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UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

MINERAL RESOURCES OF THE GILA PRIMITIVE AREA AND GILA WILDERNESS, CATRON AND GRANT COUNTIES, NEW MEXICO

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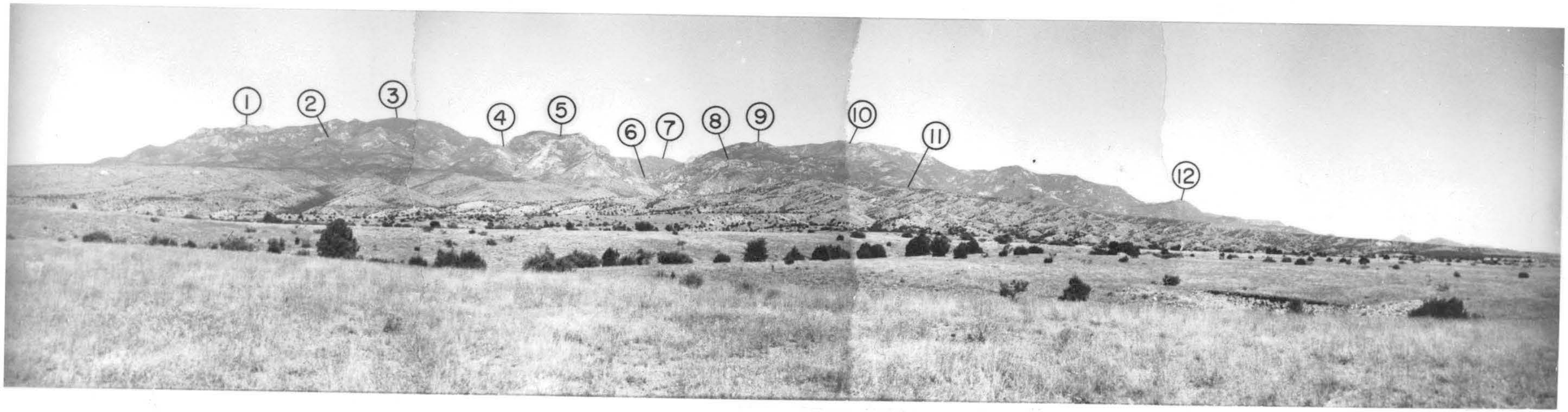
This report is preliminary and has not been edited or reviewed for conformity with U.S. Geological Survey standards and nomenclature.

Open-file report
1972

STUDIES RELATED TO WILDERNESS

PRIMITIVE AREAS

In accordance with the provisions of the Wilderness Act (Public Law 88-577, September 3, 1964) and the Conference Report on Senate bill 4, 88th Congress, the U.S. Geological Survey and the U.S. Bureau of Mines are making mineral surveys of wilderness and primitive areas. Areas officially designated as "wilderness," "wild," or "canoe" when the act was passed were incorporated into the National Wilderness Preservation System. Areas classed as "primitive" were not included in the Wilderness System, but the act provides that each primitive area be studied for its suitability for incorporation into the Wilderness System. The mineral surveys constitute one aspect of the suitability studies. This bulletin reports the results of a mineral survey in the Gila Primitive Area and Gila Wilderness, New Mexico, as defined, and some bordering areas that may come under discussion when the area is considered for wilderness status.



Gila Wilderness looking northeast from Leopold Vista, Catron County, N. Mex. (1) Nabours Mountain, (2) Wilcox Peak, (3) Holt Mountain, (4) Sheridan Gulch, (5) Sheridan Mountain, (6) Big Dry Creek, (7) Black Mountain, (8) Crown Mountain, (9) West Baldy, (10) Sacaton Mountain, (11) Little Dry Creek, (12) Haystack Mountain.

IN REPLY REFER TO:

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
FEDERAL CENTER, DENVER, COLORADO 80225

Mineral Resources - Wilderness Studies

December 1, 1972

Memorandum

To: Open-file depositories

From: James C. Rattė, Geologist, U.S. Geological Survey

Subject: Mineral Resources of the Gila Primitive Area and Wilderness, Catron and Grant Counties, New Mexico

Please place the enclosed statement with your copy of the U.S. Geological Survey - U.S. Bureau of Mines open-file report on the Mineral Resources of the Gila Primitive Area and Wilderness, Catron and Grant Counties, New Mexico.

James C Rattė

IN REPLY REFER TO:

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
FEDERAL CENTER, DENVER, COLORADO 80225

Mineral Resources--Wilderness Studies

December 1, 1972

Reproducible copy of the non-page size illustrations of the open-file report on the Mineral Resources of the Gila Primitive Area and Wilderness, Catron and Grant Counties, New Mexico will be available soon at the U.S. Geological Survey Library, 345 Middlefield Road, Menlo Park, California 94025, and copies can be made at requestor's expense. Although it may be two or three weeks before the availability of reproducible copy can be announced in a press release, the copy is expected to be in Menlo Park within a week or less, and can be ordered at any time.

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U. S. Bureau of Mines

Summary

A mineral survey of the Gila Primitive Area and the Gila Wilderness and vicinity in southwestern New Mexico was made by the U. S. Geological Survey and the U. S. Bureau of Mines in 1968-1971. The Gila Wilderness, established by the U. S. Forest Service in 1924, was the first area in the United States to be administered as wilderness. The Gila Wilderness includes approximately 685 square miles in the Mogollon Mountains and adjacent areas at the headwaters of the Gila River. The Gila Primitive Area consists of 9 separate tracts totalling about 210 square miles adjoining the wilderness, the largest of these tracts, about 150 square miles, is east of the Gila Wilderness. The total area included in the mineral survey is about 970 square miles.

The purpose of the mineral survey of the Gila Primitive Area is to appraise the mineral resources potential as one aspect of studies to determine the suitability of the area for inclusion in the National Wilderness Preservation System. An appraisal of mineral resources of the wilderness is required by the Wilderness Act of 1964.

The mineral survey was conducted by means of reconnaissance geologic, geochemical and geophysical surveys by the U. S. Geological Survey, and by searching the existing official mining claim records and sampling the mines and prospects by the U. S. Bureau of Mines.

Geologically, the area studied is in the southern part of the Datil Volcanic Area, which covers roughly 10,000 square miles at the southeastern corner of the Colorado Plateaus structural province. The Gila Primitive Area and Wilderness are in a mountainous part of the volcanic area that is bounded by structural blocks formed by faulting during the development of the Basin and Range structural province in late Tertiary time. The rocks exposed in the study area are nearly all volcanic igneous rocks of Oligocene and Miocene age. The aggregate exposed thickness of lava flows, ash-flow tuffs, and shallow intrusive bodies is at least 6,000 feet. Older Tertiary(?) volcanic rocks that are exposed locally at the mountain front along the southwestern border of the study area indicate that rocks of Laramide age (Late Mesozoic-Early Tertiary) may underlie part of the study area. Pre-Tertiary sedimentary and metamorphic rocks were not observed in the study area, but the geologic section in the Silver City area to the south suggests that perhaps as much as 5,000 feet of Paleozoic and Mesozoic strata may underlie the primitive area and wilderness. Gila Conglomerate overlies the Tertiary volcanic rocks in part of the study area.

The Datil volcanic field represents a caldera complex, and as such it shows an eruptive sequence that fits a pattern familiar from the study of other caldera complexes. Early eruptions in the sequence produced volcanoes of andesitic lavas and breccias that can be observed only locally in the primitive area and wilderness. Succeeding activity was characterized by violent eruptions that produced widespread sheets of ash-flow tuff. The great volumes of material involved and the rapidity with which the tuff was erupted caused collapse of source areas of the ash-flow tuff, creating large subsidence calderas, two of which, the Bursum and Gila Cliff Dwellings calderas, are largely within the Gila study area. The ash-flow tuff deposits were followed by comparably voluminous effusions of viscous flow-banded rhyolite that accumulated in coalescing domes and flows above the ring fractures of the caldera structures. These silicic eruptions at last gave way to basaltic volcanism and extensive shield volcanoes formed over a large part of the study area. The volcanic eruptions took place between about 40 million and 20 million years ago. Toward the end of this period, the area began to be broken by faults related to the Basin and Range structural province. Northwest-trending faults have modified most of the constructional volcanic features and account for the northwest grain that dominates the present physiography.

Certain parts of the study area have a significant minerals resource potential for base and precious metals and fluorspar. There is no significant potential within the area for mineral fuels, but a possible geothermal energy resource, represented by a zone of thermal springs near Gila Hot Springs, is virtually unexplored. More than 90 percent of the Gila Primitive Area and Wilderness has no evidence of significant mineralization in surface rocks.

At least 3 ages of mineralization are indicated within the study area. The oldest is represented by hydrothermally altered and mineralized rocks in the Gila fluorspar district, where zircons in altered rocks of the volcanic complex of Brock Canyon have given fission track ages of about 49±2 million years, suggesting a middle Eocene age of mineralization. However, the fluorspar veins in the Gila district and elsewhere along the front of the Mogollon Mountains, and the gold-silver deposits of the Mogollon district at the northwest corner of the study area belong to a younger age of mineralization believed to be related to rhyolitic intrusions of Oligocene-Miocene age. The hydrothermally altered and mineralized rocks in the Alum Mountain and Copperas Canyon areas probably represent an intermediate age of mineralization; they occur unconformably beneath unaltered volcanic rocks about 32 million years old.

The main areas of minerals potential evident in the surface rocks occur along the fringes of the wilderness and primitive area. Of the 9 tracts of primitive area, the southwestern edge of tract 1, and adjoining parts of tracts 2 and 3 in the Alum Mountain-Copperas Canyon area, and tract 7 in the Big Dry-Little Dry Creek area, and tract 8 in the Seventyfour Mountain area have significant potential for important mineral discoveries. Although tract 9 of the primitive area is adjacent to an important mineral exploration target within the Gila fluorspar district,there is little potential formineral deposits within tract 9 itself.

The part of the present wilderness having the greatest evidence of mineral potential is the Spider-Spruce-Big Dry Creeks area, where numerous weakly mineralized structures, in an area of very difficult access, deserve further exploration. Other mineralized areas inside the wilderness that have a significant minerals potential are all near the boundaries of the wilderness, mainly from Whitewater Creek to Seventyfour Mountain and in the Alum Mountain-Copperas Canyon area. That portion of the Gila Wilderness near the southern margin of the Bursum caldera from Big Dry Creek to Haystack Mountain is of particular interest for the number of copper occurrences present, as well as gold, tellurium, silver and fluorspar.

In addition to the evidence of mineralization in surface rocks, there exists a very significant potential for "blind" ore deposits in the subvolcanic zone of the Middle Tertiary volcanic rocks as well as in rocks of Laramide age or older that underlie the Middle Tertiary volcanic rocks throughout the Gila Primitive Area and Wilderness. This potential is largely unassessable by the methods of this study, except as can be inferred from the geologic and structural setting of the area and from the gravity and aeromagnetic surveys that indicate subsurface rock masses having different physical properties.

The mineral resources potential of the study area has been appraised using the following information: regional geologic setting, geochemical sampling, geophysical character of the rocks, past history of exploration and production, and sampling of mines and prospects. More than 2,500 geochemical samples of stream sediment and rocks were collected and over 500 samples from mines and prospects were assayed.

From the perspective of regional structures and mineralization patterns, the following points tend to focus attention on the greater than average mineral potential of parts of the Gila Primitive Area, Gila Wilderness, and adjoining areas: 1) The area is located in a region of abundant fracture systems whose diverse trends give intersections of regional significance. Intersections of fracture systems are favored targets for mineral exploration because they can provide the plumbing systems for mineralizing fluids. One of these fracture systems includes the controversial Texas Lineament, whose importance in localizing major ore deposits in southwestern New Mexico and Arizona has been widely discussed. 2) The position of the study area at the northeastern extension of a copper province in Arizona and southwestern New Mexico that includes more than 70 percent of all past production and present reserves of copper in the United States. This metal province includes the deposits at SantaRita, Tyrone and Morenci, having a combined production and reserves valued at more than 5 billion dollars, all within 50 miles of the study area. 3) The probability that intrusive igneous rocks of Laramide age, like those that contain the disseminated copper deposits of Santa Rita, Morenci, and Tyrone, may be present beneath the Middle Tertiary volcanic rocks that blanket the study area. If sedimentary formations of pre-Tertiary age exist beneath the volcanic rocks, they too probably were mineralized.

Within the study area, extensive areas of hydrothermal alteration and weak mineralization are found to be almost continuous along the front of the Mogollon Mountains from the Mogollon mining district to the Gila River, and in an extensive area around Alum Mountain and Copperas Canyon. Geochemical sampling shows that these same areas have anomalous concentrations of a number of metals including beryllium, mercury, bismuth, antimony, arsenic, gold, silver, tellurium, copper, molybdenum, lead, zinc, and manganese.

Comparison of geophysical data and geologic and geochemical patterns shows some striking correlations. The southwestern edge of the study area is the site of an elongate sharply crested positive gravity anomaly that trends northwestward for more than 25 miles from the volcanic complex of Brock Canyon at the south edge of the wilderness at the Gila River. The anomaly has a residual peak amplitude of 36 miligals, too great to be accounted for solely by structural relief between the exposed volcanic rocks and adjacent valley fill. The anomaly is interpreted as expressing a small batholithic body of intermediate to mafic composition. The axis of the anomaly also is the site of several discrete magnetic anomalies, believed to represent individual plutons or pipelike bodies of altered rock within the postulated batholith; the axis also is the site of a swarm of rhyolite dikes and plug domes and associated altered and mineralized rocks that produce geochemical anomalies.

Wherever older andesitic and latitic volcanic and intrusive rocks are exposed in the study area, they seem to be associated with moderate gravity highs. Some of the older rocks and a positive gravity anomaly are present along the northward projection of the Santa Rita-Hanover axis, which has been proposed as a pre-Miocene topographic and structural high that has localized or been localized by the Laramide porphyry stocks at Santa Rita and Hanover-Fierro. The Alum Mountain and Copperas Canyon mineralized areas are on the western flank of this gravity anomaly. Thus the geophysical data support and enhance the possible mineral potential of these areas.

Although eighty to ninety percent of the study area is devoid of mining claims or other evidence of prospecting activities, thousands of mining claims have been located within the study area, principally adjacent to the boundaries of the primitive area and wilderness from the northwest corner of the wilderness south of the Mogollon mining district to the Gila fluorspar district at the Gila River, and in the Alum Mountain-Copperas Canyon area. Sixteen patented mining claims and 2 patented mill sites are within the study area. Past mineral production from the area includes 58,700 tons of fluorspar, an estimated 1,000 tons of meerschaum, a few hundred ounces of gold and silver, and a few tons of copper, lead, zinc and tellurium ore. In addition a small tonnage of clay was mined adjacent to tract 1 of the Gila Primitive Area in Copperas Canyon and a low-grade deposit of alum at Alum Mountain is a possible source of aluminum.

U. S. Bureau of Mines sampling of mines and prospects indicates that no major metallic mineral resources are known in the study area. The Uncle John mine on Big Dry Creek within the Gila Wilderness contains small indicated and inferred reserves of copper-lead-zinc-cadmium ore.

Present economic mineral resources within the study area are confined largely to fluorspar, which was being mined and actively developed adjacent to the wilderness in the Gila fluorspar district and in Little Whitewater Creek at the time of these investigations. Almost all of the past fluorspar production of 58,700 tons has been from mines outside of the present primitive area and wilderness, mainly from the Gila fluorspar district but also from the Little Whitewater Creek area. About 1,000 tons of fluorspar have been shipped from the Gold Spar mine on Rain Creek, just west of the wilderness boundary. High-grade fluorspar also occurs on and near Seventyfour Mountain just inside the wilderness, but the potential for this area seems to be limited because the veins are narrow and the access is difficult. Further production of fluorspar, probably from small scale operations, can be expected in the area within and adjacent to the primitive area and wilderness along the boundary zone from Little Whitewater Creek to the Gila River.

The meerschaum in the Gila Primitive Area north of Sapillo Creek has little commercial potential because the veins are discontinuous and narrow and the grade is low.

Although past production of mineral commodities--except for fluorspar--has been negligible, the combined geologic, geochemical and geophysical factors indicate a considerable likelihood for the presence of important mineral deposits containing gold, silver, tellurium, copper, molybdenum, lead, or zinc adjacent to and within the Gila Primitive Area and Wilderness. Areas of highest potential are in the mineralized zone bordering the wilderness between the Mogollon mining district and the Gila fluorspar district, and in the Copperas Canyon-Alum Mountain area. The parts of the Gila Primitive Area that show strong evidence of mineralization are the western part of tract 1 and adjoining parts of tracts 2 and 3 in the Alum Mountain-Copperas Canyon area, and tracts 7 and 8 along the southwestern side of the wilderness. A potential for metallic ore deposits also exists for the Spider Creek-Spruce Creek-Big Dry Creek area within the northwestern part of the Gila Wilderness.

Introduction

This report considers the geology and mineral resources of the several parts of the Gila Primitive Area, and adjoining lands in the Gila National Forest, Catron and Grant Counties, southwestern New Mexico (fig. 1). Together, these areas constitute the Gila study area

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Figure 1.--Near here

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as used in this report (fig. 2).

Figure 2.--Near here

The mineral resources studies in the Gila Primitive Area and Gila Wilderness serve somewhat different purposes, but the location and geology of the areas are so interrelated that the areas were surveyed together and the results of the study are presented here in a single report. Mineral resources will be a factor in the legislative decision to add or not to add the primitive area to the National Wilderness Preservation System. The wilderness, on the other hand, is already in the system; it was studied to gain information that may be useful in decisions to change the boundary, for administration of possible mineral exploration as provided in the Wilderness Act, and for other aspects of public land management.

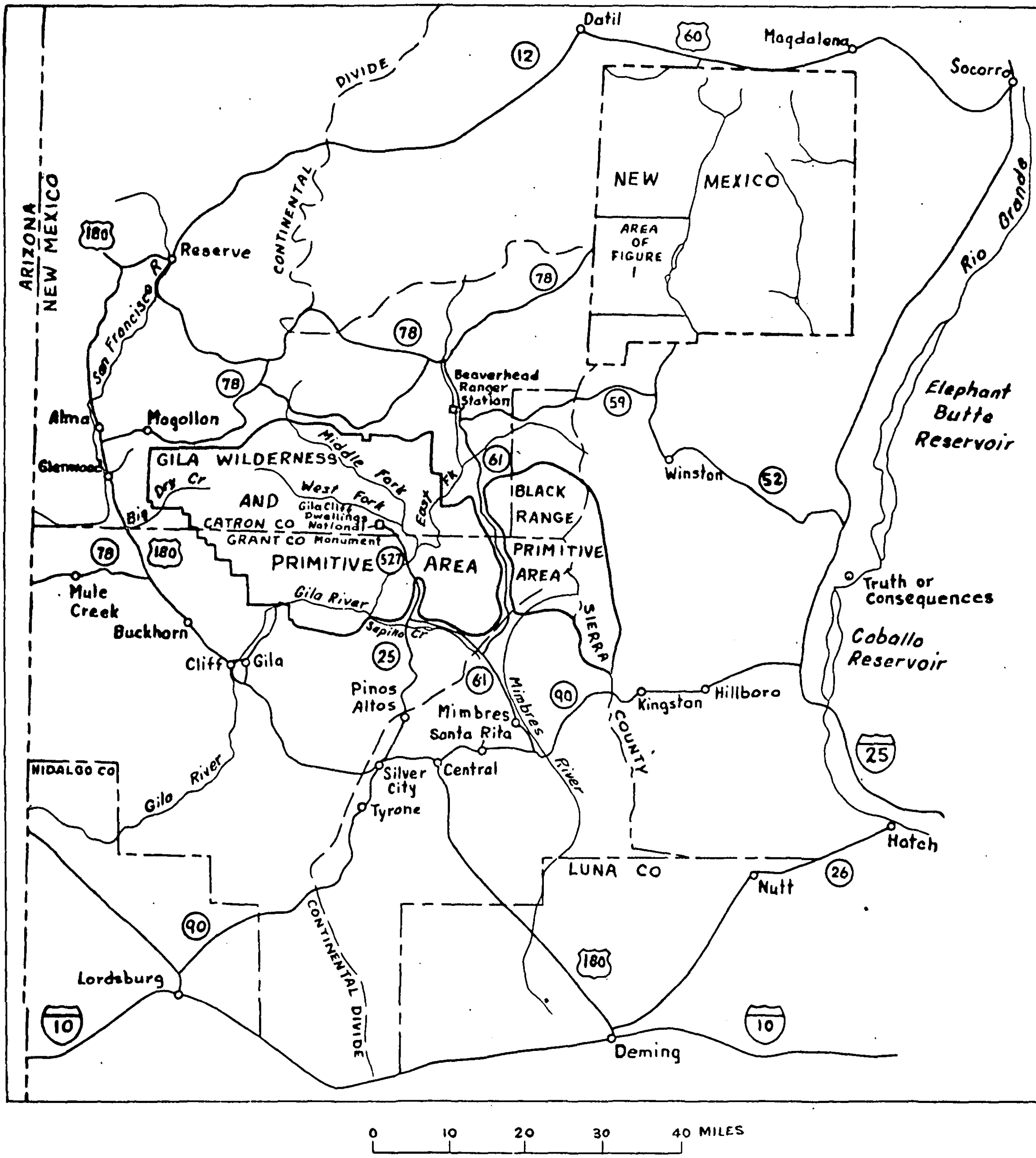

Figure I.-- Location of Gila study area in southwestern New Mexico

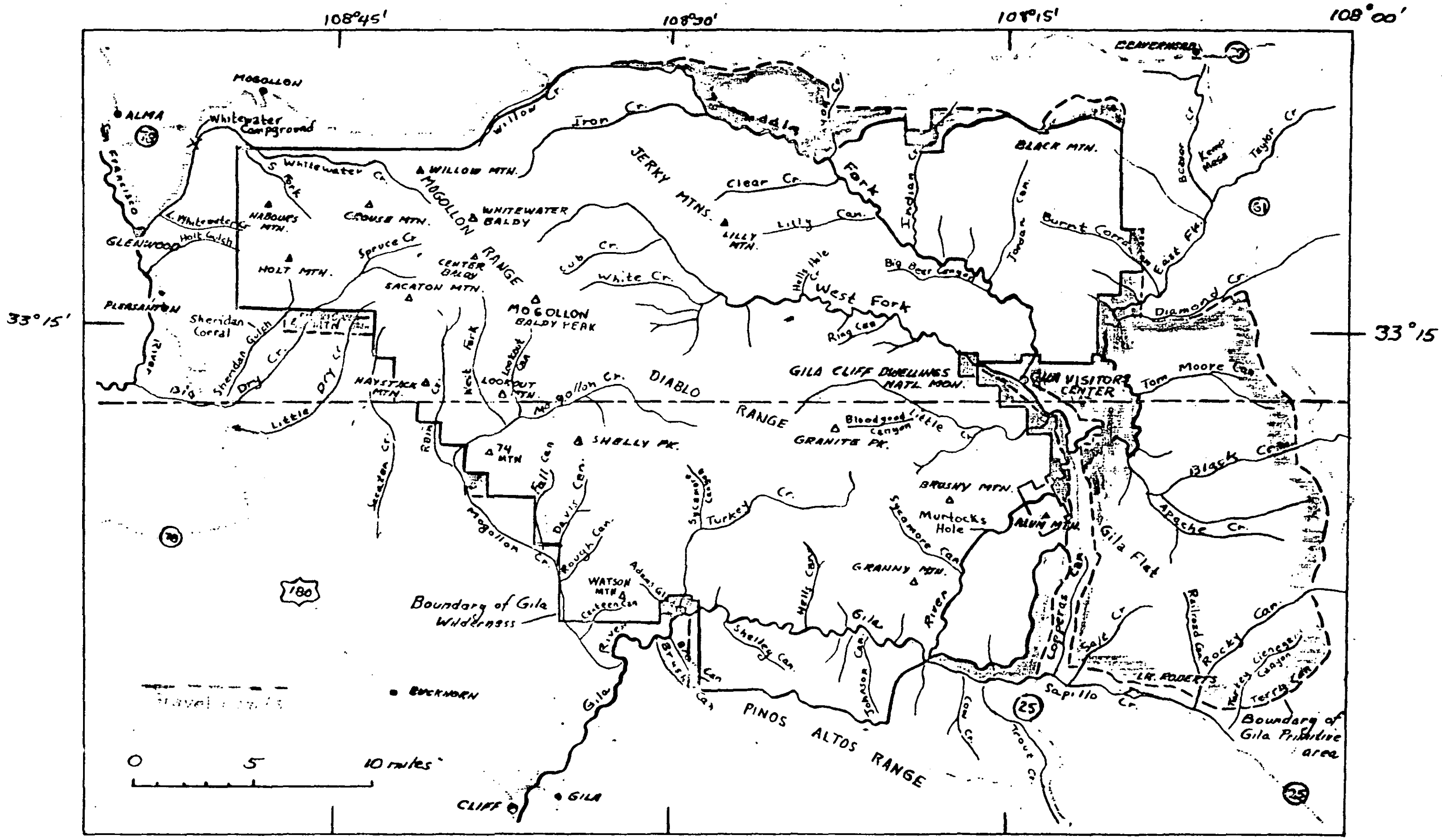

Figure 2.--Index map of the Gila study area, showing major mountain ranges and highest peaks, drainage, and access roads.

In 1924 the Gila Wilderness was designated by the U. S. Forest Service as the first wilderness area in the United States, largely through the efforts of Aldo Leopold, a dedicated conservationist, and an official of the U. S. Forest Service. A monument commemorating the establishment of the Gila Wilderness and Leopold's part in it stands alongside U. S. Highway 180, several miles south of Glenwood, before a magnificent view of the Mogollon Range within the wilderness (see frontispiece). This tract of 438,626 acres was administered by the Forest Service as a roadless area in which commercial usage was limited to grazing and horse pack trips until 1964, when with passage of the Wilderness Act, it became a part of the National Wilderness Preservation System. Only 266 acres of private land, all patented mining claims, are within the wilderness.

The Gila Primitive Area consists of a main area east of the wilderness and 8 smaller tracts that fringe the wilderness, for a total of 132,788 acres, including 3,158 acres of private land. These tracts are numbered 1-9 on figure 3. In addition, 61 patented mining claims

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Figure 3.--Near here

(1,252 acres) within tract 3 of the primitive area (fig. 3) were purchased by the Forest Service in 1969 under the Acquired Lands Leasing Act of 1947. Another 50,000 or so acres of contiguous National Forest were studied at the request of the Forest Service. Together, the wilderness and primitive area are nearly 900 square miles, and the total study area about 970 square miles in extent.

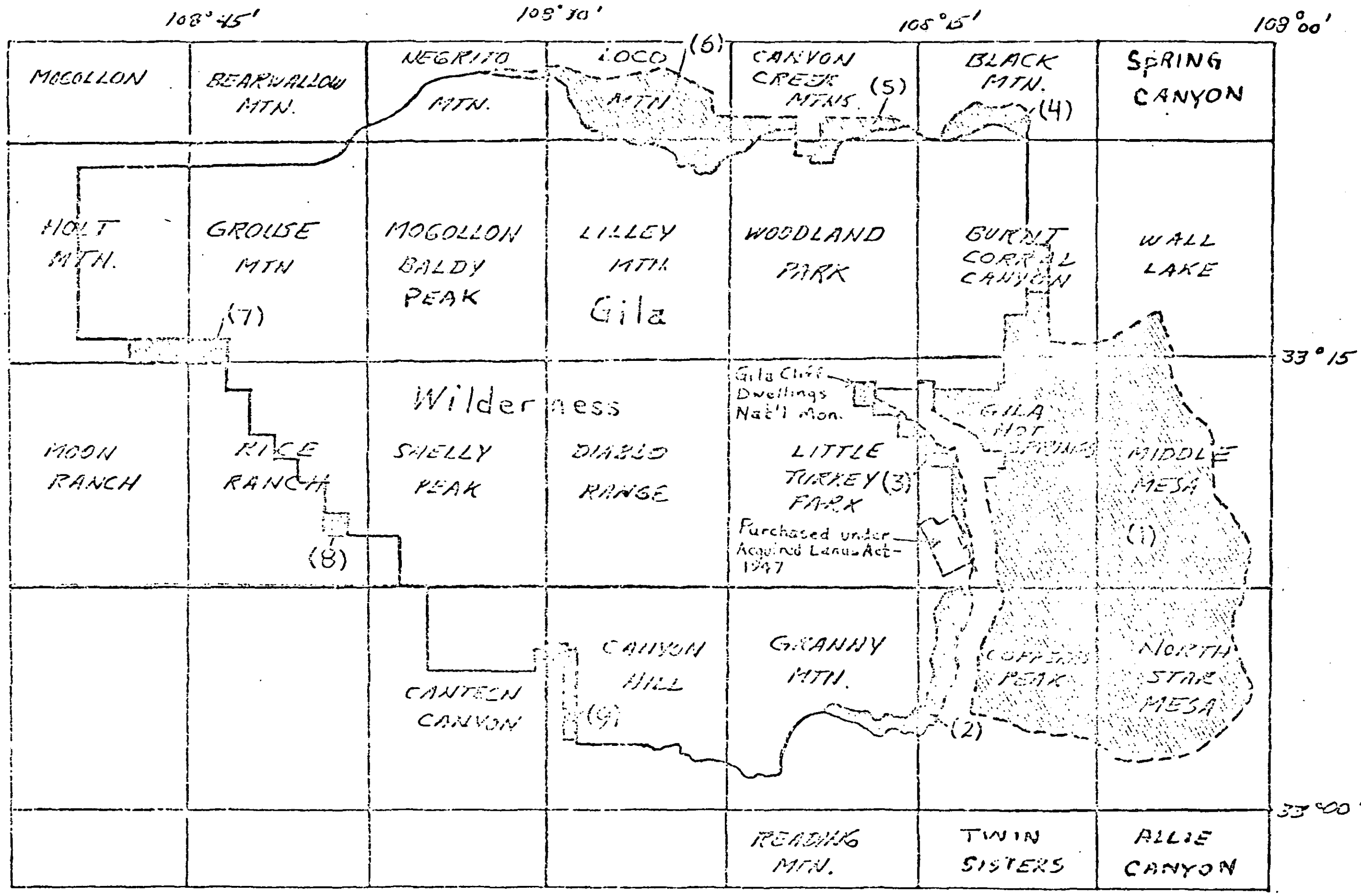

Figure 3.--Index to published topographic 7 1/2 minuete quadrangle maps of the Gila study area. Numbered tracts 1 through 9 identify the Gila Primitive Area.

Location and accessibility.--The location of the Gila study area in southwestern New Mexico is shown on figure 1. . Silver City is the nearest population center. Access from Silver City to the Gila study area is largely by way of Highways 25 and 180 and by secondary roads leading from these highways (fig. 2). The Gila Cliff Dwellings National Monument is reached by State Highway 527, a paved road through a mile-wide corridor between tract 1 and tracts 2 and 3 of the Gila Primitive Area. A rough jeep trail extends about 5 miles west from State Highway 25 into the Pinos Altos Range and affords access to part of the study area south of the mouth of Sapillo Creek (fig. 2). A graded road from the town of Gila serves the Gila fluorspar district and provides access to the wilderness on the Gila River. Other graded roads afford entry to the study area at several places along the southwestern edge of the study area between the Gila River and Little Dry Creek. Northwest of Big Dry Creek, a gravel road goes to Sheridan Corral, a major trail head for wilderness travel. A paved road from Glenwood to the mouth of White-water Canyon at the Catwalk, provides another major entry into the western part of the wilderness. State Highway 78 leads to points of entry along the northwestern border of the wilderness from Mogollon to Willow Creek, and graded dirt and gravel roads border the study area on the north and east (figs. 1, 2).

