

Volume 39, No. 6
June 1977

THE ORE BIN



STATE OF OREGON

DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES

The Ore Bin

Published Monthly By

STATE OF OREGON
DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES
Head Office: 1069 State Office Bldg., Portland, Oregon 97201
Telephone: [503] 229-5580

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Available back issues, \$.25 at counter, \$.35 mailed

Second class postage paid at Portland, Oregon

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A GEOLOGICAL FIELD TRIP GUIDE FROM SWEET HOME, OREGON, TO THE QUARTZVILLE MINING DISTRICT

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Introduction

This article is designed to be a self-explanatory field trip guide to the geology and mining history of the Quartzville mining district and the area between Quartzville and Sweet Home. Much of the information is taken from unpublished works by Steven R. Munts, consulting geologist, Sweet Home, Oregon, and the unpublished "Linn County Water Resources Study - Mining Subcommittee Report," by A.J. Kauffman, Jr. (1961). More detailed information on individual mines and the geology of Linn County can be found in the sources listed at the end of the article.

All persons taking this field trip are warned of the dangers of entering abandoned mines, caves, and open pits. Remember, you enter any mine at your own risk; and the greatest dangers are those that you cannot see until it is too late.

Location and Geography

The Quartzville mining district is in eastern Linn County, 40 miles east of Albany, on the headwaters of Quartzville Creek, a tributary of the Middle Santiam River. The Quartzville 15-minute topographic map covers the mining district; the entire field trip is covered by the Quartzville, Cascadia, and Sweet Home 15-minute topographic maps. The district is reached by a major access road which leaves U.S. Highway 20 six miles east of Sweet Home. The field trip begins at Sweet Home, which is 27 miles southeast of Albany on U.S. Highway 20.

Most of the actively prospected part of the district lies in the southeastern part of T. 11 S., R. 4 E., but the district extends into the northeast corner of T. 12 S., R. 4 E. Almost all production has come from the ridge south of Dry Gulch in sec. 22 and 23 (Callaghan and Buddington, 1938).

The Quartzville district, which lies in the central part of the Western Cascades, is steep and heavily timbered, with elevations ranging from 1,500 feet on Quartzville Creek to about 3,500 feet on the ridges. The entire district is drained by Quartzville Creek and its tributaries, most of which are characterized by

steep gradients. A series of terraces and alluvial fills extend from the mouth of Canal Creek to Dry Gulch, and bed rock is not exposed in the lower 2 miles of Dry Gulch. As the stream in Dry Gulch flows on the surface only during periods of excessive runoff, mining and prospecting operations have been generally curtailed throughout the summer months.

Geology

The bed rock of the Quartzville mining district is composed primarily of basalt, andesite, and rhyolite flow rock with interbedded tuffs, volcanic breccias, and scattered dacite, diorite, and basaltic intrusives. Peck and others (1964) mapped most of the rocks in the area as Oligocene to early Miocene Little Butte Volcanic Series, middle Miocene Columbia River Basalt, and middle to late Miocene Sardine Formation. Many of the rocks mapped by Peck as Sardine Formation and Columbia River Basalt are classified by Beaulieu (1974) as part of the Little Butte Formation, which he considers the most extensive bedrock unit in the area. The youngest rocks are Recent volcanic flow rock and pyroclastic debris which are found at the confluence of Quartzville and Canal Creeks.

No formal names have been given to individual rock units exposed in the Quartzville area; therefore, modifiers of "lower," "middle," and "upper" are used in describing distinguishable units in the district. The lowest unit exposed in and near the abandoned Quartzville town site consists of several pyroclastic flows, tuffs, lapilli tuffs, andesite flows, and flow-banded tuffs. Resting conformably above the lowest unit is the middle unit, a 200-foot-thick rhyolite flow which thins to the west. The rhyolite is generally gray but in places has been altered to various shades of red, yellow, and orange. Above the rhyolite is the upper unit, which consists of interbedded flows of tuff, lapilli tuff, and volcanic breccia, with a few intercanyon flows of dark-green porphyritic andesite. The Recent volcanic rocks (see Checkpoint 28) lie unconformably above the older units and are basaltic in composition.

Within this district are areas of propylitic alteration surrounding small stocks, dikes, and plugs (Peck and others, 1964). Many veins follow faults and shear zones that are also present, and all of the ore mineral deposits that have been worked to date have occurred along these fissures and faults (Munts, 1976).

