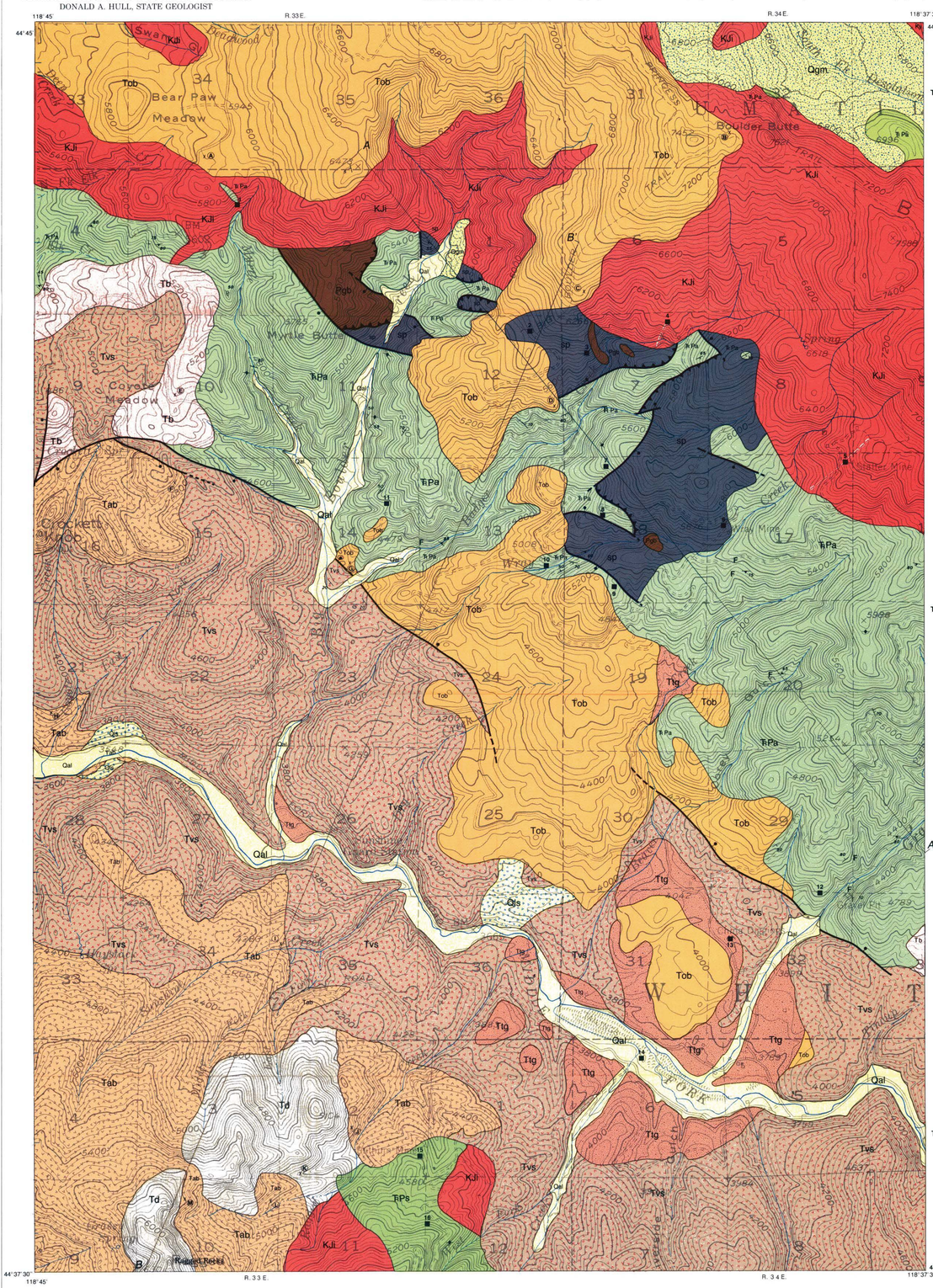
STATE OF OREGON
DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES
DONALD A. HULL, STATE GEOLOGIST

