Fox, 1972, p. 84).

COMMENTS: A 300-ft shaft was driven; crosscuts are on the 100-, 200-, and 300-ft levels (Rinehart and Fox, 1972).

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

McIntyre, A. W., 1907, Copper deposits of Washington: American Mining Congress, 9th Annual Session, Report of Proceedings, p. 238-250.

Patty, E. N., 1921, The metal mines of Washington: Washington Geological Survey Bulletin 23, 366 p.

Patty, E. N.; Glover, S. L., 1921, The mineral resources of Washington, with statistics for 1919: Washington Geological Survey Bulletin 21, 155 p., 1 pl.

Rinehart, C. D; Fox, K. F., Jr., 1972, Geology and mineral deposits of the Loomis quadrangle, Okanogan County, Washington: Washington Division of Mines and Geology Bulletin 64, 124 p., 3 pl.

Umpleby, J. B., 1911, Part I. Geology and ore deposits of the Myers Creek mining district; Part II—Geology and ore deposits of the Oroville-Nighthawk mining district: Washington Geological Survey Bulletin 5, 111 p.

Crounse placer (488)

ALTERNATE NAMES		DISTRICT	COUNTY
Strawberry Creek placer			Okanogan
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Strawberry Mountain	1:24,000	Nespelem	Okanogan
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
48° 23′ 59.18″ N	118° 52′ 43.94″ W	S½ sec. 35, 34N, 31E	

LOCATION: on Strawberry Creek

HOST ROCK: NAME	LITHOLOGY	AGE
Quaternary alluvium	sand and gravel	Quaternary

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au	gold magnetite ilmenite	stream gravel

DEPOSIT TYPE	MINERALIZATION AGE
placer	Quaternary

PRODUCTION: Reportedly $100 worth of gold (Huntting, 1956, p. 187).

TECTONIC SETTING: Deposition of heavy minerals in river gravels.

ORE CONTROLS: Heavy-mineral concentration by stream action. Terraces from 20 to 200 ft wide along the stream are underlain by a shallow layer of coarse gravel (Huntting, 1956, p. 187).

COMMENTS: The deposit has been examined by small pits. Two pans of gravel from the layer next to the bedrock yielded 1 cent in Au and 1 oz of black sand (Huntting, 1956, p. 187).

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Pardee, J. T., 1918, Geology and mineral deposits of the Colville Indian Reservation, Washington: U.S. Geological Survey Bulletin 677, 186 p., 1 pl.

Crystal Butte (386)

ALTERNATE NAMES	DISTRICT	COUNTY
Crystal Butte Camp Mother Lode	Myers Creek Buckhorn Mtn area	Okanogan

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Chesaw	1:24,000	Republic	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 55′ 15.07″ N	119° 0′ 16.66″ W	center W½ sec. 35, 40N, 30E

LOCATION: elev. 4,800 ft

HOST ROCK: NAME	LITHOLOGY	AGE
Spectacle Formation of the Anarchist Group	limestone, argillite, quartzite	Permian

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
acidic to intermediate intrusive rock	Mesozoic

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au Ag Pb Zn Cu	galena chalcopyrite sphalerite	pyrite, arsenopyrite

DEPOSIT TYPE	MINERALIZATION AGE
contact metamorphic disseminated	

PRODUCTION: A mill was built in 1908, but there is no record that the mill produced concentrate. A small-scale mining operation was carried out from 1937 to 1941; this resulted in several carloads of ore being shipped to the smelter in Trail, British Columbia, and to the Bunker Hill smelter in Idaho. A few shipments ran as high as 1 oz/ton Au, 33 oz/ton Ag, and 28% Pb. The mine has been idle since 1941 (Moen, 1980, p. 44-45).

TECTONIC SETTING: Late Paleozoic rocks were deposited along an active continental margin.

ORE CONTROLS: Quartz fissure veins are in limestone, argillite, and quartzite and in quartz- and plagioclase-bearing porphyritic rocks. The N15-80E-striking vein dips 10-35NW and is 8-12 in. wide. Gouge zones are present along the hanging and foot walls of the vein; normal faults perpendicular to the vein have resulted in minor offsets. Sulfide minerals are sparsely disseminated in the vein or are present as thin, discontinuous bands that roughly parallel the walls of the vein (Moen, 1980, p. 45).

GEOLOGIC SETTING: Metasedimentary rocks of the Permian Spectacle Formation were intruded by quartz-plagioclase porphyritic intrusive rock of Mesozoic age (Moen, 1980, p. 45).

COMMENTS: Several adits were driven into the south-facing hillside at the property. The property is on patented mining claims (Moen, 1980, p. 44).

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Moen, W. S., 1980, Myers Creek and Wauconda mining districts of northeastern Okanogan County, Washington: Washington Division of Geology and Earth Resources Bulletin 73, 96 p., 6 pl.

Umpleby, J. B., 1911, Part I. Geology and ore deposits of the Myers Creek mining district; Part II—Geology and ore deposits of the Oroville-Nighthawk mining district: Washington Geological Survey Bulletin 5, 111 p.

First Thought (421)

ALTERNATE NAMES		DISTRICT	COUNTY
		Conconully Ruby Hill area	Okanogan

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Ruby Hill	1:24,000	Omak	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 29′ 35.23″ N	119° 44′ 19.67″ W	center NE¼ sec. 31, 35N, 25E

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
metamorphic complex of Conconully	gneiss, schist	pre-Jurassic

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
Conconully pluton	Cretaceous

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Ag Pb Cu Zn	galena tetrahedrite chalcopyrite chalcocite sphalerite stephanite	pyrite, quartz

DEPOSIT TYPE	MINERALIZATION AGE
vein	

PRODUCTION: The mine produced silver ore valued at $66,000 from 1892 to 1893. Production came to an end during the silver panic of 1893. Several small shipments of silver ore were made from the mine in the 1920s (Moen, 1973, p. 16).

TECTONIC SETTING: The Conconully pluton is a directionless, post-tectonic plutonic rock that intruded into a major structural zone (Stoffel, K. L., DGER, 1990, oral commun.).

ORE CONTROLS: Mineralization occurs in discontinuous lenticular lenses of quartz that are as much as 90 ft thick and as much as 700 ft in maximum width. The lenses strike N10E and dip 55 to 60E. They are present in highly foliated micaceous gneiss and feldspathic quartzite in the metamorphic complex of Conconully. The trend of the lenses of quartz is parallel to the foliation in the gneiss. Ore minerals are concentrated in ore shoots along the walls of the lenses; some of the ore shoots are as much as 5 ft thick. The ore shoots contain 75-100 oz/ton Ag, whereas the massive quartz between the shoots contains only 6-8 oz/ton Ag (Moen, 1973, p. 16-17).

GEOLOGIC SETTING: The mineralization at the First Thought occurs in the gneiss and quartzite of the metamorphic complex of Conconully near the contact of the Conconully pluton of Cretaceous (Rinehart, 1981; Stoffel, 1990).

COMMENTS: Underground workings of the First Thought mine consist of more than 4,000 ft of drifts on three levels that have a vertical extent of 350 ft (Moen, 1973, p. 17).

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Moen, W. S., 1973, Conconully mining district of Okanogan County, Washington: Washington Division of Mines and Geology Information Circular 49, 42 p.

Patty, E. N., 1921, The metal mines of Washington: Washington Geological Survey Bulletin 23, 366 p.

Rinehart, C. D., 1981, Reconnaissance geochemical survey of gully and stream sediments, and geologic summary, in part of the Okanogan Range, Okanogan County, Washington: Washington Division of Geology and Earth Resources Bulletin 74, 24 p., 3 pl.

Stoffel, K. L., compiler, 1990, Geologic map of the Oroville 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-11, 58 p., 1 pl.

Four Metals (467)

ALTERNATE NAMES		DISTRICT	COUNTY
Mammoth (?)			Okanogan
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Nighthawk	1:24,000	Oroville	Okanogan
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
48° 56′ 54.31″ N	119° 39′ 51.78″ W	secs. 22 and 23, 40N, 25E	

LOCATION: elev. 1,160 ft, on the south slope of Little Chopaka Mountain, on the Similkameen River

HOST ROCK: NAME	LITHOLOGY	AGE
Kobau Formation	quartzite (chert)	Permian or Triassic (?)
ASSOCIATED IGNEOUS ROCK: DESCRIPTION		AGE
Similkameen composite pluton		Jurassic

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Pb	galena	quartz, garnet, epidote
Ag	chalcopyrite	
Cu	bornite	
Zn	sphalerite	
W	scheelite	
Mo	molybdenite	

DEPOSIT TYPE	MINERALIZATION AGE
vein	

PRODUCTION: Produced 20 or more carloads of high-grade ore and concentrates between 1918 and 1921; 600 tons were milled in 1939 (Huntting, 1956, p.219).

TECTONIC SETTING: The sediments and volcanic materials of the Kobau Formation were deposited proximal to an island arc along a convergent continental margin.

ORE CONTROLS: A vein striking N7W and dipping 32-37W is in granodiorite at its contact with a roof pendant (Patty, 1921, p. 233; Rinehart and Fox, 1972).

GEOLOGIC SETTING: The deposit is a vein in the Similkameen composite pluton at or near the contact with quartzite (chert), limestone, and greenstone (hornblende schist) of the Kobau Formation of Permian or Triassic (?) age.

COMMENTS: Two shafts and three adits are present at the property (Rinehart and Fox, 1972).

REFERENCES

Culver, H. E.; Broughton, W. A., 1945, Tungsten resources of Washington: Washington Division of Geology Bulletin 34, 89 p., 23 pl.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Patty, E. N., 1921, The metal mines of Washington: Washington Geological Survey Bulletin 23, 366 p.

Rinehart, C. D.; Fox, K. F., Jr., 1972, Geology and mineral deposits of the Loomis quadrangle, Okanogan County, Washington: Washington Division of Mines and Geology Bulletin 64, 124 p., 3 pl.

Fourth Of July (476)

ALTERNATE NAMES		DISTRICT	COUNTY
		Conconully Ruby Hill area	Okanogan

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Ruby Hill	1:24,000	Omak	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 28′ 36.64″ N	119° 43′ 39.10″ W	SE¼NW¼ sec. 5, 34N, 25E

LOCATION: elev. 4,500 ft

HOST ROCK: NAME	LITHOLOGY	AGE
Salmon Creek schist and gneiss	biotite gneiss	pre-Jurassic

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Ag	tetrahedrite	quartz
Au	galena	
Pb	argentite	
Cu	silver	
	stephanite	
	cerargyrite	
	ruby silver	
	galena	

DEPOSIT TYPE	MINERALIZATION AGE
vein	

PRODUCTION: The vein was discovered in 1887. In 1889 a shipment of high-grade silver ore was sent to the smelter in Helena, Montana. A 200 ft shaft was sunk on the vein, and an average of 10 tons of high-grade ore per month was shipped to smelters. Silver ore was shipped to a concentrating mill in Ruby City until mid-1893 when the mine was forced to shut down because of the silver panic. Total production to this time amounted to $36,000. From 1958 to 1964 hand-sorted shipments were sent to the smelter in Trail, British Columbia. Except for a small shipment in 1967, those were the last shipments from the mine (Moen, 1973).

TECTONIC SETTING: The Salmon Creek schist and gneiss is laterally equivalent to the metamorphic complex of Conconully (Gulick and Korosec, 1990), which is thought by Rinehart and Fox (1976) to grade into and include Late Triassic rocks. Late Triassic sedimentary rocks were deposited in an active continental margin setting associated with an island arc.

ORE CONTROLS: The vein, which averages 6 ft in thickness, strikes N10W and dips 70-80E. The vein is in biotite gneiss and is parallel to the contact with a granodiorite gneiss that is several hundred feet to the west. The ore minerals seem to be in a 2-ft-thick band that parallels the hanging wall. Parts of the vein are sheared; shears parallel the vein (Moen, 1973, p. 13-14).

GEOLOGIC SETTING: The vein is in biotite gneiss of the pre-Jurassic Salmon Creek schist and gneiss parallel to and west of the contact with granodiorite gneiss (Moen, 1973).

COMMENTS: The underground workings at the mine consist of a double-compartment 500-ft shaft and a single-compartment 200-ft shaft. Several levels have been driven and mined (Moen, 1973).

REFERENCES

Gulick, C. W.; Korosec, M. A., compilers, 1990, Geologic map of the Omak 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-12, 52 p., 1 pl.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Jones, E. L., Jr., 1917, Reconnaissance of the Conconully and Ruby mining districts, Washington. *In* Contributions to economic geology (short papers and preliminary reports), 1916-Part I, metals and nonmetals except fuels: U.S. Geological Survey Bulletin 640, p. 11-36.

Moen, W. S., 1973, Conconully mining district of Okanogan County, Washington: Washington Division of Mines and Geology Information Circular 49, 42 p.

Rinehart, C. D.; Fox, K. F., Jr., 1976, Bedrock geology of the Conconully Quadrangle, Okanogan County, Washington: U.S. Geological Survey Bulletin 1402, 58 p., 1 pl.

Schuster, J. E., 1973, Directory of Washington mining operations, 1971-72: Washington Division of Mines and Geology Information Circular 48, 97 p.

Friday (453)

ALTERNATE NAMES		DISTRICT	COUNTY
Tom Hal		Squaw Creek	Okanogan
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Pateros	1:24,000	Oroville	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 4′ 51.79″ N	119° 59′ 8.22″ W	SW¼ sec. 20, 30N, 23E

LOCATION: about 5 mi northwest of Pateros

HOST ROCK: NAME	LITHOLOGY	AGE
Methow Gneiss	tonalitic gneiss	Cretaceous

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au	chalcopyrite	quartz
Ag	bornite	
Cu	malachite	
	pyrite	
	arsenopyrite	

DEPOSIT TYPE: vein

MINERALIZATION AGE:

PRODUCTION: Production includes a $5,000 shipment made prior to 1897 and one carload shipped in 1940. Ten tons of selected ore yielded $70/ton prior to 1902 (Huntting, 1956, p. 139).

TECTONIC SETTING: The Methow Gneiss is a directionless, post-tectonic pluton that was emplaced at moderate to deep levels and then metamorphosed (Gulick and Korosec, 1990).

ORE CONTROLS: The quartz vein in the Cretaceous Methow Gneiss is about 1 ft wide (Huntting, 1956, p. 139).

GEOLOGIC SETTING: The vein is in tonalitic gneiss of the Methow Gneiss (Gulick and Korosec, 1990, geol. map).

COMMENTS: Mineralization at the Friday mine may be similar to that at the Sullivan prospect.

REFERENCES

Bunning, B. B., compiler, 1990, Geologic map of the east half of the Twisp 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-9, 51 p, 1 pl.

Gulick, C. W.; Korosec, M. A., compilers, 1990, Geologic map of the Omak 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-12, 52 p., 1 pl.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Fuller (465)

ALTERNATE NAMES		DISTRICT	COUNTY
Lone Pine Claims		Squaw Creek	Okanogan
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Pateros	1:24,000	Omak	Okanogan
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
48° 4′ 14.81″ N	119° 55′ 13.59″ W	near center sec. 26, 30N, 23E	

LOCATION: elev. 2,300 ft, about 1 mi northwest of Pateros

HOST ROCK: NAME	LITHOLOGY	AGE
Alta Lake migmatite	migmatite	Jurassic - Cretaceous (?)

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Fe Cu Ti	magnetite chalcopyrite	hornblende, actinolite, biotite, calcite, epidote

DEPOSIT TYPE	MINERALIZATION AGE
disseminated	

PRODUCTION: Reportedly, 1,000 tons of ore was shipped prior to 1943; 1,250 tons were shipped in 1943 (Huntting, 1956, p. 198).

TECTONIC SETTING: Migmatitic parts of the gneiss of Alta Lake; migmatization appears to have been a polyphase event that involved both anatexis and igneous injection (Gulick and Korosec, 1990).

ORE CONTROLS: Magnetite is intimately intermixed with large amounts of hornblende and actinolite. The ore is coarse grained and has a schistose appearance. Ore occurs in seams and thin lenses. The deposit varies from a few feet to 15 ft thick and is exposed along strike for 400-500 ft. The mineralized zone grades into the gneiss and migmatite (Shedd and others, 1922).

GEOLOGIC SETTING: The Fuller deposit is in the migmatitic part of the amphibolite, schist, and gneiss of the Alta Lake migmatite. The migmatite is gradational with the layered metamorphic rocks and is characterized by irregular, lenticular, swirled, and contorted granitic, tonalitic, aplitic, and pegmatitic leucosomes (Gulick and Korosec, 1990, p. 40).

COMMENTS: Development consists of 150 ft of adits and a quarry (Huntting, 1990).

REFERENCES

Gulick, C. W.; Korosec, M. A., compilers, 1990, Geologic map of the Omak 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-12, 52 p., 1 pl.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Shedd, Solon; Jenkins, O. P.; Cooper, H. H., 1922, Iron ores, fuels, and fluxes of Washington: Washington Division of Geology Bulletin 27, 160 p., 1 pl.

Gold Axe (387)

ALTERNATE NAMES	DISTRICT	COUNTY
	Myers Creek Buckhorn Mtn area	Okanogan

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Buckhorn Mountain	1:24,000	Republic	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 57′ 3.99″ N	118° 58′ 48.94″ W	SE¼SW¼ sec. 24, 40N, 30E

LOCATION: elev. 5,280 ft, about 500 ft east of the summit of Buckhorn Mountain

HOST ROCK: NAME	LITHOLOGY	AGE
Kobau Formation	limestone, greenstone	Permian or Triassic (?)

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
Buckhorn Mountain pluton	Jurassic - Cretaceous

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au Cu Ag Fe	pyrite pyrrhotite magnetite	pyrite, pyrrhotite, magnetite, garnet, epidote

DEPOSIT TYPE	MINERALIZATION AGE
shear zone contact metamorphic	

PRODUCTION: Sporadic production of copper and gold from 1910 to 1934; total production probably did not exceed 5,000 tons (Moen, 1980, p. 47). Handy (1916, p. 8) reports that six carloads of ore containing $10-$20 per ton in Au and minor amounts of silver were shipped. Huntting (1956, p. 139) reports 16 or 17 carloads of ore were shipped in 1914-15.

TECTONIC SETTING: The Kobau Formation was deposited along an active continental margin proximal to an island arc.

ORE CONTROLS: The shear zone trends N34W and dips from 65SW to vertical; magnetite and pyrrhotite occur in lens-like bodies with garnet and epidote along the shear zone and range from several inches to 1 ft in width. The contact metamorphic zone is not as well developed here as at the Magnetic mine (Moen, 1980, p. 47).

GEOLOGIC SETTING: The Jurassic-Cretaceous Buckhorn Mountain pluton intruded and contact metamorphosed limestones and greenstones of the Permian or Triassic (?) Kobau Formation.

COMMENTS: Development of the property consists of an adit and many prospect pits. Drilled by Crown Resources Corp. in 1989 and by Battle Mountain Gold in 1990. The property is part of a joint venture between Crown Resources and Battle Mountain Gold and is known as the Buckhorn Mountain deposit.

REFERENCES

Handy, F. M., 1916, An investigation of the mineral deposits of northern Okanogan County: State College of Washington Department of Geology Bulletin 100, 27 p.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Moen, W. S., 1980, Myers Creek and Wauconda mining districts of northeastern Okanogan County, Washington: Washington Division of Geology and Earth Resources Bulletin 73, 96 p., 6 pl.

Stoffel, K. L., compiler, 1990, Geologic map of the Oroville 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-11, 58 p., 1 pl.

Gold Crown (388)

ALTERNATE NAMES		DISTRICT	COUNTY
Golden Crown		Palmer Mountain	Okanogan
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Enterprise	1:24,000	Oroville	Okanogan
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
48° 50′ 4.94″ N	119° 36′ 38.11″ W	SE¼ sec. 31, 39N, 26E	

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
Palmer Mountain Greenstone	meta-andesite, metagabbro	Permian - Triassic

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au	gold	quartz

DEPOSIT TYPE: vein

MINERALIZATION AGE:

PRODUCTION: Amount not known. Assay from a dump sample was $105/ton Au (Bethune, 1891, p. 63).

TECTONIC SETTING: The Palmer Mountain Greenstone was deposited along a convergent continental margin proximal to an island arc.

ORE CONTROLS: The 10-ft-wide vein strikes northwest and dips 50E (Bethune, 1991, p. 63).

GEOLOGIC SETTING: Quartz vein in the Permian-Triassic Palmer Mountain Greenstone (Rinehart and Fox, 1972, geol. map).

COMMENTS: Ore from this mine was handled at a 5-stamp mill at the War Eagle-Black Bear mine (Bethune, 1991).

REFERENCES

Bethune, G. A., 1891, Mines and minerals of Washington—Annual report of G. A. Bethune, first state geologist: Washington State Printer, 122 p.

Bethune, G. A., 1892, Mines and minerals of Washington—Second annual report of G. A. Bethune, state geologist: Washington State Printer, 183 p.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Rinehart, C. D.; Fox, K. F., Jr., 1972, Geology and mineral deposits of the Loomis quadrangle, Okanogan County, Washington: Washington Division of Mines and Geology Bulletin 64, 124 p., 3 pl.

Gold Key (454)

ALTERNATE NAMES		DISTRICT	COUNTY
		Mazama	Okanogan
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Mazama	1:62,500	Robinson Mountain	Concrete

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 35′ 58.82″ N	120° 24′ 4.21″ W	near northwest corner sec. 30, 36N, 20 E

LOCATION: about 1,000 ft northwest of the upper workings of the Mazama Pride mine

HOST ROCK: NAME	LITHOLOGY	AGE
Midnight Peak Formation	andesite	Cretaceous

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
Fawn Peak stock	Cretaceous

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au Cu	chalcopyrite	quartz, calcite, pyrite, arsenopyrite

DEPOSIT TYPE	MINERALIZATION AGE
stringer zone stockwork	Cretaceous

PRODUCTION: In 1931, 37 tons of ore were shipped (Huntting, 1956, p. 140).

TECTONIC SETTING: The Midnight Peak Formation and the Fawn Peak stock were part of a Cretaceous island arc (Riedell, 1979).

ORE CONTROLS: The ore consists of quartz stringer veins that are mineralized to some extent (Huntting, 1956, p. 140). The deposit is in the actinolite-chlorite zone of the Mazama molybdenum porphyry system. Veins peripheral to the porphyry system generally trend N10-40E and N70-85W (Riedell, 1979).

GEOLOGIC SETTING: The Gold Key mine is in andesites of the Midnight Peak Formation, which are intruded by the Cretaceous Fawn Peak stock. The stock is probably the intrusive equivalent of the volcanic rocks (Stoffel and McGroder, 1990, p. 15).

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Riedell, K. B., 1979, Geology and porphyry copper mineralization of the Fawn Peak intrusive complex, Methow Valley, Washington: University of Washington Master of Science thesis, 52 p., 4 pl.

Stoffel, K. L.; McGroder, M. F., compilers, 1990, Geologic map of the Robinson Mtn. 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-5, 39 p., 1 pl.

Golden Chariot (370)

ALTERNATE NAMES		DISTRICT	COUNTY
		Oroville	Okanogan
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Oroville	1:24,000	Oroville	Okanogan
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
48° 59′ 23.78″ N	119° 28′ 52.44″ W	SE¼ sec. 6, and NE¼ sec. 7, 40N, 27E	

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
Silver Nail Lake pluton	quartz diorite	Jurassic - Cretaceous (?)
Kobau Formation	argillite, quartzite	Permian or Triassic (?)

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Cu	chalcopyrite	pyrite, quartz
Au	scheelite	
Ag	molybdenite	
W		
Mo		

DEPOSIT TYPE	MINERALIZATION AGE
porphyry	
vein	

PRODUCTION: Produced $4,000 worth of ore prior to 1911; nine carloads of hand-sorted ore shipped sometime later (Huntting, 1956, p. 65).