Map and aerial coverage.--The entire study area is covered by recent 7-1/2 minute u.S. Geological Survey topographic quadrangle maps having a scale of one inch equals 2,000 feet (fig. 3). The area also is covered by the Clifton, Arizona-New Mexico 1°x2° topographic sheet of the U.S. Geological Survey at a scale of one inch equals four miles (1:250,000), and by various planimetric maps, available from the Forest Service, showing trails and other features. Black and white aerial photographs of the study area at various scales can be obtained from the U.S. Geological Survey or U.S. Forest Service, and color aerial photographs at an original scale of one inch equals one-quarter mile are available from the Forest Service.

Ranches are located along parts of the wilderness and primitive area boundaries, particularly between Glenwood and the Gila River along Sapillo Creek, on Canyon and Indian Creeks near the Middle Fork of the Gila River, and near Beaverhead. Several small ranches and other small tracts of privately owned land are within the study area along Diamond Creek, and the East and West Forks of the Gila River. A U. S. Post-office and general store are maintained at Gila Hot Springs, a joint Forest Service-National Park Service Headquarters and Visitor's Center is located near the Gila Cliff Dwellings National Monument, and a New Mexico State Fish and Game facility is nearby. A general store is located at Lake Roberts (fig. 2) along Sapillo Creek at the southeast edge of the study area. Livestock graze over much of the study area, particularly northeast of the Jerky Mountains, and in tract 1 of the Gila Primitive Area (fig. 3). Many residents adjacent to the study area earn at least part of their livelihood servicing fishing and hunting activities, and wilderness pack trips.

Silver City, the seat of Grant County, is the main business center of the region, and the location of the administrative headquarters of the Gila National Forest. Silver City also is the center of an extraordinarily rich mining industry represented by the Santa Rita, Tyrone, Hanover, Fierro, Central and other mining districts. Other trade centers adjacent to the study area include Mimbres, Gila, Cliff, and Glenwood. Reserve, the seat of Catron County is the center of a lumbering industry. Pinos Altos, north of Silver City, and Mogollon, northeast of Glenwood, are old mining towns that have been attracting growing numbers of tourists and artists.

Physical features in the study area

The Gila study area is in a mountainous region that includes most of the headwater drainage of the Gila River. The Mogollon Mountains (fig. 4) dominate the southwestern half of the study area; broadly

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Figure 4.--Near here

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defined, they form a northwest trending mountain mass approximately 40 miles long and 15 miles wide. Less well defined, locally designated ranges within the Mogollon Mountains include the Mogollon Range, Jerky Mountains, Diablo Range, and Pinos Altos Range (fig. 2). Northeast of the mountains, the upper forks of the Gila River have incised spectacular canyons into a plateau-like area of relatively subdued topography that characterizes the northeastern half of the study area (fig. 5). The

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Figure 5.--Near here

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steep southwestern wall of the Mogollon Mountains, from Mogollon to the Gila River, is cut by gorges with precipitous walls 2,500-3,000 feet high in many places; the canyons of Whitewater Creek, Dry Creek, Rain Creek, West Fork Mogollon Creek, and the lower Gila Canyon are especially impressive. The drainage off the crest of the Mogollon Range shows a radial pattern centered on Whitewater Baldy (fig. 2) and is related to the geologic structure of the Bursum caldera, to be discussed later in this report.

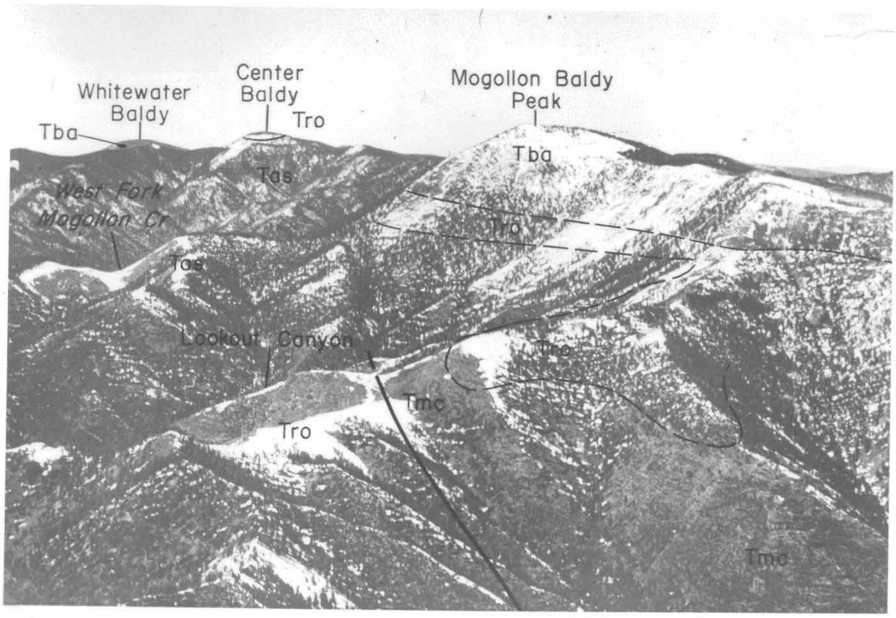

Figure 4.--View northwestward along the crest of the Mogollon Range. Ash-flow tuff of Apache Spring (Tas) is exposed within the Bursum caldera along the West Fork of Mogollon Creek, and is overlain by Mineral Creek Andesite (Tmc), flow-banded rhyolite and associated pyroclastic rocks (Tro) and late andesitic flows (Tba).

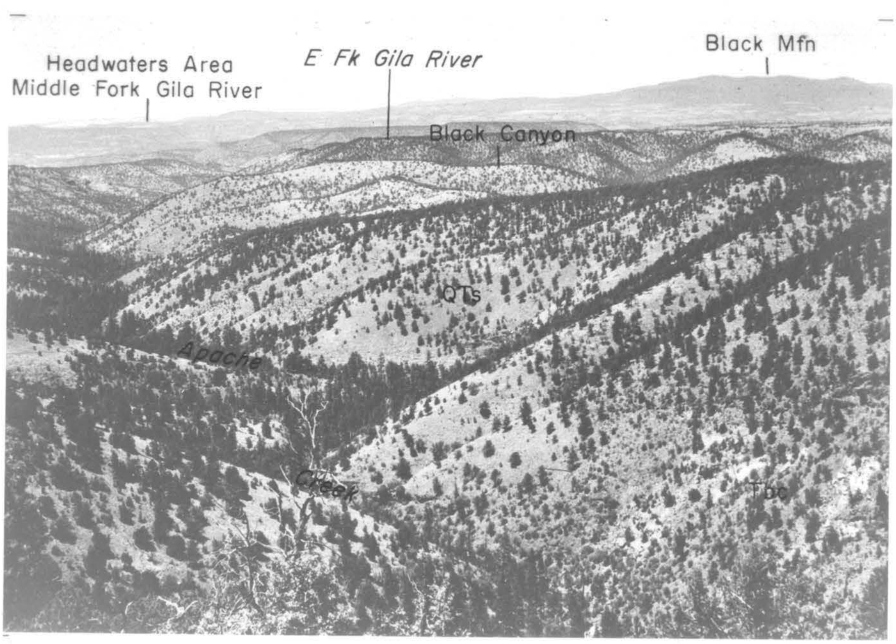

Figure 5.--View northwest down Apache Creek to the headwaters of the Middle Fork of the Gila River. Foreground is largely Gila Conglomerate (QTs); in foreground Bloodgood Canyon Rhyolite Tuff of Elston (Tbc) is exposed on the upthrown side of a fault in lower right corner of photograph.

Maximum relief in the study area exceeds 6,000 feet; elevations range from about 4,750 feet in the Gila River Canyon at the mountain front to 10,892 feet on the crest of the Mogollon Range at Whitewater Baldy. Willow Mountain, Center Baldy, Mogollon Baldy Peak, Grouse Mountain, Sacaton Mountain, and other points in the Mogollon Range rise above 10,000 feet. Much of the central and eastern parts of the study area have broad mesa-like divides at 7,500-8,500 feet along the West and Middle Forks of the Gila, and less than 7,000 feet along the East Fork and southward to Sapillo Creek.

All of the study area is in the Gila River drainage which flows to the Pacific Ocean. However, a drainage divide between Little Dry and Sacaton Creeks separates streams east of the divide, which flow more or less directly into the Gila River, from those in the northwest part of the area, which flow into the San Francisco River, a major tributary that joins the Gila River in Arizona. Most of the streams in the region flow intermittently; perennial streams flow only in the major canyons and longer tributaries.

Previous geologic investigations.--Although numerous reports have been published on various aspects of the geology and mineral deposits of this region, there is little detailed information specifically on the geology of the study area. Until recently, Ferguson's (1927) comprehensive study of the geology and mineral deposits of the Mogollon mining district included the only detailed geologic map available on the area, and was the first attempt to establish a stratigraphic succession in the volcanic rocks of the study area. In 1945, C. P. Ross of the U. S. Geological Survey made a geological reconnaissance between Mogollon and the Gila fluorspar district, north of Cliff, and prepared a geologic map, at a scale of one inch to one-half mile, of approximately 25 square miles between Rough Canyon and Brock Canyon, including the Gila fluorspar district. Ross' unpublished manuscript has been utilized in preparing this report. Reconnaissance geologic mapping of the Mogollon 30-minute quadrangle (Weber and Willard, 1959b) and the Alum Mountain 30-minute quadrangle (Willard, Weber, and Kuellmer, 1961) was done for the New Mexico State geologic map. In those rapid reconnaissance studies the geology of the relatively inaccessible Gila Wilderness and Primitive Area was accorded particularly brief attention. Other regional geologic studies that are pertinent to the geology of the study area are cited in appropriate sections of this report.

In 1964, geologic studies involving the Gila study area were begun by W. E. Elston and associates, University of New Mexico, who initiated a program to study the "Mogollon Plateau volcanic province" under a NASA research grant. In a series of articles, road logs, and progress reports since 1965 (particularly, Elston, 1965b, 1968, 1970; Elston, Coney, and Rhodes, 1968, 1970; Elston Bikerman, and Damon, 1968; Elston and Damon, 1970; and Rhodes, 1970), this group has published columnar sections and stratigraphic correlation charts, diagrammatic maps and sections, geochronological data and magnetic polarity data, and a gravity profile across the north side of the study area. They have postulated a volcano-tectonic framework for the entire volcanic field and described volcano-tectonic subsidence structures and eruptive centers within and beyond the study area. A reconnaissance geologic map of the Mogollon Mountains accompanies the Ph.D dissertation of R. C. Rhodes (1970).

Some of the mineral deposits and mining districts within and adjacent to the study area have been described in various reports. During World War II, detailed investigations of the fluorspar mines and prospects in the area were made by the U. S. Bureau of Mines, and the results were published as Bulletin 21 of the New Mexico State Bureau of Mines and Minerals Resources (Rothrock, and others, 1946). The U. S. Bureau of Mines later examined other fluorspar deposits in Little Whitewater Creek (Sur, 1947) and the Gila fluorspar district (Russell, 1947), and prepared a summary of New Mexico fluorspar deposits (Williams, 1966). In other studies, the U. S. Bureau of Mines made a reconnaissance investigation in 1950 of the Uncle John copper-lead-zinc prospect in the Gila Wilderness on Big Dry Creek (no report was published), and examined clay deposits in Copperas Canyon (also unpublished). Tin deposits in the Taylor Creek district, north of the main Gila Primitive Area, were described by Volin and others (1947), and tellurium resources in New Mexico, including tellurium in the Lone Pine district at the edge of Gila Primitive Area tract 7, were discussed by Everett (1964). The alum deposits near Alum Mountain were described by Hayes (1907), and the Taylor Creek tin deposits were described by Fries (1940). Northrup (1959) reviewed the literature on sepiolite in the meerschaum deposits near the south end of tract 1 of the Gila Primitive Area, and native tellurium from the Lone Pine district is described by Ballmer (1932) and Crawford (1937). The mineral deposits of western Grant County, New Mexico are reviewed by Gillerman (1964), and the mineral resources of the Black Range Primitive Area, which adjoins the Gila study area on the east, were appraised by Ericksen, Wedow and others (1970).

Present investigations.--This is a joint report of investigations conducted separately by the U. S. Bureau of Mines and the U. S. Geological Survey. The Bureau of Mines conducted a search of courthouse records in Catron, Grant and Socorro Counties (Catron County was formed from Socorro County in 1921) during the winters of 1968-70, and mining claim data on approximately 4,000 claims were obtained. Bureau of Mines field investigations during the field seasons of 1968-70 totalled approximately 19 man months. An effort was made to locate all claims and workings in the study area and to obtain samples for assay from veins, mineralized zones, alteration zones and dumps. Five hundred and sixty-three samples were collected and analyzed. Most of the Bureau of Mines work was accomplished by horseback packing, and the services of local packers and guides were found to be indispensable in locating and identifying many obscure and overgrown claims and diggings.

The Geological Survey investigations in the Gila study area were begun in March 1968, and approximately 2 man years of field studies were conducted through the period to May 1971. Although horses and helicopter support were used in parts of the area, most of the work was done on foot traverses. The Geological Survey study involved geologic mapping, geochemical sampling, and geophysical surveys. A reconnaissance geologic map was prepared to assess the geologic environment and tectonic setting, and individual geologic structures were examined for evidence of mineralization; a geochemical survey was made to locate unusual concentrations of elements that might indicate the presence of buried or otherwise unknown mineralized areas; and aeromagnetic and gravity surveys were made to provide additional information for interpreting the geology of the study area.

Acknowledgements.--We encountered a surprising number of people during this 3-year study of the Gila Wilderness and Primitive Area. Were we to try to name everyone who helped us, the list would be long, and, worse, we might inadvertently leave someone out. We enjoyed the cooperation of nearly everyone we met. Particularly, however, we wish to thank the staffs of the U. S. Forest Service, Gila National Forest, Mr. Richard C. Johnson, Supervisor, and the U. S. National Park Service, William M. Lukens, Park Superintendent until spring 1971, for their wholehearted support. Special thanks must go to our helicopter pilots, Phil Craig, Roy Cooper, Jim Scott, Bud Williams, Creig Dunn, Lou Testa and Harold Hjertage, and our packers J. E. Bostrom, Jack Edwards and Kenneth Shellhorn of Glenwood; Doc Campbell, J. W. (Woody) Hoge, William Hoge and Jack Carter of Gila Hot Springs; Quentin Hulse of Canyon Creek Ranch, R. S. Rice and Sons ranches on Mogollon and Sacaton Creeks; W. N. Shelley of Gila River Ranch, D. C. Watkins and H. Thorntenbury of Cliff, and V. Williams of Deep Creek Ranch, and to Jack M. Foster, Fire Control Officer, Gila National Forest for cooperative arrangements on helicopter use.

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Geologic appraisal

The geologic appraisal of the mineral resources of the Gila study area is based mainly on three considerations: 1) the regional geologic setting, 2) the geologic history of the study area, particularly of the structural development and igneous activity, and 3) the distribution of altered and mineralized rocks, and metallic elements, as determined by geochemical sampling of rocks and stream sediments.

Regional geologic setting

The Gila study area is near the southeastern corner of the Colorado Plateaus structural province, in a mountainous region where Tertiary volcanic rocks cover the transition between the flat-lying sedimentary rocks of the plateaus province and the tilted and deformed rocks in the Basin and Range structural province to the south. The study area is within the Datil volcanic area, one of four major areas of Tertiary volcanic rocks that occur roughly at the corners of the Colorado Plateaus province (fig. 6). The volcanic rocks exposed at the surface within the study area are underlain by an unknown thickness of Mesozoic and Paleozoic sedimentary rocks, and by a basement of Precambrian rocks where not invaded by younger intrusive rocks.

Precambrian rocks exposed adjacent to the study area are mainly in the Burro Mountains, which trend northwesterly in the vicinity of Tyrone, south of the study area and southwest of Silver City (fig. 1). The Precambrian rocks in the Burro Mountains and elsewhere in southwestern New Mexico (fig. 22) are mainly granitic but minor amounts of schist and diabase also occur.

The distribution and thickness of Paleozoic rocks as known near the Gila study area indicate a history of alternating deposition and erosion in a relatively stable shelf environment adjacent to the Paleozoic Cordilleran geosyncline. Paleozoic rocks aggregate only about 3,000 feet in the Santa Rita quadrangle, near Silver City (Jones, Hernon, and Moore, 1967, p. 8-9) and are less than 1,000-feet thick in the Morenci district, Arizona (Lindgren, 1905, p. 59). Pre-Pennsylvanian rocks, which are about 1,500-feet thick in the Silver City area, are believed by Foster (1964) to pinch out some 30 miles north of Gila Hot Springs. Facies and thickness maps by Kottlowski (1965a) show 2,000-3,000 feet of Paleozoic strata interpreted to be beneath the study area.

Mesozoic rocks must be very thin or absent beneath the study area. Early Mesozoic strata are absent in the adjoining areas, and the northern limit of Early Cretaceous strata is interpreted to have been near the southern edge of the study area (Kottlowski, 1965a, fig. 10). Late Cretaceous rocks are widespread in the Silver City region where they are as much as 2,000 feet thick (Kottlowski, 1965a, fig. 11; Foster, 1964), but may have been largely removed by erosion from beneath the study area as postulated for the Pinos Altos and Black Ranges by Jones, Hernon and Moore (1967, p. 33).

The distribution of Late Paleozoic and Mesozoic rocks in the vicinity of the Gila study area was probably influenced by the Deming Axis (Turner, 1962, p. 59-71) a northwest-southeast line connecting 5 small uplifts that expose Precambrian rocks from the Van Horn uplift in West Texas to the Graham and Florence uplifts in eastern Arizona (fig. 6). Along this line in New Mexico are the Burro uplift (Elston, 1958), which is adjacent to the study area on the south (fig. 6), and the Florida uplift. The Deming axis is believed by Turner to have formed first as a weak tectonic element during the Mississippian period, but it probably was not a significant tectonic feature in the vicinity of the Burro uplift until Early Cretaceous time (Elston, 1958, p. 2516). Late Cretaceous rocks directly overlie Precambrian crystalline rocks in the Burro uplift, and an unconformity between Lower and Upper Cretaceous rocks in southwestern New Mexico was recognized by Elston (1958, p. 2516), but the lack of pre-Laramide folds and faults (Jones, Hernon and Moore, 1967, p. 112-113; Lindgren, 1905, p. 92-93) indicates that in the vicinity of the Gila study area these earlier tectonic movements were largely epeirogenic, consisting of broad uplifts or depressions.

No additional information on the presence or distribution of Paleozoic or Mesozoic rocks beneath the study area was obtained during the present study. Although limestone boulders containing chert lenses have been reported by prospectors at two localities (in Big Dry Creek above Spruce Creek, and above Lookout Canyon, near the foot of the Seventyfour Mountain trail at Mogollon Creek) we have not verified these reports, nor have we recognized basement rock inclusions in any of the volcanic rocks.

The main structural developments in southwestern New Mexico and adjacent areas date mainly from the Laramide orogeny of Late Cretaceous and Early Tertiary age, during which widespread faulting and folding, and igneous intrusion and volcanism took place throughout the Cordilleran region of the Western United States. There is little direct evidence of Laramide structures in the Gila study area because most of the volcanic rocks in the study area were deposited in Middle Tertiary time, subsequent to the Laramide orogeny. Even where older Tertiary rocks are exposed, as in the volcanic complex of Brock Canyon, Laramide structures have not been documented. However, the major structural features in the Santa Rita quadrangle include strong northeast and northwest fault trends, which Jones, Hernon, and Moore (1967, p. 112-125) have shown to have originated during Laramide deformation. Some of these Laramide structures, including the Mimbres fault, which projects into the study area, were recurrently active through Late Tertiary and perhaps Quaternary time. Thus it is probable that some of the larger faults cutting Middle Tertiary volcanic rocks in the Gila study area may have originated earlier, and were reactivated during and following volcanic activity.

The obvious structural trends in the Gila study area are post-Laramide, that is, Middle Tertiary or younger, and they generally formed during development of the Basin and Range structural province. On a regional basis, the Basin and Range structural trends in New Mexico and Arizona are dominantly north to north-northwest (Turner, 1962, fig. 9; Cohee and others, 1961) but in the vicinity of the study area, northwest trends are dominant (fig. 2), and a strong northeast trend characterizes an area west and north of the study area (fig. 16) that extends from the San Augustin Plains southwestward to Morenci, Ariz. (fig. 6). Thus the study area is adjacent to a zone where the generally northerly Basin and Range structures apparently are deflected to northwest and west-northwest trends. This zone of deflection is approximately coincident with the Deming axis (Turner, 1962, p. 59-67), and it is this deflection of trends that is the main basis for the controversial concept of a Texas Lineament.

The validity of the Texas Lineament concept will be considered at some length here because of its possible significance to the mineral resource potential of the Gila study area. Some geologists accept the hypothesis that the location of most of the major ore deposits of the southwest is determined primarily by the intersection of two or more major structural trends, whereas other geologists recognize fracture control as important at a district or mine level but believe that other factors are more fundamental in regional localization of ore deposits.

The Texas Lineament (fig. 6) was first recognized by Hill (1902) and was named by Ransome (1915); it has been described as a structural zone, up to 100 miles wide, that extends from the Transverse Ranges of Southern California to the Trans Pecos region of West Texas, or even projects across the Gulf of Mexico and the Carribean to follow the northeast coast of Brazil (Baker, 1933, 1935). The history of thought concerning the lineament and the evidence for it has been reviewed by Albritton and Smith (1957, p. 501-518). The Texas zone is interpreted by some geologists as a major transcurrent fault or deep fracture in the earth's crust along which there has been extensive strike slip or lateral movement, possibly left lateral according to Moody and Hill (1956, p. 1223-1224; fig. 11). Although granting that Laramide and younger features support left-lateral slip, Muehlberger (1965) has proposed right lateral displacement of 200-250 miles during the Late Paleozoic along the Texas zone, based on subsurface studies of Paleozoic rocks and isotopic dating of Precambrian basement rocks in West Texas and Oklahoma. On the other hand, King (1969, p. 72-73) recognizes the Texas Lineament as a zone separating the southern and central parts of the North American Cordillera which have "different topographies, geologic histories, and styles of deformation", but denies that the zone represents a through-going fault zone for lack of evidence based on his own field studies in the type area in the Sierra Diablo region of West Texas (King, 1965, p. 115, 118). In another interpretation (Turner, 1962, p. 67-71), the strike deflections of topographic and structural features along the Texas Lineament are considered more likely to be "* * * due to refraction effects across the ancient Deming axis than to some form of regional shear or wrench-fault tectonics".

Whether influenced primarily by a through-going "Texas Lineament" by a more local "Deming axis", or by some other less obvious geologic control, most of the known mineralized areas in and near the Gila study area are localized along the northwest trending faulted front of the Mogollon Mountains. More detailed discussions of mineralized areas within this zone will be given later in the "Mineral Resource Appraisal" section of this report.

Description of rock units

Most of the rocks exposed in the Gila study area (pl. 1A, 1B) are extrusive rocks and their shallow intrusive equivalents. Some volcaniclastic sediments are interlayered in the volcanic section, and thick deposits of fluvial conglomerate and finer grained stream-deposited sediments cover large tracts in the eastern part of the study area, and along its western and southwestern edges. The volcanic rocks are probably all of Tertiary age as indicated by isotopic and fission-track dating.

The major units in the volcanic section are listed in table 1. The volcanic rocks can be divided into three groups, based on their relative geologic ages, each having a different potential for mineral resources: 1) locally exposed older volcanic rocks, some of which may be early Tertiary--possibly of Laramide age. These rocks may have major undiscovered ore deposits associated with them, 2) wide-spread rhyolitic ash-flow tuff sheets and associated volcanic rocks of Middle Tertiary age. These rocks generally have been referred to the Datil Formation or Group (Dane and Bachman, 1965). The ore deposits of the Mogollon district are associated with the Datil rocks, and many mineralized areas with a potential for important ore deposits, as along the west and southwest flanks of the Mogollon Mountains, are relatively unexplored, 3) late Tertiary andesitic and basaltic lavas that have little potential for significant mineral deposits.

Table 1.--Tertiary volcanic rocks in the Gila study area

Epoch	Stratigraphic unit	Approximate thickness (ft)	Character and distribution
Pliocene	Alkali olivine basalt	0-200?	Lava flows capping some ridges of Gila Conglomerate in southeast corner of study area.
	UNCONFORMITY		
Miocene	Late andesitic rocks, undivided	0-2,000+	Lava flows, flow breccia and interlayered volcaniclastic sediments and rhyolitic pyroclastic rocks.
Miocene	Younger rhyolite lava flows and domes	0-800+	Flow-banded rhyolite flows and domes; mainly at Indian Creek, Beaver Creek, and Rocky Canyon in northeastern part of study area; interlayered with lower part of Late andesitic rocks.
Miocene or Oligocene	Bloodgood Canyon Rhyolite Tuff of Elston (1968)	0-1,000+	Mainly phenocryst-rich densely welded ash-flow tuff; phenocrysts of quartz, sanidine, minor plagioclase, conspicuous honey-yellow sphene; in Gila Cliff Dwellings caldera in east central part of area.
Oligocene	Older rhyolite lava flows and domes	0-3,000?	Flow-banded rhyolite lava and associated pyroclastic and volcaniclastic rocks; abundant dikes, plugs and domal intrusive bodies along southwest side of study area from Mogollon to Gila River.
Oligocene	Andesitic flows and breccias of Murtock's Hole	0-600	Mainly in Gila River Canyon; includes a discontinuous thin layer of sanidine-bearing crystal-poor tuff.
Oligocene	Mineral Creek andesite	0-1,000?	Lava flows beneath the older rhyolite flows and domes within the Bursum caldera.
Oligocene	Rhyolite of Sacaton Mountain	0-1,300+	Porphyritic rhyolite lavas largely if not entirely, within the Bursum caldera.
Oligocene	Tuff of Apache Spring	0-2,500+	Phenocryst-rich, compositionally zoned ash-flow tuff with the Bursum caldera; phenocrysts of quartz, sanidine, plagioclase, biotite, minor pyroxene and sphene, same as Apache Spring Quartz Latite of Elston (1968).
Oligocene	Tuff of Shelley Peak	0-800+	Phenocryst-rich, compositionally zoned ash-flow tuff; phenocrysts of quartz, sanidine, plagioclase, biotite, minor pyroxene; recognized mainly from Shelley Peak, east.

Table 1.--Tertiary volcanic rocks in the Gila study area--Continued

Epoch	Stratigraphic unit	Approximate thickness (ft)	Character and distribution
Oligocene	Tuff of Davis Canyon	0-300+	Pumice-rich ash-flow tuff; sparse small quartz and sanidine phenocrysts; occurs between Mogollon Creek and Gila River.
	Tuff of Fall Canyon	0-500	Phenocryst-rich ash-flow tuff; phenocrysts of quartz, sanidine, plagioclase, biotite; occurs between Rain Creek and Gila River.
	Cooney Quartz Latite	0-2,000+	Phenocryst-rich compositionally zoned ash-flow tuff; phenocrysts of plagioclase, biotite, minor pyroxene. As mapped, includes Whitewater Rhyolite, and minor amounts of Houston Andesite and Cranktown Sandstone as defined by Ferguson (1927) in the Mogollon mining district.
	Latitic and andesitic flows of Gila Flat	0-600+	Flows mapped mainly east of Gila River beneath tuff of Shelley Peak, but flows of similar lithology are interlayered between ash-flow tuffs west of Gila River.
	—UNCONFORMITY—		
	Complex of Alum Mountain	0-1,400+	Andesitic flows, breccia and bedded volcaniclastic and pyroclastic rocks cut by small intrusive rhyolite bodies; confined to windows through younger rocks in the Alum Mountain and Copperas Canyon area in the eastern part of the study area.
	Ash-flow tuffs or Rocky Canyon	0-600+	Includes at least two separate ash-flow tuff sheets in eastern part of study area.
	Andesitic flows and breccias of Turkey Cienga Canyon	0-400+	Upper part interlayered with overlying ash-flow tuffs of Rocky Canyon.
	—UNCONFORMITY—		
Eocene(?)	Dacitic intrusive? rocks of Holt Gulch	0-800+	Propylitically altered fine grained rocks with micro-granitic texture; restricted to vicinity of Holt Gulch near western edge of study area.
	Volcanic complex of Brock Canyon	0-1,200+	Altered and unaltered latitic flows and intrusives at the mouth of the Gila River Canyon at the southern edge of the study area.

Older volcanic rocks

The older volcanic rocks include those that underlie the ash-flow tuff sequence of the Datil Group, namely, the volcanic complex of Brock Canyon, and the dacitic intrusive(?) rocks of Holt Gulch (table 1). A fission-track age on zircons indicates a middle Eocene or older age for the Brock Canyon complex.

Volcanic complex of Brock Canyon

Altered and unaltered latitic(?) lava flows, breccias and probable intrusive rocks of the volcanic complex of Brock Canyon are exposed in the Gila fluorspar district along the Gila River at the southern edge of the Gila Wilderness and Primitive Area (pls. 1A, 1B). The complex probably represents the oldest rocks of the study area, and as mapped, includes all the volcanic and related rocks beneath the lowest ash-flow tuff sheet of the Datil Volcanic Group in this area. The ash-flow sequence unconformably overlies the complex and the contact dips 5-10 degrees northward into the canyon of the Gila River (pl. 1B). The flows and breccias along the northern exposures of the complex dip generally 20-25 degrees away from the central part, and local flow banding dips 45-90 degrees around the margins of pluglike intrusions(?), as for example north of the Gila River opposite Brushy Canyon (pl. 1B). The position of the unconformity between the complex and the ash-flow section is somewhat uncertain, however, and some of the lava flows mapped as part of the complex in such places as the east side of Brock Canyon and near the Clum mine (pl. 1B) are, in retrospect, probably above the unconformity. Potassium-argon dates on biotite from two samples of latitic lavas near the Clum fluorspar vein (pl. 1B) have yielded isotopic ages of 31.0±1.1 and 32.7±1.1 m.y. (oral commun., R. F. Marvin, 1972), which are within the range of previously determined isotopic ages of volcanic units in the lower part of the Datil Group (Elston, Coney and Rhodes, 1970, p. 75); these ages contrast with the fission-track minimum age of 49±2 m.y. for zircons from highly altered rocks of the volcanic complex of Brock Canyon from Brushy Canyon (Charles W. Naeser, oral commun., 1970).

Rocks of the volcanic complex of Brock Canyon are highly altered in the Gila fluorspar district on both sides of the Gila River. Alteration was probably pre-Datil in age. The altered rocks are characterized by widespread argillically and sericitically altered feldspars and biotite, oxidized mafic minerals, and locally very intensely silicified and pyritized rock along fractures or faults. The most intensely altered rocks which are most likely to have mineralization associated with them, are centered south and east of the Gila River, in the vicinity of Brock and Brushy Canyons, outside the lands now designated as wilderness or primitive. Other pre-Datil altered and mineralized rocks could exist beneath the younger volcanic rocks in the wilderness and primitive area, but their existence can only be surmised.