Mining History

The Quartzville mining district has been the site of both hard-rock and placer mining for gold. Dr. E.O. Smith is credited with the original discovery of lode gold in the district. Jeremiah Driggs located the first claims, the White Bull and Red Bull claims, on September 5, 1863; and a mining district was organized in 1864. Several large stopes in the Lawler mine and a small stope in the Albany mine were worked, and mills were installed in the early 1890's.

Although most mining operations ceased by 1900, hard-rock prospectors have been in the district almost every year since; and some of them have recovered small quantities of gold from pockets, as Table 1 shows.

Table 1. *Known hard-rock mine development in the Quartzville district*
[in feet.]

Mine	Drifts	Open cuts	Shafts	Cross cuts	Raises	Total
A - Albany group	1,500	-	-	-	60	1,560
B - Bob & Betty	700	-	100	550	300	1,650
D - Lawler	1,050	-	-	250	700	2,000
I - Riverside	303	700	-	-	-	1,003
J - Savage (Vandalia)	600	-	80	-	300	980
E - Snowstorm (Edson)	570	-	-	80	-	650
F - Munro	217	-	-	263	-	480
G - Paymaster	150	-	-	-	-	150
C - Galena	-	-	-	725	-	725
H - Red Heifer	-	-	-	60	30	90
K - Tillicum & Cumtillie	300	-	-	-	-	300
Others	690	40	-	370	-	1,100
Total	6,080	740	180	2,298	1,390	10,688

Gold has also been recovered from placer deposits. Gravel bars along the Quartzville Creek drainage and parts of the Middle Fork of Santiam River were placered in the middle 1800's, and small-scale placer mining has continued to the present.

During the depression of the early 1930's, miners using hand-placer mining equipment were able to recover enough gold to survive. Merrill and others (1937) reported that during 1935 eleven mines were being worked on three creeks in Linn County. Small gold miners in Oregon in 1935 sold bullion buyers 8,032 parcels of gold with total weight of 4,021 ounces and value of \$140,730. Average daily gross income for all miners was \$1.19 per day, and their average annual income from mining was \$44, since miners worked an average of 37 days per year.

Table 2 summarizes small-scale gold placer operations in 13 of Oregon's 36 counties and in 358 creeks and dry placers in the State during 1935. The two principal placer mining counties were Jackson and Josephine. The only other counties with more than 100 miners were Baker, Grant, and Douglas.

Table 2. *Small-scale gold placer operations in Oregon in 1935*
[Production and income of all placer miners, by counties]

County	No. miners working	No. creeks worked	Gold produced		Ave. gross ann. income per miner
			Fine ounces	Value	
Baker.....	490	61	339.23	\$11,873	\$27
Coos.....	17	9	10.65	373	25
Curry.....	75	15	110.28	3,860	57
Douglas....	145	26	169.06	5,917	46
Grant.....	313	37	235.99	8,260	29
Jackson....	1,454	84	1,563.53	54,724	43
Josephine..	1,039	110	1,496.56	52,380	56
Lane.....	1	1	.84	29	33
Linn.....	11	3	12.96	454	46
Malheur....	28	6	27.05	947	38
Marion.....	2	1	8.73	305	172
Umatilla...	10	2	14.16	495	56
Union.....	21	3	10.96	383	20
Unallocated	25	-	20.86	730	33
Total	3,631	358	4,020.86	140,730	44

Present Status of Exploration Activity

Prospecting and hard-rock and placer mining in the Quartzville district are now undertaken only as hobbies. The prospecting, claim work, and portable dredge operations take place during weekends and vacation time.

Production

According to U.S. Mint reports for the years 1884 through 1886, the Quartzville district has been credited with production of 8,359.33 ounces of gold valued at \$172,786.35 based on gold value of \$20.67 per ounce. Silver produced during this period was valued at \$2,869.00. No production was recorded from 1897 through 1924.

U.S. Bureau of Mines data show that from 1925 through 1940 seven operations produced 281 tons of crude ore which yielded 112.53 ounces of gold and 56 ounces of silver. No production has been recorded for the Quartzville district since 1940. Unofficial estimates put the production of the Lawler mine alone at \$1 million.

R o a d L o g

(Refer to map, p. 100-101.)