TECTONIC SETTING: The Kobau Formation was deposited along an active continental margin proximal to an island arc.

ORE CONTROLS: The 5-ft-wide ore zone strikes north and dips 35W; it consists of a series of S-shaped mineralized quartz lenses. The quartz lenses range from a fraction of an inch to a foot in thickness (Culver and Broughton, 1945, p. 32-33). The deposit contains stockwork with quartz-K-feldspar flooding and sericitic alteration which is part of the Kelsey copper-molybdenum porphyry copper system (Roper, 1973).

GEOLOGIC SETTING: The deposit is in argillite of the Permian or Triassic (?) Kobau Formation and quartz diorite and fine-grained diorite of the concentrically zoned Jurassic-Cretaceous (?) Silver Nail Lake pluton (Stoffel, 1990, p. 28).

COMMENTS: The property was opened up by an inclined shaft down the 30 degree dip of the ore zone for a reported distance of 350 ft; several open cuts were also present (Culver and Broughton, 1945 , p. 32).

REFERENCES

Culver, H. E.; Broughton, W. A., 1945, Tungsten resources of Washington: Washington Division of Geology Bulletin 34, 89 p., 23 pl.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Patty, E. N., 1921, The metal mines of Washington: Washington Geological Survey Bulletin 23, 366 p.

Roper, M. W., 1973, Geology of the Kelsey copper-molybdenum property, Okanogan County, Washington: Montana State University Master of Science thesis, 97 p., 5 pl.

Stoffel, K. L., compiler, 1990, Geologic map of the Oroville 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-11, 58 p., 1 pl.

Umpleby, J. B., 1911, Part I. Geology and ore deposits of the Myers Creek mining district; Part II—Geology and ore deposits of the Oroville-Nighthawk mining district: Washington Geological Survey Bulletin 5, 111 p.

Golden Zone (389)

ALTERNATE NAMES	DISTRICT	COUNTY
	Nighthawk Mt Chopaka area	Okanogan

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Nighthawk	1:24,000	Oroville	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 58′ 33.30″ N	119° 43′ 52.23″ W	near SE corner sec. 7, 40N, 25E

LOCATION: at the base of Mount Chopaka, elev. 1,600 ft

HOST ROCK: NAME	LITHOLOGY	AGE
Similkameen composite pluton	granodiorite	Jurassic

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au	gold	pyrite, arsenopyrite, quartz
Ag	galena	
Pb	chalcopyrite	
Cu	malachite	
Zn	azurite	
Mo	sphalerite	
	molybdentite?	

DEPOSIT TYPE	MINERALIZATION AGE
shear zone	

PRODUCTION: Produced prior 1911 and in 1939 (Huntting, 1956, p. 140).

TECTONIC SETTING: The Similkameen batholith is a concentrically zoned plutonic suite with early mafic alkalic rocks bordering and intruded by calc-alkalic granitic rocks. The undeformed body is in the upper plate of the Okanogan Valley fault (Buddington and Burmester, 1990).

ORE CONTROLS: The vein trends N20E and dips 40NW; rocks are visibly altered as much as 1 ft from the vein (Rinehart and Fox, 1972, p. 88).

GEOLOGIC SETTING: Shear zone in Similkameen composite pluton (Rinehart and Fox, 1972, geol. map).

COMMENTS: Developed by 5,000 ft of tunnels and drifts (Rinehart and Fox, 1972, p. 89).

REFERENCES

Buddington, A. M.; Burmester, R. F., 1990, The Similkameen batholith: A mid-Jurassic, post-tectonic complex in the Quesnel terrane, north-central Washington and south-central British Columbia [abstract]: Geological Society of America Abstracts with Programs, v. 22, n. 3, p. 10-11.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Rinehart, C. D.; Fox, K. F., Jr., 1972, Geology and mineral deposits of the Loomis quadrangle, Okanogan County, Washington: Washington Division of Mines and Geology Bulletin 64, 124 p., 3 pl.

Umpleby, J. B., 1911, Part I. Geology and ore deposits of the Myers Creek mining district; Part II—Geology and ore deposits of the Oroville-Nighthawk mining district: Washington Geological Survey Bulletin 5, 111 p.

Gray Eagle (390)

ALTERNATE NAMES		DISTRICT	COUNTY
Eagle		Myers Creek Chesaw area	Okanogan
PRIMARY QUADRANGLE	**SCALE**	**½° x 1° QUAD**	**1° x 2° QUAD**
Chesaw	1:24,000	Oroville	Okanogan
LATITUDE	**LONGITUDE**	**SECTION, TOWNSHIP, AND RANGE**	
48° 57′ 47.34″ N	119° 2′ 36.68″ W	SW¼ sec. 16, 40N, 30E	

LOCATION: elev. 3,040 ft

HOST ROCK: NAME	LITHOLOGY	AGE
Kobau Formation	greenstone, siltite	Permian or Triassic (?)

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
hornblende-biotite granitic rocks	

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au Ag	gold chalcopyrite arsenopyrite azurite sphalerite unknown Mo mineral galena	pyrite, quartz, calcite

DEPOSIT TYPE	MINERALIZATION AGE
vein shear zone	

PRODUCTION: Small-scale mining in late 1900s. Minor production in 1916, 1921-24, 1937-39, and 1950-51; value probably less than $50,000. Most mining was by pick and shovel. A small amalgamation mill was built in 1950-51; only 8 tons of ore containing a total of 4 oz Au and 4 oz Ag were mined and milled (Moen, 1980, p. 35).

TECTONIC SETTING: The Kobau Formation was deposited along an active continental margin proximal to an island arc.

ORE CONTROLS: North-striking, west-dipping, quartz and calcite veins in fractures 0.5-6 in. wide in sheared and brecciated rock. Visible gold is present in veins and stringers. The adit is in hydrothermally altered granitic rocks, greenstone, and siltite (Moen, 1980, p. 35).

GEOLOGIC SETTING: The vein is in siltite and greenstone of the Kobau Formation; altered granitic rocks occur with the mineralization.

COMMENTS: Mining on the Gray Eagle claim appears to have been carried out on two widely separated veins. One of the veins has also been mined as part of the Reco vein in the No. 2 adit of the Reco mine.

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Moen, W. S., 1980, Myers Creek and Wauconda mining districts of northeastern Okanogan County, Washington: Washington Division of Geology and Earth Resources Bulletin 73, 96 p., 6 pl.

Gray Eagle no. 2 (391)

ALTERNATE NAMES		DISTRICT	COUNTY
		Squaw Creek Chesaw area	Okanogan

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Cooper Mtn	1:24,000	Twisp	Concrete

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 5′ 2.41″ N	120° 1′ 28.87″ W	NW¼SE¼ sec. 24, 30N, 22E

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
Methow Gneiss	tonalitic gneiss	Cretaceous

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au Cu	pyrite	pyrite, quartz

DEPOSIT TYPE	MINERALIZATION AGE
shear zone	

PRODUCTION: Amount of production is unknown (Huntting, 1956, p. 140).

TECTONIC SETTING: The Methow Gneiss is a Cretaceous tonalitic gneiss that has been metamorphosed to the amphibolite facies (Bunning, 1990).

ORE CONTROLS: A lens of quartz, which is 15 ft long and 3 ft wide at its thickest portion, occurs in a shear zone in Cretaceous tonalite gneiss (Huntting, 1956, p. 140; Bunning, 1990, geol. map).

GEOLOGIC SETTING: The vein is in tonalitic gneiss of the Methow Gneiss of Cretaceous age (Bunning, 1990, geol. map).

COMMENTS: The deposit was developed by a short adit and open cuts (Huntting, 1956).

REFERENCES

Bunning, B. B., compiler, 1990, Geologic map of the east half of the Twisp 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-9, 51 p, 1 pl.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Hiawatha (392)

ALTERNATE NAMES		DISTRICT	COUNTY
Josie		Wannacut Lake	Okanogan
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Bullfrog Mtn	1:24,000	Oroville	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 54′ 1.39″ N	119° 32′ 44.98″ W	NE¼ sec. 10, 39N, 26E

LOCATION: elev. 3,200 ft

HOST ROCK: NAME	LITHOLOGY	AGE
Spectacle Formation of the Anarchist Group	argillite	Permian

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
Whisky Mountain pluton	Jurassic - Cretaceous

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au	galena	quartz
Ag	chalcopyrite	
Pb	sphalerite	
Cu	gold	
Zn	pyrite	

DEPOSIT TYPE	MINERALIZATION AGE
vein	

PRODUCTION: Produced some ore in 1938 (Huntting, 1956, p. 141).

TECTONIC SETTING: Marine sedimentary rocks of the Spectacle Formation were deposited along an active continental margin.

ORE CONTROLS: A friable white quartz vein is 1 to 12 ft wide, averages 3-4 ft wide, and crops out for about 2,500 ft. The vein dips 10W at the surface and 45W at depth. Faults offset the vein (Rinehart and Fox, 1972, p. 88).

GEOLOGIC SETTING: The vein is in argillite of the Spectacle Formation near the contact with monzonite and quartz diorite of the Whisky Mountain pluton (Huntting, 1956, p. 141; Rinehart and Fox, 1972, geol. map).

COMMENTS: Two 80-ft adits 80 ft apart are connected by a drift near the face (Rinehart and Fox, 1972, p. 89).

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Rinehart, C. D.; Fox, K. F., Jr., 1972, Geology and mineral deposits of the Loomis quadrangle, Okanogan County, Washington: Washington Division of Mines and Geology Bulletin 64, 124 p., 3 pl.

Umpleby, J. B., 1911, Part I. Geology and ore deposits of the Myers Creek mining district; Part II—Geology and ore deposits of the Oroville-Nighthawk mining district: Washington Geological Survey Bulletin 5, 111 p.

Hidden Treasure (455)

ALTERNATE NAMES	DISTRICT	COUNTY
Sunshine Triangle	Squaw Creek	Okanogan

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Cooper Mtn	1:24,000	Robinson Mountain	Concrete

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 6′ 24.24″ N	120° 2′ 26.96 ″W	SE¼ sec. 11, 30N, 22E

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
Methow Gneiss	tonalitic gneiss	Cretaceous

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au Ag Cu	chalcopyrite galena sphalerite malachite	pyrite, quartz, calcite

DEPOSIT TYPE	MINERALIZATION AGE
vein	

PRODUCTION: Produced 90 tons of ore prior to 1902, and that returned $67 per ton. Produced again in 1939-1942 (Huntting, 1956, p. 141).

TECTONIC SETTING: Intrusion of the Methow Gneiss protolith took place at moderate crustal levels; the intrusive was later metamorphosed to lower amphibolite grade with other metamorphic sequences in the area (Bunning, 1990).

ORE CONTROLS: Mineralization is in a 2-4-ft-wide vein in the Methow Gneiss (Huntting, 1956, p. 141).

GEOLOGIC SETTING: The vein is in tonalitic gneiss of the Methow Gneiss (Bunning, 1990, geol. map).

COMMENTS: The deposit is developed by two adits (Huntting, 1956, p. 141).

REFERENCES

Bunning, B. B., compiler, 1990, Geologic map of the east half of the Twisp 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-9, 51 p, 1 pl.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Hodges, L. K., 1897, Mining in the Pacific Northwest: Seattle Post Intelligencer, 116 p. [Facsimile reprinted 1967 in two volumes, Mining in eastern and central Washington, and, Mining in western Washington: Shorey Book Store, Seattle, Washington.]

Landes, Henry; Thyng, W. S.; Lyon, D. A.; Roberts, Milnor, 1902, Annual report for 1901, in six parts; Part II-The metalliferous resources of Washington, except iron: Washington Geological Survey, 123 p.

Highland (393)

ALTERNATE NAMES		DISTRICT	COUNTY
Highland Light		Squaw Creek	Okanogan
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Cooper Mtn	1:24,000	Twisp	Concrete

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 6′ 36.38″ N	120° 2′ 6.23″ W	E½ sec. 11, and W½ sec. 12, 30N, 22E

LOCATION: 30N, 22E

HOST ROCK: NAME	LITHOLOGY	AGE
Methow Gneiss	tonalitic gneiss	Cretaceous

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au	gold	pyrite, quartz
Cu	chalcopyrite	
W	scheelite	
Zn	sphalerite	

DEPOSIT TYPE	MINERALIZATION AGE
vein	Eocene?

PRODUCTION: Production totaled $13,000 during 1938 to 1941 in Au and Zn (Huntting, 1956, p. 141).

TECTONIC SETTING: The Methow Gneiss is a tonalitic gneiss of Cretaceous age that has been metamorphosed to amphibolite-facies grade (Bunning, 1990).

ORE CONTROLS: Several gold-bearing veins are present at the property. The Sailor Boy vein averages 6 ft thick and strikes S70E and dips 70NE. The quartz vein is exposed over a distance of 3,000 ft and is in the Methow Gneiss (Culver and Broughton, 1945, p. 47; Bunning, 1990, geol. map).

GEOLOGIC SETTING: The veins cut the Cretaceous Methow Gneiss (Bunning, 1990, geol. map).

COMMENTS: The property is developed by a 40-ft shaft and a 15-ft shaft 3,000 ft apart on the vein. An crosscut adit lies north of the shafts and 200 ft below them (Culver and Broughton, 1945). The property is bounded by the Holden-Campbell property on the west.

REFERENCES

Bunning, B. B., compiler, 1990, Geologic map of the east half of the Twisp 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-9, 51 p, 1 pl.

Culver, H. E.; Broughton, W. A., 1945, Tungsten resources of Washington: Washington Division of Geology Bulletin 34, 89 p., 23 pl.

Hodges, L. K., 1897, Mining in the Pacific Northwest: Seattle Post Intelligencer, 116 p. [Facsimile reprinted 1967 in two volumes, Mining in eastern and central Washington, and, Mining in western Washington: Shorey Book Store, Seattle, Washington.]

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Landes, Henry; Thyng, W. S.; Lyon, D. A.; Roberts, Milnor, 1902, Annual report for 1901, in six parts; Part II-The metalliferous resources of Washington, except iron: Washington Geological Survey, 123 p.

Holden-Campbell (394)

ALTERNATE NAMES		DISTRICT	COUNTY
Hunter			Okanogan
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Cooper Mtn	1:24,000	Twisp	Concrete
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
48° 6′ 59.89″ N	120° 3′ 24.64″ W	mainly in secs. 10 and 11, 30N, 22E	

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
Methow Gneiss	tonalitic gneiss	Cretaceous
ASSOCIATED IGNEOUS ROCK: DESCRIPTION		AGE
basic dike		Eocene?

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au	gold	pyrite, quartz
Cu	chalcopyrite	
W	molybdenite	
Ag	scheelite	
Mo		

DEPOSIT TYPE	MINERALIZATION AGE
vein	Eocene?

PRODUCTION: The Holden-Campbell has produced a considerable amount of gold ore, and the adjacent Hunter mine (now part of the Holden-Campbell property) produced a small amount in 1940 (Huntting, 1956, p. 141).

TECTONIC SETTING: The Methow Gneiss is a tonalitic gneiss that has been metamorphosed to amphibolite grade (Bunning, 1990).

ORE CONTROLS: Several veins are present at the property. The mineralized rock consists of northeast-striking, steeply dipping, quartz veins that cut the gneiss. Several dikes are parallel to basic dikes that cut the gneiss (Culver and Broughton, 1945, p. 46).

GEOLOGIC SETTING: The veins are in tonalitic gneiss of the Cretaceous Methow Gneiss that has been cut by dikes of probable Eocene age (Bunning, 1990, geol. map; Culver and Broughton, 1945, p. 46).

COMMENTS: More than 1,100 ft of underground workings and several surface cuts developed the several veins on the property (Huntting, 1956, p. 141).

REFERENCES

Bunning, B. B., compiler, 1990, Geologic map of the east half of the Twisp 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-9, 51 p, 1 pl.

Culver, H. E.; Broughton, W. A., 1945, Tungsten resources of Washington: Washington Division of Geology Bulletin 34, 89 p., 23 pl.

Hodges, L. K., 1897, Mining in the Pacific Northwest: Seattle Post Intelligencer, 116 p. [Facsimile reprinted 1967 in two volumes, Mining in eastern and central Washington, and, Mining in western Washington: Shorey Book Store, Seattle, Washington.]

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Homestake (414)

ALTERNATE NAMES	DISTRICT	COUNTY
	Conconully Conconully-Salmon Creek area	Okanogan

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Conconully East	1:24,000	Oroville	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 34′ 19.08″ N	119° 44′ 42.89″ W	E½ SW¼ sec. 31, 36N, 25E

LOCATION: E½ SW¼ sec. 31, 36N, 25E, elev. 3,200 ft

HOST ROCK: NAME	LITHOLOGY	AGE
metamorphic complex of Conconully	quartz-mica schist	pre-Jurassic

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Pb	galena	quartz
Ag	arsenopyrite	
Au	unknown Bi mineral	
Bi		

DEPOSIT TYPE	MINERALIZATION AGE
vein	

PRODUCTION: Produced 400 tons of ore prior to 1902, of which 100 tons netted $1,200 (Moen, 1973, p. 28).

TECTONIC SETTING: Rocks of the metamorphic complex of Conconully are thought by Rinehart and Fox (1976) grade upward into and include, in part, Late Triassic rocks. These rocks are of amphibolite grade where they are near plutonic rocks. These rocks formed in an active margin setting associated with island arcs.

ORE CONTROLS: The 11-ft-thick, N22W-trending quartz vein dips 30SW (Moen, 1973, p. 28).

GEOLOGIC SETTING: Quartz-mica schists of the metamorphic complex of Conconully contain garnet and sillimanite near the contact with plutonic rocks. The unit is intruded by irregular masses of alaskite and pegmatite (Rinehart and Fox, 1976, p.16)

COMMENTS: This property was developed by a 29-ft shaft and a 75-ft adit (Moen, 1973)

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Moen, W. S., 1973, Conconully mining district of Okanogan County, Washington: Washington Division of Mines and Geology Information Circular 49, 42 p.

Rinehart, C. D.; Fox, K. F., Jr., 1976, Bedrock geology of the Conconully Quadrangle, Okanogan County, Washington: U.S. Geological Survey Bulletin 1402, 58 p., 1 pl.

Stoffel, K. L., compiler, 1990, Geologic map of the Oroville 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-11, 58 p., 1 pl.

Horn Silver (422)

ALTERNATE NAMES	DISTRICT	COUNTY
Arizona	Nighthawk Bullfrog Mtn area	Okanogan

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Bullfrog Mtn	1:24,000	Oroville	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 56′ 45.44″ N	119° 34′ 5.27″ W	S½ sec. 21, 40N, 26E

LOCATION: elev. 3,200 ft

HOST ROCK: NAME	LITHOLOGY	AGE
Palmer Mountain Greenstone	greenstone, argillite	Permian - Triassic

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
granodiorite	Jurassic - Cretaceous

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au Ag Cu	stephanite cerargyrite prousite galena chalcopyrite sphalerite pyrite	pyrite, quartz

DEPOSIT TYPE	MINERALIZATION AGE
vein	

PRODUCTION: Several carloads were shipped prior to and during 1909 (Huntting, 1956, p.304); the values were mostly in silver and the ore averaged $62/ton in 1909 (Rinehart and Fox, 1972, p. 90).

TECTONIC SETTING: Rocks of the Palmer Mountain Greenstone were deposited along an active continental margin proximal to an island arc.

ORE CONTROLS: Three veins are present on the property. The most developed vein strikes N53E and dips 40NW, and is from 4 in. to 4 ft wide, averaging 18 in. (Rinehart and Fox, 1972, p. 90).

GEOLOGIC SETTING: The quartz vein is in metavolcanic rocks of the Palmer Mountain Greenstone (Rinehart and Fox, 1972, geol. map).

COMMENTS: Development consists of a 75-ft adit and a 100-ft shaft (Moen, 1976, p. 122).

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Moen, W. S., 1976, Silver occurrences of Washington: Washington Division of Geology and Earth Resources Bulletin 69, 188 p.

Rinehart, C. D.; Fox, K. F., Jr., 1972, Geology and mineral deposits of the Loomis quadrangle, Okanogan County, Washington: Washington Division of Mines and Geology Bulletin 64, 124 p., 3 pl.

Umpleby, J. B., 1911, Part I. Geology and ore deposits of the Myers Creek mining district; Part II—Geology and ore deposits of the Oroville-Nighthawk mining district: Washington Geological Survey Bulletin 5, 111 p.

Independence (456)

ALTERNATE NAMES		DISTRICT	COUNTY
			Okanogan
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Methow	1:24,000	Robinson Mountain	Concrete

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 9′ 24.23″ N	120° 7′ 12.39″ W	SW¼ sec. 29, 31N, 22E

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
Methow Gneiss	tonalitic gneiss	Cretaceous

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au Cu Mo	chalcopyrite molybdenite	pyrite, quartz

DEPOSIT TYPE	MINERALIZATION AGE
vein	

PRODUCTION: Produced an unknown amount of ore in 1940 and 1942 (Huntting, 1956, p. 142).

TECTONIC SETTING: The Methow Gneiss protolith was probably intruded at moderate crustal levels; the intrusive was later metamorphosed to the amphibolite grade together with other metamorphic rocks in the area (Bunning, 1990).

ORE CONTROLS: Mineralization is in a 3-ft-wide quartz vein in gneissic diorite (Huntting, 1956, p. 142).

GEOLOGIC SETTING: The deposit consists of a vein in the Methow Gneiss (Bunning, 1990, geol. map).

REFERENCES

Bunning, B. B., compiler, 1990, Geologic map of the east half of the Twisp 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-9, 51 p, 1 pl.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Landes, Henry; Thyng, W. S.; Lyon, D. A.; Roberts, Milnor, 1902, Annual report for 1901, in six parts; Part II-The metalliferous resources of Washington, except iron: Washington Geological Survey, 123 p.

Ivanhoe (423)

ALTERNATE NAMES		DISTRICT	COUNTY
Ivanhoe Group		Palmer Mtn	Okanogan
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Enterprise	1:24,000	Oroville	Okanogan
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
48° 52′ 29.63″ N	119° 34′ 26.40″ W	SW¼ sec. 16, 39N, 26E	

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
Bullfrog Mountain Formation of the Anarchist Group	argillite, siltite, phyllite	Permian
ASSOCIATED IGNEOUS ROCK: DESCRIPTION		AGE
dacitic dikes		Tertiary

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Ag	stephanite	quartz
Au	cerargyrite	
Sb	tetrahedrite	
Pb	pyrite	
	galena	
	gold	
	silver	

DEPOSIT TYPE	MINERALIZATION AGE
vein	

PRODUCTION: Hand-sorted, near-surface ores mined between 1888 and 1897 contained as much as 1,000 oz/ton Ag and several ounces of Au. Approximately 1,000 tons of ore was shipped to smelters in Washington and Montana; several shipments averaged 392 oz/ton Ag and 1.2 oz/ton Au (Moen, 1976, p. 123; Rinehart and Fox, 1972, p. 91).

TECTONIC SETTING: Sediments of the Anarchist Group were deposited along an active continental margin.

ORE CONTROLS: Seven quartz veins were mined. The Ivanhoe vein is 3.5-4.5 ft thick and strikes north-northwest and dips 60W. Silver ore was richer near the surface; veins intersected at a depth of 1,560 ft had average Ag content of less than 1 oz/ton (Umpleby, 1911).

GEOLOGIC SETTING: The vein is in phyllite and argillite of the Permian Bullfrog Mountain Formation of the Anarchist Group.

COMMENTS: The Ivanhoe vein was developed by several shallow shafts, one of which was later sunk to a depth of 500 ft. The richest ores were near the surface; these were mined by stripping the hanging wall of the vein over an area 70 by 120 ft. In about 1914, a 4,400-ft crosscut was driven from the west slope of Palmer Mountain in an attempt to intersect the vein at a depth of 1,560 ft (Umpleby, 1911).

