History of Selected Mines in the Mineral District, Washington County, Idaho

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INTRODUCTORY NOTE

This report was prepared under a cooperative agreement with the U.S. Bureau of Land Management (BLM), Idaho State Office, as part of a project to identify and describe inactive and abandoned mines in the state of Idaho. Work on this project included preparing detailed histories of selected mines on BLM-administered lands in Idaho. The information in this report is from a number of published and unpublished sources in the Idaho Geological Survey's mineral property files. Where not otherwise noted, most of the mine production data is drawn from the U.S. Geological Survey's (USGS) annual volumes on *Mineral Resources of the United States* (1882-1923) and the equivalent volumes produced by the U.S. Bureau of Mines (USBM) (*Mineral Resources of the United States,* 1924-1931, and *Minerals Yearbook,* 1932 to present). Information on underground workings and mine equipment is generally from the annual reports of the Idaho Inspector of Mines (IMIR), published from 1899 to 1979. After 1974, the Mine Inspector's office was known as the Mine Safety Bureau, a section of the Idaho Department of Labor and Industrial Services. Detailed accounts of mine operations are, for the most part, drawn from annual reports made by the companies to the State Inspector of Mines; these reports were required by law and the information contained in them formed the basis of the Mine Inspector's annual reports. Reports of recent developments are taken from the Idaho Geological Survey's (IGS) annual reports on the developments in mining and minerals in Idaho (from 1984 to present) or from similar reports produced by the Survey's predecessor, the Idaho Bureau of Mines and Geology (IBMG) from 1975 to 1984. Other published sources are referenced in the text. A complete bibliography is included at the end of the report. Where direct quotations are taken from source materials, the original spelling and grammar are preserved even in cases where they do not conform to currently accepted usage.

History of Selected Mines in the Mineral District, Washington County, Idaho

Victoria E. Mitchell[1]

MINERAL DISTRICT

The Mineral district, also known as the Washington district, is located in western Washington County about 4 miles east of the Snake River. Most of the mines are along Dennett Creek between elevations of 3,000 to 5,000 feet (Figure 1). Accessibility has always been a major problem for these mines. In 1945 (when the last major activity occurred in the area), the preferred route for shipping ore was down Dennett Creek to the Snake River and then across the Snake by ferry. From there, the ore could be trucked to Huntington, Oregon, or shipped by railroad via a branch of the Union Pacific Railroad. All the roads heading east from the district were steep, in poor repair, or both (Anderson and Wagner, 1952).

The geology of the area is complex, consisting of folded and faulted volcanic, volcaniclastic, and igneous rocks that have been metamorphosed to the greenschist facies (Figures 2 and 3). The district is part of the Olds Ferry terrane, one of several allochthonous blocks present in western Idaho and eastern Oregon. The oldest rocks in the area are the volcanic and volcaniclastic rocks of the Seven Devils Group. These rocks were intruded by a composite pluton of Early Jurassic age. Rock types in the pluton

[1]Idaho Geological Survey, Main Office at Moscow, University of Idaho, Moscow.

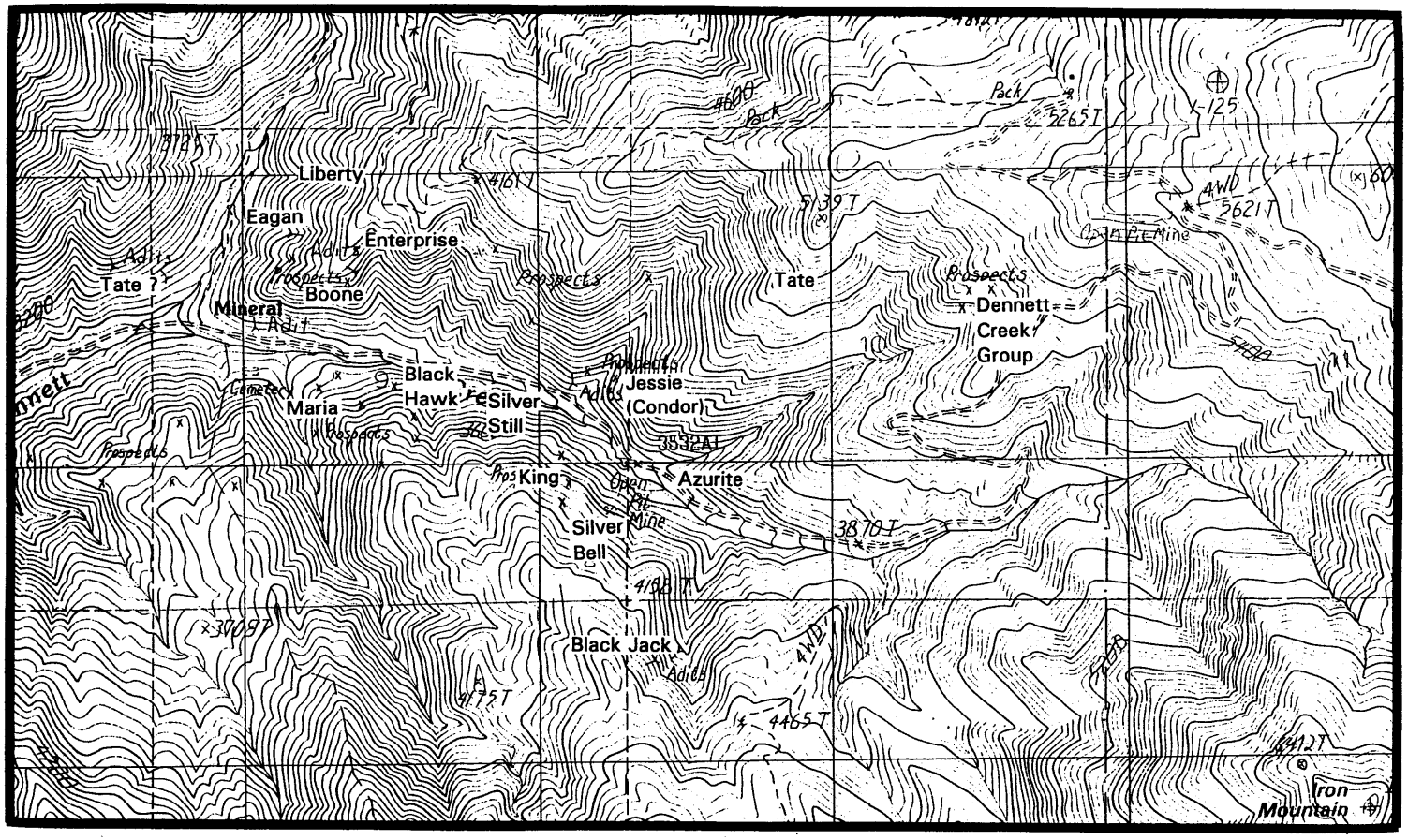

Figure 1. Topographic map of the mining area along Dennett Creek near Mineral (U. S. Geological Survey Monroe Butte 7.5-minute quadrangle).

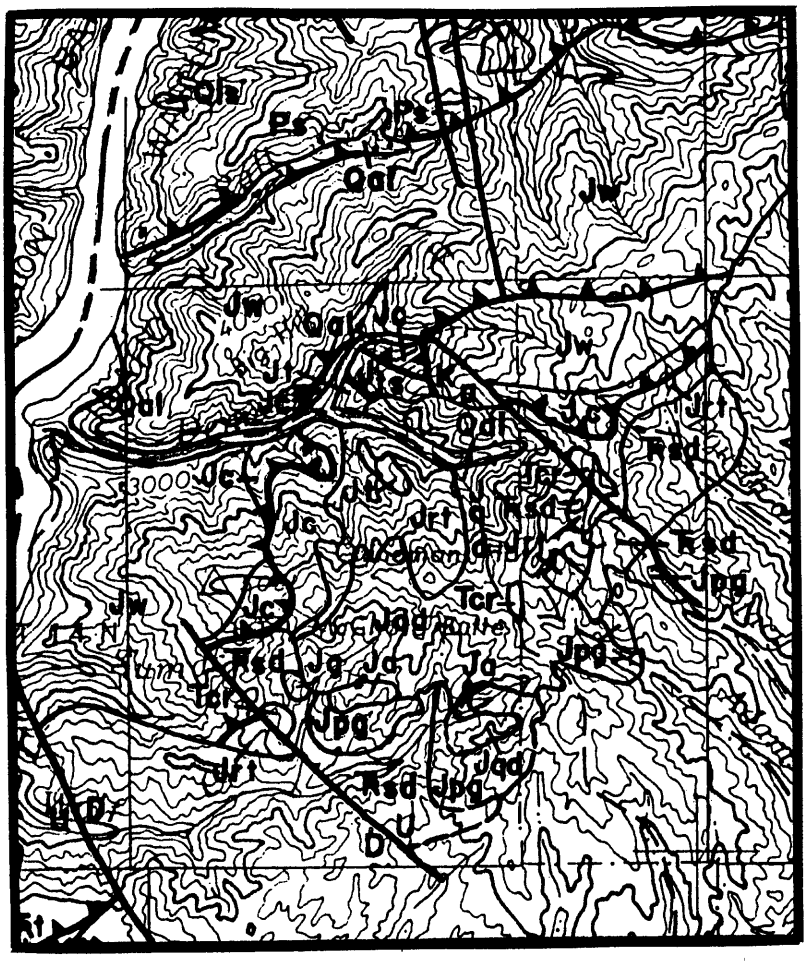

Figure 2. Geologic map of the Mineral area, scale approximately 1:125,000. Weatherby Formation: Jts - black shale; Jw - volcaniclastic wackes; Jc - conglomerate; Jt - tuffaceous sandstone and conglomerate. Tsd - Seven Devils Group; Jqd - quartz diorite; Jpg - porphyritic granodiorite; Ja - aplite; Jrt - porphyritic rhyolite tuff; Ka - andesite porphyry; Tcr - Columbia River Basalt; Qal - alluvium (Mitchell, and Bennett, 1979).

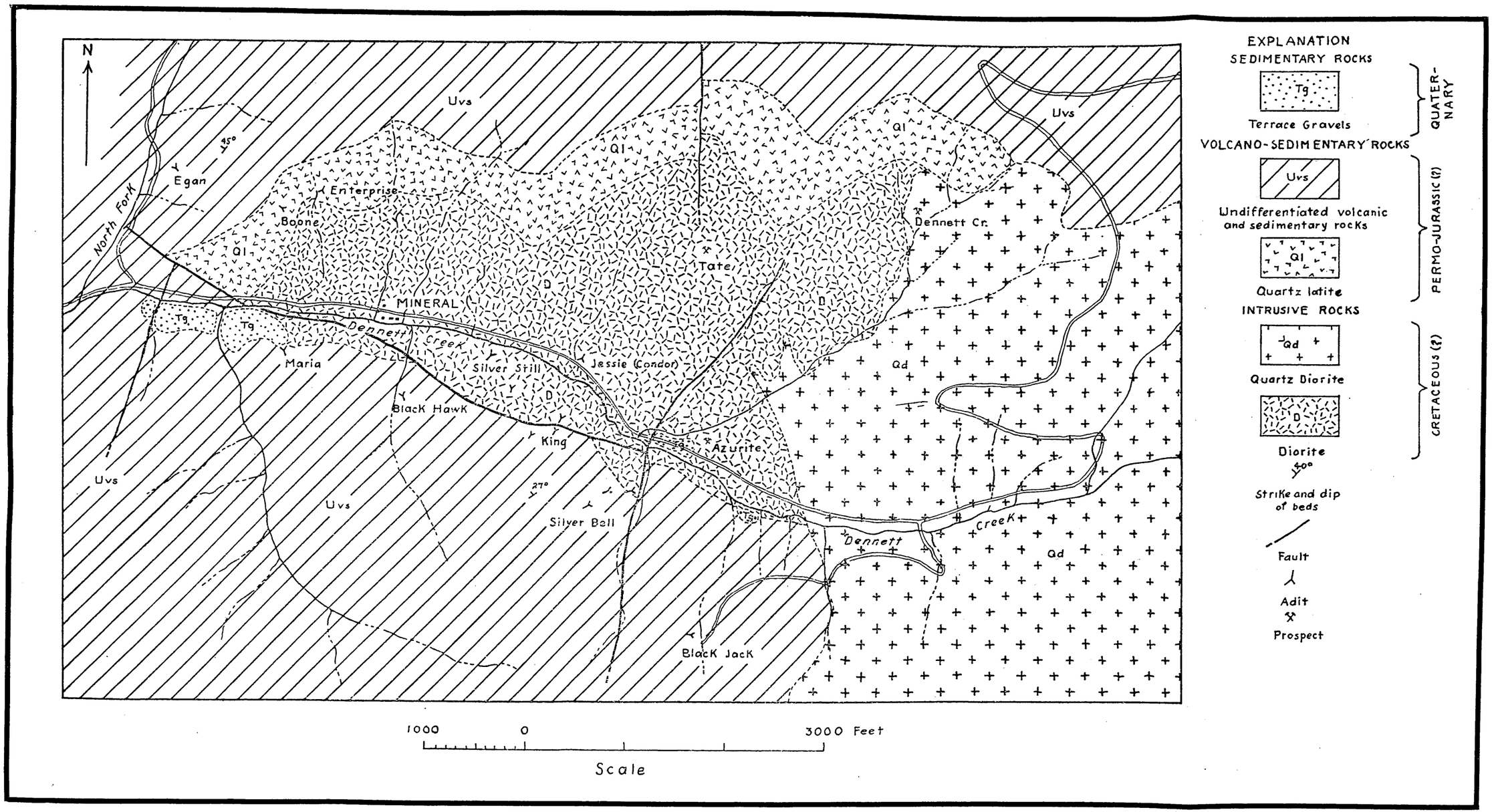

Figure 3. Geologic sketch map of the Mineral district, showing the location of the mines (Anderson and Wagner, 1952, Figure 2).

include gabbro, quartz diorite, porphyritic granodiorite, and aplite. The volcaniclastic rocks of the Early to Middle Jurassic Weatherby Formation were deposited on an erosional surface above the older rocks (Henricksen, 1975; Imlay, 1986).

