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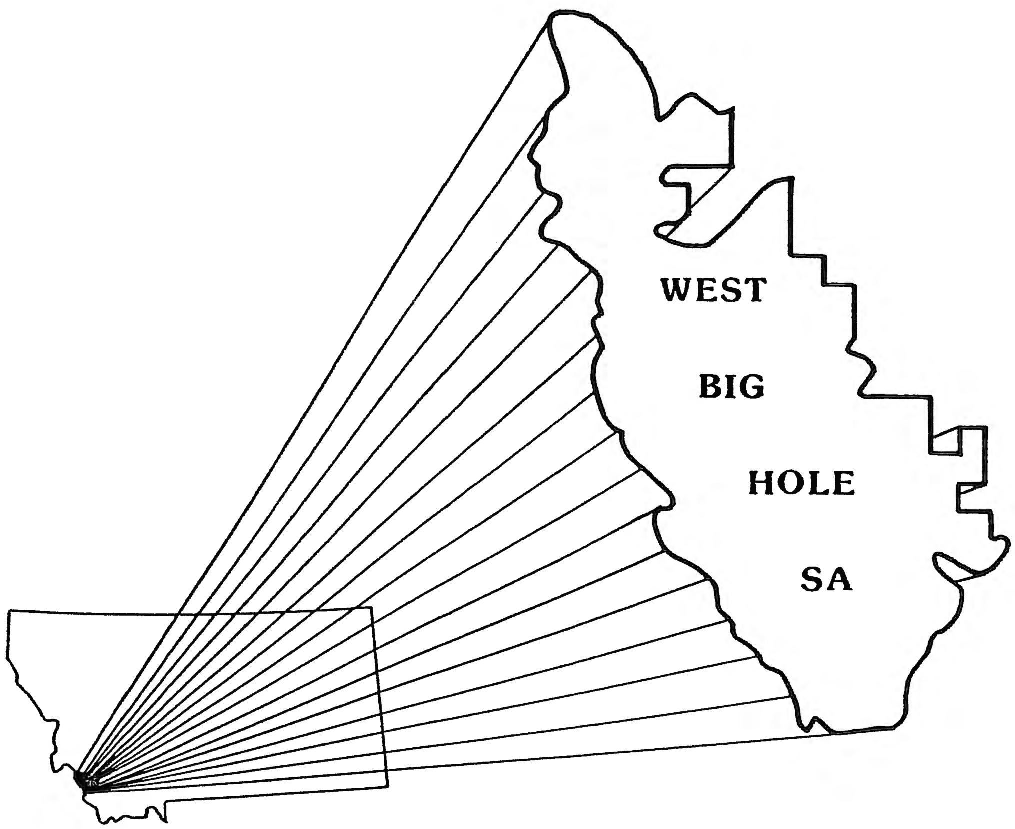
Mineral Resources of the West Big Hole Study Area, Beaverhead County, Montana



BUREAU OF MINES

UNITED STATES DEPARTMENT OF THE INTERIOR

MINERAL RESOURCES OF THE WEST BIG HOLE STUDY AREA, BEAVERHEAD COUNTY, MONTANA

By
David A. Lipton, Martin D. Conyac, and Spencee L. Willett

MLA 16-88

Western Field Operations Center
Spokane, Washington

UNITED STATES DEPARTMENT OF THE INTERIOR
Donald P. Hodel, Secretary

BUREAU OF MINES
T S Ary, Director

MINERAL BRIEFING SUMMARY

Area Name, Number, Classification, Size

West Big Hole study area (I1-943 and A1-943), 109,000 acres

State

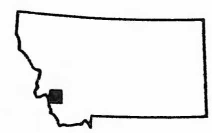
Montana

National Forest

Beaverhead

Mineral Commodity Significance

An estimated 452,000 tons of identified subeconomic gold-silver resources, containing between 0.02 and 0.23 oz/ton gold and as much as 4.8 oz/ton silver, occur at four lode properties in and near the study area. Gold, silver, and base-metal content in samples of poorly exposed mineralized structures indicate exploration may identify resources in 18 additional lode properties within the study area and 5 adjacent to it. Alluvial (placer) reconnaissance samples show significant gold values on 11 streams. The occurrences may be of interest to recreational suction dredgers.



Recorded Production

Lode mine production occurred intermittently between 1902 and 1965. U.S. Bureau of Mines records, Geach (1972), and Umpleby (1913) show that the Ajax mine produced 979 oz of gold, 7,621 oz of silver, 299 lb of copper, and 140,239 lb of lead; Copper Queen mine produced 4 oz of silver and 22 lb of copper; Jahnke mine produced 16 oz of gold, 1,238 oz of silver, 4,804 lb of copper, and 17,129 lb of lead; and the Jackson mine 1 oz of gold, 73 oz of silver, and 5,108 lb of lead. Production from four mines adjacent to the area totaled 740 oz of gold, 2,361 oz of silver, 293,776 lb of copper, and 391 lb of lead.

Mining Districts, Mines, and Claims

The area is partly covered by the Jahnke, Pioneer, Jackson/Miner Creek, Ajax, Ranger, and Saginaw mining districts. Districts bordering the project area include the Pioneer (north), North Fork, Carmen Creek, Kirtley Creek, Eldorado, and Sandy Creek. About 468 lode and 18 placer claims were located or relocated since 1885 in the study area. In 1985, 275 unpatented lode claims were current. There are nine patented claims. A total of 218 mine and prospect workings were studied in or adjacent to the study area.

Recent Company Activity

In 1985, exploration and assessment work was underway at the Lucy prospect and the Ajax mine. The Silver Ridge claim was recently active but is currently idle.

Mineral Setting

The study area is primarily underlain by quartzite of the Precambrian-age Belt Supergroup. Numerous diabase and mafic dikes and sills have intruded these rocks. Most of the Belt and intrusive rocks are covered by glacial conglomerate. Extensive faulting has occurred along the continental divide as a result of the activity of two thrust plates overlapping in the area. Principal mineralized structures are gold- and silver-bearing quartz veins which are in most cases associated with the dikes and sills. Copper and lead occur as accessory minerals in most of the vein systems.

Recommendations

More extensive work would be needed to further delineate the four properties in and near the study area that contain identified resources, and the 23 additional lode properties with locally significant metal content in poorly-exposed mineralized structures. Work should include more detailed sampling, geochemical and geophysical surveys, and drilling, where warranted.

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PREFACE

The Wilderness Act (Public Law 88-577, September 3, 1964) and related acts required the U.S. Bureau of Mines and U.S. Geological Survey to survey certain areas of Federal lands ". . . to determine the mineral values, if any, that may be present . . ." Results must be made available to the public and be submitted to the President and the Congress. This report presents the results of a Bureau of Mines mineral survey of the West Big Hole study area (I1-943 and A1-943), Beaverhead County, MT, which was classified as Non-wilderness Recommended during the Second Roadless Area Review and Evaluation (RARE II) by the Forest Service, January 1979, and later reclassified for wilderness review.

This open-file report contains data gathered and interpreted by Bureau of Mines personnel from Western Field Operations Center, East 360 Third Avenue, Spokane, Washington 99202. The report has been edited by members of the Branch of Resource Evaluation at the field center and reviewed at the Division of Mineral Land Assessment, Washington, DC.

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UNIT OF MEASURE ABBREVIATIONS USED IN THIS REPORT, AND CHEMICAL FORMULAS AND NAMES OF MINERALS IDENTIFIED IN THE STUDY AREA

ft^3	cubic foot
ft	foot
in.	inch
mg	milligram
mi	mile
lb	pound
oz	troy ounce
oz/ton	troy ounce per ton
%	percent
yd^3	cubic yard

arsenopyrite	FeAsS (iron arsenic sulfide)
azurite	$Cu_3(CO_3)_2(OH)_2$ (hydrous copper carbonate)
bornite	Cu_5FeS_4 (copper iron sulfide)
chalcocite	Cu_2S (copper sulfide)
chalcopyrite	$CuFeS_2$ (copper iron sulfide)
chrysocolla	$CuSiO_3 \cdot 2H_2O$ (hydrous copper silicate)
cuprite	Cu_2O (copper oxide)
galena	PbS (lead sulfide)
hematite (specular)	Fe_2O_3 (iron oxide)
limonite	hydrated iron oxide group
magnetite	Fe_3O_4 (iron oxide)
malachite	$Cu_2(CO_3)(OH)_2$ (hydrous copper carbonate)
marcasite	FeS_2 (iron sulfide)
molybdenite	MoS_2 (molybdenum sulfide)
psilomelane	MnO_2 (manganese oxide)
pyrite	FeS_2 (iron sulfide)
scheelite	$CaWO_4$ (calcium tungstate)
sphalerite	ZnS (zinc sulfide)

SUMMARY

In the summer of 1985, at the request of the U.S. Forest Service, the U.S. Bureau of Mines examined the 109,000-acre West Big Hole study area to evaluate its identified mineral resources. The study area is in Beaverhead County, about 50 mi west of Dillon, MT.

Four lode properties within or adjacent to the study area contain an estimated 452,000 tons of identified subeconomic gold-silver resources. Resources ranged from 900 to 302,000 tons, with estimated grades between 0.02 and 0.23 oz/ton gold and as much as 4.8 oz/ton silver. Gold, silver, and base-metal content in samples of poorly exposed mineralized structures indicate that exploration may identify resources on 18 additional lode properties within the study area and 5 properties adjacent to it.

The area is primarily underlain by quartzite of the Precambrian-age Belt Supergroup. Extensive faulting has occurred along the continental divide as a result of the activity of two thrust plates overlapping in the area. Numerous diabase and mafic sills and dikes have intruded the Belt rocks. Principal mineralized structures are gold- and silver-bearing quartz veins which are, in many cases, associated with the dikes and sills. Copper and lead occur as accessory minerals in most of the vein systems but as the primary metals in some veins.

Production of gold, silver, copper, or lead, valued at about $668,000 at current prices, has been recorded from four lode mines in the study area. Four other lode mines have produced within 1 mi of the area. Placer gold production was not recorded. There are no active mines. Approximately 468 lode and 18 placer claims have been located or relocated in the study area since 1885; 275 unpatented claims were current in 1985. Nine lode claims are patented. Approximately 218 workings and mineralized outcrops at 42 localities in or near the study area were examined during the study.

Most of the vein systems are narrow, and would not be economic at standard mining width, and all would have to be mined by underground methods (at a cost in excess of $100/ton). Access to nearly all of the workings is extremely difficult, as they are located in steep terrain on or near the continental divide. Mining would be dependent on the weather - a mining season of only about five months for these small size deposits. There are no custom milling facilities near the study area, and the nearest railroad is 50 mi distant in Dillon. A centrally located custom milling facility would reduce many of the transportation and milling costs.

Reconnaissance pan samples showed that 11 streams in the area contained placer gold. Gold content went as high as 125 cents/yd^3. Recreational suction dredging might be of interest to small-scale operators.

Glacial river sand and gravel accumulations in the study area are too distant from major markets to be resources, and stone in the study area is not suitable for decorative or dimension use. Occurrences of energy minerals have not been identified. There are no mineral, oil and gas, or geothermal leases.

INTRODUCTION

This report describes the USBM (U.S. Bureau of Mines) study to evaluate mineral resources of the West Big Hole study area at the request of USFS (U.S. Forest Service). The USBM examined individual mines, prospects, claims, and mineralized zones, and evaluated identified mineral resources. Results of the investigation will be used to help determine the suitability of the study area for inclusion into the National Wilderness Preservation System. Although the immediate goal of this and other USBM mineral surveys is to provide data for the President, Congress, government agencies, and the Public for land-use decisions, the long-term objective is to ensure the Nation has an adequate and dependable supply of minerals at a reasonable cost.

Setting

The West Big Hole study area encompasses 109,000 acres in the southwestern part of Montana on the Idaho-Montana border, approximately 55 mi west of Dillon (fig. 1). Access to area borders is by gravel and unmaintained roads from U.S. Highway 93 and State Highways 43, 287, and 278 (pl. 1). Most of the major drainages have old jeep trails that turn into pack trails to the continental divide, which forms the west boundary of the study area. The area is high in elevation. The eastern edge is part of the Big Hole Valley, with elevations averaging 7,000 ft. Most of the study area lies in the Beaverhead Mountains with elevations as high as 10,621 ft at Homer Youngs Peak. The Beaverhead Mountains are part of the southern portion of the Bitterroot Range of the northern Rocky Mountains.

The climate of the area is extremely variable. In the valleys, temperatures in summer months can reach the 90's (°F). Winter months often have average temperatures in the 20's (Tucker, 1975, p. 15). Mountain temperatures are usually 10 to 20 °F cooler than the valley areas. Precipitation in the valleys averages about 10 in. or less per year, which is considered semiarid. The mountain areas usually have yearly snow accumulations of up to 10 ft or more, and many of the snowfields last year-round. Travel may be restricted from October or November to May or June in some areas of the range. Sagebrush and grasses predominate in the lower valleys; higher elevations support yellowpine, Douglas fir, spruce, and lodgepole pine (Anderson, 1959, p. 12). Figure 2 shows typical geomorphology and vegetation overgrowth in the mountainous part of the area.

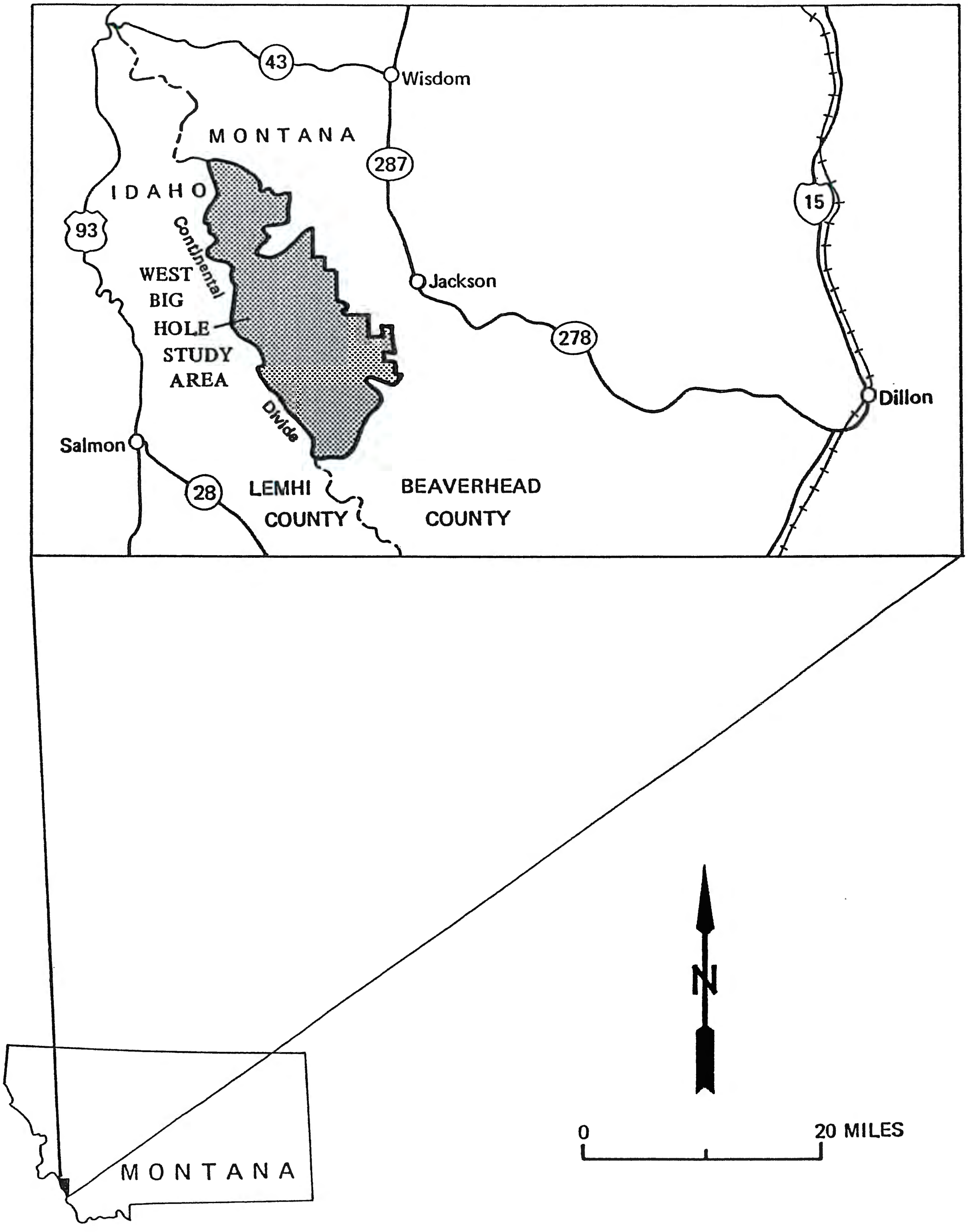

FIGURE 1.– Location of the West Big Hole study area, Beaverhead County, Montana

Figure 2.--View southwest along the continental divide.
Note the numerous glacial lakes and glacial
geomorphology of the area. The lakes are called
Rock Island Lakes and are located at the head of Miner Creek.

Previous Studies

There has been much geologic and mining information written about the West Big Hole study area and vicinity. Geological publications on the area and vicinity include Umpleby (1913), Mackenzie (1949), Ross and others (1955), Anderson (1959), Ross (1963), Harrison (1972), Brown (1973), Coppinger (1974), Tucker (1975), Bond (1978), Ruppel (1978), McClernan (1981), Peterson (1981), Ruppel and others (1981), Ruppel (1982), and Ruppel and Lopez (1984). The mines and limited production figures have been reported in Umpleby (1913), Winchell (1914), Sassman (1941), Lyden (1948), Mackenzie (1949), Walker (1963), Geach (1972), Coppinger (1974), Tucker (1975), and Strowd and others (1981). Umpleby (1913), Sahinen (1935), Geach (1972), Krohn and Weist (1977), Strowd and others (1981), and Loen and Pearson (1984) all described mining districts in either the study area or in the adjoining areas in Montana and Idaho. The operating or idle mines and known mining districts from about 1935 were listed in 32 Montana Bureau of Mines and Geology publications. Historial mining information about the West Big Hole area includes Dingman (1932), Noyes (1966), Geach (1972), Coppinger (1974), and Loen and Pears (1984).

Present Study

Work by the USBM on the West Big Hole study area involved prefield, field, and report preparation stages. Personnel from the Bureau's Western Field Operations Center (WFOC), Spokane, WA, began this investigation with a search for all literature pertinent to the geology and mineral resources of the study area and surrounding region. An examination of courthouse records of Beaverhead County was conducted to determine mining claim locations. In addition, current claim activity was researched using BLM (U.S. Bureau of Land Mangement) mining and mineral lease records. Attempts were made to contact all current claimants for permission to examine their mines and prospects and to obtain pertinent scientific or historial information. In some cases, claimants accompanied the authors to the mineral property. USBM files were checked for information on known mines and prospects, and regional offices of the USFS were contacted to determine if any active claims or mineral and fuel leases were within the study area. Field studies involved searches for all mines, prospects, and claims which were indicated by prefield studies to be within or near the study area. Those found were examined and, where warranted, mapped and sampled. Mines and prospects outside, but near the study area, also were investigated to determine whether mineralized zones might extend into the study area and to establish guides to mineralized zones in the area. In addition to ground investigation, air reconnaissance was undertaken to help locate known and unknown workings and rock alteration zones.

A total of 473 rock samples were collected at 42 mines, prospects, claims, and mineralized sites (pl. 1). The rock samples were of four types: 1) chip - a regular series of rock chips taken in a continuous line across a mineralized zone or other exposure; 2) random chip - an unsystematic series of chips taken from an exposure of apparently homogeneous rock; 3) grab - rock pieces taken unsystematically from a dump, stockpile, or of float (loose rock lying on the ground); and select - pieces of rock chosen, generally, from the apparently best mineralized parts of a stockpile or exposure, or of any particular fraction (e.g., quartz host rock). Only chip samples were used for estimates of resource tonnage and grade. One petrographic sample was taken to identify the dike rocks.

The rock samples were analyzed at the USBM Research Center in Reno, NV, and were fire-assayed for gold and silver (see glossary for description of analytical procedures). Presence and abundance of other identified or suspected elements of possible economic significance were determined by the ICP (inductively coupled plasma) method. Many of the samples were analyzed for 40 1/ elements by semiquantitative emission spectrographic methods to detect unexpected elements of possible significance. Samples appearing to contain anomalous concentrations were reassayed by quantitative methods.

There were 42 reconnaissance alluvial (placer) samples taken. They were of surficial sand and gravel, generally one or two level 14-in. panfuls concentrated on site to check for presence of placer gold or other heavy minerals. Table C-1 lists the samples taken in the area, and figure 7 shows their locations. The samples, partially concentrated in the field, were further concentrated at WFOC on a laboratory-size Wilfley 2/ table. Resulting heavy mineral fractions were scanned with a binocular microscope to determine heavy mineral content. When gold was detected, larger particles were hand-picked and weighed along with fine gold recovered by amalgamation. Concentrates were also checked for radioactivity and fluorescence.

Appendix C lists complete analyses for all rock and alluvial samples taken in the West Big Hole study area. The most significant samples are described in detail in discussions of the mines and prospects in appendices A and B.