(1) (2) (3)*

[1] 0.0 0.0

West city limits of Sweet Home, on Highway 20, 0.6 miles east of milepost 26. (At the time of publication, the city limits sign had been taken down because of road construction.) Dense, dark rocks with columnar jointing that are found on the south or right-hand side of the road are basalts that have been classified by various authors as Columbia River Basalt, Stayton Lava, or Little Butte Volcanics.

Drive east through town on Highway 20.

[2] 4.6 4.6

On the left side is the Foster Reservoir viewpoint.

[3] 1.3 5.9

In the roadcut on the right-hand side of the road at the traffic separator sign, just before the road curves to the right, note the irregular contact between underlying sedimentary beds of siltstone and shale and an overlying basalt flow (see Figure 1). Note also the baked zone along the edges of the sedimentary rocks, caused by the heat of the basalt. Slickensides (scratches or grooves) occur in this zone, indicating movement of the sediments, probably from the weight and flowing motion of the lava.

[4] 0.5 6.4

You are now at the junction of Highway 20 and the Green Peter Dam-Quartzville townsite road. Note the columnar jointed basalt to the right of the junction.

Turn left here and drive toward Quartzville. After you have crossed the bridge, you again see basalt overlying sediments, as at Checkpoint 3.

[5] 0.8 7.2

Before you cross the north arm of Foster Reservoir, note the paleoriver terraces in the roadcut to the left, indicating that the Santiam River was once at this level. Some of the old river terrace gravels contain gold and have been mined in the past.

[6] 0.5 7.7

In the roadcut on your left, below the schoolhouse, you can see graded stream gravels and alluvial fan deposits. This material was probably deposited by a fast-moving stream which flowed into a slower-moving body of water and

*(1) Checkpoints; (2) Mileage intervals; (3) Cumulative mileage.

dropped its load of sand and gravel. Imbrication (shingling or overlapping) of the rocks can be used to determine stream-flow direction. Note also that some of the bedding is abruptly terminated or truncated.

7 0.2 7.9

The Sunnyside Park entrance is to the right. The park is located on an old river terrace known as the Green Horn Bar, which was placer mined for gold in the late 1850's and 1860's. The men working the bar were called "greenhorns" because of their lack of mining experience. In their hydraulic mining, they used California-type riffles in the sluice boxes, resulting in the loss of most of the gold.

8 0.6 8.5

Across the river to your right are a series of cliff-forming basalt flows, locally named the Green Peter Basalts by the U.S. Army Corps of Engineers. These basalts are faulted and cut in some places by dikes.

9 1.0 9.5

Note the zone of alteration in the roadcut to the left. Stop at the small turnout on the right, just before the road curves to the left. In this outcrop you are looking at the mineralization of the Quartzville mining district in miniature (see Figure 2). Notice the three types of alteration that occur here, ranging from propylitic (hydrothermal alteration that has produced epidote, chlorite, and pyrite) at the edges through argillic (alteration producing clay minerals) to phyllic (alteration to quartz and sericite) at the center of the zone. The phyllic alteration occurs along a very narrow fracture which acted as a channel for ascending hydrothermal fluids through otherwise impermeable basalt. Dioritic and granodioritic intrusive rocks are exposed to the west (left) of this fracture. This intrusion and associated alteration are indicative of the type of hydrothermal fluid at depth that was the carrier for the mineralization in the Quartzville mining district. The zonation of alteration that you see here is present in most large mining districts, but it usually covers hundreds of feet, rather than inches, as here.

10 2.0 11.5

Green Peter Dam. To your right is a parking area and viewpoint. Work on the dam and its reservoir lasted from 1961 to 1967. The dam, which used 1,142,000 cubic yards of concrete, is 320 feet high, with deck elevation of 1,020 feet.