Two types of deposits occur in the Mineral district. Most of the ore came from silver-bearing lodes composed of fine-grained sulfides in a calcite gangue. The sulfide minerals included pyrite, tetrahedrite, chalcopyrite, galena, and sphalerite, with local concentrations of marcasite, wurtzite, and sulfosalts (Anderson and Wagner, 1952). Colloidal textures and the presence of low-temperature minerals indicate that these deposits were formed close to the surface at temperatures below 135° C. (Anderson, 1963). The veins are stratabound, occurring within a horizon of Early Jurassic silicic volcanic rocks that is less than 1,000 feet thick and extends for at least 42 miles. (These rocks occur in the upper part of unit *Jrt* on Figure 2.) The silver lode deposits were probably formed by hydrothermal activity related to the eruption of the silicic volcanic rocks (Henricksen, 1975).

The second type of deposit in the district consists of quartz-tourmaline veins that contain pyrite, chalcopyrite, and sphalerite, and that occur in fissured and fractured diorite and quartz diorite. The ore contains appreciable amounts of gold but no silver (Anderson and Wagner, 1952). These veins are related to magmatic-hydrothermal activity associated with the intrusion of the Jurassic porphyritic granodiorite. Copper-zinc and copper-molybdenum porphyry deposits to the south and east of the Mineral district and skarn deposits near Iron Mountain are also associated with this event (Henricksen, 1975).

Most of the ore mined in the early days of the district was oxidized or partially oxidized and richer in silver than the deeper ore. The grade was moderate to good, but rarely ran over 40 ounces of silver to the ton. The mineralization had a limited vertical range of only a few hundred feet, with the richest ore occurring within 200 feet of the surface. Most of the unmined ore in the district is low grade (Anderson and Wagner, 1952). However, it has long been suggested that the ore could be effectively processed by flotation methods (Anderson and Wagner, 1952; IMIRs starting in the mid-1920s).

The first discoveries in the Mineral district were made in the 1870s. However, serious development did not start until a wagon road was built into the district around 1888. A pyritic smelter was constructed at Mineral by Messrs. Biddle and Lang in 1889. A second smelter was built just below the forks of Dennett Creek in 1890. Both smelters operated until 1893, when a drop in the price of silver forced them to close. Coke for the smelters cost $28 per ton at Mineral, and the smelters charged $16 to process a ton of wet ore (Lindgren, 1901). Between 1889 and 1892, the smelters shipped copper matte containing 302,273 ounces of silver and 266,700 pounds of copper (Turner, 1908). Lindgren (1901) estimated that the pre-1900 production of the district was about 600,000 ounces of silver.

In November 1900, A.J. Crook built a new 60-ton smelter at Mineral, but little production took place until 1903 (Lindgren, 1901). Toward the end of the year, Ladd Metals Company made some large shipments of copper matte. (Table 1 shows the companies operating in the district.) This constituted the bulk of the copper produced

Table 1. Companies operating in the Mineral district.

Company Name	Officer	Date Incorporated	Charter Forfeited	Year(s) in District	Mine(s) Operated
Ladd Metals Company	---	---	---	1903-1905 (1927)	Silver Bell, Black Hawk, Maria, Eagan(?)
Silver Cable Mining Co.	C. M. Martin, President	Jan. 10, 1921	Dec. 1, 1921	1922	Enterprise, Liberty
B.W.F. Mining Co.	---	---	---	1921	Eagan
Silver Bell Mining & Milling Co.	Herbert G. Myers, President	Sept. 10, 1925	1927	1925-1927	Silver Bell, Maria
Gem State Copper Co.	Emil Melzer, President	May 9, 1924	1926(?)	1924-1926	Dennett Creek Prospect (?)
Silver Still Mining Co.	John G. Still, President	August 21, 1924	active -- 1981	1924-	Silver Still, North Star, Maria, Silver Bell, Black Hawk, Enterprise
Idaho Mineral Mining Co.	A. I. D'Arcy, President-Manager	Nov. 22, 1929	1932	1929	Enterprise, Silver Still, Liberty
Condor Mines, Inc.	A. C. Merrill, Manager	April 13, 1949	Dec. 1, 1947	1941	Condor

from Washington County that year. Small quantities of ore were also shipped directly to outside smelters. One of the unused smelters was moved from Mineral to Landore during the year (Wells, 1983).

As many as six mines were producing or shipping ore during the next two years (Anderson and Wagner, 1952). According to the 1904 IMIR (p. 129-130):

> The Ladd Metals Company have done a good deal of experimenting with Washington County copper ores and of mining development work, and the county is extremely fortunate in getting such substantial people interested in its copper resources. Their smelter at Mineral made a good run during the year. Several shipments of gold and silver-bearing copper matt were made, and their mines at that point have been undergoing considerable development, and have shown great improvement in ore values, so much so that the company are planning to start the smelter again at an early date.

Mining ceased in 1905, and all the mines in the district were inactive until 1918 (Anderson and Wagner, 1952). Between 1903 and 1905, the Ladd Metals Company

shipped ore and matte containing a total of 81,727 ounces of silver and 261,112 pounds of copper (Turner, 1908).

Several properties were worked from 1918 to 1923, with the Enterprise and Eagan mines being the most consistent producers. In 1918, several small operations in the district shipped ore mined from "old" veins that contained 5-10 percent copper and 50-70 ounces of silver per ton. In 1922, three mines in the district produced a total of 669 tons of ore, which contained $45 in gold, 16,373 ounces of silver, 9,435 pounds of copper, and 1,928 pounds of lead. The ore was valued at $17,798, or $26.60 a ton.

During 1924 and 1925, several new mining organizations appeared in the district. Silver Still Mining Co. and Silver Bell Mining & Milling Co. both began development work. The Gem State Copper Co., rumored to be financed by money from the W.A. Clark interests of Butte, Montana, was organized in 1924 to develop a property on the east fork of Dennett Creek. The claims operated by this company are not shown on Figure 4, but they may have been near the Dennett Creek Prospect shown on Figure 3 and discussed below. Gem State did 175 feet of development work in 1924, 188 feet of work in 1925, and 800 feet of work in 1926. The company suspended all operations in August 1926. At that time, its property had seven tunnels and two crosscuts, for a total of 972 feet of workings. The lengths of the tunnels were: No. 1, 48 feet; No. 2, 190 feet; No. 3, 330 feet; No. 4, 114 feet; No. 5, 160 feet; No. 6, 60 feet; and No. 7, 20 feet. The number of tunnels on the property and their lengths also suggests that this may be the Dennett Creek Prospect described by Anderson and Wagner (1952).

The Silver Still Mining Co. began production from its mine in 1929 and operated (with interruptions) until 1950. Sporadic work was done at other properties in the district, and the U.S. Bureau of Mines ran a rehabilitation program during the early part of World War II. (Figure 4 is a map of active claims in 1943.) Except for the Silver Still and the workings reopened by the U.S. Bureau of Mines, most of the mines in the district were inaccessible by the mid-1940s. There has been no production from the district since 1950.

The 1922 IMIR (p. 180) contained the following description of the Mineral district:

> At one time this district was a large producer of silver, two blast furnaces were in operation and the camp of Mineral was a good sized town; but the town has been deserted for many years, the smelters have been dismantled and the camp reverted to its primitive condition. Practically all of the deposits are high grade silver-copper ores, rather complex, but amenable to modern metallurgical methods. Many of these deposits are extensive, a considerable tonnage of ore is available, and there seems to be no reason why this district should not be receiving more attention than it has during the past two years, as there are many properties that are worthy of investigation and development.

The 1923 IMIR (p. 192) elaborated on this theme:

> The Mineral district is credited with a substantial production, all of which was mined in the limited area adjacent to the old town of Mineral. The principal ore is a copper-silver, occurring as an oxide and sulphide in different deposits. The sulphide ores are complex but amenable to modern metallurgical methods[2]. During the early days only the high grade ores could be treated. The low grade thus rejected

[2]Later reports recommended flotation methods for concentrating the ore.

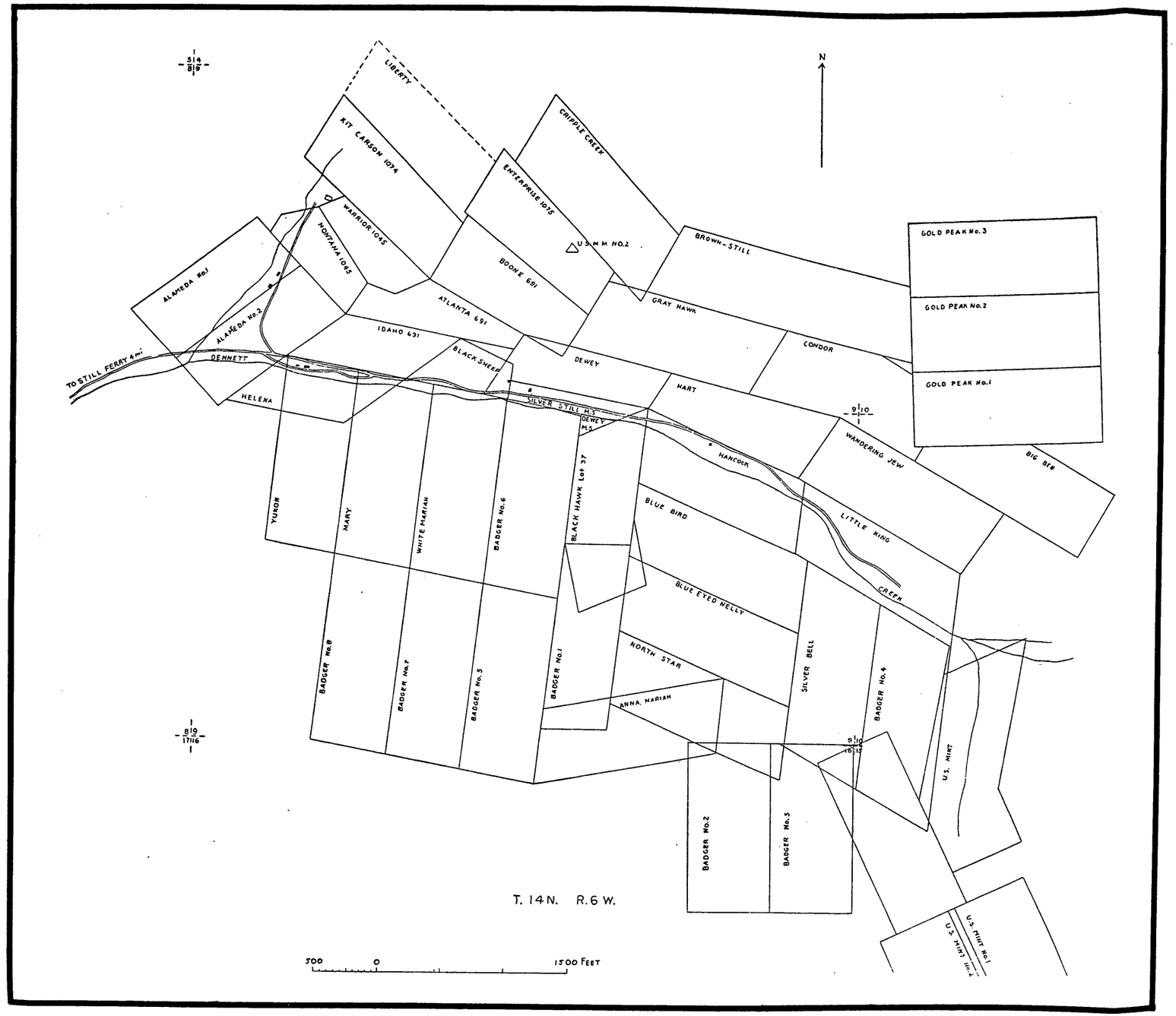

Figure 4. Claim map of the Mineral district in 1943 (Anderson and Wagner, 1952, Figure 3).