Dacitic intrusive(?) rocks of Holt Gulch.--The dacitic intrusive(?) rocks of Holt Gulch crop out in an area of 1-2 square miles that crosses Holt Gulch at the western edge of the study area (pl. 1A). The dacite is unconformably overlain by younger volcanic units and seems to have been topographically high when the basal units of the younger ash-flow tuff sequence were deposited. Similar rock crops out in small areas from Holt Gulch southeast to Minton Canyon, particularly in the Little Dry Creek-Pine Creek area. These small areas have not been mapped separately, and correlations of the small outcrops of dacitic rocks are highly uncertain. Where unweathered, the dacite in Holt Gulch is a distinctive fine grained, aplitic rock that has been altered propylitically to a greenish-gray rock with 1-3 mm white feldspar laths. The plagioclase phenocrysts are partly altered to fine-grained clay, carbonate, and epidote, and biotite(?) is completely chloritized. Small grains of opaque oxide and interstitial quartz and feldspar are common, as seen in thin sections. Small pink veinlets of aplite 1-4 mm wide cut the propylitized rock. The propylitic alteration seems to be limited to the dacitic intrusive(?), but may be related to the argillic and silicic alteration associated with younger rhyolitic intrusive rocks in the same area.

Ash-flow tuff sequence and associated lavas

The volcanic sequence of the Gila study area is dominated by a series of rhyolitic ash-flow tuff sheets that are interlayered with intermediate to mafic lava flows and extensive masses of intrusive-extrusive rhyolite lava. From reconnaissance isotopic ages of generally correlative rocks, largely from outside but adjacent to the study area, it seems certain that the volcanic activity resulting in the ash-flow sequence and associated lavas took place during Oligocene and early Miocene time, i.e., between about 35 million and 20 million years ago (Damon and Bikerman, 1964; Damon, 1967, 1970). These rocks are generally correlated with the Datil Formation of Winchester (1921), which in the type area at the north end of the Bear Mountains, about 70 miles northeast of the study area, includes an ash-flow tuff that has yielded K-Ar ages of about 32 m.y. (Burke and others, 1963, p. 224; Weber and Bassett, 1963, p. 220). Recently, Elston, Coney and Rhodes (1970, p. 75-86) have defined most of the Oligocene-Miocene volcanic rocks in the study area and the surrounding region in terms of the type Datil. The general contemporaneity of the volcanic rocks throughout the Datil Volcanic Area (Cohee and others, 1962) is not in doubt, but the relations between mappable units and source areas are only beginning to be unravelled; certainly the Gila study area is one of the major volcanic source areas of the Datil volcanic field.

The stratigraphy of the Datil sequence in the Gila study area will be described mainly with reference to the ash-flow tuff units, because these are relatively distinctive and more easily traced and correlated than the more mafic lava flows between them. Also, the ash-flow tuffs more nearly represent points in geologic time because they were erupted and deposited so rapidly. Stratigraphic names have been assigned to most of the major volcanic units in the study area, first by Ferguson (1927) for units mapped in the Mogollon district, and recently by Elston, Coney, and Rhodes (1970), who have extended Ferguson's units into much of the study area, and added many new names. Some of the new names have been used in this report, and additional informal names are introduced here, but many of the correlations are tentative, and much remains to be learned about the complex inter-relations of the volcanic units.

At least 8 major ash-flow tuff sheets are represented in the study area (table 1), including two sheets exposed along Rocky Canyon in the eastern part of tract 1 of the Gila Primitive Area, which may represent the Kneeling Nun Tuff, and the Caballo Blanco Rhyolite Tuff of Elston (1957). The most complete sections of the ash-flow tuff sequence crop out along the front of the Mogollon Range between Rain Creek and the Gila River; specifically the Canteen Canyon section on the south face of Watson Mountain and the Shelley Peak section in the Fall Canyon and Davis Canyon areas on the south slopes of Shelley Peak (pl. 1A, fig. 7). Both

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Figure 7.--Near here

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sections are interrupted by northwest-trending faults, which repeat some units. Probable Cooney Quartz Latite ash-flow tuff is at the base of the Canteen Canyon section, overlain successively by the tuffs of Fall Canyon, Davis Canyon, and Shelley Peak and Bloodgood Canyon Rhyolite Tuff to the top of Watson Mountain. The Shelley Peak section, which has good exposures of Cooney Quartz Latite in the lower parts of Davis and Fall Canyons, is capped by about 800 feet of the ash-flow tuff of Shelley Peak. Thick lava flow sequences of intermediate composition separate some of the ash-flow tuffs in both sections.

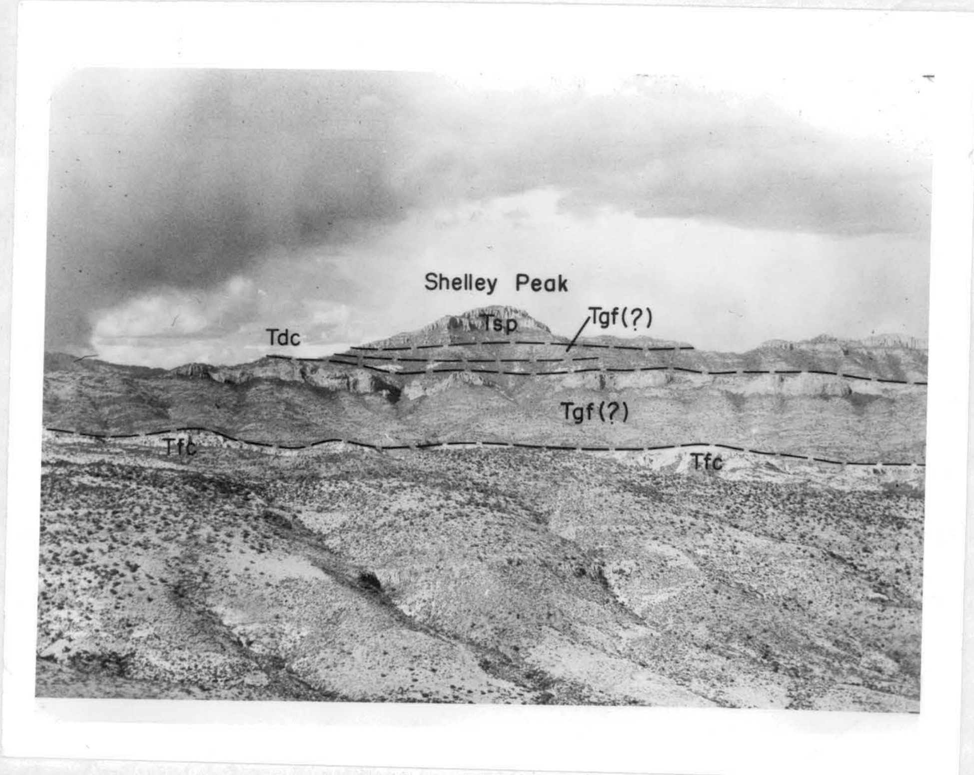

Figure 7.--View of Shelley Peak ash-flow tuff section as viewed from mesa southwest of Mogollon Creek. Tsp, ash-flow tuff of Shelley Peak; Tdc, ash-flow tuff of Davis Canyon; Tfc, ash-flow tuff of Fall Canyon. Ash-flow tuffs are separated by latitic and andesitic flows of Gila Flat(?). Base of Tuff of Fall Canyon is uncertain in photograph.

Stratigraphic problems.--Although correlations remain tentative and other problems related to the volcanic stratigraphy of the ash-flow tuff sequence are unsolved, the problem that seems to be most important at this time is the relative age of the tuff of Apache Spring and the Bloodgood Canyon Rhyolite Tuff of Elston (1968) (table 1). This problem also involves the relative ages of the Bursum and Gila Cliff Dwellings calderas, and perhaps the very nature and existence of the latter. The few isotopic ages available are ambiguous because the one age of 27.3±0.8 m.y. for the tuff of Apache Spring is within the statistical uncertainty of some of the ages of rocks correlated with the Bloodgood Canyon Rhyolite Tuff, which range from 23.2±0.7 m.y. to 26.5±1.2 m.y. (Elston, Bikerman, and Damon, 1968, p. AIV-5). New fission-track dates on sphenes from samples of both units from their type areas also give equivocal results, but tend to indicate a real difference in the ages of the two units with the Bloodgood Canyon Rhyolite being the younger. At the 95 percent confidence level, fission tracks in sphene from the tuff of Apache Spring indicate an age of 28.0±1.8 m.y., compared to 24.7±2.5 m.y. for the age of sphenes in the Bloodgood Canyon Rhyolite of Elston (personal commun., Charles W. Nasser, 1971). Some critical geologic relations occur in the Hells Hole area on the West Fork of the Gila River, where the margins of the two calderas may intersect. Here, the tuff of Apache Spring is plastered against the inside of the east wall of the Bursum caldera, which dips about 55 degrees westward. That this is not a simple fault relationship is shown by a marginal vitrophyre zone in the tuff of Apache Spring, which parallels the dipping surface where it was chilled against the caldera wall. On the south side of the West Fork of the Gila, the caldera wall is the tuff of Shelley Peak; north of the river the wall consists of andesitic lava flows, and a possible continuation of the wall on the east side of Hells Hole has flow-banded rhyolite and associated pyroclastic rocks apparently abutting Bloodgood Canyon Rhyolite (pl. 1B). South of the West Fork, however, what appear to be the same flow banded rhyolites are mapped beneath the Bloodgood Canyon, but above the tuffs of Apache Spring and Shelley Peak. If the rhyolites are the same both north and south of the river, the tuff of Apache Spring is older than Bloodgood Canyon Rhyolite and another explanation is required for the relationships between the rhyolite flows and the Bloodgood Canyon Rhyolite on the east side of Hells Hole. If the look-alike rhyolite flows are in fact different, then Bloodgood Canyon rhyolite appears to form part of the wall of the Bursum Caldera and is thus older than the tuff of Apache Spring.

Some of our colleagues, who visited the study area in the fall of 1970, suggested that the Bloodgood Canyon Rhyolite Tuff actually is the early outflow sheet of the Apache Spring unit, and there is no denying the petrographic similarity of the rocks, and that certain puzzling aspects of the Bloodgood Canyon Rhyolite and its supposed source caldera (Gila Cliff Dwellings Caldera) might be explained through this hypothesis. It would provide for an extensive outflow sheet of relatively silicic ash-flow tuff commensurate in volume with the extraordinary size of the Bursum caldera. It would follow that the Gila Cliff Dwellings caldera could not be the source of the Bloodgood Canyon Rhyolite, but would represent an older caldera that might be the source of one of the other major sheets in the ash-flow tuff sequence, and which was filled by the early eruptions of ash-flow tuff from the Bursum caldera source area. This would help to explain the lack of alteration and sparse lithic inclusions in the Bloodgood Canyon Rhyolite within the Gila Cliff Dwellings caldera.

Attractive as this hypothesis seems, it is not confirmed and appears unlikely to us in the light of our present data. As presently mapped, the large masses of flow-banded rhyolite around the margins of the resurgent Bursum caldera overlie the tuff of Apache Spring within the caldera and appear to extend outward from the caldera beneath the Bloodgood Canyon Rhyolite. This relationship is well illustrated on plate 1B along and south of the West Fork of the Gila River in the general Hells Hole area, and is supported by the extensive flow-banded rhyolite that underlies Bloodgood Canyon Rhyolite east of the mouth of Turkey Creek, which apparently forms part of the scalloped south wall of the Gila Cliff Dwellings caldera (pl. 1B). For the Apache Spring and Bloodgood Canyon tuffs to be equivalent, this mass of rhyolite would have to be split into two units, one in the caldera wall beneath the Bloodgood Canyon, and the other above the Apache Spring within the Bursum caldera. Although an outlier of flow-banded rhyolite overlies the Bloodgood Canyon Rhyolite on Watson Mountain (pl. 1B), no such split was recognized in the Hells Hole area. The accumulated evidence at this time, though incomplete, forces us to postulate that the Apache Spring and Bloodgood Canyon tuffs are genetically related to the same magmatic source, but were erupted from separate source calderas, and that the Bloodgood Canyon Rhyolite most likely is younger than the tuff of Apache Spring.

A related stratigraphic problem is the close textural and mineralogical resemblance of the tuff of Fall Canyon, which has been mapped only between Minton Canyon and the Gila River (pl. 1A), to the tuff of Apache Spring, which fills the Bursum caldera. This resemblance led us to consider that the tuff of Fall Canyon might be the outflow sheet of the tuff of Apache Spring, but in so far as our field evidence that the Apache Spring is younger than the tuff of Shelley Peak is valid, the tuff of Fall Canyon cannot be equivalent to Apache Spring because the former is stratigraphically below the tuff of Shelley Peak in a well exposed section.

Andesitic flows and breccias of Turkey Cienega Canyon

The oldest rocks in tract 1 of the Gila Primitive Area are a series of andesite flows and breccias in Turkey Cienega Canyon, and in a small window along Terry Canyon (pl. 1B). In Turkey Cienega Canyon the andesites are interlayered with the oldest ash-flow tuffs of the study area. The andesites extend eastward into the Black Range Primitive Area, where they were mapped as the andesite of Mimbres River--McKnight Mountain area (Ericksen and others, 1970, pl. 1). The age of the andesitic rocks is unknown, but their position may be the same as the Rustler Canyon Basalt of Elston (1957), p. 30), which separates the Kneeling Nun and Caballo Blanco tuffs in the northwestern part of the Dwyer quadrangle, 20 miles to the south. The andesitic rocks are mainly dark gray, purple, and red; fine grained to prophyritic; and contain sparse pyroxene and olivine, or iddingsite, in an aphanitic matrix of fine-grained plagioclase. Two pyroxenes are present in a thin section of similar rock exposed in Terry Canyon, but the correlation of these rocks with those in Turkey Cienega Canyon is uncertain.

Ash-flow tuffs of Rocky Canyon.--Ash-flow tuffs crop out in an area of 7-8 square miles along Rocky Canyon and Turkey Cienega Canyon, and continue eastward into the Black Range Primitive Area, where they were mapped as the Caballo Blanco Rhyolite Tuff Member of the Datil Formation (Ericksen and others, 1970, pl. 1), after the Caballo Blanco Tuff of Elston (1957). Actually, there are at least two ash-flow tuff sheets included in this unit in the Gila study area: 1) a fine-grained, crystal-rich amphibole-bearing tuff closely resembling the Kneeling Nun Tuff (Jicha, 1954, p. 44) crops out along the west side of Rocky Canyon, about 2 miles below the Beaverhead road, 2) this possible Kneeling Nun Tuff is apparently faulted against quartz-feldspar-biotite tuff that may correlate with the Caballo Blanco Tuff of Elston (1957). The detailed relations of these units were not mapped, and their correlation with either or both the 33.4 ± 1.0 m.y. old Kneeling Nun Tuff of the Santa Rita Quadrangle (McDowell, 1966) and the 29.8 ± 0.8 m.y. old Caballo Blanco Tuff of the Dwyer Quadrangle (Damon, 1967, p. 65) must be considered tentative.

Volcanic complex of Alum Mountain

The volcanic complex of Alum Mountain consists largely of porphyritic pyroxene-plagioclase andesite flows and breccias, pyroclastic rocks, volcaniclastic sedimentary rocks, rhyolite intrusives and hydrothermally altered and mineralized rocks that are exposed in two windows through younger lava flows. One window, about 15 square miles, is along Copperas Canyon in the southeastern part of the study area; the other, about 6 square miles, is centered on Alum Mountain, just northwest of the first window (pl. 1B). The rocks in these two outcrop areas likely represent the products of a single complex volcanic center or vent area that is continuous beneath the younger unaltered flows. The complex probably is equivalent to the lower sandstone and porphyritic andesite members of the Alum Mountain Formation of Elston, Coney and Rhodes (1968, p. 266, 268). The unaltered upper latitic and basaltic members of the previously defined Alum Mountain Formation are here called the latitic and andesitic flows of Gila Flat, and the basaltic flows and breccias of Murtock's Hole, respectively (table 1). We believe that the contact between altered Alum Mountain rocks and the unaltered flows of Gila Flat represents a significant unconformity, and that the two groups of rocks should not be lumped in a single formational unit.

Plate 1B shows in some detail how the younger rock units overlap the complex in the Alum Mountain window. The upper part of the Alum Mountain complex commonly consists of bedded tuffs and volcaniclastic deposits that in places are intensely altered, in contrast to overlying unaltered flows of Gila Flat, which include breccia, scoriaceous agglomerate(?) and unaltered pyroclastic and sedimentary beds as much as 200 feet thick at the base.

Although rocks of the volcanic complex of Alum Mountain seem to be readily separable from the latitic flows of Gila Flat around the Alum Mountain and Copperas Canyon windows, they may have been mapped with the flows of Gila Flat along the east side of the Gila River Canyon above Sapillo Creek and near the heads of Apache Creek and Rocky Canyon, east of the windows.

The age of the volcanic complex is uncertain. It is older than the lava flows of Gila Flat. A new potassium-argon age from apparently unaltered potassium feldspar in a sample of a somewhat pyritized granitic dike that cuts the rocks within the Copperas Canyon window (pl. 1B) gave an age of 29.7±1.0 m.y. (R. F. Marvin, 1972, personal commun.). This age is indistinguishable from two new potassium-argon ages (R. F. Marvin, 1972, personal commun.) of biotite and sanidine from biotite-quartz latite vitrophyre collected south of Sapillo Creek (pl. 1B) from rock mapped as latite of Gila Flat.

A variety of small intrusive bodies were noted in and near the Alum Mountain and Copperas Canyon windows. Andesitic dikes cut unaltered rocks of the Alum Mountain complex, and two small hornblende-bearing latitic dikes cut the latitic flows of Gila Flat (pl. 1B). Silicic intrusives, mainly small rhyolite or quartz monzonite dikes and sills, seem to be confined to the volcanic complex of Alum Mountain, and most of those mapped are in the Copperas Canyon window (pl. 1B). Several

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of these small intrusives a few feet thick have altered margins of several inches that grade into unaltered interiors, indicating that the altering solutions may have been contained in and expelled from the rhyolite. The largest of the rhyolite intrusives is a dike exposed in road cuts along New Mexico 527 about a mile north of Sapillo Creek (pl. 1B). The dike is nearly a mile long and a quarter of a mile wide; it consists of fine-grained fluidal rhyolite with sparse and inconspicuous feldspar phenocrysts that in thin section appear to be entirely plagioclase. The rock is more or less completely bleached and in thin sections shows plagioclase crystals set in a fine grained partly argillized matrix. Any mafic crystals in the original rock are completely altered or replaced by disseminated pyrite and specular hematite. Tiny seams and veinlets of quartz and specularite crisscross much of the rock. Otherdikes are less pervasively bleached and consist of gray fluidal aphanitic rhyolite with scattered white clay pseudomorphs of feldspar crystals 2-4 mm long.

Fine grained granitic textured quartz monzonite forms a fairly large intrusive about a half mile north of the clay pit on the east side of Copperas Canyon (mine symbol on pl. 1B), and a dike on the northeast side of Alum Mountain. Extensive craggy knobs of completely silicified rock, showing no vestiges of original texture, are common in Copperas Canyon on both sides of the highway. These outcrops may represent completely silicified rhyolite intrusions or extrusive volcanic country rock.

Each of the windows of older volcanic rocks in the complex of Alum Mountain includes extensive areas of hydrothermally altered and mineralized rocks. The hydrothermal activity was older than the unaltered overlying lava flows of Gila Flat. In both windows, white intensely argillized rocks are stained in bright reds and yellows from the oxidized iron-bearing minerals; these are visible on both sides of the highway through Copperas Canyon and from the Alum Mountain overlook. The highly argillized rocks on the lower slopes of Alum Mountain grade upward into a pervasively opalized cap. The most abundant alteration minerals are quartz, opal and kaolinite, although other clay minerals are undoubtedly present. Halloysite (endellite) was reported from the clay pit in lower Copperas Canyon, and alunite was reported by Weber in the Alum Mountain area (Elston and others, 1965, p. 52, 53). Only kaolinite was identified in the limited number of samples that we collected from the clay pit; apparently the other minerals are less obvious minor alteration products. Pyrite seems to be confined largely to the more silicified ribs and pipes that probably represent the channelways for the altering solutions. Where pyrite and other metallic minerals are present, the silica is usually dark gray to bluish in color. Some of the silicified knobs consist of honeycombed breccia pipes that suggest the orifices of thermal springs, and the general aspect of the altered areas is that of an extinct solfataric field similar to the one now active at Yellowstone Park.

All rock types in the Alum Mountain complex seem to have been altered in one place or another, but the most intensely altered and widely altered rocks are localized in areas where bedded tuffs and volcaniclastic rocks are particularly abundant. This preference may reflect greater accumulation of pyroclastic deposits near eruptive centers that progressed into centers of solfataric activity, or perhaps may reflect a particular susceptibility to alteration of the pyroclastic rocks because of high porosity and permeability. The alteration seems related spatially to the rhyolitic intrusions that cut the volcanic rocks in the Alum Mountain complex in both windows of exposure. The hydrothermal solutions responsible may have been derived in part from these intrusions, as well as from a common source beneath these vent areas. More local structural control by near-surface fractures of diverse trends is evident from the linear distribution of many of the more silicified pipes and ribs.

Supergene alteration caused widespread solution and redeposition of materials in the weathering environment, and some of the resulting mineral products account for the name and the early economic interest in the Alum Mountain area. Unusually thick deposits of aluminum sulfates, mainly halotrichite and alunogen, have been prospected for alum; at present these deposits are more interesting for their mineralogy and origin than as an economic source of aluminum or its salts. The origin of the aluminum sulfate deposits has been discussed by Blake (1894) and Hayes (1907) and will be considered further in the economic geology section of this report. Hayes (1907, p. 218-219) interpreted the altered rocks at Alum Mountain to be intrusive; our reconnaissance indicates that only relatively small dikes and sills are exposed at the present surface, and that the primary alteration probably resulted from hydrothermal solutions given off by a larger intrusion at depth.

Latitic and andesitic flows of Gila Flat.--As shown on plate 1A, the lava flows of Gila Flat occur mainly eastward from the Gila River and Alum Mountain-Copperas Canyon area, where they overlie the complex of Alum Mountain and form rims along most of the divide between Sapillo Creek and the East Fork of the Gila. However, similar flows are interlayered with the ash-flow sequence west of the Gila (pl. 1A, 1B) and may in part be a westward extension of Gila Flat flows derived from sources in the Alum Mountain, Copperas Canyon and Gila Flat areas as well as from local sources west of the Gila River. The flows of Gila Flat are relatively coarse porphyritic rocks with pyroxene and/or biotite and plagioclase phenocrysts. Many of the rocks have sparse but visible quartz grains that may be mostly xenocrysts. Thick domal accumulations of biotitic quartz latite are cut by lower Sapillo Creek in a tortuous narrow defile that exposes black vitrophyre with steep flow layers. Hornblende-rich flows are conspicuous locally, as near the head of Railroad Canyon (pl. 1B), and two small hornblendic dikes cut Gila Flat flows in the Alum Mountain area. As previously cited in the description of the volcanic complex of Alum Mountain, biotite-quartz latite from outcrops near the highway south of Sapillo Creek has given new potassium-argon ages of 29.6±1.0 m.y. and 29.3±1.0 m.y. for biotite and sanidine from the same glassy rocks (oral commun., R. F. Marvin, 1972). Gila Flat flows are unconformably overlain by ash-flow tuff of Shelley Peak and Bloodgood Canyon Rhyolite west of the Gila River near Alum Mountain (pl. 1B). The flows of Gila Flat are equivalent to part of the Alum Mountain Formation of Elston and others (1968).

Cooney Quartz Latite.--The Cooney Quartz Latite, as mapped in the study area (pl. 1A), includes Cooney Quartz Latite, Whitewater Creek Rhyolite (here recognized as a cooling unit within the Cooney ash-flow tuff) and small exposures of Cranktown Sandstone, Houston Andesite, and Pacific Quartz Latite. All of these units were first described by Ferguson (1927) in his report on the Mogollon mining district. Cooney Quartz Latite extends from the type area in the Mogollon district at least to Seventyfour Mountain, about 20 miles to the southeast (Rhodes, 1970, pl. 1). However, exposures are discontinuous between the two areas, and the Cooney in the Rain Creek-Seventyfour Mountain section is correlated with that in the type area on petrographic similarity and comparable stratigraphic position. Additional exposures of Cooney are tentatively identified as far as Canteen Canyon, only about 2 miles northwest of the Gila River.

The geologic age of the Cooney Quartz Latite relative to other ash-flow tuffs in the study area is uncertain, but it is probably the oldest ash-flow tuff unit in the western part of the study area. Although the correlation has not been established by mapping, Elston, Coney, and Rhodes (1968, p. 267) consider the Cooney Quartz Latite to be equivalent to their Tadpole Ridge Quartz Latite in the Pinos Altos Range, southeast of the study area, and biotite from the Tadpole Ridge has been dated as 31.2 ± 0.9 m.y. old by Damon (1967, p. 65). Damon has also dated Cooney Quartz Latite from the Whitewater Creek section, but considers the K-Ar biotite age of 23.7 ± 0.8 m.y. to be too young, because of the very low potassium content of the rock which may have been caused by "regional alteration associated with mineralization in the Mogollon mining district" (Damon, 1967, p. 64-65).

Where the Cooney Quartz Latite along Whitewater Creek is least disturbed by faulting, a composite section of multiple cooling units can be traced through an elevation change of nearly 3,000 feet and the base of the unit is not exposed. Taking into account possible repetitions from minor faulting, and corrections of thickness owing to dip, a section more than 2,000 feet thick can be estimated. Another well exposed section of Cooney Quartz Latite is exposed near the junction of Rain and Mogollon Creeks where 1,200-1,400 feet of densely welded tuff is exposed, but here too, the base of the section is not exposed. The two sections differ mainly in the contact relations between separate ash-flow units. In the Whitewater Canyon section, there are many cooling units, from a few tens of feet to several hundreds of feet thick. The thicker more densely welded cooling units appear to be in the lower and upper thirds of the section, whereas multiple, thin, commonly partially welded cooling units in the middle third are separated by dark sandstone and conglomerate beds a few feet to a few tens of feet thick (fig. 8).

Figure 8.--Near here

The Rain Creek section, on the other hand, consists of relatively homogeneous densely welded tuff without obvious cooling breaks or other partings between ash-flow units, except at the top of the section.

Figure 8.--View of the south side of Whitewater Canyon above the Catwalk, a Forest Service trail along an old flume in the bottom of the canyon. Dark sandstone and conglomerate layers in the cliffs separate ash-flow tuff cooling units in the Cooney Quartz Latite.

The rocks of the Whitewater Creek section are variably altered, and red, green, and gray argillized rocks contain calcite, clays, and secondary micaceous minerals. The alteration is not obviously related to local mineralized structures in Whitewater Canyon, but instead appears to be widespread, and was thought by Ferguson (1927, p. 54-55) to have resulted from hydrothermal activity that accompanied the mineralization of the Mogollon district. Most of the rock in the Rain Creek section is pervasively propylitized to a dark, greenish gray rock that formed during a different type of alteration than that present in Whitewater Canyon.

The source area of the Cooney tuffs is not known. From observations on the directions of thickening and flow, Rhodes (1970, p. 17) proposed a source to the south or southwest of the type area in the Mogollon district and the Rain Creek section. The thickness of densely welded tuff, in particular, and the abundance of lithic material and pervasively propylitized rock lead us to speculate that the Rain Creek section may be within or near its source, and could represent part of the fill of a Cooney caldera.

Tuff of Fall Canyon.--The tuff of Fall Canyon is well exposed in the Canteen Canyon and the Rain Creek-Mogollon Creek areas (pl. 1A). It has a maximum thickness of 400-500 feet in the study area, but thins eastward and probably wedges out against the older volcanic complex of Brock Canyon. One hundred feet or more of brown fluvial sandstone separates tuff of Fall Canyon from Cooney Quartz Latite in Fall and Davis Canyons, and in some other places thin lavas of intermediate composition underlie the tuff. Whereas several hundred feet of latitic lava flows overlie the tuff of Fall Canyon in Fall Canyon and on the slopes south of Shelley Peak (fig. 7), elsewhere the tuff may be overlain directly by the tuff of Davis Canyon.

West of Rain Creek, a tuff-breccia unit has been mapped as tuff of Fall Canyon (pl. 1A), although the rocks resemble and may have been mistakenly distinguished from the caldera-fill facies of the tuff of Apache Spring. The nature of the contact between this tuff breccia and the ash-flow tuff in the tuff of Fall Canyon east of Rain Creek is uncertain, but it could be a fault.

The ash-flow tuff of Fall Canyon has moderately abundant 1-3 mm rounded quartz and tabular alkali-feldspar and plagioclase phenocrysts. The alkali feldspar rarely shows the opalescent colors of microperthitic moonstone, but commonly is weakly sericitized and has a silky sheen in hand specimens. Sparse, commonly altered biotite is evident in most specimens. Sphene has not been noted except in a thin section of one specimen of the tuff breccia west of Rain Creek. The absence of sphene in the tuff of Fall Canyon may be most significant in distinguishing it from the tuff of Apache Spring, which otherwise has very similar mineralogy.

Tuff of Davis Canyon.--The ash-flow tuff of Davis Canyon has been mapped for about 15 miles along the southwest facing slopes of the Mogollon and Pinos Altos ranges from Shelley Peak (fig. 7)to the edge of the study area, east of the Gila River. It is 200-300 feet thick over most of this distance, but wedges out locally against the complex of Brock Canyon (pl. 1B). In the Shelley Peak section, the tuff of Davis Canyon is sandwiched between andesitic and latitic lava flows, but in the Canteen Canyon section (pl. 1A) it is overlain directly by the ash-flow tuff of Shelley Peak. This unit is characterized by light colored, partially welded tuff containing sparse small quartz, moonstone, and biotite phenocrysts, and stringy lenses of pumice. In isolated exposures it can be confused with partially welded tuff of Fall Canyon, but generally it is a distinctive unit that is not known outside the area described here. The source of the tuff of Davis Canyon is not known.

Tuff of Shelley Peak.--Shelley Peak is capped by an ash-flow tuff sheet about 700 feet thick, with no top present (fig. 7). Equivalent rocks averaging about 200 feet thick have been mapped along the southern slopes of the Mogollon and Pinos Altos ranges from the ridge east of Rain Creek to the southeast edge of the study area. The tuff has been traced northward to the Hells Hole area on the West Fork of the Gila River, where it is at least 200-300 feet thick in the east wall of the Bursum caldera. It also forms a layer, generally less than 100 feet thick, in the walls of the Gila River Canyon from Turkey Creek nearly to Alum Mountain. Also, 100 feet or more of the tuff of Shelley Peak crops out along the Beaverhead road near the head of Rocky Canyon at the eastern edge of tract 1 of the Gila Primitive Area.

The tuff of Shelley Peak on Shelley Peak is a simple cooling unit of compositionally zoned welded tuff ranging from a crystal-poor rhyolite having a few percent phenocrysts, mainly alkali feldspar and subordinate plagioclase and biotite, at the base, to a crystal-rich quartz latite with abundant plagioclase and minor biotite and pyroxene phenocrysts at the top. Large eutaxitic white pumice relicts characterize the quartz latitic rocks. Away from Shelley Peak, the unit appears to be represented mainly by the quartz latitic facies, and the characteristic green pyroxene phenocrysts are particularly useful in field identification of the unit. East of Rough Canyon, the tuff of Shelley Peak consists of two sheets separated by a thin andesite flow. The lower sheet contains only plagioclase and biotite phenocrysts, whereas the upper sheet contains green pyroxene phenocrysts as well.

The basal contact of the tuff of Shelley Peak is difficult to map in many places, particularly where the underlying unit is the tuff of Davis Canyon. A vitrophyre zone as much as 10 feet thick within the lower 50 feet of the tuff of Shelley Peak is a useful marker near the mouth of Turkey Creek and on the east side of the Gila River nearby.