GEOLOGY AND GOLD DEPOSITS MAP OF THE NORTHWEST QUARTER OF THE BATES QUADRANGLE, GRANT COUNTY, OREGON

1984



Base map from U.S.G.S. 15' series (topographic)
enlarged to 7½' scale 1:24 000

Control by USGS and USC&GS

Topography from aerial photographs by multiplex methods
Aerial photographs taken 1946 Field check 1951

Polyconic projection. 1927 North American datum
10,000-foot grid based on Oregon coordinate system, north zone

Dashed land lines indicate approximate locations

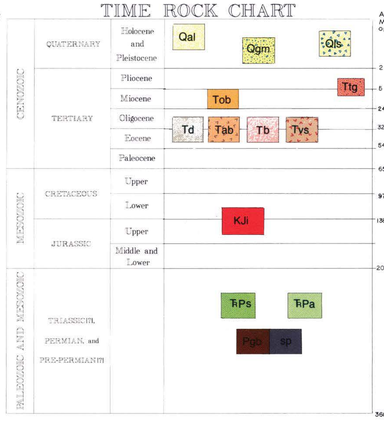
SCALE 1:24 000
1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0 1 KILOMETER
CONTOUR INTERVAL 40 FEET

UTM GRID AND 1951 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

OREGON
QUADRANGLE LOCATION

Geology by M.L. Ferns, H.C. Brooks, and G.R. Wheeler
Field work completed in 1983
Map reviewed by J.G. Evans, U.S. Geological Survey, and D.G. Avery, U.S. Forest Service

TIME ROCK CHART



EXPLANATION

Qal **Alluvium (Holocene and Pleistocene)** — *Unconsolidated, poorly sorted fluviatile deposits consisting of gravel, sand, and silt in channels and flood plains of the present drainage systems*

Qls **Landslide debris (Holocene and Pleistocene)** — *Unstratified, heterogeneous mixtures of soil and angular rock fragments resulting from bedrock failure on oversteepened slopes; typified by hummocky topography*

Qgm **Glacial deposits (Holocene and Pleistocene)** — *Unconsolidated, unsorted accumulations of boulders, cobbles, sand, and silt deposited by glaciers*

Tlg **Terrace gravels (Pliocene and Miocene?)** — *Unconsolidated to poorly consolidated deposits of gravel, sand, and silt which underlie, interfinger with, and overlie the lava flows of unit* **Tob**. *The gravels consist mainly of well-rounded pebbles, cobbles, and boulders of basalt, andesite, dacite, granodiorite, argillite, chert, and ultramafic rocks. Tertiary volcanic rock fragments predominate. Locally, as at China Diggings (13) in sec. 32, T. 10 S., R. 34 E., the deposits have been mined for placer gold along the present stream channels*

Tob **Olivine basalt (Miocene?)** — *Predominantly dark-gray to black, aphyric to slightly porphyritic holocrystalline olivine basalt flows which commonly weather to a reddish-brown color. Porphyritic rocks contain about 2 percent phenocrysts including olivine up to 3 mm in diameter, labradorite, and rare clinopyroxene. Groundmass minerals include plagioclase and clinopyroxene. Aphyric basalts are pilotaxitic and are composed of plagioclase, olivine, and clinopyroxene. Gray to dark-gray, hackly jointed, augite-bearing andesite is exposed at the base of the section in secs. 1 and 12, T. 10 S., R. 33 E., and is included as part of unit* **Tob**. *The augite occurs as phenocrysts in a pilotaxitic groundmass of stubby plagioclase, granular clinopyroxene, and interstitial glass. Unit* **Tob** *unconformably overlies rocks of units* **Tvs**, **TrPa**, and **KJi** *and was mapped by Brown and Thayer (1966) as part of their Columbia River Group. The basalts of this unit have relatively high MgO and low P_2O_5 and TiO, contents for basalts of the Columbia River Basalt Group. Flows in and south of sec. 12, T. 10 S., R. 33 E., have been mapped as part of the older Oligocene-Eocene volcanic rocks (Brown and Thayer, 1966; Wheeler, 1976) but are considered by Ferns and Brooks to be stratigraphically equivalent to the flows at Bear Paw Meadow and Boulder Butte*