> has accumulated into a large tonnage in the dumps, old stopes and faces in the mines. This ore can be reclaimed at a small cost and when considered with the possibilities for developing new ore there appears to be no reason why this district is not receiving more attention than it has during the past few years.

Similar statements appeared in every IMIR until 1971, when the summaries of the year's activities in each county were discontinued.

Total recorded production from the Mineral district between 1903 and 1950 was 14,017 tons of ore and 4 tons of reprocessed tailings. This material yielded 92 ounces of gold, 437,599 ounces of silver, 634,164 pounds of copper, 141,273 pounds of lead, and 4,630 pounds of zinc (Table 2). These numbers do not include any estimates for material mined before the turn of the century.

INDIVIDUAL MINES

SILVER BELL MINE

The Silver Bell Mine is a short distance above the townsite of Mineral at an elevation of about 3,600 (Figures 1, 3, and 4). In 1900, it was developed by three tunnels and had a total of about 2,000 feet of drifts and crosscuts. The upper tunnel cut the vein about 100 feet from the portal. The vein had a northwest strike and dipped to the southwest, but it was not very regular or well defined. A short distance farther along the tunnel was a 40-foot-square body of oxidized ore that was "full of copper sulphate and gypsum." The middle tunnel reached the same orebody, while the sulfide ore in the lowest tunnel was less rich than the material in the upper workings. The Silver Bell, which was worked in combination with the Black Hawk and Maria, was credited with most of the early production from the camp (Lindgren, 1901). Turner (1908) stated that the largest and best stopes in the Silver Bell were at the intersections between a west-dipping basalt dike and east-dipping ore-bearing seams (Figure 5). The higher amounts of copper and silver in these stopes were related to the presence of more tetrahedrite than was normally found in the ore. The "Ladd Raise," shown on Figure 5, indicates that the Silver Bell was one of the mines operated by the Ladd Mining Co. between 1903 and 1905. Most of the workings were caved and inaccessible by the early 1920s (Livingston, 1923).

The property, along with the adjoining Maria Mine, was leased by Silver Bell Mining & Milling Company in September 1925. (According to the company's report to the Idaho Inspector of Mines, the current owners had changed the name of the Silver Bell to the "Copper Bell.") The company started cleaning out the tunnels in both mines. The combined workings for the two properties included ten tunnels, three shafts, three raises, at least ten crosscuts, and ten drifts. The total length of the workings is not known. No further work was done on either mine, and Silver Bell Mining & Milling Co. forfeited its corporate charter in 1927.

Table 2. Total recorded production from the Mineral district[1].

Mine and Years in Production	Ore (tons)	Old Tailings (tons)	Gold (ounces)	Silver (ounces)	Copper (pounds)	Lead (pounds)	Zinc (pounds)
Black Hawk Mine (1947)	21	—	—	515	590	247	—
Condor Mine (1941)	12	—	8	15	705	—	—
Enterprise Mine (1918-1947)	210	—	—	10,306	11,560	1,928	—
Eagan Mine (1919-1949)	3,177	4	4.20	169,051	122,524	3,205	—
Ladd Metals Co. (1903-1905)	5,673	—	55	88,900	373,493	—	—
Other properties (1940)	26	—	—	2,630	2,022	338	—
Silver Still Mine (1922-1950)	4,898	—	25.16	166,182	123,275	135,555	4,630
Total for district	14,017	4	92.36	437,599	634,169	141,273	4,630

[1]Production data for all mines taken from U.S. Bureau of Mines information.

The U.S. Bureau of Mines reopened the Intermediate adit during the early part of World War II (Figure 6). The ore was chiefly pyritic, but it contained appreciable chalcopyrite and tetrahedrite with a little galena and sphalerite (Anderson and Wagner, (1952.

MARIA MINE (BLACK MARIA)

The Maria Mine is on the hillside south of Mineral (Figures 1, 3, and 4). It was developed by several tunnels over a vertical distance of 200 feet. The vein was fairly well defined, 2-4 feet wide, and dipped to the northeast. The oxidized ore was confined to within 50 feet of the surface. At depth, the sulfide ore consisted of fine-grained pyrite, chalcopyrite, tetrahedrite, galena, and sphalerite in a calcite gangue. The ore averaged 1-2 percent copper and 25-30 ounces of silver per ton, while a sample of richer ore assayed 0.28 ounce of gold and 55.92 ounces of silver per ton. The production from the Maria

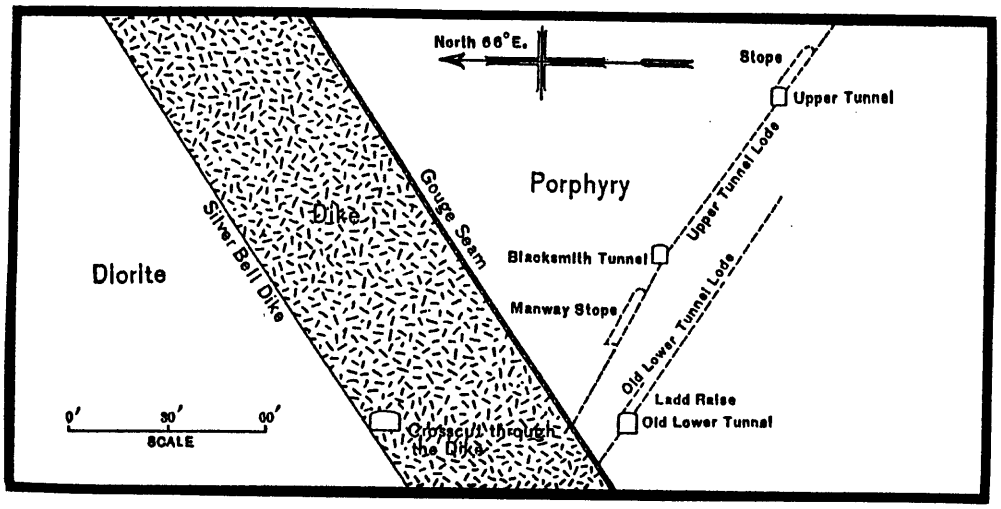

Figure 5. Vertical section of the Silver Bell Mine around 1905 (Turner, 1908, Figure 45).

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before 1900 was reported as 150,000 ounces of silver (Lindgren, 1901). The best stopes in the Maria were worked prior to 1904 (Turner, 1908). Silver Bell Mining & Milling Company did a small amount of work at the mine in 1925. (The company noted the name of the mine had been changed to "White Mariah," which is the name shown on Figure 4.) Apparently no work has been done at the mine since that time.

The U.S. Bureau of Mines reopened the lowest adit on the Maria (Figure 7) but apparently failed to find any ore of commercial grade. On the lowest level, the vein may be present only as a zone of fractured, mineralized rock. Bunches of fine-grained sulfide minerals in the lower tunnel were mostly pyrite, but considerable amounts of chalcopyrite were also present, along with small amounts of tetrahedrite, galena, and sphalerite (Anderson and Wagner, 1952).

BLACK HAWK MINE

The Black Hawk Mine is on the south side of Dennett Creek between the Maria and the Silver Bell. Lindgren (1901) credited the Black Hawk with producing 200,000 ounces of silver before 1900. It is one of the properties that was worked by the Ladd Metals Co. between 1903 and 1905. (Production from the mine during this period was included with the total production for all the properties operated by Ladd Metals Co. What percentage of the total production shown in Table 2 should be credited to the Black Hawk is not

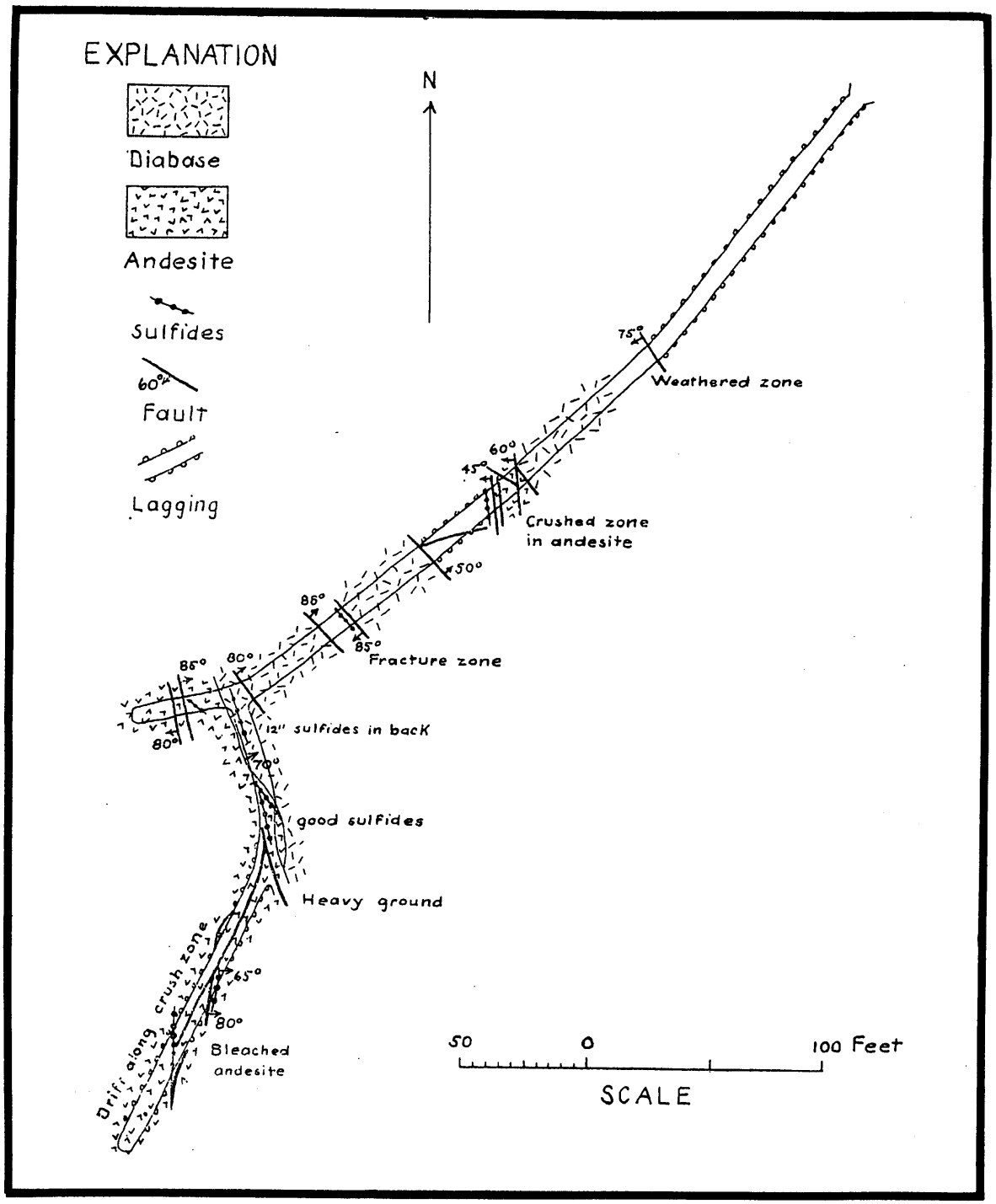

Figure 6. Geologic sketch map of the Intermediate adit level of the Silver Bell Mine (Anderson and Wagner, 1952, Figure 7).