Tuff of Apache Spring.--The tuff of Apache Spring includes two facies: 1) a predominant ash-flow tuff facies, which is the same as the Apache Spring Quartz Latite of Elston (1968, p. 235) and, 2) a subordinate caldera-fill facies consisting of conglomerate, breccia, and mixed pyroclastic debris. The tuff facies constitutes a major ash-flow tuff deposit, which has not been identified with certainty outside of the Bursum caldera (pl. 1A). Within the caldera, the tuff of Apache Spring is at least 3,000 feet thick; no base is exposed but the tuff is overlain by various units, including the rhyolite of Sacaton Mountain, Mineral Creek andesite, and flow-banded rhyolites. The distribution and thickness of the tuff of Apache Spring within the Bursum caldera, the abundance of lithic material and weakly altered character leave little doubt that the caldera is the source area for this ash-flow tuff.

The age of the tuff of Apache Spring, particularly its age with respect to the Bloodgood Canyon Rhyolite Tuff, and the rest of the ash-flow tuff sequence, is a major unresolved problem that was discussed earlier (p. 63). To repeat, in part, new fission-track ages for the tuff of Apache Spring and the Bloodgood Canyon, although not precise enough to give a final solution to the age problem, are compatible with previous potassium-argon ages of 27.3±0.8 m.y. for biotite from the tuff of Apache Spring (Damon, 1967, p. 65), whereas ages for the Bloodgood Canyon Rhyolite range from 26.5±2 to 23.2±0.7 m.y. Geologic evidence indicates that both units are younger than the tuff of Shelley Peak; flow-banded rhyolites, and associated pyroclastic and volcaniclastic rocks that are beneath Bloodgood Canyon Rhyolite seem to be the same as those above the tuff of Apache Spring. For these reasons, the tuff of Apache Spring is judged to be the older.

The caldera-fill facies includes as much as several hundred feet of crossbedded fluvial conglomerate (fig. 9) and coarse breccia (fig. 10),

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Figure 9.--Near here

Figure 10.--Near here

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that is interpreted as having originated partly as avalanche deposits calved from over-steepened caldera walls and mixed with other caldera-fill deposits. The breccia is partly a chaotic mixture of older andesitic and rhyolitic rocks that include huge slabs of andesite hundreds of yards long and tens of feet thick; the breccia matrix appears to be quartz-bearing tuff of Apache Spring. The caldera-fill conglomerate and breccia seem to thin toward the center of the Bursum caldera; their relationships are spectacularly displayed in the walls of Mogollon Canyon of Rain Creek, north of Haystack Mountain, where the avalanche deposits are interlayered between identical layers of densely welded ash-flow tuff of Apache Spring (fig. 11). Similarly layered

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Figure 11.--Near here

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deposits of the caldera-fill facies are shown separately on the reconnaissance geologic map (pl. 1A), in the Cave Rock area along Sacaton Creek, in Little Dry Creek, and in the canyon of Big Dry Creek.

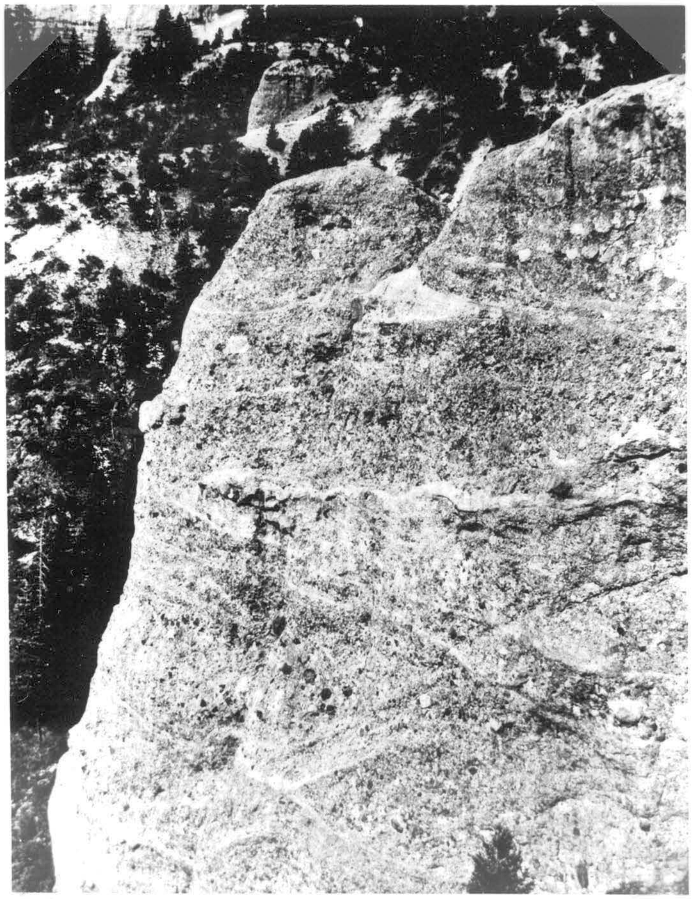

Figure 9.--Crossbedded fluvial conglomerate of the caldera-fill facies of the tuff of Apache Spring. View of north wall of tributary canyon west of Rain Creek on the north side of Haystack Mountain.

Figure 10.--Coarse chaotic breccia of caldera-fill facies of the tuff of Apache Spring. View of west wall of Mogollon Canyon of Rain Creek, northeast of Haystack Mountain.

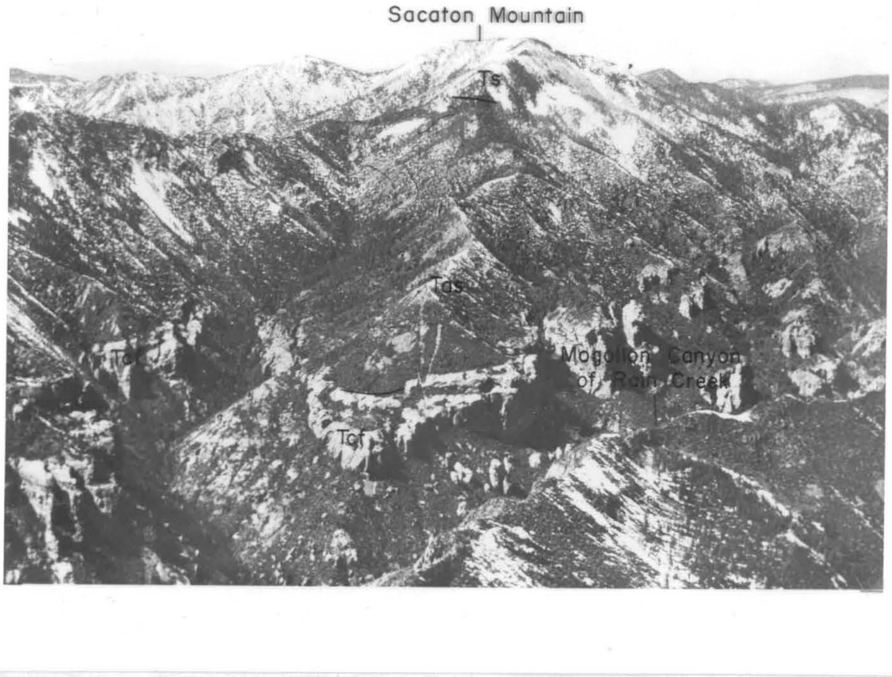

Figure 11.--Cliffs of the caldera-fill facies (Tcf) of the tuff of Apache Spring on west side of Mogollon Canyon of Rain Creek. Ts, rhyolite of Sacaton Mountain; Tas, tuff of Apache Spring, which also occurs in canyon bottom beneath Tcf.

The tuff of Apache Spring has not been clearly identified along the front of the Mogollon Mountains between Dry Creek and the Mogollon district. However, some of the quartz-bearing rocks in that area, especially rocks mapped as Pacific Quartz Latite in and adjacent to the Mogollon district (Ferguson, 1927), and rocks referred to by Rhodes, after Elston (1970, p. 28) as a "melange of Cooney fragments intruded by Sacaton Quartz Latite" probably are Apache Spring rocks, and the abundance of Cooney Quartz Latite blocks in a matrix of Apache Spring(?) may be related to the caldera-fill facies.

Petrographically, the tuff of Apache Spring is characterized by abundant phenocrysts of quartz and sanidine, and lesser amounts of plagioclase and biotite. Sanidine commonly has a silky sheen related to sericitic alteration observed in thin sections. Sphene is a prominent accessory mineral. Isolated outcrops of ash-flow tuff of Apache Spring are not always readily distinguishable from other ash-flow tuff units that have similar mineralogy, as the tuff of Davis Canyon, tuff of Fall Canyon, and Bloodgood Canyon Rhyolite Tuff.

Rhyolite of Sacaton Mountain.--The rhyolite of Sacaton Mountain consists of porphyritic lavas that overlie the tuff of Apache Spring within the Bursum caldera and that are overlain unconformably by Mineral Creek Andesite (pl. 1A). Whereas the rhyolitic lavas are believed to have been deposited within the Bursum caldera, it is not known whether they overflowed the caldera, except that no equivalant rocks have been identified in the volcanic section exposed along the front of the Mogollon Range to the south.

The rhyolite of Sacaton Mountain as used in this report is equivalent to most of the rocks included in the Sacaton Quartz Latite of Elston (1968, p. 237) and Rhodes (1970, p. 28-30), except that we do not include the Pacific Quartz Latite of the Mogollon district (Ferguson, 1927) because we believe that it is a mixed unit whose correlation needs to be reassessed. The most complete section of the rhyolite flows of Sacaton Mountain observed during this study is on the ridge extending southeast from Sacaton Mountain (pl. 1A; fig. 11), where the rhyolite flows are about 1,300 feet thick. The lower 300 feet in this section is made up of several relatively thin flows of both quartz-bearing and quartz-free rhyolite, but most of the overlying section consists of a thick pile of pink feldspar-quartz porphyry. Sanidine is perthitic and commonly has a skeletal appearance both in hand specimens and thin sections, similar to perthitic sanidine in most of the tuff of Apache Spring; and some typical quartz-feldspar porphyry of this unit is very difficult to distinguish from some densely welded, crystal-rich ash-flow tuff of Apache Spring in the central part of the caldera. Thick sections of the rhyolite of Sacaton Mountain may be present in Lookout Canyon, north of upper Mogollon Creek, where the contact between flows and ash-flow tuff is not closely located on the reconnaissance geologic map (pl. 1A).

The rhyolite flows of Sacaton Mountainprobably were erupted from the ring-fracture zone of the Bursum caldera, but no vents were mapped. Some steeply dipping flow structures, possibly reflecting proximity to source, were observed on the east side of Lookout Canyon near its mouth, and some of the rhyolite dikes near the margins of the Bursum caldera may have fed the flows of Sacaton Mountain, although no distinction was made in this study between them and rhyolite dikes associated with later flow-banded rhyolite.

Mineral Creek Andesite.--The Mineral Creek Andesite of the Mogollon district (Ferguson, 1927, p. 12-14) and rocks correlated with it unconformably overlie the tuff of Apache Spring and rhyolite of Sacaton Mountain inside the Bursum caldera, and in turn are overlain by flow-banded rhyolite. The Mineral Creek Andesite was deposited on the developing resurgent dome of the Bursum caldera, but we are uncertain if the andesite is present outside the caldera. The andesite has been mapped mainly near the caldera margins, but does occur in faulted blocks associated with the Spruce Creek graben (pl. 1A) in the central part of the resurgent dome. Other exposures are in Whitewater Canyon above the forks, on the ridge between Big Dry and Little Dry Creeks, and north of upper Mogollon Creek (pl. 1A). The mafic lavas that make up Lilley Mountain north of the West Fork of the Gila (pl. 1B) also seem to have the stratigraphic position of the Mineral Creek Andesite and are so mapped. Maximum thickness north of Mogollon Creek and at Lilley Mountain is on the order of 1,000 feet.

In most places, the Mineral Creek Andesite consists of numerous thin flows and flow breccia units, tens of feet thick. The rocks are commonly vesicular or amygdaloidal, and some flows have a distinctive outcrop appearance where weathering has accentuated a texture of coarse jack-strawed plagioclase laths about 1 cm long.

Andesitic flows and breccias of Murtock's Hole.--North of Murtock's Hole on the Gila River, on the south slopes of Brushy Mountain, the tuff of Shelley Peak is separated from overlying Bloodgood Canyon Rhyolite Tuff of Elston by 500-600 feet of thin andesite or basaltic andesite flows and oxidized flow breccia layers (pl. 1B). The flows apparently pinch out rapidly eastward, for they generally do not appear on the east side of the Gila River very far above the mouth of Sapillo Creek, even where the Shelley Peak and Bloodgood Canyon tuffs occur in small outliers on the latitic flows of Gila Flat. The andesitic flows maintain their stratigraphic position westward in both walls of the Gila Canyon as far as the head of Rough Canyon, between the Gila River and Shelley Peak. South of lower Sapillo Creek and along Panther Canyon, south of the Gila River, where Bloodgood Canyon Rhylolite Tuff is discontinuous or absent, it is difficult to distinguish between the andesitic flows of Murtock's Hole and younger basaltic andesite flows. Within the flows of Murtock's Hole along the Gila Canyon and its tributary canyons, the only observed marker unit is a thin discontinuous tuffaceous unit with small sparse sanidine crystals, at most 30 feet thick.

Older rhyolite flows and domes.--Rocks called flow-banded rhyolites because of their highly developed and commonly contorted flow layering cover at least 20 percent of the study area (pls. 1A, 1B). They formed as thick accumulations of highly viscous rhyolite lava around numerous local vents, and form coalescing lava domes with attendant flows and pyroclastic aprons. The extrusive rhyolite is commonly difficult to distinguish from intrusive rhyolite, and associated pyroclastic deposits include welded tuffs formed locally by welding of near-source air fall pumice deposits that are practically identical to ash-flow tuff in the Bloodgood Canyon Rhyolite.

The older rhyolite lava flows and domes and associated pyroclastic and volcaniclastic rocks are believed to be older than the Bloodgood Canyon Rhyolite of Elston. Most of the flow-banded rhyolite in the study area is included in this unit, except for the younger rhyolites of Indian Creek, Beaver Creek, and Rocky Canyon in the extreme northern and eastern parts of the study area. The major masses of older flow-banded rhyolite are largely peripheral to or within the Bursum caldera; they occur in the western part of the Mogollon Range, in the Jerky Mountains and Diablo Range in the central part of the study area, and along the upper part of the Middle Fork of the Gila River (pls. 1A, 1B). In addition rhyolite plugs and domes at Wilcox Peak, Sheridan Mountain (fig. 12), and Seventyfour Mountain; domes near the mouths

Figure 12.--Near here

of Davis and Rough Canyons, and a multitude of rhyolite dikes and less regular intrusives pervade the entire steep southwestern front and lower slopes of the Mogollon Mountains from the Gila River to the Mogollon mining district (pl. 1A).

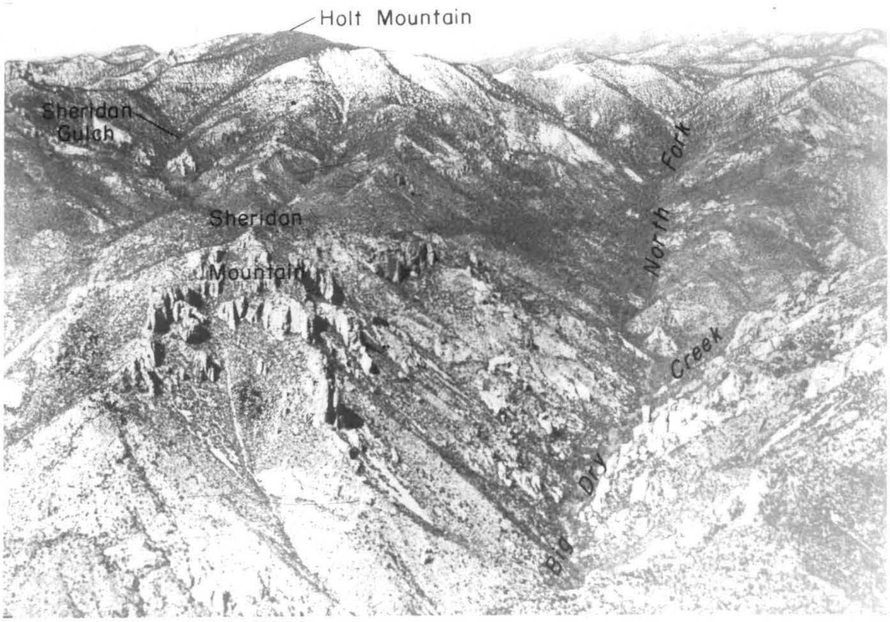

Figure 12.--Sheridan Mountain plug dome of older flow-banded rhyolite and associated lavas.

There are no isotopic ages for the older flow-banded rhyolites, but they seem everywhere to be younger than the tuff of Shelley Peak. They generally overlie Mineral Creek Andesite in the western part of the Mogollon Range in the Jerky Mountains, and along the upper West Fork of the Gila River. The rhyolite along the West Fork is continuous with flow-banded rhyolite that extends from the Diablo Range south to the mouth of Turkey Creek, where the rhyolite is older than rocks mapped as Bloodgood Canyon Rhyolite (pl. 1B).

The older rhyolite flows and domes include rocks previously called Fanney Rhyolite in the Mogollon district (Ferguson, 1927), Jerky Mountain Rhyolite (Elston, 1968, p. 237), and Nabours Mountain Quartz Latite (Rhodes, 1970). The Fanney Rhyolite was described by Ferguson as a spherulitic to felsitic rhyolite flow up to 1,300 feet thick, which occurs between Mineral Creek Andesite and Mogollon Andesite. South and east of the district, on Nabours, Holt, and Grouse Mountains, typical Fanney flows are overlain by more porphyritic rhyolitic flows, some of which were mapped as Nabours Mountain Quartz Latite by Rhodes (1970, pl. 1). A basal chill zone or vitrophyre commonly separates the younger flows from typical Fanney Rhyolite, and on the southeast slopes of Holt Mountain, pumiceous pyroclastic rocks and a thick black ledge of glassy agglutinate resembling welded ash-flow tuff separates the Fanney Rhyolite from the younger flows. The capping flows on Holt and Nabours Mountains are distinctive because of their small black hornblende crystals, and they probably are related to a vent area near the head of Spider Creek where hornblendic breccia layers studded with large scoriaceous blocks, dip as much as 50 degrees away from a glassy plug(?) centered on Grouse Mountain. Rhyolitic or latitic flows along Willow Creek at the north edge of the study area also have been included with the older rhyolites in this study. The aggregate thickness of the older rhyolite flows around Holt Mountain is about 3,000 feet.

Flow-banded rhyolite previously mapped as Jerky Mountain Rhyolite (Rhodes, 1970, pl. 1) occurs mainly in the Jerky Mountains and the Diablo Range around Granite Peak. Great flowage folds tens of feet in amplitude and wavelength characterize the rhyolite in many areas. Several eruptive centers have been tentatively identified in the Diablo Range and elsewhere, and local intrusive relations were observed.

Petrographically, the older flow-banded rhyolites are all very similar except for the porphyritic Nabours Mountain-type flows. Whereas typical Fanney Rhyolite has few phenocrysts of quartz, sanidine and plagioclase, the Jerky Mountain Rhyolite of Elston is more porphyritic with quartz and moonstone sanidine crystals half a centimeter long. Plagioclase in the Jerky Mountain type is less abundant proportionally than among the phenocrysts in Fanney Rhyolite. The differences between the Fanney and Jerky Mountain flows probably is related to different eruptive centers and provincialism within the source magma.

At least some age difference between Fanney and Jerky Mountain-type rhyolites is indicated by differing polarity of their remanent magnetism. Three specimens of Fanney Rhyolite examined in this study have normally polarized remanent magnetism, which is in agreement with earlier observations reported by Rhodes (1970, p. 82).

A recurrent problem during field work has been to distinguish between Bloodgood Canyon Rhyolite welded ash-flow tuffs and similar rocks that appear to be gradational with flow-banded rhyolite. The problem has been particularly acute on both slopes of the Diablo Range and in the headwater areas of Mogollon Creek, Turkey Creek, Manzanita Creek, and both Sycamore Canyons--one north of Turkey Creek, and the other west of the Gila River. Originally, we mapped most of the problematical welded tuff as Bloodgood Canyon ash-flow tuff, and thus it appeared that flow-banded rhyolites lay both above and beneath Bloodgood Canyon Rhyolite Tuff, and locally intruded it. Now we believe that there is only one flow-banded rhyolite unit in this area, and probably all of the questionable welded tuff, despite having mineralogy and texture virtually identical with Bloodgood Canyon Rhyolite, is actually air-fall pyroclastic material related to the flow-banded rhyolite eruptions. Thus, these welded tuffs, with their apparent gradations to flow-banded rhyolites, are probably fused tuffs, i.e., air-fall tuffs that have been welded through postdepositional burial by hot rhyolite flows; or agglutinates, pumiceous air-fall tuffs that were deposited close enough to their eruptive vents to permit the heat retention necessary for welding. The importance of this seemingly academic discussion is that if the welded tuffs in question are related to flow-banded rhyolite eruptions, not Bloodgood Canyon Rhyolite, then it is possible for all of the flow-banded rhyolite in the Jerky Mountains and Diablo Range to be older than Bloodgood Canyon but younger than the tuff of Apache Spring.

The correlation of rhyolitic volcaniclastic rocks, pumiceous and tuffaceous breccia, and thin welded tuffs that in part are interlayered with the flow-banded rhyolites, is still another aspect of the flow-banded rhyolite problem. Some such deposits in the study area have been correlated with the Deadwood Gulch Rhyolite of the Mogollon district (Coney and Rhodes, 1968, p. 281; Rhodes, 1970, pl. 1, fig. 2), but are here combined with the older flow-banded rhyolites. The rhyolite flows were deposited across an irregular terrain on a variety of older volcanic rocks, and they were erupted from a large number of vents. It is reasonable therefore to expect that pyroclastic deposits and volcaniclastic debris shed from accumulating domes and viscous flows should be deposited in low areas surrounding theeruptive centers, and that these deposits will be interlayered between flows from adjacent centers, as well as extending beyond the flows and domes locally to cover the older rocks. In many places, as on top of Sheridan Mountain, the layered pumiceous rocks seem to be clearly related to the local eruptive center. Thus, where deposits of this type rest on the flow-banded rhyolites or on older rocks, we include them with the rhyolites. Our reservations concerning correlations of the Deadwood Gulch Rhyolite of the Mogollon district are discussed under a separate heading.

Bloodgood Canyon Rhyolite Tuff of Elston (1968)--The Bloodgood Canyon Rhyolite Tuff of Elston (1968, p. 236) is a major ash-flow tuff sheet that probably was derived from the Gila Cliff Dwellings caldera (Elston, Coney and Rhodes, 1968, p. 267) near the center of the Gila study area (pl. 1B). Within the caldera, the ash-flow tuff is at least 1,000 feet thick on the south side of the West Fork opposits Hells Hole (fig. 13) and possibly 2,000 feet of tuff is exposed in this faulted

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Figure 13.--Near here

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area. The outflow sheet is widely distributed outside the caldera; within the study area it is found in an arc of 120-150 degrees around the southeast side of the caldera, from the head of Rocky Canyon, at the east edge of the study area, where it is less than 100 feet thick, at least to the Canteen Canyon section (pl. 1A), where it is about 400 feet thick on Watson Mountain. The ash-flow tuff is 600-800 feet thick in the walls of the Gila Canyon. Uncertain Bloodgood Canyon tuff crops out high on the ridge between Rain Creek and the West Fork of Mogollon Creek (pl. 1A); otherwise it has not been observed in thewestern half of the study area, where it was probably blocked by the massive accumulations of older flow-banded rhyolites. Beyond the study area, however, rocks of virtually identical lithology have been mapped as far west as the Blue Range Primitive Area, Arizona (Ratté and others, 1969, p. 12-14), in the Saliz and Tularosa Mountains north and west of the study area (Weber and Willard, 1959a, 1959b; Stearns, 1962), and south of the study area near Riverside, a few miles east of Cliff (Wargo, 1959). Even if some of these correlations are erroneous, it seems certain that the outflow sheet of Bloodgood Canyon tuff once covered several thousand square miles in and adjacent to the study area.

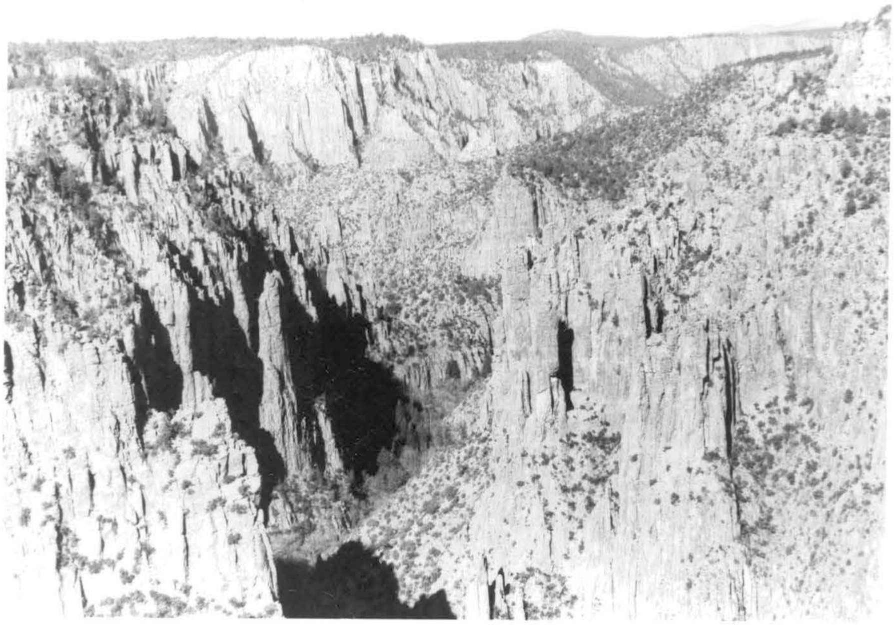

Figure 13.--Columnar jointed cliffs of densely welded Bloodgood Canyon Rhyolite Tuff of Elston (1968) along the West Fork of the Gila River.

The age of the Bloodgood Canyon Rhyolite is critical to an understanding of the volcanic history of the study area. At present, no isotopic ages are available for this unit in the type area in Bloodgood Canyon, east of Granite Peak, or elsewhere in the study area. However, three rocks from outside the study area, which may correlate with the Bloodgood Canyon Rhyolite, have yielded K-Ar ages as follows: 1) 23.2±0.7 m.y. for sanidine from moonstone tuff near Reserve, New Mexico northwest of the study area; 2) 24.9±0.7 m.y. for sanidine from moonstone tuff in the Blue Range Primitive Area, Arizona, west of the study area; 3) 26.5 m.y. for biotite from moonstone tuff south of Cliff, New Mexico, south of the study area. Isotopic age data for these samples are in Elston, Bikerman, and Damon (1968, p. Aiv-5) and Damon (1968, p. 44). Because of the perthitic character of sanidine in these moonstone tuffs, the biotite age is probably more reliable, but within the limits of error of the ages, it overlaps with the 27.3_0.8 m.y. age of biotite from the tuff of Apache Spring, cited earlier.

Fission-track ages of Bloodgood Canyon Rhyolite of Elston (24.7± 2.8 m.y.) and tuff of Apache Spring (28.0±1.8 m.y.) tend to indicate that the Bloodgood Canyon Rhyolite is slightly younger than the tuff of Apache Spring (C. W. Naeser, personal commun., 1971). The sphenes in both units have relatively small amounts of uranium, resulting in few fission tracks and a relatively high uncertainty in the calculated ages. At the 95 percent confidence level, two standard deviations, the Bloodgood Canyon is probably younger, but the calculated ages of the two units overlap within the range of uncertainty.

Geological evidence of the age of the Bloodgood Canyon Rhyolite also is incomplete. The outflow sheet unconformably overlaps the volcanic complex of Alum Mountain, flows of Gila Flat, tuff of Shelley Peak, and flows of Murtock's Hole (pl. 1B), south and east of the caldera, and it overlies flow-banded rhyolites at the mouth of Turkey Creek. It is overlain nearly everywhere by basaltic-andesite flows, except near the head of Rocky Canyon (pl. 1B) and on top of Watson Mountain (Pl. 1A), where younger flow-banded rhyolite overlies the Bloodgood Canyon tuff. Evidence presented in the discussion of the tuff of Apache Spring and the older flow-banded rhyolites leads us to believe that the Bloodgood Canyon Rhyolite of Elston is younger than the tuff of Apache Spring.

Petrographically, densely welded Bloodgood Canyon tuff is crystal-rich with abundant quartz and sanidine phenocrysts, commonly 3-5 mm in diameter. The sanidines characteristically display a moonstone opalesence. Honey-yellow sphenes, visible in most hand specimens, and sparse to rare biotite are typical of the rock. Although generally a distinctive rock, where altered or in isolated outcrops it can be confused with tuff of Apache Spring, tuff of Davis Canyon, or tuff of Fall Canyon.

Younger rhyolite lava flows and domes.--Included in this unit are the flow-banded and lithophysal rhyolites of Rocky Canyon, Beaver Creek, and Indian Creek in the eastern and northeastern parts of the study area (pl. 1B). None of these rocks from the study area, has been dated, but a similar rhyolite, the Taylor Creek Rhyolite of Elston and Damon, has given a K-Ar sanidine age of 24.0 ± 0.5 m.y. (Elston and Damon, 1970, p. Avi, 1-8).

The rhyolite of Rocky Canyon is part of a dome that extends eastward into the Black Range Primitive Area (Ericksen and others, 1970, p. 34, pl. 1); it is as much as 800 feet thick within the study area. The rhyolite rests on a thin sheet of Bloodgood Canyon Rhyolite ash-flow tuff near the head of Rocky Canyon, but in Apache Creek, the edge of the dome rests on basaltic andesite above Bloodgood Canyon Rhyolite, and in Squaw Creek the rhyolite grades marginally into pumice breccia and pumiceous sandstone that intertongue with basaltic andesite flows. The rhyolite of Rocky Canyon contains a few phenocrysts of quartz and sanidine, and rare flakes of biotite. It commonly shows lithophysal layering, and some pumice accumulated on the southern flanks of the dome.

The rhyolite of Beaver Creek is exposed in a small erosional window cut through rocks in the northeastern part of the study area. It most likely is related to the so-called "tin rhyolites" of earlier reports in the Taylor Creek tin district immediately to the east. The rhyolite of Beaver Creek is a chalky porphyritic rhyolite with amethystine quartz and moonstone.

The rhyolite of Indian Creek is exposed in several small erosional windows near the head of Indian Creek. The rocks are considerably argillized, silicified, and hematite-stained, and may be near a local extrusive vent. Lithophysal zones, presumably in the upper part of the rhyolite, were observed along the creek; they contain fluorite, pseudobrookite, and bixbyite, the latter two being rare minerals that also occur in the "tin rhyolite" of the Taylor Creek district (Fries, Schaler, and Glass, 1942). Topaz and cassiterite, which also are present in the "tin rhyolite", have not been identified in mineral specimens from the Indian Creek area. The identification of younger vs. older rhyolites along the north side of the Middle Fork near and below the mouth of Clear Creek is uncertain.

Small erosional remnants of younger(?) flow-banded rhyolite overlie Bloodgood Canyon tuff on Watson Mountain (pl. 1A), and north of Cave Canyon on the south side of the Gila River (pl. 1B).

Deadwood Gulch Rhyolite

The Deadwood Gulch Rhyolite of the Mogollon mining district was defined as a rhyolite tuff separating the Last Chance and Mogollon Andesites (Ferguson, 1927, p. 18-19). Ferguson described the tuff as consisting of small fragments of white flow-banded rhyolite in an exceedingly fine-grained matrix, commonly with obvious layering and with sandstone beds and lenses interlayered throughout. A maximum thickness of about 400 feet of Deadwood Gulch Rhyolite was mapped by Ferguson in the Mogollon district.