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Moen, W. S., 1976, Silver occurrences of Washington: Washington Division of Geology and Earth Resources Bulletin 69, 188 p.

Rinehart, C. D.; Fox, K. F., Jr., 1972, Geology and mineral deposits of the Loomis quadrangle, Okanogan County, Washington: Washington Division of Mines and Geology Bulletin 64, 124 p., 3 pl.

Umpleby, J. B., 1911, Part I. Geology and ore deposits of the Myers Creek mining district; Part II—Geology and ore deposits of the Oroville-Nighthawk mining district: Washington Geological Survey Bulletin 5, 111 p.

John Judge (396)

ALTERNATE NAMES	DISTRICT	COUNTY
Leadville Denver City Grandview	Palmer Mtn	Okanogan

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Enterprise	1:24,000	Oroville	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 51′ 35.94″ N	119° 37′ 11.74″ W	SW¼ sec. 19, 39N, 26E

LOCATION: elev. 2,500 ft, about 2.7 mi north-northeast of Loomis, and on the west side of Palmer Mountain

HOST ROCK: NAME	LITHOLOGY	AGE
Palmer Mountain Greenstone	meta-andesite; metagabbro	Permian - Triassic

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au Cu Pb Ag	gold chalcopyrite bornite galena pyrargyrite	pyrite, quartz

DEPOSIT TYPE	MINERALIZATION AGE
vein	

PRODUCTION: Produced 15 tons of ore in 1937; also produced in 1938 and 1939 (Huntting, 1956, p. 143).

TECTONIC SETTING: The Palmer Mountain Greenstone was deposited along an active continental margin proximal to island arcs.

ORE CONTROLS: Vertical, 2-3-ft-wide vein trending N60E in chlorite schist (Rinehart and Fox, 1972, p. 90). The vein is traceable for 200 ft in the lower adit (Huntting, 1956, p. 143).

GEOLOGIC SETTING: Vein in chlorite schist of the Permian-Triassic Palmer Mountain Greenstone (Rinehart and Fox, 1972).

COMMENTS: Development consisted of 2,500 ft of adits and shafts (Rinehart and Fox, 1972, p. 91)

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Rinehart, C. D.; Fox, K. F., Jr., 1972, Geology and mineral deposits of the Loomis quadrangle, Okanogan County, Washington: Washington Division of Mines and Geology Bulletin 64, 124 p., 3 pl.

Johnson Creek (445)

ALTERNATE NAMES	DISTRICT	COUNTY
Funkhauser Omak	Conconully Omak area	Okanogan

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Omak	1:24,000	Omak	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 28′ 55.10″ N	119° 34′ 57.35″ W	NE¼ sec. 5, 34N, 26E

LOCATION: elev. 1,750 ft, 6 mi north of Omak by road; near the intersection of the Riverside cut-off and the Omak-Conconully highway

HOST ROCK: NAME	LITHOLOGY	AGE
unnamed serpentinite	serpentinite	pre-Cretaceous
unnamed calc-silicate rocks	calc-silicate rocks	pre-Cretaceous

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Cr Ni Fe	chromite white sulfide of nickel	serpentinite, antigorite, magnesite, talc, garnet, diopside

DEPOSIT TYPE	MINERALIZATION AGE
disseminated (?) magmatic segregation (?)	

PRODUCTION: Produced 5.9 tons of ore in 1955; these assayed 42% Cr_2O_3 and had a Cr/Fe ratio of 2.9 (Huntting, 1956, p. 38).

TECTONIC SETTING: An ultramafic mass in the North Cascades.

ORE CONTROLS: The deposit is near an ultrabasic-dolomite contact. Chromite is disseminated sparsely through the ultrabasic rock. Near the ultrabasic-dolomite contact, a tabular body of nearly solid chromite is present; it measures 7.5 ft by 6 ft by 3 ft. A stringer about 2 in. wide and 18 in. long was found about 10 ft north of the main pod (Huntting, 1956, p. 38).

GEOLOGIC SETTING: The deposit is in calc-silicate rock derived from altered ultrabasic rocks or from dolomitic sedimentary rocks. The chromite-bearing unit consists of calc-silicate minerals and magnesite, talc, and tremolite; serpentinized magnesite talc schist; and garnet-diopside calc-silicate granofels, hornblende schist, and serpentinized carbonate (Gulick and Korosec, 1990, p. 27).

REFERENCES

Banta, H. E., 1956, Directory of Washington mining operations, 1956: Washington Division of Mines and Geology Information Circular 25, 87 p.

Gulick, C. W.; Korosec, M. A., compilers, 1990, Geologic map of the Omak 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-12, 52 p., 1 pl.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Livingston, V. E., Jr., 1957, Directory of Washington mining operations, 1957: Washington Division of Mines and Geology Information Circular 27, 94 p.

Wilson, Hewitt; Skinner, K. G.; Hurst, T. L., 1943, Some refractory properties of Washington chromite: U.S. Bureau of Mines Report of Investigations 3694, 31 p.

Kaaba (415)

ALTERNATE NAMES	DISTRICT	COUNTY
Caaba Kaaba-Texas	Nighthawk	Okanogan

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Nighthawk	1:24,000	Oroville	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 57′ 16.13″ N	119° 39′ 4.71″ W	center NE¼ sec. 23, 40N, 25E

LOCATION: elev. 2,500 ft, about 9 mi north of Loomis, near the base of the southwest slope of Little Chopaka Mountain

HOST ROCK: NAME	LITHOLOGY	AGE
Similkameen composite pluton	granodiorite	Jurassic

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
lamprophyre granodiorite	Eocene? Jurassic - Cretaceous

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Pb Ag Zn Cu Au W Mo	galena sphalerite chalcopyrite scheelite molybdenite	pyrite, marcasite, quartz, calcite, gouge

DEPOSIT TYPE	MINERALIZATION AGE
vein	

PRODUCTION: Produced in 1918 and 1943-1951; total is about 205,000 oz of Ag. From 1943 to 1946, the mine produced 135,973 oz Ag, 1,357,185 lb Pb, 506,050 lb Zn, and 99,410 lb Cu (Moen, 1976, p. 123).

TECTONIC SETTING: The Similkameen batholith is a concentrically zoned plutonic suite with early mafic alkalic rocks bordering and being intruded by calc-alkalic granitic rocks. The undeformed body is on the upper plate of the Okanogan Valley fault (Buddington and Burmester, 1990).

ORE CONTROLS: The vein at the Kaaba mine is a persistent, but low-grade, banded quartz vein that strikes N3W, dips 43-55W, and averages 10 ft in width. This vein appears to be bordered by two dikes; however, at the 200-ft level the dike in the footwall cuts the vein, and 50 ft below the collar, the vein is entirely in the Similkameen composite pluton (Patty, 1921, p. 230). Patty (1921) suggests that the dikes are younger than the mineralization because they are not altered and because they cut mineralized rock. The depth to the bottom of the deposit is 240 ft.

GEOLOGIC SETTING: The vein is in the granodiorite of the Similkameen composite pluton of Jurassic age.

COMMENTS: An inclined shaft is 300 ft long with 1,100 ft of drifts are on four levels; more than half the drifting is on the third level. A 150-ton/day flotation mill was constructed on property (Huntting, 1956, p. 220).

REFERENCES

Buddington, A. M.; Burmester, R. F., 1990, The Similkameen batholith: A mid-Jurassic, post-tectonic complex in the Quesnel terrane, north-central Washington and south-central British Columbia [abstract]: Geological Society of America Abstracts with Programs, v. 22, n. 3, p. 10-11.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Patty, E. N., 1921, The metal mines of Washington: Washington Geological Survey Bulletin 23, 366 p.

Rinehart, C. D.; Fox, K. F., Jr., 1972, Geology and mineral deposits of the Loomis quadrangle, Okanogan County, Washington: Washington Division of Mines and Geology Bulletin 64, 124 p., 3 pl.

Kankakee (450)

ALTERNATE NAMES		DISTRICT	COUNTY
		Nespelem	Okanogan
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Armstrong Creek	1:24,000	Omak	Okanogan
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
48° 10′ 42.25″ N	119° 2′ 13.19″ W	near NW corner, sec. 22, 31N, 30E	

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
porphyritic granodiorite of Manila Creek	granite, granodiorite	(Paleocene?) - Eocene
unnamed quartzite	quartzite	Paleozoic

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Cu	chalcopyrite	pyrite, fluorite, quartz
Pb	argentite?	
Ag		

DEPOSIT TYPE	MINERALIZATION AGE
vein	(Paleocene?) - Eocene

PRODUCTION: A small test shipment of oxidized lead ore was made (Huntting, 1956, p. 66).

TECTONIC SETTING: The porphyritic granodiorite of Manila Creek is part of the Keller Butte suite of Holder and Holder (1988). Intrusion of Keller Butte suite rocks into metasedimentary country rocks was contemporaneous with regional ductile stretching associated with the formation of the metamorphic core complexes (Holder and Holder, 1988).

ORE CONTROLS: Weak mineralization is present along fractures in granite and quartzite. One quartz vein is 2-in. wide (Huntting, 1956, p. 66).

GEOLOGIC SETTING: Quartzite of probable Paleozoic age is intruded by the (Paleocene?)-Eocene porphyritic granodiorite of Manila Creek (Gulick and Korosec, 1990).

REFERENCES

Gulick, C. W.; Korosec, M. A., compilers, 1990, Geologic map of the Omak 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-12, 52 p., 1 pl.

Holder, R. W.; Holder, G. A. M., 1988, The Colville batholith—Tertiary plutonism in northeast Washington associated with graben and core complex (gneiss dome) formation: Geological Society of America Bulletin, v. 100, no. 12, p. 1971-1980.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Kelsey (438)

ALTERNATE NAMES	DISTRICT	COUNTY
Hart Stone Stone	Similkameen Oroville	Okanogan

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Oroville	1:24,000	Oroville	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 59′ 41.66″ N	119° 28′ 40.74″ W	secs. 5, 6, 7, and 8, 40N, 27E

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
Silver Nail Pluton	diorite	Jurassic - Cretaceous (?)
Silver Nail Pluton	quartz diorite	Jurassic

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
quartzo-feldspathic dikes	

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Cu Mo Ag Au	chalcopyrite molybdenite malachite azurite chrysocolla	pyrite (dominant), magnetite, pyrrhotite, chlorite, quartz, calcite, epidote, sericite, secondary biotite (weak), K-spar, actinolite, garnet; sericitization, potassic alteration, tactite development

DEPOSIT TYPE	MINERALIZATION AGE
porphyry copper veins veinlets disseminated	

PRODUCTION: Has not produced.

TECTONIC SETTING: To the north in British Columbia, distribution of major porphyry copper deposits is, in part, controlled by the Quesnel trough. The Kelsey property lies on the southward projection of this structural trough and is similar to mined deposits to the north.

ORE CONTROLS: The bulk of the mineralization is in the Silver Nail pluton, a coarsely crystalline quartz diorite. The intrusive is sheeted; contacts between the various phases are fairly flat. Sills and thrust faults are present. At the south end of the property, the pluton is brecciated. Permian Anarchist Group rocks (slate, phyllite, impure marble, greenstone, metaconglomerate, and metawacke) were incorporated as fragments in the breccia and as slivers in the pluton. The most concentrated copper-molybdenum mineralization is associated with quartz-sericite alteration and intense fracturing; country rock surrounding the mineralized zone is chloritized. Mineralization in greenstone and limy portions of the Anarchist Group consists of copper-bearing tactite containing pyrrhotite, minor garnet, and epidote. Quartz veins contain chalcopyrite-rich pods. Huntting (1956, p. 67) reports 18 assays averaging 2.62% Cu, 0.6 oz/ton Ag, and 0.04 oz/ton Au. During the 1960s, exploration programs for porphyry copper deposits outlined two zones in the pluton. The Central Zone is 4,800 ft long, has a northwest-trending axis, and averages 1,530 ft wide. It contains 66,575,200 tons of indicated ore averaging 0.286% Cu and an additional 137,560,000 tons of inferred ore of similar grade. The geological potential of the central zone to a depth of 600 ft is 280,000,000 tons. Molybdenum credits are variable and range from 0.015 to 0.02% MoS_2. Hole K-3 drilled by Inland Copper Ltd. encountered 85 ft of ore averaging 0.407% Cu and 0.13% Mo. The Northwest Zone contains a total of 34,320,000 tons of indicated and inferred ore grading 0.241% Cu. The Northwest Zone extends across the international boundary into British Columbia.

GEOLOGIC SETTING: The major rock type at the Kelsey deposit is the Jurassic-Cretaceous (?) Silver Nail quartz diorite pluton. Subordinate intrusive rock types are quartz monzonite and syenite. Late aplite occurs near the south contact. All intrude Permian Anarchist Group greenstone, phyllite, slate, and minor marble, limestone, and quartzite. Tertiary conglomerate and dacite adjoining the deposit are not altered, and therefore, are post ore.

COMMENTS: The Kelsey property, in 1974, consisted of 15 patented claims, 91 unpatented claims, and land held in fee. It was discovered in the late 1800s, and attempts were made to develop the higher grade quartz veins. From 1965 to 1974 American Smelting and Refining Co., Inland Copper Ltd., Canadian Superior Exploration Ltd., St. Joe Minerals Corp., Placer-Amex Inc., and U.S. Borax explored the property for porphyry copper deposits. They drilled a total of 36,085 ft of X-ray, rotary, percussion, and core holes. The property in now (1990) owned by Wilbur G. Hallauer of Oroville.

UNPUBLISHED INFORMATION: Grant, A.R., 1974, Report of evaluation, Kelsey property, Okanogan County, Washington. Grant, A.R., 1980, Summary report, Kelsey property, Okanogan County, Washington. These reports are in DGER files.

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Roper, M. W., 1973, Geology of the Kelsey copper-molybdenum property, Okanogan County, Washington: Montana State University Master of Science thesis, 97 p., 5 pl.

Umpleby, J. B., 1911, Geology and ore deposits of the Oroville-Nighthawk mining district: Washington Geological Survey Bulletin 5, pt. 2, p. 55-111.

Key (424)

ALTERNATE NAMES	DISTRICT	COUNTY
	Conconully Conconully area	Okanogan

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Conconully West	1:24,000	Oroville	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 34′ 39.73″ N	119° 45′ 8.35″ W	SW¼NW¼ sec. 31, 36N, 25E

LOCATION: elev. 2,800 ft

HOST ROCK: NAME	LITHOLOGY	AGE
metamorphic complex of Conconully	schist, migmatite	pre-Jurassic

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Ag	galena	quartz
Pb	pyrite	
Au	chalcopyrite	
Cu	sphalerite	
Zn	unknown Bi mineral	
Bi		

DEPOSIT TYPE	MINERALIZATION AGE
vein	

PRODUCTION: Produced a total of 1,500 tons; 12 tons were produced in 1914 and netted $444 in Ag and Pb (Moen, 1973, p. 28).

TECTONIC SETTING: Triassic (or pre-Jurassic) sediments were deposited along an active continental margin setting.

ORE CONTROLS: The sparsely metallized quartz vein is 3-10 ft thick, strikes N25E, and dips 60NW.

GEOLOGIC SETTING: The vein is in schist and migmatite of the metamorphic complex of Conconully. These rocks are thought by Rinehart and Fox (1976) to be in part Late Triassic because they are intruded by a small pluton that is correlated with the Loomis pluton, dated at 194 m.y.

COMMENTS: Development at the property consists of a 300-ft adit, a 80-ft shaft, and a 105-ft drift (Moen, 1973, p. 28).

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Moen, W. S., 1973, Conconully mining district of Okanogan County, Washington: Washington Division of Mines and Geology Information Circular 49, 42 p.

Rinehart, C. D.; Fox, K. F., Jr., 1976, Bedrock geology of the Conconully Quadrangle, Okanogan County, Washington: U.S. Geological Survey Bulletin 1402, 58 p., 1 pl.

Stoffel, K. L., compiler, 1990, Geologic map of the Oroville 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-11, 58 p., 1 pl.

Kimberly (416)

ALTERNATE NAMES		DISTRICT	COUNTY
		Wannacut Lake	Okanogan
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Bullfrog Mtn	1:24,000	Oroville	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 53′ 24.32″ N	119° 31′ 57.40″ W	SW¼ sec. 11, 39N, 26E

LOCATION: elev.: 1,920 ft, about 7 mi northeast of Loomis

HOST ROCK: NAME	LITHOLOGY	AGE
Spectacle Formation of the Anarchist Group	argillite	Permian

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
Whisky mountain pluton	Jurassic to Cretaceous

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Pb	galena	quartz
Ag	chalcopyrite	
Au	sphalerite	
Cu		
Zn		

DEPOSIT TYPE	MINERALIZATION AGE
vein	

PRODUCTION: Rinehart and Fox (1972, p. 93) report that the mine has produced "considerable hand-sorted ore of $40 grade." Presumably this is ore worth $40 per ton.

TECTONIC SETTING: Marine rocks of the Spectacle Formation were derived from sediments deposited along an active continental margin.

ORE CONTROLS: Mineralization is present in en echelon lenses of quartz as much as 50 ft in long and 1-5 ft wide, in the hanging wall over contact (possibly fault) that strikes N46W and dips 52SW between a porphyritic granodiorite and quartz monzonite pluton and argillite and slate (Umpleby, 1911, p. 97; Rinehart and Fox, 1972, geol. map).

GEOLOGIC SETTING: The deposit occurs at contact of the Permian Spectacle Formation and the Jurassic-Cretaceous Whisky Mountain pluton (Rinehart and Fox, 1972, geol. map).

COMMENTS: Development at the site included a 140-ft inclined shaft and drifts at the 60-, 80-, and 100-ft levels (Rinehart and Fox, 1972).

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Rinehart, C. D.; Fox, K. F., Jr., 1972, Geology and mineral deposits of the Loomis quadrangle, Okanogan County, Washington: Washington Division of Mines and Geology Bulletin 64, 124 p., 3 pl.

Umpleby, J. B., 1911, Part I. Geology and ore deposits of the Myers Creek mining district; Part II—Geology and ore deposits of the Oroville-Nighthawk mining district: Washington Geological Survey Bulletin 5, 111 p.

King Solomon (435)

ALTERNATE NAMES		DISTRICT	COUNTY
		Nighthawk	Okanogan
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Nighthawk	1:24,000	Oroville	Okanogan
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
48° 56′ 57.93″ N	119° 38′ 10.73″ W	NE¼SW¼ sec. 24, 40N, 25E	

LOCATION: elev. 3,040 ft, about 9.2 mi north of Loomis

HOST ROCK: NAME	LITHOLOGY	AGE
Kobau Formation	metachert, slate	Permian or Triassic (?)

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Pb Cu Au	galena chalcopyrite	pyrite, banded vuggy quartz

DEPOSIT TYPE	MINERALIZATION AGE
vein	

PRODUCTION: Produced lead ore in 1924 (Huntting, 1956, p. 220).

TECTONIC SETTING: Marine sedimentary and volcanic materials of the Kobau Formation were deposited along an active continental margin proximal to an island arc.

ORE CONTROLS: The 7-ft-wide, banded, vuggy quartz vein trends N5E and dips 50W. The vein pinches at depth (Rinehart and Fox, 1972, p. 92).

GEOLOGIC SETTING: The vein is in thinly laminated slate and quartzite (metachert) of the Kobau Formation (Rinehart and Fox, 1972, geol. map).

COMMENTS: An inclined shaft developed property (Rinehart and Fox, 1972).

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Rinehart, C. D.; Fox, K. F., Jr., 1972, Geology and mineral deposits of the Loomis quadrangle, Okanogan County, Washington: Washington Division of Mines and Geology Bulletin 64, 124 p., 3 pl.

Lakeview (395)

ALTERNATE NAMES		DISTRICT	COUNTY
		Oroville	Okanogan
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Oroville	1:24,000	Oroville	Okanogan
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
48° 58′ 50.21″ N	119° 28′ 59.72″ W	center sec. 7, 40N, 27E	

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
Kobau Formation	greenstone, metachert	Permian or Triassic (?)
ASSOCIATED IGNEOUS ROCK: DESCRIPTION		AGE
Silver Nail Lake pluton		Jurassic - Cretaceous

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au	gold	

DEPOSIT TYPE	MINERALIZATION AGE
vein	

PRODUCTION: Two carloads were shipped prior to 1916 (Huntting, 1956, p. 143).

TECTONIC SETTING: The Kobau Formation was deposited along an active continental margin proximal to island arcs.

ORE CONTROLS: Said to be a thick blanket-like body of ore parallel to the slope of the hill (Huntting, 1956, p. 143).

GEOLOGIC SETTING: Partly chloritzed greenstone and metachert of the Triassic or Permian Kobau Formation (Fox, 1970, geol. map; Roper, 1973, alteration map).

COMMENTS: Hydrothermal alteration associated with the Lakeview mine occurs in the alteration halo of the Kelsey porphyry Cu-Mo system (Roper, 1973; alteration map)

REFERENCES

Fox, K., F., Jr., 1970, Geologic map of the Oroville quadrangle, Okanogan County, Washington: U. S. Geological Survey Open-File Report 70-128, 3 sheets, scale 1:62,500.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Handy, F. M., 1916, An investigation of the mineral deposits of northern Okanogan County: State College of Washington Department of Geology Bulletin 100, 27 p.

Hodges, L. K., 1897, Mining in the Pacific Northwest: Seattle Post Intelligencer, 116 p. [Facsimile reprinted 1967 in two volumes, Mining in eastern and central Washington, and, Mining in western Washington: Shorey Book Store, Seattle, Washington.]

Roper, M. W., 1973, Geology of the Kelsey copper-molybdenum property, Okanogan County, Washington: Montana State University Master of Science thesis, 97 p., 5 pl.

Last Chance (477)

ALTERNATE NAMES	DISTRICT	COUNTY
Ruby Lode claim	Conconully Ruby Hill area	Okanogan

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Ruby Hill	1:24,000	Omak	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 29′ 30.19″ N	119° 44′ 23.92″ W	E½ sec. 31, 35N, 25E

LOCATION: elev. 3,000 ft, at the north end of Ruby Hill

HOST ROCK: NAME	LITHOLOGY	AGE
Conconully granodiorite	granodiorite	Cretaceous
metamorphic complex of Conconully	hornblende-mica schist	pre-Jurassic

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Ag	tetrahedrite	pyrite, quartz
Pb	galena	
Cu	chalcopyrite	
Zn	sphalerite	

DEPOSIT TYPE	MINERALIZATION AGE
vein	

PRODUCTION: Ore was blocked out but was not mined because of the silver panic of 1983. In 1920 the mine was reopened, and ore that averaged 30 oz/ton Ag, 17% Pb, and 4% Cu was shipped to a smelter at Bradley, Idaho. Small shipments of ore were made again in 1921 and 1924 (Moen, 1973, p. 18).

TECTONIC SETTING: The quartz monzonite was probably emplaced in a magmatic arc.

ORE CONTROLS: The quartz fissure vein that averages 12 ft in width strikes S50E and dips 70SW. Ore minerals are concentrated in ore shoots that are 2-4 ft thick and as much as 200 ft long. Ore minerals are sparsely disseminated between ore shoots (Moen, 1973, p. 18).

GEOLOGIC SETTING: The vein is in granodiorite of Cretaceous age near the contact with hornblende-biotite schist of the metamorphic complex of Conconully (Gulick and Korosec, 1990, geol. map).

REFERENCES

Gulick, C. W.; Korosec, M. A., compilers, 1990, Geologic map of the Omak 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-12, 52 p., 1 pl.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Moen, W. S., 1973, Conconully mining district of Okanogan County, Washington: Washington Division of Mines and Geology Information Circular 49, 42 p.

Patty, E. N., 1921, The metal mines of Washington: Washington Geological Survey Bulletin 23, 366 p.