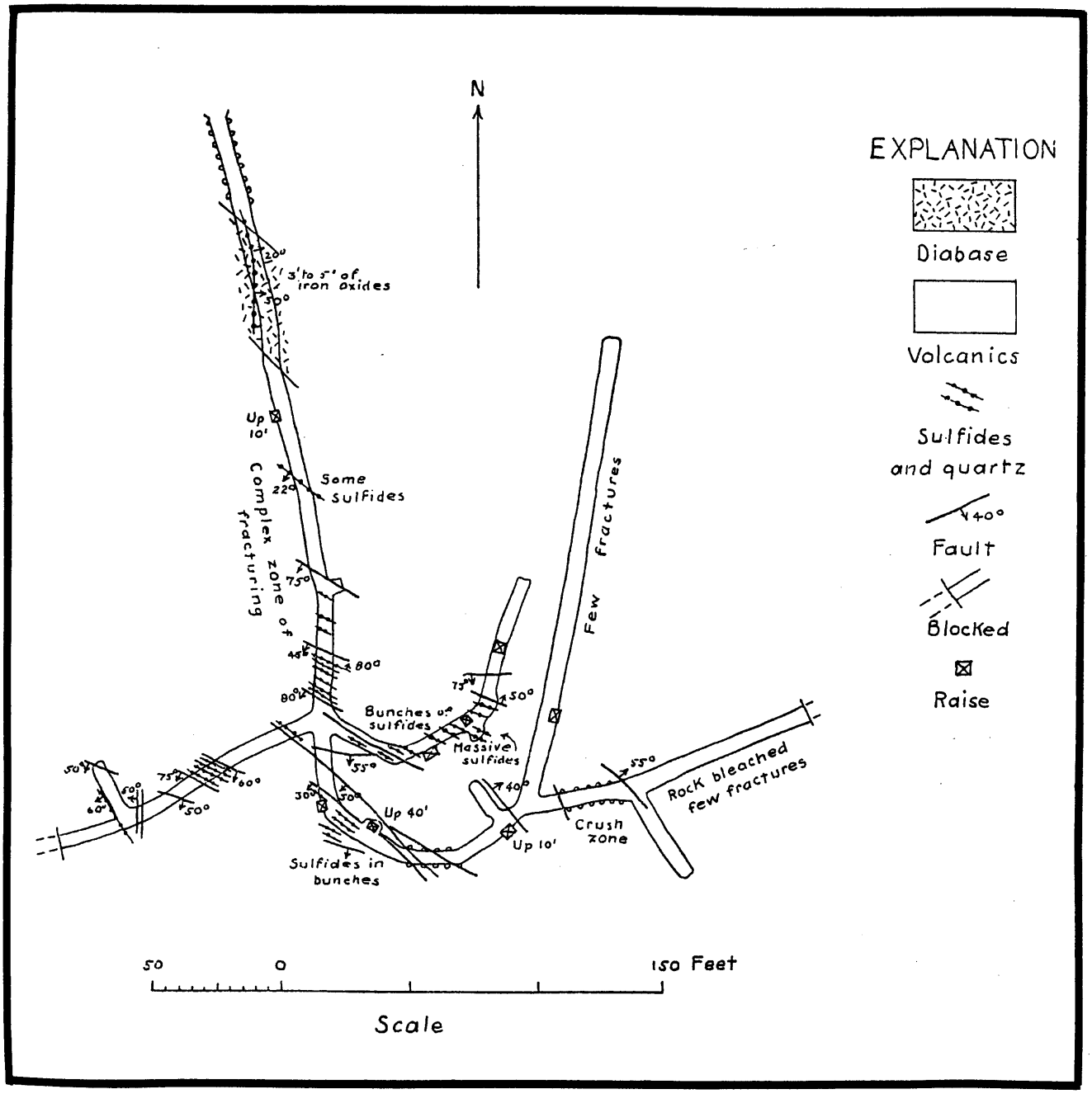

Figure 7. Geologic sketch map of the lower Maria adit (Anderson and Wagner, 1952, Figure 4).

known.) The ore in the mine showed a sharp distinction between the upper oxidized zone and the lower sulfide zone. The average value of 27 smelter samples taken in 1904 from the oxidized ore was 0.9 percent copper and 28 ounces of silver per ton. In contrast, the sulfide ore ran 1.25 percent copper and 10 ounces of silver per ton (Turner, 1908).

The workings at the Black Hawk were more extensive than at most of the other mines in the district. The mine had seven adits, two of which were reopened by the U.S. Bureau of Mines (Figure 8). Two well-defined veins on the Intermediate level had a strike of about N. 70° W. and a dip of 60° to 75° NE. Most of the orebodies in the mine had a north-northwest trend, which was parallel to the more prominent faults in the area. The majority of the fractures in the mine were mineralized, commonly containing scattered bunches of sulfide minerals. The sulfides were extremely fine grained and often could be identified only under a microscope. The most common sulfides were pyrite and chalcopyrite, with lesser amounts of tetrahedrite, galena, and sphalerite. The ore was apparently richer in the upper levels, since much of the stoping went from there to the surface. Smelter returns[3] on 37 tons of sorted ore from the south vein on the Intermediate level at the far end of the Blacksmith Shop tunnel were 4.2 percent copper, 0.4 percent lead, 5.2 percent zinc, and 19.25 ounces of silver and 0.005 ounce of gold per ton. The average returns[3] for 50 tons of unsorted ore from the other vein on the same level were 3.4 percent copper, 0.9 percent lead, 5 percent zinc, and 15.6 ounces of silver and 0.005 ounce of gold per ton (Anderson and Wagner, 1952).

The Ladd Metals Co. held the Black Hawk until 1928 but apparently did no work after 1905. According to U S. Bureau of Mines records, a small amount of ore was produced from the Black Hawk in 1947. This is the only recorded production from the mine since 1905.

EAGAN MINE (EGAN)

The Eagan Mine is on the steep slope facing the North Fork of Dennett Creek (Figures 1, 3, and 4). It is credited with producing 100,000 ounces of silver before 1900. The silver was in tetrahedrite ore that also contained arsenic (Lindgren, 1901). The mine was probably active through 1905 (Anderson and Wagner, 1952). The vein on the Eagan was nearly 20 feet wide, with a strike of N. 30° W. and a dip of 60° NE. The vein was associated with a basalt dike and pinched out against the dike to the southeast. Several tunnels opened the vein, and the upper levels, which were in the oxidized zone, were nearly mined out by the early 1920s (Livingston, 1923).

Two carloads of rich ore were ready to ship from the mine in late December 1918. Some of the stope faces were said to show veins up to 5 feet wide that carried 50 ounces of silver per ton.

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[3]The dates when these shipments were made is not given by Anderson and Wagner (1952).

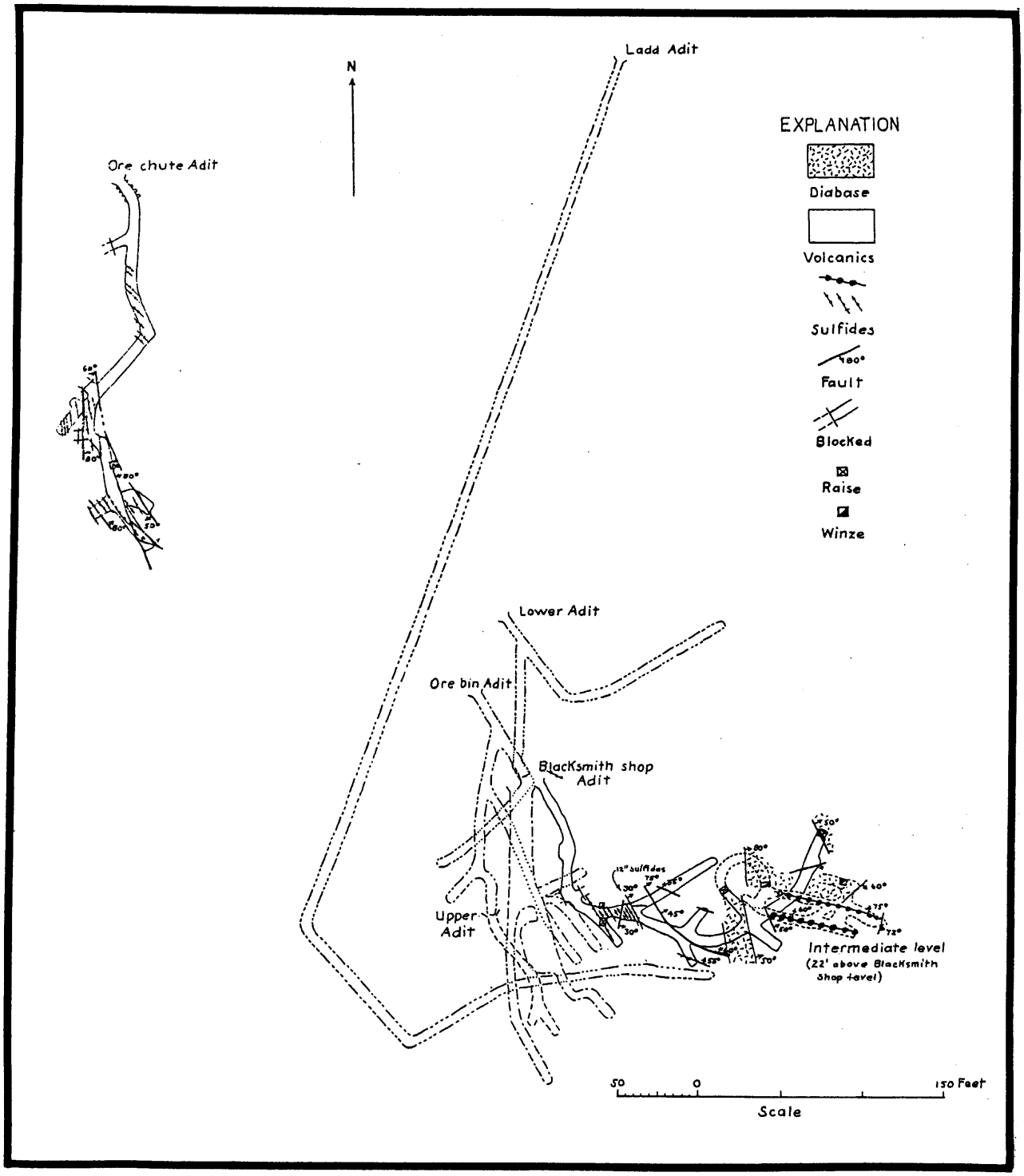


Figure 8. Map of underground workings at the Black Hawk Mine, with the geology shown on the Blacksmith Shop and Ore Chute levels (Anderson and Wagner, 1952, Figure 5).

In 1919, the Eagan produced a significant tonnage of copper sulphide ore that contained considerable silver. Development work during the year consisted of 190 feet of raises and 510 feet of drifts and crosscuts. According to the 1919 IMIR (p. 87-88):

> Another interesting successful new revival of interest in a dead old mining district in which silver values predominate, occurred during the year at Mineral, in Washington County, 16 miles north of Huntington, Oregon, and four miles east of Mineral Ferry on the Homestead branch of the Oregon Short Line. This old camp has been idle and practically abandoned in a mining way for 15 years. In December, 1918, one of its old patented properties was taken over under lease and bond by some Baker City people under the management of Emil Melzer, an experienced operator, who has revived this old ghost mining camp in a most substantial manner, and during the year shipped 1225 tons of ore containing 77,500 ounces of silver and 58,000 pounds of copper and the present resources of the mine are said to show an extensive reserve of milling ore of 30 to 40-ounce values in shoots two to five feet thick and of considerable length in addition to the richer segregations of grey copper shipping ore.
>
> The ore is hauled over an easy grade four miles to the railroad at Mineral Ferry. The Egan Mine is a small patented group with several short adit tunnels and is said to have produced $70,000 worth of ore to former operations. This district is said to have produced half a million dollars worth of 50 to 60-ounce silver-copper ore during its former activities 15 to 20 years ago, the bulk of which was treated in a small pyretic smelter in the camp and was largely derived from the Bell, Mariah and Blackhawk Mines on the south side of Dennett Creek canyon. The mines have been idle for years and, while elaborate underground maps are available of their quite extensive drifts, the portals of nearly all the openings are caved.
>
> This interesting group of claims, however, contains the probable basis of a successful concentration of ore resources of very considerable volume. The veins or zones of mineralization vary up to 200 feet wide and the richer values run in fairly definite fissure courses that are from a few inches to several feet wide. There is no great depth attained by any development in the district. I doubt that any depth exceeding 300 feet vertically has been reached on any of the ore bodies, but the deeper development shows a decidedly interesting change from black manganese and gosseny brown iron stained croppings with silver chloride and residue pebbles of grey copper, to clean bands and kidneys of grey copper and chalcopyrite mineral rich in silver and carry from 5 to 15 ounces silver for each unit of copper. It is likely that these deposits at a little further depth will enter a permanent sulphide zone and may afford a large tonnage of fair grade sulphide concentrating mineral that will produce a mill product rich in both copper and silver.