During more recent studies in and adjacent to the study area, rhyolitic tuffs, tuff breccias, and volcaniclastic deposits found in discontinuous and often isolated exposures from west of Glenwood to north of Beaverhead have been correlated with the Deadwood Gulch Rhyolite. As much as 1,100 feet of Deadwood Gulch Rhyolite was mapped in the Mogollon Range (Rhodes, 1970, pl. 1, fig. 2). A K-Ar age of 21.7±0.7 m.y. has been reported by Elston and Damon (1970, p. Avi-6) on sanidine from supposed Deadwood Gulch Rhyolite north of Beaverhead, about 45 miles east of the type area in the Mogollon district. The Deadwood Gulch Rhyolite is cited as "the stratigraphic marker horizon of the entire province" (Elston and Damon, 1970, p. Avi-2; Elston, Coney and Rhodes, 1970, p. 81), and they believe that it overlies a regional unconformity "showing that the Mogollon Plateau was bevelled to an area of low relief" prior to deposition of the Deadwood Gulch (Elston and Damon, 1970, p. Avi-2). By contrast, we are convinced that some of the various deposits that have been correlated with the Deadwood Gulch Rhyolite differ in age and stratigraphic position. Consequently, Deadwood Gulch Rhyolite is shown on our reconnaissance geologic map (pl 1A) only where it was mapped by Ferguson (1927, pls. 1, 3) in the southern part of the Mogollon district. Elsewhere, we include deposits that may be Deadwood Gulch with the flow-banded rhyolites or the younger basaltic andesites with which they are interlayered.

Evidence that deposits correlated with the Deadwood Gulch Rhyolite vary in age and stratigraphic position from one locality to another includes the following observations: In the Mogollon district type Deadwood Gulch Rhyolite is defined as being between Last Chance and Mogollon andesites; Sheridan Mountain is capped by pumiceous rhyolite, consisting in part of layered pyroclastics that has been called Deadwood Gulch Rhyolite, but is surely a phase of a typical flow-banded plug dome of Fanney Rhyolite; Deadwood Gulch-type rocks north of upper Whitewater Creek occur both beneath and above the flow-banded rhyolite there; at Hells Hole, and elsewhere along the West Fork of the Gila River, Deadwood Gulch-type volcaniclastic and pyroclastics occur beneath the Jerky Mountains Rhyolite of Elston; in the northeastern part of the study area Deadwood Gulch-type rocks generally occur interlayered with basaltic andesite flows, as in the Mogollon district. Given the multiplicity of andesitic and basaltic flows in the study area (Ferguson, 1927, p. 5-6; Elston, Coney, and Rhodes, 1970, p. 78) and lacking firm correlations between them, it seems unlikely that the locally interlayered Deadwood Gulch-type deposits ever formed a widespread coherent sheet that can be used as a marker horizon.

The heterogeneous materials, comprising the Deadwood Gulch Rhyolite of earlier reports are obviously in part reworked materials of local derivation. Thus the type Deadwood Gulch Rhyolite in the Mogollon district contains abundant fragments of flow-banded Fanney-type rhyolite, whereas south of upper Whitewater Creek, volcaniclastic beds correlated with Deadwood Gulch Rhyolite (Rhodes, 1970, pl. 1) locally contain a predominance of fragments of the tuff of Apache Spring. It has been shown in the previous descriptions in this report that the domes and flows of flow-banded rhyolite are of at least two different general ages, (1) Fanney, Jerky Mountain and Nabours Mountain, and 2) Rocky Canyon, Beaver Creek and Indian Creek), and it seems reasonable to expect that there will be pyroclastic and volcaniclastic deposits associated with the rhyolites of both groups .

Late andesitic rocks, undivided.--The youngest rocks in the main volcanic sequence in the Gila study area are largely andesitic or basaltic lavas that have been described as a number of different units as follows: Last Chance Andesite and Mogollon Andesite in the Mogollon Mining district (Ferguson 1927, p. 16-21); Wall Lake Latite and Bearwallow Mountain Formation of Elston (1968, p. 238); and Double Springs Andesite of Elston, in Rhodes (1970, p. 45, pl. 1). These rocks overlie a variety of older rocks over a large part of the study area (pls. 1A, 1B). The basaltic rocks are probably at least 2,000 feet thick on Black Mountain in the northeastern part of the study area, exceed 1,000 feet in thickness on the crest of the Mogollon Range under Willow Mountain, Whitewater Baldy, and Mogollon Baldy Peak, and are of comparable thickness north of the East Fork of the Gila River, and in both walls of the Gila River Canyon below the East Fork.

The andesitic and basaltic flows are largely indistinguishable from one another in the field, except where they are separated by contrasting materials such as rhyolitic pyroclastic and volcaniclastic deposits. Locally, the Wall Lake Latite of Elston contains distinctive light green pyroxene phenocrysts and rather conspicuous quartz xenocrysts and appears somewhat more silicic than most of the other lavas in this map unit. Rhodes (1970, p. 51-58) described 5 petrographic types of flows in the Bearwallow Mountain Formation of Elston, including 3 that contain quartz xenocrysts; these rocks range from basaltic andesites to biotite-pyroxene latites.

The late sequence of andesitic and basaltic rocks undoubtedly was erupted from a number of different volcanoes in and adjacent to the study area, as cited by Rhodes (1970, fig. 3, p. 50-51) and Elston and others (1970, p. 84), particularly in the northern part of, and north of the study area. The most prominent source is the shield volcano at Black Mountain at the northeast corner of the study area (pl. 1B). The andesitic and basaltic rocks probably represent more or less continual eruptions of thin flows and breccia over a considerable time interval that overlapped with eruption of young rhyolite flows and domes within the study area and in the Black Range to the east.

Quaternary and Late Tertiary sediments and interlayered lava flows

Extensive deposits of coarse alluvial conglomerate and finer sediments occur along the west and southwest margins of the study area and cover large areas in the eastern part. Most are basin-fill type of deposits of Middle Tertiary to Pleistocene age that are assigned to the Gila Conglomerate where they occur west of the Mimbres Valley, or to the Santa Fe Formation east of the Mimbres. These sediments, as mapped on plates 1A and 1B, include younger alluvial and colluvial deposits as well as the older fluvial conglomerates. Lake beds exposed in the Duck Creek valley west of Cliff may extend into the western fringe of the study area south of Mogollon Creek, but no attempt was made to differentiate them.

In the eastern half of the study area, 800-1,000 feet of Gila Conglomerate is present along Sapillo and Trout Creeks (fig. 14),

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Figure 14.--Near here

600-700 feet along the East Fork of the Gila River, and 300-400 feet of Gila is present north of Hells Hole and south of the West Fork of the Gila. The thickest sections of conglomerate appear to be preserved in downfaulted blocks, which suggests that the conglomerate was once considerably more extensive and may have covered much of the study area.

Basaltic andesite at or near the base of the Gila Conglomerate along Sapillo Creek west of Roberts Lake has been dated at 20.6 ± 0.5 m.y. (Elston and Damon, 1970, p. Avi-6; Damon, 1970, p. 39) and gives an approximate maximum age for Gila Conglomerate in this area.

Basalt flows interlayered with Gila Conglomerate.--Alkali olivine basalt at or near the top of the Gila Conglomerate caps the ridges on both sides of lower Turkey Cienega Creek in the southeast corner of the study area (pl. 1B). It most likely correlates with the 6.3 m.y. basalt near the top of the Gila Conglomerate in the Mimbres Valley a few miles southeast of the study area (Damon, 1969, p. 27).

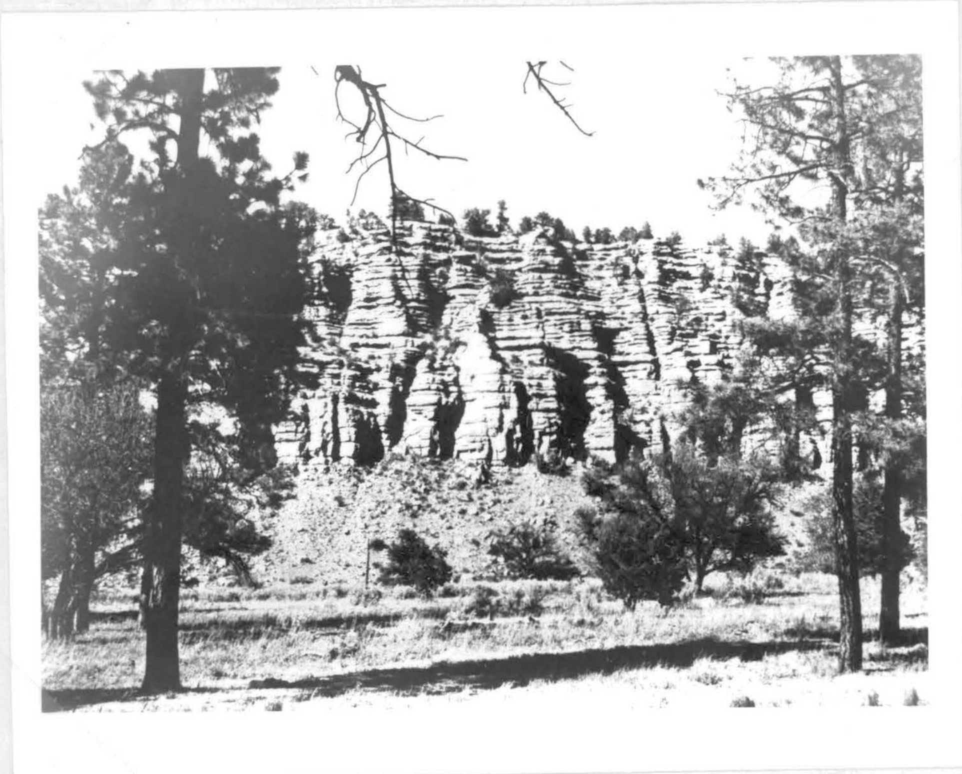

Figure 14.--Cliffs of Gila Conglomerate at the southern edge of tract 1 of the Gila Primitive Area on the north side of Sapillo Creek near Roberts Lake.

Structure

The Gila study area is in the southwestern part of the Datil Volcanic Area (Cohee and others, 1962), which with the contiguous White Mountain Volcanic Area in Arizona constitutes a Tertiary volcanic field of more than 10,000 square miles. The major structural elements of the study area are of constructional volcanic or volcano-tectonic origin, modified and complicated by tensional faulting associated with the development of basin and range structure during late Tertiary time. The structure of the Datil Volcanic Area is very similar to the structure of the San Juan Volcanic Area of southwestern Colorado and New Mexico, where a complex of volcano-tectonic subsidence structures (calderas) and associated ore deposits have been intensively studied over the past 20 years (Lipman, Steven, Mehnert, 1970; Steven and Ratté, 1960, 1965; Luedke and Burbank, 1963, 1968; Fischer and others, 1968). Both are major areas of Tertiary volcanic activity localized at the margin of the Colorado Plateau structural province (fig. 10).

Previous structural analyses.--Major structural elements in Grant County, New Mexico, which includes approximately the southern half of the study area, were described by Trauger (1965). The naming by Trauger of such features as the Gila Sag, Mangas Trench, and Mimbres Trench, Black Range Arch and Mogollon Arch, among others, facilitated the description of major topographic and structural trends at a time when geologic details were all but lacking. In the same year, an interpretation of the structure of the Mogollon region was presented by Elston (1965b, p. 823-833) in a paper on terrestrial analogs of moon features. Basically the interpretation is that the Mogollon Plateau (Elston, 1965b, fig. 1, p. 823) is a large volcano-tectonic structure, roughly circular of polygonal in plan and 75-90 miles in diameter, which consists of a central basin 35-40 miles in diameter (the Gila Sag), with a raised mountainous rim consisting in part of the Mogollon, Diablo, and Pinos Altos ranges on the west and south, and the Black Range on the east (fig. 15), all surrounded by a graben system, which comprised the San Augustin Plains, Tularosa Valley, Duck Creek Valley (Mangas Trench), Sapillo Creek and Mimbres River Valleys (Mimbres Trench), and various grabens east of the Black Range that are now modified by later faulting along the Rio Grande depression. Superimposed on this master structure, are numerous small calderas and volcanic centers, and larger calderas, which include the Bursum and Gila Cliff Dwellings calderas (Elston, 1968, p. 236-237), both largely within the study area.

The origin of the Mogollon Plateau is described by Elston (1970, p. 80, 84, 85) as follows: "According to the interpretation given here, the Mogollon Plateau is a master structure of volcano-tectonic origin. Presumably, upwelling magma of the framework rhyolite caused arching of the rim, and withdrawal of magma from below caused sagging of the inner basin, and possibly, subsidence of the outer graben. Most of the volcanic rocks, by volume, however, came from secondary vents superimposed on the main structures. They range in size from cinder cones a few hundred meters across to 25 kilometer ash-flow cauldrons". The structure is said to have developed during 3 cycles of eruptive activity of the Datil Formation, beginning about 39 million years ago and ending about 20 million years ago, and during the succeeding period of basin and range deformation, the main stage of which was between 20 and 6 million years ago. The first topographic expression of the master subsidence structure is given as during the second eruptive cycle, 23-27.5 m.y. ago; the Bursum and Gila Cliff Dwellings calderas formed also during this second cycle, and the plateau was beveled preceding third cycle activity, after which "subsidence of the inner basin, rises of the rim, and subsidence of the outer graben were renewed and continued until about 6 m.y. ago". The entire Mogollon Plateau, they believe, is the surface expression of a large pluton with roots in the deep crust or upper mantle.

Evaluation of the "Mogollon Plateau" structural hypothesis of Elston and others.--We have attempted only a brief summary of the major points of this provocative and imaginative Mogollon Plateau structural hypothesis. According to Elston and others (1970, p. 84), the hypothesis remains essentially unchanged since its conception in 1965, although many details have been added. The critical reader is urged to consult the several progress reports and related papers (Elston, 1965a, 1965b, 1968; Elston, Coney and Rhodes, 1968, 1970; Elston, Bikerman and Damon, 1968; Elston and Damon, 1970).

Whereas our work substantiates the concept of a caldera complex in the Datil volcanic area, and adds some data relevant to the definition, history and origin of the Bursum and Gila Cliff Dwellings calderas, we remain skeptical of the origin and development of the "Mogollon Plateau structure" as an integral structure. Our doubts center around the apparent dependence of the hypothesis on the present topographic features that we believe have originated largely later than the geologic features they supposedly reflect. In the proposed sequence of events, initial development of the structure in the early Miocene or earlier, subsequent beveling, followed by a rejuvenation of the central basin, uplift of the rim, and subsidence of surrounding graben took place during a period also cited as the main stage of basin and range tectonism (Elston, Coney, and Rhodes, 1970). It seems to us that many of the features described can as plausibly be ascribed primarily to this basin and range tectonism without specific interrelation with volcanic phenomena.

We consider the younger basin and range structures to have made a strong disruptive overprint on older volcano-tectonic structures, and suggest that the present topography, and the major structural elements of the "Mogollon Plateau structure" can be explained largely in terms of intersecting basin and range structures. The Gila Sag, or central depression, and the raised rims and bounding graben of the "Mogollon Plateau volcano-tectonic structure" include linear structural elements of diverse trends and ages, but all seem to have formed concurrently with basin and range faulting subsequent to the main period of volcanic activity. The central depression is a roughly triangular block, bounded on the east by the north-trending Black Range, on the southwest by the northwest-trending Mogollon, Diablo, and Pinos Altos ranges, and on the northwest by the northeast-trending Saliz and Tularosa Mountains, and plains of San Augustin (fig. 15). Within the triangular block, the predominant structural trends parallel the northwest structure that prevails in most parts of the Gila study area (pls. 1A, 1B). North of the study area, the northwest trend continues to be strong within the central depression, particularly through Elk and East Elk Mountains and southof O-Bar-O Mountain (fig. 16). This northwest structural grain is

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Figure 16.--Near here

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cut-off at both ends, suggesting perhaps, that the north-south structure of the Black Range and northeast structure in the Tularosa Mountains and vicinity are somewhat younger than the northwest structures. However, faults of all 3 trends cut Gila Conglomerate, and thus formed or at least continued to be active during the late Cenozoic period of basin and range faulting, following the major volcanic eruptive activity evident in this region.

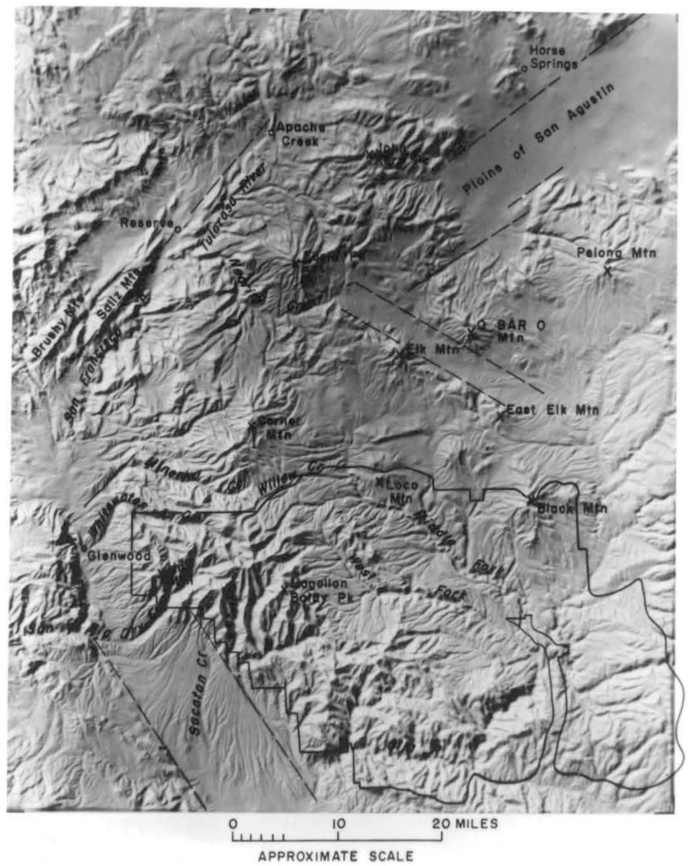

Figure 16.--Physiography near the western edge of the Gila study area showing intersecting northwest- and northeast-trending fault lineaments. Photograph of Army Map Service 1:250,000, Clifton, New Mexico-Arizona quadrangle.

Description of structures related to mineralization.--The emphasis here is on those structures that could have been important in the emplacement of ore deposits in the study area. These include the volcanic centers of the older volcanic complex of Brock Canyon, the dacitic intrusive(?) rocks of Holt Gulch, the volcanic complex at Alum Mountain the Bursum caldera and its faulted resurgent dome, the Gila Cliff Dwellings caldera, the north-south faults that extend south from the Mogollon mining district, and the northwest fault system that determines the structural grain in much of the study area (pls. 1A, 1B).

Brock Canyon volcanic center

The volcanic complex of Brock Canyon of possible middle Eocene age is exposed at the mouth of the Gila River Canyon along the southwest edge of the study area (pls. 1A, 1B), largely as a result of northeastward tilting of the faulted block that makes up the Pinos Altos and Mogollon mountains. This complex of flows, probable intrusive rocks, and volcanic breccias is unconformably overlain by ash-flow tuffs and lavas of the main ash-flow tuff sequence. Local steep flow layers in many of the unaltered flows indicate that at least part of them are near an eruptive center, or faulted, beneath the more gently dipping ash-flow units. East of the Gila River, the tuff of Davis Canyon is locally absent, as though deposited on a rough underlying topography. The exact position of the unconformity is uncertain in places and some of the unaltered lavas mapped with the complex of Brock Canyon on pl. 1B are probably related in age to the overlying ash-flow tuff sequence (fig. 17).

Figure 17.--Near here

Gila Conglomerate is faulted against and overlaps the complex on the southwest. Hydrothermally altered rocks within the complex are confined to an oval shaped area around Brushy and Brock Canyons that has a north-northwest axis about 2 miles long. The most intensely silicified and pyritized rocks commonly are along obvious shears or brecciated zones within the complex.

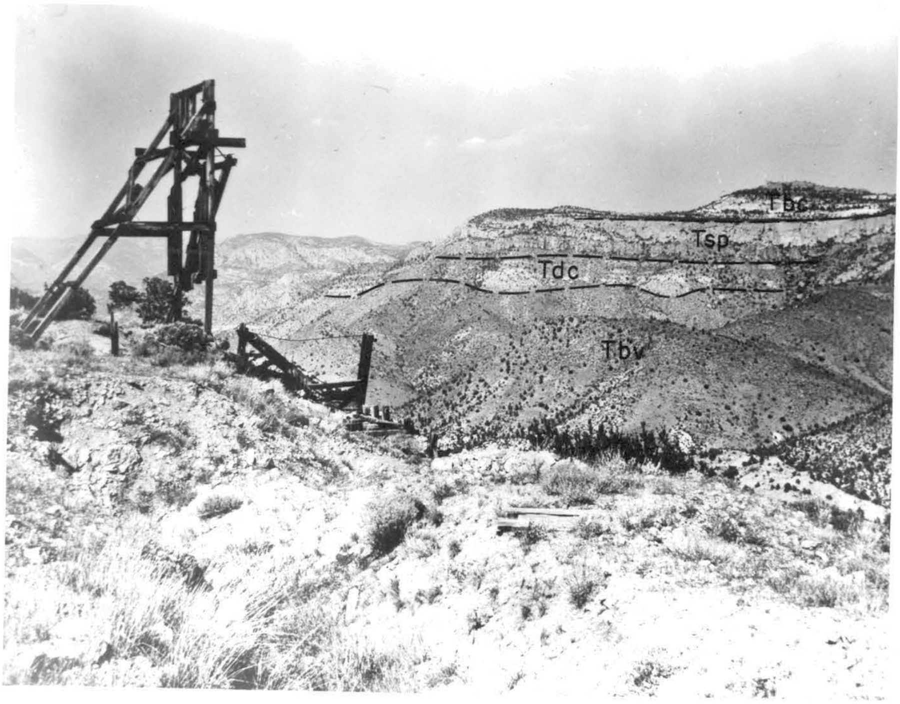

Figure 17.--Ash-flow tuff sequence above volcanic complex of Brock Canyon (Tvb), includes ash-flow tuff of Davis Canyon (Tdc), ash-flow tuff of Shelley Peak (Tsp), and Bloodgood Canyon Rhyolite tuff of Elston (1968) (Tbc). View eastward across Brock Canyon from the Clum shaft.

Three fracture systems are apparent in and near the volcanic complex of Brock Canyon. North-trending fractures are prevalent in the rocks of the complex although many northwest faults and a few northeasterly ones also are present (pl. 1B). Faults that cut the younger ash-flow sequence in the vicinity appear to have mainly northwest trends. All three fracture systems are mineralized within the Gila fluorspar district. The fluorite veins that cut the volcanic complex of Brock Canyon also cut unaltered lavas younger than the complex in the vicinity of the Clum mine, and post-fluorspar faulting has been described at the southern edge of the Gila fluorspar district, where the Gila Conglomerate is faulted against the volcanic rocks, cutting off the south end of the Foster fluorspar vein (Rothrock and others, 1946, p. 89).

Two ages of mineralization are indicated in the Gila fluorspar district: an older mineralization related to the widespread hydrothermal alteration that is restricted to the complex of Brock Canyon, and a younger fluorspar mineralization, which occurs both in the complex and in younger rocks all along the western flanks of the Mogollon mountains from the Gila River to the Mogollon mining district, 25-30 miles to the northwest. Further description of the veins in the Gila district and the fractures they follow are given by Rothrock, Johnson and Hahn (1946), Gillerman (1964) and Williams (1966).

Holt Gulch intrusion

The possibly intrusive rock of Holt Gulch is exposed over approximately one square mile on both sides of Holt Gulch and at the head of Goddard Canyon (pl. 1A). This dacitic or monzonitic rock has a fine grained granitic texture and a massive outcrop character, suggesting that it may be intrusive in origin. No evidence was seen to indicate its relation to the ash-flow tuff sequence except that it apparently is overlain unconformably by flow-banded rhyolite and pre-rhyolite rocks as well as being intruded by rhyolite on Gold Hill and Wilcox Peak (pl. 1A). The rock is pervasively propylitized in contrast to argillized and silicified intrusive rhyolite near by, but the alteration is not known to be different than that which accompanied the intrusions of rhyolite in this area. The mineralized quartz veins that cut the Holt Gulch intrusive(?) on Gold Hill (pl. 1A) may represent the same age of mineralization as that in the rhyolite.

Alum Mountain-Copperas Canyon volcanic center.--The volcanic complex of Alum Mountain is exposed in two erosional windows through the overlying latitic flows of Gila Flat, east of the Gila River in the eastern part of the study area (pl. 1B). The apparent unconformity between the extensively altered Alum Mountain rocks, and the unaltered flows of Gila Flat indicates a possible appreciable age difference between them. However, isotopic dating shows no distinguishable difference in the potassium-argon ages of rocks from below and above the unconformity (R. F. Marvin, personal commun., 1972). The altered rocks in the Alum Mountain window were interpreted to be intrusive by Hayes (1907, p. 218), but we believe that most of the altered rocks are flows or pyroclastic and sedimentary rocks, and that any major intrusive bodies are largely below outcrop levels in the Alum Mountain window. However, one large dike, and numerous smaller rhyolitic intrusions are exposed in this complex, mainly in the Copperas Canyon window. Structural details within the Alum Mountain and Copperas Canyon windows were not mapped, although a few west-, northwest-, and north-trending faults and fracture zones that control alteration and mineralization within the windows are shown on the reconnaissance geologic map (pl. 1B). A more detailed description of the rocks in the volcanic complex of Alum Mountain, their distribution and alteration, was included in an earlier section of this report.

A system of intersecting fractures within the Copperas Canyon window seems to be unique in the area. Several west- to northwest-trending faults and shear zones were mapped within the window (pl. 1B), and numerous other shears were noted in the road cuts in Copperas Canyon, but aerial photographs (fig. 18) show the fracture system most clearly

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Figure 18.--Near here

A fine-textured pattern of polygonal drainage and other lineaments within the window contrast with the dendritic or trellis patterns of drainage in Gila Conglomerate south of the window, and the much coarser drainage patterns that characterize the areas of latitic flows on the three other sides of the window. The distribution of lineament trends within the window, taken from aerial photographs, is represented on a compass rose diagram (fig. 19). The distribution of trends is tentatively inter-

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Figure 19.--Near here

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preted as two possible conjugate shear sets, labeled S_1 and S_2 on figure 19 , which subtend angles of about 50 and 55 degrees respectively. On the other hand, the pattern departs only slightly from a radial one, as might result from magmatic doming (Anderson, 1937, p. 36-37; Wisser, 1960, p. 10-11). The contrast between the fracture pattern within the Copperas Canyon window and the surrounding rocks may indicate that the fracturing within the window is older, thus supporting the interpretation of an unconformity above the volcanic complex of Alum Mountain.

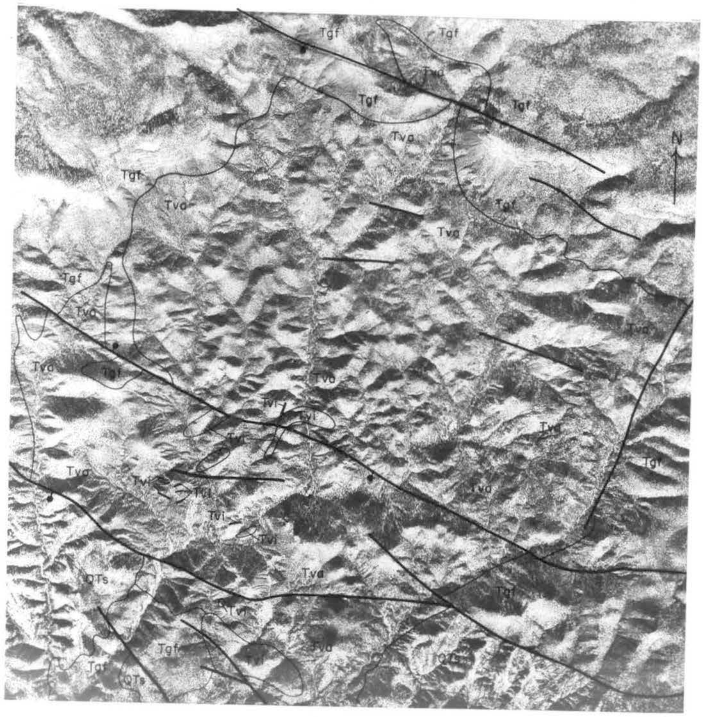

Figure 18.--Aerial photograph showing fracture-controlled drainage pattern in rocks of the volcanic complex of Alum Mountain as exposed in the Copperas Canyon window. Tva, volcanic complex of Alum Mountain; Tvi, silicic intrusive rocks; Tgf, latite and andesite flows of Gila Flat.

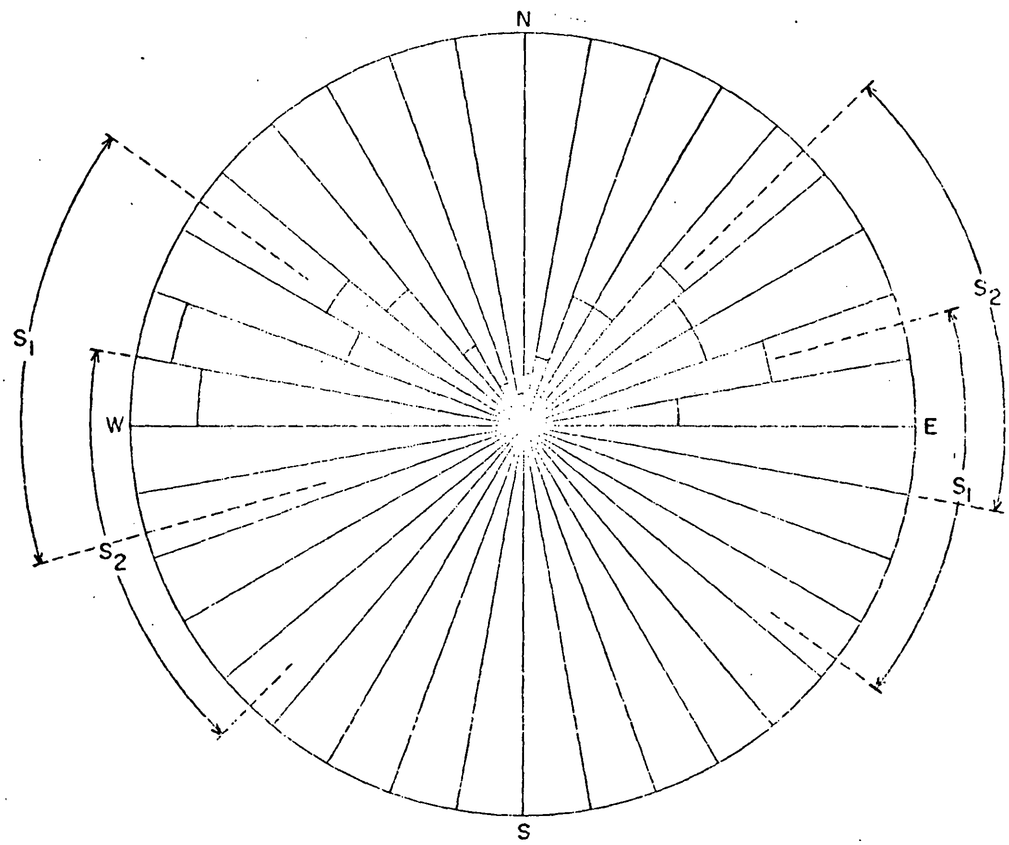

Figure 19.--Compass rose diagram of fracture trends in the Copperas Canyon window. Radial scale: one inch equals 20 observations; 289 lineaments measured

The possibility of doming above a shallow intrusive body in the Copperas Canyon area suggested by the fracture pattern is enhanced by the presence of rhyolite intrusives, and the extensive hydrothermal alteration and mineralization within the window. It is also important to note that the Copperas Canyon window is on the northern flank of one of the most conspicuous magnetic highs in the study area to be discussed further in the next section of this report. We found no evidence to support the presence of a caldera or other structural depression in the Copperas Canyon area, as proposed by Elston, Coney and Rhodes (1968, p. 268; 1970, p. 80).