1/ Aluminum, antimony, arsenic, barium, beryllium, bismuth, boron, cadmium, calcium, chromium, cobalt, copper, gallium, gold, iron, lanthanum, lead, lithium, magnesium, manganese, molybdenum, nickel, niobium, palladium, phosphorus, platinum, potassium, scandium, silicon, silver, sodium, strontium, tellurium, thallium, tin, titanium, vanadium, yttrium, zinc, and zirconium.

2/ Trade names are used for descriptive purposes only and do not imply endorsement by the USBM (also see glossary).

ACKNOWLEDGEMENTS

The authors wish to express a special thanks to Andy and John Siaperos who were extremely helpful in providing us with background information and data on their properties. USFS personnel Sandy Skotupa and Mark Vattaion made available claim data and road and trail access information. Calvin Boland, Bill Wikstrom, and John Jackson, college students, assisted in field examinations of mining properties in 1985.

GEOLOGIC SETTING

The geology of the study area is extremely complex, both structurally and stratigraphically, and mineralization was influenced by this complex system. The area is situated in a thrust belt covering southwest Montana, east-central Idaho, and part of eastern Washington. The thrusting occurred in the Cenozoic age. Two major thrust plates composed of Belt Supergroup rocks overlap within and adjacent to the study area. They are the Medicine Lodge plate and the Grasshopper plate. Figure 3 (adapted from Ruppel and Lopez, 1984, pl. 1; and Tucker, 1975, pl. 1) shows the relationship of the two plates and some of the major faulting which coincided with the thrusting. The Grasshopper thrust plate is structurally beneath the Medicine Lodge.

The emplacement of Tertiary-age intrusive igneous rocks, sources of the mineralizing fluids, near or in the thrust system appears to have been controlled by both plates (Ruppel and Lopez, 1984, p. 35). Figure 3 shows some of the intrusions and their association with the structure of the area. Figure 4 also is a generalized map (adapted from Harrison, 1972, p. 1218) showing granitic rocks near the study area. Throughout the study area, strongly sheared and altered, Cretaceous/Tertiary-age diabasic and mafic dikes intrude the plates. Another system of dikes and sills with accompanying mineralization are composed predominantly of granodiorite and have their largest exposures around Squaw Mountain (not shown on map).

"Because the Belt formations are so thick and contain so few reliable horizon markers, details of the structure are difficult to trace" (Anderson, 1959, p. 45). Large areas of the Belt Supergroup are obscured by Pleistocene-age glaciation debris. Despite the widespread occurrence of the Belt Supergroup, it is poorly understood, except in intensely studied areas, but even some of these studies contradict one another. For more detailed discussion on individual members of the Belt Supergroup, see the following references: Anderson (1959), Walker (1963), Geach (1972), Coppinger (1974), Tucker (1975), and Ruppel and Lopez (1984). In the Beaverhead Mountains, Belt rocks show a general northwesterly regional strike with dips to the northeast and east (Coppinger, 1974, p. 165).

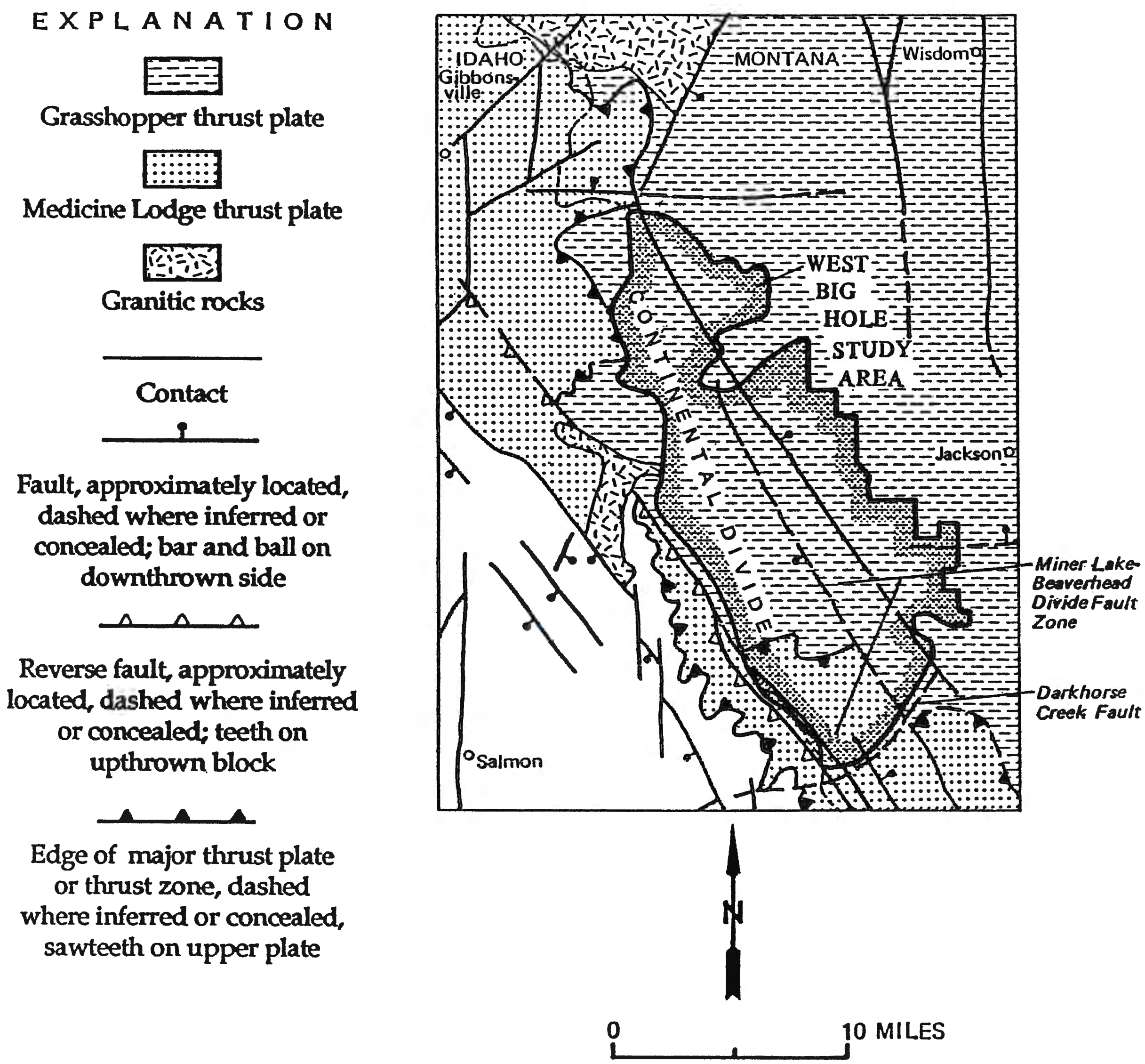

FIGURE 3.— Structural geology in and around the West Big Hole study area (adapted from Ruppel and Lopez, 1984, pl. 1; and Tucker, 1975, pl. 1)

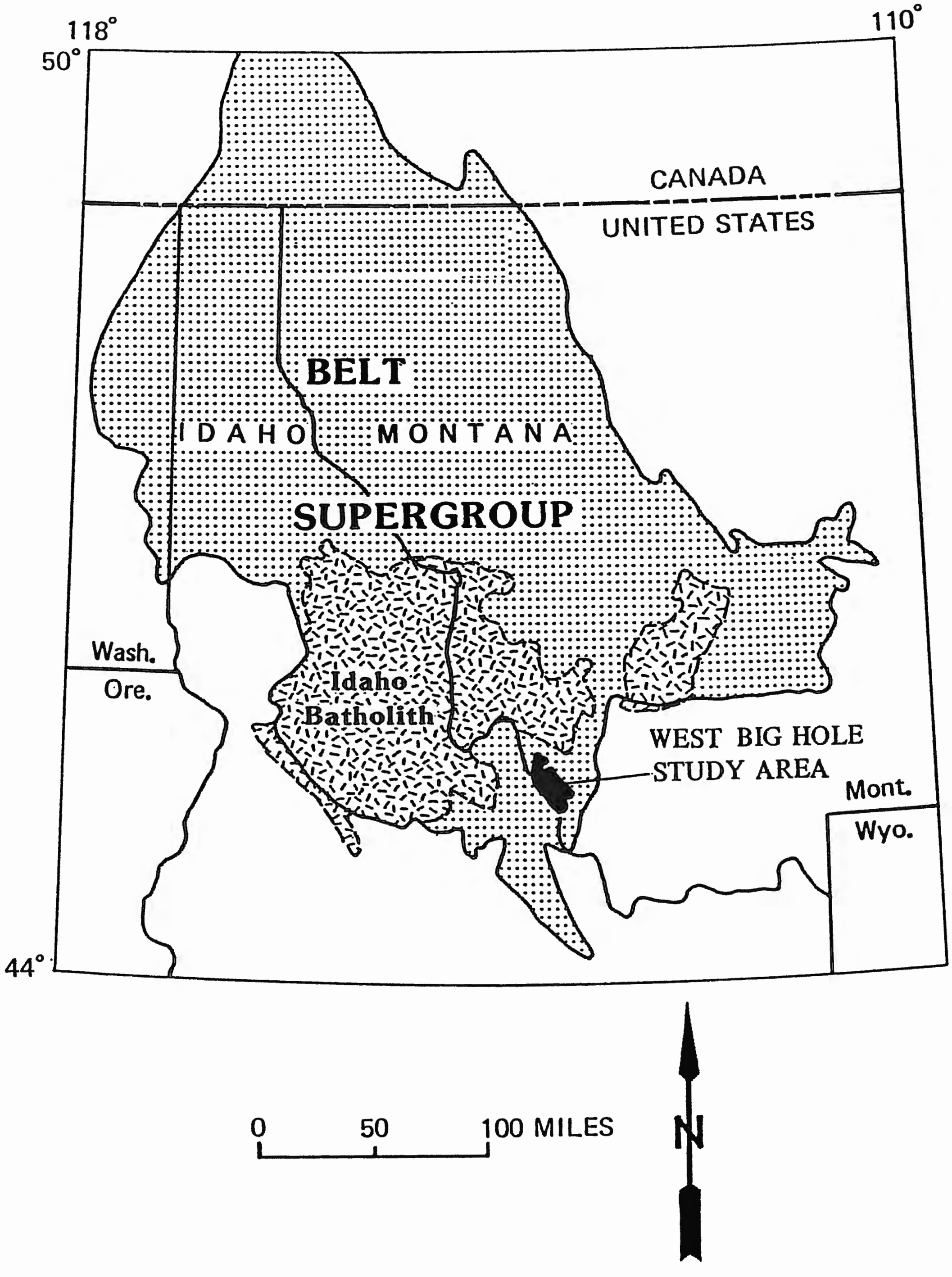

FIGURE 4.– Generalized geologic map showing the Precambrian-age Belt Supergroup and Tertiary-age Idaho Batholith rocks relative to the West Big Hole study area

Other geologic structures in the area also controlled mineralization. The Miner Lake fault runs northwest along the continental divide and merges with the Beaverhead Divide fault zone (Ruppel, 1978, p. 4; and Mackenzie, 1949, p. 34). The fault zone continues southeast until it is cut off by the Dark Horse Creek fault (Tucker, 1975, pl. 1). This fault runs northeast (fig. 3).

In the study area, mineral-bearing quartz veins and stringers occur throughout the Belt rocks and in most cases are associated with the diabase dikes. Twenty-one mines and prospects explore this type of occurrence, notably the Ajax and Copper Queen mines and the Flying Cloud, Hope, Treasure Box, High, and Old Timer prospects, as well as an unnamed prospect (pl. 1, nos. 7, 8, 9, 15, 18, 19, 25, 30). Several other quartz vein systems are closely related to granodiorite-diorite sills and dikes such as at the HRS claim group, Jahnke mine, Silver Ridge group, and Lucy prospect (pl. 1, nos. 4, 5, 37, 39). All other quartz vein systems in the study area appear to be of random emplacement; however, intrusives are probably prevalent at depth. The veins reach a maximum width of 11 ft (Silver Ridge group) and can be traced on the surface for as much as 3,000 ft (Ajax mine). They are iron-stained, often brecciated, and contain some or all of the following minerals occurring as stains, streaks, disseminations, and blebs: native gold, argentiferous galena, chalcopyrite, azurite, arsenopyrite, chrysocolla, malachite, chalcocite, cuprite, specular hematite, magnetite, molybdenite, scheelite, bornite, pyrite, and sphalerite (see glossary for description of minerals), plus inclusions of altered dike or country rock fragments.

MINING HISTORY

The mining history, production, and current activity of individual mines in the study area are discussed separately in appendices A and B. Sources of study area history were county mining claim records, claimant information, USFS claimant files, BLM claim recordation files, USBM production records and property file data, and published information.

Mining in the vicinity of the West Big Hole study area began in 1862 when placer gold was discovered in tributaries of the Big Hole River west of Wisdom and just north of the study area in what is now known as the Ruby mining district (Geach, 1972, p. 6). The same year, richer gold placers were discovered on Grasshopper Creek southeast of the study area (Coppinger, 1974, p. 199). Lode exploration and mining began sometime in the 1880's, with recorded production taking place from about 1902 to 1965.

Figure 5 shows the mining districts and their approximate locations as reported by Umpleby (1913), Sahinen (1935), Geach (1972), Krohn and Weist (1977), Strowd and others (1981), and Loen and Pearson (1984). Beaverhead County records indicate that from 1885 to 1967, 468 lode and 18 placer claims were recorded in or near the study area. Most activity took place during 1888 to 1914 and 1937 to 1940. BLM claim recordation files as of 1986 revealed that 275 unpatented lode claims were current in and adjacent to the study area. There are also 9 patented lode claims in the study area and 11 that border the boundary. In 1985 current activity included exploration or other assessment work at the Lucy, Ajax, and Silver Ridge properties.

A total of 218 mine and prospect workings on lode properties examined during this investigation consisted of 26 open adits, 50 inaccessible adits, 3 shafts, and 139 prospect pits, cuts, and trenches (see glossary for definition of workings). Open adits ranged from a few feet to 1,028 ft long; shafts were less than 30 ft deep; and surface workings were typically shallow, 10 to 15 ft long, and 5 to 10 ft wide. The caved adits are estimated to have been as much as 3,100 ft long, based on the volume of material in their dumps.

Ore processing mills in the area date back to the turn of the century, and ruins are still present at the Jahnke and Ajax mines (pl. 1, nos. 37 and 7) and outside the study area at the Darkhorse, Saginaw, and Oro Cache mines (pl. 1, nos. 40, 34, 16). A crusher was installed at the Silver Ridge group (pl. 1, no. 4) within the past few years but was idle at the time of the study (see fig. A-30 for a photograph of the mine).

Production from the study area and vicinity was primarily during the years 1902 to 1940. Table 1 lists all known mineral production from within and adjacent to the West Big Hole study area. Table 2 lists known production for Idaho mining districts adjacent to the study area.

COMMODITY HIGHLIGHTS

Gold, silver, copper, and lead are the chief mineral commodities in and near the West Big Hole study area. Identified resources are currently subeconomic (see appendix D for resource definitions). Applicable mining methods considered for these resources included underground methods for high-value, small tonnage deposits. Production costs are influenced greatly by deposit accessibility, power availability, size and depth of the deposit, and amenability to metallurgical processing. Other important considerations affecting resource values of commodities are market conditions and in some cases dependence on foreign sources. Table 3 summarizes domestic mine production and consumption, import sources and reliance, commodity prices, and uses of those mineral commodities found in and near the study area.

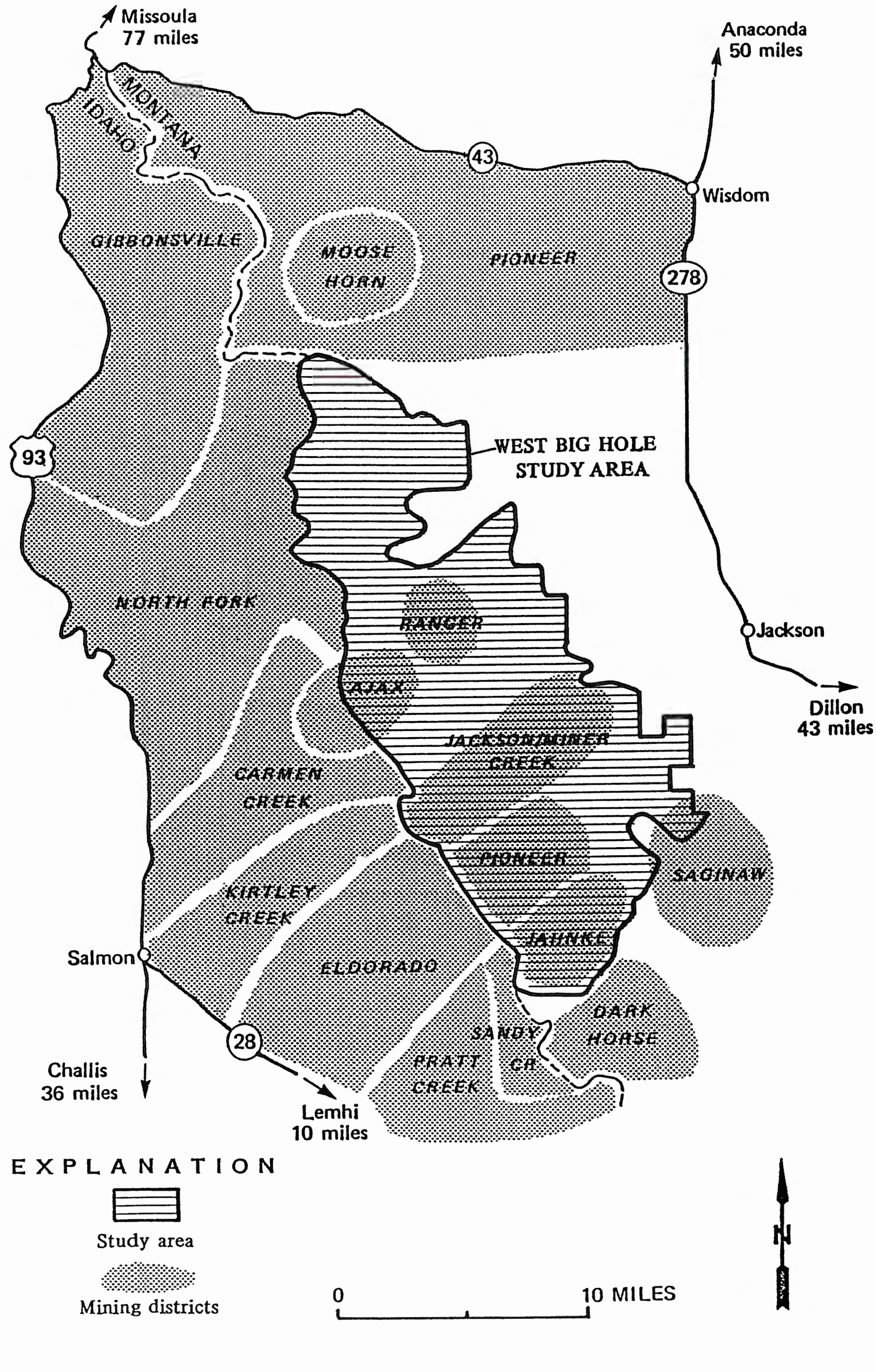

FIGURE 5.– Mining districts in and near the West Big Hole study area

TABLE 1.--Recorded production from lode deposits within and adjacent to the West Big Hole study area

(*, outside the study area; NR, not reported)
(from U.S. Bureau of Mines statistical records; Geach, 1972; and Umpleby, 1913)

Mine	Mining district	Years of production	Ore (tons)	Gold (oz)	Silver (oz)	Copper (lb)	Lead (lb)
Ajax	Ajax	1902-1940	1,643	979	7,621	299	140,239
Copper Queen	Pioneer	1948	1	NR	4	22	NR
Darkhorse	Darkhorse	1907-1939	294	93	1,611	85,739	NR
Jackson	Jackson/Miner Creek	1917-1957	22	1	73	NR	5,108
Jahnke	Jahnke	1916-1940	106	16	1,238	4,804	17,129
Mendota prospect*	Pratt Creek	1938	60	12	229	1,755	391
Oro Cache*	Carmen Creek	1902-1914	3,972	635	76	NR	NR
Saginaw*	Saginaw	1902-1965	1,236	NR	445	206,282	NR

TABLE 2.--Gold production from Idaho mining districts adjacent to the West Big Hole study area (Loen and Pearson, 1984, p. 6)

Mining district	Estimated total production value 1/
Carmen Creek	$ 50,000
Eldorado	400,000
Gibbonsville	2,000,000
Kirtley Creek	600,000
North Fork	Small
Pratt Creek	50,000
Sandy Creek	50,000
Pioneer 2/	10,000

1/ Historical value.
2/ Located in both Idaho and Montana just north of the study area; also known as Ruby mining district (not to be confused with the Pioneer district within the study area).