Siliceous silver ore containing copper was shipped from the mine in 1920. The B.W.F. Mining Co. operated the Eagan for part of 1921 and shipped several lots of silver ore. In the middle of the year, B.W.F. apparently defaulted on its lease, and the property was leased to another company toward the end of the year. A small concentration and flotation mill was installed on the property in 1921. The only mention of the mill's size rated its capacity at 25 tons-per-day (Swanson, 1933). According to Livingston (1923), the mill was built by the Wymans of Boise while they had the mine under lease and bond. Both ore and concentrates were shipped from the mine in 1922 (Livingston, 1923). Production from the upper levels came from a large stope that followed the ore "to the grass roots" (Swanson, 1933). No further work was done until the U.S. Bureau of Mines reopened and sampled the property.

Most of the development on the Eagan was in four adits and two intermediate levels (Figures 9 and 10). Other workings, not shown, included the 90-foot Carson Discovery

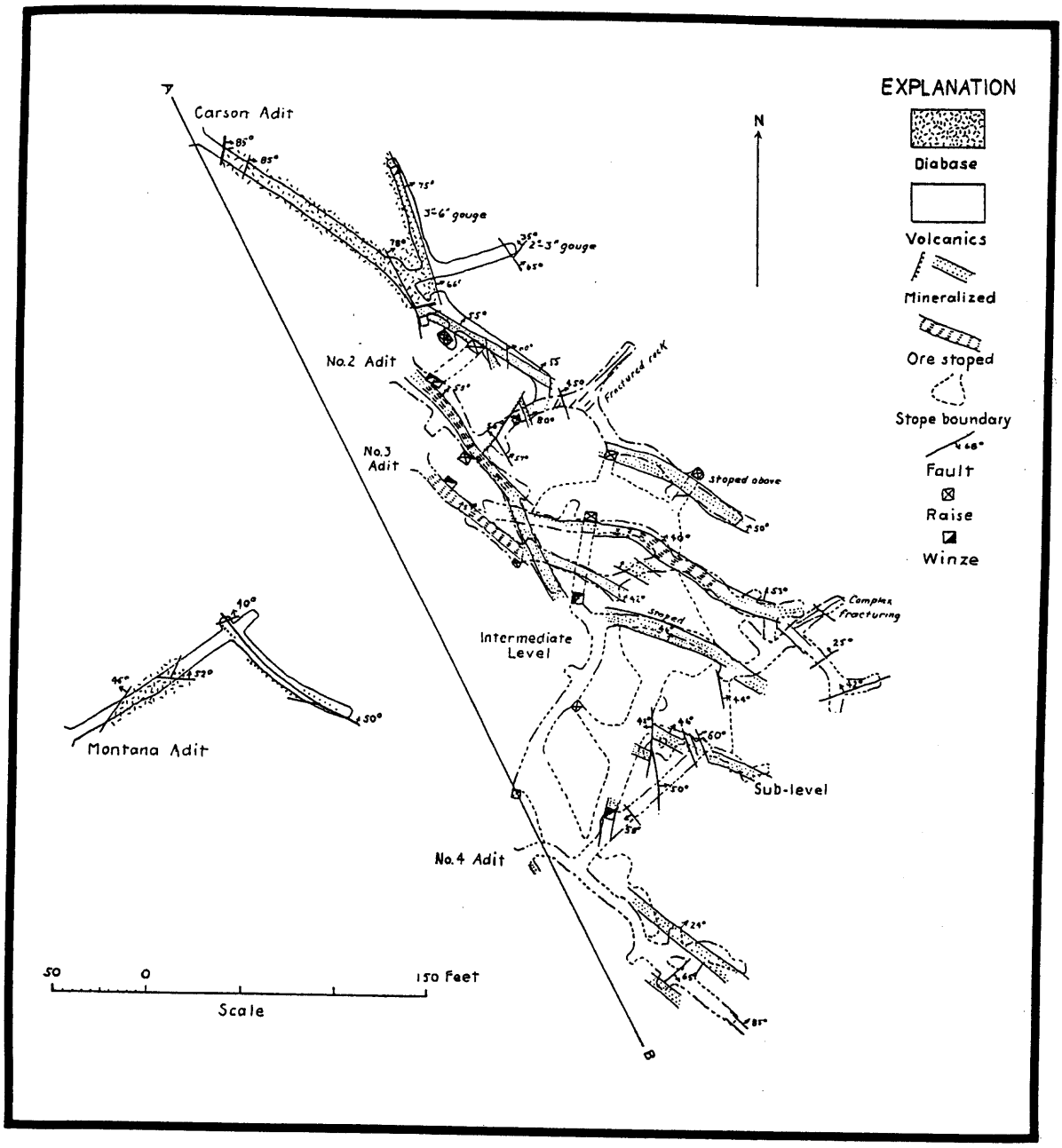
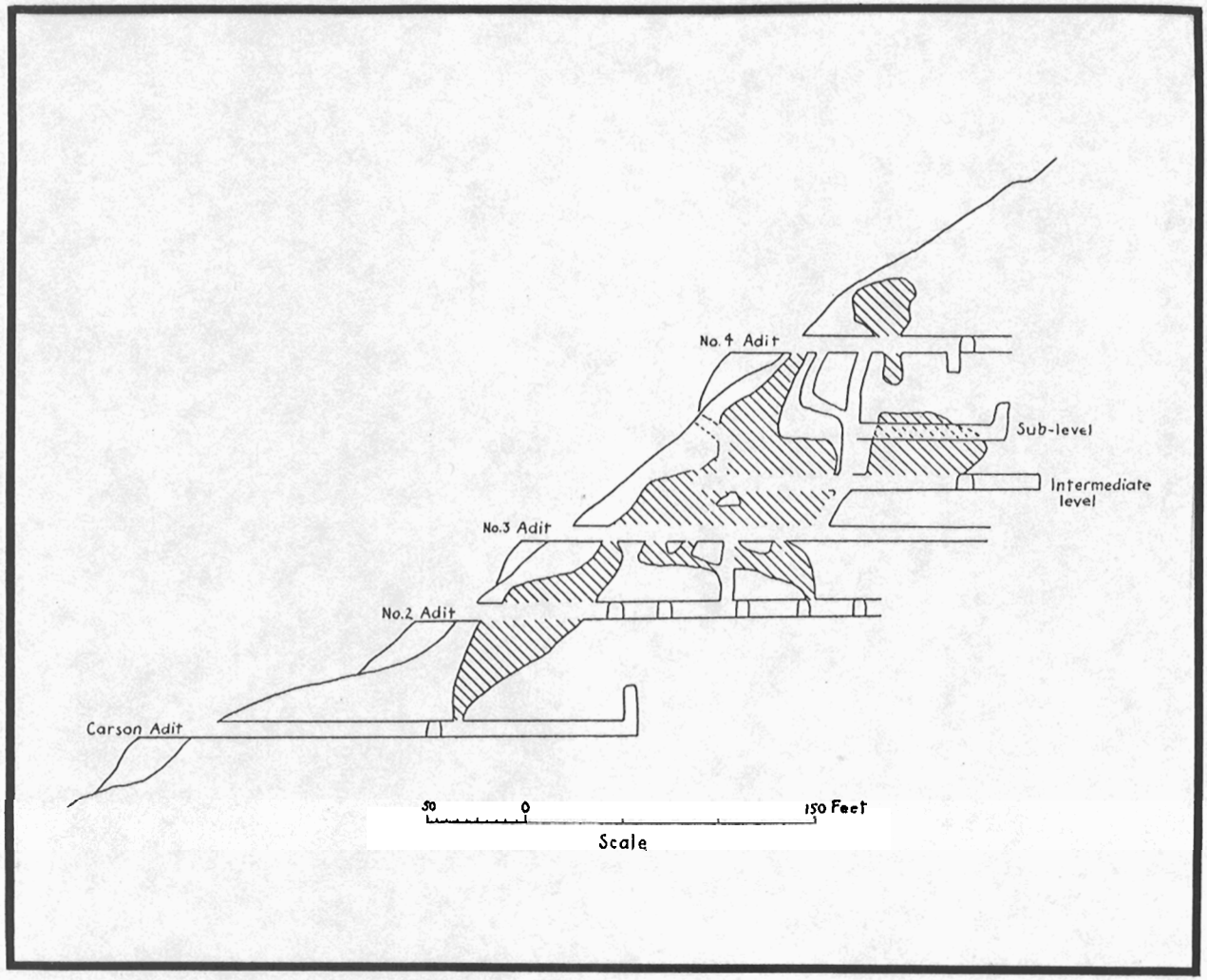


Figure 9. Geologic sketch map of the underground work at the Eagan Mine (Anderson and Wagner, 1952, Figure 9).


No. 4 Adit
Sub-level
Intermediate level
No.3 Adit
No.2 Adit
Carson Adit
50
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150 Feet
Scale

adit and the 150-foot Montana adit. The latter was not on the Eagan lode. Mineralization occurred in highly altered latitic volcanic rocks that had been extensively fractured. Northwest-trending faults controlled the mineralization. The main ore zone had a strike of about N. 60° W., which varied locally to N. 30° W. The dip was 25°-55° NE. The main orebody was up to 20 feet wide and plunged about 40° NW., at about the same angle as the surface of the hillside. In places the vein split and was locally bordered by minor, parallel veins. Most of the ore remaining in the mine in the 1940s was of rather low grade (Anderson and Wagner, 1952).

Some ore was produced from the mine in 1942 and 1943. In 1949, 4 tons of mill cleanings was shipped from the Mineral district. Presumably, this material was from the Eagan mill. It yielded 3,160 ounces of silver and 1 ounce of gold.

BOONE MINE

The Boone Mine is on the ridge north of the townsite of Mineral at an elevation of about 3,700 feet (Figures 1, 3, and 4). It produced some rich ore in the early days of the district (Lindgren, 1901). Apparently no further work was done on the property. Development consisted of three main levels connected by raises (Figure 11). Additional workings not shown on Figure 11 included several short adits on the opposite side of the ridge (inaccessible in 1945) and a stope from the intermediate level to the surface. The mine is on a zone of fractures that trends about N. 50° W. and dips steeply northeast. The open stope trended N. 30°-60° W. and was inclined about 80° NE. However, most of the ore was along the parts of the vein where the strike was about N. 30° W. and the dip was nearly vertical (Anderson and Wagner, 1952).

ENTERPRISE MINE

The Enterprise is on the ridge above Mineral a short distance east of the Eagan and the Boone (Figures 1, 3, and 4). It is supposed to have produced some rich ore before 1900 (Lindgren, 1901) and was not worked again until 1918. At that time, it was operated by the Silver Cable Mining Co. under an agreement with the owners, Frank G. McCorkle and A.T. Shane. The adjacent Liberty and Kit Carson claims were apparently worked along with the Enterprise.

In 1918, a 20-inch streak of high-grade tetrahedrite ore that carried 150 ounces of silver per ton was discovered. The 1919 IMIR (p. 88) described the property as follows:

> Adjoining the Egan Mine to the east the McCorkle-Shane property was also operated with a small crew and shipped two cars of silver and copper mineral carrying 70 to 80 ounces silver and five per cent copper. This property has a number of promising ore courses well worth more extensive work.