Bursum resurgent caldera.--The Bursum resurgent caldera is the dominant structural and topographic feature in the western part of the study area (pls. 1A,B/ fig. 2). The cauldron was first described by Elston (1968, p. 235-237, pl. 1) and later by Rhodes (1970). This extraordinary volcano-tectonic structure formed first as a subsidence caldera about 25 miles (40 km) in diameter, almost certainly as a result of recurrent ring-fracture eruptions of many cubic miles of ash-flow tuff of Apache Spring, which accumulated largely within the subsiding caldera. Younger flows of porphyritic rhyolite lavas of Sacaton Mountain, and perhaps of Mogollon Andesite covered the tuff of Apache Spring within the caldera. A wedge of coarse chaotic to layered debris as much as several hundred feet thick near the caldera wall thins toward the center of the caldera (fig. 11). This avalanche breccia from the caldera wall and other caldera-filling sediments are interlayered between masses of densely welded ash-flow tuff of Apache Spring, indicating subsidence of the caldera during an early stage of the Apache Spring eruptions. After the caldera was filled, resurgent uplift of the subsided block domed the caldera-fill deposits, the renewed eruptions from the ring fracture zone of the caldera produced lava domes and flows of fluidal rhyolite, which filled in between the resurgent core and topographic wall of the caldera, the moat area. The dome was undoubtedly buried by the encircling rhyolites or by younger volcanic rocks. Later erosion, initiated by the uplift of the Mogollon Range on basin and range faults, exposed the dome to view.

The original structural wall of the Bursum caldera has been identified only at one place, about a mile above Hells Hole at a ford on the West Fork of the Gila River (pl. 1B). Here the caldera wall consists of ash-flow tuff of Shelley Peak on the south side of the river, and andesitic or latitic flows and breccias north of the river. The caldera wall dips about 55 degrees northwestward north of the river, but appears to be somewhat steeper to the south. Ash-flow tuff of Apache Spring is plastered against the wall on the inside of the caldera, and the margin of the tuff is marked by a vitrophyric chill zone several feet thick. Thus the caldera wall existed when the ash-flow tuff was deposited, and the rock relationships were not produced by faulting. The trace of the southern margin of the Bursum caldera is closely bracketed from Hells Hole to Rain Creek, within a mile or less in most places, by the presence of the ash-flow tuff of Shelley Peak or older rocks in the caldera wall juxtaposed to the tuff of Apache Spring or rhyolite of Sacaton Mountain within the caldera. Farther west and north, the caldera margin is largely buried and obscured by the flow-banded rhyolites and related moat-lavas. However, in the area from Whitewater Creek to Sheridan Gulch along the western flank of the Mogollon Range, a steep wall of flow-banded rhyolite rises from the frontal faults to the top of Holt and Nabours Mountains and probably approximates the caldera margin. This rhyolite may in part actually represent a ring-fracture intrusion.

Resurgence of the Bursum caldera is expressed by the domal structure of ash-flow tuff of Apache Spring as seen in the canyon walls along upper Rain Creek, West Fork of Mogollon Creek, and Lookout Canyon (fig. 20). The radial drainage controlled by the domal structure can

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Figure 20.-Near here

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still be recognized within most of the caldera, despite modifications caused by northwest-trending basin and range faults (   ). Whereas the moat area between the caldera walls and the dome is largely buried by flow-banded rhyolite, the root zone of some of the rhyolitic flows and domes is exposed along the southwest flank of the Mogollon Range, where older rocks on the caldera margin are invaded by rhyolite dikes and more irregular intrusive bodies. Remnants of flow-banded rhyolite and tuff breccia on Center Baldy indicate that the rhyolite may have completely buried the dome at one time.

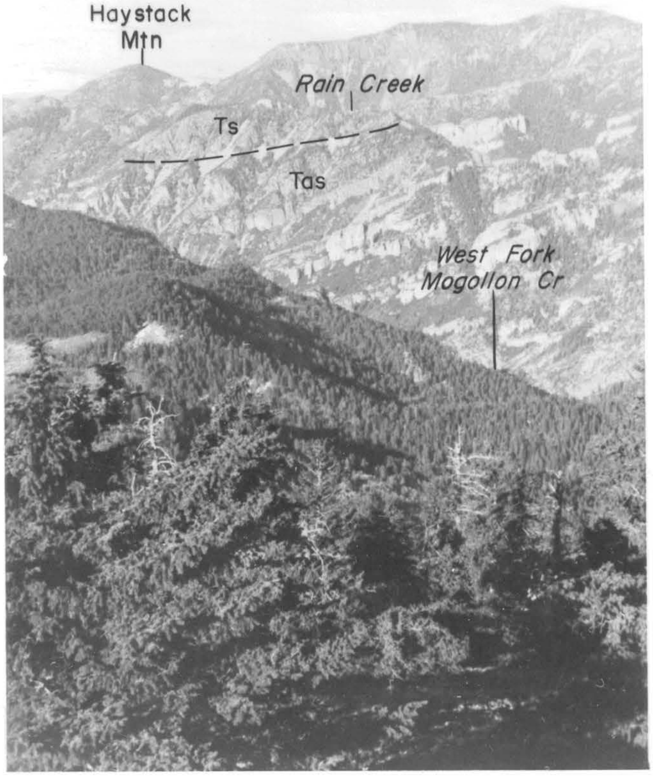

Figure 20.--Tilting of the tuff of Apache Spring (Tas) and rhyolite of Sacaton Mountain (Ts) is attributed to resurgent doming of the Bursum caldera. View westward from Mogollon Baldy Peak across the West Fork of Mogollon Creek and Rain Creek.

Apical graben on the Bursum dome.--Northeast trending mineralized faults in the Spruce Creek-Spider Creek-upper Dry Creek area may define the southwestern part of an apical graben on the resurgent dome (pl. 1A). The graben appears to be about 2 miles wide in the Spruce Creek area, and the northeast-trending faults converge sharply to the south. Northward the graben is inferred to open to as much as 4 miles wide on the north side of the Mogollon Range. Younger basaltic andesites, filled at least the northeast part of the graben, and were in turn broken by late movement on the graben faults. The northeast-trending faults are locally cut by mineralized northwest-trending faults, as for example the fault on the north side of Spider Creek (pl. 1A). The mineralization, thus may be of a later age and not related to the evolution of the Bursum resurgent caldera.

Gila Cliff Dwellings caldera.--The Gila Cliff Dwellings caldera (Elston, 1968, p. 237) is the probable source of the Bloodgood Canyon Rhyolite Tuff of Elston, which fills the caldera. Evidence for the caldera consists of the distribution of the thickest section of Bloodgood Canyon tuff in a roughly circular area 10-12 miles (16-20 km) in diameter, within which the ash-flow tuff is more than 1,000 feet thick and no base is exposed (pl. 1B; fig. 2). The west wall of the caldera, which probably intersects or overlaps the east wall of the Bursum caldera may be exposed in the Hells Hole area where Bloodgood Canyon tuff is in contact with flow-banded rhyolite and associated pyroclastic rocks, either in a fault relationship, or with the Bloodgood Canyon plastered against a pre-existing wall. Similar relations occur north of Granite Peak, where contacts between flow-banded rhyolite and Bloodgood Canyon tuff were mapped as dipping steeply beneath the tuff, indicating that here also the flow-banded rhyolite may be in the wall of the Gila Cliff Dwellings caldera. At the head of Ring Canyon and the north fork of Little Creek, biotite latite flows (latite flows of Gila Flat(?), (table 1) are in steep contact with Bloodgood Canyon tuff and quite likely define the southwest wall of the caldera. On the east and north, the distribution of Bloodgood Canyon tuff and the arcuate fault pattern are believed to locate the approximate margin of the caldera. Many of the arcuate faults show movement that is younger than basaltic andesites overlying the Bloodgood Canyon tuff and clearly were active during basin and range tectonism, but these may be young faults deflected along older caldera-margin fractures.

An alternative interpretation, suggested to us by some of our colleagues is that the Gila Cliff Dwellings caldera may not be the source of the Bloodgood Canyon tuff, but that the tuff is an early facies of the tuff of Apache Spring that filled an older caldera related to the eruption of one of the older ash-flow tuff units in the area, such as the Tadpole Ridge Quartz Latite of Elston (1968, p. 235), or the tuff of Shelley Peak. The mineralogical similarity of the Apache Spring and Bloodgood Canyon tuffs favors this hypothesis. Furthermore, were the Bloodgood Canyon tuff filling its source cauldron, the lack of contained fragmental lithic debris is unusual, and contrasts with the lithic-rich Apache Spring tuff in the Bursum caldera. But mainly the proponents of this hypothesis ask, where is the great ash-flow sheet outside the Bursum caldera that corresponds to the Apache Spring tuff within this huge caldera? Is it not the Bloodgood Canyon tuff, which seems to be distributed over an area of at least a thousand square miles? Another feature that seems incompatible with a genetic relationship between the Cliff Dwellings caldera and the Bloodgood Canyon tuff is the lack of alteration of the tuff within the caldera, particularly if it has undergone some resurgence. In spite of the many questions, at present we must rely on what seems to us to be the more direct geologic evidence, which indicates that the Bloodgood Canyon tuff and Gila Cliff Dwellings caldera are younger than the tuff of Apache Spring and the Bursum caldera, and that the Bloodgood Canyon tuff had its source in the Gila Cliff Dwellings caldera. Refined dating of the tuff units in the future may resolve the problem.

We recognized no evidence of significant mineralization related to the Gila Cliff Dwellings caldera.

Faults.--Most of the many faults mapped on plates 1A and 1B trend northwest, but intersecting west- and north-trending faults are prevalent in and south of the Mogollon district, and a few north- to northeast-trending faults in the eastern part of the study area probably reflect proximity to the dominant north-south structure in the adjacent Black Range. Whereas faults in each of these systems locally cut Gila Conglomerate and are thus thought to be related mainly to late Tertiary basin and range faulting, evidence from the nearby Silver City region (Jones, Hernon and Moore, 1967, p. 12) indicates that at least parts of the northwest fault system formed first during the Laramide Orogeny of Late Cretaceous--early Tertiary age. The northwest-trending faults are particularly disruptive along the Mogollon Mountains front from Mogollon Creek to Sheridan Gulch, where the southern margin of the Bursum caldera seems to be greatly complicated by the younger faults. Along the Gila River Canyon and elsewhere, the northwest faults form several narrow horsts and grabens, two to three miles wide, including the Sapillo Creek graben, which may be the westward extension of the Mimbres and related faults (Moore, 1970), the Sycamore Canyon graben and the arcuate Gila Hot Springs graben (pl. 1B). Nearly all of these faults are steep normal faults with a dominant dip-slip movement and displacements of as much as about 1,500 feet; displacements of a few hundred feet are common. An example is the Sycamore Canyon graben whose narrow core is displaced downward about 1,000 feet (fig. 21). North-westward from the

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Figure 21.--Near here

Gila River, the northwest-trending faults become increasingly more difficult to trace through the massive accumulations of flow-banded rhyolite.

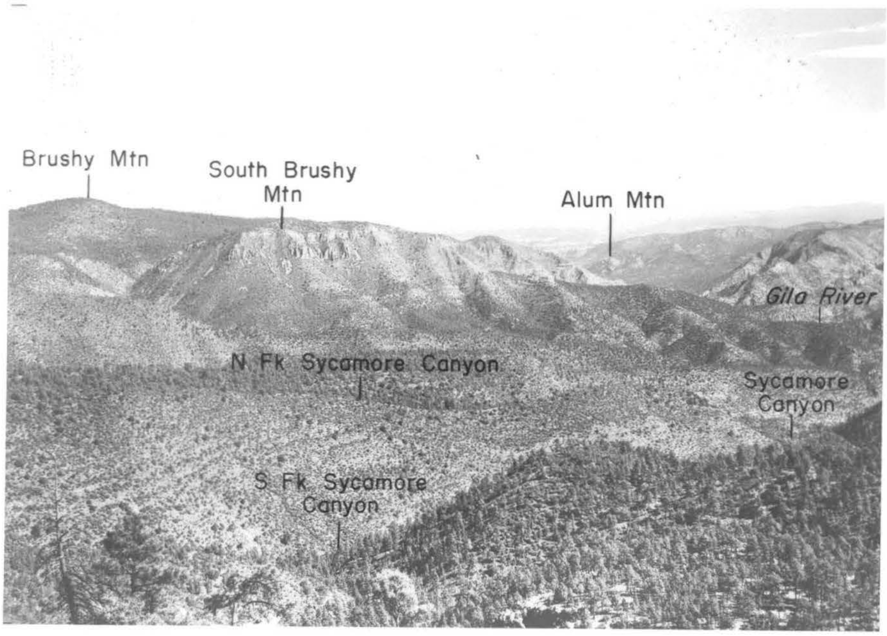

Figure 21.--Bloodgood Canyon Rhyolite, which forms the cliffs of South Brushy Mountain has been displaced down about 1,000 feet within the Sycamore Canyon graben. View northward from Granny Mountain west of the Gila River.

Faulting related to more localized structures has been described in the Copperas Canyon window, and on the resurgent Bursum caldera. The reticulate fault pattern in the Mogollon district (Ferguson, 1927, pl. 1), also may represent a local structural situation. Wisser (1960, p. 91-94) related the Mogollon structure to a major anticline, but as we would interpret relations, the margin of the Bursum caldera projects through the Mogollon district. Future work in the Mogollon district will require reconsideration of its structural setting, but is beyond the scope of this report.

Weak to strongly mineralized rocks occur on faults mainly in the south half of the study area, and generally are increasingly stronger toward the southwest front of the Mogollon Mountains. Metallic minerals, associated with quartz, fluorite, and calcite are the most common vein materials, but meerschaum occurs in faults that cut Gila Conglomerate in tract 1 of the Gila Primitive Area, north of Sapillo Creek.

Santa Rita-Hanover Axis.--The Santa Rita and Hanover stocks (Jones, Hernon, and Moore, 1967) are along a Cretaceous structural high named the Santa Rita-Hanover axis by Elston, Coney and Rhodes (1968, pl. 1; 1970, p. 75-76). This seems to be virtually the same feature referred to as a pre-Miocene topographic high extending northward from the Chino Mine area in the central part of the Santa Rita quadrangle by Jones, Hernon, and Moore (1967, p. 134). The restricted distribution of older units of the ash-flow tuff sequence east or west of the axis is attributed to its having acted as a barrier between separate eruptive sources in Oligocene time (Elston, 1968, p. 235). The subsurface continuation of the axis and its possible control on the emplacement of other mineralized prophyries of Laramide age beneath the study area is of paramount concern in this appraisal. Gravity and magnetic anomalies to be discussed in the next section of this report add credence to previous suggestions (Elston, Coney, and Rhodes, 1970, p. 75) that some kind of buried structure exists in this area on the northward projection of the Santa Rita-Hanover axis. The altered rocks of the Alum Mountain and Copperas Canyon erosional windows are only a few miles west of the axis as sketched by Elston, Coney and Rhodes (1968, pl. 1).

Other structures that have been proposed as localizing ore deposits in the study area include domal upwarps and culminations in the rim of the so-called Mogollon volcano-tectonic depression (Elston, 1970, p. 150; fig. 3). Descriptions of these structures are tenuous, and we have not recognized them in the field. Most have been interpreted from the distribution of Deadwood Gulch Rhyolite (Rhodes, 1970, p. 75-78; Elston and Damon 1970, p. Avi-2) as discussed earlier (p. 113), we are skeptical that the widely separated deposits of various lithologies that have been correlated with Deadwood Gulch Rhyolite ever were parts of a single coherent stratigraphic unit.

Geophysical investigations in the Gila study area

Both aeromagnetic and gravity surveys were made of the Gila Wilderness and adjoining Gila Primitive Area. This part of the report has been prepared by Eaton and Peterson, who were responsible for the geophysical work. The aeromagnetic survey was flown in March 1968 over a broad region containing the Blue Range Primitive Area of Arizona and the Gila Wilderness and Primitive Area and Black Range Primitive Area of New Mexico (Ratté and others, 1969; Eaton and Ratté, 1969; Ericksen and others, 1970; U. S. Geol. Survey, in press-a). This survey was flown at a constant barometric elevation of 10,500 feet and a flight-line spacing of 1 mile. The gravity survey was made in April 1970. Physical properties were measured on approximately 160 oriented rock samples.

The principal purpose of a geophysical survey is an interpretation of subsurface geology, particularly to locate rock bodies that do not crop out or to map the subsurface extent of rock bodies that are only partially exposed. A coherent geophysical anomaly of moderate areal extent provides a measure of the size, shape, and trend of that body. A geophysical anomaly that cuts across the boundaries of rock units of different lithologic character suggests a buried, coherent body of more or less uniform physical properties. Similarly, an anomaly that cuts across the structural grain of an area with more or less uniform lithology, at a high angle suggests a cross-cutting body with physical properties which contrast with those of the enclosing rocks. In this study, geophysical anomalies were examined in order to locate buried or partially exposed bodies of rock that may have mineral potential.

Only in special circumstances are magnetic or gravity anomalies associated directly with deposits of metallic ores. Several of the oxides of iron and titanium and the iron sulfide, pyrrhotite, are ferrimagnetic, and concentrations of sufficient quantities of these minerals will produce high amplitude magnetic anomalies. Massive bodies of dense metal sulfides also are known to produce positive gravity anomalies. In general, however, the magnetic and gravity methods are reconnaissance tools, used primarily to locate geologic settings that may be favorable for the accumulation of ores. Thus the geophysical interpretations made below are focused on a search for blind plutons that might have associated mineral deposits. In a few localities, the geological and geochemical data presented elsewhere in this report seem to correlate with the geophysical data so as to be encouraging, insofar as mineral potential is concerned. In many instances, however, the interpretation that specific geophysical anomalies arise from buried plutons stands unsupported by other data and must be regarded as speculation.

Gravity investigation

Collection and reduction of data.--The gravity map (pl. 2A) was prepared from data gathered by both the U. S. Geological Survey and the U. S. Army (TOPOCOM). Approximately 115 of the U.S.G.S. stations, most of them in rugged terrain, were reached by helicopter and another 25, by automobile. Approximately 40 stations, all of them in the south-western part of the map, within or southwest of, the Mangas trench, were occupied by U.S. Army personnel. All stations were tied to a U.S. Army (TOPOCOM) gravity base station at Truth or Consequences, New Mexico (R. B. Beruff, oral commun., 1970).

The data were reduced using a Bouguer density of 2.45 g/cc, in contrast to the value of 2.67 g/cc used in most regional gravity surveys. Use of this density and substantial terrain corrections account for the fact that the values on our map differ materially from those of Woollard and Joesting (1964). Examination of tabulated densities for the Gila study area (table 2) indicates that only eight of the 18 map units that were sampled have mean values in excess of 2.45 g/cc, and only six of these are appreciably higher. As one might expect, they are the intermediate to mafic flow rocks (the latites, andesites and basalts). The great range in density of these mafic rocks (from 2.23 to 2.81 g/cc) probably reflects variations in vesicularity and alteration. The equally large ranges in density (from 1.94 to 2.56 g/cc) for the ash-flow tuffs (notably the tuffs of Apache Springs, Shelley Peak, Cooney, and Bloodgood Canyon Rhyolite Tuff) varies with their degree of compaction and welding. The highest values in both groups of rocks (intermediate to mafic flows and silicic ash-flow tuffs) are almost certainly less than those of intrusive rocks of similar composition.

Because the geology of the area is moderately complex it was not possible to estimate a weighted average density for the rocks of the Gila study area for use in data reduction. The value used was determined, instead, from a gravity meter density profile (Nettleton, 1939) that crossed a range of hills west of the Blue Range Primitive Area eroded from volcanic rocks nearly identical to those of the Gila area.

Table 2.--Dry bulk densities of rocks from Gila study area

Map unit		Number of specimens	Range of densities observed	Mean density	Standard deviation
Tob			NO DATA		
Tba		30	2.28-2.81	2.61	0.12
Try		1	---	2.27	---
Tbc		16	1.94-2.50	2.34	0.18
Tro	Jerky Mts.	10	2.20-2.40	2.30	0.07
	Fanney	3	2.35-2.39	2.37	0.02
Tmc		4	2.39-2.78	2.67	0.19
Ts		7	2.45-2.56	2.49	0.05
Tas		16	2.11-2.54	2.35	0.15
Tsp		7	1.97-2.39	2.17	0.14
Tdc		3	1.94-2.16	2.08	0.12
Tfc		1	---	2.17	---
Tc		13	2.20-2.56	2.41	0.12
Tgf		6	2.39-2.63	2.57	0.09
Trc			NO DATA		
Ttc			NO DATA		
Thg		1	---	2.56	---
Tva		26	2.23-2.72	2.52	0.12
Tadpole Ridge[1/] ash flow tuff		6	2.24-2.34	2.29	0.03
Tvb		2	2.47-2.49	2.48	---
Older andesites[2/]		8	2.56-2.79	2.64	0.09

1/ Stratigraphic unit not shown on geologic map (fig. 9).

2/ May be correlative with Tmc, Tgf, Tva or intermediate rocks of Tbu.

Terrain corrections were made for all gravity stations by a method developed by Plouff (1966). For those stations in, or closely adjacent to, areas of rugged relief (solid circles on pl. 2A) inner zone corrections were made by hand out to a distance of 2.6 km; beyond that, they were calculated by digital computer to a distance of 167 km. For stations in areas of gentle relief (open circles on pl. 2A) corrections were applied only for the terrain from 2.6 to 167 km. Values of the combined (0-2.6 plus 2.6-167 km) terrain corrections ranged from 0.50 to 37.06 mgals. The maximum inner zone correction (0-2.6 km) was 26.37 mgals. Obviously, complete Bouguer gravity values are necessary for meaningful and interpretable results.

Interpretation of the gravity map.--The most conspicuous feature of the gravity map is a large high (anomaly 2A) centered over the Brock Canyon complex in the southern part of the area. It crests at a value of -167.9 mgals and continues with diminished amplitude to the northwest for 45 km (nearly to the town of Glenwood) where its value is -195 mgals (anomaly 2C) over the intrusive(?) rocks of Holt Gulch. Flanking it on the southwest is a closed low (anomaly 8) over the relatively less dense Gila Conglomerate of the Mangas trench. In the southeastern part of the map, over some older andesites and ash flow tuffs (Tcu), another high (anomaly 1A) has a peak value above -190 mgals and a local relief of approximately 15 mgals. To its west is still another high (anomaly 1B) that extends northward across the Copperas Canyon and Alum Mountain window of the Alum Mountain complex. Anomaly 1C is the northward continuation of anomaly 1A. As a group, anomalies 1A, 1B, and 1C, lie approximately along the trend of Elston's (1968) Santa Rita-Hanover axis, an extension of the pre-Miocene(?) topographic high of Jones and others (1967, p. 134).

Other anomalies deserving comment are: 1) 2E, which may be an interrupted westward continuation of 1B, linking the latter, perhaps, with 2A, as suggested by magnetic anomaly A on plate 2B; 2) an unlabelled, northeast-trending low, west of anomaly 6, which coincides with the crestal graben on the resurgent dome of the Bursum caldera; and 3) anomalies 2D and 7, which appear to be related to elevated tracts of relatively dense, older lava flows of intermediate composition, as discussed below.

A residual gravity map of the Turkey Creek area (anomalies 2D and 7, pl. 2A) is shown on figure 22. It was prepared by smoothing the northeast flank of anomaly 2A-2B-2C by inspection (a subjective and arbitrary process) and determining the algebraic difference between the smoothed field and the observed field. The result is a positive residual gravity anomaly with a peak value exceeding 7 milligals. The anomaly is crudely Y-shaped, with the upright arm trending northeasterly, approximately along exposures of the andesite and latite flows of Gila Flat (?), and the other arm trending northwest along the horst which brackets Lilly Mountain, a possible eruptive center for the Mineral Creek andesite(?). Table 2 indicates that both these andesites are denser than their surrounding rocks. One could thus account for the residual anomaly by the relative structural elevation of these exposed, older and denser rocks.

The principal significance of figure 22 is that it exhibits a relationship similar to that seen elsewhere on the larger gravity map, namely the coincidence of a local gravity high with outcrops of some of the older rock units of the area. Thus anomaly 2A is centered over exposures of the volcanic complex of Brock Canyon, anomaly 2C coincides with exposures of the intrusive(?) rocks of Holt Gulch, anomalies 1B and 1C occur over exposures of the Alum Mountain complex, and the eastern part of anomaly 1A coincides with exposures of the andesitic flows and breccias of Turkey Cienega Canyon and the ash-flow tuffs of Rocky Canyon.

The data of table 2 reveal that Alum Mountain rocks (Tva), most of which are altered, have a mean density of 2.52 g/cc. Unfortunately, our sampling of the Brock Canyon Complex and the Holt Gulch intrusion(?) was inadequate to treat statistically, but the lithologies exposed suggest densities similar to those of the rocks of the Alum Mountain complex, and are in approximate agreement with the few values measured (Tvb, 2.48 g/cc; Thg, 2.56 g/cc). These rocks are largely andesites and latites, which, if fresh and nonvesicular, would have densities as high as 2.70-2.75 g/cc. The density contrasts with their surroundings are sufficient to account, at least in part, for anomalies 1A, 1B, 1C, and 1D, in the southeastern part of the map, but we doubt very much that they are sufficient to account for anomalies 2A-2B-2C. This doubt is based on the estimated value of residual gravity for this anomaly, as illustrated in figure 23 and explained in the following paragraphs.

Figure 23 shows a complete Bouguer gravity profile (A-A' in plate 2A) which crosses the western part of the study area and extends southwestward about 20 miles beyond, as shown in the small index map (pl. 2A). The data south of 33°00' N. latitude were obtained from the U.S. Army.

The area has a steep, north-northeast dipping regional gradient, as both the observed Bouguer profile A-A' and the map of Woolard and Joesting (1964) indicate and yet whatever regional gradient one assumes will strongly influence the residual values of both anomaly 8 and anomaly 2B. By manipulating the regional gradient, the negative anomaly associated with the Gila Conglomerate in the Mangas trench can range from 0 to 30 mgals, and at the same time the residual value of anomaly 2B will range from 30 mgals to 0. Thus the amplitude and the very existence of anomaly 2 could be questioned were it not for the strong variation in its magnitude (28 mgals from 2C to 2A), normal to the line of profile.

The only control available in constructing a regional gradient along the line of profile is the knowledge that whatever the magnitude of the residual anomaly associated with the Mangas trench, it should decay to 0 upon moving southwest from the bedrock margin of the trench, if no local anomalies exist over the rocks exposed to the southwest. Using this as an assumed constraint, the regional gravity field was calculated in the manner of Mabey (1966); regional elevations within circles of 64 km radius were estimated at a series of stations along the profile and these were multiplied by a constant (-0.03086) which was determined by a least squares fit of the observed Bouguer gravity data plotted against these elevations. The resulting regional gradient isshown in figure 22 . The residual curve is the algebraic difference between the calculated regional gradient and the observed Bouguer field. The calculated residual value of the gravity ridge (anomaly 2B) where it is crossed by profile AA' is 23.0 mgals. The ridge crest is, at that point, 13 mgals below the gravity peak over exposures of the Brock Canyon Complex, indicating a residual peak value for the latter of 36.0 mgals. Rocks with a mean density of 2.48-2.56 g/cc will not produce an anomaly of this magnitude, nor would their fresh and nonvesicular equivalents, unless the surrounding rocks are of extremely low density. We believe therefore, that the principal causative body for anomaly 2A-2B-2C (and, on the basis of the magnetic data, possibly also, for anomalies 1A, 1B, 1C and 1D) consists of rocks that differ from those exposed in the volcanic complex of Brock Canyon or the intrusive(?) rocks of Holt Gulch.

Preliminary gravity modelling of anomaly 2B virtually rules out the possibility that it arises from topography carved from an older volcanic or pre-volcanic basement. Similarly, it is highly unlikely that it is a simple, elevated structural block, such as a horst. A density contrast of 0.15 g/cc between such a block and its surroundings requires as much as 7 to 9 km of relief. The causative body is therefore regarded as an intrusive, with deep roots.

The vent zone bodies of older rhyolite (Trv on Pl. 2A) tend to follow the gravity ridge (2A-2B-2C) and the entire anomaly, including its north and northeast flank of which anomalies 2D, 6 and 7 are a part, coincides with the distribution of the extrusive-intrusive complex of older rhyolite (Tro). It may be that the andesite exposed in the structural highs underlying anomalies 2D and 7 was elevated in part by intrusive doming. Table 2 indicates that the older rhyolites (Tro) have lower densities (mean values, 2.30 g/cc and 2.37 g/cc), than all of the rocks excepting the ash-flow tuffs of Shelly Peak, Davis Canyon and Fall Canyon, and the lighter phases of the ash-flow tuffs of Bloodgood Canyon and Apache Springs. If rocks of the Brock Canyon Complex are too light to produce this broad gravity high, as indicated above, the less dense older rhyolites cannot be the source either. Therefore, we believe that the principal gravity high of the map (2A-2B-2C) is possibly due to a small batholithic body of intermediate to mafic composition. If the older rhyolites are genetically related to the gravity high, they may be merely silicic differentiates above a more mafic batholithic body. More probably, all of these rhyolites represent simply the latest of several intrusive events that have taken place along this zone. The large gravity anomaly, if it stems from a plutonic body, is due to a much larger body, of more mafic composition.

If we knew the composition of its wallrocks, we could estimate the composition of the supposed batholith. Two interpretations seem possible from a regional standpoint: 1) the wallrocks are intrusive equivalents of rhyolitic and quartz latitic ash-flow tuffs; or 2) they are like the widespread Precambrian granite of the region.

The exposed precambrian rocks in southwestern New Mexico are predominantly granite (Ballman, 1960, p. 9-10; Bromfield and others, 1972; Darton, 1917, p. 3-4; Elston, 1957, p. 4; Entwistle, 1944, p. 24-25; Gillerman, 1952, p. 265-267; Gillerman, 1958, p. 9-12; Gillerman and Whitebread, 1956, p. 287-292; Hewitt, 1959, p. 9-77; Jicha, 1954, p. 6; Jones and others, 1967, p. 9; Kelley and Silver, 1952, p. 32-33; Kuellmer, 1954, p. 6-10; Lindgren, 1905, p. 2-3; Loughlin and Koschman, 1942, p. 7-13; Morrison, 1965, p. 1; Paige, 1916, p. 3; Paige, 1922, p. 10-13; Zeller, 1965, p. 6-18). The densities of 28 samples of Precambrian granite from the region average 2.63 g/cc, range from 2.55 g/cc,to 2.75 g/cc and have a standard deviation of 0.05 g/cc. It is unlikely that the average density of the plutonic equivalents of the ash-flow tuffs (granites or quartz monzonites) of the Gila study area is much less than 2.63 g/cc (see table below, unless there had been extensive hydrothermal alteration. It is suggested, therefore, on the basis of modelling, that the batholithic body reflected in the principal gravity high of plate 2A, has a density of about 2.78 ± 0.05 g/cc and hence is at least as dense as a mafic granite or granodiorite (see ranges stated in table below), and possibly as dense as gabbro or diabase. If hydrothermal alteration of the country rock has been entensive throughout the region, a less dense, and therefore somewhat less mafic, batholith is required.