Td **Dacite and silicic andesite (Oligocene-Eocene)** — *Coarse to medium-grained, light- to medium-gray porphyritic hornblende dacite and silicic andesite flows, domes, and small intrusives. Mineralogically, most rocks are dacites with hornblende, oligoclase, biotite, enstatite, and quartz phenocrysts in a cryptocrystalline to felsic matrix. Phenocrysts up to 8 mm in size compose up to 20 percent of the rock. The hornblende phenocrysts are commonly replaced by calcite and granular opaque minerals. The cliff-forming columnar-jointed dacite of Ragged Rocks (sec. 10, T. 11 S., R. 33 E.) is interpreted as part of a volcanic plug or dome intruded into rocks of unit* **Tab**

Tab **Andesite and basalt (Oligocene-Eocene)** — *Predominantly gray to black and reddish-brown porphyritic andesite with some interlayered basalt and basaltic andesite. Exposures in secs. 1 and 2, T. 11 S., R. 33 E., are mostly basalt and basaltic andesite. Basalt and andesite are interlayered in secs. 9 and 4, T. 11 S., R. 33 E. Dacite and silicic andesite are interlayered with andesite flows near Ragged Rocks in the north half of sec. 10, T. 11 S., R. 33 E. Porphyritic andesites interfinger with and overlie mudflow deposits of unit* **Tvs** *in sec. 28, T. 10 S., R. 33 E., and clasts of similar andesites are major components of unit* **Tvs**. *Porphyritic andesites contain up to 20 percent phenocrysts, including plagioclase crystals up to 5 mm in diameter, hornblende, and augite in a fine-grained to pilotaxitic groundmass. Glassy varieties contain plagioclase phenocrysts in a hyalopilitic groundmass. The basalts contain up to 20 percent phenocrysts including corroded olivine crystals up to 5 mm in diameter, labradorite, and augite in a hyalopilitic groundmass of plagioclase laths, clinopyroxene, iron oxides, and glass. Exposures at Crockett Knob in sec. 16, T. 10 S., R. 33 E., include reddish-weathering vesicular basaltic andesite containing iron-oxide-coated olivine phenocrysts up to 1 mm across in a trachytic groundmass*

Tvs **Volcaniclastic rocks (Oligocene-Eocene)** — *Predominantly volcanic mudflow breccia deposits with irregularly intercalated tuffaceous conglomerates, bedded tuffs, and tuffaceous sandstones and siltstones. Porphyritic andesite flows are intercalated with the mudflow deposits in several places, e.g., adjacent to the Riverside Gulch road in the N½ sec. 7, T. 11 S., R. 34 E. The volcaniclastic deposits are typically poorly consolidated and consist of poorly sorted, subrounded to subangular volcanic rock fragments up to 3 ft in diameter in a matrix of felsic volcanic ash, sand, and silt. Rock fragments are predominantly plagioclase, hornblende, and pyroxene phyric andesites with smaller amounts of dacite, rhyodacite, and basalt. Fossil-wood fragments occur in the mudflow breccias on both sides of the Middle Fork near the western edge of the quadrangle in secs. 21 and 28, T. 10 S., R. 33 E. Fossil leaves of Eocene age have been reported from roadcuts in sec. 22, T. 10 S., R. 33 E. (Mobley, 1956)*

Tb **Basalt (Oligocene-Eocene)** — *Reddish-brown weathering, dark-gray to black porphyritic olivine basalt flows composed of up to 5 percent olivine phenocrysts as large as 5 mm in diameter in a hyalopilitic groundmass of plagioclase, clinopyroxene, iron oxides, and glass. These flows underlie mudflows of unit* **Tvs** *and overlie pre-Tertiary rocks in the quadrangle. East of the quadrangle boundary, similar basalt flows underlie and interfinger with mudflow deposits of unit* **Tvs** *(Brooks and others, 1983)*