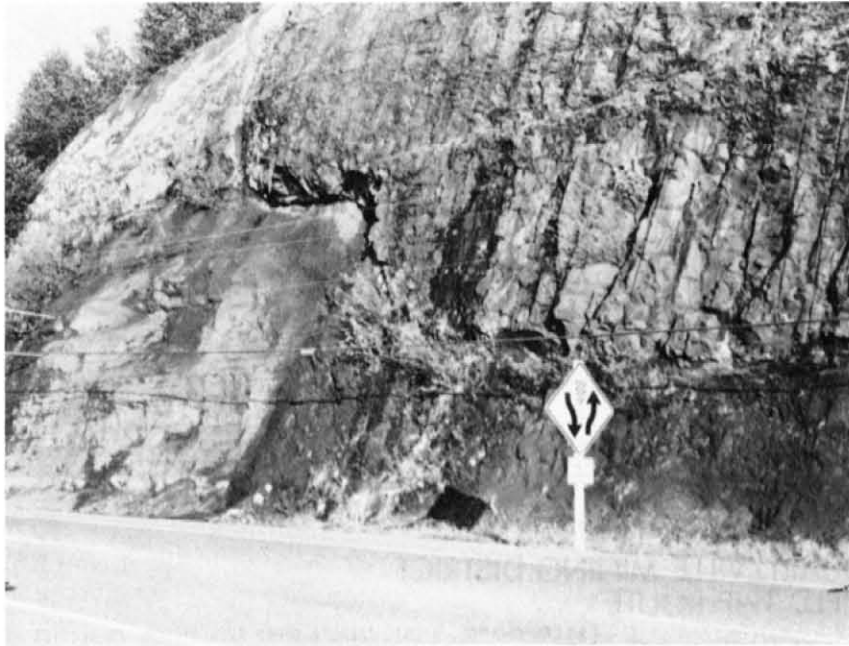
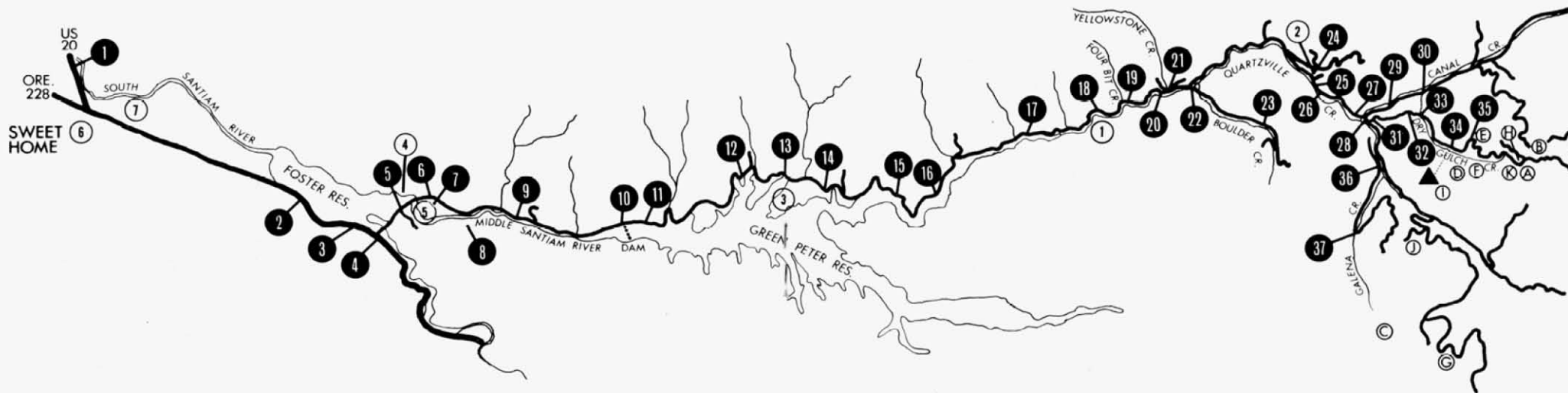


Figure 1. Checkpoint 3. Irregular contact between basalt and sedimentary rocks.



Figure 2. Checkpoint 9. Alteration zone.



QUARTZVILLE MINING DISTRICT FIELD TRIP ROUTE



- ③ CAMPGROUNDS, PICNIC AREAS & OTHER RECREATIONAL FACILITIES
1. Dogwood (B.L.M.), 14 sites, picnic
 2. Yellow Bottom (B.L.M.), 12 sites, picnic
22 sites, camp
 3. Whitcomb Creek (Linn County), 60 sites, picnic
34 sites, camp
 4. Lewis Creek (Linn County), picnic
 5. Sunnyside (Linn County), 65 sites, camp
 6. Sankey Park (City), picnicking, ballfield, playground equip.
 7. Northside Park (City), tennis court, handball court, basketball court, softball field, swimming, picnicking, 18 sites

LEGEND

- ⑭ CHECKPOINT

⑧ MINES & PROSPECTS

- | | |
|------------------------|---|
| A. Albany | G. Paymaster |
| B. Bob and Betty | H. Red Heifer (Silver Signal) |
| C. Galena | I. Riverside |
| D. Lawler | J. Savage (Vandalia) |
| E. Lucille (Snowstorm) | K. Tillicum & Cumtillie (Golden Fleece) |
| F. Munro (Mayflower) | |

Do not enter any mines except E

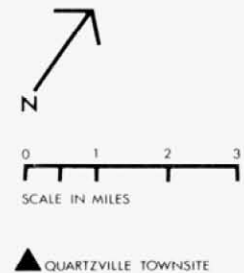


Figure 3. Checkpoint 12.