Leuena (425)

ALTERNATE NAMES	DISTRICT	COUNTY
Laeuna Launa	Conconully Mineral Hill area	Okanogan

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Conconully West	1:24,000	Oroville	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 34′ 19.69″ N	119° 47′ 32.48″W	SW¼ sec. 35, 36N, 24E

LOCATION: elev. 5,000 ft

HOST ROCK: NAME	LITHOLOGY	AGE
Conconully pluton	granodiorite, quartz monzonite	Cretaceous

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Ag Cu Au	tetrahedrite stephanite argentite chalcopyrite?	quartz, pyrite

DEPOSIT TYPE	MINERALIZATION AGE
vein	

PRODUCTION: Several carloads were shipped prior to 1890 (Moen, 1973).

TECTONIC SETTING: The Conconully pluton is a directionless, post-tectonic pluton that was intruded into a major structural zone (Stoffel, K. L., DGER, 1990, oral commun.)

ORE CONTROLS: The 7-ft-thick quartz vein in granodiorite strikes N55E and is vertical (Moen, 1973).

GEOLOGIC SETTING: The vein is in the Conconully pluton, which is a leucocratic, equigranular to porphyritic, medium- to coarse-grained, biotite- and hornblende-bearing granodiorite to quartz monzonite of Cretaceous age (Stoffel, 1990).

COMMENTS: High-grade parts of the vein contained 200-800 oz/ton Ag.

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Moen, W. S., 1973, Conconully mining district of Okanogan County, Washington: Washington Division of Mines and Geology Information Circular 49, 42 p.

Purdy, C. P., Jr., 1951, Antimony occurrences of Washington: Washington Division of Mines and Geology Bulletin 39, 186 p.

Stoffel, K. L., compiler, 1990, Geologic map of the Oroville 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-11, 58 p., 1 pl.

Lilman (478)

ALTERNATE NAMES		DISTRICT	COUNTY
		Nespelem	Okanogan
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Armstrong Creek	1:24,000	Oroville	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 9′ 16.46″ N	119° 1′ 18.92″ W	SE¼SE¼ sec. 27, 31N, 30E

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
porphyritic granodiorite of Manila Creek	granite, granodiorite	(Paleocene?) - Eocene-

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Ag Au Cu	tetrahedrite chalcopyrite	pyrite, pyrrhotite, quartz

DEPOSIT TYPE	MINERALIZATION AGE
vein veinlets	(Paleocene?) - Eocene

PRODUCTION: Produced 16 tons of ore prior to 1940 (Moen, 1976, p. 131).

TECTONIC SETTING: The porphyritic granodiorite of Manila Creek is part of the Keller Butte suite of Holder and Holder (1988). Rocks of the Keller Butte suite were emplaced during regional ductile stretching associated with deformation in the metamorphic core complexes (Holder and Holder, 1988).

ORE CONTROLS: The deposit consists of lenses and veinlets along a 1.5-20-ft-wide shear zone in granodiorite.

GEOLOGIC SETTING: The vein is in the (Paleocene?)-Eocene porphyritic granodiorite of Manila Creek (Gulick and Korosec, 1990, geol. map).

COMMENTS: Development consists of 35- and 50-ft shafts and a 150-ft adit (Moen, 1976, p. 131).

REFERENCES

Broch, M. J., 1979, Igneous and metamorphic petrology, structure, and mineral deposits of the Mineral Ridge area (Moses mining district), Colville Indian Reservation, Washington: Washington State University Master of Science thesis, 204 p., 1 pl.

Gulick, C. W.; Korosec, M. A., compilers, 1990, Geologic map of the Omak 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-12, 52 p., 1 pl.

Holder, R. W.; Holder, G. A. M., 1988, The Colville batholith—Tertiary plutonism in northeast Washington associated with graben and core complex (gneiss dome) formation: Geological Society of America Bulletin, v. 100, no. 12, p. 1971-1980.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Moen, W. S., 1976, Silver occurrences of Washington: Washington Division of Geology and Earth Resources Bulletin 69, 188 p.

Little Chief (479)

ALTERNATE NAMES	DISTRICT	COUNTY
Double Header Grand Coulee Ruby Silver	Nespelem	Okanogan

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Armstrong Creek	1:24,000	Omak	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 8′ 55.66″ N	119° 0′ 31.70″ W	NE¼NW¼ sec. 35. 31N, 30E

LOCATION: about 2 mi southwest of Nespelem village

HOST ROCK: NAME	LITHOLOGY	AGE
porphyritic granodiorite of Manila Creek	granite, granodiorite	(Paleocene?) - Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Ag Au Cu	argentite stephanite pyrargyrite silver chalcopyrite	pyrite, quartz, calcite

DEPOSIT TYPE	MINERALIZATION AGE
vein	(Paleocene?) - Eocene

PRODUCTION: The mine is the second largest producer in the Nespelem district. The deposit produced $60,000 in silver from 1911 to 1921. A small amount of concentrate was produced from 1937 to 1954 (Moen, 1976, p. 132).

TECTONIC SETTING: The porphyritic granodiorite of Manila Creek is part of the Keller Butte suite of Holder and Holder (1988). The Keller Butte suite was intruded during regional ductile stretching related to deformation in the metamorphic core complexes (Holder and Holder, 1988).

ORE CONTROLS: Two veins produced ore. The main vein strikes N45W and dips 45-60NE. Fluid inclusions in calcite in the vein homogenized at between 235 and 245 degrees C (Broch, 1979).

GEOLOGIC SETTING: Two veins are present in the (Paleocene?)-Eocene porphyritic granodiorite of Manila Creek (Gulick and Korosec, 1990, geol. map).

COMMENTS: Development consists of a 560-ft adit with 640 ft of drifts and crosscuts as well as a 200-ft shaft with stopes (Moen, 1976, p. 131).

REFERENCES

Broch, M. J., 1979, Igneous and metamorphic petrology, structure, and mineral deposits of the Mineral Ridge area (Moses mining district), Colville Indian Reservation, Washington: Washington State University Master of Science thesis, 204 p., 1 pl.

Gulick, C. W.; Korosec, M. A., compilers, 1990, Geologic map of the Omak 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-12, 52 p., 1 pl.

Holder, R. W.; Holder, G. A. M., 1988, The Colville batholith—Tertiary plutonism in northeast Washington associated with graben and core complex (gneiss dome) formation: Geological Society of America Bulletin, v. 100, no. 12, p. 1971-1980.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Moen, W. S., 1976, Silver occurrences of Washington: Washington Division of Geology and Earth Resources Bulletin 69, 188 p.

Pardee, J. T., 1918, Geology and mineral deposits of the Colville Indian Reservation, Washington: U.S. Geological Survey Bulletin 677, 186 p., 1 pl.

Washington Division of Mines and Geology, 1971, Directory of Washington mining operations, 1969-70: Washington Division of Mines and Geology Information Circular 46, 88 p.

Lone Star (468)

ALTERNATE NAMES	DISTRICT	COUNTY
Star	Conconully Conconully area	Okanogan

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Conconully West	1:24,000	Oroville	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 34′ 29.92″ N	119° 45′ 20.28″ W	E½ sec. 36, 36N, 24E

LOCATION: elev. 2,480 ft, about 1 mi north of Conconully and on the west side of Salmon Creek

HOST ROCK: NAME	LITHOLOGY	AGE
Conconully pluton	granodiorite and quartz monzonite	Cretaceous

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Pb	galena	quartz, banded quartz, pyrite
Ag	tetrahedrite	
Au	stephanite	
Cu	chalcopyrite	
Zn	sphalerite	
W		

DEPOSIT TYPE	MINERALIZATION AGE
vein	

PRODUCTION: By 1890, ore that contained as much as 200 oz/ton Ag and 30% Pb was mined from several levels. By 1897, about $40,000 had been spent developing the mine, but production amounted to only several thousand dollars. Trial shipments of ore were made to smelters in 1913, 1943, and 1969 (Moen, 1973, p. 25).

TECTONIC SETTING: The quartz monzonite was probably emplaced in a magmatic arc.

ORE CONTROLS: The main vein has an average thickness of 3 ft, strikes north, and dips 45-50W. On the south end of the vein, where shearing and faulting in the granodiorite is prominent, the vein consists of as much as 12 ft of banded quartz. The south end of the vein has been offset as much as 50 ft by faults. Ore minerals are generally sparsely scattered through the vein. However, in some parts of the vein, the ore minerals are concentrated in bands as much as several feet wide, which parallel the walls of the vein (Moen, 1973, p. 26).

GEOLOGIC SETTING: The vein is in the medium- to coarse-grained granodiorite and quartz monzonite of the Conconully pluton. The pluton is hydrothermally altered on its eastern edge near the town of Conconully (Stoffel, 1990 p. 24).

COMMENTS: The Lone Star mine has more than 2,000 ft of underground workings in the form of shafts, drifts, and crosscuts (Moen, 1973, p. 26).

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

McFarland, C. R.; McLucas, G. B.; Rigby, J. G.; Stoffel, K. L., 1979, Directory of Washington mining operations, 1979: Washington Division of Geology and Earth Resources Information Circular 69, 100 p.

Moen, W. S., 1973, Conconully mining district of Okanogan County, Washington: Washington Division of Mines and Geology Information Circular 49, 42 p.

Purdy, C. P., Jr., 1951, Antimony occurrences of Washington: Washington Division of Mines and Geology Bulletin 39, 186 p.

Stoffel, K. L., compiler, 1990, Geologic map of the Oroville 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-11, 58 p., 1 pl.

Lucky Knock (444)

ALTERNATE NAMES		DISTRICT	COUNTY
Lawrence			Okanogan
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Ellisforde	1:24,000	Oroville	Okanogan
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
48° 46′ 16.16″ N	119° 29′ 7.85″ W	SE¼SW¼ sec. 19, 38N, 27E	

LOCATION: west of Whitestone Mountain

HOST ROCK: NAME	LITHOLOGY	AGE
Spectacle Formation of the Anarchist Group	limestone, phyllite	Permian

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Sb	stibnite sphalerite	calcite, quartz

DEPOSIT TYPE	MINERALIZATION AGE
veinlets	

PRODUCTION: About 40 tons assaying 62% Sb were shipped in about 1907. A plant to transform stibnite to antimony oxide was built at the site between 1915 and 1917. Antimony oxide and about 500 tons of high-grade stibnite ore were shipped. One carload containing 42 tons of hand-sorted ore grading 30.47% Sb was shipped in 1941. In 1948, seven shipments totaling 47 tons of hand-sorted material that averaged 55.9% Sb were made (Purdy, 1951, p. 94-96).

TECTONIC SETTING: Sediments of the Spectacle Formation were deposited along an active continental margin.

ORE CONTROLS: Stibnite crystals are found in veinlets in fractured and generally silicified limestone beds and in faults in the limestone beds overlying phyllitic beds. Stibnite sometimes is present along bedding planes in limestone, and in some places, the stibnite replaces the limestone (Purdy, 1951, p. 99-101).

GEOLOGIC SETTING: The deposit is in a sequence limestone and phyllite of the Permian Spectacle Formation of the Anarchist Group (Stoffel, 1990, geol. map).

COMMENTS: Development consists of 1,000 ft of drifts, crosscuts, and winzes (Huntting, 1956, p. 19).

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Patty, E. N.; Glover, S. L., 1921, The mineral resources of Washington, with statistics for 1919: Washington Geological Survey Bulletin 21, 155 p., 1 pl.

Purdy, C. P., Jr., 1951, Antimony occurrences of Washington: Washington Division of Mines and Geology Bulletin 39, 186 p.

Purdy, C. P., Jr., 1952, Directory of Washington mining operations, 1952: Washington Division of Mines and Geology Information Circular 20, 75 p.

Shedd, Solon, 1924, The mineral resources of Washington with statistics for 1922; with an article on coal and coke, by G. W. Evans: Washington Division of Geology Bulletin 30, 224 p.

Stoffel, K. L., compiler, 1990, Geologic map of the Oroville 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-11, 58 p., 1 pl.

Umpleby, J. B., 1911, Part I. Geology and ore deposits of the Myers Creek mining district; Part II—Geology and ore deposits of the Oroville-Nighthawk mining district: Washington Geological Survey Bulletin 5, 111 p.

White, D. E., 1962, Antimony in the United States (exclusive of Alaska and Hawaii): U.S. Geological Survey Mineral Investigations Resource Map MR-20, 1 sheet, scale 1:3,168,000, with 6 p. text.

Magnetic (412)

ALTERNATE NAMES	DISTRICT	COUNTY
Buckhorn Natural Aztec Neutral	Myers Creek	Okanogan

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Buckhorn Mountain	1:24,000	Republic	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 57′ 28.60″ N	118° 58′ 43.18″ W	NE¼NW¼ sec. 24, 40N, 30E

LOCATION: elev. 5,000 ft

HOST ROCK: NAME	LITHOLOGY	AGE
unnamed limestone	limestone	Permian

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
Buckhorn Mountain pluton	Jurassic - Cretaceous

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Fe Cu Ag Au	magnetite pyrrhotite pyrite chalcopyrite scheelite gold	garnet, epidote, pyrrhotite, pyrite

DEPOSIT TYPE	MINERALIZATION AGE
contact metamorphic replacement	

PRODUCTION: Small shipments of copper ore were made from the Neutral claim to a smelter in British Columbia. A total of 80,000 tons of magnetite were shipped from the Neutral claim between 1918 and 1950 (Moen, 1980, p. 47).

TECTONIC SETTING: Late Paleozoic sediments were deposited along an active continental margin.

ORE CONTROLS: Contact-metamorphic replacement of limestone in contact with the Cretaceous or Jurassic Buckhorn Mountain pluton. The magnetite zone is proximal to the pluton; tactite includes grossularite garnet, epidote, zoisite, quartz, and calcite. Tactite pods in places contain disseminated grains, pods, and pockets of intermixed magnetite, pyrrhotite, pyrite and chalcopyrite. Magnetite is irregularly distributed in the tactite zone, but near the Magnetic mine, it is roughly parallel to the northeast-trending contact, which appears to dip about 65SW (Moen, 1980, p. 47-49). Shear zones contain moderate amounts of sulfides and an estimated several million tons of iron ore (Huntting, 1956, p. 199).

GEOLOGIC SETTING: Magnetite bodies are located in a northwest-trending contact-metamorphic zone in limestones of Permian age adjacent to biotite-hornblende granodiorite of the Jurassic-Cretaceous Buckhorn Mountain pluton (Moen, 1980, p. 47; Stoffel, 1990).

COMMENTS: Development work consisted of three open pits, two adits, and numerous open cuts and prospects pits. The main pit is 280 ft long and 65-130 ft wide and has a maximum vertical face of 50 ft (Moen, 1980, p. 49). The Magnetite mine is part of the Buckhorn Mountain project drilled by Crown Resources Corp. in 1988-89. Other than iron the ore bodies contain traces to 0.02% Cu, traces to 0.15 oz/ton Au, and 0.05-0.40 oz/ton Ag (Moen, 1980, p. 49). Broughton (1943, p.17) estimated reserves of 4,826,000 tons of iron ore averaging 47.3% Fe, 1.57% S, 0.03% P, and 0.03% Ti.

REFERENCES

Broughton, W. A., 1943, The Buckhorn iron deposits of Okanogan County, Washington—Results of a magnetic survey: Washington Division of Geology Report of Investigations 8, 21 p., 1 pl.

Culver, H. E.; Broughton, W. A., 1945, Tungsten resources of Washington: Washington Division of Geology Bulletin 34, 89 p., 23 pl.

Glover, S. L., 1942, Washington iron ores, a summary report: Washington Division of Mines and Mining Report of Investigations 2, 23 p.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Moen, W. S., 1980, Myers Creek and Wauconda mining districts of northeastern Okanogan County, Washington: Washington Division of Geology and Earth Resources Bulletin 73, 96 p., 6 pl.

Shedd, Solon; Jenkins, O. P.; Cooper, H. H., 1922, Iron ores, fuels, and fluxes of Washington: Washington Division of Geology Bulletin 27, 160 p., 1 pl.

Stoffel, K. L., compiler, 1990, Geologic map of the Republic 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-10, 62 p., 1 pl.

Umpleby, J. B., 1911, Part I. Geology and ore deposits of the Myers Creek mining district; Part II—Geology and ore deposits of the Oroville-Nighthawk mining district: Washington Geological Survey Bulletin 5, 111 p.

Whitwell, G. E.; Patty, E. N., 1921, The magnesite deposits of Washington, their occurrence and technology: Washington Geological Survey Bulletin 25, 194 p.

Zapffe, Carl, 1949, A review—Iron bearing deposits in Washington, Oregon, and Idaho: Raw Materials Survey Resource Report 5, 89 p.

Zoldok, S. W.; Cole, J. W.; Dougherty, E. Y., 1947, Iron deposits of Buckhorn Mountain, Meyers Creek mining district, Okanogan County, Washington: U.S. Bureau of Mines Report of Investigations 4051, 22 p.

Mammoth (426)

ALTERNATE NAMES		DISTRICT	COUNTY
Mammoth Claim		Conconully Conconully area	Okanogan
PRIMARY QUADRANGLE	**SCALE**	**½° x 1° QUAD**	**1° x 2° QUAD**
Conconully East	1:24,000	Oroville	Okanogan
LATITUDE	**LONGITUDE**	**SECTION, TOWNSHIP, AND RANGE**	
48° 35′ 14.63″ N	119° 44′ 54.49″ W	sec. 30, 36N, 25E	

LOCATION: northeast of the Monitor property

HOST ROCK: NAME	LITHOLOGY	AGE
metamorphic complex of Conconully	schist, gneiss	pre-Jurassic

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
alaskite and pegmatite	

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Ag Cu Au		quartz

DEPOSIT TYPE	MINERALIZATION AGE
vein	

PRODUCTION: A shipment of ore to the smelter at Helena, Montana, in 1889 netted $250 per ton (Huntting, 1956, p. 306).

TECTONIC SETTING: Late Triassic rocks formed along an active continental margin setting and are associated with island arcs.

ORE CONTROLS: Two veins are on the property; the upper one is 5 ft thick and the lower one is 6 ft thick (Huntting, 1956, p. 306).

GEOLOGIC SETTING: The quartz veins are in metasedimentary rocks of the metamorphic complex of Conconully (Stoffel, 1990)

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Rinehart, C. D.; Fox, K. F., Jr., 1976, Bedrock geology of the Conconully Quadrangle, Okanogan County, Washington: U.S. Geological Survey Bulletin 1402, 58 p., 1 pl.

Stoffel, K. L., compiler, 1990, Geologic map of the Oroville 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-11, 58 p., 1 pl.

Mary Ann Creek placer (489)

ALTERNATE NAMES		DISTRICT	COUNTY
			Okanogan
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Chesaw	1:24,000	Oroville	Okanogan
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
48° 56′ 24.90″ N	119° 3′ 6.44″ W	sec. 30, 40N, 30E	

LOCATION: on Mary Ann Creek, 1 mi south of Chesaw

HOST ROCK: NAME	LITHOLOGY	AGE
Quaternary alluvium	sand and gravel	Quaternary

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au	gold	stream gravels

DEPOSIT TYPE	MINERALIZATION AGE
placer	Quaternary

PRODUCTION: The deposit yielded $40,000 in the 1880s (Huntting, 1956, p. 188).

TECTONIC SETTING: Deposition of heavy minerals in river gravels.

ORE CONTROLS: Heavy-mineral concentration by stream action. Gold occurs from grass roots downward to bedrock. A 7-in.-wide clay seam, 4 ft above bedrock, acts as false bedrock, and better gold values are found above the clay (Huntting, 1956, p. 188).

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Landes, Henry; Thyng, W. S.; Lyon, D. A.; Roberts, Milnor, 1902, Annual report for 1901, in six parts; Part II-The metalliferous resources of Washington, except iron: Washington Geological Survey, 123 p.

Mazama (439)

ALTERNATE NAMES		DISTRICT	COUNTY
Lesley		Mazama	Okanogan
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Mazama	1:62,500	Robinson Mtn	Concrete
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
48° 36′ 52.91″ N	120° 22′ 55.20″ W	SW¼ sec. 17, SE¼, SE¼ sec. 18, E½ sec. 19, and W½ sec. 20, 36N, 20E	

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
Fawn Peak stock	diorite, quartz diorite, plagioclase porphyry	Cretaceous
ASSOCIATED IGNEOUS ROCK: DESCRIPTION		AGE
andesite and andesite porphyry breccia fragments		

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Cu	chalcopyrite	pyrite

DEPOSIT TYPE	MINERALIZATION AGE
porphyry system breccia pipe	

PRODUCTION: There is no recorded production.

TECTONIC SETTING: The Fawn Peak stock was probably the intrusive rock core of an island arc (Riedell, 1979).

ORE CONTROLS: Mineralization is confined to fractures and a breccia body. This appears to be primarily a porphyry copper deposit that has no other metal values. Reserves are given as nearly 150 million tons averaging 0.36% Cu. The overall waste to ore ratio is 2.5:1. Quartz veins 0.5 mi to the south at the Mazama Pride mine produced 37 tons of ore in 1931, which contained copper and 0.7 oz/ton Au.

GEOLOGIC SETTING: The Fawn Peak stock is an elongate, northwest-trending intrusion along the northeast side of the Methow River valley; it is situated along the axis of the Goat Peak syncline. The stock consists of finely to coarsely crystalline diorite, porphyritic quartz diorite, plagioclase porphyry, and intrusion breccia. The porphyritic rocks occur along the border of the stock. The stock intrudes the Winthrop Sandstone and the Midnight Peak Formation. The sandstone contains epidote (hornfels) alteration. Swarms of porphyritic sills and dikes extend as much as 1 km from the stock. The intrusive breccia is a pipelike body and consists of subrounded clasts as much as 10 in. long of diorite, quartz diorite, andesite, and andesite porphyry in a matrix of plagioclase porphyry. Three K-Ar magmatic biotite ages for the stock averaged 88 m.y. Altered rocks in the stock yield K-Ar secondary biotite ages of 85.1 ± 3.5 m.y. and 69.7 ± 2.9 m.y.

COMMENTS: This property consists of unpatented mining claims and is being explored (1990) by Vanderbilt Gold Corporation. Considerable drilling was conducted by Bear Creek, Noranda, Inspiration Development Co., and Quintana. Bear Creek and Inspiration spent $700,000 on drilling.

UNPUBLISHED INFORMATION: Vanderbilt Gold Corporation, 1989, Mazama project description. This report is in DGER files.

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Stoffel, K. L.; McGroder, M. F., compilers, 1990, Geologic map of the Robinson Mtn. 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-5, 39 p., 1 pl.

Methow (397)

ALTERNATE NAMES	DISTRICT	COUNTY
London New London	Squaw Creek Hunter Mtn area	Okanogan

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Cooper Mtn	1:24,000	Twisp	Concrete

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 6′ 25.19″ N	120° 1′ 6.13″ W	E½, secs. 12 and 13, 30N, 22E

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
Methow Gneiss	tonalitic gneiss	Cretaceous

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
basic dikes	Eocene?

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au W Cu Ag Mo	scheelite gold chalcopyrite	pyrite, quartz

DEPOSIT TYPE	MINERALIZATION AGE
disseminated vein	

PRODUCTION: $40,000 in gold was produced in 1940-41 (Huntting, 1956, p. 144).

TECTONIC SETTING: The Methow Gneiss is a Cretaceous intrusive body that has been metamorphosed to amphibolite grade (Bunning, 1990).

ORE CONTROLS: The deposit is made up of several veins. The New London vein is less than 1 ft wide and contains quartz, pyrite, gold, chalcopyrite, and scheelite. It lies along the footwall of a narrow basic dike that strikes N60E and dips 55NW. Scheelite crystals are disseminated in the quartz veins and are as much as 0.5 in. across. The veins are cut by several reverse faults. Other veins on the property are similarly mineralized and either parallel basic dikes or are contained within them (Culver and Broughton, 1945, p. 48-49).