KJi **Intrusive rocks (Cretaceous-Jurassic)** — *Coarse- to medium-grained equigranular hornblende-biotite tonalite and granodiorite similar in composition to the Bald Mountain batholith and assumed to be of similar age. Porphyritic and aplitic tonalite and granodiorite dikes up to 40 ft wide are included within unit* **TrPa** *between Granite Boulder Creek and Corey Gulch in secs. 20, 21, 29, and 30, T. 10 S., R. 34 E.*

TrPs **Argillite and chert (Triassic? and Permian?)** — *Predominantly black to bluish-gray siliceous argillite, banded chert, and carbonaceous argillite. Rocks of this unit have been converted to a granular quartz-biotite hornfels along the margins of the intrusive rock near the Stillhum Mine (15) in secs. 1, 2, 11, and, 12, T. 11 S., R. 33 E. Similar argillites and cherts are tectonically intercalated with serpentinite and are included in serpentine-matrix melange 3 mi south of the quadrangle boundary*

TrPa **Clastic sedimentary rocks (Triassic? and Permian)** — *Predominantly argillite and sandstone with smaller amounts of conglomerate, chert, and limestone. Coarse-grained rocks include chert-pebble conglomerates, calcareous wackes, and poorly sorted lithic wackes composed of chert, argillite, and sandstone fragments in an argillaceous matrix. Finer grained wackes commonly display graded bedding. Interbedded conglomerate lenses and crinoidal limestone pods are found in several places. Known fossil localities are indicated on the map. Mullen (1979) reported conodonts of Early Permian (Leonardian) age and fusulinids of Early Permian (Wolfcampian) age from the limestone locality in the SE¼ sec. 29, T. 10 S., R. 34 E. C.D. Blume of the U.S. Geological Survey (verbal communication, 1983) has identified radiolaria of Late Permian (Guadalupian) age from interbedded cherts which he collected in the north end of the rock quarry in the NE¼ sec. 32, T. 10 S., R. 34 E., and poorly preserved radiolaria of probable Mesozoic age from rocks mapped as unit* **TrPa** *in the Greenhorn quadrangle (SE¼ sec. 16, T. 10 S., R. 35 E.) to the east. The fossil data indicate that unit* **TrPa**, *although deposited under somewhat different sedimentary conditions, is age-correlative with rocks mapped as Elkhorn Ridge Argillite to the north and east*

Pgb **Metamorphosed intrusive rocks (Triassic?-Permian)** — *Chiefly gabbro with some pyroxenite and diorite which have been metamorphosed to greenschist-, locally amphibolite-, facies rocks. Predominantly black to greenish-black coarse-grained pyroxene gabbros*

sp **Serpentinized ultramafic rocks (Triassic?-Permian)** — *Massive green to black serpentinite cut locally by narrow stringers of light-green to pale-yellow serpentine and talc. Weathers to reddish- to yellowish-brown color. Metamorphosed to olivine-talc-antihophyllite and olivine-enstatite hornfels along the southern margins of the large tonalite (unit* **KJi**) *intrusion in secs. 1 and 12, T. 10 S., R. 33 E., and secs. 7 and 8, T. 10 S., R. 34 E. The unit includes scattered small blocks and pods of amphibolite, metagabbro, and pyroxenite, e.g., near the head of Wray Creek in secs. 7 and 18, T. 10 S., R. 34 E. As the cross sections indicate, we believe that most exposures of unit* **sp** *in the quadrangle represent ultramafic rocks which were thrust over and later folded with rocks of unit* **TrPa**

REFERENCES

Brooks, H.C., Ferns, M.L., Wheeler, G.R., and Avery, D.G., 1983, Geology and gold deposits map of the northeast quarter of the Bates quadrangle, Baker and Grant Counties, Oregon: Oregon Department of Geology and Mineral Industries Geological Map Series GMS-29.