Average densities of common igneous rocks from the data of Daly and others (1966, table 4-1), Press (1966, tables 9-2 and 9-3) and Clark (1966, table 21-4).

Rock type	No. of samples	Mean density	Observed range of density
Granite	175	2.67	2.52-2.81
Quartz monzonite	3	2.65	2.64-2.65
Granodiorite	13	2.72	2.67-2.79
Quartz diorite	26	2.81	2.68-2.96
Gabbro, diabase, and norite	84	2.97	2.80-3.12

Unless its close association in space with Tertiary structures, igneous rock distributions, and geochemical anomalies is fortuitous, the batholith is probably Tertiary in age and may be genetically related to the overlying volcanic field. It also is probably in some way associated with the widespread mineralization manifested by the known mineralized areas and geochemical anomalies discussed elsewhere in this report.

The residual anomaly of 9 mgals over the Mangas trench (fig. 23) indicates a thickness of as much as 500 to 600 m of low density valley-fill sediments along the northeastern side of the trench, if the density contrast between the trench fill and the local bedrock is typical of that of other parts of the Basin and Range province (0.45 g/cc). As will be seen below, the magnetic data place the bedrock floor of the trench at the somewhat shallower depth of 300 m, at least locally.

Correlation of the gravity field with the Bursum caldera is apparently totally lacking; the gravity contours trend, seemingly undisturbed, east-west across the southern half of the caldera.

A positive correlation of the gravity data with the Gila Cliff Dwellings caldera is suggested by anomaly 3, which conforms approximately to the southern margin of the thick block of Bloodgood Canyon Rhyolite within the caldera. The abrupt steepening of the gravity gradient that trends northwest between anomalies 3 and 7 suggests a sharp boundary between lighter rocks in the Gila Cliff Dwellings caldera and denser rocks of the postulated batholith and/or the flows of Gila Flat. If the closed low beneath Black Mountain is also related to the caldera, it must have a greater eastern and northern extent than is shown on the reconnaissance geologic map (pl. 1B). However, anaomaly 4 may have a completely separate origin, possibly related to an intrusion of relatively light rock beneath the Black Mountain basaltic volcano. Gravity anomaly 4 would seem to require a deeper source than the exposed basalt on Black Mountain which is represented by a strong positive magnetic anomaly (pl. 2B).

Magnetic investigation

Overview of the aeromagnetic map.--Five magnetic anomalies in the Gila study area that may have potential economic significance are labelled A, B, C, D, and H on plate 2B. Before examining their individual characteristics, some of the broader features of the map and the general methods of interpretation will be described.

The magnetic anomalies on plate 2B have relatively long wave lengths and small amplitudes in two broad areas, one in the southwestern part of the map, where surface elevations range from 1,500 to 1,800 m, and the other, around Gila Gliff Dwellings National Monument, where the elevations range from 1,800 to 2,100 m. In sharp contrast, over Black Mountain (2,831 m) and in the area between Mogollon Baldy Peak (3,283 m) and Willow Mountain (3,287 m), the magnetic anomalies have short wave lengths and very high amplitudes. These observations suggest, and detailed areal correlations over the entire map area confirm, that the magnetic field is strongly influenced by topography. This influence stems from the fact that most of the rocks in the area are moderately to strongly magnetic (table 3) and there is pronounced topographic relief (1,950 m). During the present investigation all anomalies were screened for topographic components in two stages: first, by overlaying a transparent copy of the aeromagnetic map on a regional topographic map and rejecting those anomalies clearly centered on prominent mountains or mountain groups; and second, by detailed comparison of the magnetic analog records with the radar altimeter records along each flight line. In those instances where several flight lines crossed the same anomaly and only one or two lines suggested correlation with topography, the anomaly was retained for further study. Because we did not utilize any of the sophisticated techniques of filtering that would allow us to separate topographic components from those with deeper sources, the rejected anomalies, like those around Black Mountain and between Mogollon, Baldy Peak and Corner Mountain may contain some geologic information.

Nineteen anomalies were selected for investigation after topographic screening. They are indicated by light shading on plate 2B and several, which are regarded as significant, are identified by letters, which will serve as their identification in the discussion below.

Relationship of magnetic anomalies to structure.--The directional grain of the aeromagnetic map is emphasized by the lines bounding anomaly zones on plate 2B. In some places, the lines bracket elongate anomalies (e.g., anomalies A and G). In other places, they coincide with isolated gradients which have strike lengths of several miles or more, as in the southwest corner of the map. Three directions of grain are apparent; listed in order of decreasing frequency, they are: 1) northwest to west-northwest, 2) northeast, and 3) east-west.

Although relatively few anomalies have east-west trends, one near Holt Gulch (anomaly D) and another, near the Alum Mountain window (western extension of anomaly A) are believed to have possible economic significance, as will be mentioned below. Ratté and others (1969, pl. 1) have shown that east-west magnetic trends have real geologic significance elsewhere in this region.

The relationship between the strike of faults and the trend of magnetic gradients and anomalies is especially apparent for the northwest to west-northwest trending magnetic gradients of the Gila study area, proper. In the southeastern part of the area this trend is approximately west-northwest, but to the west and north, it becomes more strongly northwest, in almost perfect conformity with the pattern of the Basin and Range faults. The northeastward trend is particularly strong in the western part of the area. The anomalies parallel several faults with similar trend, including the pair that bound the crestal graben of the Bursum caldera.

To some extent, this relationship between magnetic and structural grains may be a function of topography, in that the structural grain has determined, at least locally, the topographic grain. There are examples of magnetic anomalies unrelated to topography, however (see for example, anomalies A or D) and we regard the effect of topographic grain as minimal.

The relationship of the magnetic pattern to the Bursum and Gila Cliff Dewllings calderas in the area is not obvious. It would appear, at first glance, that the Bursum caldera is expressed clearly in the cluster of high amplitude anomalies in the area around West Baldy, Mogollon Baldy, Center Baldy, Grouse Mountain and Willow Mountain. A similar expression was found to characterize the Kneeling Nun cauldron in the Black Range Primitive Area to the east (Ericksen and others, 1970), but in both instances, the anomalies in question occur over relatively high topography carved from moderately to highly magnetic rocks and it is difficult to say whether the magnetic field is influenced directly by the caldera structure or indirectly by the local topography which is, in turn, related to the structure.

The magnetic expression of the Gila Cliff Dwellings caldera is subtle, at best. As outlined on the geologic map, the caldera coincides with part of a broad and irregular magnetic low. An aeromagnetic map of the San Juan Mountains, Colorado (U. S. Geol. Survey, in press-b) shows that of twelve calderas in the San Juan volcanic field (Lipman and others, 1970, fig. 1; T. A. Steven, oral commun., 1971) some have pronounced magnetic anomalies associated with them (for example, the Creede caldera) but others, such as the Bachelor and Mount Hope calderas, seem to have no magnetic expression whatsoever.

Depth estimates from magnetic anomalies.--Each of the 19 magnetic anomalies selected for geologic consideration was evaluated in terms of depth to the top of its source. The method used was essentially that of Vacquier and others (1951) and it was applied to the analog records rather than to the map. This method is based on the assumption that the anomaly producing body is a right rectangular prism with considerable vertical extent relative to its depth of burial. Although of value in estimating depths to crystalline basement beneath broad sedimentary basins, its application in volcanic terranes of pronounced topographic relief is hazardous for two reasons: 1) an individual anomaly is rarely sufficiently isolated so that its various parameters are unaffected by the magnetic field of adjoining bodies of rock, and 2) volcanic rocks locally possess very intense magnetizations and thus produce notable anomalies even if their vertical extent is not very great. An experienced interpreter usually can recognize this latter sort of anomaly and take it into account when estimating depths. The usual procedure is to use a depth index based on horizontal tabular bodies. Several of the anomalies studied in the course of the present investigation are estimated to have sources at the surface, yet the geologic mapping and geochemical sampling failed to reveal any evidence of intrusive bodies and thus they may reflect local thickening of the surface units.

In the section on the interpretation of individual anomalies, depths of anomaly sources are intentionally stated in ranges or in vague terms, except in those instances where we feel that the anomalies are: 1) relatively free of interference from nearby sources; 2) the continuous analog record was free from instrumental noise; and 3) the configuration of the anomaly was such as to suggest a body of considerable vertical extent.

Magnetic properties.--Oriented rock samples from approximately 125 field localities were collected to measure magnetic susceptibility and remanent magnetization. which aid in the interpretation of the aeromagnetic map (pl. 2B). Hand specimens were oriented in the field by Brunton compass and brought into the laboratory for coring. Errors in the azimuth of the remanent magnetization are to be expected from this method of sample orientation. In addition, the dip and strike of a formational unit at the outcrop could not be determined in many instances and, although most of the stratigraphic units in the area are essentially flat lying, some scatter in the inclination and azimuth of the remanent magnetization is to be expected. Finally, none of the specimens was demagnetized to remove the effects of lightning strikes or of the earth's magnetic field during recent geologic time. The data obtained should thus be regarded as only approximate in nature. Our interest was primarily in the polarity and intensity of the remanent magnetic field relative to the induced field. Table 3 lists the properties of the various units sampled. Where an adequate number of samples of a given unit was collected, quantitative means are given. For those units from which only a few samples were collected, ranges of values are presented. Both normal means and the antilogarithms of mean log normal distributions are given. The latter have the advantage of suppressing the effect of extreme values in one or two samples from a geologic unit.

Table 3.--Magnetic properties of rocks[1] from the Gila study area

[k_n, M_n, and Q_n, normal mean; k, M, and Q, antilogarithm of mean log-normal distribution; decl., declination measured clockwise from north; incl.[2], inclination measured positive downward from horizontal; susceptibility in emu/cc; magnetism in emu; angles in degrees]

Map unit	No. of samples	Magnetic susceptibility $k \times 10^4$	$k_n \times 10^4$	Remanent magnetism $M \times 10^4$	$M_n \times 10^4$	Koenigsberger ratio[3] Q	Q_n	Total magnetization $M \times 10^4$	$M_n \times 10^4$	decl.	incl.
Tob	NO DATA										
Tba[4]	30	0-40.8		0.8-590.0		1.0-830.5		0.8-589.7			+63 to -64
Try	1	---	3.1	---	1.7	---	1.1	---	---	---	+58
Tbc[5]	12	1.3	2.1	1.1	5.2	1.6	5.8	1.5	5.4	136	+32
Tro (Jerky Mts)	10	0.8	1.5	13.2	40.6	32.2	78.5	11.7	40.5	194	-67
Tro (Fanney[6])	3	0-1.2		0.4-19.6		173.0-180.0		0.9-19.6		---	+
Tmc[6]	2	11.4-16.0		20.1-52.4		3.4-6.4		24.0-46.4			+ and -
Ts	5	1.6	1.9	36.0	42.1	43.3	63.2	35.8	42.1	311	-17
Tas	13	0.5	2.5	1.7	4.6	6.8	15.1	1.4	3.5	160	-37
Tsp	7	1.6	2.5	7.5	8.4	9.4	33.4	6.3	7.3	180	-47
Tdc[6]	3	0		3.6-4.2		---	---	3.7-4.2		---	+
Tfc[7]	1	---	0	---	2.7	---	---	---	2.7	---	-35
Tc	13	0.8	6.1	3.1	9.1	7.9	20.4	2.9	7.7	169	-26
Tgf	6	12.3	15.2	13.2	19.1	2.1	2.7	17.4	22.3	75	+66

Table 3.--Magnetic properties of rocks[1/] from the Gila study area--Continued

Map unit	No. of samples	Magnetic susceptibility $k \times 10^4$	Magnetic susceptibility $k_n \times 10^4$	Remanent magnetism $M \times 10^4$	Remanent magnetism $M_n \times 10^4$	Koenigsberger ratio[3/] Q	Koenigsberger ratio[3/] Q_n	Total magnetization $M \times 10^4$	Total magnetization $M_n \times 10^4$	Total magnetization decl.	Total magnetization incl.
Trc	NO DATA										
Tlc	NO DATA										
Thg	NO DATA										
Tva	25	4.6	9.6	9.1	17.6	3.9	9.0	9.6	16.3	138	-34
Tadpole Ridge	6	1.5	2.3	21.0	24.2	27.4	31.5	20.3	23.3	99	-73
Trb	NO DATA										
Older andesites	8	7.8	10.4	7.6	10.4	1.9	4.6	12.5	14.1	292	+68

1/ None of the samples has been demagnetized.

2/ Both declination and inclination relate to total magnetization not to remanent or induced magnetization alone.

3/ The Koenigsberger ratio is the ratio of remanent to induced magnetizations of the sample.

4/ Represents several different stratigraphic units, therefore only ranges are stated.

5/ All samples of Tbc display reversed remanent magnetization.

6/ Too few samples for significant means, therefore only ranges stated.

7/ Single sample only.

Because of the reconnaissance nature of the geologic mapping, at least two stratigraphic units that were sampled are believed to contain materials from eruptive centers that were active at different times. The more conspicuous of these are the late andesitic rocks, undivided (Tba). This unit, as noted in another part of this report, includes the following formations of Ferguson (1927), Elston (1968), and Rhodes (1970): Last Chance Andesite, Mogollon Andesite, Wall Lake Latite, Bearwallow Mountain Basalt, and Double Springs Andesite. Approximately 25 oriented samples were collected from the late andesitic rocks and they are about evenly divided as to polarity of remanent magnetization. The susceptibilities of most are moderately high, as would be expected from their intermediate to mafic composition, but calculated values for the total magnetization (the vector sum of the calculated induced and measured remanent magnetizations) reveals that a variety of anomalies might be expected from large bodies of these rocks. These anomalies could range, theoretically, from strongly positive, to undetectable, to strongly negative ones.

The other map unit that displays approximately equal division as to polarity is Tro, the older rhyolites. Unfortunately, there are too few samples to draw statistically meaningful distinctions, but the limited data at hand suggests that the polarity of the Jerky Mountain Rhyolite of Elston (1968) is negative, whereas the 3 samples of Fanney Rhyolite of Ferguson (1927) are positive. If further sampling substantiates this apparent difference, one might expect either positive or negative anomalies from bodies of the older rhyolites.

Interpretation of magnetic anomalies.--The 19 magnetic anomalies that were selected for further study are identified on plate 2B by shading, and the ones which are regarded as potentially significant are labelled by letter and discussed below. Lows, as well as highs, were studied because of the observation of Brant (1966) that Laramide porphyry intrusives in the Southwest generally are characterized by relatively weak magnetism and appear as magnetic lows against the background of their enclosing rocks. An anomaly was considered to be significant if: 1) its configuration suggested a body with at least moderate vertical extent; 2) it did not correlate well with the surface geology in terms of either the properties of the surface rocks or the estimated depth to source; 3) it seemed to correlate with geochemical anomalies; or 4) it correlated with gravity anomalies. Special weight was given to criterion 3.

The general magnetic anomaly pattern (pl. 2B) seems to show little correlation with the gravity pattern (pl. 2A) as illustrated by the axes of the principal gravity highs that are shown on the aeromagnetic map. There is,however, a crude areal correlation of the northwest-trending gravity high in the south-central part of the map with the zone containing magnetic anomalies B, C, and D. This zone is regarded as the most economically significant one on the map and we believe that all of the labelled anomalies within it may represent individual blind plutons that are part of the larger batholithic body indicated by the gravity data. Although we interpret this larger body to be granodioritic, quartz dioritic, or even gabbroic in composition, on the basis of its apparent density, it does not have a strongly positive magnetic expression, which may be attributed to several possible causes, including alteration, pervasive shearing, the relatively low topography that characterizes much of the mountain front, and/or the relative abundance of weakly magnetic rocks or rocks with a total magnetization of negative polarity in the surface geology.

Anomalies A, H, and I in the eastern part of the map, occur in a broad zone that lies on the trend of Elston's (1968) Santa Rita-Hanover axis. The gravity data suggest the existence of a north-trending topographic or structural high along this zone and the magnetic data were studied with this in mind. The northwest-trending magnetic high that occurs within this zone at the north edge of the map may also reflect this axis as it appears to have a moderately shallow source (200-300 m). We have no geological, geochemical, or gravity data from its general vicinity, however, and are thus unable to judge its true significance.

Discussion of individual anomalies

A. Anomaly A is a strong magnetic high in the southeastern part of plate 2B, with an amplitude of approximately 340 gammas. Its peak is centered on Sapillo Creek at the mutual junction of State Highways 25, 61, and 527. Although its long axis is parallel to, and in most places coincident with, the course of Sapillo Creek, it has no apparent relationship to the local topography. The western end parallels the canyon of the Gila River. Interpretations of depth to the top of the anomaly source place it approximately 600 m below the surface near the highway junction. Farther west, near the Gila River Canyon, the source is apparently shallower.

The coincidence of the eastern part of this positive magnetic anomaly with outcrops of the volcanic complex of Alum Mountain, including the north-trending magnetic spur with a peak value of 677 gammas, suggests that the source for the anomaly is related to the rocks of this complex, and to the hydrothermally altered rocks and anomalous geochemical concentrations associated with them. But the hydrothermally altered rocks and geochemical anomalies within them are believed to be related to small rhyolitic intrusive bodies that cut the complex of Alum Mountain, and both the intrusives and the rocks of the complex have magnetic properties (table 3) which indicate that they should produce a negative magnetic anomaly. This would seem to invalidate a relationship between the source of the positive magnetic anomaly and the rhyolitic intrusions and altering and mineralizing fluids, but a relationship between all three still is possible if the rhyolitic intrusions are altered equivalents or differentiated bodies with different magnetic properties than a shallow source pluton. Regardless of the unexplained discrepancies, we consider this to be one of the more significant magnetic anomalies in the area from the standpoint of mineral potential.

B. The northern part of a rather inconspicuous, elongate northwest-trending magnetic high is located just south of the confluence of Brock Canyon with the Gila River. The Gila fluorspar district is in the northwestern part of this anomaly. The general area of the anomaly coincides with exposures of the volcanic complex of Brock Canyon and an estimate of depth places the anomaly source within a hundred meters or so of the surface. Unfortunately, no oriented samples of the Brock Canyon complex were collected and thus its magnetic properties are not known. By analogy with anomaly A, we suggest that the anomaly arises from a small, northwest-trending pluton which may have been the source for the fluids which altered the rocks of the complex. Geochemical anomalies which cluster in the area just northwest of magnetic anomaly B support this interpretation.

C. Anomaly C is one of 4 magnetic anomalies that form a northwest-trending zone near the crest of the gravity high and is thus one that may have important economic significance. All but the steep northeast flank lies over the Gila Conglomerate of the Mangas trench and depth estimates of its source place it at approximately 25 to 300 m below the surface. The configuration of the anomaly is characteristic of a small pluton. The fluorite veins of Rain Creek occur on its northeast flank. Overall, it correlates in moderate degree with geochemical anomalies of several elements, and the correlation becomes stronger toward its northwest end (see table 7). If the source of anomaly C is actually a pluton, this body occurs within the bedrock beneath the Gila Conglomerate. Gravity anomaly 2B bulges slightly in the area of magnetic anomaly C, suggesting a small, but local, increase in density.

D. Anomaly D trends east-west across the grain of the surface geology. The axis of the major gravity high crosses it diagonally and the crest of the gravity high bulges locally (gravity anomaly 2C) in its vicinity. The northwestern corner of anomaly D is underlain by the intrusive(?) rocks of Holt Gulch. The source of the anomaly appears to be in the shallow subsurface and could readily be this intrusive rock. Unfortunately, we collected no samples from which magnetic properties could be measured, so this must remain a speculation at present. Table 7 indicates that anomaly D has a stronger affiliation with anomalous concentrations of metals than any other anomaly on the map (a strong correlation with 9 geochemical elements and a moderate correlation with 4 others). It is therefore regarded as significant and deserving of further study.

E. Anomaly E, which overlies the town of Alma, New Mexico, occurs above the Gila Conglomerate and other valley fill alluvial deposits. It has an apparent source depth of between 100 and 800 m, depending on what one assumes for the configuration of the source. Its broad, flat top is not suggestive of a body with great vertical extent and it may conceivably represent a tabular body within the conglomerate. Nevertheless, like the other anomalies within the northwest-trending zone of magnetic anomalies it is considered to be of possible economic significance. Geochemical sampling and geologic studies are needed to further assess the mineral potential of this anomaly.

F. Anomaly F lies outside the area that was mapped geologically in the course of this study. It has an amplitude of approximately 600 gammas, making it one of the strongest on the map. Although it shows an inverse correlation with topography in its northeastern part, there is no correlation between the two toward the southwest. The top of the source appears to range in depth from the shallow subsurface to approximately 500 m, depending on location. Because anomaly F extends southwestward into the Mogollon District, it may be worthy of further investigation.

G. Anomaly G cuts north-northeastward across the regional grain, roughly coincident with positive gravity anomaly 2D. It is underlain predominantly by the extrusive-intrusive complex of older rhyolites (Tro) and the Bloodgood Canyon ash-flow tuff (Tbc), but throughout its length, scattered exposures of the andesite and latite flows of Gila Flat(?) (Tgf?) are seen (fig. 22). Table 3 indicates that a total magnetization contrast of nearly 30×10^{-4} emu exists between the Gila Flat(?) rocks and the Jerky Mountains Rhyolite and preliminary calculations show that as little as 300 m of the Gila Flat(?) rocks, if isolated, would account for the anomaly. However, the highest exposures of the flows of Gila Flat(?) are at an altitude exceeding 2,600 m, whereas the top of the magnetic body is estimated to be below 1,700 m, and hence well below the surface. Thus, magnetic anomaly G may arise from an intrusive hidden beneath the Gila Flat(?) rocks. If so, its emplacement may have been responsible for elevating the Gila Flat(?) rocks, or alternatively, it may have been emplaced passively beneath a pre-existing structural high.

H. Anomaly H occurs over flat-lying and extensively faulted late andesitic rocks, Gila Conglomerate, and Bloodgood Canyon Rhyolite. Its source appears to be at relatively shallow depth (150-300 m). A single hot spring occurs near the center of the anomaly. Because it shows a weak to moderate correlation with six geochemical elements, it may be deserving of further study.

I. Anomaly I is a gentle-flanked feature with approximately 75 gammas of local relief. It occurs over a plateau underlain by Gila Conglomerate, late andesitic rocks, and Bloodgood Canyon Rhyolite. The source depth is approximately 350 to 400 m. The axis of gravity anomaly 1D trends northward through this magnetic anomaly. Locally hot springs issue from the Bloodgood Canyon Rhyolite tuff in an area crossed by several faults of the Gila Hot Springs graben. Altered rocks occur nearby. There is a weak areal correlation between this anomaly and concentrations of three elements. Because of these facts, and the occurrence of the anomaly along the northward prolongation of the Santa Rita-Hanover axis, it is regarded as deserving of further study, both geophysical and geochemical.

Mineral resources appraisal

The purpose of this study is to appraise the mineral resources of the Gila Wilderness and Primitive Area. Mineral resources may be a factor in the legislative decision that will determine if the Primitive Area is to be added to the National Wilderness Preservation System. The Gila Wilderness, on the other hand, is already part of the system, and the mineral appraisal in the Wilderness is more of a mineral resources inventory to help guide administration of the wilderness, particularly in the period prior to 1984, when claim staking is permitted by the Wilderness Act of 1964.

In a broad sense, thestudy area seems a prime target for metallic and nonmetallic minerals exploration. It is within a major volcanic field near the intersection of regional tectonic trends; major deposits of copper, gold, silver, lead, zinc, iron and manganese are nearby; and evidence of hydrothermal alteration and mineralization is widespread. These and other factors indicate that the study area is not a likely site for mineral fuel resources of coal, oil, gas or uranium. A potential may exist for developing geothermal energy resources within the study area. The main regional factors that enhance the possibilities for metallic mineral resources of the study area include: 1) its location in one of the four major areas of igneous rocks at the margin of the Colorado Plateaus structural province; 2) its position on and adjacent to major structural trends, which comprise several intersecting fracture systems; 3) its position within several so-called metal or metallogenic provinces.

A spatial association of ore deposits with the Tertiary volcanic areas at the margins of the Colorado Plateau (fig. 6), was recognized by Butler (1929), and more recently has been emphasized by Noble (1970, p. 1607), who notes this feature in considering metal provinces of the Western United States as follows: "The combined metal provinces of the Western United States make a crude raylike pattern around the Colorado Plateau, localized at four thick piles of Tertiary volcanic rocks". Whether the ore deposits occur in these areas because they are derived from the igneous magmas that fed the volcanic areas, or because of the tangential orogenic belts that bound the Colorado Plateau (Schmitt, 1966, p. 21) or some other process, related or unrelated to the origin of the Plateau, is not yet understood. The ore deposits are of more than one age and in fact, most of the deposits are older than the middle to late Tertiary volcanic rocks that predominate in the main volcanic areas. This suggests that there is a more fundamental control on ore deposition than the igneous rocks themselves. Whatever the cause, the associative relationship cannot be ignored as a first order criterion for selecting areas of greater than average mineral resource potential.

Structural intersections are of basic importance in localizing ore deposits, and extraordinary significance is accorded to them in many minerals exploration programs. Particular attention has been given by some students of ore deposits to the large scale orogenic or tectonic features that are believed to cut deeply into the earth's crust, and thereby provide access for rising igneous magmas that may themselves be the source of ore materials, or tap more directly theoretical sources of metals in the earth's mantle (Kutina, 1969). That many ore districts occur at "crossroads" where orogenic belts intersect (Billingsley and Locke, 1941) is a familiar thesis in the ore-finding profession. The Gila study area is within a region of multiple structural intersections of fracture systems of diverse trends. Structural lineaments or trends in or adjacent to the study area have been described by Mayo (1958) and Schmitt (1959), both of whom attach special significance to the Texas Lineament, which they infer to more or less bound the Mogollon volcanic area on the south. The Texas Lineament is a controversial major transcurrent feature of the earth's crust that trends about east-west from the Trans-Pecos region of West Texas to the Transverse Ranges of the California coastal region, and has even been projected eastward to the northern coast of Brazil (Baker, 1933, 1935). Some of the evidence related to this inferred structure is discussed with reference to the regional geologic setting of the study area in preceding pages of this report. Six structural lineaments in the Mogollon region were recognized by Mayo (1958, figs. 2, 3): the nearly east-west Texas Lineament zone; a northwest trending, southwestern New Mexico belt;

northeast trending Santa Rita and Morenci belts; and north-south Peloncillo and Cordilleran Front belts. Although Mayo indicates that the southwestern New Mexico belt is obscure in the Datil volcanic field in the Mogollon region, little detailed information was available when he made his study; subsequent work including the present studies show that northwest-trending faults predominate in the southwestern part of the Datil field including the study area. Morenci, Mogollon, Santa Rita, Tyrone, and Magdalena are major ore-producing districts in the vicinity of the Gila study area that are located at multiple lineament intersections, according to Mayo (1958, p. 1174).

The concept of metallogenic or metallographic provinces dates back at least to the beginning of this century (Burnham, 1959, p. 2-6); it implies that metals, singularly or in combinations of elements having similar chemical and physical properties, occur in belts and provinces with abnormal concentrations of metal or metals of similar origin. A prime example is the southwest copper province in Arizona and southwestern New Mexico (Schmitt, 1959). Metal provinces, as used by Noble (1970, p. 1607) are areas containing concentrations of a particular metal, or metals, without regard to origin, in contrast to metallogenic provinces which contain concentrations with related origins. The Gila Study Area is within the northeast extension of a multimetal province that includes major production and reserves of lead, zinc, molybdenum, silver, gold, and copper (Noble 1970, figs. 1, 3-10). A separate copper province map by Noble shows that the study area is within an open-ended rectangular area that contains approximately 72 percent of the past copper production and future reserves of the Western United States (Noble, 1970, fig. 3, p. 1614). The importance of copper in the total mineral picture of this area is increased because major amounts of other metals, such as gold and molybdenum, occur as by-products.

In most of the study area, only the upper volcanic levels are exposed, whereas most large ore deposits, particularly the disseminated copper and molybdenum deposits, form in lower volcanic levels, or in the intrusive zone below. For example, the major areas of mineralized and altered rocks in the Gila study area are seen where the middle Tertiary volcanic rocks are tilted up along the front of the Mogollon Mountains, exposing the root zone of the intrusive rhyolites. Similar altered and mineralized areas should be expected at the comparable volcanic levels in other parts of the study area, particularly in the caldera ring fracture zones, and economic ore deposits may be present at still deeper levels.

Implicit in this discussion is the need to assess the probability of mineral deposits that may be buried beneath the mid-Tertiary volcanics now exposed over most of the study area. Such deposits could have the form of disseminated mineralization in intrusive bodies of Laramide age, or in veins and replacement deposits in older volcanic rocks and Paleozoic rocks. Present geologic and exploration techniques are not adequate to assure us a thorough look through the mask of younger volcanic rocks, particularly in a reconnaissance study such as this, and our appraisal must involve the general geologic history of the study area and its surroundings, supplemented by geophysical and geochemical studies. From the regional point of view, we know that major disseminated copper deposits occur in Late Cretaceous-Early Tertiary (Laramide) stocks at Santa Rita, Hanover-Fierro, Tyrone, and Morenci, all within 50 miles of the study area. These deposits, and associated vein and metasomatic deposits of lead, zinc, and iron, were once buried by younger volcanic rocks like those that now cover most of the study area, and thus similar mineralized bodies may occur beneath the middle Tertiary volcanic rocks within the study area. The Santa Rita and Hanover-Fierro stocks appear to have been intruded along the crest of a Cretaceous structural high (Santa Rita axis of Elston, 1968, pl. 1) that projects northward beneath the eastern part of the study area (p. 151).

The relative importance of different factors in determining the localization of major mineral deposits is a controversial subject, and this fact points up the limitations in the present state of the art and science of minerals exploration. However, each of the approaches discussed in the preceding paragraphs indicates that the Mogollon volcanic area has a much greater than ordinary mineral potential on a regional basis.

In summary, whereas virtually no reserves of mineral resources of presently economic value can be measured over 90 percent of the study area, the potential for discovery of such resources at depth somewhere in the study area seems good. Minable fluorspar deposits, anomalous concentrations and noneconomic deposits of gold, silver, lead, zinc, copper, tellurium, tin, meerschaum, alum and clay are known within the study area, and possible buried ore deposits could contain these and other commodities.

Oil, gas and coal.--The study area has not attracted exploration for fossil fuels in the past, and there is no reason to encourage such exploration. The section of Paleozoic and Mesozoic sedimentary rocks adjacent to the study area is thin and pervasive igneous activity throughout the area has resulted in complex volcano-tectonic structures that are not encouraging targets. Isopachous and facies maps by Kottlowski (1965a,figs. 2, 10, 11) show 2,000-3,000 feet of Paleozoic strata and little or nor Cretaceous strata beneath the study area. Pre-Pennsylvanian rocks, about 1,800 feet thick in the Silver City area, are believed to pinch out less than 30 miles north of Gila Hot Springs (Foster, 1964). The nearest oil tests are located about 70 miles north and 50 miles east of the study area, and the nearest reported occurrence of coal is in the Engle field, 50 miles east of the study area in Sierra County (Kottlowski, 1965b, p. 114).