TABLE 3.--United States commodity statistics for minerals in the West Big Hole study area*
(From U.S. Bureau of Mines Mineral Commodity Summaries - 1988)

Commodity	Domestic mine production, 1/ 1987	Apparent consumption, 1/ 1987	Units	Major import sources	Net import reliance, 1987 2/ (percent)	Average domestic price (dollars)	Price unit	Major uses
Gold	4.9	2.8	Troy ounce	Canada Switzerland Uraguay	4/	$444.00	Troy ounce	Jewelry and arts, industrial (mainly electronic), dental, and small bars (investment)
Silver	38.0	144.0	do---------	Canada Mexico United Kingdom Peru	57	7.20	Troy ounce	Photography, electrical and electronic products, sterling ware, electroplated ware, jewelry, brazing alloys and solders
Lead	330	1,130	Metric 3/ tons	Canada Mexico Peru Australia	15	.36	Pound	Batteries, gasoline additives, construction, electrical, TV glass, paint, ceramics, ballasts, tubes, containers, type metal
Copper	1,270	2,190	do-----	Chile Canada Peru	25	.80	do-----	Building construction, electrical and electronic products, industrial machinery and equipment, transportation

* All data for the year 1987
1/ Estimated data in millions of troy ounces for gold and silver, and thousands of metric tons for lead and copper.
2/ Defined as imports minus exports plus adjustments for government and industry stock changes.
3/ Metric ton = 1.10 short tons
4/ The U.S. is a net importer of gold; however, changes in unreported investor stocks preclude calculation of a meaningful net import reliance.

MINES, PROSPECTS, CLAIMS, AND MINERALIZED SITES

Forty-two lode properties were examined during the 1985 field study; most are shown on plate 1; a concentration of workings in the Ridge Lake area is shown separately on figure 6. Thirty-three of the properties are within the study area or occur both in and adjacent to it, and nine are outside the area. Mines, prospects, and claims described are primarily on gold- and silver-bearing quartz veins and shear zones in the Belt Supergroup rocks and are usually associated with mafic/diabase and granitic dikes. Seven major mineral properties are described in detail in appendix A; data on minor or less well exposed properties are summarized in appendix B. A complete listing of all samples for each property is in appendix C. Resource block diagrams include indicated and inferred blocks. Indicated blocks are either bounded by mine sampling, the topography, or geologic structures, or are determined by taking one-half the strike length up and/or down the dip of the vein. Inferred blocks were estimated by either taking one-half the strike length of the indicated or one-half the width of the indicated block. Topography and/or geologic contraints also limited inferred blocks.

Alluvial (placer) reconnaissance sample localities are shown on figure 7. Placer gold contents are listed in appendix C (table C-1).

APPRAISAL OF STUDY AREA MINERAL RESOURCES

Gold and silver identified resources at four lode mines and prospects in and near the study area (table 4) are subeconomic at a gold price of $465/oz and a silver price of $6.65/oz. These resources are in narrow (1- to 5-ft-thick) veins and shear zones that dip steeply to near vertical. They would require mining by relatively high-cost underground methods, and mining of the narrow vein widths would result in significant dilution of ore grades.

At the Ajax mine (pl. 1, no. 7), gross metal values in the resources (table 4) are estimated at $37/ton, based on an average vein width of 3.0 ft. Diluted to a mining width of at least 5 ft, the resource value would be only about $23/ton; mining costs would be greater than $100/ton. Other factors which would limit development would be the high elevation of the mine and weather conditions which might only permit mining from about June to October. Also, the lead content is too low to justify a lead recovery circuit in a mill, yet high enough to incur a smelter penalty or interfere in a gold-silver recovery circuit.

The Silver Ridge group (pl. 1, no. 4) resources contain gross metal values of $25/ton, based on a 4.5-ft width and thus are too low grade to be minable; the vein system is nearly vertical and would require high-cost underground mining methods. Reported historical assay values from the workings indicate high silver content; however, our sampling did not verify this. The workings are located at high elevations, and the mining season might be limited by the weather. There are no processing mills near the property, and the nearest railroad is at Dillon, nearly 50 mi distant. The property does have a recently installed crusher.

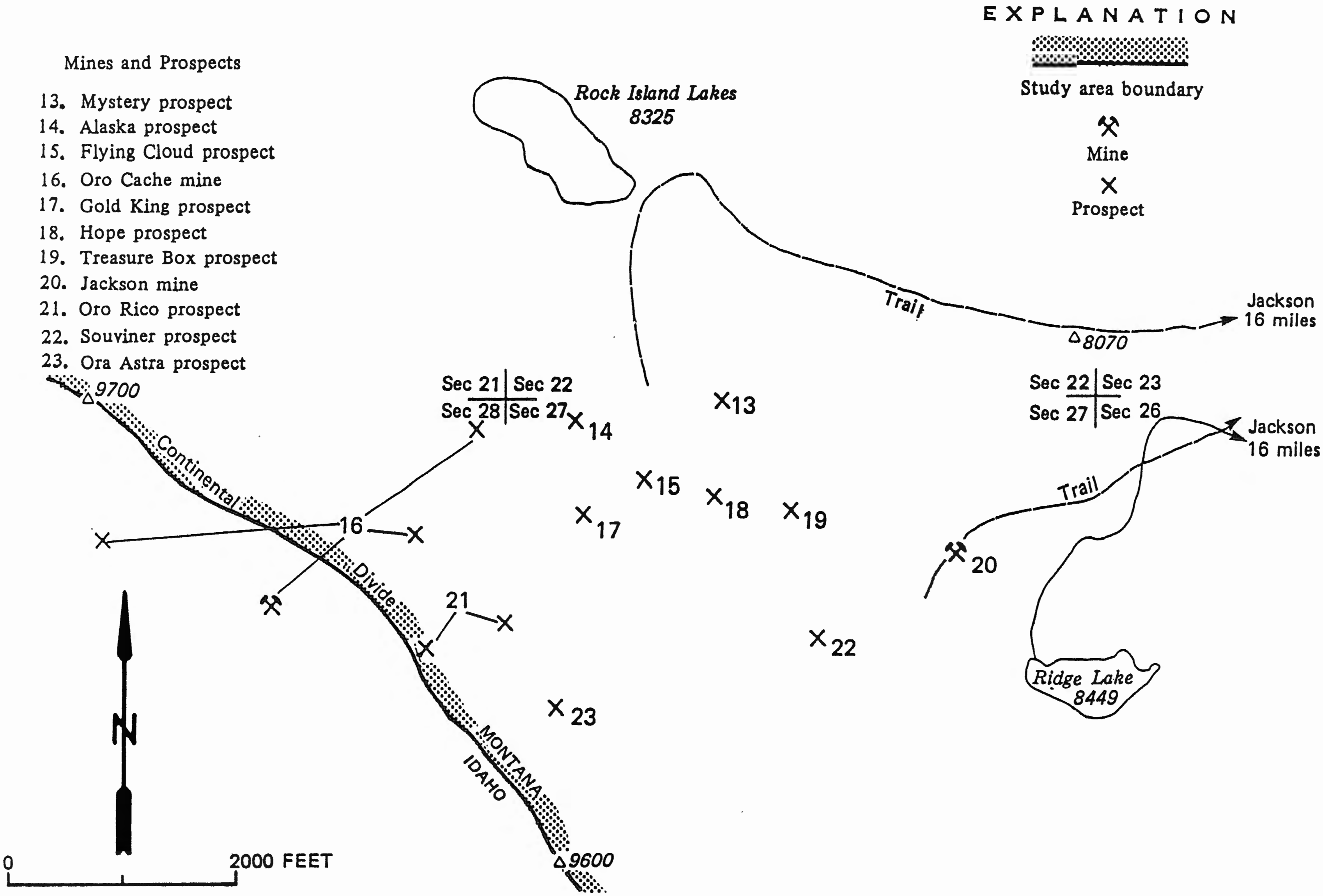

FIGURE 6.— Mines and prospects in the Ridge Lake area of the West Big Hole study area

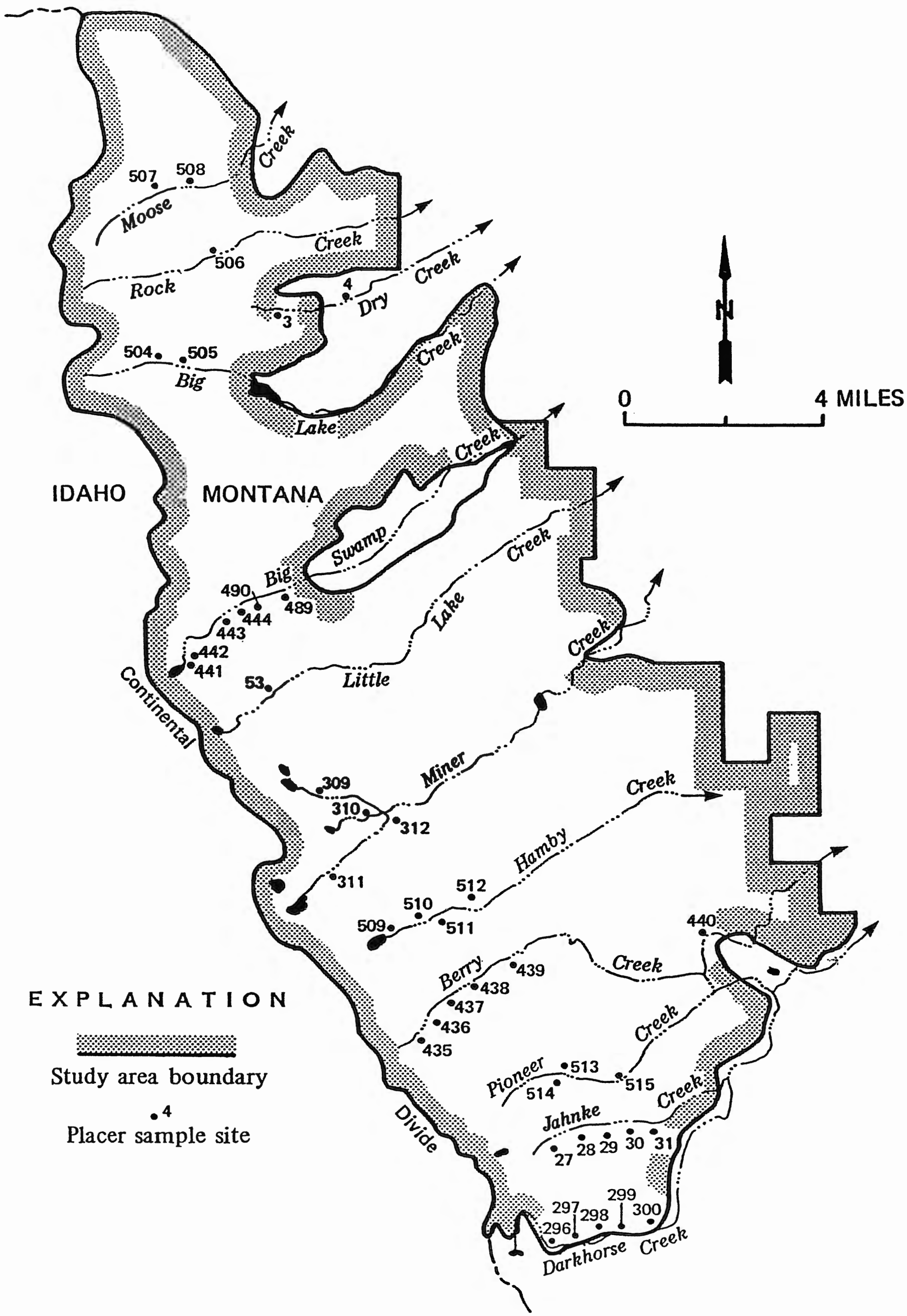

FIGURE 7.— Alluvial (placer) sample localities in the West Big Hole study area

TABLE 4.--Identified mineral resources in and near the West Big Hole study area

Map no. (pl. 1)	Property name	Quantity (tons)	Resource classification 1/	Grade
7	Ajax mine	138,000	Indicated and inferred subeconomic resources	0.07 oz/ton gold .3 oz/ton silver .59% lead
37	Jahnke mine	1,700	Indicated and inferred subeconomic resources (adit B)	.13 oz/ton gold 4.8 oz/ton silver 1.24% copper 1.01% lead
		1,200	Indicated and inferred subeconomic resources (adit D)	8.57% lead 1.2 oz/ton silver .64% copper
26	Northern prospect (outside the study area)	900	Indicated and inferred subeconomic resources	.23 oz/ton gold 1.1 oz/ton silver
4	Silver Ridge groups	302,000	Indicated and inferred subeconomic resources	.05 oz/ton gold .1 oz/ton silver
		7,900	Indicated subeconomic resources (stockpile)	.02 oz/ton gold .5 oz/ton silver

1/ Resource definitions from U.S. Bureau of Mines and U.S. Geological Survey Circular 831, 1980 (see appendix D).

At the Northern prospect (pl. 1, no. 26) little of the vein was exposed; however, where it was accessible, nearly 1,000 tons was identified having a high gold content (0.23 oz/ton), with significant silver. The location of the working is at a high elevation, and access is difficult. It is within 1/2 mi of the Eldorado mine in Idaho (pl. 1, no. 28), and the geology of the two areas is similar. Mining at the Eldorado has indicated high metal content; similar metal content occurs at the Northern, but in a vein system only about 1 ft wide. Exploration could increase the resource base and perhaps show a widening of the vein, similar to that at the Eldorado mine.

The Jahnke mine (pl. 1, no. 37) is developed in or near a mafic dike. Little resources could be identified due to inaccessibility of the workings and poor exposure of the vein system. The Jahnke is one of 21 prospects in the West Big Hole study area that are in or near mafic or diabase dikes or sills. The Jahnke has the best likelihood of containing large resources. The main adit never intersected the mafic sill, which might have a high metal content. However, the workings are in a remote, high-altitude location that has difficult access and adverse weather. The complex nature of the ore, having four possible products, would require milling methods not found in the vicinity. In addition to milling costs, transportation and underground mining methods would be expensive; total costs would be in excess of $100/ton.

With the exception of four localities, all 42 properties examined in and near the study area contained gold and silver. In the study area proper, high gold contents were obtained in samples from 11 of the 32 properties visited, and moderate to high silver contents at 10 properties. Copper and lead were less prevalent; however, six properties showed either high copper, lead, or both.

Properties outside the study area having vein systems possibly trending into the area include the Saginaw, Oro Cache and Dark Horse mines, Northern, High and Mendota prospects and HRS claim group. The Mendota and HRS workings are in the Jahnke mine area and could have similar resources. The same restrictions as at the Jahnke--remoteness, high elevation, and complex ore--also apply to these properties. The High prospect is on the same vein as the Ajax mine; although our examination did not identify resources, exploration should find metal content similar to that at the Ajax. Elsewhere, the vein system at the Dark Horse mine, as reported in historical records (Tucker, 1975, p. 190), appears to trend into the study area and is probably related to the geology of the Jahnke mine area. Exploration between the two properties might reveal resources with ore-grades similar to past production at the Dark Horse.

The Oro Cache mine (pl. 1, no. 16) has a reported (MacKenzie, 1949, p. 43) vein system that should extend into the study area; alignment of the workings indicates this. Little of the vein is exposed in the study area, but exploration would probably identify resources similar in size and grade to those mined previously. Like most of the mineral properties in the study area, the Oro Cache is located on the continental divide, which makes access difficult. Roads to the mine from the Idaho side are washed out. Mining costs would be prohibitive unless exploration revealed sizeable resources and high ore-grades.

No vein was exposed at the Saginaw mine (pl. 1, no. 34). Historical records (Coppenger, 1974, p. 204) reported a west-striking vein with high copper content. The vein was associated with a diabase dike. Similar geology and metal content are found at the Copper Queen mine (pl. 1, no. 30), and the strike of the dike there also is eastward, in line with the Saginaw dike/vein system. Too little information is available on these two properties to estimate a resource between them. The Miner Lake fault zone may also disrupt continuity of the dike. Extensive exploration might reveal resources similar to those reported at the Saginaw, but current mining costs would inhibit development of the deposits. Access to the Copper Queen mine is limited, but a road once extended to it.

Eleven streams in the area contain placer gold, as shown in reconnaissance samples. Gold content went as high as 125 cents/yd^3. Recreation suction dredging there might be of interest to small-scale operators. The gold is limited to stream gravels and not glacial gravels and thus will be most likely found in that part of the stream close to the divide.

Sand and gravel are plentiful along drainages throughout the study area but are glacial till--poorly sorted and irregularly distributed, both in aggregate size and quantity. The study area is far from any potential major aggregate market. Rock types in the study area do not have unique characteristics and thus are not of value as decorative stone. No energy resources are known in the area.

RECOMMENDATIONS FOR FURTHER STUDY

Estimates of resource tonnage and grade were made by evaluating exposed segments of the veins and inferring blocks of resources around the segments. More extensive work is recommended to better quantify the identified resources and to delineate additional resources. Detailed work would include close-space sampling of vein systems, magnetic surveys for hidden parts of the veins, and drilling to determine thickness, dip, and depth of the veins and their metal content.

In addition to the four properties where resources have been identified, detailed studies should be conducted in the area shown on figure 6, the Ridge Lake area. There, eight of the properties are associated with diabase dikes, which are good mineralized rock indicators, and six of these properties yielded samples with moderate to high gold or silver content. A high level of exploration activity is indicated by numerous pits, trenches, and shallow adits and shafts. A geophysical survey of the dikes should be initiated to determine their extent, followed by drilling programs to delineate the dikes at depth and to determine metal content. Properties which should have priority include the Mystery, Treasure Box, and Victory No. 1 prospects and the Jackson and Oro Cache mines. The Oro Cache vein system, although in Idaho, extends into the study area. If a number of dike/vein systems, with high metal content, can be delineated in the Ridge Lake area (fig. 6), sufficient resources may warrant a study to examine the feasibility of developing the properties collectively.

Additional field work is recommended at miscellaneous prospects where anomalous metallic-mineral concentrations were found (appendix B). There are 24 of these properties where work is needed to better expose the mineralized zones, in addition to the previously mentioned properties.

GLOSSARY

(Technical terms used in this report.) 1/

adit: A horizontal or nearly horizontal passage driven from the surface for exploration purposes or for the working or unwatering of a mine.

amalgamation: A process of gold or silver recovery in which the ore, finely divided and suspended in water, is passed over a surface of liquid mercury to form an amalgam.

back: The roof or upper part in any underground mining drift or stope.

batholith: A huge, domed intrusive igneous body of at least 40 square miles in extent whose sides slope gently outward, enlarging downward.

brecciated: Rock composed of angular fragments held together in a matrix.

dike: A discordant tabular body of igneous rock that was injected into a fissure when molten, that cuts across the structure of the adjacent country rocks, and which has a high angle of dip.

drift: A horizontal passage underground. A drift follows the vein, as distinguished from a crosscut which intersects it.

emission spectrography (optical): An analysis technique based upon the principle that when a sample is heated to high temperature in an electric arc or spark, causing the sample to be completely vaporized, each element present in the sample emits a unique optical spectrum characteristic of that particular element. The radiation thus is passed into a spectrograph where it is resolved into its component wavelengths by either a prism or a diffraction grating. The strongest and most characteristic lines are detected for qualitative identification, and their intensity measured for semi-quantitative determinations.

face: The working face, front, or end is the face at the end of a drift or crosscut.

fire assaying: A quantitative chemical analysis by which metals are separated and determined in ores and metallurgical products with the aid of heat and dry reagents.

fluorescence: The emission of visible light by a substance exposed to ultraviolet light.

footwall: The wall or rock under a vein.

geochemical exploration: Exploration or prospecting methods depending on chemical analysis of the rocks or soil.

geomorphology: The science that treats the general configuration of the earth's surface; specifically the study of the classification, description, nature, origin, and development of present landforms and their relationships to underlying structures, and of the history of geologic changes as recorded by these surface features.

geophysical survey: The exploration of an area in which geophysical properties and relationships unique to the area are mapped by one or more geophysical methods. These might include gravitational, magnetic, electrical, and seismic methods.

gouge: The clay or clayey material in a fault zone.

hanging wall: The wall or rock on the upper side of an inclined vein.

horse: A large block of unmineralized rock included in a vein.

inductively coupled plasma analysis (ICP): The inductively coupled plasma is a highly ionized, very hot gas. It is spatially stable, chemically inert, and achieves temperatures estimated to be near $4,000^{o}$ to $8,000^{o}$ K. At these temperatures more than 70 percent of the elements on the periodic table will emit an analytically useful spectrum. The sample is introduced as a liquid into the plasma and emission spectrum is resolved into its component wavelength by a diffraction grating.

kaolinized: A process which occurs as a result of either hydrothermal alteration or by weathering, alteration of rocks, ores, and minerals by atmospheric waters, forming a clay.

lode: A mineral deposit consisting of a zone of veins, veinlets, disseminations, or planar breccias; a mineral deposit in consolidated rock as opposed to placer deposits.

mafic: Igneous rock composed of dark minerals.

metasediments: A sediment or sedimentary rock that shows evidence of having been subjected to metamorphism.

muck: Rock or ore broken in process of mining.

nonferrous: Metals and compounds not containing appreciable quantities of iron

Precambrian: All rocks formed before 570 million years ago.