Figure 4. Checkpoint 15.
Slickensides on fault plane.



Figure 5. Checkpoint 18.
(Photo courtesy Albany Democrat-Herald.)



Figure 6. Checkpoint 23.

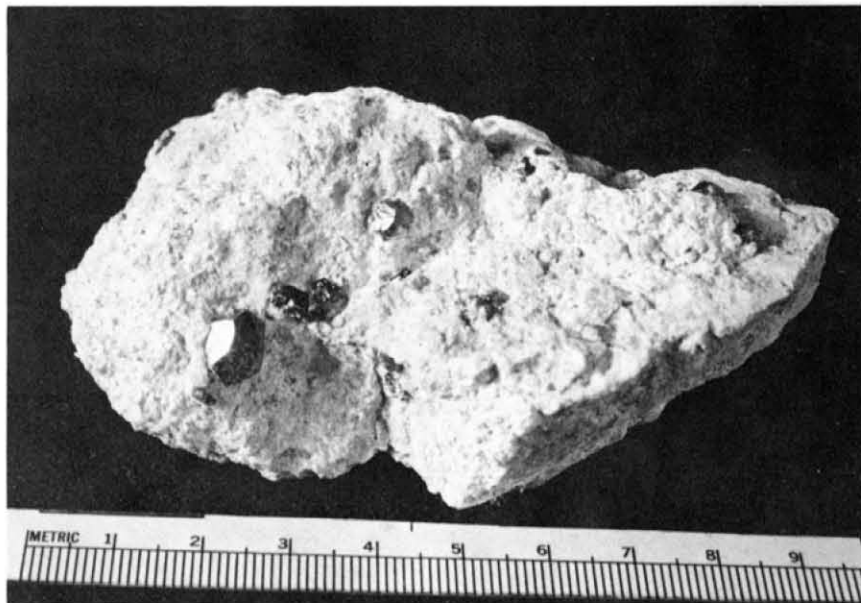


Figure 7. Checkpoint 23. Pyrite crystals found in alteration zone.



Figure 8. Checkpoint 35. Snowstorm tunnel. (Photo courtesy of Albany Democrat-Herald.)

The reservoir holds 430,000 acre-feet of water and covers 3,720 acres of land. During construction of the dam, emery boulders were uncovered at the bottom of the river. The original emery outcrop was located by tracing emery "float" (loose boulders of emery) back to the source, 36 river-miles up the Middle Fork of the Santiam River.

11 0.5 12.0

Park in the pulloff to your right and look to your left at the basaltic lava flow rock which is cut by several vertical basalt dikes. The dikes, which look very much like the flow rock because of similarities in composition, can be identified by their horizontal jointing which formed perpendicular to their cooling edges. At the west end of the roadcut are southeastward-dipping basalt flows which were deformed before being covered by the younger basalt flow you can see above them. The white blebs in the basalt are amygdules (secondary quartz, calcite, or zeolite minerals that filled small cavities left in cooling lava by escaping gas bubbles).

12 3.3 15.3

Just after crossing a small stream, the road curves to the right. In the roadcut to the left, note the orange and yellow alteration, which is due to hydrothermal processes that have altered the minerals to clay and deposited pyrite, which in turn weathered to various iron oxides (rust) (see Figure 3). Because the alteration has affected all of the different types of rock exposed here, you can see that it is younger than they are.

13 1.7 17.0

You are now crossing an arm of the Green Peter Reservoir.

14 0.8 17.8

On the right is the entrance to Whitcomb Creek Park.

15 1.7 19.5

At the curve just past milepost 12, note the slickensides in the rocks to your left (see Figure 4). Slickensides are polished and striated (scratched) surfaces resulting from rocks moving past one another along a fault plane. This particular fault plane has been exposed to weathering; therefore the striations and polish are not as distinct as those on a freshly exposed surface.