Brown, C.E., and Thayer, T.P., 1966, Geological map of the Canyon City quadrangle, northeastern Oregon: U.S. Geological Survey Miscellaneous Geologic Investigations Map I-447.

Mobley, S.J., 1956, Geology of the southwest quarter of the Bates quadrangle, Oregon: Eugene, Oreg., University of Oregon master's thesis, 66 p.

Mullen, L.D., 1979, Geology of the Greenhorn Mountains, northeastern Oregon: Corvallis, Oreg., Oregon State University master's thesis, 372 p.

Parks, H.M., and Swartley, A.M., 1916, Handbook of the mining industry of Oregon: Oregon Bureau of Mines and Geology, Mineral Resources of Oregon, v. 2, no. 4, 306 p.

Swartley, A.M., 1914, Ore deposits of northeastern Oregon: Oregon Bureau of Mines and Geology, Mineral Resources of Oregon, v. 1, no. 8, 229 p.

Wheeler, G.R., 1976, Geology of the Vinegar Hill area, Grant County, Oregon: Seattle, Wash., University of Washington doctoral dissertation, 94 p.

MAP SYMBOLS

- **Contact** — Approximately located. Queried where location is questionable
- **Thrust fault** — Teeth on upper plate
- **Fault** — Bar and ball on downthrown side
- **Quartz veins and shear zones**
- 53 **Strike and dip of beds or lava flows**
- **Strike of vertical bed**
- 59 **Strike and dip of foliation**
- **Strike of vertical foliation**
- 17 **Mine and prospect location** — Numbers correspond to numbers in Table 1
- **Rock sample site** — Chemical data are given in Table 2
- F **Fossil localities**

GMS-31

Geology and Gold Deposits Map of the Northwest Quarter of the Bates Quadrangle, Grant County, Oregon

1984

M.L. Ferns and others

Funded in part by United States Department of Agriculture — U.S. Forest Service

MINERAL DEPOSITS

A small amount of gold and silver has been produced from mines within the quadrangle, which encloses the former New Eldorado mining district. The recorded value of gold and silver produced from placer mines is about $292,000. The amount of lode gold and silver production is unknown but probably small. Dollar values of production presented here are based on metal prices at the time of mining.

Known mines and prospects are located on the map by numbers that correspond to those in Table 1. Because of time constraints, mapping traverses were as much as half a mile apart, and it is likely that some small veins and prospect excavations were not observed. The historical information and data on individual mines in the following paragraphs are largely from Swartley (1914) and Parks and Swartley (1916).

Lode deposits

The bulk of the lode deposits are fissure veins and mineralized shear zones which occur in all of the pre-Tertiary rock types and which are concentrated along the margins of the larger intrusives. The principal lode gold and silver deposits are at the Reed (4) and Stalter (5) Mines. These deposits are associated with zones of fracturing and hydrothermal alteration as much as 200 ft wide and 1,000 ft long in tonalite and granodiorite. Precious metal mineralization consists of streaks and disseminations of sulfides in discontinuous narrow veins and veinlets of quartz and gouge which locally contain pyrite, sphalerite, stibnite, pyrrhotite, scheelite, and gold. Silver sulfides have been reported (Swartley, 1914).

A second type of precious metal deposit occurs at the Myrtle Mine (1), where tactite is developed in a roof pendant of altered limestone. Mineralization consists of small amounts of massive pyrite and pyrrhotite and traces of gold in a coarse crystalline mass of garnet-epidote rock.

Placer deposits

The bulk of recorded gold production in the quadrangle came from the Timms gold dredge (14), a bucket-line dredge which operated on the Middle Fork of the John Day River below the mouth of Granite Boulder Creek from 1939 through 1942. Smaller placers have also been exploited at China Diggings (13) and on Beaver Creek (secs. 30 and 31, T. 10 S., R. 34 E.) and Ruby Creek (secs. 1 and 12, T. 11 S., R. 33 E.).