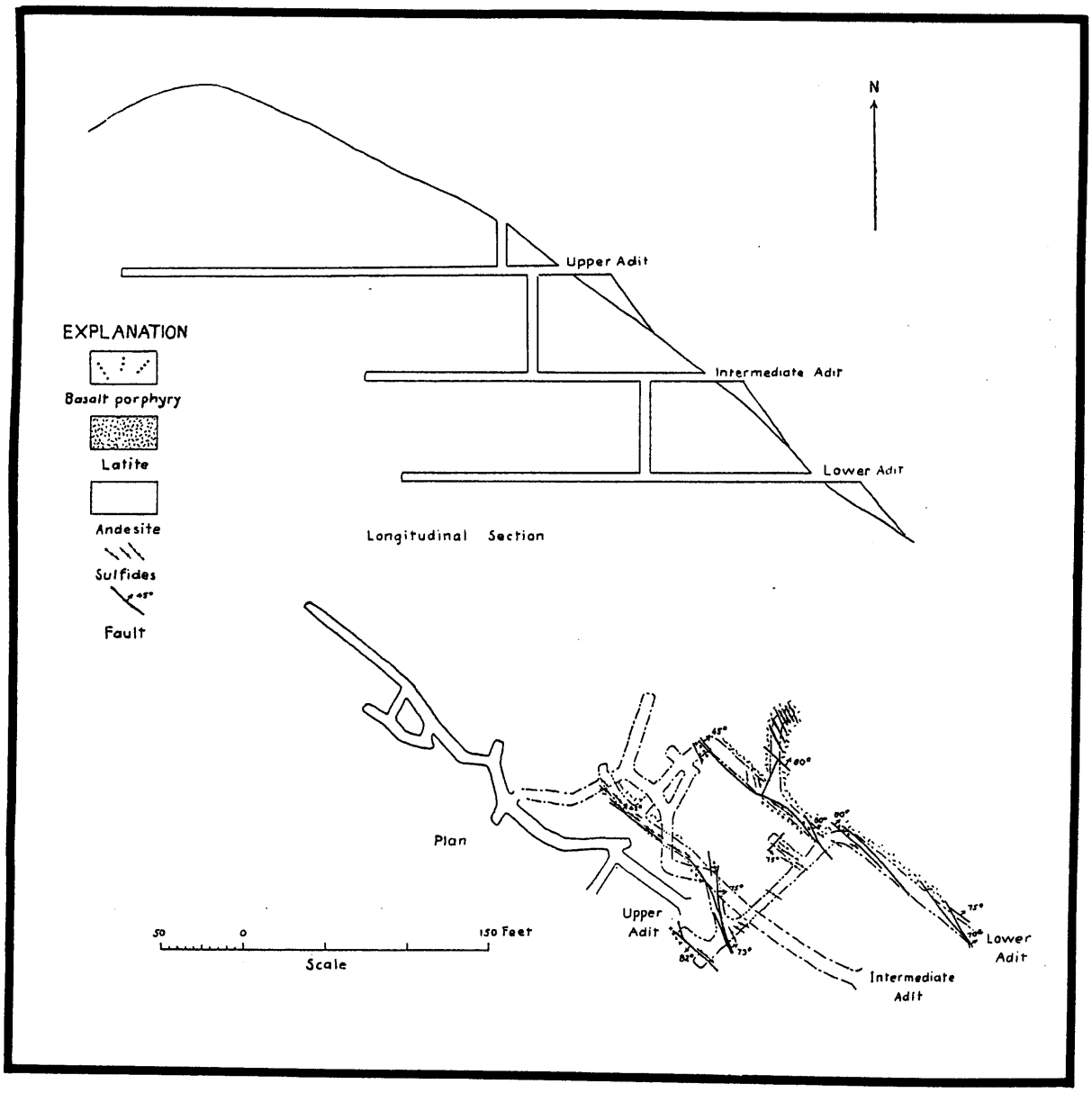

Figure 11. Plan and longitudinal section of the Boone Mine, with the geology shown on the lower adit level (Anderson and Wagner, 1952, Figure 11).

> There are a number of handsome idle silver-copper prospects in this district whose geology is favorable for permanency. A cross section of the district discloses a boss of eruptive granite succeeded by metamorphosed shales and limestones of carboniferous age with an excessive development of igneous intrusive rocks of varying character with conspicuous dikes of diabase, diorite and basalt. The vein courses hugging the basic dikes are traceable for hundreds of feet across the steep canyon topography and present some attractive opportunities for intelligent mining development enterprises.

The mine produced silver-bearing copper ore in 1918, 1919, and 1922. At the end of 1920, the claim block operated by Silver Cable Mining Co. had approximately 2,000 feet of workings. During the year, the company shipped 27 tons of ore that had an average value of $80 a ton. Total mining costs, including transportation and treatment, were $30 a ton.

An "important showing of new ore" was discovered on the Shane-McCorkle group in 1925. In 1930, the Idaho Mineral Mining Co., which was operating the Silver Still Mine, also shipped some ore from the McCorkle group (i.e., the Enterprise Mine). The low price of silver forced the company to discontinue its Idaho operations on October 15, 1930. As a result, the company forfeited its option on the Enterprise group. This was apparently the last work done on the property.

Development on the Enterprise consisted of a 180-foot adit with 380 feet of drifts driven to the northwest and the southeast about halfway between the portal and the face (Figure 12). Older work, consisting of cuts and short adits, was only partially accessible in the mid-1940s. The mine is in latitic rock that was extensively fractured along a northwest trend. It has several small veins, less than 150 feet long, that strike N. 45°-60° W. and dip 35°-45° NE. In places the veins are offset by faults with an east-northeasterly trend and a northerly dip. The ore was fine grained and consisted of galena and sphalerite with lesser amounts of pyrite, chalcopyrite, and some tetrahedrite (Anderson and Wagner, 1952).

LIBERTY MINE

The Liberty Mine is a short distance northeast of the Eagan Mine and northwest of the Enterprise (Figures 1 and 4). The workings consisted of an adit about 100 feet long, with small stopes extending above and below the adit level. The orebody, which the adit followed for about 60 feet, ended at a diabase dike. The strike of the orebody was N. 60° W. and the dip was N. 30° E. (Anderson and Wagner, 1952).

KING MINE

The King Mine is to the east of the Black Hawk and north of the Silver Bell at an elevation of about 3,900 feet on the hill above the Silver Still (Figures 1 and 3). The workings in the late 1940s consisted of a 60-foot adit and a 100-foot drift, with about 60

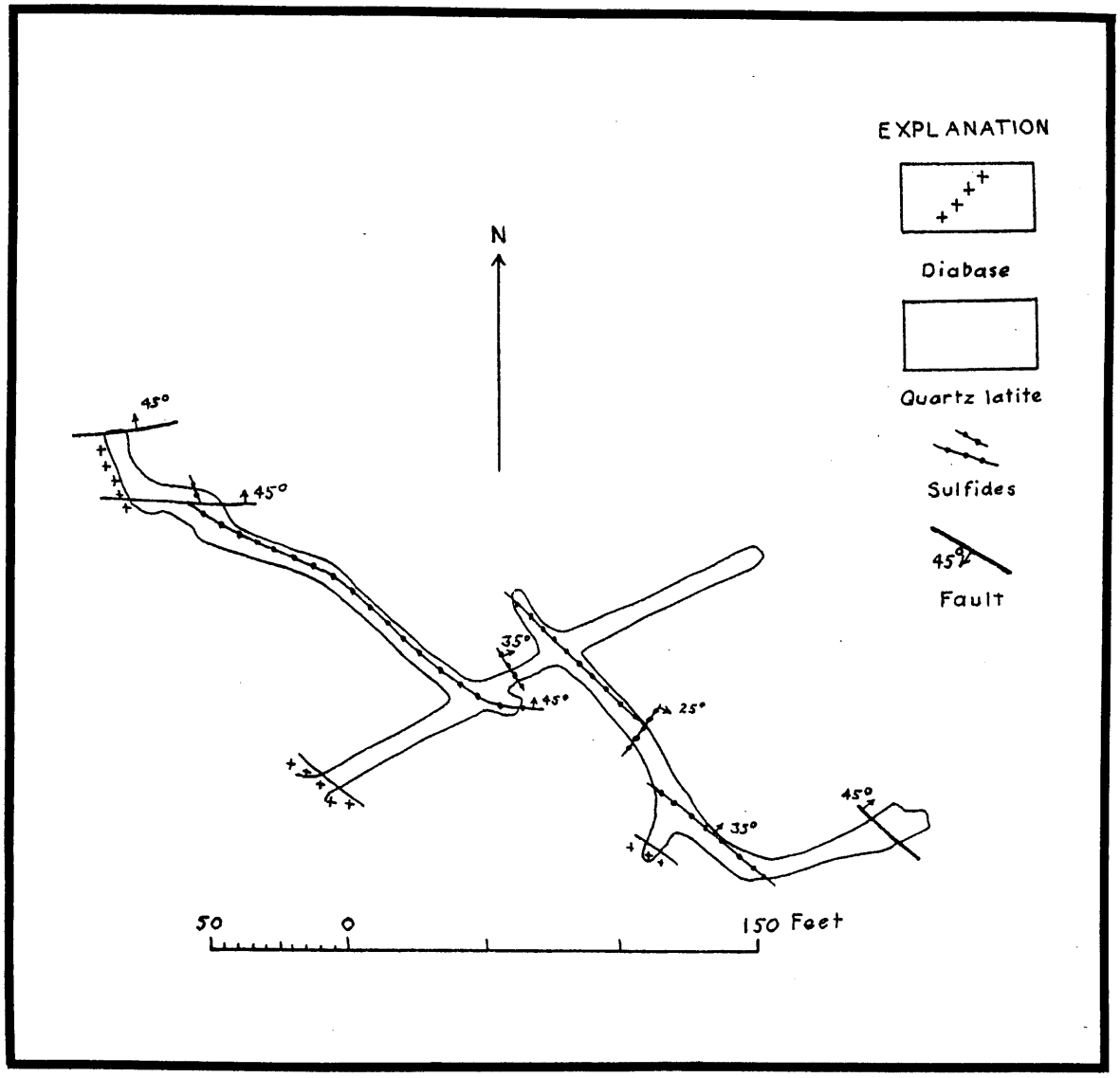

Figure 12. Geologic sketch map of the Enterprise Mine (Anderson and Wagner, 1952, Figure 12).

feet of exposed stopes extending to the surface a short distance above the adit (Figure 13). Mineralization was in a zone of fractured and altered volcanic rocks that trended northwest and dipped steeply to the northeast. The ore zone was lenticular; in places it was as wide as the tunnel, and in others it was broken into a series of small stringers. Ore minerals consisted of fine-grained pyrite with lesser amounts of sphalerite, chalcopyrite, and tetrahedrite. Assay results showed the ore contained less than 1 percent copper and generally less than 1 ounce of silver per ton (Anderson and Wagner, 1952).

BLACK JACK MINE (SALYER)

The Black Jack Mine is in a tributary gulch that enters Dennett Creek from the south. The mine workings are between 4,000 and 4,200 feet in elevation, and one of the dikes intercepted by the mine workings is the same as the one on the Silver Bell (Turner, 1908). Much of the work on the property seems to have been done before 1900, since the descriptions of the rocks in the Salyer tunnel (Turner, 1908) and the lower adit described by Anderson and Wagner (1952) are almost identical. Turner (1908) noted that the mineralization consisted of iron, copper, and zinc sulfides associated with tourmaline and quartz, but that the precious metal content of the material was too low for it to be considered ore. In the late 1940s, there were two adits on the property. A short adit and a winze had been driven into the outcrop of the mineralized zone, and a longer adit, intended to intersect the vein at depth, entered the hillside 210 feet below the shorter adit (Figure 14). The lower adit was not long enough to reach the vein, which dipped 40° S. in the upper workings (Anderson and Wagner, 1952).

CONDOR MINE (JESSIE)

The Condor Mine is on Dennett Creek about 1 mile above the townsite of Mineral between the elevations of 3,400 and 3,700 feet. The earliest workings on the property were on the Jessie claim, and later adits were located farther up the creek. The mine was worked before 1900, and Lindgren (1901, p. 455) described the deposit as follows:

> The Jessie, situated half a mile northwest of the town, at an elevation of 3,400 feet, represents a totally different type of deposit, and is developed by a tunnel 100 feet from the croppings. It is contained in a dioritic rock, but in the hanging wall is a dike of normal basalt with diabasic-granular structure. The strike of the well-defined vein is northeasterly, the dip 45° NW. The vein shows 2 to 3 feet of pyrite and chalcopyrite in gangue of quartz and tourmaline; in addition, the microscope shows the presence of specularite, vesuvianite, and a little dolomite and calcite. This ore is said to contain, besides much copper, 0.1 ounce of gold and 3 ounces of silver per ton.

One quartz vein on the property carried $10 per ton in gold (0.48 ounce at the then-current gold price of $20.67 an ounce) in the parts of the vein that were rich in sphalerite.