Pseudomorph: A mineral whose outward crystal form is that of another mineral species.

raise: A vertical or inclined mine opening driven upward from a level to connect with the level above, or to explore the ground for a limited distance above one level.

reverse fault: Where the hanging wall appears to have moved up with relation to the footwall.

rib: The side of a drift.

shaft: A vertical or steeply inclined excavation or opening from the surface down through the strata to the mineral to be developed.

sill: A sheet of igneous rock lying nearly horizontal.

stamp mill: An early device in which rock was crushed by descending pestles (device for pounding), operated by water power or steam power.

stoping: Extraction of ore in an underground mine by working laterally along a vein. It is generally done from lower to upper levels, so that the whole vein is ultimately removed.

thrust fault: A reverse fault that is characterized by a low angle of inclination with reference to a horizontal plane.

vuggy: Applied to rocks or mineral deposits abounding in cavities, often with mineral lining of different composition from that of the surrounding rock.

Wilfley table: A brand of shaking table. Sands are fed continuously and worked along the table with the aid of feedwater, and across riffles downslope by gravity tilt adjustment and added wash water. At the discharge end, the sands have separated into bands, the heaviest and smallest are uppermost on the table, the largest and lightest are the lowest.

winze: A vertical or inclined opening, or excavation, connecting two levels in a mine, differing from a raise only in construction. A winze is sunk underhand and a raise is driven overhand.

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APPENDIX A: Mineral Property Descriptions

(alphabetical order)

APPENDIX A: Mineral Property Descriptions

(alphabetical order)

APPENDIX A.--Descriptions of major mineral properties in or near the West Big Hole study area (see appendix C for listing of all sample analytical results)

LIST OF PROPERTIES DESCRIBED

Plate 1 map no.	Name
7	Ajax mine
40	Dark Horse mine
39	HRS claim group
37	Jahnke mine
26	Northern prospect
16	Oro Cache mine
4	Silver Ridge group

NAME: Ajax mine (four patented lode claims: Ajax, Edna and Edith, Hattie and Erma, Ajax Extension. Three unpatented millsite claims: Three J's, Jewel, Ajax)

OWNER: Don J. Jenkins, Ajax Gold, Inc.; Corvallis, MT

MAP NO.: Plate 1, no. 7

LOCATION: Sec. 7 and 8, T. 6 S., R. 17 W., Beaverhead County, Montana

ACCESS: From Wisdom, County road 278 south for 7 mi to Twin Lakes turn-off, then west for appoximately 5 mi to the Ajax Ranch, then southwest 2 mi to intersection of Twin Lakes road, then south for 3 1/2 mi to Big Swamp Creek, then approximately 10 mi on Forest Road 625. Access to within 1 mi of the mine is limited to foot traffic, due to a locked gate on the road.

HISTORY: Sassman (1941, p. 283-286) gives a detailed history of the Ajax. The vein was discovered by W. S. Burnett, who located it as the "Carrie Leonard" in 1874. In the early 1880's, Frank Brown relocated the mine and named it the Ajax. Later claimants built an arrastra to crush gold ore valued at $14 per ton; however, the arrastra was never used. In 1902 and 1903, the four claims were patented. A tramway 860 ft long was constructed to transport ore from the main mine (adits D-G) to the basin below. (This tramway was located by the lake and is no longer standing.) The ore was then sacked and shipped to Omaha, NB. A stamp mill was built at the property during the late 1890's but proved inefficient (Geach, 1972, p. 33). In 1903 the Montana-Ajax Company was organized to operate the mine. The old mill was torn down and a new ten-stamp mill erected, including two Wilfley tables. In 1905, bullion, valued at $1,160, was produced. The Little Blackfoot Queen Mining Company modified the stamp mill in 1940 by the addition of flotation cells. However, no mining activity has been reported from 1940 to the present. Figure A-1 is a map of the patented claims.

PRODUCTION: Ore was produced from 1902 to 1940 as shown on the following table.

TABLE A-1.--Ajax mine production

Year	Ore (tons)	Gold (oz)	Silver (oz)	Copper (lb)	Lead (lb)
1902	1200	630	7,200	--	120,000
1904	200	240	--	--	--
1905	200	72	--	--	5,600
1912	16	26	199	147	4,929
1916	17	4	171	129	5,624
1940	10	7	51	23	4,086
Totals	1,643	979	7,621	299	140,239

GEOLOGY: The Ajax mine is developed on a quartz vein striking N. 54° E. to N. 64° E. and dipping 30° to 50° SE. The vein replaces a diabase dike. Country rock consists of gray quartzite, argillite, and hornfels of the Belt Supergroup. Minor faulting occurred near adits C and D, with minor displacement. The vein is exposed intermittently from the continental divide northeast for 3,000 ft and ranges from a few feet to about 7 ft thick. It branches at the extreme northeast exposure into three veins, as shown in adit D (figs. A-6 and A-8). The vein at adit A (fig. A-4) has zones where there is only quartz and zones where the quartz contains quartzite. Both zones contain gold and silver. The rest of the vein, from adit A to adit D, appears to be only quartz.

Primary ore minerals include galena, chalcopyrite, and free gold that was observed in the main quartz vein in adit D. Secondary minerals which occur less frequently are chrysocolla, malachite, azurite, chalcocite, cuprite, specular hematite, magnetite, and pyrite.

The quartz vein has not replaced all of the diabase near adit D and at exposures on the continental divide. The dike continues into Idaho for several hundred feet where it is again replaced by quartz at the High prospect (pl. 1, no. 8).

WORKINGS AND FACILITIES: Figure A-2 is a view of the workings. Their relative locations are shown on figure A-3. They consist of five open adits and two caved adits, all ranging in length from 5 ft (adit B) to 220 ft (adit C) (figs. A-4 through A-8). Adits D through G are interconnected by raises and contain numerous stopes. The two caved adits are accessible from others that interconnect with them. There is a cabin by Ajax Lake (fig. A-1) and remnants of a ten-stamp mill in the valley below the lake; a tramway from the cabin to the mill has collapsed and no longer is used. An aerial tramway and an ore chute are still standing near adits C and G.

SAMPLE RESULTS: A total of 106 chip and 2 select samples were taken of the quartz vein. Sample locations are shown on figures A-3 through A-8, and gold-silver-lead analyses are listed in table A-3. Ninety-two of the samples contained measurable gold, and four had a trace. All but 18 samples contained silver. Table A-2 shows a grouping of gold and silver assays in the chip samples. The two select samples assayed 0.12 and 0.710 oz/ton gold, 0.4 and 5.8 oz/ton silver, and 1.18 and 7.7 percent lead. Twenty-nine chip samples contained between 1.0 and 10.0 percent lead; two contained 14.6 and 17.60 percent. Copper contents of at least 0.01 percent were detected in all but 8 of the 108 samples; the maximum was 1 percent. Tungsten was analyzed for in 73 samples; assays were a maximum of 0.13 percent. Molybdenum was analyzed for in 76 samples; analyses ranged from 0.002 to 0.055 percent. A complete list of analyses is in appendix C.

TABLE A-2.--Assay concentration ranges for gold and silver in chip samples from the Ajax mine (oz/ton)

Range	Number of samples
Gold	
0.01 - 0.09	50
.10 - .19	22
.20 - .29	7
.30 - .39	2
.40 - .49	4
.50 - .59	3
.60 - .69	1
.70 - .79	2
.80 - .89	0
.90 - .99	1
Silver	
0.1 - 0.9	79
1.0 - 2.9	8
3.0 - 4.9	1

TABLE A-3.--Sample assay data and descriptions to accompany figures A-3 through A-8, Ajax mine

[Tr, trace; N, none detected; <, less than shown; NA, not applicable]
(see appendix C for additional analyses)

Sample			Gold (oz/ton)	Silver (oz/ton)	Lead (%)	Copper (%)
No.	Length (ft)	Description (chip samples across vein, unless noted)				
54	3.5	Quartz vein replacing mafic dike. Sample taken at western part of Ajax claims not shown. Quartz is massive, fractured, and limonite-stained.	0.30	N	0.03	0.02
		Surface samples (fig. A-3)				
4/ 55	7.0	Massive and fractured quartz vein. Minor limonite- and malachite-stain and small number of magnetite veinlets.	.04	0.3	.12	.03
56	NA	Select sample of 13 by 7 by 2 ft stockpile. Massive quartz with abundant limonite stains, trace of malachite and chrysocolla stains, minor chalcoyprite and specular hematite, malachite, and chrysocolla veinlets.	.12	.3	.13	.18
4/ 57	6.4	Massive vuggy quartz vein. Abundant limonite stains and trace of chrysocolla stains.	.05	.1	.09	.02
4/ 58	7.0	Massive vuggy quartz vein. Abundant, banded, limonite stains.	.17	.4	1.18	.02
4/ 59	3.2	Massive quartz vein with abundant limonite stains. Minor veinlets of hematite, pyrite, and chalcopyrite.	.10	.3	1.31	.03

TABLE A-3.--Sample assay data and descriptions to accompany figures A-3 through A-8, Ajax mine--Continued

Sample No.	Length (ft)	Description (chip samples across vein, unless noted)	Gold (oz/ton)	Silver (oz/ton)	Lead (%)	Copper (%)
		Surface samples (Continued)				
4/ 60	4.7	Massive, vuggy quartz vein with abundant limonite stain. Trace of pyrite.	Tr	N	0.02	0.02
4/ 61	8.0	Massive quartz vein with abundant, banded, limonite stain. Abundant pyrite and spotty galena blebs.	0.11	0.1	.17	.02
4/ 62	8.0	Massive, vuggy quartz vein with a 2.5-ft zone of hornfels intermixing with quartz. Moderate limonite stain and minor blebs of pyrite and galena.	.01	.1	.10	.10
4/ 63	6.5	Massive quartz vein with minor limonite stain.	Tr	N	<.01	Tr
4/ 64	6.8	do.	.05	.1	.04	.02
4/ 65	6.0	Massive quartz vein with trace of malachite and chrysocolla stain and minor veinlets of limonite.	.03	.6	.09	.03
4/ 66	6.0	Massive quartz vein with minor limonite stain.	.04	.2	.05	.01
4/ 67	6.6	do.	N	.1	<.01	Tr
4/ 68	4.0	Massive, fractured quartz vein with abundant limonite stain. Traces of malachite and chrysocolla stains.	.02	.2	.13	.03

TABLE A-3.--Sample assay data and descriptions to accompany figures A-3 through A-8, Ajax mine--Continued

No.	Length (ft)	Sample Description (chip samples across vein, unless noted)	Gold (oz/ton)	Silver (oz/ton)	Lead (%)	Copper (%)
		Surface samples (Continued)				
69	2.3	Thin portion of split quartz vein (sample 70 is from the thicker part). The quartz is massive and fractured, with abundant limonite stain and minor vugs.	0.07	0.4	1.18	0.29
70	6.7	Thick portion of split, massive quartz vein. Quartzite country rock interfingers with the quartz. Abundant limonite stain.	Tr	.1	.12	.02
71	.7	Thin portion of split, massive, fractured quartz vein (sample 73 is from thicker part). Abundant limonite stain and minor malachite and chrysocolla stain. Limonite fills vuggy areas of quartz.	.28	.6	.36	.06
72	1.2	Thin portion of split, vuggy quartz vein. Moderate limonite stain with blebs of galena and chalcopyrite occupying vugs within the quartz.	.96	2.8	7.90	.35
73	1.4	Thick portion of split, vuggy quartz vein (total width of this portion of vein not exposed). Abundant limonite and chrysocolla stain. Botryoidal psilomelane (see glossary) in minor amounts.	.74	1.4	1.21	.18

TABLE A-3.--Sample assay data and descriptions to accompany figures A-3 through A-8, Ajax mine--Continued

Sample No.	Sample Length (ft)	Sample Description (chip samples across vein, unless noted)	Gold (oz/ton)	Silver (oz/ton)	Lead (%)	Copper (%)
		Adit D, level 3 (fig. A-8)				
3/ 74	3.9	Zone of interfingering vein quartz and quartzite country rock. Moderate limonite and chrysocolla staining.	0.02	0.4	1.60	0.07
3/ 75	1.6	Altered quartz vein. Abundant limonite stain, minor chrysocolla stain, and blebs of galena and chalcopyrite fill vuggy areas.	.03	.8	2.00	.06
3/ 76	3.6	Altered quartz vein inclusions of quartzite. Abundant vugs filled with limonite, galena, chalcopyrite, and chrysocolla and trace of visible gold.	.21	2.3	6.40	.38
3/ 77	1.2	Massive, vuggy quartz vein with abundant limonite stain.	.48	N	.83	.07
1/ 78	3.2	Massive, vuggy quartz vein with inclusions of quartzite country rock. Footwall of quartz vein not exposed. Blebs of galena; moderate limonite stain.	.57	.3	.86	.22
1/ 79	3.1	Zone of fractured quartz vein and interfingered quartzite/hornfels country rock. Zones of alteration.	.03	.5	1.40	.29

TABLE A-3.--Sample assay data and descriptions to accompany figures A-3 through A-8, Ajax mine--Continued

	Sample No.	Length (ft)	Description (chip samples across vein, unless noted)	Gold (oz/ton)	Silver (oz/ton)	Lead (%)	Copper (%)
			Adit D, level 3 (Continued)				
1/	80	2.7	Massive, fractured, and vuggy quartz vein. Zones of alteration with moderate limonite stain. Minor inclusions of quartzite country rock.	0.25	0.2	0.31	0.06
1/	81	4.9	Fractured, vuggy quartz vein with moderate limonite stain.	.16	.3	.54	.12
1/	82	2.8	do.	.05	.1	.48	.13
	83	1.3	Zone of altered quartzite country rock with fractured quartz and abundant limonite stain.	.55	.4	.34	.34
1/	84	1.5	Fractured quartz vein. Abundant limonite and chrysocolla stain. Blebs of chalcopyrite, galena, chrysocolla, chalcocite, and possible cuprite and sphalerite. Zinc assayed 0.01%.	.05	.7	3.50	.27
	85		Select sample of quartz muck on stope floor. Quartz contains blebs and vug linings of chalcopyrite, cuprite, galena, chalcocite, and chrysocolla.	.71	5.8	7.70	1.00

TABLE A-3.--Sample assay data and descriptions to accompany figures A-3 through A-8, Ajax mine--Continued

No.	Sample Length (ft)	Sample Description (chip samples across vein, unless noted)	Gold (oz/ton)	Silver (oz/ton)	Lead (%)	Copper (%)
		Adit D, level 2 (fig. A-7)				
2/ 86	1.4	Quartz vein with interfingering hornfels. Minor limonite and chrysocolla stain and trace veinlets of limonite.	0.10	0.1	0.47	0.13
2/ 87	1.2	Quartz vein with assimilated hornfels inclusions. Minor limonite stain and veinlets.	.04	.2	.46	.04
88	.6	Fractured quartz vein with minor limonite and chrysocolla stain.	N	.1	1.00	.08
1/ 89	2.2	Altered, pulverized quartz vein with minor limonite and chrysocolla stain. Minor inclusions of hornfels country rock assimilated in quartz.	.13	.1	.30	.12
2/ 90	1.8	Massive, fractured, vuggy quartz vein with moderate limonite stain.	.20	.4	.20	.02
2/ 91	2.0	do.	.19	.1	.07	.02
2/ 92	4.5	Massive, fractured quartz vein with limonite stain and trace of chrysoclla stain.	.19	.1	.28	.03
2/ 93	1.5	Massive, fractured quartz vein with blebs of galena, chrysocolla, and chalcocite. Fragments of quartzite have been assimilated into the quartz.	.04	2.0	3.80	.24

TABLE A-3.--Sample assay data and descriptions to accompany figures A-3 through A-8, Ajax mine--Continued

Sample			Gold	Silver	Lead	Copper
No.	Length (ft)	Description (chip samples across vein, unless noted)	(oz/ ton)	(oz/ ton)	(%)	(%)
		Adit D, level 2 (Continued)				
2/ 94	1.1	Fragments of assimilated quartzite in the quartz vein with layered limonite stain.	0.04	0.1	0.44	0.19
2/ 95	4.9	Branching, vuggy quartz vein. Sample was of quartzite/argillite and quartz. Quartz contains blebs of malachite, galena, chrysocolla, hematite, and pyrite pseudomorphs. Quartzite/ argillite and quartz have moderate limonite and copper stain.	.29	.3	2.80	.14
1/ 96	5.0	Quartzite fragments assimilated in quartz vein, with blebs of chrysocolla, galena, and limonite and chrysocolla stains.	.28	.4	14.60	.46
1/ 97	2.3	Massive quartz vein with abundant limonite stain and blebs of galena. Minor quartzite fragments assimilated in the quartz.	.16	.3	2.00	.42
1/ 98	2.0	Brecciated quartz vein with limonite stain, blebs of galena, and veinlets of limonite.	.75	1.2	4.50	.67
1/ 99	2.5	Fractured, massive quartz vein, with veinlets of limonite, blebs of galena, azurite, malachite, and chalcopyrite, and pyrite. Moderate limonite stain.	.11	.7	7.50	.49
1/ 100	2.5	Fractured, massive quartz vein with chlorite and limonite stain and limonite veinlets.	.37	.5	1.00	.09

TABLE A-3.--Sample assay data and descriptions to accompany figures A-3 through A-8, Ajax mine--Continued

Sample No.	Length (ft)	Description (chip samples across vein, unless noted)	Gold (oz/ton)	Silver (oz/ton)	Lead (%)	Copper (%)
		Adit C (fig. A-5)				
4/ 108	3.4	Fractured quartz vein with moderate limonite stain. Upper part of vein brecciated.	0.05	0.9	1.47	0.04
4/ 109	3.3	Fractured quartz vein with moderate limonite stain. Lower 1 ft of vein is brecciated.	.13	.2	.14	.20
4/ 110	3.0	Fractured quartz vein with abundant limonite stain. Upper 6 in. of vein is brecciated.	.07	.2	.20	.03
4/ 111	.8	Part of fractured quartz vein with abundant limonite stain.	.03	.1	.24	.02
4/ 112	1.5	Altered quartz vein with gouge intermixed with the quartz. Minor limonite stain.	.12	.7	.49	.14
4/ 113	3.4	Altered quartz vein with quartzite and gouge comprising most of vein. Abundant limonite stain.	.02	.2	.40	.03
4/ 114	3.2	do.	Tr	.2	.45	.03
4/ 115	2.4	do.	.14	.3	2.70	.36

TABLE A-3.--Sample assay data and descriptions to accompany figures A-3 through A-8, Ajax mine--Continued

No.	Length (ft)	Sample Description (chip samples across vein, unless noted)	Gold (oz/ton)	Silver (oz/ton)	Lead (%)	Copper (%)
		Adit C (Continued)				
4/ 116	4.2	Gouge zone with 6 in. quartz vein. Gouge is comprised of argillite and quartzite and has abundant limonite stain.	0.06	0.2	0.35	0.08
4/ 117	1.5	Fractured quartz vein with abundant limonite stain. Gouge material within vein. Trace of malachite stain.	.14	.5	.91	.36
4/ 118	2.5	Fractured quartz vein with 6 in. of gouge. Moderate blebs and staining by limonite, malachite, azurite, and chrysocolla.	.40	.3	1.64	.27
4/ 119	2.3	do.	.09	.3	.57	.07
4/ 120	3.3	Fractured quartz vein and gouge zone 6 in. wide. Moderate limonite stain with trace of chrysocolla stain.	N	.3	.64	.07
4/ 121	2.7	Altered quartzite and 2 in. gouge zone. Minor stringers of quartz. Minor limonite and chrysocolla stains.	.07	.2	.75	.04
4/ 122	2.4	Altered quartzite and gouge. Moderate limonite stain. Minor veinlets of quartz.	.03	.1	.32	.04
4/ 123	3.6	do.	.02	.1	.24	.08

TABLE A-3.--Sample assay data and descriptions to accompany figures A-3 through A-8, Ajax mine--Continued

No.	Length (ft)	Sample Description (chip samples across vein, unless noted)	Gold (oz/ton)	Silver (oz/ton)	Lead (%)	Copper (%)
		Adit C (Continued)				
4/ 124	2.3	Altered quartzite and gouge. Moderate limonite stain. Minor veinlets of quartz.	0.05	0.1	0.53	0.06
4/ 125	2.0	Limonite-stained quartz vein with 4 in. of gouge. Abundant galena blebs.	.48	1.9	6.00	.37
4/ 126	2.2	Quartzite and gouge with up to 3 in. veinlets of quartz. Minor limonite and chrysocolla stains.	.08	.2	.75	.14
4/ 127	2.0	Quartz vein contains quartzite inclusions. Minor limonite stain.	.20	N	.36	.02
128	3.2	Fault zone. Abundant blebs and staining by limonite and psilomelane, chalcopyrite, azurite, and galena.	.02	N	2.40	.13
129	2.1	Fault zone with gouge, quartzite, and quartz veinlets.	N	N	.18	.01
130	5.0	Across banded quartz vein within fault zone. Abundant fracturing.	.04	N	.47	.01
4/ 131	1.5	Quartz vein with abundant blebs of galena and chrysocolla. Minor limonite stain.	.15	4.0	17.70	.90

TABLE A-3.--Sample assay data and descriptions to accompany figures A-3 through A-8, Ajax mine--Continued