GEOLOGIC SETTING: These veins are in basic dikes of probably Eocene age and which cut the Cretaceous Methow Gneiss (Bunning, 1990; Culver and Broughton, 1945).

COMMENTS: The quartz veins that make up the deposit were developed by several shafts and adits. More than 2,200 ft of underground workings were present; more than half of these were west of the Methow River (Huntting, 1956, p. 144).

REFERENCES

Barksdale, J. D., 1975, Geology of the Methow Valley, Okanogan County, Washington: Washington Division of Geology and Earth Resources Bulletin 68, 72 p., 1 pl.

Bunning, B. B., compiler, 1990, Geologic map of the east half of the Twisp 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-9, 51 p, 1 pl.

Culver, H. E.; Broughton, W. A., 1945, Tungsten resources of Washington: Washington Division of Geology Bulletin 34, 89 p., 23 pl.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Mid Range (457)

ALTERNATE NAMES		DISTRICT	COUNTY
			Okanogan
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Gilbert	1:24,000	Twisp	Concrete

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 29′ 7.33″ N	120° 35′ 49.04″ W	sec. 34, 35N, 18E

LOCATION: at the head of North Creek, elev. 6,000-7,760 ft, about 5 mi by trail north of Gilbert, at the terminus of the Twisp River road

HOST ROCK: NAME	LITHOLOGY	AGE
Golden Horn batholith	granite	Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au Ag Cu Zn	chalcopyrite sphalerite	pyrite, pyrrhotite, quartz, arsenopyrite

DEPOSIT TYPE	MINERALIZATION AGE
vein	Eocene

PRODUCTION: Ten tons of ore in 1939 and 22 tons in 1940 were shipped to the Tacoma smelter (Huntting, 1956, p. 144).

TECTONIC SETTING: The Golden Horn batholith was intruded into the Hozameen fault, the major fault bounding the southwestern side of the Methow basin. Radiometric dating suggests that magmatic crystallization occurred at approximately 47 m.y. K-Ar biotite, fission-track allanite, and Rb-Sr isochron ages that fall between 38 and 42 m.y. probably represent the age of postcrystallization hydrothermal alteration (Stoffel and McGroder, 1990).

ORE CONTROLS: The deposit consists of two mineralized quartz veins in granite (Huntting, 1956, p. 144).

GEOLOGIC SETTING: The veins are in granite of the Golden Horn batholith of Eocene age (Stoffel and McGroder, 1990).

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Stoffel, K. L.; McGroder, M. F., compilers, 1990, Geologic map of the Robinson Mtn. 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-5, 39 p., 1 pl.

Washington Division of Mines and Mining, 1941, Directory of Washington metallic mining properties: Washington Division of Mines and Mining Information Circular 7, 74 p.

Minnie (398)

ALTERNATE NAMES	DISTRICT	COUNTY
	Squaw Creek Leecher Creek area	Okanogan

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Twisp East	1:24,000	Twisp	Concrete

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48°15′ 51.32″ N	120° 3′ 16.53″ W	NW¼NW¼ sec. 23, 32N, 22E

LOCATION: elev. 2,400 ft

HOST ROCK: NAME	LITHOLOGY	AGE
Leecher Metamorphics	schist, amphibolite, marble	pre-Cretaceous

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au Ag W Cu Zn S	gold sphalerite chalcopyrite	pyrite, marcasite, quartz

DEPOSIT TYPE	MINERALIZATION AGE
vein	

PRODUCTION: Shipped one carload of ore in 1941. A carload of ore shipped in November 1945 netted $667.56 and gave assays of 0.46 oz/ton Au and 7.75 oz/ton Ag. A mining and gold heap-leach operation was worked by Cordilleran Exploration, Inc., in 1984-85 (Huntting, 1956, p.144; Joseph, 1986).

TECTONIC SETTING: Much of the rock of the Leecher Metamorphics has been recrystallized after mylonitization, probably due to the intrusion of the Okanogan complex (Bunning, 1990, p. 40).

ORE CONTROLS: The vein at the Minnie mine strikes N15E, dips 63SE, and parallels the orientation of the fabric in the Leecher Metamorphics. The porous white quartz vein averages 3 ft in width (Culver and Broughton, 1945, p. 52-53; Bunning, 1990, p. 28).

GEOLOGIC SETTING: The vein is parallel to the fabric in the biotite schist and marble in the Leecher Metamorphics. The deposit is reported to be within 1,000 ft of the Summit-Frazer gneiss of Cretaceous age (Culver and Broughton, 1945, p. 52-3; Bunning, 1990).

COMMENTS: The property was mined in 1984 and 1985 by Cordilleran Exploration, Inc. A small heap-leach system was operated by the company; dore was poured on site (Joseph, 1986).

REFERENCES

Barksdale, J. D., 1975, Geology of the Methow Valley, Okanogan County, Washington: Washington Division of Geology and Earth Resources Bulletin 68, 72 p., 1 pl.

Bunning, B. B., compiler, 1990, Geologic map of the east half of the Twisp 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-9, 51 p, 1 pl.

Culver, H. E.; Broughton, W. A., 1945, Tungsten resources of Washington: Washington Division of Geology Bulletin 34, 89 p., 23 pl.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Joseph, N. L., 1986, Washington's mineral industry, 1985: Washington Geologic Newsletter, v. 14, no. 1-2, p. 1-17.

Lemmon, D. M.; Tweto, O. L., 1962, Tungsten in the United States exclusive of Alaska and Hawaii: U.S. Geological Survey Mineral Investigations Resource Map MR-25, 1 sheet, scale 1:3,168,000, with 25 p. text.

Washington Division of Mines and Geology, 1971, Directory of Washington mining operations, 1969-70: Washington Division of Mines and Geology Information Circular 46, 88 p.

Mohawk (436)

ALTERNATE NAMES	DISTRICT	COUNTY
Silver Peak Sunny Peak Chief Sunshine	Salmon River Mining	Okanogan

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Conconully West	1:24,000	Oroville	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 34′ 11.70″ N	119° 47′ 5.06″ W	SW¼SE¼ sec. 31,T 36N, R 24E

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
Conconully pluton	granodiorite, quartz monzonite	Cretaceous

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Ag Pb Cu Zn	galena sphalerite tetrahedrite	quartz, pyrite

DEPOSIT TYPE	MINERALIZATION AGE
vein	

PRODUCTION: The mine was worked as early as 1890, but mining ceased during the silver panic of 1893. Between 1951 and 1954, ore that contained as much as 60 oz/ton Ag was produced. In 1961 and 1967, small shipments of silver ore were made to the Cominco smelter in Trail, British Columbia (Moen, 1973).

TECTONIC SETTING: The Conconully pluton is a directionless post-tectonic body that was intruded into a major structural zone (Stoffel, K. L., DGER, oral commun., 1990).

ORE CONTROLS: The 1.5-3-ft-wide vein has a general strike of N30W and dips 30-40SW. Ore minerals are concentrated in bands as much as 1 ft wide that contain as much as 60 oz/ton Ag, 13% Pb, and 3% Cu (Moen, 1973, p. 24).

GEOLOGIC SETTING: The vein is in the biotite- and hornblende-bearing Conconully pluton of Cretaceous age (Stoffel, 1990).

COMMENTS: Two adits were worked at the property (Moen, 1973, p.24).

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Jones, E. L., Jr., 1917, Reconnaissance of the Conconully and Ruby mining districts, Washington. *In* Contributions to economic geology (short papers and preliminary reports), 1916-Part I, metals and nonmetals except fuels: U.S. Geological Survey Bulletin 640, p. 11-36.

Moen, W. S., 1973, Conconully mining district of Okanogan County, Washington: Washington Division of Mines and Geology Information Circular 49, 42 p.

Purdy, C. P., Jr., 1951, Antimony occurrences of Washington: Washington Division of Mines and Geology Bulletin 39, 186 p.

Stoffel, K. L., compiler, 1990, Geologic map of the Oroville 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-11, 58 p., 1 pl.

Montana (451)

ALTERNATE NAMES		DISTRICT	COUNTY
		Mazama	Okanogan
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Mazama	1:62,500	Robinson Mountain	Concrete

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 36′ 59.65″ N	120° 20′ 59.85″ W	SE¼SW¼ sec. 16, 36N, 20E

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
Fawn Peak stock	diorite	Cretaceous

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Cu Au	chalcopyrite	pyrite, quartz, calcite, arsenopyrite, pyrrhotite

DEPOSIT TYPE	MINERALIZATION AGE
vein	Cretaceous

PRODUCTION: Produced an unknown amount in 1915 (Huntting, 1956, p. 68).

TECTONIC SETTING: The Fawn Peak stock was probably the intrusive rock core of an island arc (Riedell, 1979).

ORE CONTROLS: The deposit consists of veins in the actinolite alteration zone of the Mazama porphyry molybdenum system (Riedell, 1979).

GEOLOGIC SETTING: The Montana deposit is in the Cretaceous Fawn Peak stock. It is an elongate, northwest-trending intrusion along the northeast side of the Methow River valley; it is situated along the axis of the Goat Peak syncline (Stoffel and McGroder, 1990).

REFERENCES

Barksdale, J. D., 1975, Geology of the Methow Valley, Okanogan County, Washington: Washington Division of Geology and Earth Resources Bulletin 68, 72 p., 1 pl.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Purdy, C. P., Jr., 1952, Directory of Washington mining operations, 1952: Washington Division of Mines and Geology Information Circular 20, 75 p.

Riedell, K. B., 1979, Geology and porphyry copper mineralization of the Fawn Peak intrusive complex, Methow Valley, Washington: University of Washington Master of Science thesis, 52 p., 4 pl.

Stoffel, K. L.; McGroder, M. F., compilers, 1990, Geologic map of the Robinson Mtn. 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-5, 39 p., 1 pl.

Mountain Beaver (458)

ALTERNATE NAMES		DISTRICT	COUNTY
			Okanogan
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Billy Goat Mtn	1:24,000	Robinson Mountain	Concrete
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
48° 47′ 10.98″ N	120° 19′ 10.57″ W	sec. 15, 38N, 20E	

LOCATION: (unsurveyed, approximate location) on Isabella Ridge adjacent to the Billy Goat prospect

HOST ROCK: NAME	LITHOLOGY	AGE
andesite of Isabella Ridge	andesite	Cretaceous?

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
plagioclase porphyry sill or dike	

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au	chalcopyrite	pyrite
Cu	pyrite	
Ag	bornite	
Bi	chalcocite	
	gold	

DEPOSIT TYPE	MINERALIZATION AGE
shear zone stockwork disseminated	

PRODUCTION: Small shipments were made in 1922, 1931, 1934, and 1935 (Huntting, 1956, p. 144). One shipment of 3,639 lb made in 1934 assayed 4.1% Cu, 2.08 oz/ton Au, and 1.9 oz/ton Ag (Staatz and others, 1971). Another shipment of crude ore yielded 1.81% Cu, 1.53 oz/ton Au, 1.13 oz/ton Ag, and a minor amount of bismuth (Huntting, 1956, p. 144). The Mountain Beaver is the only claim in the Billy Goat property to have produced (Staatz and others, 1971).

TECTONIC SETTING: The volcanics were deposited as part of an island arc.

ORE CONTROLS: Andesite tuff and breccia generally strike N30W and dip 70W to vertical. A plagioclase porphyry dike or sill is discontinuously exposed along the west edge of the Billy Goat property. Pyrite and copper minerals occur locally in 0.25-2-in.-wide quartz veinlets, which are located near steeply dipping, northwest-trending faults and fractures. The veinlets are disseminated through the fractured and layered andesite and the plagioclase porphyry (Staatz and other, 1971, p.111-112).

GEOLOGIC SETTING: Mineralization is present in andesite tuff and breccia of probable Cretaceous age and in a plagioclase porphyry dike or sill that intrudes the volcanic rocks (Staatz, 1990).

COMMENTS: The property was reportedly developed by two adits (Staatz and others, 1971).

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Staatz, M. H.; Tabor, R. W.; Weis, P. L.; Robertson, J. F.; Van Noy, R. M.; Pattee, E. C., 1972, Geology and mineral resources of the northern part of the North Cascades National Park, Washington: U.S. Geological Survey Bulletin 1359, 132 p., 2 pl.

Stoffel, K. L.; McGroder, M. F., compilers, 1990, Geologic map of the Robinson Mtn. 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-5, 39 p., 1 pl.

Mountain Boy (469)

ALTERNATE NAMES		DISTRICT	COUNTY
		Park City	Okanogan
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Bald Knob	1:24,000	Nespelem	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 22′ 34.87″ N	118° 52′ 4.34″ W	NE¼ sec. 11, 33N, 31E

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
unnamed metasedimentary rocks	argillite, limestone	Paleozoic

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
granite of Moses Mountain	Paleocene - Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Pb	galena	pyrite, quartz
Ag	sphalerite	
Sb	chalcopyrite	
Cu	tetrahedrite	

DEPOSIT TYPE	MINERALIZATION AGE
vein	

PRODUCTION: Total production at the mine is reported to be four or five carloads with an average value of $60/ton, presumably in Ag and Pb (Pardee, 1918, p.95).

TECTONIC SETTING: The granite of Moses Mountain is part of the Keller Butte suite of Holder and Holder (1988). Rocks of the Keller Butte suite were emplaced during regional ductile stretching associated with deformation in the metamorphic core complexes (Holder and Holder, 1988).

ORE CONTROLS: Rocks near the Mountain Boy mine trend northeast and dip 30-60NW. Quartz lenses at the mine vary from 0.5 to 18 in. in width and from 2 in. to 30 ft in length. The lenses contain irregularly scattered patches of sulfide minerals. The sulfide minerals show some banding and are brecciated. Both the quartz lenses and the metasedimentary rocks are cut by calcite-filled stringers (Pardee, 1918, p. 95).

GEOLOGIC SETTING: Veins are in metasedimentary rocks of probable Paleozoic age that are intruded by the nearby Paleocene-Eocene granite of Moses Mountain (Joseph, 1990).

COMMENTS: Three adits with short drifts, inclines, and other workings are located near each other at the Mountain Boy (Pardee, 1918)

REFERENCES

Holder, R. W.; Holder, G. A. M., 1988, The Colville batholith—Tertiary plutonism in northeast Washington associated with graben and core complex (gneiss dome) formation: Geological Society of America Bulletin, v. 100, no. 12, p. 1971-1980.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Joseph, N. L., compiler, 1990, Geologic map of the Nespelem 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-16, 47 p., 1 pl.

Pardee, J. T., 1918, Geology and mineral deposits of the Colville Indian Reservation, Washington: U.S. Geological Survey Bulletin 677, 186 p., 1 pl.

Purdy, C. P., Jr., 1951, Antimony occurrences of Washington: Washington Division of Mines and Geology Bulletin 39, 186 p.

Mountain Sheep (428)

ALTERNATE NAMES		DISTRICT	COUNTY
		Nighthawk	Okanogan

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Nighthawk	1:24,000	Oroville	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 56′ 30.80″ N	119° 42′ 9.27″ W	NE¼NW¼ sec. 28, 40N, 25E

LOCATION: 0.75 mi north of the Ruby mine

HOST ROCK: NAME	LITHOLOGY	AGE
Kobau Formation	greenstone	Permian or Triassic (?)

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
Loomis pluton	Triassic - Jurassic

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Ag Cu Ag	pyrite malachite	quartz, pyrite

DEPOSIT TYPE	MINERALIZATION AGE
vein	

PRODUCTION: A few cars of ore were shipped prior to 1911 (Huntting, 1956, p. 307).

TECTONIC SETTING: The Kobau Formation was deposited along an active continental margin proximal to an island arc.

ORE CONTROLS: The deposit is on same fault as and is similar to the Ruby deposit. The vein trends N65W, dips 35SW, and can be traced for 3,000 ft along the outcrop. The vein is altered as much as 4 ft from the fault (Huntting, 1956, p. 307; Rinehart and Fox, 1972, p. 96).

GEOLOGIC SETTING: The Kobau Formation is intruded by granodiorite and tonalite of the Triassic-Jurassic Loomis pluton. Mineralization is present in a west-northwest trending-fault near the contact (Rinehart and Fox, 1972, geol. map).

COMMENTS: Three adits totaling 2,000 ft were driven (Rinehart and Fox, 1972).

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Rinehart, C. D.; Fox, K. F., Jr., 1972, Geology and mineral deposits of the Loomis quadrangle, Okanogan County, Washington: Washington Division of Mines and Geology Bulletin 64, 124 p., 3 pl.

Umpleby, J. B., 1911, Part I. Geology and ore deposits of the Myers Creek mining district; Part II—Geology and ore deposits of the Oroville-Nighthawk mining district: Washington Geological Survey Bulletin 5, 111 p.

Murray placer (490)

ALTERNATE NAMES		DISTRICT	COUNTY
			Okanogan
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Trefry Canyon	1:24,000	Oroville	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 6′ 29.93″ N	119° 16′ 23.84″ W	sec. 11, 30N, 28E

LOCATION: Kartar area

HOST ROCK: NAME	LITHOLOGY	AGE
Quaternary alluvium	sand and gravel	Quaternary

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au	gold	stream gravels

DEPOSIT TYPE	MINERALIZATION AGE
placer	Quaternary

PRODUCTION: The placer has produced intermittently (Huntting, 1956, p. 188).

TECTONIC SETTING: Deposition of heavy minerals in river gravels.

ORE CONTROLS: Heavy-mineral concentration by stream action.

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Purdy, C. P., Jr., 1952, Directory of Washington mining operations, 1952: Washington Division of Mines and Geology Information Circular 20, 75 p.

Nevada (429)

ALTERNATE NAMES	DISTRICT	COUNTY
War Eagle Peacock		Okanogan

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Conconully East	1:24,000	Oroville	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 30′ 20.91″ N	119° 44′ 23.72″ W	SW¼NE¼ sec. 30, 35N, 25E

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
metamorphic complex of Conconully	schist, gneiss	pre-Jurassic

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
Conconully pluton	Cretaceous

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Ag	galena	pyrite, quartz
Pb	tetrahedrite	
Cu	chalcopyrite	
Sb	sphalerite	
	stromeyerite	

DEPOSIT TYPE	MINERALIZATION AGE
vein	Cretaceous?

PRODUCTION: In 1901 a carload of ore was shipped to a smelter; $10/ton was received. In 1923-24 several small shipments of lead and copper ore were made; however, returns from the smelter did not exceed mining costs. In 1957 ore was concentrated at a flotation mill in Omak and shipped to the smelter (Moen, 1973, p. 20).

TECTONIC SETTING: Late Triassic rocks of the area formed in an active margin setting. The Conconully pluton is a directionless, post-tectonic pluton that was intruded into a major structural zone (Stoffel, K. L., DGER, 1990, oral commun.)

ORE CONTROLS: The 3-5-ft-thick vein has a general strike of N15W and dips 60E. The Nevada vein is the most persistent of several metallized quartz veins on Peacock Mountain. It is in hornblende-biotite schist and quartz diorite gneiss and parallels the foliation in the metamorphic rocks. Ore minerals are disseminated in the veins or concentrated in bands as much as 1 ft thick that parallel the walls of the vein. The silver is present mainly in galena. Tetrahedrite occurs near the surface. At 100 ft beneath the surface chalcopyrite is the dominant copper mineral (Moen, 1976, p. 20).

GEOLOGIC SETTING: The deposit is in hornblende- and biotite-bearing schist and quartz diorite gneiss near the contact with the Conconully pluton of Cretaceous age, according to Moen (1973). The deposit is shown as being within the metamorphic complex of Conconully by Stoffel (1990) and is shown by Rinehart to be (1981) at the contact of the Conconully pluton of Cretaceous age and metasedimentary and metavolcanic rocks of Permian and Triassic age that are elsewhere (Rinehart and Fox, 1976) shown as the metamorphic complex of Conconully.

COMMENTS: Underground workings at the Nevada mine consisted of four shafts, the deepest which is 220 ft, several hundred feet of drifts, and a 1,000-ft adit (Moen, 1973).

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Moen, W. S., 1973, Conconully mining district of Okanogan County, Washington: Washington Division of Mines and Geology Information Circular 49, 42 p.

Purdy, C. P., Jr., 1951, Antimony occurrences of Washington: Washington Division of Mines and Geology Bulletin 39, 186 p.

Rinehart, C. D., 1981, Reconnaissance geochemical survey of gully and stream sediments, and geologic summary, in part of the Okanogan Range, Okanogan County, Washington: Washington Division of Geology and Earth Resources Bulletin 74, 24 p., 3 pl.

Rinehart, C. D.; Fox, K. F., Jr., 1976, Bedrock geology of the Conconully Quadrangle, Okanogan County, Washington: U.S. Geological Survey Bulletin 1402, 58 p., 1 pl.

Stoffel, K. L., compiler, 1990, Geologic map of the Oroville 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-11, 58 p., 1 pl.

Nighthawk (417)

ALTERNATE NAMES		DISTRICT	COUNTY
			Okanogan
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Nighthawk	1:24,000	Oroville	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 57′ 45.16″ N	119° 38′ 19.38″ W	sec. 13, 40N, 25E, and sec. 18, 40N, 26E

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
Similkameen composite pluton	granodiorite	Jurassic

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
granite	

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Pb Ag	galena	pyrite, quartz

DEPOSIT TYPE	MINERALIZATION AGE
breccia	

PRODUCTION: The mine has produced, but the amount is unknown (Huntting, 1956, p. 221).

TECTONIC SETTING: The Similkameen batholith is a concentrically zoned plutonic body with early mafic alkalic rocks bordering and intruded by calc-alkalic granitic rocks. The complex is undeformed and on the upper plate of the Okanogan valley fault (Buddington and Burmester, 1990).

ORE CONTROLS: Irregular mineralized bodies of friable quartz, which are commonly mixed with gouge, occur along the margins of a brecciated zone in the granodiorite. The principal ore has been mined from near the hanging wall; the contact with the granodiorite on the hanging wall is sharp, but it is gradational on the footwall. The brecciated zone is as much as 100 ft wide at one place (Umpleby, 1911, p. 90).

GEOLOGIC SETTING: In the Jurassic Similkameen composite pluton (Rinehart and Fox, 1972, geol. map).

COMMENTS: The deposit was developed by a 1,700 ft adit (Rinehart and Fox, 1972).

REFERENCES

Buddington, A. M.; Burmester, R. F., 1990, The Similkameen batholith: A mid-Jurassic, post-tectonic complex in the Quesnel terrane, north-central Washington and south-central British Columbia [abstract]: Geological Society of America Abstracts with Programs, v. 22, n. 3, p. 10-11.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Rinehart, C. D.; Fox, K. F., Jr., 1972, Geology and mineral deposits of the Loomis quadrangle, Okanogan County, Washington: Washington Division of Mines and Geology Bulletin 64, 124 p., 3 pl.

Washington Division of Mines and Mining, 1941, Directory of Washington metallic mining properties: Washington Division of Mines and Mining Information Circular 7, 74 p.

Umpleby, J. B., 1911, Part I. Geology and ore deposits of the Myers Creek mining district; Part II—Geology and ore deposits of the Oroville-Nighthawk mining district: Washington Geological Survey Bulletin 5, 111 p.

O.K. (371)

ALTERNATE NAMES	DISTRICT	COUNTY
OK Copper OK O. K.		Okanogan

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Oroville	1:24,000	Oroville	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48°59 35.24 N	119° 28 54.16 W	SE¼ sec. 6, 40N, 27E

LOCATION: 4 mi north of Oroville

HOST ROCK: NAME	LITHOLOGY	AGE
Silver Nail Lake pluton	quartz diorite	Jurassic - Cretaceous (?)