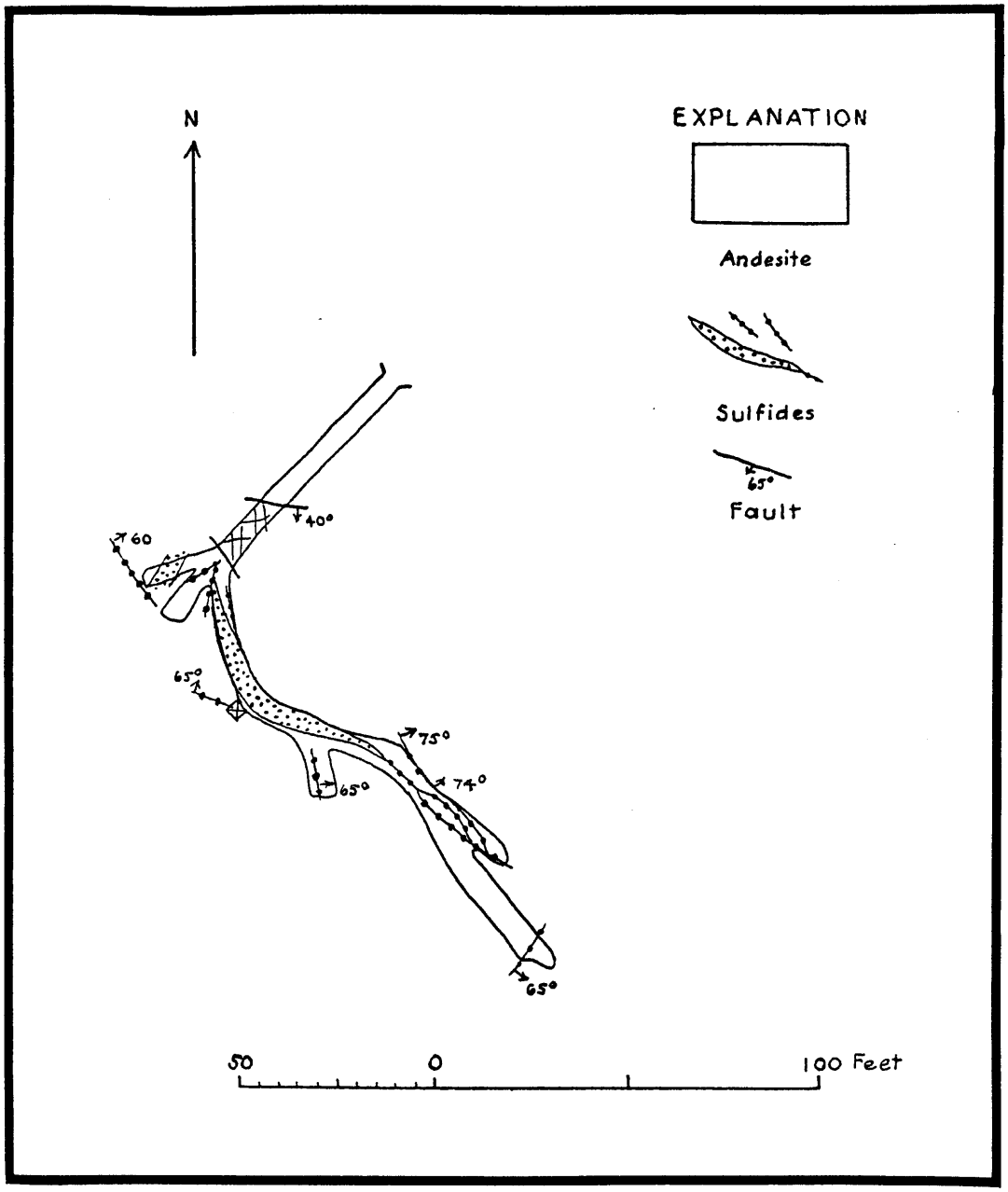

Figure 13. Geologic map of the King adit (Anderson and Wagner, 1952, Figure 8).

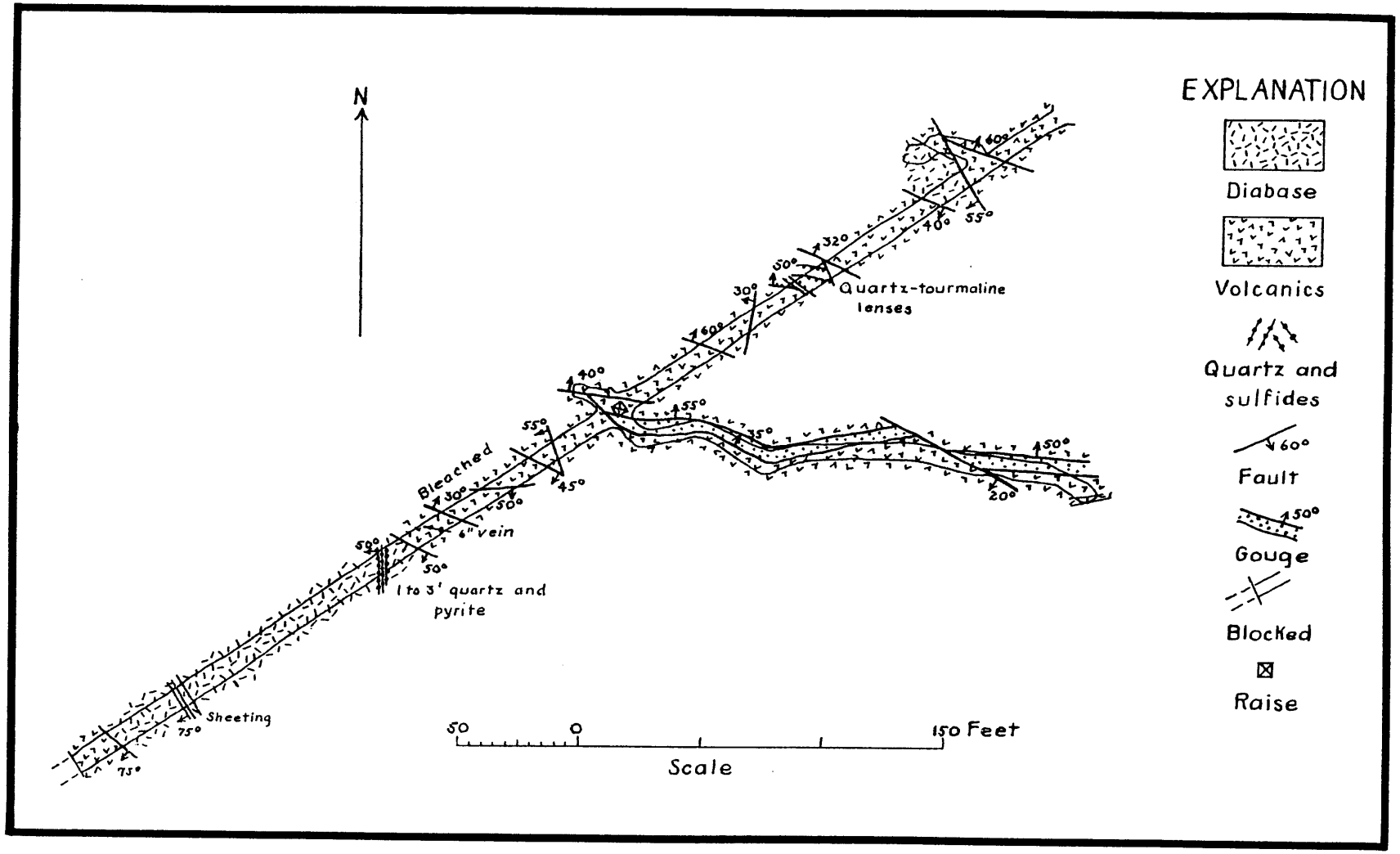

Figure 14. Geologic sketch map of the lower adit at the Black Jack Mine (Anderson and Wagner, 1952, Figure 13).

The vein in the lower tunnel of the Jessie workings contained tourmaline, pyrite, chalcopyrite, and hematite crystals (Turner, 1908).

Development on the property consisted of a number of short adits "on almost as many veins" (Figure 15). These veins were from a few inches to about 3 feet thick. The main work was on the Jessie adit, but the best exposures of the veins were on the outcrop and in the shorter adits just below the outcrop (Anderson and Wagner, 1952).

Some gold-copper ore was shipped from the Condor property in 1941. This is the only recorded production from the mine. Condor Mines, Inc., which operated the mine in 1941, listed the workings on the property as three tunnels (50 feet long, 48 feet long, and 52 feet long), one 12-foot-deep winze, and numerous surface cuts.

SILVER STILL MINE

The Silver Still Mine is on Dennett Creek just east of the Black Hawk (Figures 1, 3, and 4). At various times, the mine was also known as the Doris, Darris, Addie, Addie Darris, and North Star. Some of these names may represent subgroups of claims within the block that were eventually consolidated into the holdings of the Silver Still Mining Co. The Silver Still is the most productive mine in the district since the U.S. Bureau of Mines began compiling records in 1901. At times, operations at the Silver Still Mine also included the Enterprise, Condor, and Liberty properties.

The first description of this property was Livingston's (1923, p. 21) discussion of the North Star:

> The North Star property, owned by Peter Davis, is under bond by Mrs. E. J. Burnham. It is located on the hillside northeast[4] of Mineral and is opened by a tunnel about 150 feet above the creek, and a raise to the surface. This tunnel passes through a basalt dike into a broad, crushed zone, which is probably a fault. Ore occurs on the northeast side of the crushed zone but the size and position of the ore body are not shown by the scanty development work. The visible features suggest a zone of sparse mineralization, as much as 50 feet wide, within which occur streaks of high grade sulphide ore about one foot wide. These ore streaks strike a little west of north and are almost vertical. A crosscut in the oxidized portion of the zone of sparse mineralization shows about 50 feet of low grade ore, which has been reported to carry 10 to 12 ounces of silver per ton.

The Doris produced some siliceous silver ore in 1922, and in 1923, the North Star shipped one lot of silver ore to the smelter at Sumpter, Oregon. Silver Still Mining Co. was organized in 1924 and, at first, the company controlled only a small group of claims along Dennett Creek near the townsite of Mineral. The property had three tunnels and one shaft. The No. 1 tunnel was 110 feet; the No. 2, 60 feet; and the No. 3, 30 feet. The shaft was about 30 feet deep.

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[4]Actually, it was on a north-*facing* slope to the *south*east of Mineral.

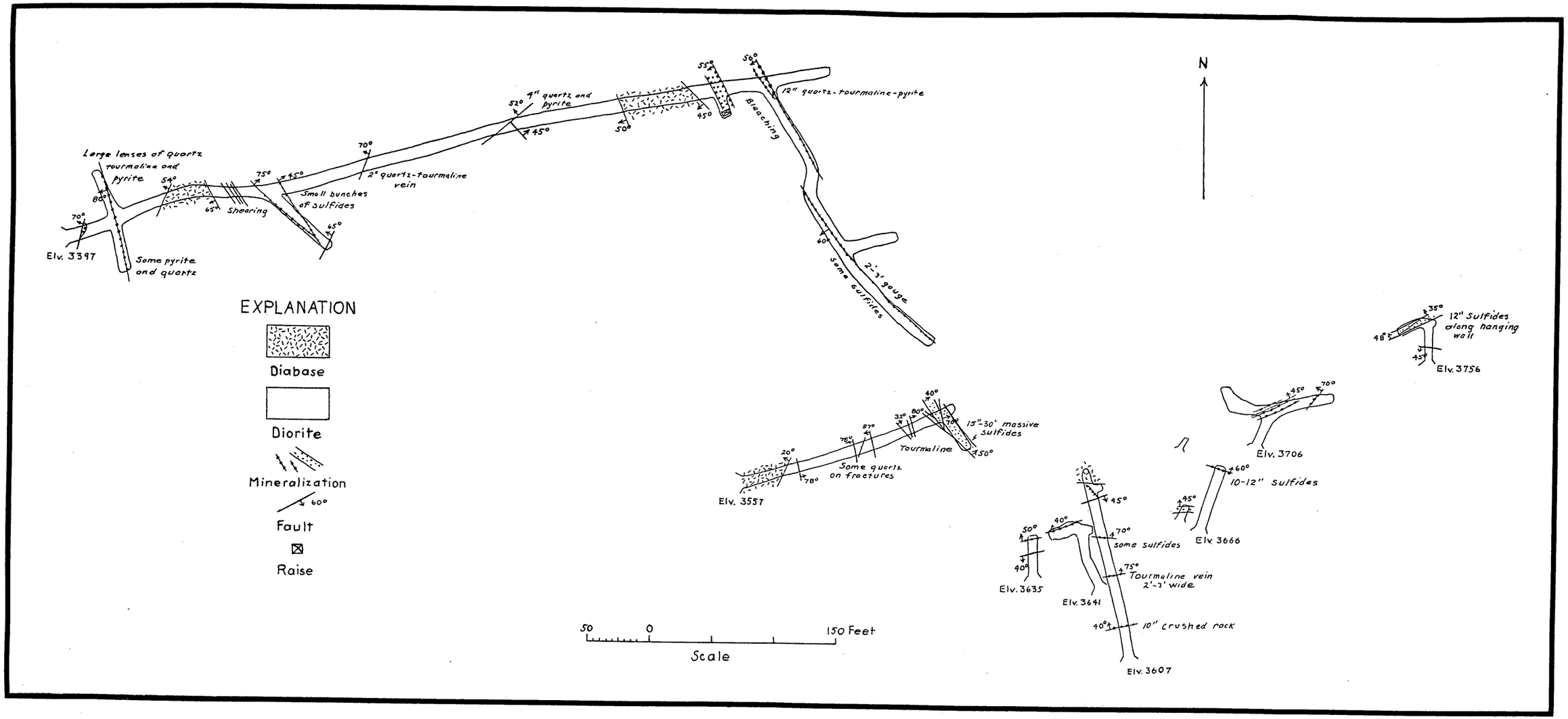

Figure 15. Geologic map of the workings on the Condor group (Anderson and Wagner, 1952, Figure 14).