Sample No.	Sample Length (ft)	Sample Description (chip samples across vein, unless noted)	Gold (oz/ton)	Silver (oz/ton)	Lead (%)	Copper (%)
		Adit C (Continued)				
4/ 132	2.1	Limonite-stained quartz vein with 2 in. of gouge. Quartzite fragments assimilated in the quartz.	0.02	N	0.63	0.02
4/ 133	2.3	Limonite-stained quartz vein with 2 to 3 in. of gouge.	.01	0.1	.14	Tr
4/ 134	4.0	Quartz vein with assimilated quartzite fragments. Minor limonite stain.	.10	.2	.83	.05
4/ 135	5.0	do.	.02	.1	.74	.05
4/ 136	3.0	do.	.16	.2	.37	.05
4/ 137	4.0	Limonite-stained quartz vein with gouge and assimilated quartzite fragments.	.02	.3	.36	.01
		Adit D, level 1 (Continued) (fig. A-6)				
1/ 151	3.0	Massive quartz vein with abundant limonite stain. Abundant blebs and stain by azurite, malachite, chrysocolla, and galena.	.06	.9	4.10	.21
1/ 152	1.5	Massive, fractured quartz vein. Moderate limonite stain. Minor zones of gouge and quartzite.	.07	.1	.29	.03

TABLE A-3.--Sample assay data and descriptions to accompany figures A-3 through A-8, Ajax mine--Continued

Sample No.	Length (ft)	Description (chip samples across vein, unless noted)	Gold (oz/ton)	Silver (oz/ton)	Lead (%)	Copper (%)
		Adit D, level 1 (Continued) (fig. A-6)				
1/ 153	2.0	Massive, fractured quartz vein with moderate limonite stain. Zones of gouge and quartzite with gray areas, possibly galena.	0.30	1.6	3.30	0.16
1/ 154	1.5	do.	.11	.2	1.30	.15
1/ 155	3.0	do.	.44	.2	1.00	.12
1/ 156	2.0	do.	.54	.2	1.10	.03
1/ 157	1.3	do.	.16	.1	.71	.14
		Adit D, level 2 (Continued) (fig. A-7)				
158	1.8	Massive quartz vein with assimilated argillite fragments and containing zones of kaolinized gouge. Minor chrysocolla and limonite stain.	.62	1.0	7.30	.39
159	6.0	Quartzite country rock with veinlets of quartz. Minor limonite and copper stain.	N	N	.21	.11
		Adit A (fig. A-4)				
160	.3	Across small quartz lens. Minor limonite stain.	N	N	.02	Tr
161	.5	Across small shear zone consisting of kaolinized clay and quartzite.	N	N	.01	Tr

TABLE A-3.--Sample assay data and descriptions to accompany figures A-3 through A-8, Ajax mine--Continued

Sample No.	Sample Length (ft)	Sample Description (chip samples across vein, unless noted)	Gold (oz/ton)	Silver (oz/ton)	Lead (%)	Copper (%)
		Adit A (Continued)				
4/ 162	3.0	Massive quartz vein with blebs of chalcopyrite and copper and limonite stain (sample 177 samples included country rock part of vein).	0.12	0.3	0.15	0.01
4/ 163	4.4	Massive, fractured quartz vein with limonite stain (sample 178 is country rock part of vein).	.06	.2	.24	.02
4/ 164	4.4	do. (sample 179 is country rock part of vein.)	.01	N	.15	.01
4/ 165	3.0	do. (sample 180 is country rock part of vein.)	.04	.2	.57	.02
4/ 166	2.4	do. (sample 176 is country rock part of vein.)	.05	.3	.40	.03
4/ 167	2.0	do. (sample 168 is country rock part of vein.)	.01	N	.05	.01
4/ 168	3.0	Massive quartz vein with assimilated quartzite fragments throughout. Moderate limonite stain.	.01	N	.11	.02
169	.5	Shear zone with kaolinized clay, quartzite, and quartz fragments.	.01	.1	.20	.02

TABLE A-3.--Sample assay data and descriptions to accompany figures A-3 through A-8, Ajax mine--Continued

No.	Length (ft)	Sample Description (chip samples across vein, unless noted)	Gold (oz/ton)	Silver (oz/ton)	Lead (%)	Copper (%)
		Adit A (Continued)				
4/ 170	3.0	Massive quartz vein with assimilated quartzite fragments throughout. Moderate limonite stain and blebs (sample 171 is country rock part of vein).	N	0.1	0.02	Tr
4/ 171	4.0	Massive quartz vein with minor assimilated quartzite fragments. Moderate to minor limonite stain.	0.01	N	.02	0.01
4/ 172	2.5	Massive, fractured quartz vein with minor limonite stain (sample 173 is country rock part of vein).	.12	.3	.16	Tr
4/ 173	1.5	Across quartzite zone with minor fragments of quartz. Quartzite is highly altered and kaolinized.	N	.1	.03	.01
4/ 174	2.0	Quartz vein with assimilated quartzite/argillite fragments and minor limonite stain.	.01	.2	.18	.02
4/ 175	2.0	Massive quartz vein with minor assimilated quartzite fragments. Minor limonite stain (sample 174 is country rock part of vein).	.01	.2	.08	.01
4/ 176	4.9	Quartz vein with assimilated quartzite fragments and minor limonite stain.	.03	.3	.50	.03

TABLE A-3.--Sample assay data and descriptions to accompany figures A-3 through A-8, Ajax mine--Continued

Sample No.	Length (ft)	Description (chip samples across vein, unless noted)	Gold (oz/ton)	Silver (oz/ton)	Lead (%)	Copper (%)
		Adit A (Continued)				
4/ 177	4.2	Quartz vein with assimilated quartzite fragments and minor limonite stain.	0.01	0.1	0.13	0.01
4/ 178	4.3	Quartz vein with assimilated quartzite fragments and minor limonite and copper stain.	.02	.2	.09	.03
4/ 179	3.5	Quartz vein with assimilated quartzite fragments and minor limonite stain.	.01	.1	.09	.21
4/ 180	2.5	do.	.14	N	.18	.07
		Adit B (no map)				
181	NA	A random chip sample of massive, fractured quartz vein with limonite and chrysocolla stains. (Adit is 15 ft long.)	N	N	.10	.02

1/ Samples used in resource calculation for vein A adits D-G
2/ Samples used in resource calculation for vein B adits D-G
3/ Samples used in resource calculation for vein C adits D-G
4/ Samples used in resource calculation for adit A-C

RESOURCE ESTIMATE: Gold, silver, and lead resources at the Ajax mine are estimated for two blocks (fig. A-9). Block 1 includes adits A, B, and C; Block 2 includes adits D through G (veins A, B, C). All tonnages were calculated using a weight factor of 12 ft^3/ton. Samples used in the calculations are noted in table A-3. At adit A, if two samples were taken of different zones at any one locality, a weighted average of the two was used for the calculation of resources.

Block 1 contains an estimated 50,000 tons of indicated and 82,000 tons of inferred resources averaging 0.06 oz/ton gold, 0.24 oz/ton silver, and 0.50 percent lead; vein width averages 4.0 ft. Block 2 contains an estimated 2,300 tons of indicated and 3,500 tons of inferred resources averaging 0.22 oz/ton gold, 0.5 oz/ton silver, and 2.47 percent lead; vein width averages 2.0 ft.

An average tonnage and grade was determined for the combined resource blocks. The total of 138,000 tons has a weighted average grade of 0.07 oz/ton gold, 0.3 oz/ton silver, and 0.59 percent lead; average vein width is 3.0 ft. This resource is classified as subeconomic (see appendix D for a summary of resource definitions).

The resources contain about $5 million worth of metals. This value is based on a 3 ft width and 1987 metal prices of $465/oz gold, $6.65/oz silver, and $0.40/lb lead. This equates to roughly $37.00/ton. Resources were not calculated for the dumps, due to landslide material covering them.

CONCLUSIONS: The Ajax mine resources could not be mined profitably at present day costs. Underground, the vein is generally less than 5 ft thick; mining at that optimum width would result in significant grade dilution. It would cost in excess of $100/ton to mine at this property. Our estimate indicates the gross value of metals in the vein is about $37.00/ton. However, historical reports indicate assay values much higher. There may be rich pockets or shoots which were not detected; drilling is needed to delineate these possible higher grade zones. Resources could also be discovered in the westward projection of the vein, toward the High prospect on the Idaho side of the continental divide.

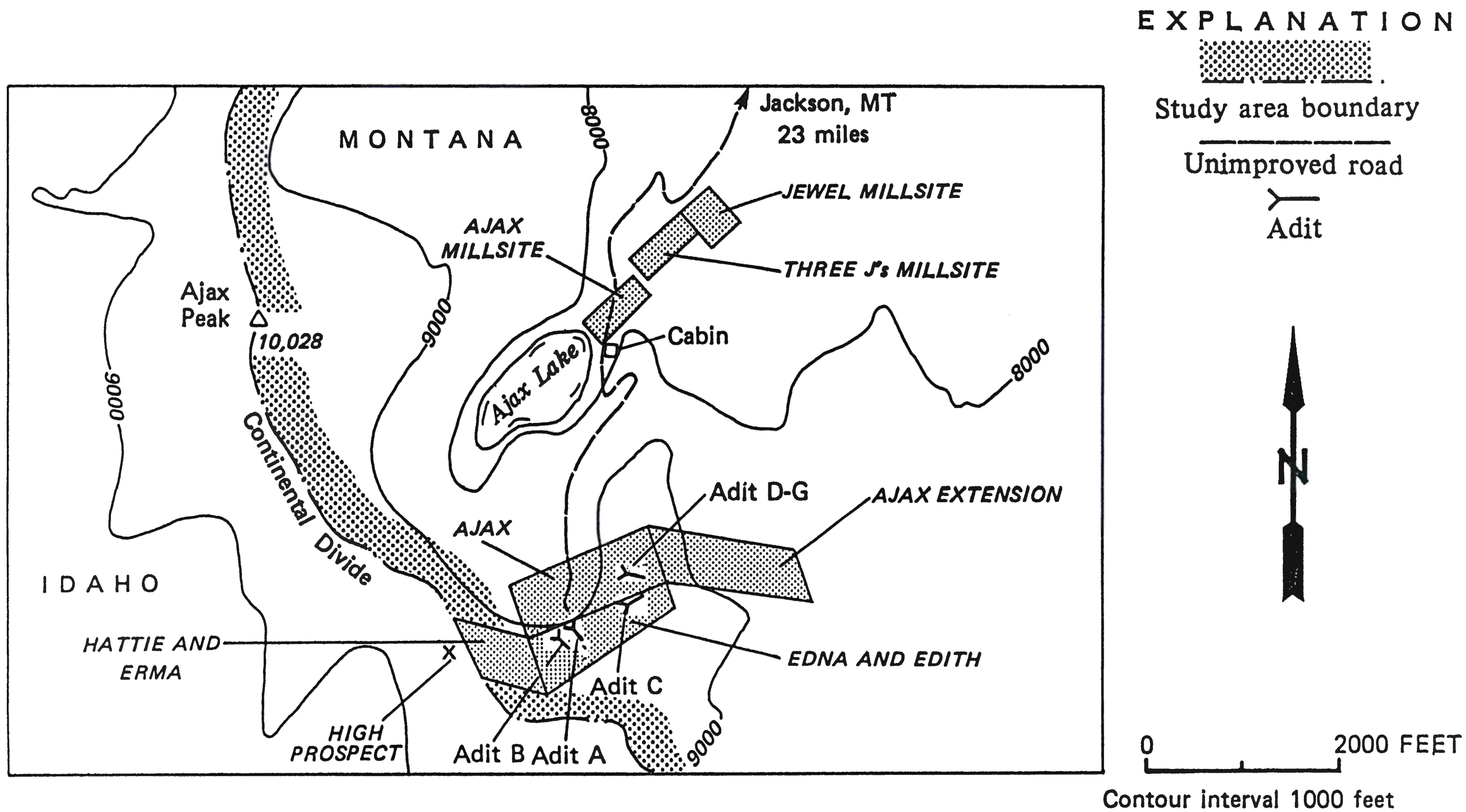

FIGURE A-1– Patented claims at the Ajax mine

FIGURE A-2.--View of the Ajax mine, looking east.

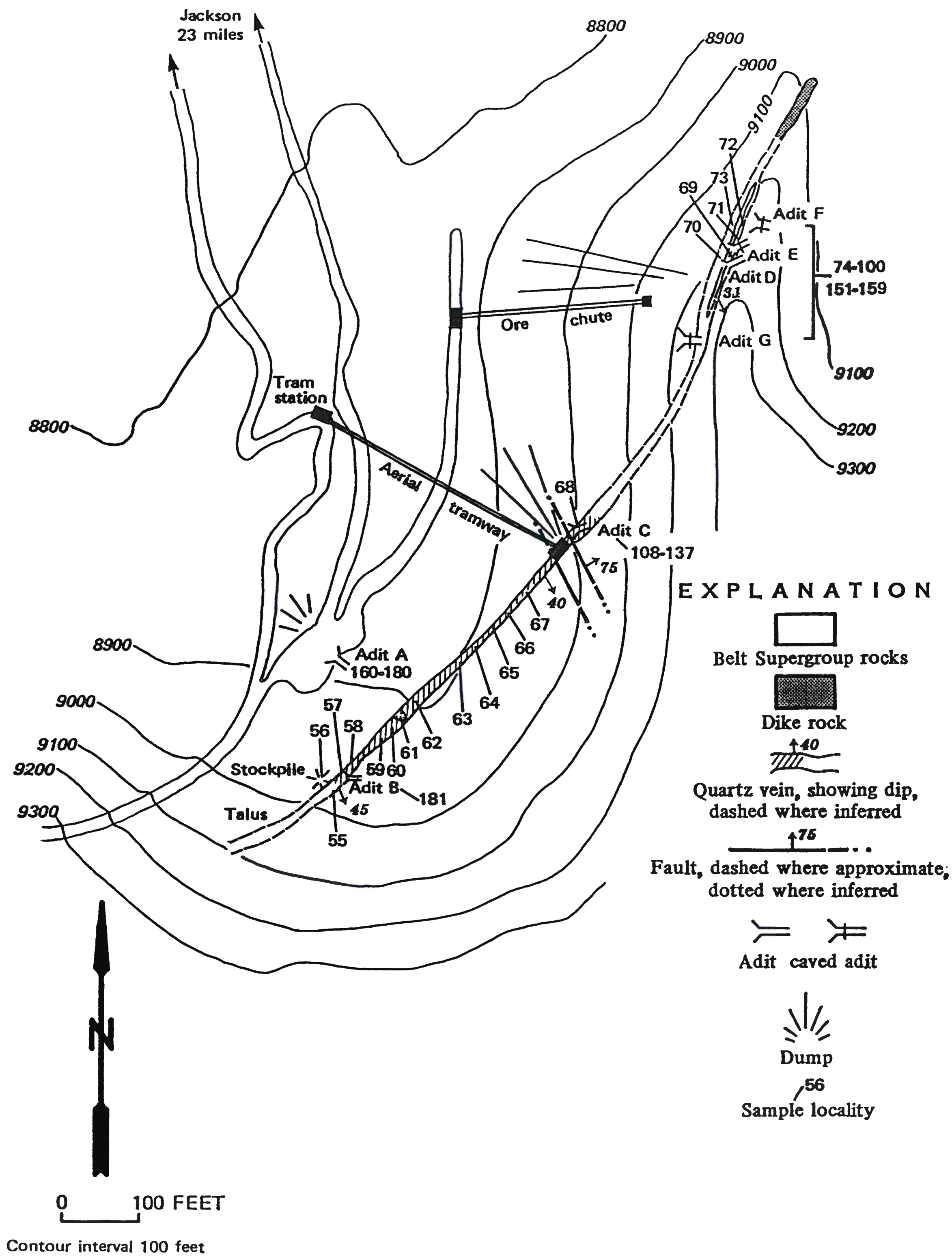

FIGURE A-3.— Surface map of workings and geology at the Ajax mine

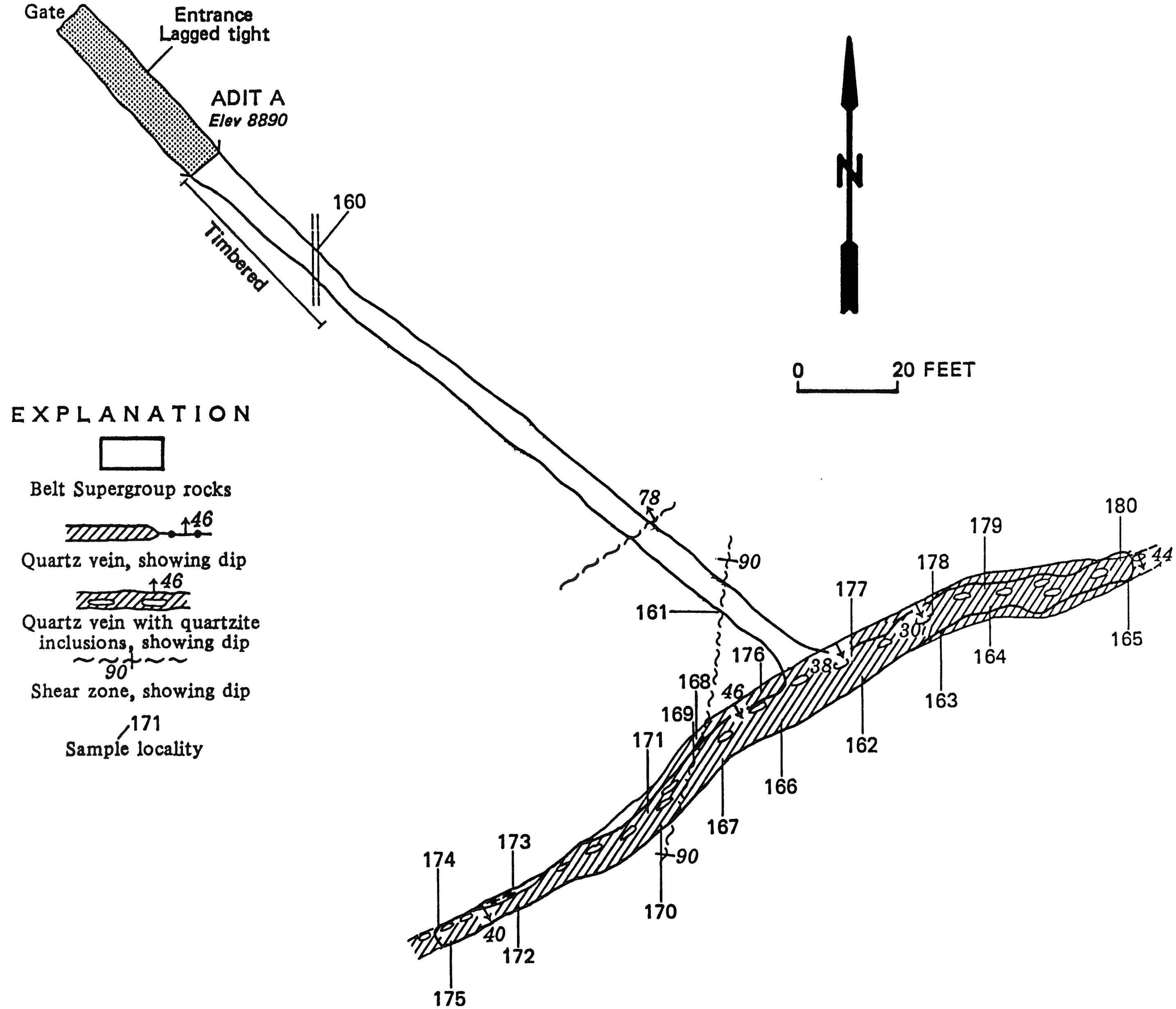

FIGURE A-4.– Underground geologic map with sample locations for adit A of the Ajax mine