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Cu Ag Au	chalcopyrite bornite tetrahedrite molybdenite scheelite	pyrite, quartz, serpentine

DEPOSIT TYPE	MINERALIZATION AGE
vein shear zone porphyry	

PRODUCTION: Three carloads of ore were shipped prior to 1911. Nineteen carloads of ore were shipped between 1917 and 1921; this ore averaged 7% Cu, 6 oz/ton Ag, and $2/ton Au. Approximately 1,000-2,000 tons of 1-2% Cu ore remains on the dump and in the workings (Patty, 1921, p. 244).

TECTONIC SETTING: The Silver Nail Lake pluton was probably emplaced in a magmatic arc.

ORE CONTROLS: The deposit is in the silicifed-sericitic zone of the Kelsey porphyry copper deposit (Roper, 1973). Mineralization is in a shear zone striking N10W and dipping 30-50 southwest. The quartz diorite is crumpled along the shear zone and consists of light-green quartz-mica and serpentine schist over a width of 6-10 ft. Pinch and swells have formed along which mineralization has developed; mineralization also cements broken wall rock and replaces schist along planes of schistosity (Patty, 1921, p. 245).

GEOLOGIC SETTING: Mineralization is in a shear zone in quartz diorite of the Jurassic-Cretaceous (?) Silver Nail Lake pluton (Fox, 1970).

COMMENTS: Part of the Kelsey porphyry copper-molybdenum deposit (Roper, 1973).

REFERENCES

Culver, H. E.; Broughton, W. A., 1945, Tungsten resources of Washington: Washington Division of Geology Bulletin 34, 89 p., 23 pl.

Fox, K., F., Jr., 1970, Geologic map of the Oroville quadrangle, Okanogan County, Washington: U. S. Geological Survey Open-File Report 70-128, 3 sheets, scale 1:62,500.

Horton, F. W., 1916, Molybdenum, its ores and their concentration, with discussion of markets, prices, and uses: U.S. Bureau of Mines Bulletin 111, 132 p.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Patty, E. N., 1921, The metal mines of Washington: Washington Geological Survey Bulletin 23, 366 p.

Roper, M. W., 1973, Geology of the Kelsey copper-molybdenum property, Okanogan County, Washington: Montana State University Master of Science thesis, 97 p., 5 pl.

Okanogan Free Gold (399)

ALTERNATE NAMES	DISTRICT	COUNTY
Owasco Allison		Okanogan

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Oroville	1:24,000	Oroville	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 57′ 25.84″ N	119° 29′ 4.27″ W	SE¼NW¼ sec. 19, 40N, 27E

LOCATION: on N side of Similkameen River, elev. 1,200 ft

HOST ROCK: NAME	LITHOLOGY	AGE
Spectacle Formation of the Anarchist Group	limestone, quartzite, schist	Permian

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au Ag Zn Pb	sphalerite galena gold	pyrite, quartz

DEPOSIT TYPE	MINERALIZATION AGE
vein	

PRODUCTION: Ore was produced in 1914, 1918, 1936, and 1938-1939 (Huntting, 1956, p. 145).

TECTONIC SETTING: Marine sedimentary rocks of the Spectacle Formation formed along an active continental margin.

ORE CONTROLS: A quartz vein as much as 12 ft wide cuts country rock of limestone, quartzite, and schist. Ore minerals are disseminated in the quartz (Huntting, 1956, p. 145).

GEOLOGIC SETTING: The deposit is in limestone, quartzite, and schist of the Permian Spectacle Formation (Fox, 1970, geol. map).

COMMENTS: Three adits and a glory hole were developed at the property (Huntting, 1956, p. 145).

REFERENCES

Fox, K., F., Jr., 1970, Geologic map of the Oroville quadrangle, Okanogan County, Washington: U. S. Geological Survey Open-file report 70-128, 3 sheets, scale 1:62,500.

Handy, F. M., 1916, An investigation of the mineral deposits of northern Okanogan County: State College of Washington Department of Geology Bulletin 100, 27 p.

Hodges, L. K., 1897, Mining in the Pacific Northwest: Seattle Post Intelligencer, 116 p. [Facsimile reprinted 1967 in two volumes, Mining in eastern and central Washington, and, Mining in western Washington: Shorey Book Store, Seattle, Washington.]

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Washington Division of Mines and Mining, 1941, Directory of Washington metallic mining properties: Washington Division of Mines and Mining Information Circular 7, 74 p.

Umpleby, J. B., 1911, Part I. Geology and ore deposits of the Myers Creek mining district; Part II—Geology and ore deposits of the Oroville-Nighthawk mining district: Washington Geological Survey Bulletin 5, 111 p.

Palmer Summit (400)

ALTERNATE NAMES		DISTRICT	COUNTY
Grand Summit		Palmer Mountain	Okanogan
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Enterprise	1:24,000	Oroville	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 51′ 34.53″ N	119° 33′ 46.44″ W	SE¼SE¼ sec. 21, 39N, 26E

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
Palmer Mountain Greenstone	gabbro	Permian - Triassic

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
gabbro diorite	

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au Cu Pb	chalcopyrite galena	pyrite, quartz

DEPOSIT TYPE	MINERALIZATION AGE
vein	

PRODUCTION: Ore worth $1,000 was produced prior to 1897; also produced in 1937 and 1939 (Huntting, 1956, p. 146).

TECTONIC SETTING: The Palmer Mountain Greenstone was deposited along a convergent continental margin.

ORE CONTROLS: The deposit consists of narrow and sparsely mineralized quartz veins in gabbro (Huntting, 1956, p. 146).

GEOLOGIC SETTING: A vein in metagabbro and greenstone of the Permian-Triassic Palmer Mountain Greenstone (Rinehart and Fox, 1972, geol. map).

COMMENTS: Two adits and a shaft accessed the deposit (Huntting, 1956, p. 146).

REFERENCES

Hodges, L. K., 1897, Mining in the Pacific Northwest: Seattle Post Intelligencer, 116 p. [Facsimile reprinted 1967 in two volumes, Mining in eastern and central Washington, and, Mining in western Washington: Shorey Book Store, Seattle, Washington.]

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Rinehart, C. D.; Fox, K. F., Jr., 1972, Geology and mineral deposits of the Loomis quadrangle, Okanogan County, Washington: Washington Division of Mines and Geology Bulletin 64, 124 p., 3 pl.

Washington Division of Mines and Mining, 1941, Directory of Washington metallic mining properties: Washington Division of Mines and Mining Information Circular 7, 74 p.

Panama (480)

ALTERNATE NAMES		DISTRICT	COUNTY
		Nespelem	Okanogan
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Armstrong Creek	1:24,000	Omak	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 9′ 16.91″ N	119° 1′ 40.78″ W	center S½ sec. 27, 31N, 30E

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
porphyritic granodiorite of Manila Creek	granite, granodiorite	(Paleocene?) - Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Ag	stephanite	pyrite, quartz
Au	argentite	
Sb	silver	
	chalcopyrite	

DEPOSIT TYPE	MINERALIZATION AGE
vein	(Paleocene?) - Eocene

PRODUCTION: A 12-ton shipment of hand-sorted ore was made to the Tacoma smelter; it returned 56.8 oz/ton Ag and 9.32 oz/ton Au (Colville Confederated Tribes, 1984). Shipments totaling 26 tons were made in 1919, 1921, and 1936 (Moen, 1976).

TECTONIC SETTING: The porphyritic granodiorite of Manila Creek is part of the Keller Butte suite of Holder and Holder (1988). Rocks of the Keller Butte suite were emplaced during regional ductile stretching that resulted in the deformation associated with the metamorphic core complexes (Holer and Holder, 1988).

ORE CONTROLS: Quartz lenses and veins are present in a 4-ft-wide shear zone in the granodiorite (Moen, 1976). The vein may be crosscut by an Eocene hypabyassal dacite dike (Colville Confederated Tribes, 1984).

GEOLOGIC SETTING: The veins are in the (Paleocene?)-Eocene porphyritic granodiorite of Manila Creek (Gulick and Korosec, 1990, geol. map).

REFERENCES

Colville Confederated Tribes Geology Department, 1984, Revised geology and mineral potential of the Colville Indian Reservation, Washington, 1984: Colville Confederated Tribes [Nespelem, Wash.], 2 v.

Gulick, C. W.; Korosec, M. A., compilers, 1990, Geologic map of the Omak 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-12, 52 p., 1 pl.

Holder, R. W.; Holder, G. A. M., 1988, The Colville batholith—Tertiary plutonism in northeast Washington associated with graben and core complex (gneiss dome) formation: Geological Society of America Bulletin, v. 100, no. 12, p. 1971-1980.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Moen, W. S., 1976, Silver occurrences of Washington: Washington Division of Geology and Earth Resources Bulletin 69, 188 p.

Purdy, C. P., Jr., 1951, Antimony occurrences of Washington: Washington Division of Mines and Geology Bulletin 39, 186 p.

Paymaster (459)

ALTERNATE NAMES		DISTRICT	COUNTY
		Squaw Creek	Okanogan
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Cooper Mtn	1:24,000	Twisp	Concrete
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
48° 6′ 3.71″ N	120° 3′ 14.15″ W	SW¼NW¼ sec. 14, 30N, 22E	

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
Methow Gneiss	tonalitic gneiss	Cretaceous

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au	gold scheelite	quartz, iron oxide

DEPOSIT TYPE	MINERALIZATION AGE
vein	

PRODUCTION: An unknown amount of gold ore was produced from the oxidized zone (Huntting, 1956, p. 146).

TECTONIC SETTING: The Methow Gneiss protolith was intruded at moderate crustal levels and then metamorphosed to amphibolite grade (Bunning, 1990).

ORE CONTROLS: Mineralization is in a 3-ft-wide vein composed of sheared granitic rock and quartz. Iron-oxide bands from 1 to 3 in. wide on each wall of the vein carry free gold (Huntting, 1956, p. 146).

GEOLOGIC SETTING: The deposit is in the Methow Gneiss of probable Cretaceous age (Bunning, 1990).

REFERENCES

Bunning, B. B., compiler, 1990, Geologic map of the east half of the Twisp 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-9, 51 p, 1 pl.

Hodges, L. K., 1897, Mining in the Pacific Northwest: Seattle Post Intelligencer, 116 p. [Facsimile reprinted 1967 in two volumes, Mining in eastern and central Washington, and, Mining in western Washington: Shorey Book Store, Seattle, Washington.]

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Washington Division of Mines and Mining, 1941, Directory of Washington metallic mining properties: Washington Division of Mines and Mining Information Circular 7, 74 p.

Peacock (481)

ALTERNATE NAMES		DISTRICT	COUNTY
			Okanogan
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Conconully East	1:24,000	Oroville	Okanogan
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
48° 30′ 25.98″ N	119° 44′ 27.62″ W	NE¼ sec. 30, 35N, 25E	

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
Conconully pluton metamorphic complex of Conconully	granite, quartz monzonite schist	Cretaceous pre-Jurassic

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au Ag Cu Pb Zn Sb	galena tetrahedrite chalcopyrite sphalerite	pyrite, pyrrhotite

DEPOSIT TYPE	MINERALIZATION AGE
vein	

PRODUCTION: Extensive exploration and development was done; however, only several small shipments made (Moen, 1973, p. 20).

TECTONIC SETTING: The Conconully pluton is a directionless, post-tectonic plutonic body that was intruded into a major structural zone (Stoffel, K. L., DGER, oral commun., 1990).

ORE CONTROLS: The vein strikes N15W, dips 60E, and is at the contact between granite and quartz monzonite and schist (Moen, 1973; Stoffel, 1990).

GEOLOGIC SETTING: The vein is near the contact of the Conconully pluton and the metamorphic complex of Conconully (Stoffel, 1990, geol. map).

COMMENTS: The Peacock mine is also considered part of the Nevada mine.

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Moen, W. S., 1973, Conconully mining district of Okanogan County, Washington: Washington Division of Mines and Geology Information Circular 49, 42 p.

Purdy, C. P., Jr., 1951, Antimony occurrences of Washington: Washington Division of Mines and Geology Bulletin 39, 186 p.

Stoffel, K. L., compiler, 1990, Geologic map of the Oroville 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-11, 58 p., 1 pl.

Pinnacle (401)

ALTERNATE NAMES		DISTRICT	COUNTY
			Okanogan
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Loomis	1:24,000	Oroville	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 51′ 30.11″ N	119° 37′ 45.14″ W	SE¼ sec. 24, 39N, 25E

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
Palmer Mountain Greenstone	gabbro	Permian - Triassic

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au	gold	pyrite, quartz, calcite
Cu	chalcopyrite	
Pb	sphalerite	
Zn		
Ag		

DEPOSIT TYPE	MINERALIZATION AGE
vein	

PRODUCTION: Produced $200,000 worth of gold ore prior to 1910 (Huntting, 1956, p. 146).

TECTONIC SETTING: The Palmer Mountain Greenstone was deposited along a convergent continental margin.

ORE CONTROLS: The deposit consists of a vertical, N60E-trending, 4-10-ft-wide quartz vein; disseminated chalcopyrite and sphalerite are also present in altered gabbro and in sheared gabbro (Huntting, 1956, p. 146).

GEOLOGIC SETTING: The Pinnacle deposit is in metagabbro of the Permian-Triassic Palmer Mountain Greenstone (Rinehart and Fox, 1972, geol. map).

COMMENTS: Development consists of 2,000 ft. of workings in three adits (Rinehart and Fox, 1972, p. 99).

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Rinehart, C. D.; Fox, K. F., Jr., 1972, Geology and mineral deposits of the Loomis quadrangle, Okanogan County, Washington: Washington Division of Mines and Geology Bulletin 64, 124 p., 3 pl.

Stebbins, R. H., 1951, Directory of Washington mining operations, 1951: Washington Division of Mines and Geology Information Circular 19, 75 p.

Umpleby, J. B., 1911, Part I. Geology and ore deposits of the Myers Creek mining district; Part II—Geology and ore deposits of the Oroville-Nighthawk mining district: Washington Geological Survey Bulletin 5, 111 p.

Pittsburg (482)

ALTERNATE NAMES		DISTRICT	COUNTY
		Nespelem	Okanogan
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Armstrong Creek	1:24,000	Omak	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48°10 6.43 N	119° 2 36.36 W	SE¼ sec. 21, 31N, 30E

LOCATION: about 0.5 mi west of the Gould and Curry property

HOST ROCK: NAME	LITHOLOGY	AGE
porphyritic granodiorite of Manila Creek	granite, granodiorite	(Paleocene?) - Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Ag Pb	galena chalcopyrite malachite	pyrite, quartz

DEPOSIT TYPE	MINERALIZATION AGE
vein	(Paleocene?) - Eocene

PRODUCTION: Produced an unknown amount of ore in 1914 (Huntting, 1956, p. 308).

TECTONIC SETTING: The porphyritic granodiorite of Manila Creek is part of the Keller Butte suite of Holder and Holder (1988).

ORE CONTROLS: Ore is in fractures in highly silicified and altered granite. A sizable silver-lead ore body was exposed (Huntting, 1956, p. 308).

GEOLOGIC SETTING: Veins and stockwork(?) in the porphyritic granodiorite of Manila Creek of (Paleocene?)-Eocene age (Gulick and Korosec, 1990, geol. map).

COMMENTS: The property is developed by open pits and a steeply inclined shaft (Huntting, 1956, p. 308).

REFERENCES

Gulick, C. W.; Korosec, M. A., compilers, 1990, Geologic map of the Omak 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-12, 52 p., 1 pl.

Holder, R. W.; Holder, G. A. M., 1988, The Colville batholith—Tertiary plutonism in northeast Washington associated with graben and core complex (gneiss dome) formation: Geological Society of America Bulletin, v. 100, no. 12, p. 1971-1980.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Pardee, J. T., 1918, Geology and mineral deposits of the Colville Indian Reservation, Washington: U.S. Geological Survey Bulletin 677, 186 p., 1 pl.

Pogue Flat (471)

ALTERNATE NAMES		DISTRICT	COUNTY
Three Buttes			Okanogan
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Omak	1:24,000	Omak	Okanogan
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
48° 26′ 21.59″ N	119° 33′ 29.45″ W	near SW corner, sec. 15, 34N, 26E	

LOCATION: elev. 1,400 ft.

HOST ROCK: NAME	LITHOLOGY	AGE
Pogue Mountain quartz monzonite	quartz monzonite, granite	Cretaceous?

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Mn	pyrolusite rhodochrosite	quartz, calcite

DEPOSIT TYPE	MINERALIZATION AGE
vein disseminated veinlets	

PRODUCTION: In 1916, the mine produced twenty-five 30-ton carloads of ore said to contain 20% Mn (Huntting, 1956, p. 261).

TECTONIC SETTING: The quartz monzonite was probably emplaced in a magmatic arc.

ORE CONTROLS: Two quartz veins are present in the decomposed granite; one is 2 ft wide and the other is 1 ft wide. Manganese minerals occur in stringers in the quartz and as disseminations in the granite (Huntting, 1956, p. 261).

GEOLOGIC SETTING: The deposit occurs in hydrothermally altered quartz monzonite of the Pogue Mountain quartz monzonite (Gulick and Korosec, 1990 p. 24).

REFERENCES

Gulick, C. W.; Korosec, M. A., compilers, 1990, Geologic map of the Omak 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-12, 52 p., 1 pl.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Pardee, J. T., 1922, Deposits of manganese ore in Montana, Utah, Oregon, and Washington: U.S. Geological Survey Bulletin 725-C, p. 141-243.

Patty, E. N.; Glover, S. L., 1921, The mineral resources of Washington, with statistics for 1919: Washington Geological Survey Bulletin 21, 155 p., 1 pl.

Shedd, Solon, 1924, The mineral resources of Washington with statistics for 1922; with an article on coal and coke, by G. W. Evans: Washington Division of Geology Bulletin 30, 224 p.

Poland China (402)

ALTERNATE NAMES	DISTRICT	COUNTY
Molson Overtop	Myers Creek	Okanogan

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Chesaw	1:24,000	Oroville	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 58′ 26.59″ N	119° 7′ 21.04″ W	SE¼SE¼ sec. 11, 40N, 29E

LOCATION: elev. 3,850 ft

HOST ROCK: NAME	LITHOLOGY	AGE
Spectacle Formation of the Anarchist Group	argillite	Permian

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au Pb	pyrite galena marcasite gold	marcasite, quartz

DEPOSIT TYPE	MINERALIZATION AGE
vein	

PRODUCTION: The Poland China was discovered in 1896. A 25-ton/day mill was erected in 1907 which produced a small shipment in 1914. Overtop Mining Co shipped 168 tons of concentrate containing 72 oz of Au and 70 oz of Ag in 1933-1934. From 1937 to 1939, 11 carloads of siliceous ore assaying 0.37 oz/ton Au were shipped to the smelter in Trail, British Columbia. Mining ceased in 1939 (Moen, 1980, p.35-37).

TECTONIC SETTING: Marine sedimentary rocks of the Spectacle Formation formed along an active continental margin.

ORE CONTROLS: The deposit contains a black to white, northwest-striking, east-dipping, 2-15-ft-wide quartz vein in graphitic argillite. The vein walls are generally well-defined, but in several places the vein gradually grades into the argillite; the vein also contains fragments of argillite. Locally, the vein is offset by north- and northeast-trending, high-angle faults. Ore minerals are sparsely disseminated in quartz (Moen, 1980, P. 37).

GEOLOGIC SETTING: The vein is in graphitic argillite of the Permian Spectacle Formation of the Anarchist Group (Moen, 1980).

COMMENTS: High-grade near-surface ore contained 0.15-30 oz/ton Au. Ore that was mined averaged only 0.24 oz/ton Au and 0.40 oz/ton Ag. Some wall rock contained from 0.018 to 0.06 oz/ton Au. Development consisted of more than 1,500 ft of adits, shafts, and crosscuts. This property is on patented mining claims (Moen, 1980, p. 38).

REFERENCES

Hodges, L. K., 1897, Mining in the Pacific Northwest: Seattle Post Intelligencer, 116 p. [Facsimile reprinted 1967 in two volumes, Mining in eastern and central Washington, and, Mining in western Washington: Shorey Book Store, Seattle, Washington.]

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Moen, W. S., 1969, Mines and mineral deposits of Whatcom County, Washington: Washington Division of Mines and Geology Bulletin 57, 134 p., 14 pl.

Umpleby, J. B., 1911, Part I. Geology and ore deposits of the Myers Creek mining district; Part II—Geology and ore deposits of the Oroville-Nighthawk mining district: Washington Geological Survey Bulletin 5, 111 p.

Poorman (485)

ALTERNATE NAMES		DISTRICT	COUNTY
		Park City	Okanogan
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Bald Knob	1:24,000	Nespelem	Okanogan
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
48° 22′ 38.14″ N	118° 52′ 2.86″ W	SE¼NE¼ sec. 11, 33N, 31E	

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
unnamed metasedimentary rocks	argillite	Late Paleozoic

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Zn	galena	pyrite, quartz, calcite
Pb	sphalerite	

DEPOSIT TYPE	MINERALIZATION AGE
vein	

PRODUCTION: Produced an unknown amount of ore in 1937 (Huntting, 1956, p. 365).

TECTONIC SETTING: Late Paleozoic sediments were deposited along an active continental margin.

ORE CONTROLS: Breccia at the Poorman mine is cemented by calcite and is sparsely mineralized with pyrite and sphalerite. A 6-18-in.-wide vein trending N15E and consisting of banded quartz and some sulfide minerals was encountered in the adit (Pardee, 1918, p. 97).

GEOLOGIC SETTING: The deposit is in unnamed Late Paleozoic argillite.

REFERENCES

Gage, H. L., compiler, 1941, Some foreign and domestic zinc-lead mines that could supply zinc concentrates to a Pacific Northwest electrolytic zinc industry; Domestic western mines IV—The zinc-lead mines of Washington: U.S. Bonneville Power Administration Market Development Section, 235 p.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Pardee, J. T., 1918, Geology and mineral deposits of the Colville Indian Reservation, Washington: U.S. Geological Survey Bulletin 677, 186 p., 1 pl.

Prize (418)

ALTERNATE NAMES		DISTRICT	COUNTY
Lakeview			Okanogan
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Nighthawk	1:24,000	Oroville	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 55′ 56.79″ N	119° 38′ 12.64″ W	SE¼ sec. 25 and NW¼ sec. 36, 40N, 25E

LOCATION: on the east side of the valley, elev. 3,200 ft

HOST ROCK: NAME	LITHOLOGY	AGE
Kobau Formation	greenstone, phyllite	Permian or Triassic (?)

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
metagabbro; metadiorite	Permian or Triassic

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Pb	galena	pyrite, limonite, quartz
Ag	chalcopyrite	
Au	malachite	
Cu	azurite	

DEPOSIT TYPE	MINERALIZATION AGE
vein	

PRODUCTION: Produced in 1906 and 1913 (Huntting, 1956, p. 222).

TECTONIC SETTING: The Kobau Formation was deposited proximal to an island arc along a convergent continental margin.

ORE CONTROLS: An east-striking vein, 15-in.-wide quartz vein in greenstone and schist; quartz is in large part intermixed with country rock, both enclosing fragments of it and extending into it as irregular stringers (Umpleby, 1911, p. 93).

GEOLOGIC SETTING: The vein is in greenstone and phyllite of the Triassic or Permian Kobau Formation, which is cut by metagabbro and metadiorite that is probably coeval with the greenstones (Rinehart and Fox, 1972).

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Rinehart, C. D.; Fox, K. F., Jr., 1972, Geology and mineral deposits of the Loomis quadrangle, Okanogan County, Washington: Washington Division of Mines and Geology Bulletin 64, 124 p., 3 pl.

Umpleby, J. B., 1911, Part I. Geology and ore deposits of the Myers Creek mining district; Part II—Geology and ore deposits of the Oroville-Nighthawk mining district: Washington Geological Survey Bulletin 5, 111 p.