Table 1. MINES AND PROSPECTS IN THE NORTHWEST QUARTER OF THE BATES QUADRANGLE

Map no.	Mine or prospect name	Quarter section	Section	Township (south)	Range (east)	Elevation (ft)	Geologic formation	Geologic description	Surface and or underground workings	Past production	References
1.	Myrtle	NE	3	10	33	5,600	TrPa, KJi	Pyrite and pyrrhotite in massive garnet and epidote tactite. Along contact between limestone and quartz diorite	Several hundred feet of workings in three adits	None	5
2.	Golden West	NE	12	10	33	5,920	sp, TrPa	Iron and copper oxides with quartz veinlets in silicified gabbro and ultramafic rock. Some argillite on adit dump. Shear zone at shaft strikes N. 70° W., dips 70° N.	About 300 ft of workings in adit and caved shaft	Unknown	6 (12-3-04)
3.	Name unknown	NW	7	10	34	5,800	Pgb, sp	Pyrite and minor copper oxides in silicified gabbro and ultramafic rocks	Shallow cuts	None	—
4.	Reed, Pioneer	NE	7	10	34	6,040	KJi	Quartz veins and stringers and layers of gouge in N. 35° E.-striking zone of altered quartz diorite about 200 ft thick. Ore minerals include stibnite, pyrite, sphalerite, and silver sulfides	About 300 ft of workings in three adits	Unknown	1,2,3
5.	Stalter, Mayflower	NE	17	10	34	6,320	KJi	N. 40°-50° E.-striking zone of discontinuous quartz veins and gouge zones in altered quartz diorite and aplite dikes. Ore minerals include pyrite, manganese oxides, chalcopyrite, tetrahedrite, and scheelite	About 1,200 ft of workings in six adits and numerous surface pits and trenches	Small	1,2,3,4,5, 6 (10-1-04)
6.	Wray, Mammoth	NW	17	10	34	5,600	sp	10-ft-wide limonitic fracture zone striking N. 80° E. in ultramafic rocks. Opaline quartz stringers in strongly silicified gabbro	Shallow shaft	None	1,2,3, 6 (11-12-04)
7.	Name unknown	NW	18	10	34	5,560	TrPa, sp	Discontinuous quartz stringers in argillite	Shallow trenches and pits	None	—
8.	Wisconsin	NW	18	10	34	5,360	TrPa, sp	12-ft-wide zone of silicified argillite breccia strikes N. 80° E., dips 80° S.	Shallow prospect pits	None	6 (11-12-04)
9.	Name unknown	SW	18	10	34	5,160	TrPa	15-ft-wide zone of iron-stained silicified chert pebble conglomerate strikes N. 45° W.	Shallow prospect pits	None	—
10.	Name unknown	SE	13	10	33	4,880	TrPa	Quartz stringers with iron and manganese oxides in silicified aplite dikes which strike N. 20°-45° W.	Prospect pits	None	—
11.	Longwalk	NE	14	10	33	4,560	TrPa	Shear zone in calcareous graywacke. Strikes N. 40° W. Contains widely spaced stringers of calcite and traces of cinnabar	Bulldozer cuts	None	5
12.	Dixie Group, Three Hills	NE	32	10	34	4,240	TrPa	Northeast-striking, limonitic zones in silicified porphyritic quartz diorite dikes in argillite	About 400 ft of workings in two adits with trenches and prospect pits	Unknown	6 (7-18-03, 3-11-04)
13.	China Diggings	NW	32	10	34	4,000	Tlg	Tertiary gravel deposits	About 2 acres worked	Small	—
14.	Middle Fork placers, Timms gold dredge	SW NE	31 6	10 11	34 34	3,720	Qal	Channel gravels in Middle Fork of the John Day River	About 200 acres of channel dredged 1939-1942	8,312 oz gold; 1,529 oz silver	3,5
15.	Three Corners, Stillhum	SE	2	11	33	4,600	TrPa	1-ft wide quartz vein and gouge zone with pyrite and arsenopyrite. Strikes N.	200-ft adit and caved shaft	Small?	—
16.	Golden Icetope	NW	12	11	33	4,920	TrPa, KJi	Gouge and quartz veinlets in strongly hornfelsed argillite	About 500 ft of workings in three adits	Small?	—