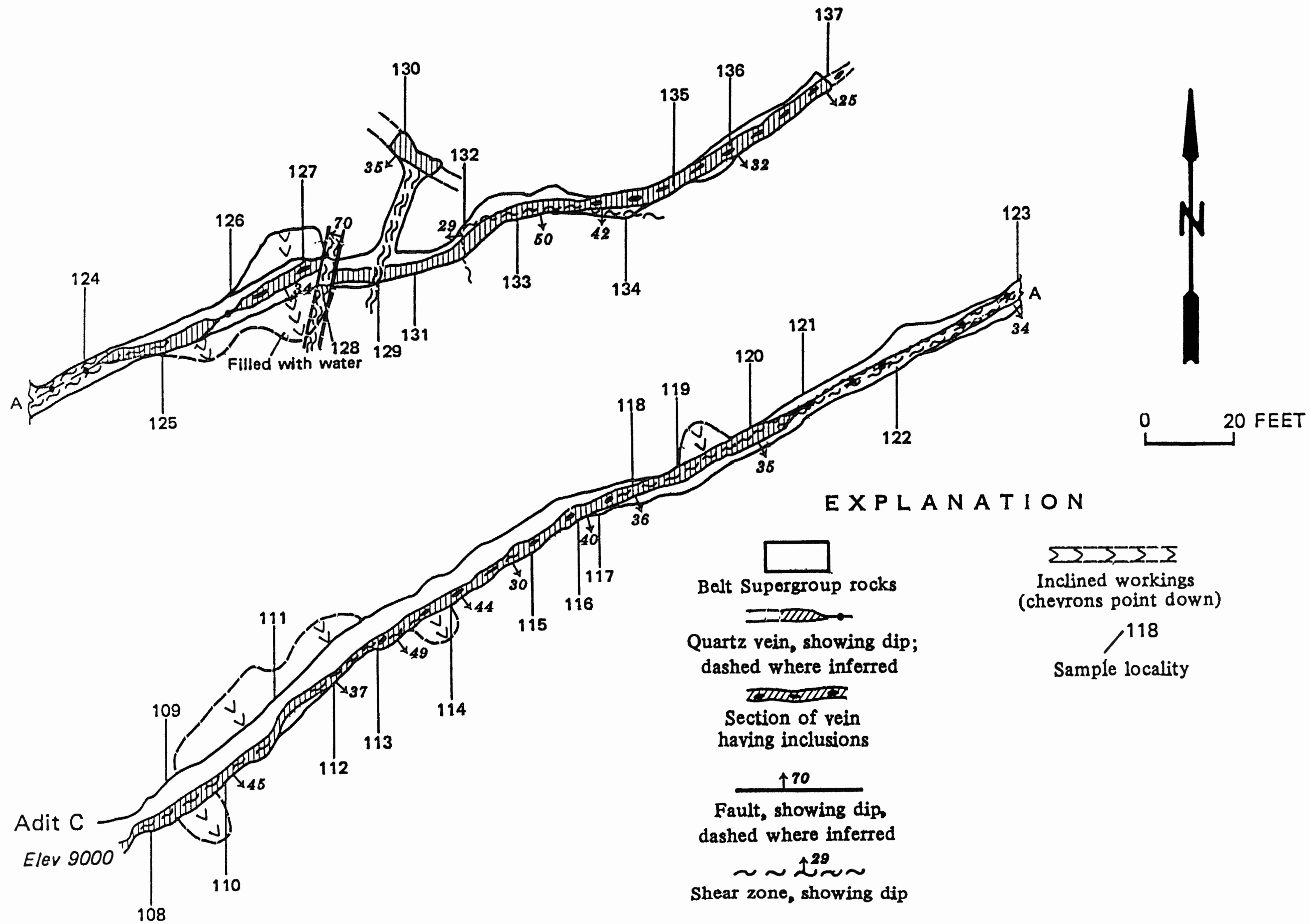

FIGURE A-5.– Underground geologic map with sample locations for adit C of the Ajax mine

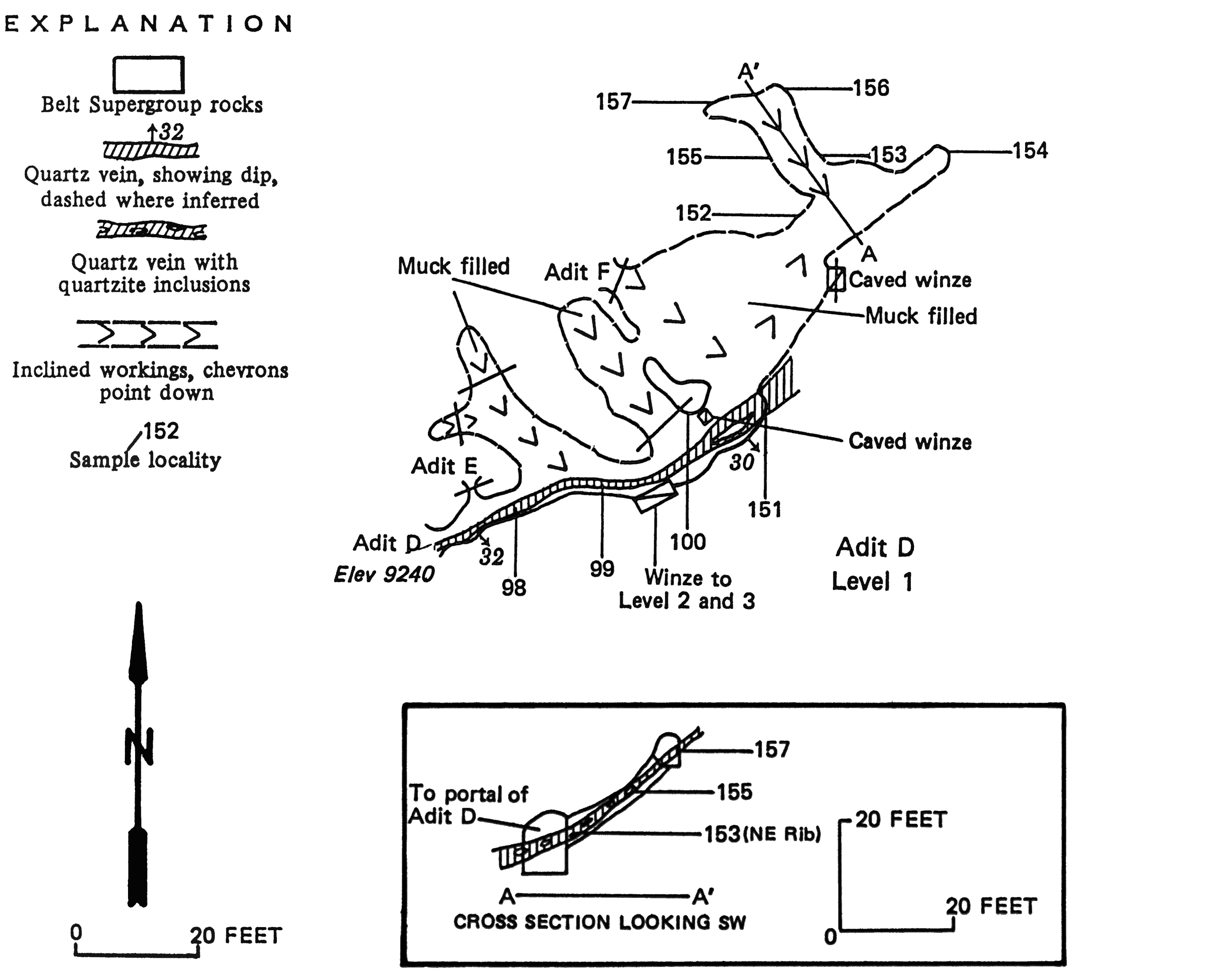

FIGURE A-6.– Underground geologic map showing sample localities for level 1 of adit D, and caved portals of adits E and F of the Ajax mine. (For definintions of mining terms see glossary)

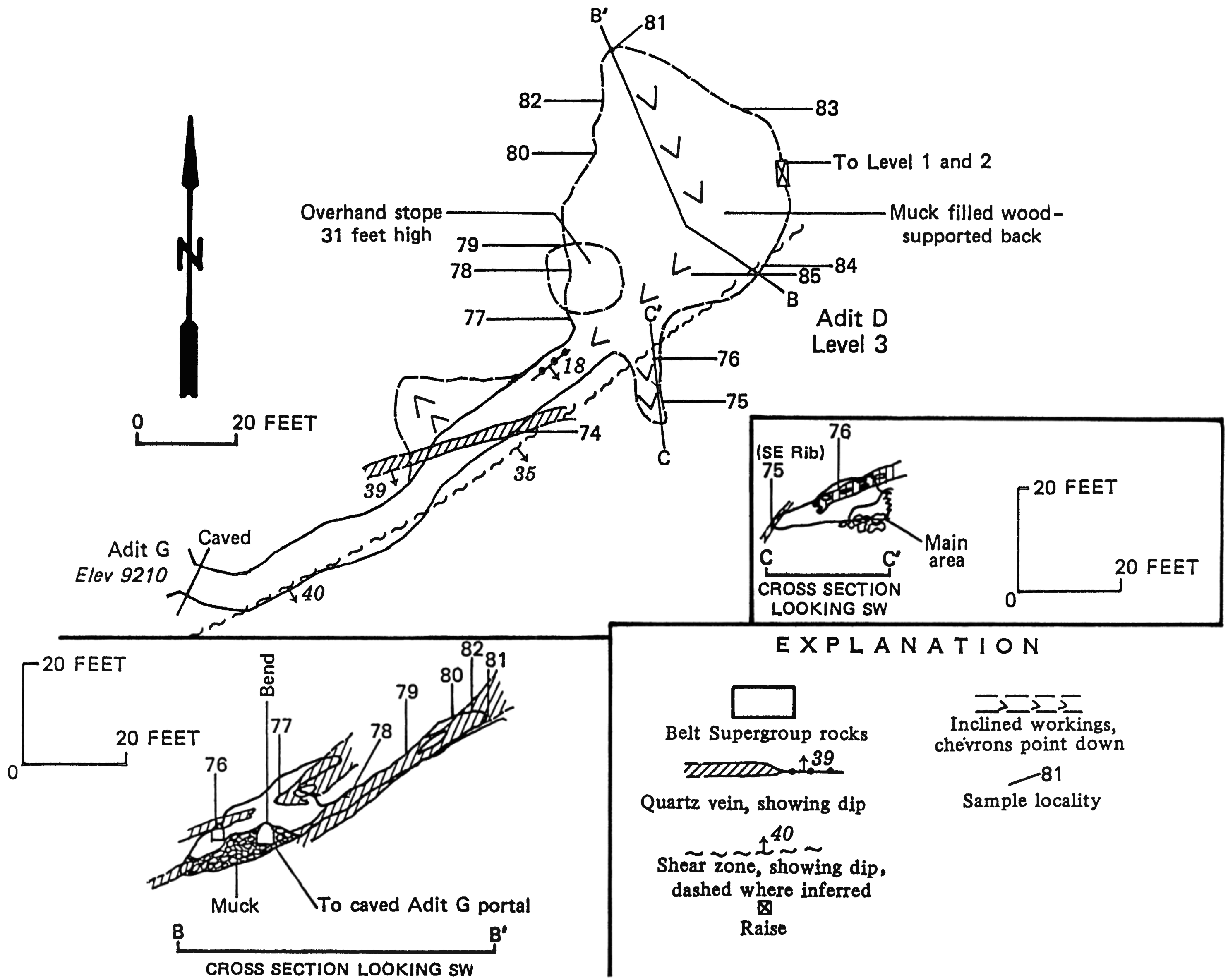

FIGURE A-8.– Underground geologic maps with sample localities at level 3 of adit D of the Ajax mine. (For definintion of mining terms, see glossary)

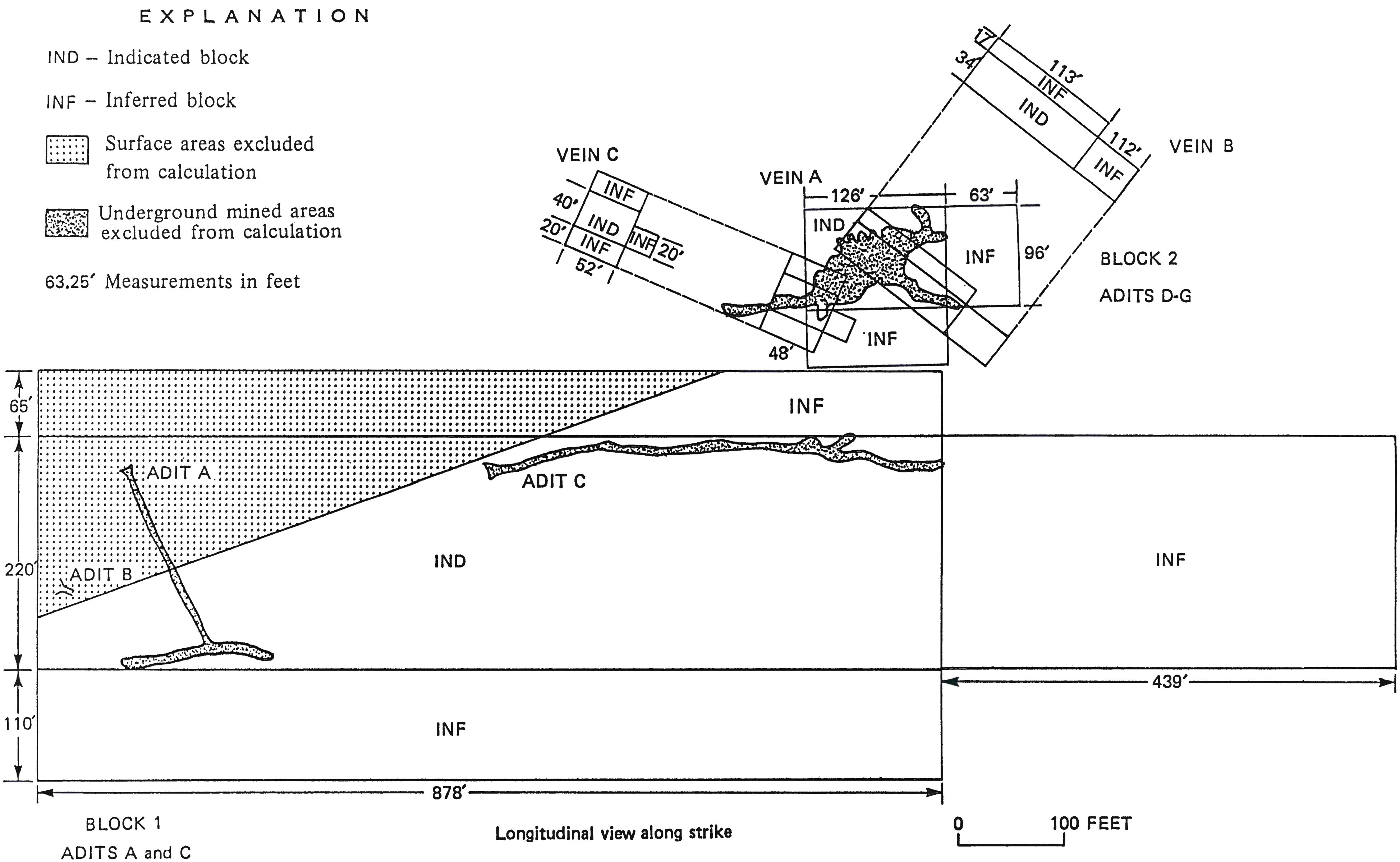

FIGURE A-9.– Diagram of resource blocks used for tonnage calculation at the Ajax mine

TABLE C-1.--Summary of reconnaissance alluvial (placer) samples from the West Big Hole study area.

Sample no. (fig.7	Volume (yd3)	Gold weight (mg)	Gold value_1/ (cents/yd3)
3	0.004	0.145	54
4	0.004	0.069	26
27	0.008	0.041	8
28	0.008	0.022	4
29	0.008	0.017	3
30	0.008	0.011	2
31	0.008	0.006	1
53	0.008	0.058	11
296	0.008	0.009	2
297	0.008	0.071	13
298	0.008	0.049	9
299	0.008	0	0
300	0.008	0.139	26
309	0.012	0	0
310	0.012	0.285	36
311	0.008	0	0
312	0.008	0.087	16
435	0.008	0	0
436	0.008	0	0
437	0.008	0	0
438	0.008	0	0
439	0.008	0.224	42
440	0.008	0.073	14
441	0.008	0.034	6
442	0.008	0.028	5
443	0.008	0.196	37
444	0.008	0.176	33
489	0.008	0.311	58
490	0.008	0.669	125
504	0.008	0.093	17
505	0.008	0.024	4
506	0.008	0.049	9
507	0.008	0.013	2
508	0.008	0	0
509	0.008	0.056	10
510	0.008	0	0
511	0.008	0	0
512	0.008	0	0
513	0.008	0	0
514	0.008	0	0
515	0.008	0	0

_1/ Gold at $465 per troy ounce

TABLE C-2.--Analytical data for rock samples from the West Big Hole study area.
(N= nil; <= less than; C= chip; S=select; G=grab)

Property (map no.)	Sample No.	Type	Au oz/ton	Ag oz/ton	Cu %	Pb %	Zn %	W %	Mo %	Sb %	As %
Ajax mine	054	C	0.030	N	0.02	0.03	<0.01			<0.005	<0.005
Ajax mine	055	C	0.040	0.300	0.03	0.12	<0.01			0.058	<0.005
Ajax mine	056	S	0.120	0.300	0.18	0.13	<0.01			<0.005	<0.005
Ajax mine	057	C	0.050	0.100	0.02	0.09	<0.01				
Ajax mine	058	C	0.170	0.400	0.02	1.18	<0.01				
Ajax mine	059	C	0.100	0.300	0.03	1.31	<0.01			<0.005	<0.005
Ajax mine	060	C	<0.005	N	0.02	0.02	<0.01				
Ajax mine	061	C	0.110	0.100	0.02	0.17	<0.01				
Ajax mine	062	C	0.010	0.100	0.01	0.10	<0.01				
Ajax mine	063	C	<0.005	N	<0.01	<0.01	<0.01				
Ajax mine	064	C	0.050	0.100	0.02	0.04	<0.01				
Ajax mine	065	C	0.030	0.600	0.03	0.09	<0.01				
Ajax mine	066	C	0.040	0.200	0.01	0.05	<0.01				
Ajax mine	067	C	N	0.100	<0.01	<0.01	<0.01				
Ajax mine	068	C	0.020	0.200	0.03	0.13	<0.01				
Ajax mine	069	C	0.070	0.400	0.29	1.18	<0.01			<0.005	<0.005
Ajax mine	070	C	<0.005	0.100	0.02	0.12	<0.01				
Ajax mine	071	C	0.280	0.600	0.06	0.36	<0.01			<0.005	<0.005
Ajax mine	072	C	0.960	2.800	0.35	7.90	<0.01			<0.005	<0.005
Ajax mine	073	C	0.740	1.400	0.18	1.21	<0.01			<0.005	<0.005
Ajax mine	074	C	0.020	0.400	0.07	1.60	0.01	0.023	0.003	0.004	
Ajax mine	075	C	0.030	0.800	0.06	2.00	0.01	0.011	0.004	<0.005	
Ajax mine	076	C	0.210	2.300	0.38	6.40	0.01	0.039	0.010	0.005	
Ajax mine	077	C	0.480	N	0.07	0.83	0.04	0.005	0.003		
Ajax mine	078	C	0.570	0.300	0.22	0.86	0.01	0.013	0.003	0.003	
Ajax mine	079	C	0.030	0.500	0.29	1.40	0.01	0.023	0.003	0.007	
Ajax mine	080	C	0.250	0.200	0.06	0.31	<0.01	0.006	0.008		
Ajax mine	081	C	0.160	0.300	0.12	0.54	<0.01	0.017	0.004		
Ajax mine	082	C	0.050	0.100	0.13	0.48	<0.01	0.017	0.005		
Ajax mine	083	C	0.550	0.400	0.34	3.10	0.01	0.034	0.006	0.005	
Ajax mine	084	C	0.050	0.700	0.27	3.50	0.01	0.008	0.003		
Ajax mine	085	S	0.710	5.800	1.00	7.70	0.01	0.032	0.003	0.003	
Ajax mine	086	C	0.100	0.100	0.13	0.47	0.01	0.014	0.006	0.003	
Ajax mine	087	C	0.040	0.200	0.04	0.46	0.01	0.020	0.003	0.005	
Ajax mine	088	C	N	0.100	0.08	1.00	0.01	0.007	0.003		
Ajax mine	089	C	0.130	0.100	0.12	0.30	0.01	0.007	0.003	0.003	
Ajax mine	090	C	0.200	0.400	0.02	0.20	<0.01	0.067	0.003		
Ajax mine	091	C	0.190	0.100	0.02	0.07	<0.01	0.007	0.003		
Ajax mine	092	C	0.190	0.100	0.03	0.28	<0.01	0.006	0.004		
Ajax mine	093	C	0.040	2.000	0.24	3.80	<0.01	0.020	0.004	0.003	
Ajax mine	094	C	0.040	0.100	0.19	0.44	0.01	0.015	0.003	0.003	

TABLE C-2.--Analytical data for rock samples from the West Big Hole study area (continued).
(N= nil; <= less than; C= chip; S=select; G=grab)