Washington Bureau of Statistics, Agriculture, and Immigration, 1903, Mines and mining: Washington Bureau of Statistics, Agriculture, and Immigration Biennial Report for 1903, p. 124-138.

Rainbow (403)

ALTERNATE NAMES	DISTRICT	COUNTY
		Okanogan

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Enterprise	1:24,000	Oroville	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 52′ 6.00″ N	119° 32′ 32.30″ W	NE¼ sec. 22, 39N, 26E

LOCATION: between Palmer Mountain and Wannacut Lake, elev. 2,600 ft

HOST ROCK: NAME	LITHOLOGY	AGE
Spectacle Formation of the Anarchist Group	limestone, quartzite, schist	Permian

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
metagabbro, metadiorite	Permian - Triassic

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au	gold	limonite, quartz, pyrite
Ag	arsenopyrite	
Cu	chalcopyrite	
Pb	galena	
	malachite	

DEPOSIT TYPE	MINERALIZATION AGE
vein	

PRODUCTION: The mine is known to have produced (Huntting, 1956, p. 147).

TECTONIC SETTING: Marine sedimentary rocks of the Spectacle Formation formed along an active continental margin.

ORE CONTROLS: The vein consists of quartz lenses enclosed in limestone, quartzite, and schist. The lenses pinch and swell over short distances (Huntting, 1956, p. 147).

GEOLOGIC SETTING: The veins are in the Permian Spectacle Formation (Rinehart and Fox, 1972, geol. map).

COMMENTS: The property was developed by three adits and several crosscuts (Rinehart and Fox, 1972).

REFERENCES

Bethune, G. A., 1891, Mines and minerals of Washington—Annual report of G. A. Bethune, first state geologist: Washington State Printer, 122 p.

Bethune, G. A., 1892, Mines and minerals of Washington—Second annual report of G. A. Bethune, state geologist: Washington State Printer, 183 p.

Handy, F. M., 1916, An investigation of the mineral deposits of northern Okanogan County: State College of Washington Department of Geology Bulletin 100, 27 p.

Hodges, L. K., 1897, Mining in the Pacific Northwest: Seattle Post Intelligencer, 116 p. [Facsimile reprinted 1967 in two volumes, Mining in eastern and central Washington, and, Mining in western Washington: Shorey Book Store, Seattle, Washington.]

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Rinehart, C. D.; Fox, K. F., Jr., 1972, Geology and mineral deposits of the Loomis quadrangle, Okanogan County, Washington: Washington Division of Mines and Geology Bulletin 64, 124 p., 3 pl.

Umpleby, J. B., 1911, Part I. Geology and ore deposits of the Myers Creek mining district; Part II—Geology and ore deposits of the Oroville-Nighthawk mining district: Washington Geological Survey Bulletin 5, 111 p.

Ramore (470)

ALTERNATE NAMES		DISTRICT	COUNTY
		Park City	Okanogan
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Central Peak	1:24,000	Nespelem	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 21′ 44.90″ N	118° 52′ 28.89″ W	NE¼SW¼ sec. 14, 33N, 31E

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
unnamed metasedimentary rocks	black argillite, phyllite, limestone	Paleozoic

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
granite of Moses Mountain	Paleocene - Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Pb	sphalerite	pyrite, pyrrhotite, quartz, fluorite, calcite
Ag	galena	
Au	chalcopyrite	
Cu	tetrahedrite	
Zn		

DEPOSIT TYPE	MINERALIZATION AGE
vein massive sulfide? (in core)	

PRODUCTION: No large shipment of ore reported (Huntting, 1956, p. 222).

TECTONIC SETTING: Metamorphosed sediments that were originally deposited along a Paleozoic active continental margin are intruded by the granite of Moses Mountain. The granite of Moses Mountain is part of the Keller Butte suite of Holder and Holder (1988). Rocks of the Keller Butte suite were emplaced during regional ductile stretching associated with deformation in the metamorphic core complexes (Holder and Holder, 1988).

ORE CONTROLS: Veins are at or near the contact of the metasedimentary rocks and the granite of Moses Mountain. The main vein strikes northeast and dips 45NW to vertical (Pardee, 1918).

GEOLOGIC SETTING: Black argillite and graywacke of probable Paleozoic age is intruded by the Paleocene-Eocene granite of Moses Mountain (Joseph, 1990, geol. map).

REFERENCES

Bancroft, Howland, 1914, The ore deposits of northeastern Washington: U.S. Geological Survey Bulletin 550, 215 p.

Colville Confederated Tribes Geology Department, 1984, Revised geology and mineral potential of the Colville Indian Reservation, Washington, 1984: Colville Confederated Tribes [Nespelem, Wash.], 2 v.

Gage, H. L., compiler, 1941, Some foreign and domestic zinc-lead mines that could supply zinc concentrates to a Pacific Northwest electrolytic zinc industry; Domestic western mines IV—The zinc-lead mines of Washington: U.S. Bonneville Power Administration Market Development Section, 235 p.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Joseph, N. L., compiler, 1990, Geologic map of the Nespelem 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-16, 47 p., 1 pl.

Pardee, J. T., 1918, Geology and mineral deposits of the Colville Indian Reservation, Washington: U.S. Geological Survey Bulletin 677, 186 p., 1 pl.

Reco (404)

ALTERNATE NAMES		DISTRICT	COUNTY
		Myers Creek	Okanogan

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Chesaw	1:24,000	Oroville	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 57′ 51.96″ N	119° 2′ 35.78″ W	center, S½ sec. 16, 40N, 30E

LOCATION: 0.5 mi north of Chesaw

HOST ROCK: NAME	LITHOLOGY	AGE
Kobau Formation	greenstone, argillite, siltite	Permian or Triassic (?)

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
intermediate to acidic granitic rocks	Mesozoic

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au Ag Cu	arsenopyrite gold chalcopyrite pyrite bornite	marcasite, quartz, calcite

DEPOSIT TYPE	MINERALIZATION AGE
vein	

PRODUCTION: Most of work at mine took place between 1897 and 1900. From 1916 to 1953, the mine produced 1,015 tons of ore valued at $23,000 from gold and $365 from silver. The mine has been idle since 1953 (Moen, 1980, p. 40).

TECTONIC SETTING: Sedimentary and volcanic materials of the Kobau Formation were deposited proximal to an island arc along a convergent continental margin.

ORE CONTROLS: The 1-2-ft-wide vein strikes north and dips 50-70W. The vein consists of quartz and minor calcite and is sheared and fractured due to recurrent movement. Ore minerals are sparse and are present as disseminated grains, small blebs, and thin, dark bands in the quartz. Native gold was present in high-grade ore mined near the surface but absent in deeper parts of the vein. About 30 ft from the surface, the vein terminated at a north-dipping fault. Most of the vein is on the Gray Eagle claim. Gold content ranges from 0.04 to 16.8 oz/ton. Ore averaged 0.87 oz/ton Au, and most of it was hand sorted (Moen, 1980, p. 40).

GEOLOGIC SETTING: A north-striking vein in the Kobau Formation, which was intruded by Mesozoic intermediate and acidic composition dikes (Stoffel, 1990).

COMMENTS: Development work consists of several prospect pits, trenches, short adits, and two main adits. The longest adit (No. 2) was driven for 148 ft onto the Gray Eagle claim. The property is on patented mining claims (Moen, 1980, p. 40).

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Moen, W. S., 1980, Myers Creek and Wauconda mining districts of northeastern Okanogan County, Washington: Washington Division of Geology and Earth Resources Bulletin 73, 96 p., 6 pl.

Stoffel, K. L., compiler, 1990, Geologic map of the Oroville 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-11, 58 p., 1 pl.

Washington Division of Mines and Mining, 1941, Directory of Washington metallic mining properties: Washington Division of Mines and Mining Information Circular 7, 74 p.

Red Shirt (460)

ALTERNATE NAMES		DISTRICT	COUNTY
			Okanogan
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Thrapp Mtn	1:24,000	Omak	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 20′ 54.91″ N	119° 59′ 56.07″ W	NE¼ sec. 19, 33N, 23E

LOCATION: on the lower part of the west slope of Pole Pick Hill, elev. 3,800 ft

HOST ROCK: NAME	LITHOLOGY	AGE
Red Shirt gabbro	gabbro, diorite	Jurassic - Cretaceous

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au	pyrite	quartz
Ag	chalcopyrite	
Cu	arsenopyrite	

DEPOSIT TYPE - MINERALIZATION AGE

vein
shear zone

PRODUCTION: The mine is credited with more than $100,000 worth of production, and it produced intermittently for 50 years. The latest work was in 1936-1938 (Huntting, 1956, p. 147).

TECTONIC SETTING: The Red Shirt gabbro is part of the Frazer Creek complex. Rocks were strongly sheared along the Red Shirt thrust and have undergone retrograde metamorphism and alteration to epidote and chlorite (Gulick and Korosec, 1990).

ORE CONTROLS: The ore is in a quartz vein that is 1-5 ft wide (Huntting, 1956, p. 147).

GEOLOGIC SETTING: The vein and associated mineralization are in a shear zone in the Red Shirt gabbro of Jurassic-Cretaceous age (Gulick and Korosec, 1990).

COMMENTS: The property was developed by several drifts and crosscuts (Huntting, 1956, p. 147).

REFERENCES

Bethune, G. A., 1891, Mines and minerals of Washington—Annual report of G. A. Bethune, first state geologist: Washington State Printer, 122 p.

Bethune, G. A., 1892, Mines and minerals of Washington—Second annual report of G. A. Bethune, state geologist: Washington State Printer, 183 p.

Gulick, C. W.; Korosec, M. A., compilers, 1990, Geologic map of the Omak 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-12, 52 p., 1 pl.

Hodges, L. K., 1897, Mining in the Pacific Northwest: Seattle Post Intelligencer, 116 p. [Facsimile reprinted 1967 in two volumes, Mining in eastern and central Washington, and, Mining in western Washington: Shorey Book Store, Seattle, Washington.]

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Review (405)

ALTERNATE NAMES		DISTRICT	COUNTY
		Myers Ck	Okanogan
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Chesaw	1:24,000	Oroville	Okanogan
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
48° 57′ 58.75″ N	119° 2′ 35.99″ W	NE¼SW¼ sec. 16, 40N, 30E	

LOCATION: elev. 3,080 ft

HOST ROCK: NAME	LITHOLOGY	AGE
Kobau Formation	greenstone	Permian or Triassic (?)
ASSOCIATED IGNEOUS ROCK: DESCRIPTION		AGE
Buckhorn Mountain pluton		Jurassic - Cretaceous

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au	gold	quartz, calcite
Cu	chalcopyrite	
	pyrite	

DEPOSIT TYPE: vein

MINERALIZATION AGE:

PRODUCTION: According to Landes and others (1902, p. 27), a smelter test, consisting of 50 tons of ore, averaged 0.86 oz/ton Au.

TECTONIC SETTING: The Kobau Formation was deposited proximal to island arcs along a convergent continental margin.

ORE CONTROLS: The vein consists of quartz and calcite with minor amounts of chalcopyrite, pyrite, and gold (Moen, 1980, p. 40).

GEOLOGIC SETTING: The vein is in greenstones of the Kobau Formation of Permian or Triassic age.

COMMENTS: Two adits, 360 and 813 ft in length, respectively, were driven into the hillside to intersect the vein at depth (Moen, 1980, p. 40).

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Landes, Henry; Thyng, W. S.; Lyon, D. A.; Roberts, Milnor, 1902, Annual report for 1901, in six parts; Part II-The metalliferous resources of Washington, except iron: Washington Geological Survey, 123 p.

Moen, W. S., 1980, Myers Creek and Wauconda mining districts of northeastern Okanogan County, Washington: Washington Division of Geology and Earth Resources Bulletin 73, 96 p., 6 pl.

Roosevelt (413)

ALTERNATE NAMES	DISTRICT	COUNTY
Grant Maclean Teddy Roosevelt		Okanogan

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Buckhorn Mountain	1:24,000	Republic	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 56′ 37.54″ N	118° 58′ 28.93″ W	secs. 24 and 25, 40N, 30E

LOCATION: elev. 4,475 ft

HOST ROCK: NAME	LITHOLOGY	AGE
Spectacle Formation of the Anarchist Group	hornfels, calc-silicate	Permian

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
Buckhorn Mountain pluton	Jurassic - Cretaceous

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Cu	magnetite	epidote, garnet
Au	chalcopyrite	
Ag	pyrite	
Fe	scheelite	
W		

DEPOSIT TYPE	MINERALIZATION AGE
contact metamorphic	

PRODUCTION: Twelve carloads of hand-sorted ore were shipped to smelters in 1911; ore ran 7-9% Cu, 0.10-0.20 oz/ton Au, and 3.75-7.5 oz/ton Ag (Huntting, 1956, p. 199). In 1919-20 a total of 2,000 tons of iron ore was shipped (Moen, 1980, p. 54).

TECTONIC SETTING: The Spectacle Formation was deposited along an active continental margin.

ORE CONTROLS: Ore minerals occur at the contact between Permian metasedimentary rocks and the biotite-hornblende of the Jurassic-Cretaceous Buckhorn Mountain pluton. The contact metamorphic zone contains hornfels and calc-silicate rocks and minor quartzite, marble, and phyllite. The skarn and the ore bodies occur as irregular replacements that apparently favored beds of limestone and calcareous shale. Ore minerals are present as disseminated grains, as well as in pods and lenses. Small, sparsely disseminated grains of scheelite occur in garnet-epidote-rich areas of the contact zone.

GEOLOGIC SETTING: Contact metamorphic deposit at the contact of Permian metasedimentary rocks and the Jurassic-Cretaceous, biotite-hornblende Buckhorn Mountain pluton (Moen, 1980, p. 54; Stoffel, 1990).

COMMENTS: The main development at the Roosevelt mine consisted of an 855-ft lower adit with about 750 ft of drifts and crosscuts. About 200 ft higher in elevation are several open cuts and caved adits. The upper adits appear to be the earlier workings. The lower adit was driven in an attempt to intersect the downward extension of the ore bodies. However, these bodies apparently did not extend to the depth of the lower adit, although isolated occurrences of magnetite were found (Moen, 1980, p. 54). Broughton (1943, p. 20-21) estimated only about 2,000 tons of magnetite remains in the floor of the large stope of the lower adit. He also reported an area of moderately high dip needle readings S60E, 250 ft from the stope.

REFERENCES

Broughton, W. A., 1943, The Buckhorn iron deposits of Okanogan County, Washington—Results of a magnetic survey: Washington Division of Geology Report of Investigations 8, 21 p., 1 pl.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Moen, W. S., 1980, Myers Creek and Wauconda mining districts of northeastern Okanogan County, Washington: Washington Division of Geology and Earth Resources Bulletin 73, 96 p., 6 pl.

Stoffel, K. L., compiler, 1990, Geologic map of the Republic 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-10, 62 p., 1 pl.

Umpleby, J. B., 1911, Part I. Geology and ore deposits of the Myers Creek mining district; Part II—Geology and ore deposits of the Oroville-Nighthawk mining district: Washington Geological Survey Bulletin 5, 111 p.

Ruby (430)

ALTERNATE NAMES		DISTRICT	COUNTY
Pyrargyrite		Nighthawk	Okanogan
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Nighthawk	1:24,000	Oroville	Okanogan
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
48° 56′ 8.75″ N	119° 41′ 39.40″ W	center E½ sec. 28, 40N, 25E	

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
Anderson Creek pluton	granodiorite	Jurassic - Cretaceous (?)

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Ag	chalcopyrite	quartz, pyrite, arsenopyrite
Au	galena	
Cu	sphalerite	
Pb	proustite	
Zn	pyrargerite	
	argentite	
	gold	
	malachite	
	azurite	

DEPOSIT TYPE	MINERALIZATION AGE
vein	

PRODUCTION: The mine produced approximately 100,000 oz Ag from 1915 to 1922. High-grade ore contained as much as several hundred oz/ton Ag, but mill-run ore averaged only 10 oz/ton Ag. A mill (capacity 75-ton/day) was built in 1920. Prior to 1920, crude ore was shipped to smelters.

TECTONIC SETTING: The quartz monzonite was probably emplaced in a magmatic arc.

ORE CONTROLS: The quartz fissure vein is in a shear zone in granodiorite; the zone strikes N45W and dips 42SW. Ore minerals occur as sparsely scattered grains in the vein (Moen, 1976, p. 121).

GEOLOGIC SETTING: The vein is in a shear zone in granodiorite of Jurassic-Cretaceous (?) age (Rinehart and Fox, 1972).

COMMENTS: The mine was developed by at least 5,000 ft of underground workings and several stopes. The main adit intersects the vein at 950 ft from the portal and 550 ft beneath the outcrop. A 75-ton/day mill was built at the site in 1920 (Moen, 1976, p. 121).

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Moen, W. S., 1976, Silver occurrences of Washington: Washington Division of Geology and Earth Resources Bulletin 69, 188 p.

Purdy, C. P., Jr., 1951, Antimony occurrences of Washington: Washington Division of Mines and Geology Bulletin 39, 186 p.

Rinehart, C. D.; Fox, K. F., Jr., 1972, Geology and mineral deposits of the Loomis quadrangle, Okanogan County, Washington: Washington Division of Mines and Geology Bulletin 64, 124 p., 3 pl.

Security (372)

ALTERNATE NAMES		DISTRICT	COUNTY
		Palmer Mountain	Okanogan
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Loomis	1:24,000	Oroville	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 50′ 27.63″ N	119° 38′ 9.34″ W	½ N sec. 36, 39N, 25E

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
Palmer Mountain Greenstone	greenstone	Permian - Triassic

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
granitic rocks, felsic to intermediate	Jurassic - Cretaceous

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Cu	chalcopyrite	pyrite, quartz
Pb	galena	
Zn	sphalerite	
Au	gold	

DEPOSIT TYPE	MINERALIZATION AGE
vein	

PRODUCTION: Has produced (Huntting, 1956, p. 70).

TECTONIC SETTING: The Palmer Mountain Greenstone was deposited at a convergent continental margin.

ORE CONTROLS: The shear zone in argillite carries a vein 70 ft long and as much as 3 ft wide; it is sparsely mineralized. A similar vein occurs in the upper adit (Huntting, 1956, p. 70).

GEOLOGIC SETTING: The vein is in banded and schistose greenstone of the Permian-Triassic Palmer Mountain Greenstone that was intruded to the west by felsic to intermediate rocks of probable Jurassic-Cretaceous age (Rinehart and Fox, 1972, geol. map).

COMMENTS: Two adits were developed on the property (Rinehart and Fox, 1972).

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Rinehart, C. D.; Fox, K. E., Jr., 1972, Geology and mineral deposits of the Loomis quadrangle, Okanogan County, Washington: Washington Division of Mines and Geology Bulletin 64, 124 p., 3 pl.

Sheridan (431)

ALTERNATE NAMES		DISTRICT	COUNTY
Phil Sheridan		Sheridan	Okanogan
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Bodie Mountain	1:24,000	Republic	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 46′ 42.73″ N	118° 51′ 17.17″ W	SW¼NW¼ sec. 24, 38N, 31E

LOCATION: in a small gulch 1 mi north of the East Fork Toroda Creek

HOST ROCK: NAME	LITHOLOGY	AGE
Klondike Mountain Formation	andesite, dacite	Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Ag Au	silver mineral	quartz, calcite, pyrite

DEPOSIT TYPE	MINERALIZATION AGE
vein, epithermal breccia	Eocene

PRODUCTION: Between 1906 and 1919, shipments of high-grade gold-silver ore were made to smelters. In 1918 a 50-ton/day flotation mill was built at the mine, and concentrates averaging as much as 300 oz/ton Ag were shipped until 1920. For this period, the mine production was estimated at $60,000 to $100,000 (Moen, 1980, p. 72).

TECTONIC SETTING: The Toroda Creek graben is a volcano-tectonic depression, which resulted from east-west extension during the Eocene (Holder and others, 1989).

ORE CONTROLS: Silver minerals occur in a series of closely spaced, silicified and pyritized shear zones in altered and silicified andesites and dacites. Brecciation of the rocks accompanied the shearing, and clasts of the breccia have been considerably altered and silicified by hydrothermal solutions. The main vein is 1-7 ft wide, strikes N20E, and dips 50NW. During mining operations it was necessary to closely assay the vein material in order to establish borders of the ore shoots (Moen, 1980, p. 72).

GEOLOGIC SETTING: The ore is in altered and silicified volcanic rocks of the Eocene Klondike Mountain Formation. The geology here is similar to that described for the American Flag mine).

COMMENTS: A 50-ton/day flotation mill was built in 1918. Most adits have heading of N35E. The vein was mined from several levels over a vertical distance of about 500 ft and along strike for about 400 ft. Several raises connect the different levels of the mine (Moen, 1980, p. 72).

REFERENCES

Holder, R. W.; Gaylord, D. R.; Holder, G. A. M., 1989, Plutonism, volcanism, and sedimentation associated with core complex and graben development in the central Okanogan Highlands, Washington. *In* Joseph, N. L.; and others, editors, 1989, Geologic guidebook for Washington and adjacent areas: Washington Division of Geology and Earth Resources Information Circular 86, p. 187-200.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Moen, W. S., 1980, Myers Creek and Wauconda mining districts of northeastern Okanogan County, Washington: Washington Division of Geology and Earth Resources Bulletin 73, 96 p., 6 pl.

Patty, E. N., 1921, The metal mines of Washington: Washington Geological Survey Bulletin 23, 366 p.

Shotwell placer (491)

ALTERNATE NAMES		DISTRICT	COUNTY
			Okanogan
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Bridgeport	1:24,000	Omak	Okanogan
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
48° 2′ 3.42″ N	119° 40′ 58.45″ W	NW¼ sec. 10, 29N, 25E	

LOCATION: on a terrace about 100 ft above the Columbia River

HOST ROCK: NAME	LITHOLOGY	AGE
Quaternary alluvium	sand and gravel	Quaternary

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au	gold	stream gravels

DEPOSIT TYPE	MINERALIZATION AGE
placer	Quaternary

PRODUCTION: Produced an unknown of gold in 1954. A small amount of gold was produced as byproduct of aggregate production for the Chief Joseph Dam (Huntting, 1956, p. 188).

TECTONIC SETTING: Heavy minerals were deposited in river gravels.

ORE CONTROLS: Heavy-mineral concentration by stream action.

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Silver Bell (406)

ALTERNATE NAMES		DISTRICT	COUNTY
			Okanogan
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Bodie Mountain	1:24,000	Republic	Okanogan
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
48° 45′ 34.50″ N	118° 50′ 17.97″ W	sec. 25, 38N, 31E	

LOCATION: 12 mi northwest of Republic

HOST ROCK: NAME	LITHOLOGY	AGE
Klondike Mountain Formation	trachyte	Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au Ag	chalcopyrite galena tetrahedrite pyrite	purple fluorite, sanidine, quartz

DEPOSIT TYPE	MINERALIZATION AGE
vein, epithermal	Eocene

PRODUCTION: High-grade gold ore was reported shipped from a surface pit prior to 1907. In 1940 a 29-ton shipment gave net smelter returns of $244.03 (Huntting, 1956, p. 148). There was a small amount of production in the 1980s.

TECTONIC SETTING: East-west extension during the Eocene resulted in formation of the Toroda Creek graben and other structures in which a thick section of volcanic and sedimentary materials was deposited and preserved (Holder and others, 1989).

ORE CONTROLS: The deposit is contained in brecciated and silicified trachyte. The breccia has a general northeast strike and dips about 45W. The breccia is about 50-75 ft wide and is cemented with quartz, sanidine, and as much as 4% fluorite. The deposit is near the center of the Zalla M-American Flag mineralized belt, which is almost a mile long and several hundred feet wide (Moen, 1980, p. 69).