In 1925, the company added to its claim block and did a small amount of work on the property. Total development was about 590 feet of workings, with 350 feet of the work scattered about the property in various small adits. (Table 3 shows development work on the property). In 1926, the company noted that the mine had fourteen veins, which together contained ore that averaged about $20 a ton in silver, copper, lead, and zinc. The company worked a few men for part of 1927. A crew of two men started development work in the No. 6 tunnel on May 22, 1928, and found a 6-foot ore zone; some of this ore was shipped during the year.

During 1929, three cars of oxidized copper ore were shipped from the Doris and Silver Still groups (Table 4). The ore ran about 30 ounces of silver to the ton. The company also did about 300 feet of tunnel work during the year. In November, Idaho Mineral Mining Co. (a subsidiary of Goldfield Deep Mines Co. of Nevada) obtained a lease and option to most of the mines adjacent to the townsite of Mineral, including the Silver Still. The purchase price for the combined properties was $95,000, of which $5,000 was paid in 1929. The new company installed a small gas-driven compressor and "complete mining equipment." A small office building and a compressor room were also constructed, and houses in the area were remodeled to serve as the bunkhouse and boarding house. An active development program started late in the year.

Idaho Mineral Mining Co. continued its development program in 1930, doing about 850 feet of work, primarily cleaning out old tunnels. The property had 870 feet of accessible workings, most of which the company had reopened. A car of siliceous silver ore and a car of sulphide copper ore were shipped to smelters near Salt Lake City, Utah. The low price of silver forced the company to discontinue its Idaho operations on October 15, 1930. (Metal prices reached all-time record lows in 1932.) Idaho Mineral Mining maintained its option on the Silver Still for another year. Except for assessment work, the mine was idle for the next two years. At this time, the workings at the mine consisted of two main tunnels, but only the upper one had found significant amounts of ore (Swanson, 1933).

According to the USBM, one car of silver ore was shipped from the mine to a smelter in 1933; the IMIR stated that no activity took place in the district during the year. In 1934, a crew of four men carried out stoping operations all summer. The mine shipped 560 tons of siliceous silver ore to a Utah smelter.

The Silver Still Mining Co. produced at least some ore every year for the following decade. Production for 1935 and 1936 was described as first-class silver ore. The company report for 1936 to the Idaho Mine Inspector stated, "We are doing a lot of development work and property is showing nicely." The mine had two tunnels, five raises, and seven crosscuts. The No. 1 tunnel was 750 feet long, and the No. 2 tunnel was 625 feet long. There were also 415 feet of shafts. The total development at the mine was about 2,260 feet of workings.

In 1937, the entire output of Washington County was first-class silver ore containing lead and copper, which was produced by Silver Still Mining Co. and shipped to a smelter

Table 3. Development work, employment, and operating companies at the Silver Still Mine, for selected years.

Year	No. of Men Employed	Tunnels (feet)	Cross-cutting (feet)	Drifting (feet)	Raising (feet)	Operator
1926	2	105	—	—	—	Silver Still Mining Co.
1928	2	[1]	—	—	—	Silver Still Mining Co.
1929	3/8[2]	[3]	—	—	—	Silver Still Mining Co./ Idaho Mineral Mining Co.
1930	11	870	530	340	—	Idaho Mineral Mining Co.
1931	8	—	197	112	—	Idaho Mineral Mining Co.
1936	2	—	—	150	125	Silver Still Mining Co.
1951	4	200	—	—	—	Silver Still Mining Co.

[1]The amount of development work was not given. The company report stated that work in the No. 6 tunnel had discovered a 6-foot vein and that some ore had been shipped from that level.
[2]Three men were employed by Silver Still Mining Co. and eight by Idaho Mineral Mining Co.
[3]The amount of development work was not given for the year, but Silver Still Mining Co. produced 105 tons of ore.

in Utah. Production for 1938 was virtually the same as 1937. James G. Still, the owner and operator, carried on a development campaign throughout the year.

Several cars of silver ore that contained lead and copper were shipped to smelters in Utah during 1939. In 1940, the mine shipped a few cars of crude silver ore. Between 1934 and 1940 the mine shipped 3,628 tons of ore, from which was obtained 37.4 ounces of gold, 138,243 ounces of silver, 81,219 pounds of copper, and 109,446 pounds of lead. According to Anderson and Wagner (1941), assays for the ore shipped between 1934 and 1940 ran 1.1 percent copper, 1.5 percent lead, and 38.1 ounces of silver and 0.02 ounce of gold per ton. The mine also produced silver-copper ore in 1941, 1942, and 1943.

The major workings on the property in the late 1940s were two adits driven into the steep hillside on the south of Dennett Creek. The Lower Hancock level was at creek level, and the Upper Hancock level was about 140 higher. Stopes went downward a short way from the Upper Hancock level and upward to the surface. The two adits were connected by a raise, and a short intermediate level had been driven from the raise about 50 feet below the upper level (Figure 16). The adits both started in dioritic rock and entered a zone of highly fractured and altered volcanic rock that contained most of the orebodies. Irregularly and generally sparsely distributed sulfides occurred throughout the zone, but long, narrow orebodies formed along the more prominent fractures. These ore zones were nearly vertical, and some were continuous over several hundred feet, commonly

Table 4. Mine output and economic data for the Silver Still Mine for 1929 and 1930.

Year	Tons of Ore	Total Mining Cost (per ton)	Treatment Cost (per ton)	Silver Recovered (ounces)	Copper Recovered (pounds)	Lead Recovered (pounds)	Zinc Recovered (pounds)
1929[1]	105	$6.00	—	3,549	588	[2]	[3]
1930[4]	65.5	—	$3.75	1,728	2,993	—	—

[1]Production by Silver Still Mining Co.
[2]The ore contained 5.2% lead, which was not recovered.
[3]The ore contained 7.1% zinc, which was not recovered.
[4]Production by Idaho Mineral Mining Co.

overlapping one another. The ore left in the mine in the late 1940s ran somewhat higher in copper and lower in silver than the ore that had been shipped. Also, it carried 2-3 percent zinc and up to 3 percent lead (Anderson and Wagner, 1952).

In 1948, the entire output of Washington County was 40 tons of copper-silver ore produced from the Silver Still. The mine operated from April through December 15, 1950, and shipped 139 tons of silver smelting ore to a smelter in Utah. The ore yielded 2 ounces of gold, 3,191 ounces of silver, 5,167 pounds of copper, and 2,136 pounds of lead. This was apparently the last ore that was produced from the Mineral district.

TATE PROSPECT

The Tate Prospect is located on the ridge northeast of the Condor (Figures 1 and 3). Only a little work had been done on the property by the mid-1940s. It had about a dozen quartz-tourmaline veins with strikes of about N. 80° E. and dips of 55°-80° NW. The veins ranged up to 35 feet in width and were composed of quartz with some coarse-grained pyrite, chalcopyrite, sphalerite, and tourmaline (Anderson and Wagner, 1952).

AZURITE PROSPECT

The Azurite Prospect is to the south of the Tate Prospect on the ridge between the main fork of Dennett Creek and a tributary that branches to the northeast just east of the Condor (Figures 1 and 3). A short adit on the Azurite No. 1 claim followed a 12-inch vein to the east-northeast. This vein contained quartz, pyrite, chalcopyrite, and sphalerite. A second vein on the Azurite No. 2 claim was about 18 inches thick and could be traced by surface float for over 100 feet (Anderson and Wagner, 1952).

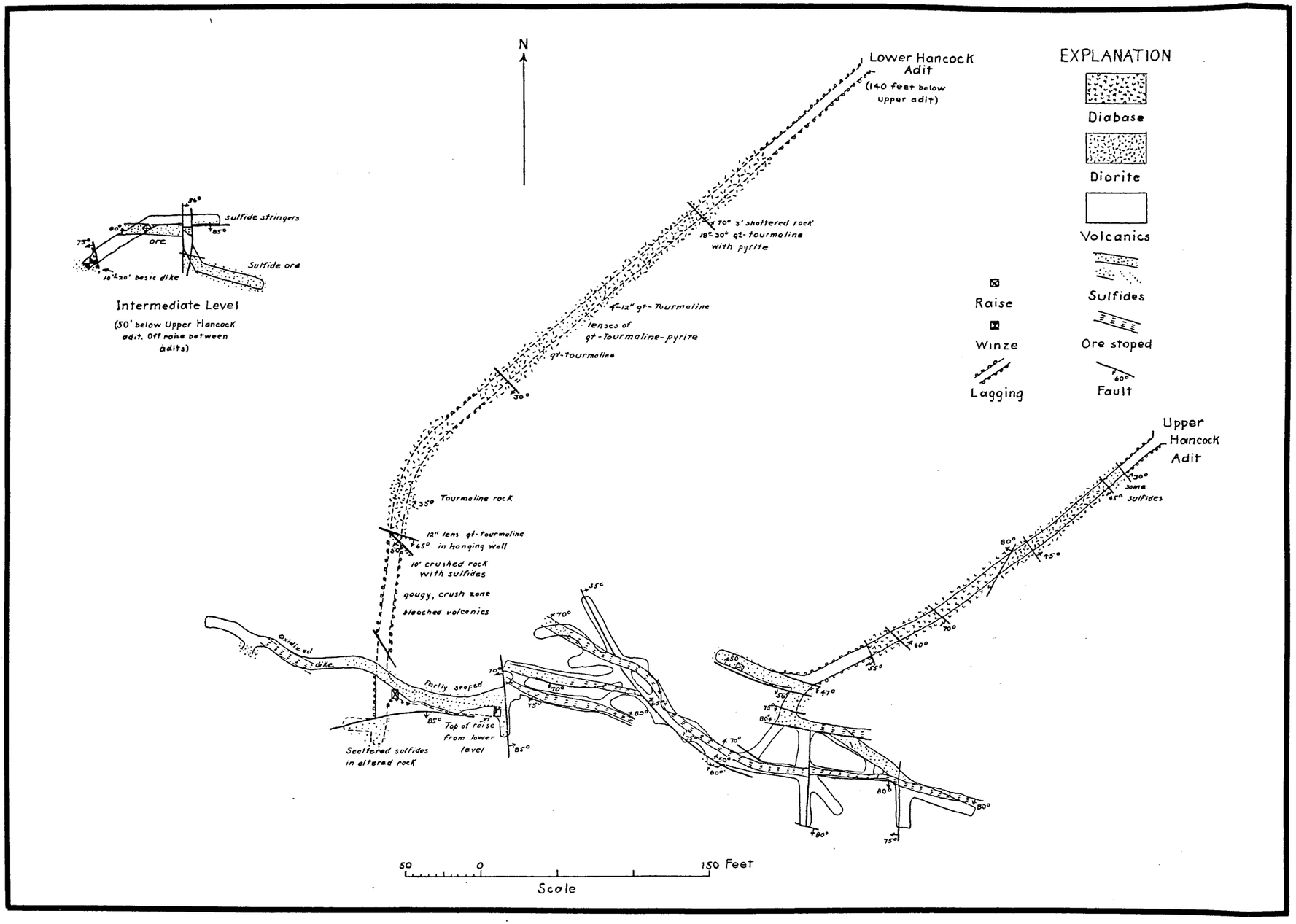

Figure 16. Geologic map of the underground workings at the Silver Still Mine (Anderson and Wagner, 1952, Figure 6).

DENNETT CREEK PROSPECT

The Dennett Creek Prospect is to the east of the Tate between elevations of about 4,800 and 5,500 feet. The prospect covers an area of extensively fractured and mineralized rock and has been explored by a number of cuts and short adits that uncovered many small veins with an east-northeast trend. The veins were normally 1-2 inches thick and rarely exceeded 2 feet, but they were so closely spaced in many places that they formed a stockwork (Anderson and Wagner, 1952). As discussed above, this may be the property worked by the Gem State Copper Co. in the late 1920s. This prospect is also just downhill from the Consumers' Cooperative Iron Mountain Gypsum Mine, which was active from 1981-1985 and which represents the only mining operation in the vicinity of the Mineral district since the early 1950s.

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