Property (map no.)	Sample No.	Type	Au oz/ton	Ag oz/ton	Cu %	Pb %	Zn %	W %	Mo %	Sb %	As %
Ajax mine	095	C	0.290	0.300	0.14	2.80	0.01	0.018	0.003	0.004	
Ajax mine	096	C	0.280	0.400	0.46	14.60	0.01	0.017	0.004	0.004	
Ajax mine	097	C	0.160	0.300	0.42	2.00	0.01	0.015	0.003	0.003	
Ajax mine	098	C	0.750	1.200	0.67	4.50	0.01	0.062	0.012	0.008	
Ajax mine	099	C	0.110	0.700	0.49	7.50	0.01	0.057	0.003	0.003	
Ajax mine	100	C	0.370	0.500	0.09	1.00	<0.01	0.012	0.004	0.003	
Ajax mine	108	C	0.050	0.900	0.04	1.47	<0.01			<0.005	<0.005
Ajax mine	109	C	0.130	0.200	0.20	0.14	<0.01			<0.005	<0.005
Ajax mine	110	C	0.070	0.200	0.03	0.20	<0.01			<0.005	<0.005
Ajax mine	111	C	0.030	0.100	0.02	0.24	<0.01			<0.005	<0.005
Ajax mine	112	C	0.120	0.700	0.14	0.49	<0.01			<0.005	<0.005
Ajax mine	113	C	0.020	0.200	0.03	0.40	<0.01			<0.005	<0.005
Ajax mine	114	C	<0.005	0.200	0.03	0.45	<0.01			<0.005	<0.005
Ajax mine	115	C	0.140	0.300	0.36	2.70	<0.01			<0.005	<0.005
Ajax mine	116	C	0.060	0.200	0.08	0.35	<0.01			<0.005	<0.005
Ajax mine	117	C	0.140	0.500	0.36	0.91	<0.01			<0.005	<0.005
Ajax mine	118	C	0.400	0.300	0.27	1.64	<0.01			<0.005	<0.005
Ajax mine	119	C	0.090	0.300	0.07	0.57	<0.01			<0.005	<0.005
Ajax mine	120	C	N	0.300	0.07	0.64	0.01	0.013	0.004	0.004	<0.005
Ajax mine	121	C	0.070	0.200	0.04	0.75	0.01	0.018	0.004	0.000	<0.005
Ajax mine	122	C	0.030	0.100	0.04	0.32	0.01	0.014	0.003	0.004	<0.005
Ajax mine	123	C	0.020	0.100	0.08	0.24	0.01	0.015	0.003	0.005	<0.005
Ajax mine	124	C	0.050	0.100	0.06	0.53	0.01	0.023	0.002	0.006	<0.005
Ajax mine	125	C	0.480	1.900	0.37	6.00	0.01	0.075	0.022	0.005	<0.005
Ajax mine	126	C	0.080	0.200	0.14	0.75	0.01	0.025	0.003	0.005	<0.005
Ajax mine	127	C	0.200	N	0.02	0.36	<0.01	0.056	0.003	<0.005	<0.005
Ajax mine	128	C	0.020	N	0.13	2.40	<0.01	0.016	0.003	0.003	<0.005
Ajax mine	129	C	N	N	0.01	0.18	<0.01	0.009	0.002	<0.005	<0.005
Ajax mine	130	C	0.040	N	0.01	0.47	0.01	0.009	0.002	0.003	<0.005
Ajax mine	131	C	0.150	4.000	0.90	17.70	0.01	0.018	0.004	0.006	<0.005
Ajax mine	132	C	0.020	N	0.02	0.63	0.01	0.009	0.002	<0.005	<0.005
Ajax mine	133	C	0.010	0.100	<0.01	0.14	<0.01	0.003	0.003	<0.005	<0.005
Ajax mine	134	C	0.100	0.200	0.05	0.83	0.01	0.010	0.003	<0.005	<0.005
Ajax mine	135	C	0.020	0.100	0.05	0.74	0.01	0.010	0.004	0.003	<0.005
Ajax mine	136	C	0.160	0.200	0.05	0.37	0.01	0.011	0.005	<0.005	<0.005
Ajax mine	137	C	0.020	0.300	0.01	0.36	0.01	0.009	0.003	0.003	<0.005
Ajax mine	151	C	0.060	0.900	0.21	4.10	<0.01	0.005	0.003		0.003
Ajax mine	152	C	0.070	0.100	0.03	0.29	0.01	0.099	0.007	0.004	
Ajax mine	153	C	0.300	1.600	0.16	3.30	0.01	0.014	0.004	0.004	
Ajax mine	154	C	0.110	0.200	0.15	1.30	0.01	0.019	0.033	0.004	
Ajax mine	155	C	0.440	0.200	0.12	1.00	0.01	0.087	0.006		

TABLE C-2.--Analytical data for rock samples from the West Big Hole study area (continued).
(N= nil; <= less than; C= chip; S=select; G=grab)

Property (map no.)	Sample No.	Type	Au oz/ton	Ag oz/ton	Cu %	Pb %	Zn %	W %	Mo %	Sb %	As %
Ajax mine	156	C	0.540	0.200	0.03	1.10	0.01	0.018	0.004	<0.005	<0.005
Ajax mine	157	C	0.160	0.100	0.14	0.71	0.01	0.055	0.007	0.004	
Ajax mine	158	C	0.620	1.000	0.39	7.30	0.01	0.008	0.005		
Ajax mine	159	C	N	N	0.11	0.21	0.01	0.012	0.003	0.004	<0.005
Ajax mine	160	C	N	N	<0.01	0.02	<0.01		0.003		
Ajax mine	161	C	N	N	<0.01	0.01	<0.01	0.010	0.002		
Ajax mine	162	C	0.120	0.300	0.01	0.15	<0.01	0.009	0.010		
Ajax mine	163	C	0.060	0.200	0.02	0.24	<0.01	<0.001	0.014	<0.005	<0.005
Ajax mine	164	C	0.010	N	0.01	0.15	<0.01	0.004	0.005		
Ajax mine	165	C	0.040	0.200	0.02	0.57	<0.01	0.130	0.010		
Ajax mine	166	C	0.050	0.300	0.03	0.40	<0.01	0.095	0.011		
Ajax mine	167	C	0.010	N	0.01	0.05	<0.01	0.006	0.002		
Ajax mine	168	C	0.010	N	0.02	0.11	<0.01	0.008	0.055		
Ajax mine	169	C	0.010	0.100	0.02	0.20	<0.01	0.007	0.002		
Ajax mine	170	C	N	0.100	<0.01	0.02	<0.01		0.002		
Ajax mine	171	C	0.010	N	0.01	0.02	<0.01		0.004		
Ajax mine	172	C	0.120	0.300	<0.01	0.16	<0.01	0.059	0.005		
Ajax mine	173	C	N	0.100	<0.01	0.03	<0.01	0.020	0.002	0.003	
Ajax mine	174	C	0.010	0.200	0.02	0.18	<0.01	0.009	0.002		
Ajax mine	175	C	0.010	0.200	0.01	0.08	<0.01	0.007	0.003		
Ajax mine	176	C	0.030	0.300	0.03	0.50	<0.01	0.004	0.005		
Ajax mine	177	C	0.010	0.100	0.01	0.13	<0.01	0.003	0.010		
Ajax mine	178	C	0.020	0.200	0.03	0.09	<0.01	0.005	0.003		
Ajax mine	179	C	0.010	0.100	0.21	0.09	<0.01	0.004	0.003		
Ajax mine	180	C	0.140	N	0.07	0.18	<0.01	0.037	0.006		
Ajax mine	181	C	N	N	0.02	0.10	0.01	0.040	0.016		
Alaska prospect	393	S	N	N	0.01	0.03	<0.01	<0.001	0.004		
Blackrock prospect	394	G	0.010	6.300	1.70	4.90	0.01		0.042	<0.005	0.011
Blackrock prospect	395	C	N	0.100							
Blackrock prospect	396	C	N	N							
Blackrock prospect	397	C	N	N							
Blackrock prospect	398	C	N	0.100							
Blackrock prospect	399	C	N	0.100							
Blackrock prospect	414	S	N	0.100			0.00	0.000			
Blackrock prospect	415	C	0.010	0.800	0.72	0.84	0.01	0.020	0.023		
Blackrock prospect	416	C	N	1.400	0.67	1.20	0.01	0.011	0.019		
Blackrock prospect	417	S	N	2.600	5.10	0.19	0.01	0.007	0.019		
Blackrock prospect	418	C	N	0.300	0.40	1.10	0.01	0.009	0.012		
Blackrock prospect	419	C	N	0.300	0.10	0.08	<0.01	0.006	0.002		
Blackrock prospect	420	S	N	0.800	1.20	0.87	0.01	0.009	0.032		
Blackrock prospect	421	C	N	4.300	0.52	4.90	0.01	0.011	0.038		

TABLE C-2.--Analytical data for rock samples from the West Big Hole study area (continued).
(N= nil; <= less than; C= chip; S=select; G=grab)

Property (map no.)	Sample No.	Type	Au oz/ton	Ag oz/ton	Cu %	Pb %	Zn %	W %	Mo %	Sb %	As %
Blackrock prospect	422	C	N	0.300	0.17	0.12	<0.01	0.011	0.003		
Blackrock prospect	423	S	N	0.800	0.32	2.10	0.01	0.005	0.008		
Blackrock prospect	424	S	N	0.600	0.41	1.90	0.01	0.009	0.046		
Blackrock prospect	450	C	N	N							
Blackrock prospect	451	C	N	N							
Blackrock prospect	452	C	N	N							
Blackrock prospect	453	C	N	0.100							
Blackrock prospect	454	C	N	N							
Blackrock prospect	455	C	N	N							
Blackrock prospect	456	C	<0.005	N	<0.01	0.01	<0.01	0.005	0.004		
Blackrock prospect	457	C	N	N	<0.01	<0.01	<0.01	0.004	0.004		
Blackrock prospect	458	C	N	N	<0.01	<0.01	<0.01	0.007	0.004		
Blackrock prospect	459	C	N	N	<0.01	<0.01	<0.01	<0.001	0.003		
Blackrock prospect	460	C	0.010	0.300	0.02	0.12	0.09	0.008	0.003		
Blackrock prospect	461	C	0.010	0.200	0.21	0.02	0.01	0.008	0.003		0.009
Blackrock prospect	462	C	N	N	0.02	0.01	0.01	0.012	0.002	0.004	
Copper Queen mine	051	S	N	15.600	4.20	1.92	0.01				
Copper Queen mine	052	S	<0.005	2.000	3.20	0.76	<0.01				
Copper Queen mine	253	S	N	11.500	2.90	4.00	0.01	<0.001	0.014		
Copper Queen mine	254	S	N	6.700	3.70	0.52	0.01	<0.001	0.029		
Copper Queen mine	255	S	0.010	3.100	4.30	0.13	0.01	0.006	0.003		
Copper Queen mine	256	S	N	0.100	0.02	<0.01	<0.01	<0.001	0.001	0.003	
Copper Queen mine	258	S	N	0.100	<0.01	<0.01	<0.01	<0.001	0.001		
Copper Queen mine	259	S	<0.005	0.100							
Eldorado mine	409	S	1.630	1.700	1.90	0.10	0.01	0.100	0.011	0.039	0.001
Flying Cloud prospect	463	C	0.020	N							
Flying Cloud prospect	464	C	N	0.100							
Flying Cloud prospect	465	C	N	N							
Flying Cloud prospect	466	S	0.060	0.500	<0.01	1.70	<0.01		0.003		
Flying Cloud prospect	467	C	N	N	<0.01	0.04	<0.01	0.004	0.002		
Flying Cloud prospect	478	G	N	0.100							
Flying Cloud prospect	479	C	N	0.100	0.02	0.45	<0.01	0.004	0.003		
Gold King prospect	378	G	N	0.100							
Goldstone mine	005	S	0.550	0.600	0.11	1.99	<0.01				
Goldstone mine	006	S	0.420	0.900	0.10	2.03	0.01				
High prospect	336	G	0.010	N	<0.01	<0.01	<0.01	<0.001	0.004	<0.005	<0.005
High prospect	337	C	N	N	0.01	<0.01	<0.01	0.003	0.003	<0.005	<0.005
High prospect	338	C	N	N	<0.01	<0.01	0.01	0.004	0.003		
High prospect	339	C	N	N	<0.01	<0.01	<0.01	0.004	0.002		
Hope prospect	468	C	N	N							
Hope prospect	469	S	0.030	0.200	0.03	0.18	0.01	0.007	0.003		

TABLE C-2.--Analytical data for rock samples from the West Big Hole study area (continued).
(N= nil; <= less than; C= chip; S=select; G=grab)

Property (map no.)	Sample No.	Type	Au oz/ton	Ag oz/ton	Cu %	Pb %	Zn %	W %	Mo %	Sb %	As %
Hose dog No.1 prospect	270	S	0.270	0.800	0.32	0.28	<0.01		0.003		
Hose dog No.1 prospect	271	S	0.580	2.000	1.60	0.23	<0.01		0.004	<0.005	0.006
Hose dog No.1 prospect	272	S	0.140	0.500	0.27	0.84	<0.01		0.004	<0.005	0.003
HRS claim group	032	S	0.010	2.100	0.10	3.30	0.02	<0.001		<0.005	<0.005
HRS claim group	033	S	N	0.100	0.21	0.04	0.01				
HRS claim group	218	C	N	0.200	0.02	0.02	<0.01				
HRS claim group	219	C	<0.005	1.200	0.21	0.39	<0.01				
HRS claim group	220	C	N	2.100	0.25	0.49	<0.01				
HRS claim group	221	C	0.030	4.200	0.52	0.99	<0.01				
HRS claim group	222	C	N	N	0.01	0.01	<0.01	0.009			
HRS claim group	223	C	N	N	<0.01	<0.01	<0.01	0.007			
HRS claim group	224	S	N	N	<0.01	<0.01	<0.01	0.007			
HRS claim group	225	C	N	N	<0.01	<0.01	<0.01	0.007			
HRS claim group	226	C	N	N	<0.01	<0.01	<0.01				
HRS claim group	227	S	N	0.100	0.01	<0.01	<0.01				
HRS claim group	228	S	N	N	<0.01	<0.01	<0.01				
HRS claim group	229	S	N	N	<0.01	<0.01	<0.01				
HRS claim group	230	S	N	0.100	0.05	<0.01	<0.01	0.007			
HRS claim group	231	C	N	N	0.09	0.01	<0.01	0.009			
HRS claim group	232	C	N	N	<0.01	<0.01	<0.01	0.007			
HRS claim group	233	S	N	N	0.14	<0.01	<0.01				
Independence prospect	265	S	0.300	0.400	0.07	0.43	<0.01	N	0.007		
Independence prospect	266	S	0.090	0.300	0.15	0.18	0.01				
Independence prospect	267	S	N	0.100	<0.01	<0.01	<0.01	0.006	0.003		
Jackson mine	301	S	0.030	3.400	0.46	6.70	<0.01	0.008	0.003	<0.005	<0.005
Jackson mine	302	S	0.730	0.700	0.77	1.80	0.01	0.008	0.004	<0.005	<0.005
Jackson mine	303	C	0.260	0.300	0.12	0.50	<0.01	0.004	0.005	<0.005	<0.005
Jackson mine	304	S	0.520	0.200	0.05	0.35	<0.01	0.090	0.021	<0.005	<0.005
Jackson mine	351	G	N	0.100							
Jahnke mine	008	R	<0.005	0.100	<0.01	0.04	<0.01				
Jahnke mine	009	C	<0.005	0.100	<0.01	0.01	<0.01				
Jahnke mine	010	C	N	0.100	<0.01	<0.01	<0.01				
Jahnke mine	011	C	<0.005	<0.05	<0.01	<0.01	<0.01				
Jahnke mine	012	C	<0.005	<0.05	<0.01	<0.01	<0.01				
Jahnke mine	013	C	<0.005	0.100	<0.01	<0.01	<0.01				
Jahnke mine	014	C	<0.005	0.100	<0.01	<0.01	<0.01				
Jahnke mine	015	R	<0.005	0.100	<0.01	<0.01	<0.01				
Jahnke mine	016	C	<0.005	0.100	<0.01	<0.01	<0.01				
Jahnke mine	017	R	<0.005	N							
Jahnke mine	018	C	<0.005	0.100	<0.01	<0.01	<0.01				
Jahnke mine	019	R	<0.005	N	N						

TABLE C-2.--Analytical data for rock samples from the West Big Hole study area (continued).
(N= nil; <= less than; C= chip; S=select; G=grab)

Property (map no.)	Sample No.	Type	Au oz/ton	Ag oz/ton	Cu %	Pb %	Zn %	W %	Mo %	Sb %	As %
Jahnke mine	020	C	<0.005	0.100	<0.01	<0.01	<0.01				
Jahnke mine	021	R	<0.005	0.200							
Jahnke mine	022	S	<0.005	1.100	0.11	5.00	<0.01	<0.001			
Jahnke mine	023	S	0.020	8.600	19.70	4.00	0.40	<0.001			
Jahnke mine	024	S	<0.005	0.100	0.07	0.33	0.01	<0.001			
Jahnke mine	025	R	<0.005	0.100							
Jahnke mine	026	R	N	N	0.02						
Jahnke mine	034	C	N	N	0.02	0.01	0.01				
Jahnke mine	035	C	N	0.400	0.01	0.29	<0.01				
Jahnke mine	036	S	0.010	4.500	0.48	31.00	<0.01				
Jahnke mine	037	C	N	0.100							
Jahnke mine	038	C	N	N	0.01	0.01	0.01				0.030
Jahnke mine	039	C	N	N	0.05	0.07	0.01				
Jahnke mine	040	S	N	0.500	0.26	14.50	0.01				0.001
Jahnke mine	041	C	N	1.100	0.81	12.50	0.01	0.001	0.013	0.021	0.001
Jahnke mine	042	S	N	1.600	6.30	33.10	0.01	<0.001		<0.005	<0.005
Jahnke mine	043	C	<0.005	2.200	1.30	25.90	0.01		0.010	0.013	0.005
Jahnke mine	044	C	N	N	0.02	0.17	0.01				0.012
Jahnke mine	045	C	N	1.700	0.09	2.90	0.02	0.008	0.010		
Jahnke mine	046	C	0.010	1.300	6.10	26.10	<0.01				
Jahnke mine	047	S	N	3.700	0.28	24.30	0.01	<0.001	0.006	0.009	<0.005
Jahnke mine	048	C	N	N	0.28	1.10	0.01	<0.001		<0.005	<0.005
Jahnke mine	049	C	N	0.100	0.01	0.01	0.01				
Jahnke mine	050	S	0.010	16.100	1.10	25.70	0.01	0.007			<0.005
Jahnke mine	201	S	N	0.400	0.01	0.03	0.02	0.015	0.003	0.004	0.011
Jahnke mine	202	S	<0.005	2.100	0.41	9.20	0.01				
Jahnke mine	234	C	N	N	0.28	0.12	<0.01	0.015	0.009		
Jahnke mine	235	c	0.370	7.400	1.40	0.59	<0.01	0.040	0.006	<0.005	<0.005
Jahnke mine	236	C	0.020	8.100	1.90	1.00	<0.01	0.090	0.017	<0.005	0.006
Jahnke mine	237	C	<0.005	1.800	0.35	0.41	<0.01	<0.001	0.005	<0.005	0.004
Jahnke mine	238	C	<0.005	0.700	0.08	0.13	<0.01	0.130	0.005	<0.005	<0.005
Jahnke mine	239	C	N	0.100	0.02	0.08	<0.01	0.040	0.003	<0.005	<0.005
Jahnke mine	240	C	<0.005	6.600	2.60	0.93	0.01	0.065	0.019		
Jahnke mine	241	C	0.020	4.300	0.58	5.00	0.01	0.005	0.003		
Jahnke mine	242	C	0.010	1.100	0.20	1.50	0.01	0.007	0.008		
Jahnke mine	243	C	0.020	2.800	0.94	2.80	0.01	0.018	0.002		
Jahnke mine	244	C	N	0.300	0.05	0.40	0.01	<0.001	0.001		
Jahnke mine	245	C	0.010	36.900	8.10	33.70	0.03	0.010	0.018		
Jahnke mine	246	S	0.030	8.300	27.40	1.70	0.26	0.026	0.004		
Jahnke mine	249	S	0.030	1.600	9.90	0.04	0.03	0.015	0.003		
Jahnke mine	250	S	0.010	6.400	11.50	1.80	0.03	0.008	0.003		

TABLE C-2.--Analytical data for rock samples from the West Big Hole study area (continued).
(N= nil; <= less than; C= chip; S=select; G=grab)

Property (map no.)	Sample No.	Type	Au oz/ton	Ag oz/ton	Cu %	Pb %	Zn %	W %	Mo %	Sb %	As %
Jahnke mine	251	C	0.010	0.600	6.10	0.06	0.03	0.006	0.002		
Jahnke mine	252	C	N	0.400	4.70	0.18	0.02	0.009	0.002		
Jahnke mine	260	C	N	0.100	<0.01	<0.01	<0.01	0.000	0.003	<0.005	<0.005
Jahnke mine	261	C	N	N	<0.01	<0.01	<0.01	0.040	0.003	<0.005	0.010
Jahnke mine	262	C	<0.005	0.100	0.02	<0.01	<0.01	0.000	0.003	<0.005	0.004
Jahnke mine	263	C	<0.005	N	0.02	<0.01	<0.01	0.000	0.003	<0.005	0.004
Jahnke mine	264	C	N	N	<0.01	<0.01	<0.01	<0.001	0.002	<0.005	0.007
Lucy prospect	500	C	<0.005	N	0.42	<0.01	0.01	0.010	0.002	<0.001	<0.005
Lucy prospect	501	C	0.010	N	0.44	<0.01	0.01	0.012	0.002	0.004	<0.005
Lucy prospect	502	S	0.010	0.200	0.75	0.01	0.01	0.012	0.003	0.003	<0.005
Lucy prospect	503	C	0.020	0.500	0.25	0.01	0.01	0.008	0.003	<0.001	<0.005
Mendota prospect	516	S	0.010	1.600	3.90	7.90	0.01	0.006	0.011	<0.001	<0.005
Mendota prospect	517	S	0.050	1.800	9.60	28.90	0.02	0.007	0.005	<0.001	<0.005
Mystery prospect	382	G	0.010	0.100							
Mystery prospect	383	G	0.020	N							
Mystery prospect	384	G	<0.005	N	0.02	0.03	<0.01	0.042	0.004		
Mystery prospect	385	G	N	0.100	<0.01	0.11	<0.01	0.006	0.003		
Mystery prospect	480	G	0.020	N							
Mystery prospect	481	C	N	N							
Mystery prospect	482	S	N	N							
Mystery prospect	483	S	0.110	0.100							
Mystery prospect	484	G	0.020	N	0.02	0.27	<0.01	0.006	0.009		
Mystery prospect	485	C	N	N							
Northern prospect	285	C	0.040	0.300	<0.01	0.04	<0.01		0.003	<0.005	<0.005
Northern prospect	286	C	0.150	4.000	0.03	1.10	<0.01		0.003	<0.005	0.003
Northern prospect	287	C	0.360	2.100	<0.01	0.68	<0.01		0.004	<0.005	0.005
Northern prospect	288	C	0.660	3.800	0.81	4.10	0.01		0.004	<0.005	0.023
Northern prospect	289	C	1.200	0.500	0.06	0.18	<0.01		0.003		
Northern prospect	290	C	0.700	5.400	0.85	35.00	0.02	0.015	0.004	0.004	
Northern prospect	291	C	0.010	N	0.01	0.67	<0.01		0.002		
Northern prospect	292	C	0.030	0.200	<0.01	0.09	<0.01		0.003		
Northern prospect	293	S	0.590	4.600	1.80	7.10	0.01		0.004		
Old Timer prospect	400	G	0.040	N							
Old Timer prospect	401	G	0.220	N							
Old Timer prospect	402	G	0.010	N							
Old Timer prospect	403	G	0.040	N							
Old Timer prospect	404	S	0.040	N							
Old Timer prospect	405	S	N	N							
Old Timer prospect	406	S	N	N							
Old Timer prospect	407	S	N	N							
Old Timer prospect	408	S	0.060	0.100							