GEOLOGIC SETTING: Geologic setting is similar to that at the American Flag mine where volcanic rocks in this part of the Toroda Creek graben plot as rhyolite on a TAS diagram, but contain sparse plagioclase and mafic phenocrysts in an aphanitic groundmass that contains abundant plagioclase microlites. Plagioclase phenocrysts are commonly strongly sericitized, and mafic minerals are generally replaced by some combination of chlorite, calcite, epidote, and sphene; shapes of altered mafic minerals suggest that they were originally pyroxene. The presence of silica stringers and veinlets in some of these rocks suggests that silica was introduced during alteration (Stoffel, 1990, p. 11).

COMMENTS: Underground workings consist of two adits, a 50-ft shaft, and several shallow shafts. Moen (1980, p. 70) reported that drilling done by the owner of the property in 1978 delineated 124,000 tons of rock having an average value of 5.46 oz/ton Ag and 0.014 oz/ton Au. Moen (1980, p. 69) also reported assays on the siliceous breccia that range from 0-30 oz/ton Ag; as much as 120 ft of breccia assayed 3.0 oz/ton Ag and, a 13-ft section assayed as much as 26.55 oz/ton Ag.

REFERENCES

Holder, R. W.; Gaylord, D. R.; Holder, G. A. M., 1989, Plutonism, volcanism, and sedimentation associated with core complex and graben development in the central Okanogan Highlands, Washington. *In* Joseph, N. L.; and others, editors, 1989, Geologic guidebook for Washington and adjacent areas: Washington Division of Geology and Earth Resources Information Circular 86, p. 187-200.

Huntting, M. T., 1949, Directory of Washington mining operations, 1949: Washington Division of Mines and Geology Information Circular 17, 62 p.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Moen, W. S., 1980, Myers Creek and Wauconda mining districts of northeastern Okanogan County, Washington: Washington Division of Geology and Earth Resources Bulletin 73, 96 p., 6 pl.

Stoffel, K. L., compiler, 1990, Geologic map of the Republic 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-10, 62 p., 1 pl.

Washington Division of Mines and Mining, 1941, Directory of Washington metallic mining properties: Washington Division of Mines and Mining Information Circular 7, 74 p.

Silver Bluff (432)

ALTERNATE NAMES		DISTRICT	COUNTY
		Galena	Okanogan

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Riverside	1:24,000	Oroville	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 34′ 48.71″ N	119° 36′ 30.09″ W	NE¼ sec. 31, 36N, 26E

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
Cave Mountain Formation	limestone, quartzite	Triassic

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Ag	argentite	quartz
Cu	chalcocite	
Au	stromeyerite	
	azurite	
	malachite	

DEPOSIT TYPE	MINERALIZATION AGE
vein	

PRODUCTION: Credited with $80,000 worth of production by the end of 1923 (Huntting, 1956, p. 310).

TECTONIC SETTING: The Cave Mountain Formation was deposited along an active continental margin proximal to an island arc.

ORE CONTROLS: A 2-ft-wide vein was exposed at the surface (Huntting, 1956, p. 310).

GEOLOGIC SETTING: The vein cuts limestone and quartzite of the Triassic Cave Mountain Formation (Rinehart and Fox, 1976, geol. map).

COMMENTS: An inclined shaft was driven 65 ft at the property (Bethune, 1892).

REFERENCES

Bethune, G. A., 1892, Mines and minerals of Washington—Second annual report of G. A. Bethune, state geologist: Washington State Printer, 183 p.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Rinehart, C. D.; Fox, K. F., Jr., 1976, Bedrock geology of the Conconully Quadrangle, Okanogan County, Washington: U.S. Geological Survey Bulletin 1402, 58 p., 1 pl.

Silver Cliff (483)

ALTERNATE NAMES		DISTRICT	COUNTY
			Okanogan
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Belvedere	1:24,000	Nespelem	Okanogan
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
48° 6′ 13.90″ N	118° 57′ .55″ W	sec. 17, 30N, 31E	

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
porphyritic granodiorite of Manila Creek	granite, granodiorite	Eocene - (Paleocene?)
unnamed metasedimentary rocks	argillite, quartzite, marble	Paleozoic

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Ag Pb	galena chalcopyrite	pyrite, quartz, sericite, rhodochrosite

DEPOSIT TYPE	MINERALIZATION AGE
vein disseminated	(Paleocene ?) - Eocene

PRODUCTION: One carload of ore was said to have been shipped (Huntting, 1956, p. 310).

TECTONIC SETTING: The porphyritic granodiorite of Manila Creek is part of the Keller Butte suite of Holder and Holder (1988). The Keller Butte suite is contemporaneous with the formation of the metamorphic core complexes (Holder and Holder, 1988).

ORE CONTROLS: Mineralization is present as disseminated grains of chalcopyrite, pyrite, and galena in metasedimentary rocks and in veins that cut the metasedimentary rocks and granodiorite. Several veins at the property range in thickness from several inches to 3 ft, strike N70W to N70E, and dip to the south (Pardee, 1918, p. 75-76). Hydrothermal alteration extends for several feet on either side of the veins (Colville Confederated Tribes, 1984, p. 53). Altered granodiorite near one open cut contains as much as 30 ft of rock that is sericitized and partially replaced by quartz and contains disseminated grains of pyrite, galena, and chalcopyrite (Pardee, 1918, p. 76).

GEOLOGIC SETTING: Roof pendants consisting of Paleozoic argillite, quartzite, and marble overlie the (Paleocene?) - Eocene porphyritic granodiorite of Manila Creek (Joseph, 1990).

REFERENCES

Colville Confederated Tribes Geology Department, 1984, Revised geology and mineral potential of the Colville Indian Reservation, Washington, 1984: Colville Confederated Tribes [Nespelem, Wash.], 2 v.

Holder, R. W.; Holder, G. A. M., 1988, The Colville batholith—Tertiary plutonism in northeast Washington associated with graben and core complex (gneiss dome) formation: Geological Society of America Bulletin, v. 100, no. 12, p. 1971-1980.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Joseph, N. L., compiler, 1990, Geologic map of the Nespelem 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-16, 47 p., 1 pl.

Pardee, J. T., 1918, Geology and mineral deposits of the Colville Indian Reservation, Washington: U.S. Geological Survey Bulletin 677, 186 p., 1 pl.

Washington Division of Mines and Mining, 1941, Directory of Washington metallic mining properties: Washington Division of Mines and Mining Information Circular 7, 74 p.

Silver Ledge (462)

ALTERNATE NAMES		DISTRICT	COUNTY
			Okanogan
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Hungry Mtn	1:24,000	Twisp	Concrete

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 12′ 15.88″ N	120° 10′ 11.53″ W	near center sec. 11, 31N, 21E

LOCATION: 0.25 mi downstream from the Antimony Queen mine, elev. 300 ft. above Gold Creek

HOST ROCK: NAME	LITHOLOGY	AGE
Newby Group	graywacke	Jurassic - Cretaceous

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au	silver sulfide	quartz
Ag	cerargyrite	
	bromyrite	
	pyrite	
	arsenopyrite	

DEPOSIT TYPE	MINERALIZATION AGE
vein	

PRODUCTION: Produced 2 tons of unsorted ore prior to 1921 (Huntting, 1956, p. 149).

TECTONIC SETTING: The Newby Group was deposited along an active continental margin in or near an island arc.

ORE CONTROLS: The deposit consists of quartz veins in graywacke and shale. The vein at the collar of the shaft is in a 5-ft-wide shear zone and consists of two parts: one is 1.5 ft wide and is at the footwall, and the other is 4 in. wide and is on the hanging wall (Huntting, 1956, p. 148).

GEOLOGIC SETTING: The vein is in metasedimentary rocks of the Jurassic-Cretaceous Newby Group (Bunning, 1990, geol. map).

COMMENTS: The property is developed by a 150-ft inclined shaft and a 1,500-ft crosscut (Huntting, 1956).

REFERENCES

Bunning, B. B., compiler, 1990, Geologic map of the east half of the Twisp 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-9, 51 p, 1 pl.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Patty, E. N., 1921, The metal mines of Washington: Washington Geological Survey Bulletin 23, 366 p.

Silver Mountain (433)

ALTERNATE NAMES		DISTRICT	COUNTY
Silver Star			Okanogan
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Aeneas Lake	1:24,000	Oroville	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 44′ 46.12″ N	119° 33′ 28.98″ W	W½ sec. 34, 38N, 26E, and NW¼ sec. 3, 37N, 26E

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
Anarchist Group	metasedimentary rocks	Permian

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Ag Pb Zn Au	galena sphalerite	pyrite, quartz

DEPOSIT TYPE	MINERALIZATION AGE
veins stockwork	

PRODUCTION: Produced in 1943 (Huntting, 1956, p. 310).

TECTONIC SETTING: Marine sediments of the Anarchist Group were deposited along an active continental margin.

ORE CONTROLS: Quartz veins and silicified zones 1-20 ft wide are present in metasedimentary rocks; the veins are sparsely mineralized (Huntting, 1956, 310).

GEOLOGIC SETTING: Mineralized veins are in the clastic metasedimentary rocks of the Permian Anarchist Group (Rinehart and Fox, 1976, geol. map).

COMMENTS: A 400-ton/day mill was under construction in 1952. A sample for a mill test showed 28.79 oz/ton Ag, O.351 oz/ton Au, 1.11% Pb, and 0.59% Zn (Huntting, 1956, p. 310).

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Purdy, C. P., Jr., 1952, Directory of Washington mining operations, 1952: Washington Division of Mines and Geology Information Circular 20, 75 p.

Rinehart, C. D.; Fox, K. F., Jr., 1976, Bedrock geology of the Conconully Quadrangle, Okanogan County, Washington: U.S. Geological Survey Bulletin 1402, 58 p., 1 pl.

Similkameen placers (437)

ALTERNATE NAMES		DISTRICT	COUNTY
			Okanogan
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Oroville	1:24,000	Oroville	Okanogan
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
48° 56′ 7.95″ N	119° 26′ 27.50″ W		

LOCATION: along the Similkameen River between Oroville and Nighthawk

HOST ROCK: NAME	LITHOLOGY	AGE
Quaternary alluvium	sand and gravel	Quaternary

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au	gold	sand and gravel

DEPOSIT TYPE	MINERALIZATION AGE
placer	Quaternary

PRODUCTION: Reportedly $500,000 in the few years following 1859. Intermittent to 1955 (Huntting, 1956, p. 188).

TECTONIC SETTING: Deposition of heavy minerals in river gravels.

ORE CONTROLS: Heavy mineral concentration by stream action.

GEOLOGIC SETTING: Deposits are in river bars and lower terraces of the Similkameen River (Huntting, 1956, p. 188).

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Bethune, G. A., 1891, Mines and minerals of Washington—Annual report of G. A. Bethune, first state geologist: Washington State Printer, 122 p.

Bethune, G. A., 1892, Mines and minerals of Washington—Second annual report of G. A. Bethune, state geologist: Washington State Printer, 183 p.

Handy, F. M., 1916, An investigation of the mineral deposits of northern Okanogan County: State College of Washington Department of Geology Bulletin 100, 27 p.

Umpleby, J. B., 1911, Part I. Geology and ore deposits of the Myers Creek mining district; Part II—Geology and ore deposits of the Oroville-Nighthawk mining district: Washington Geological Survey Bulletin 5, 111 p.

Spokane (463)

ALTERNATE NAMES		DISTRICT	COUNTY
Gold Crown			Okanogan
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Twisp West	1:24,000	Twisp	Concrete
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
48° 22′ 25.96″ N	120° 9′ 16.26″ W	sec. 12, 33N, 21E	

LOCATION: on Twisp River road, 2 mi west of Twisp

HOST ROCK: NAME	LITHOLOGY	AGE
Newby Group	dacite, andesite	Jurassic - Cretaceous
ASSOCIATED IGNEOUS ROCK: DESCRIPTION		AGE
Alder stock		Cretaceous

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au	sphalerite	quartz, calcite
Ag	arsenopyrite	
Pb	chalcopyrite	
Zn	pyrite	
Cu	galena	

DEPOSIT TYPE

vein
massive sulfide?

MINERALIZATION AGE

PRODUCTION: Small amounts of ore were shipped in 1939 and 1954. Six tons shipped in 1941 contained 0.40 oz/ton Au, 20.25 oz/ton Ag, 4.5% Zn, and 3.8% Pb (Huntting, 1956, p. 149; Burnet, 1976, table 2).

TECTONIC SETTING: The Newby Group was deposited at or near volcanic island arcs.

ORE CONTROLS: An irregular quartz-calcite vein in dacite ranges from a few inches to 3 ft thick. Ore minerals are in bunches in the vein (Huntting, 1956, p. 149). The host rock is silicified dacite breccia. Some mineralization is also in a fault zone at the contact with the Alder stock and in quartz-sericite phyllite that is on strike with the Alder mine (Burnet, 1976).

GEOLOGIC SETTING: Mineralization is in silicified dacite breccia of the Jurassic-Cretaceous Newby Group; in places the Newby Group is contact metamorphosed by the Alder Creek stock, which was dated at 137 ± 4 m.y. (Burnet, 1976; Bunning, 1990).

REFERENCES

Banta, H. E., 1956, Directory of Washington mining operations, 1956: Washington Division of Mines and Geology Information Circular 25, 87 p.

Bunning, B. B., compiler, 1990, Geologic map of the east half of the Twisp 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-9, 51 p, 1 pl.

Burnet, F. W., 1976, Felsic volcanic rocks and mineral deposits in the Buck Mountain Formation andesites, Okanogan County, Washington: University of Washington Master of Science thesis, 26 p., 1 pl.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Landes, Henry; Thyng, W. S.; Lyon, D. A.; Roberts, Milnor, 1902, Annual report for 1901, in six parts; Part II-The metalliferous resources of Washington, except iron: Washington Geological Survey, 123 p.

Washington Division of Mines and Mining, 1941, Directory of Washington metallic mining properties: Washington Division of Mines and Mining Information Circular 7, 74 p.

St. Anthony (461)

ALTERNATE NAMES		DISTRICT	COUNTY
		Squaw Creek	Okanogan
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Cooper Mtn	1:24,000	Twisp	Concrete

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 7′ 23.99″ N	120° 7′ 13.19″ W	SW¼SW¼ sec. 5, 30N, 22E

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
Methow Gneiss	tonalitic gneiss	Cretaceous

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au	gold	quartz
Ag		
Cu		

DEPOSIT TYPE	MINERALIZATION AGE
vein	

PRODUCTION: The mine produced an unknown amount of ore in 1934 (Huntting, 1956, p. 148).

TECTONIC SETTING: The Methow Gneiss protolith was intruded at moderate crustal levels, then metamorphosed along with other rocks in the area to amphibolite grade (Bunning, 1990).

ORE CONTROLS: The vein is in gneiss and is 5 ft wide (Huntting, 1956, p. 148).

GEOLOGIC SETTING: The St. Anthony mine is in the Methow Gneiss of probable Cretaceous age (Bunning, 1990).

COMMENTS: Ore from the surface to a depth of 35-ft is said to run $50/ton in Au (Huntting, 1956, p. 148).

REFERENCES

Bunning, B. B., compiler, 1990, Geologic map of the east half of the Twisp 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-9, 51 p, 1 pl.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Washington Division of Mines and Mining, 1941, Directory of Washington metallic mining properties: Washington Division of Mines and Mining Information Circular 7, 74 p.

Starr (440)

ALTERNATE NAMES	DISTRICT	COUNTY
Silver Tip Andy Starr	Conconully Galena	Okanogan

PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Aeneas Lake	1:24,000	Oroville	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 42′ 59.34″ N	119° 35′ 25.13″ W	SE¼ sec. 8, 37N, 26E

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
Aeneas Creek pluton, central phase	quartz monzonite and granodiorite	Cretaceous
Aeneas Creek pluton, border phase	quartz diorite, diorite, gabbro	Cretaceous

ASSOCIATED IGNEOUS ROCK: DESCRIPTION	AGE
pegmatite and aplite dikes and sills	

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Mo W	molybdenite molybdite scheelite chalcopyrite	quartz, limonite, hematite, sericite; kaolinization, silicification

DEPOSIT TYPE	MINERALIZATION AGE
disseminated veins fractures breccia porphyry system	

PRODUCTION: Three thousand tons of hand-sorted ore, which averaged 1.0% MoS_2, was shipped in 1939 (Huntting, 1956, p. 271). Material from dumps of the No. 1 and No. 2 adits was shipped after 1944.

TECTONIC SETTING: In British Columbia to the north, the Quesnel trough partly controls the distribution of major porphyry copper-molybdenum deposits. The Starr molybdenum property lies on the projection of this structural trough.

ORE CONTROLS: The deposit is an elliptical body striking northwest and is as much as 130 ft wide and 300-440 ft long. Mineralization is disseminated in silicified granodiorite, in fractures, associated with breccia, and in quartz veins. The deposit is oxidized to a depth of 30 ft with half of the molybdenum values molybdenite. Sampling in the No. 1 adit, which is entirely within the mineralized zone, gave a weighted average of 0.51% MoS_2. Samples from a winze from the No. 2 adit returned assays of 0.81-1.91% MoS_2. Arsenic assays by the USGS for ten samples ranged from 0.01 to 0.04%. On the basis of trench and underground sampling, indicated and inferred reserves to a depth of 300 ft total 800,000 tons averaging 0.30% MoS_2. The deposit is open at depth. There is a potential for 2 million tons averaging 0.26% MoS_2 (Wilbur Hallauer, personal commun., Aug. 15, 1967).

GEOLOGIC SETTING: The northwest-trending Aeneas Creek pluton is 1 mi wide and 3 mi long. It consists of a central phase and a border phase that is in contact with Permian Anarchist Group metasedimentary rocks. The deposit is in the central phase of the pluton. The pluton consists of medium crystalline biotite-hornblende quartz monzonite and granodiorite. The pluton has yielded K-Ar biotite ages of 92.7 ± 6.6 m.y. and 98.3 ± 3.6 m.y. A concordant K-Ar hornblende age was 92.3 ± 4.3 m.y.

COMMENTS: The property consists of unpatented mining claims and is owned (1990) by Wilbur G. Hallauer of Oroville. In 1928 the property was explored by Molybdenum Corporation of America and in 1935 and 1936 by Titanium Alloy Manufacturing Co. Carl Lundstrom mined the property in 1939. In total there are 2,700 feet of underground workings. In 1959 six short diamond drill holes were completed. From 1966 to 1967 Cambri Mining and Development Co. Ltd. leased the property and drilled six 200-ft holes.

UNPUBLISHED INFORMATION: Fawley, A.P., 1966, The Starr molybdenum mine, Washington. This report is in DGER files.

REFERENCES

Creasey, S. C., 1945, Geology of the Starr molybdenum mine, Okanogan County, Washington: U.S. Geological Survey Open-File Report, 11 p., 5 pl.

Culver, H. E.; Broughton, W. A., 1945, Tungsten resources of Washington: Washington Division of Geology Bulletin 34, 89 p., 23 pl.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Moen, W. S., 1973, Conconully mining district of Okanogan County, Washington: Washington Division of Mines and Geology Information Circular 49, 42 p.

Purdy, C. P., Jr., 1954, Molybdenum occurrences of Washington: Washington Division of Mines and Geology Report of Investigations 18, 118 p., 6 pl.

Rinehart, C. D.; Fox, K. F., Jr., 1976, Bedrock geology of the Conconully Quadrangle, Okanogan County, Washington: U.S. Geological Survey Bulletin 1402, 58 p., 1 pl.

Stoffel, K. L., compiler, 1990, Geologic map of the Oroville 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-11, 58 p., 1 pl.

Sullivan (464)

ALTERNATE NAMES		DISTRICT	COUNTY
Pateros			Okanogan
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Pateros	1:24,000	Oroville	Okanogan
LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE	
48° 4′ 50.48″N	119° 59′ 15.05″ W	SW½ sec. 20, 30N, 23E	

LOCATION: 5 mi northwest of Pateros, on the east side of the Methow River

HOST ROCK: NAME	LITHOLOGY	AGE
Methow gneiss	tonalitic gneiss	Cretaceous
ASSOCIATED IGNEOUS ROCK: DESCRIPTION		AGE
dacite dikes		Eocene

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au Ag Cu	pyrite chalcopyrite	quartz, carbonate minerals

DEPOSIT TYPE: shear zone

MINERALIZATION AGE:

PRODUCTION: Reportedly, 60 carloads of ore were produced prior to 1897; the total was valued at $72,000. Seven tons of ore that were shipped in 1940 assayed 0.63 oz/ton Au, 0.80 oz/ton Ag, and 0.17% Cu. Ore was also shipped in 1941 (Huntting, 1956, p. 149).

TECTONIC SETTING: The Methow Gneiss is a post-tectonic body that was originally intruded at moderate to deep levels and then metamorphosed to amphibolite-facies grade rock (Gulick and Korosec, 1990, p, 38).

ORE CONTROLS: The deposit consists of shear zones as much as 6 ft wide but averaging less than 3 ft. The shear zones are in granite along the margins of "andesite" dikes. The shear zones also contain small, scattered pods of shipping-grade ore (Huntting, 1956, p. 149). The andesite dikes noted in Huntting (1956) are probably dacite dikes (Gulick and Korosec, 1990, geol. map).

GEOLOGIC SETTING: The Methow Gneiss of Cretaceous age is sheared and intruded by hypabyssal dikes of probable Eocene age near the deposit (Gulick and Korosec, 1990, geol. map).

COMMENTS: The deposit may also be part of the Friday mine. The Sullivan mine was developed by 1,200 ft of workings on three levels (Huntting, 1956).

REFERENCES

Gulick, C. W.; Korosec, M. A., compilers, 1990, Geologic map of the Omak 1:100,000 quadrangle, Washington: Washington Division of Geology and Earth Resources Open File Report 90-12, 52 p., 1 pl.

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Summit (419)

ALTERNATE NAMES		DISTRICT	COUNTY
Alice		Palmer Mtn.	Okanogan
PRIMARY QUADRANGLE	SCALE	½° x 1° QUAD	1° x 2° QUAD
Enterprise	1:24,000	Oroville	Okanogan

LATITUDE	LONGITUDE	SECTION, TOWNSHIP, AND RANGE
48° 50′ 48.73″ N	119° 36′ 27.75″ W	SE¼ sec. 30, 39N, 26E

LOCATION:

HOST ROCK: NAME	LITHOLOGY	AGE
Palmer Mountain Greenstone	greenstone metagabbro	Permian - Triassic

COMMODITIES	ORE MINERALS	NON-ORE MINERALS
Au	gold	quartz
Ag	galena	
Pb	chalcopyrite	
Cu	tetrahedrite	
	malachite	
	azurite	

DEPOSIT TYPE — MINERALIZATION AGE

vein

PRODUCTION: Concentrates recovered from 85 tons of ore in 1937 were worth $1,538; total production in 1937 was about $1,900 (Huntting, 1956, p. 149).

TECTONIC SETTING:The Palmer Mountain Greenstone was deposited along a convergent continental margin proximal to an island arc.

ORE CONTROLS: The deposit consists of a 1.5-6-ft-wide, nearly vertical vein trending N55W in aphanitic greenstone and medium-grained metagabbro. Chlorite alteration is present near the vein (Rinehart and Fox, 1972, p. 78).

GEOLOGIC SETTING: The vein is in greenstone and metagabbro of the Permian-Triassic Palmer Mountain Greenstone (Rinehart and Fox, 1972).

COMMENTS: The deposit was developed by three shafts totaling 420 ft and five adits totaling 1,200 ft (Huntting, 1956, p. 149).

REFERENCES

Huntting, M. T., 1956, Inventory of Washington minerals—Part II, Metallic minerals: Washington Division of Mines and Geology Bulletin 37, v. 1, 428 p.; v. 2, 67 p.

Rinehart, C. D.; Fox, K. F., Jr., 1972, Geology and mineral deposits of the Loomis quadrangle, Okanogan County, Washington: Washington Division of Mines and Geology Bulletin 64, 124 p., 3 pl.