REFERENCES

1. Swartley, A.M., 1914, Ore deposits of northeastern Oregon: Oregon Bureau of Mines and Geology, Mineral Resources of Oregon, v. 1, no. 8, 229 p.
2. Parks, H.M., and Swartley, A.M., 1916, Handbook of the mining industry of Oregon: Oregon Bureau of Mines and Geology, Mineral Resources of Oregon, v. 2, no. 4, 306 p.
3. Oregon Department of Geology and Mineral Industries, 1941, Oregon metal mines handbook (northeastern Oregon, west half): Oregon Department of Geology and Mineral Industries Bulletin 14-B, 157 p.
4. Brooks, H.C., and Ramp, L., 1968, Gold and silver in Oregon: Oregon Department of Geology and Mineral Industries Bulletin 61, p. 119-120.
5. Oregon Department of Geology and Mineral Industries, Mine file reports. Unpublished reports and maps held at the Baker field office of the Oregon Department of Geology and Mineral Industries.
6. Blue Mountain American, 1901-1909: Sumpter, Oregon, weekly newspaper.

Table 2. CHEMICAL ANALYSES OF ROCK SAMPLES*

Sample	SiO_2	Al_2O_3	TiO_2	Fe_2O_3	FeO	MnO	CaO	MgO	K_2O	Na_2O	P_2O_5	Quarter section	Sec	T (S.)	R (E.)	Rock type	Map unit
A.	49.71	16.64	1.35	4.83	5.54	0.16	10.48	7.90	0.44	2.77	0.19	SE	34	9	33	Olivine basalt	Tob
B	49.49	16.67	1.32	4.91	5.62	0.16	10.51	8.10	0.39	2.64	0.18	SW	32	9	34	Olivine basalt	Tob
C.	58.16	15.43	1.01	3.61	4.13	0.13	7.40	5.07	0.89	2.98	0.20	SW	6	10	34	Augite andesite	Tob
D	60.02	14.99	0.82	3.31	3.79	0.12	7.22	5.60	1.22	2.72	0.17	SE	12	10	33	Augite andesite	Tob
E.	50.69	15.04	0.98	3.89	4.46	0.14	10.79	10.55	0.72	2.46	0.27	SW	10	10	33	Olivine basalt	Tb
F	52.59	15.88	1.28	4.54	5.20	0.15	8.79	6.82	0.96	3.39	0.40	NW	15	10	33	Olivine basalt	Tab
G.	49.06	16.19	1.23	4.64	5.32	0.16	11.30	9.30	0.41	2.19	0.22	SE	14	10	33	Olivine basalt	Tob
H.	57.83	16.35	1.27	3.82	4.37	0.16	7.13	4.22	1.49	3.07	0.29	SW	21	10	33	Andesite	Tab
I.	55.40	17.99	1.37	3.79	4.34	0.13	8.20	3.61	1.25	3.39	0.55	NW	35	10	33	Andesite	Tab
J.	52.29	17.73	1.35	4.68	5.36	0.16	8.85	5.16	1.02	3.12	0.29	SW	2	11	33	Basalt	Tab
K.	69.63	17.07	0.51	1.71	1.95	0.09	4.03	0.26	1.45	3.07	0.23	SW	2	11	33	Dacite	Td
L.	66.20	17.31	0.51	1.78	2.04	0.05	5.01	2.00	1.17	3.77	0.16	NE	10	11	33	Andesite	Tab
M.	61.42	17.78	0.84	2.50	2.87	0.09	6.17	2.93	1.74	3.40	0.26	NW	10	11	33	Andesite	Tab

All analyses by X-ray fluorescence performed at Washington State University, Pullman, Washington, under the direction of Dr. Peter Hooper. Analyses are normalized on a volatile-free basis, and total Fe is expressed as Fe_2O_3. FeO at an arbitrarily fixed ratio. All analyses are in weight percent

Geologic Cross Sections