TABLE C-2.--Analytical data for rock samples from the West Big Hole study area (continued).
(N= nil; <= less than; C= chip; S=select; G=grab)

Property (map no.)	Sample No.	Type	Au oz/ton	Ag oz/ton	Cu %	Pb %	Zn %	W %	Mo %	Sb %	As %
Oro Astra prospect	368	C	0.080	0.100	<0.01	0.11	<0.01		0.004		0.005
Oro Astra prospect	369	C	0.030	0.100							
Oro Astra prospect	370	S	0.090	0.100							
Oro Astra prospect	375	C	0.320	0.100							
Oro Astra prospect	379	S	N	N							
Oro Astra prospect	380	C	<0.005	N							
Oro Astra prospect	381	S	N	N							
Oro Cache mine	273	S	0.500	0.200	0.04	0.12	<0.01		0.003	<0.005	<0.005
Oro Cache mine	274	S	0.940	0.300	0.03	0.42	<0.01		0.003	<0.005	0.006
Oro Cache mine	275	S	0.100	0.100	<0.01	0.14	<0.01		0.002	<0.005	0.005
Oro Cache mine	276	S	0.770	0.300	0.02	0.48	0.01		0.002	<0.005	0.004
Oro Cache mine	277	S	N	0.100	0.01	0.01	<0.01		0.003		
Oro Cache mine	278	S	0.020	N	0.01	0.05	<0.01		0.003		
Oro Cache mine	279	S	0.040	N	<0.01	0.02	<0.01		0.003		
Oro Cache mine	280	S	<0.005	N	0.01	0.04	<0.01	0.007	0.002		
Oro Cache mine	281	S	<0.005	N	0.01	0.01	<0.01	0.004	0.002		
Oro Cache mine	282	S	<0.005	N	<0.01	0.03	<0.01		0.003		
Oro Cache mine	283	S	0.010	0.100	0.04	0.03	<0.01		0.003	<0.005	<0.005
Oro Cache mine	371	G	<0.005	N							
Oro Cache mine	392	G	N	N	N						
Oro Cache mine	410	S	0.010	N	0.01	1.40	0.01	0.009	0.004		
Oro Cache mine	411	C	0.100	0.100	<0.01	0.54	0.01	0.007	0.004		
Oro Cache mine	412	C	N	N	<0.01	0.05	<0.01		0.004		
Oro Cache mine	413	S	0.080	1.400	<0.01	7.70	0.01	0.005	0.004	0.004	
Oro Rico prospect	372	G	<0.005	N							
Oro Rico prospect	373	G	N	N							
Oro Rico prospect	374	G	<0.005	N							
Oro Rico prospect	376	S	<0.005	N							
Oro Rico prospect	377	S	N	N	<0.01	<0.01	<0.01	0.008	0.003		
Pioneer mine	257	S	N	0.100	0.01	<0.01	<0.01	0.009	0.002	0.004	
Saginaw mine	001	R	N	N	0.20	0.01	0.01				<0.005
Saginaw mine	002	S	<0.005	0.400	8.60	0.01	0.01				<0.005
Scout prospect	248	?	N	0.600	0.16	0.54	<0.01	<0.001	0.003		
Scout prospect	294	S	<0.005	2.700	2.90	1.30	<0.01		0.004		
Silver Ridge group	138	C	0.030	0.500	0.06	0.55	0.01	0.008	0.270	<0.005	<0.005
Silver Ridge group	139	C	0.040	0.300	0.07	0.83	0.01	0.005	0.060	<0.005	<0.005
Silver Ridge group	140	C	0.050	0.300	0.10	0.48	0.15	0.014	0.017	0.005	<0.005
Silver Ridge group	141	C	0.050	0.900	0.06	0.32	0.04	0.024	0.067	<0.005	<0.005
Silver Ridge group	142	C	N	2.000	1.20	0.23	0.01	0.018	0.052	<0.005	<0.005
Silver Ridge group	143	C	0.080	0.500	0.04	0.22	0.04	0.005	0.090	<0.005	<0.005
Silver Ridge group	144	C	0.010	0.200	0.14	0.08	0.14	0.015	0.031	0.004	<0.005

TABLE C-2.--Analytical data for rock samples from the West Big Hole study area (continued).
(N= nil; <= less than; C= chip; S=select; G=grab)

Property (map no.)	Sample No.	Type	Au oz/ton	Ag oz/ton	Cu %	Pb %	Zn %	W %	Mo %	Sb %	As %
Silver Ridge group	145	C	0.080	1.300	0.16	2.40	0.01	0.007	0.049	<0.005	<0.005
Silver Ridge group	146	C	0.070	0.300	0.18	0.11	0.06	0.008	0.082	<0.005	<0.005
Silver Ridge group	147	C	0.020	N	0.09	0.04	0.09	0.015	0.017	0.004	<0.005
Silver Ridge group	148	C	0.010	0.200	0.62	0.04	0.02	0.091	0.022	<0.005	<0.005
Silver Ridge group	149	C	0.070	0.400	0.07	0.18	0.05	0.016	0.110	<0.005	<0.005
Silver Ridge group	150	C	0.010	N	0.05	0.04	0.02	0.021	0.015	0.004	<0.005
Silver Ridge group	182	C	0.130	3.100	0.45	2.00	0.03	0.007	0.200	<0.001	<0.005
Silver Ridge group	183	C	0.020	0.100	0.35	0.59	0.01	0.050	0.150	<0.001	<0.005
Silver Ridge group	184	C	N	0.300	0.17	0.33	0.01	0.048	0.063	<0.001	<0.005
Silver Ridge group	185	C	0.010	0.300	0.07	0.22	<0.01	0.030	0.080	<0.001	<0.005
Silver Ridge group	186	C	0.010	N	0.05	0.16	<0.01	0.630	0.310	<0.001	<0.005
Silver Ridge group	187	C	0.160	0.400	0.09	0.53	<0.01	<0.001	0.054	<0.001	0.005
Silver Ridge group	188	C	0.110	0.500	0.03	0.51	<0.01	0.030	0.050	<0.001	0.003
Silver Ridge group	189	C	0.010	0.100	<0.01	0.06	<0.01	0.020	0.140	<0.001	<0.005
Silver Ridge group	190	C	0.020	2.100	<0.01	0.97	<0.01	0.017	0.033	<0.001	0.019
Silver Ridge group	191	C	0.010	0.300	0.02	0.14	0.01	0.007	0.170	<0.001	0.029
Silver Ridge group	192	C	0.010	0.400	0.03	0.23	0.01	0.010	0.033	<0.001	<0.005
Silver Ridge group	193	C	<0.005	0.200	0.07	0.31	0.01	0.077	0.042	<0.001	<0.005
Silver Ridge group	194	C	0.020	N	0.13	0.85	<0.01	<0.001	0.066	<0.001	<0.005
Silver Ridge group	195	C	N	0.020	0.02	0.18	<0.01	0.090	0.043	<0.001	0.004
Silver Ridge group	196	C	0.010	N	0.01	0.04	<0.01	<0.001	0.011	<0.001	0.013
Silver Ridge group	197	C	0.030	N	<0.01	0.07	<0.01	<0.001	0.032	<0.001	<0.005
Silver Ridge group	198	C	N	0.100	0.23	0.04	<0.01	0.004	0.086	<0.001	<0.005
Silver Ridge group	199	C	0.240	0.200	0.05	0.36	0.08	0.047	0.032	<0.001	<0.005
Silver Ridge group	200	C	<0.005	N	<0.01	0.01	<0.01	0.180	0.027	<0.001	<0.005
Silver Ridge group	425	C	0.010	0.300	0.04	0.12	<0.01	0.017	0.034		
Silver Ridge group	426	C	0.020	0.500	0.06	0.46	<0.01	0.056	0.060		
Silver Ridge group	427	S	0.030	0.700	0.03	0.32	<0.01	0.087	0.056		
Silver Ridge group	428	S	N	0.800	0.02	0.26	<0.01	0.041	0.039		
Silver Ridge group	429	S	0.140	6.300	0.09	0.76	<0.01	0.230	0.036		
Silver Ridge group	430	S	0.070	0.800	0.02	0.38	<0.01	0.050	0.039		
Silver Ridge group	431	S	0.020	1.300	0.06	1.30	<0.01	0.059	0.200		
Silver Ridge group	432	S	0.060	3.000	0.07	2.30	<0.01	0.130	0.360		
Silver Ridge group	433	S	N	N							
Silver Ridge group	434	S	<0.005	N	0.01	0.09	<0.01	0.005	0.006		
Silver Ridge group	448	S	0.010	0.100	0.05	<0.01	<0.01	0.004	0.009		
Silver Ridge group	491	G	0.230	4.400	0.28	0.93	0.07	0.160	0.073	<0.001	<0.005
Silver Ridge group	492	G	0.010	0.300	0.08	0.39	0.03	0.062	0.038	<0.001	<0.005
Silver Ridge group	493	G	0.040	0.300	0.15	0.37	0.10	0.009	0.026	<0.001	<0.005
Silver Ridge group	494	G	0.070	1.000	0.10	0.26	0.01	0.078	0.032	<0.001	<0.005
Silver Ridge group	495	G	0.060	N	0.19	0.54	0.08	0.068	0.059	<0.001	<0.005

TABLE C-2.--Analytical data for rock samples from the West Big Hole study area (continued).
(N= nil; <= less than; C= chip; S=select; G=grab)

Property (map no.)	Sample No.	Type	Au oz/ton	Ag oz/ton	Cu %	Pb %	Zn %	W %	Mo %	Sb %	As %
Silver Ridge group	496	G	0.020	0.100	0.14	1.20	0.01	0.040	0.071	<0.001	<0.005
Silver Ridge group	497	G	0.190	1.000	0.13	1.20	0.05	0.019	0.045	<0.001	<0.005
Silver Ridge group	498	G	0.020	0.100	0.14	0.05	0.01	0.076	0.020	<0.001	<0.005
Silver Ridge group	499	G	0.030	N	0.06	0.38	0.01	0.027	0.100	<0.001	<0.005
Silver Ridge group	313	C	N	N	0.01	0.01	<0.01		0.005		
Silver Ridge group	314	C	N	0.100	<0.01	<0.01	0.01	0.013	0.004	0.004	
Silver Ridge group	315	C	N	N	0.01	<0.01	0.01	0.012	0.010	0.004	<0.005
Silver Ridge group	316	C	N	N	0.01	<0.01	0.01	0.012	0.004	0.004	
Silver Ridge group	317	C	N	0.100	0.01	<0.01	0.01	0.012	0.005	0.005	
Silver Ridge group	318	C	N	0.100	0.01	<0.01	0.01	0.012	0.012	0.004	
Silver Ridge group	319	C	N	N	0.02	<0.01	0.02	0.013	0.005	0.004	
Silver Ridge group	320	C	N	N	0.01	<0.01	0.01	0.012	0.008	0.004	<0.005
Silver Ridge group	321	C	0.020	N	0.01	<0.01	<0.01	0.005	0.006		
Silver Ridge group	322	S	0.200	0.700	0.20	0.91	0.05	0.071	0.038	<0.005	<0.005
Silver Ridge group	323	C	0.020	N	0.03	0.18	<0.01	0.110	0.042	<0.005	<0.005
Silver Ridge group	324	C	0.030	0.400	0.05	1.10	<0.01	0.033	0.022	<0.005	<0.005
Silver Ridge group	325	C	0.100	0.700	0.01	0.53	0.03	0.006	0.040	<0.005	<0.005
Silver Ridge group	326	C	0.010	0.100	<0.01	0.10	0.01	0.007	0.013	<0.005	<0.005
Silver Ridge group	327	C	0.020	0.400	0.01	0.07	<0.01	<0.001	0.014	<0.005	0.010
Silver Ridge group	328	C	0.460	1.000	0.04	1.30	0.42	<0.001	0.036	<0.005	0.007
Silver Ridge group	329	C	0.060	0.300	0.02	0.16	0.09	<0.001	0.023	<0.005	0.005
Silver Ridge group	330	C	0.090	0.500	0.08	0.92	<0.01	0.004	0.033		
Silver Ridge group	331	C	0.060	N	<0.01	0.02	<0.01	0.005	0.200		
Silver Ridge group	332	C	0.020	1.100	0.02	1.10	0.01	0.010	0.044	<0.005	<0.005
Silver Ridge group	333	C	N	N	0.03	0.01	0.02	0.011	0.011	<0.005	<0.005
Silver Ridge group	334	C	0.010	0.900	0.15	0.10	<0.01	0.003	0.038	<0.005	<0.005
Silver Ridge group	335	C	<0.005	1.400	0.12	0.39	<0.01	0.008	0.082	<0.005	<0.005
Souviner prospect	352	C	N	0.100							
Souviner prospect	353	C	N	0.100							
Souviner prospect	354	C	N	0.100							
Souviner prospect	355	C	0.060	0.700							
Souviner prospect	356	C	N	0.100	<0.01	0.02	<0.01	0.005	0.002		
Souviner prospect	357	C	0.020	0.100	<0.01	0.01	<0.01	0.004	0.003		
Souviner prospect	358	C	<0.005	0.100							
Souviner prospect	360	C	0.010	0.200	<0.01	0.08	<0.01	0.010	0.003		
Souviner prospect	361	C	0.050	0.400	<0.01	1.90	<0.01	0.420	0.006		
Souviner prospect	362	C	0.020	N	<0.01	0.22	<0.01	0.088	0.004		
Souviner prospect	363	C	0.020	0.200							
Souviner prospect	364	S	0.010	N							
Souviner prospect	365	C	<0.005	0.200							
Souviner prospect	366	C	N	0.100							

TABLE C-2.--Analytical data for rock samples from the West Big Hole study area (continued).
(N= nil; <= less than; C= chip; S=select; G=grab)

Property (map no.)	Sample No.	Type	Au oz/ton	Ag oz/ton	Cu %	Pb %	Zn %	W %	Mo %	Sb %	As %
Souviner prospect	367	C	<0.005	0.100							
Sundog prospect	268	S	0.050	0.200							
Sundog prospect	269	S	0.200	0.100	<0.01	0.26	<0.01		0.004		
Treasure Box prospect	305	S	0.880	4.100	1.00	4.60	<0.01	0.120	0.007	<0.005	<0.005
Treasure Box prospect	306	S	0.430	1.200	0.13	3.90	<0.01	0.011	0.004	0.004	<0.005
Treasure Box prospect	307	C	N	N	0.01	0.07	<0.01	0.009	0.002	<0.005	<0.005
Treasure Box prospect	308	S	N	0.100	<0.01	0.02	<0.01	0.007	0.003	<0.005	<0.005
Unnamed prospect (1)	348	G	0.010	0.100							
Unnamed prospect (2)	349	G	0.080	0.400							
Unnamed prospect (2)	350	S	0.050	0.300							
Unnamed prospect (2)	449	S	N	N							
Unnamed prospect (3)	346	S	0.010	0.100	N						
Unnamed prospect (3)	347	S	0.460	0.700							
Unnamed prospect (6)	340	S	0.530	1.200	0.38	5.50	<0.01	0.010	0.009	<0.005	<0.005
Unnamed prospect (6)	341	C	0.010	0.100	<0.01	0.03	<0.01	0.007	0.003		
Unnamed prospect (6)	342	C	0.140	N	0.03	0.04	<0.01	0.010	0.004		
Unnamed prospect (6)	343	C	0.010	0.100	<0.01	0.05	<0.01	0.016	0.003		
Unnamed prospect (6)	344	S	0.360	0.800	0.02	3.20	<0.01	0.039	0.005		
Unnamed prospect (6)	345	C	N	0.100	<0.01	0.03	<0.01		0.003		
Unnamed prospect (10)	101	C	0.020	0.400							
Unnamed prospect (10)	102	C	0.020	1.200							
Unnamed prospect (10)	103	S	0.260	3.300	0.06						
Unnamed prospect (11)	104	C	0.010	0.400							
Unnamed prospect (11)	105	S	<0.005	0.100							
Unnamed prospect (11)	106	C	N	0.100							
Unnamed prospect (11)	107	C	<0.005	0.100							
Unnamed prospect (12)	470	C	N	N							
Unnamed prospect (12)	471	C	N	N							
Unnamed prospect (12)	472	G	N	N							
Unnamed prospect (12)	473	S	0.100	1.100	0.17	4.70	<0.01	0.007	0.013		
Unnamed prospect (12)	474	G	N	N	<0.01	0.02	<0.01		0.002		
Unnamed prospect (12)	475	G	N	N							
Unnamed prospect (12)	476	G	0.080	1.700	0.07	3.60	<0.01		0.002		
Unnamed prospect (12)	477	G	N	N							
Unnamed prospect (25)	486	C	N	N							
Unnamed prospect (25)	487	S	N	N							
Unnamed prospect (29)	284	S	<0.005	0.100	<0.01	0.05	<0.01		0.003	<0.005	<0.005
Victory prospect	386	C	N	N							
Victory prospect	387	G	N	0.100							
Victory prospect	388	C	N	0.100	<0.01	<0.01	<0.01	0.007	0.003		
Victory prospect	389	C	N	N							

TABLE C-2.--Analytical data for rock samples from the West Big Hole study area (continued).
(N= nil; <= less than; C= chip; S=select; G=grab)

Property (map no.)	Sample No.	Type	Au oz/ton	Ag oz/ton	Cu %	Pb %	Zn %	W %	Mo %	Sb %	As %
Victory prospect	390	C	<0.005	0.100							
Victory prospect	445	S	0.860	N	<0.01	0.02	<0.01	0.043	0.011		
Victory prospect	446	S	0.940	0.400	<0.01	0.06	<0.01	0.055	0.004		
Victory prospect	447	S	0.510	0.200	<0.01	0.08	<0.01	0.076	0.004		
War Eagle mine	007	S	0.070	1.400	0.05	8.50	<0.01				

APPENDIX D.--Resource definitions.

Mineral resources are classified according to the following definitions (U.S. Bureau of Mines and U.S. Geological Survey, 1980).

Resource.--A concentration of naturally occurring solid, liquid, or gaseous material in or on the Earth's crust in such form and amount that economic extraction of a commodity from the concentration is currently or potentially feasible.

Identified resources.--Resources whose location, grade, quality, and quantity are known or estimated from specific geologic evidence. Identified resources include economic, marginally economic, and subeconomic components. To reflect varying degrees of geologic certainty, these economic divisions can be subdivided into measured, indicated, and inferred.

Reserves.--That part of the reserve base which could be economically extracted or produced at the time of determination. The term reserves need not signify that extraction facilities are in place and operative. (For this designation the word "ore" is applicable).

Measured.--Quantity is computed from dimensions revealed in outcrops, trenches, workings, or drill holes; grade and (or) quality are computed from the results of detailed sampling. The sites for inspection, sampling, and measurement are spaced so closely and the geologic character is so well defined that size, shape, depth, and mineral content of the resource are well established.

Indicated.--Quantity and grade and (or) quality are computed from information similar to that used for measured resources, but the sites for inspection, sampling, and measurement are farther apart or are otherwise less adequately spaced. The degree of assurance, although lower than that for measured resources, is high enough to assume continuity between points of observation.

Inferred.--Estimates are based on an assumed continuity beyond measured and (or) indicated resources, for which there is geologic evidence. Inferred resources may or may not be supported by samples or measurements.

Subeconomic resources.--The part of identified resources that does not meet the economic criteria of reserves and marginal reserves. (Capital return would be less than 80 percent of all expenditures.)

Occurrence.--Materials that are too low grade or for other reasons are not considered potentially economic.

PLATE 1.--Map of mines, prospects, and claims in and near the West Big Hole study area, Beaverhead County, Montana.