16 1.2 20.7

Note the alteration zone with abundant iron staining. This area and the associated river bank (now under water) are known locally as the Donnaca Bar, the site of some large placer-mining operations in the late 1890's and again in the 1930's. Several thousand dollars in gold was removed from

these gravels. One possible source for the gold is the bright yellow and chocolate-brown alteration zone you see in the roadcut.

[17] 2.2 22.9

Upper end of the Green Peter Reservoir. On the south or opposite side of Quartzville Creek is a river terrace. Notice the gravel bar on the inside of the bend in the creek. Gravel is deposited here because the velocity of this side of the creek drops as the creek flows around the curve. To the left is a roadcut in which sandstone, siltstone, and volcanic material are exposed as bedded units. Note the eastward dip of the beds. At the east end of the roadcut the sedimentary sequence is overlain by a basalt flow. The black layer which separates the two units is a paleosoil horizon which was baked by the heat of the basalt flow. This soil zone contains some petrified wood fragments.

[18] 1.8 24.7

You are now at Dogwood Park, located on a gravel bar which was the site of placer-mining operations from the 1890's through the 1930's.

During the summer you can see weekend miners using small dredges, sluice boxes, and gold rockers here and all along the creek. Figure 5 shows gold-panning and a gold rocker powered by a gasoline engine.

[19] 0.7 25.4

After you cross Four-bit Creek, the BLM road shops are on your right.

[20] 1.0 26.4

The rocks in the stone quarry on your left contain much pyrite and some tourmaline, indicating a highly mineralized area. At least one rock sample taken from here contained a trace of silver.

[21] 0.2 26.6

Just before the Yellowstone access road and Yellowstone Creek, notice the alteration in the rocks to your left. The iron staining is from the oxidation of pyrite and minor amounts of chalcopyrite. Some silicification has occurred, and tourmaline is also present.

[22] 0.1 26.7

To the right a bridge crosses Quartzville Creek. This is the Boulder Creek road. Cross bridge, turn left, and drive 1.6 miles.

[23] 1.6 28.3

Note the white-colored, 25-foot-wide alteration zone in the roadcut on your left (see Figure 6). Pyrite crystals up to 3/8-inches in diameter occur in this alteration zone (see Figure 7). Many of the crystals are in the form of pyritohedrons, which means they have 12 crys-

tal faces, each of which has five sides.

After collecting some choice samples, return to the main road, turn right, and continue.

[24] 5.2 33.5

On the left is the entrance to the Yellow Bottom Creek Recreation Area.

[25] 0.1 33.6

The roadcut to the left exposes a coarse-grained buff-colored intrusive rock called diorite. The light minerals in it are primarily plagioclase feldspar; most of the dark minerals are hornblende. This diorite is part of the plutonic (intrusive) complex which is probably responsible for the mineralization in the Quartzville area.

[26] 0.1 33.7

At the curve in the road, note the outcrop in the roadcut to the left. Part of the rock in this outcrop is the same diorite you saw at Checkpoint 25. The diorite formed from the cooling and crystallization of molten rock in an underground magma chamber. In addition, near the center of the roadcut is a section of light-colored, fine-grained, and sugary-textured rock called aplite, which has a different chemical composition (more silica, less iron and magnesium) than the diorite. The aplite formed toward the end of the cooling history of the magma chamber, after most of the iron and magnesium minerals had already crystallized out of the melt. Note that the outcrop is cut by basalt dikes; therefore the basalt is younger than the diorite and the aplite.

[27] 1.0 34.7

In the roadcut to the left, just opposite the small building on the right, a basalt flow conformably overlies a lacustrine (lake) ash deposit which has thin layers called laminae. The laminae are interbedded with layers of air-fall ash. Occasional rip-up clasts (fragments of partly consolidated sediments that have been ripped up and transported by strong currents) can be found in the sediments.

[28] 0.2 34.9

You are now at a road junction. The black-top road (Road 1177) follows Quartzville Creek; the road to your left (Road 1162) follows Canal Creek; the center road (Road 1158) goes up the hill and leads to the Quartzville townsite. Note the columnar basalt in the roadcut. This vesicular basalt, which contains some olivine (the bottle-green minerals on a freshly broken surface), is classified as Recent in age because it is only a few hundred thousand years old.

Follow Road 1162, the Canal Creek road, to your left.

[29] 0.4 35.3

Stop for a moment and look across the creek at the rock projecting like a wall from the creek and hillside on the other side. The country rock was originally solid; but when deep-seated forces within the earth caused the rock to fracture, molten rock which was under great pressure moved up from great depths through the fractures to an environment where there was less pressure. As the magma passed through the fracture, some of it remained, cooled, and solidified, forming a tabular body called a dike. The surrounding rock, softer than the dike, eroded away more quickly, leaving the diorite dike exposed, as you see it, in the shape of a wall.

[30] 0.7 36.0

To your right is a quarry of columnar basalt that was a small intracanyon lava flow. Note that the base of the flow is lower than the rocks on either side.

Now walk to the edge of the road and look down at Canal Creek. You should be able to see water running out of the ground below you into the creek. The source of this water, which old-timers call Cold Spring, is in Dry Gulch. The gravels of Dry Gulch and those covered by the intracanyon basalt flow act as a channelway for water. All year this spring carries water from the slopes of Dry Gulch. The underground channelway can carry all of the summer runoff, so Dry Gulch remains dry during summer months. But the capacity of the underground channelway is insufficient during other seasons of the year, and then the excess water flows through Dry Gulch.

Return to the junction, turn left, and take the center road (Road 1158) toward the Quartzville townsite.

[31] 1.2 37.2

At the first switchback in the road, the cinders and basalt you see in the upper part of the roadcut at the right are part of the same sequence of Recent volcanics you saw at the junction (Checkpoint 28). Below the volcanic material is a layer of unconsolidated glacial drift. This sequence of deposits can be used to give a rough maximum age for the lava, for the lava lies above the glacial drift and is therefore younger.

[32] 0.9 38.1

To your right is a cinder pit. Few Recent volcanic cinder cones have been found this far west of the High Cascades. Note the dip of the

layers of cinders in the pit wall. Normally all the layers of a cinder cone dip away from the center of the cone; so the dip of these layers indicates that the cone itself should be up-slope and to the south of this location, which it is. You will find scoria, cinders, a few lava bombs, and chunks of light-colored granitic rocks which were ripped from the magma conduit by the upward-flowing magma. These granitic fragments are indicative of at least one type of rock present below this location. The extreme youthfulness of the Recent volcanic rocks seen in this part of the Quartzville district suggests that they occurred too recently to have been responsible for the mineralization of the district.

[33] 0.3 38.4

The bridge crosses Dry Gulch. This is the drainage that feeds Cold Springs (Checkpoint 30). Only during times of high water can flowing water be seen here.

[34] 0.9 39.3

To your right is a signboard identifying the Quartzville townsite. The district's largest producing mine, the Lawler, is located across the valley but is hard to see because of second-growth timber. IT IS UNSAFE TO ENTER THIS MINE!

[35] 0.6 39.9

On your left, 10 feet above the road, is the lower Snowstorm (Edson) tunnel, which was driven in a rhyolite breccia cemented with quartz. A second tunnel can be found by walking to the road switchback and entering the upstream side of the stream valley (staying to the left side of the stream valley). Shortly after leaving the road, follow the trail which goes straight up the hillside to the left. Where the trail forks, follow the steeper trail.

Both of these tunnels are reasonably safe to enter if you carry a flashlight. The second tunnel follows a fault gouge seam which you can see overhead in the tunnel. Figure 8 shows why these tunnels are safe to enter. The roof has a natural arch with no loose hanging rocks. The rock is hard and strong and will not cave in. No shafts into which you might fall have been dug below the tunnel floor. No mine timber was left to rot and form bad air. Most other mines, tunnels, and shafts in the Quartzville and other mining districts are NOT safe to enter.

The Snowstorm tunnels are owned by a private party; permission is not needed to enter these tunnels but may be required in the future.

Return to the fork in the road, turn left,

and follow the blacktop road (Road 1177), the Quartzville Creek road.

[36] 3.6 43.5 Quartzville Creek-Galena Creek road junction. Take the right-hand road (Road 1177-A), which crosses Quartzville Creek.

[37] 1.7 45.2 At this point the road crosses Galena Creek. The gravel in this creek contains specimens of tourmaline hornfels, fine-grained rocks which have been metamorphosed by contact with a hot intrusive body. These hornfels are indicative of a higher grade intrusive activity; and the original outcrop where the hornfels occurred, if cut by a vein, would be a good place to look for mineral values and interesting mineral and rock specimens.

Turn around and retrace route to Sweet Home.

End of road log.

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35. Geology of Dallas and Valsetz quadrangles, Oregon, rev. 1964: Baldwin	3.00
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