Geothermal energy

A northwest-trending belt of thermal springs within the complex arcuate Gila Hot Springs graben (pl. 1B), indicates a possible geothermal energy resource in the Gila study area. Many of the springs toward the southeast end of the belt are on private land, but within the wilderness thermal waters issue from 3 openings at The Meadows, 4 openings above Big Bear Creek, and 3 openings just inside the wilderness boundary along the Middle Fork of the Gila River. Two other springs within the graben are in tract 1 of the Gila Primitive Area on the north side of the East Fork of the Gila River above Lyons Lodge. The thermal waters range in temperature from less than 90° F. to more than 150° F. (W. K. Summers, personal commun., 1970).

Gila Conglomerate and other porous rocks within the Gila Hot Springs graben conceivably might be suitable reservoirs for a possible steam field were they properly situated with respect to heat source, ground water, impermeable cap, and other requirements. However, the Gila Conglomerate, though several hundred feet thick in parts of the graben, is above the water table along most of the Middle Fork, and outcrops of basalt and Bloodgood Canyon Rhyolite of Elston beneath the conglomerate in several places from the mouth of the West Fork to the mouth of the East Fork indicate that there is no great thickness of conglomerate below the water table in that part of the graben. Seemingly, therefore, the Gila Conglomerate in the Gila Hot Springs graben is not a suitable reservoir rock for a significant geothermal steam field, particularly within the confines of the Gila study area. However, the exploration necessary for even a preliminary evaluation of this potential energy resource has not been done. One other area of thermal waters within the wilderness has been reported along upper Mogollon Creek (Summers, 1968), but this occurrence has not been verified.

Metallic and nonmetallic mineral resources

Evidence of significant mineralization is confined largely to the periphery of the study area, from the south end of the Mogollon district at Whitewater Creek to the Gila River, but important mineral targets also cross the wilderness and primitive area boundaries in the Copperas Canyon and Alum Mountain areas, and penetrate the most rugged part of the wilderness along Big Dry Creek to its headwaters in the Spruce Creek-Spider Creek area (pl. 1A).

Gila Primitive Area.--The various tracts of the Gila Primitive Area are numbered on figure 3. Tracts 1-3 include parts of the Alum Mountain and Copperas Canyon altered and mineralized windows (pl. 1B), which represent important targets for metallic mineral exploration. Elsewhere, tract 1 is largely devoid of evidence of significant mineralization although meerschaum was once produced from the Salt Creek area north of Sapillo Creek (Northrup 1959, p. 455), and scattered metal values, mainly along Apache Creek, are slightly higher than background. Tracts 4, 5, and 6 along the northern edge of the wilderness, and adjacent parts of the study area show little evidence of significant mineralization; scattered metal values in these areas are above arbitrary threshold values, but most of the anomalous values are related to domal rhyolite lavas in the vicinity of Indian Creek (pl. 1B), and probably represent no more than minor concentrations of relatively mobile metals near volcanic vents. Tract 7 includes numerous mineralized structures along Big Dry Creek and Little Dry Creek; it is part of one of the more heavily mineralized areas in the zone of mineralization that extends along the range front from the Mogollon district to the Gila River. Tract 8 is part of the same zone, and the northern part contains mineralized structures bearing fluorite, barite, manganese, and traces of other metals; more than 90 percent of tract 8 is covered by alluvial deposits that may be masking additional mineralized structures. Tract 9 is adjacent to the Gila fluorspar district, which is one of the main targets for exploration for fluorite and metallic mineral deposits in the study area. Although most of tract 9 is outside the area of altered and mineralized rocks of the fluorspar district, strong calcite veins as much as a few feet wide were observed along faults within the primitive area and wilderness west of Turkey Creek and north of Adams Gulch (Watson Canyon) and Indian Canyon (pl. 1A), and the mineralized rocks of the fluorspar district could extend beneath adjacent parts of the primitive area. In summary, most of tract 1 of the Gila Primitive Area and tracts 4, 5, and 6 show only slight evidence or no evidence of significant mineralization in the surface rocks. However, the western part of tract 1 and tracts 2, 3, 7, and 8 show abundant signs of mineralization and have had some past minerals exploration (pl. 3) and production. The mineralized areas in and adjacent to tracts 2, 3, 7, 8, and 9 are potential exploration targets for major mineral deposits.

Gila Wilderness.--The greatest apparent potential for mineral resources in the present (1972) Gila Wilderness is the possible occurrence of blind deposits of Laramide age beneath the cover of Middle Tertiary volcanic rocks or deposits related to subvolcanic intrusive rocks of middle-Late Tertiary age. Such potential cannot be assessed adequately merely by examining the surface geology. No doubt a more detailed geochemical survey or more detailed geophysical work would be helpful in isolating possible target areas. In a more near-surface environment, our studies have found evidence of possibly significant mineralization within the wilderness mainly in the Big Dry-Spider-Spruce Creeks area, and in certain areas along the present wilderness boundary adjacent to primitive area tracts 1, 2, 3, 7, 8, and 9, particularly from Little Dry Creek to Haystack Mountain.

The Big Dry Creek drainage contains the only major concentration of mineralized structures within the wilderness, but individual targets are difficult to define. Mineralized structures occur from the Uncle John Mine, at the southern boundary of the wilderness, to the Silver Drip claims near the head of Big Dry Creek. Except for the Uncle John vein, however, the exposed structures are only weakly mineralized and no extensive areas of intensely altered rock were found that might help define specific targets for additional exploration. Nevertheless, the surface indications of mineralization are certainly sufficient to warrant further more detailed investigation.

The areas of greatest interest near the wilderness margins are: 1) that part of the Alum Mountain complex that extends into the wilderness west of the Gila River and Alum Mountain, and some weakly mineralized faults exposed along the Gila Canyon between Alum Mountain and the mouth of Sapillo Creek; 2) along the faults at the range front south of the Mogollon district from Whitewater Creek to Holt Gulch and around to Sheridan Gulch. Most of the mineralized or potentially mineralized faults are within a mile inside the wilderness boundary. Calcite veins as much as 10 feet or more wide, occupy range-front faults in this vicinity; a few of these veins dip beneath the wilderness area, and the traces of some cut back and forth across the zig-zag wilderness boundary. The fluorspar deposit currently being redeveloped at the Huckleberry property in Little Whitewater Creek appears likely to extend beneath the present wilderness (pl. 1A); 3) mineralized faults at the edge of the wilderness from north of Haystack Mountain to Seventyfour Mountain (pl. 1A). These include mainly the Fairview and Alexander prospects northwest of Haystack Mountain and prospects in Copper Canyon north of Haystack Mountain, and fluorspar veins on Seventyfour Mountain.

Certain members of the zeolite group of minerals are valuable because of their ion-exchange capacities. Zeolite-cemented, reworked tuffaceous silt and sandstone occur in the southeastern corner of the Gila Wilderness, in thin beds in the lower part of the Gila Conglomerate along Spring Canyon, north of Sapillo Creek. However, the observed beds do not contain sufficient pure zeolite to be of economic value, and the dominant fluvial character of the Gila Conglomerate makes it unlikely that pure zeolite beds are present.

Geochemical studies

A reconnaissance geochemical sampling program was conducted to supplement the geologic studies in appraising the mineral resources potential of the Gila study area. Geochemical studies are used to define areas of greater than average minerals potential by detecting trace amounts of metals dispersed around mineral deposits. Elements that prove to be useful in this manner are called indicator elements, and they may differ from one deposit to another. Primary dispersion patterns may have the form of halos surrounding veins or other types of ore bodies; secondary dispersion patterns may be revealed in the sediments of streams that drain a mineralized area. Geochemical studies are intended to test the relative favorability of an area and should not be used for economic appraisal of a given deposit. Specific samples to be used in estimating grade and tonnage of individual veins or deposits were taken by the engineers of the U. S. Bureau of Mines, and will be discussed in a subsequent section of this report.

Sampling procedures.--About 1,550 stream sediment samples (figs. 24, 25), and more than 1,000 rock samples (figs. 26, 27), were collected for analysis from all over the study area. Stream sediment samples consist of the finest alluvium available, which commonly was sieved to minus 80 mesh at the sample site if dry material was available. In the larger stream beds, an attempt was made to collect the fines from beneath boulders and to collect comparable material for each sample. However, this ideal could not always be achieved because of the highly variable character of the sediment in different parts of a stream bed and the lack of appreciable fine sediment in many steep-walled tributary canyons. Along the major streams, and at some other localities where water was available, some of the stream sediment was panned to obtain a heavy mineral concentrate; panned samples total about 175 (fig. 25).

About 500 samples were taken of relatively fresh rock from the many different volcanic formations in the study area and about an equal number were taken of altered and mineralized rocks from veins, faults, and altered areas.

The density of sample localities shown in figures 24-27 is clearly higher in areas of altered and mineralized rocks, and thus for statistical purposes the data is probably biased in favor of mineralized samples.

Analytical procedures.--All samples were analysed by semiquantitative spectrographic methods for 30 metallic elements; in addition, gold and tellurium were analyzed by atomic absorption spectrometry, mercury by a mercury detector, and arsenic by the Gutzeit colorimetric method.

Sample preparation was tailored to sample type. Stream sediment samples were sieved to minus-80 mesh and a split for mercury analysis was taken prior to high-speed grinding to avoid loss of mercury. Panned concentrates of stream sediments were handled in several ways; the heavy minerals of some samples were further concentrated in heavy liquid separations and magnetite removed with a hand magnet. For other samples, only the magnetite was removed, and some were not modified by further treatment. Some paired samples, including a magnetic and nonmagnetic fraction of the same original sample, were analyzed. The panned concentrates were collected more for qualitative estimates of the distribution of gold and tin than for quantitative geochemical comparisons, and thus are not always included in the statistical treatment of the geochemical data. Rock samples were coarse crushed to 1/4-inch size and a split taken for slow grinding of a sample for mercury analysis. The remaining sample was ground to a fine pulp for spectrographic and other chemical analysis. Samples were scanned for radioactivity with a scintillation counter, but no anomalous radioactivity was detected in any samples from the study area.

The reliability of the analytical data is of course a major factor in its use. Although some of the analytical data presented here is probably not adequate for detailed geochemical work, it is believed to be useful as a reconnaissance tool to differentiate areas with anomalous metal concentrations from those containing only background concentrations. Certain limitations are pointed out below.

Analytical error may be significant in the semiquantitative spectrographic data, where the analytical work has been spread over a period of three years and involved several analysts working at different times and with different instruments. Some analyses made in the early stages of the study and repeated later do not compare well where the values are near the limits of detection. In addition, only a small quantity of the sample is used for any given spectrometric analysis, and inhomogeneities in the sample give a further source of error. Semiquantitative spectrographic analyses are reported in a series of steps; the reported step in the 6-step series, 0.1, 0.15, 0.2, 0.3, 0.5, 0.7, 1.0--etc., includes the quantitative value only 30 percent of the time, which is a measure of the precision of the analysis.

The lower limit of detection reported in the atomic absorption analyses for gold and tellurium (0.02 ppm and 0.2 ppm respectively) have proven to be too low to be reproducible, and the analytical data has been interpreted accordingly.

Some stream-sediment samples, particularly panned concentrates, contained insufficient material for optimum gold and tellurium analyses. For these different detection limits are indicated in the table of analyses; thus, gold detected but not measurable in a 10-gram sample is reported as (0.02)L, whereas gold detected but not measurable in a 5-gram sample is reported as (0.04)L, etc.

Availability of geochemical sample data.--Analytical data on selected metals for those samples that are believed to contain anomalous concentrations of metals above certain threshold values is given in table 4A-D. The rest of the data on all of the more than 2,500 geochemical samples are available on tape from the National Technical Information Service, U. S. Department of Commerce, Springfield, Va. 22151; tape No. DVR-521.

Table 4 A-D.--Analyses of geochemical samples having anomalous metal contents

[The threshold values in parts per million (ppm) used to determine anomalous values are as follows: Ag, L(.5); Be, 7; Bi, L(10); Cd, L(10); Cu, 100; Mn, 1,500 (not included for panned concentrates); Mo, 7; Pb, 70; Sb, L(100); Sn, 15, W, L(50); Zn, L(200) for rocks, 200 for stream sediments, and not included for panned concentrates; Au, 0.05; Hg, 0.4; Te, 0.5; As, 10, except 15 for panned concentrates. Symbols used in the tables are the following: L, detected but not measurable at the level of detection; N, not detected; B, blank, indicating that the sample was not analyzed for all of the elements included in the table; H, interference in the analysis that raised doubts concerning the reported value; G, greater than the maximum measurable value, which for Bi=1,000 ppm; Cu=20,000 ppm; Mn=5,000 ppm; Pb=20,000 ppm; Zn=10,000 ppm. Numbers in parenthesis beneath the elements in the column heads indicate the sensitivity of the method used. Analytical techniques for gold and tellurium, atomic adsorption; arsenic, gutzeit method; mercury by mercury detector; and all others semiquantitative spectrographic method. Localities are designated with reference to Township, south (T), Range, west (R), and Section (S). Sample numbers ending in A or B, as ABZ-787B, indicate that a repeat analysis was made for one or more elements in that sample]

Table 4A.--Analyses of geochemical samples having anomalous metal contents in unaltered rocks

Sample	T. S. R.	Ag (.5)	Be (1)	Bi (10)	Cu (5)	Mn (20)	Mo (5)	Pb (10)	Sn (10)	Zn (200)	Au (.02)	Te (.2)	Hg (.01)	As (10)
ABZ-779	13-12-31	L	3	L	10	300	N	30	N	N	N	L	0.28	N
ABZ-782	13-13-24	N	N	L	30	1,000	N	L	N	N	N	L	.10	N
ABZ-786	13-13-17	L	3	L	5	700	N	30	N	N	N	L	.14	N
ABZ-787	13-13-17	N	2	L	7	700	N	15	N	N	N	L	.22	N
ABZ-787B	13-13-17	B	B	B	B	B	B	B	B	B	B	B	.50	B
ABZ-791	13-13-20	N	L	L	15	1,000	N	L	N	N	N	L	.04	N
ABZ-803	13-13-29	N	2	N	30	500	7	20	N	N	N	L	.22	N
ABZ-803B	13-13-29	B	B	B	B	B	B	B	B	B	B	B	.55	B
ABZ-845B	14-13-19	B	B	B	B	B	B	B	B	B	B	B	.65	B
ABZ-858	14-13-19	.5	L	N	20	700	L	30	N	N	N	L	.30	N
ABZ-858B	14-13-19	B	B	B	B	B	B	B	B	B	B	B	.75	B
ABZ-876	14-13-30	N	2	N	20	300	L	20	N	N	N	L	.80	N
ABZ-876B	14-13-30	B	B	B	B	B	B	B	B	B	B	B	.45	B
ABZ-916	14-14-36	N	L	N	70	500	5	15	N	N	N	L	1.60	N
ABZ-954	14-12-26	N	L	N	100	1,000	N	15	N	N	N	B	.05	N
ABZ-975	14-12-25	N	L	N	100	1,500	N	L	N	L	N	L	.10	N
ABZ-994	13-11-31	N	3	N	50	300	10	30	N	N	N	L	.04	N
ABZ-996	13-12-36	N	3	N	10	500	L	30	N	N	.02	L	.50	N
ABZ-997	13-12-35	N	2	N	70	700	15	70	N	N	.02	L	.28	N
ACA-473	13-13-30	N	N	N	30	L	10	30	N	N	N	L	.06	N
ACA-691	12-13-10	L	20	N	L	200	N	15	N	N	L	L	.32	N
ACA-692	12-13- 8	.5	5	N	5	300	N	20	N	N	L	L	.22	N
ACA-693	12-13- 8	1	5	N	L	L	N	N	20	N	L	L	.40	N
ACA-697	10-14-21	.5	7	N	L	700	L	50	10	N	L	.2	.60	N
ACA-704	10-15-34	N	1	N	30	500	N	15	N	N	L	L	.40	N
ACA-706	12-13-30	N	2	N	30	500	N	20	N	N	L	.2	.70	N
ACA-709	12-19- 9	N	1	10	7	30	7	100	30	N	L	L	.22	N
ACA-896	12-18-22	N	2	N	5	300	N	20	10	N	L	L	.09	10
ACA-899	11-13-29	N	L	N	50	700	N	15	N	N	L	L	.10	10
ACA-939	12-14-11	N	10	N	5	700	N	30	L	N	L	L	.06	L
ACA-941	10-14-28	N	10	N	L	700	N	30	10	N	L	L	.03	L
ACA-953	11-16-29	N	2	N	L	300	7	20	10	N	L	L	.03	L
ACA-959	11-16-15	N	3	N	L	500	10	30	L	N	L	L	.04	L
AGR-026A	14-14-36	B	B	B	B	B	B	B	B	B	B	B	.75	B
AGR-027A	15-14- 8	B	B	B	B	B	B	B	B	B	B	B	.50	B
AGR-059A	15-14-11	B	B	B	B	B	B	B	B	B	B	B	.50	B
AGR-132	11-19-21	N	1	N	20	500	7	30	N	N	L	L	.11	N
AGR-157	11-19-33	N	3	N	7	700	N	30	N	N	L	L	.16	20
AGR-264	12-18-29	N	2	N	15	200	N	10	N	N	L	1	.08	N
AGR-304	13-13-17	.5	3	L	5	700	N	20	10	N	.02	L	.10	N
AGR-305	13-13-17	N	3	L	L	700	N	20	L	N	L	L	.12	N
AGR-312	14-13- 4	N	2	N	30	300	N	20	L	N	.06	L	.15	N
AGR-313	11-19-32	N	L	10	5	20	N	15	L	N	L	.4	.18	N
AGR-314	11-19- 6	N	2	L	L	300	N	20	L	N	L	L	.12	N
AGR-315	11-19-27	N	2	L	10	300	N	20	L	N	L	L	.10	N
AGR-316	10-19-31	N	2	L	5	500	N	20	L	N	L	L	.14	N
AGR-317	10-19-31	.5	1	L	L	300	N	15	L	N	L	L	.15	N
AGR-318	10-19-31	L	3	N	L	150	N	15	L	N	L	L	.18	N
AGR-319	10-19-32	L	3	N	5	200	N	15	N	N	L	L	.19	N
AGR-323	14-12-23	.7	3	N	L	200	N	30	N	N	L	L	.09	N
AGR-325	14-12-23	.5	1	N	L	200	N	20	L	N	L	L	.12	N
AGR-326	14-12-22	.5	1	N	L	500	N	20	L	N	L	L	.11	N
AGR-329	13-12-34	1	2	N	5	500	N	20	L	N	L	L	.10	N
AGR-330	13-12-36	.7	2	N	L	200	N	30	10	N	L	L	.07	N
AGR-335	13-12-32	1	1	N	15	500	N	15	N	N	L	L	.09	N
AGR-339	14-13-29	N	1	L	L	150	N	15	L	N	L	L	.13	N
AGR-341	12-17-31	L	3	L	L	200	N	30	L	N	L	L	.14	N
AGR-353	13-17-11	N	1	N	5	1,500	N	15	L	N	L	.2	.40	N
AGR-354	13-17-11	N	2	N	L	1,500	L	30	L	N	L	L	.30	N
AGR-357	13-17-15	N	2	N	L	1,500	L	20	10	N	L	L	.24	N
AGR-358	13-17-15	N	L	N	70	1,500	L	15	N	N	L	L	0.20	N
AGR-363	13-17-22	N	L	N	50	1,500	L	15	N	N	L	L	.18	N
AGR-410	14-16-17	N	1	N	15	500	L	15	N	N	L	L	.80	N
AGR-411	14-16-16	N	1	N	L	150	N	15	L	N	L	L	.60	N
AGR-419	13-16-36	N	2	N	L	700	L	300	L	L	L	.4	.26	N
AGR-439	14-16-20	N	1	N	5	1,500	N	10	N	N	L	L	.20	N
AGR-440	14-16-20	N	1	N	20	1,500	N	10	N	N	L	L	.54	N
AGR-442	14-16-20	N	1	N	10	1,500	N	15	N	N	L	L	.44	N
AGR-516	14-16-28	N	L	N	5	500	N	15	N	N	L	L	.03	20
AGR-539[1/]	11-19-32	N	2	N	7	300	N	20	N	N	.30	L	.03	L
AGR-547[1/]	11-19-15	N	2	N	L	300	5	15	L	N	1.50	L	.03	20
AGR-551	11-19-23	N	3	N	N	300	N	20	N	N	.06	L	.07	L
AGR-569[1/]	14-14-31	N	N	N	50	1,000	N	10	N	N	.26	L	.02	L
AGR-593[1/]	14-15-23	N	N	N	50	1,000	N	L	N	N	.28	L	.03	L
AGR-624	11-18-16	N	1	N	L	300	N	20	N	N	L	L	.05	10
AGR-644	11-18- 7	1	2	N	30	700	N	20	N	N	.02	L	.03	10
AGR-651[1/]	11-18-33	N	1	N	L	500	N	20	N	N	.18	L	.02	L
AGR-654	11-18-34	N	2	N	5	500	N	15	L	N	L	L	.07	40
AGR-671	12-18- 9	N	1	N	L	700	N	20	N	N	.06	L	.02	10
AGR-692	12-19-11	L	3	N	10	700	5	20	N	N	L	L	.06	L
AGR-701	12-18-19	N	2	N	L	200	N	20	L	N	L	L	.01	10
AGR-709	12-17- 6	N	5	N	L	300	N	30	10	N	L	L	.01	10
AGR-711	12-18- 2	N	2	N	L	300	N	20	10	N	.06	L	.01	L
AGR-731	11-18-23	N	1	N	N	700	10	20	N	N	L	L	.03	L
AGR-739	11-19-24	N	7	N	L	500	N	20	N	N	L	L	.03	L
AGR-747	11-18-17	N	2	N	L	500	N	30	N	N	L	L	.22	80
AGR-776	12-19-14	N	2	N	L	500	N	20	N	N	L	L	.03	20
AGR-783	12-19-13	N	7	N	L	300	N	15	L	N	L	L	.02	L
AGR-788	12-19-11	N	2	N	L	500	N	30	L	N	L	L	.03	10
AGR-789	12-19-13	N	1	N	5	500	N	20	N	N	L	L	.02	10
AGR-811	11-19- 6	N	2	N	20	300	N	20	N	N	L	L	.07	20
AGR-814	12-14-19	N	7	N	20	300	N	15	N	N	L	L	.07	L
AGR-836	13-15-17	N	5	N	15	300	7	15	N	N	L	L	.05	L
AGR-846	14-14-21	N	5	N	15	700	N	20	N	L	L	L	.03	N
AGR-898	14-15- 1	N	L	N	100	1,000	N	10	N	N	L	L	.03	N
AGR-925[2/]	13-15-24	N	3	N	15	500	N	15	N	N	N	L	.04	N
AGR-971	14-15-13	N	L	N	50	700	N	20	N	N	L	L	.65	N
AGR-988	14-15-13	N	L	N	100	700	N	20	N	N	L	L	.14	N
AGR-992	14-15- 3	N	L	N	50	700	N	10	N	N	L	L	.45	N
AMF-073	12-15-17	N	7	N	L	500	5	30	10	N	L	L	.02	L
AMF-158	12-15-20	N	2	N	7	500	N	70	N	N	L	L	.06	N
AMF-195	12-14-11	N	10	N	N	300	N	15	N	N	L	L	.07	N
AMF-239	13-15- 3	N	2	N	5	1,500	N	30	10	N	L	L	.06	L
AMF-276	11-14-30	N	3	N	L	500	N	70	N	N	L	L	.07	L
AMF-277	11-14-30	N	3	N	L	500	N	70	N	N	L	L	.04	L
AMF-300	12-15-29	N	3	N	L	500	7	30	10	N	L	L	.03	L
AMF-316	12-15-30	L	2	N	10	500	L	50	10	L	L	L	.14	N
AMF-347	12-15-17	N	3	N	5	500	L	100	10	L	L	L	.08	N
AMF-353	11-14-17	N	7	N	L	700	N	30	N	N	L	L	.08	N
AMF-354	11-14- 3	N	7	N	10	1,000	L	50	10	N	L	L	.10	N
AMF-357	10-14-28	N	10	N	5	1,000	L	50	10	N	L	L	.18	N
AMF-358	10-14-28	N	10	N	7	700	L	70	10	N	L	L	.28	N
AMF-360	11-15- 5	N	2	N	L	500	N	30	N	N	L	L	.60	N
AMF-363	12-16- 6	N	1	N	20	700	N	10	N	N	L	L	.80	N
AMF-366	11-16-22	N	L	N	30	700	N	15	N	N	L	L	.40	N
AMF-367	11-16- 9	N	L	N	20	700	N	15	N	N	L	L	.40	N
AMF-368	11-15- 6	L	2	N	5	700	N	70	L	N	L	L	.30	N
AMZ-001	14-15-16	N	2	N	15	700	N	100	10	N	L	L	.09	N
AMZ-003	14-15- 8	N	2	N	30	700	N	70	10	N	L	L	.11	N
AMZ-008	14-16-12	N	2	N	30	700	N	70	N	N	L	L	.07	N

1/ Au = L(0.02) on repeat analysis.

2/ W = 70 ppm

Table 4A.--Continued

Sample	T. S. R.	Ag (.5)	Be (1)	Bi (10)	Cu (5)	Mn (20)	Mo (5)	Pb (10)	Sn (10)	Zn (200)	Au (.02)	Te (.2)	Hg (.01)	As (10)
AMZ-009	14-16-12	N	L	N	100	700	N	50	N	N	L	L	0.40	N
AMZ-021	14-15-28	N	L	N	100	1,000	N	20	N	N	.04	L	.12	N
AMZ-022	14-15-28	N	L	N	50	1,000	N	N	N	L	L	L	.11	N
AMZ-029	13-13-30	N	L	N	50	700	N	10	N	N	L	L	.75	N
AMZ-070	14-16- 2	N	1	N	30	700	N	70	N	N	L	L	.12	N
AMZ-073	13-16-35	N	2	N	30	500	N	70	10	N	L	L	.18	N
AMZ-101	13-16- 5	N	2	10	30	700	N	100	10	N	L	L	.12	N
AMZ-105	13-17- 4	N	2	N	15	700	N	70	L	N	L	L	.09	N
AMZ-106	13-16-29	N	2	N	10	1,000	N	70	N	N	L	L	.11	N
AMZ-108	14-16- 6	N	L	N	30	700	N	20	N	N	L	L	.40	N
AMZ-111	14-17- 1	N	1	N	15	200	N	30	L	N	L	L	.12	10
AMZ-150	11-19- 8	N	2	N	5	500	N	20	N	N	N	L	.13	N
AMZ-163	12-18-21	N	2	N	30	100	N	30	N	N	N	L	.22	N
AMZ-185	11-19-33	N	2	N	5	200	15	20	N	N	N	.2	.16	L
AMZ-189	13-17-17	N	2	N	L	300	N	30	N	N	N	.6	.30	L
AMZ-200	11-12- 5	N	10	N	10	200	N	100	50	L	L	L	.26	L

Table 4B.--Analyses of geochemical samples having anomalous metal contents in altered and mineralized rocks

Sample	T. S. R.	Ag (.5)	Be (1)	Bi (10)	Cu (5)	Mn (10)	Mo (5)	Pb (10)	Sn (10)	W (50)	Zn (200)	Au (.02)	Te (.2)	Hg (.01)	As (10)
ABZ-701	13-13- 4	N	N	L	30	700	N	10	N	N	N	N	L	0.13	N
ABZ-702	13-13- 3	N	N	L	5	2,000	N	L	N	N	N	N	L	.15	N
ABZ-704	13-13- 3	N	L	L	15	150	N	30	N	N	N	N	L	.06	N
ABZ-749	14-13-20	N	L	L	300	150	N	20	N	N	N	N	L	.12	N
ABZ-750	14-13-20	N	L	15	30	100	7	30	N	N	N	N	L	.65	L
ABZ-751	14-13-20	L	L	15	70	50	7	L	N	N	N	N	L	.35	N
ABZ-752	14-13-20	.5	L	200	200	50	7	70	N	N	N	N	L	.70	L
ABZ-753	14-13-20	L	L	L	30	200	10	L	N	N	N	N	.8	.28	N
ABZ-754	14-13-20	N	L	50	50	50	10	20	N	N	N	N	L	.28	N
ABZ-778	13-12-31	L	3	L	15	300	L	20	N	N	N	N	L	.15	L
ABZ-792	13-13-20	N	L	L	20	70	7	50	N	N	N	N	L	.22	N
ABZ-794	13-13-29	N	L	L	5	50	7	L	N	N	N	N	L	.10	N
ABZ-795	13-13-29	N	L	N	15	15	5	10	N	N	N	N	L	1.40	N
ABZ-805	13-13-30	N	L	N	10	70	7	L	N	N	N	N	L	.18	N
ABZ-809	13-13-30	N	L	N	20	70	7	15	N	N	N	N	L	.15	N
ABZ-811	13-13-30	N	L	N	10	L	10	15	N	N	N	N	L	.18	N
ABZ-814	13-13-30	N	L	N	10	70	30	L	N	N	N	N	L	.16	N
ABZ-818	13-13-30	N	1	N	20	70	70	N	N	N	N	N	L	.90	N
ABZ-819	13-13-30	N	L	N	30	50	7	L	N	N	N	N	L	2	N
ABZ-822	13-13-19	L	L	L	30	15	10	30	N	N	N	N	L	.60	N
ABZ-823	13-13-19	N	L	15	30	20	5	10	N	N	N	N	L	.80	N
ABZ-824	13-13-29	N	L	L	50	15	7	20	N	N	N	N	L	1.40	N
ABZ-825	13-13-29	N	L	L	200	30	20	30	N	N	N	N	L	.70	10
ABZ-826	13-13-29	.5	L	N	700	50	N	N	N	N	N	N	L	.70	N
ABZ-827	13-13-32	N	L	N	30	70	7	L	N	N	N	N	L	.10	N
ABZ-829	14-13- 8	N	L	N	50	150	7	L	N	N	N	N	L	1.10	N
ABZ-832	14-13- 8	.7	3	N	15	100	30	L	N	N	N	N	L	.35	N
ABZ-833	14-13- 8	N	L	N	7	70	N	L	N	N	N	N	L	.40	N
ABZ-834	14-13- 8	N	L	N	7	70	N	L	N	N	N	N	L	.40	N
ABZ-835	14-13-20	N	1	N	30	100	7	20	N	N	N	N	L	.90	N
ABZ-851	14-14-13	N	L	N	7	15	L	20	N	N	N	N	L	2	N
ABZ-856	14-13-19	N	L	N	15	50	L	L	N	N	N	N	L	.08	10
ABZ-869	14-13-29	N	L	L	150	20	L	20	N	N	N	N	L	.14	N
ABZ-870	14-13-29	N	L	10	150	100	L	15	N	N	N	N	L	.35	N
ABZ-871	14-13-30	N	2	N	15	150	L	20	N	N	N	N	L	1.40	N
ABZ-881	14-13-29	N	2	N	5	1,000	L	L	N	N	N	N	L	1.00	N
ABZ-882	14-13-29	N	L	N	7	1,500	L	L	N	N	N	N	L	1.20	N
ABZ-883	14-13-29	N	L	N	5	70	L	30	N	N	N	N	L	2.10	N
ABZ-938	10-19-28	100	30	N	30	200	N	10	N	N	N	1.20	2.5	.15	N
ABZ-939	10-19-28	100	7	N	20	100	N	L	N	N	N	1.90	.7	.10	N
ABZ-944	12-18-29	.7	2	N	30	150	N	30	N	N	N	N	N	.04	N
ABZ-945	12-18-29	N	3	N	70	300	7	30	N	N	N	N	L	.08	N
ACA-425	13-13-29	L	L	N	150	50	10	L	N	N	N	N	L	.75	N
ACA-426	13-13-29	N	L	L	150	70	5	L	N	N	N	N	L	2.40	N
ACA-427	13-13-19	N	2	N	70	50	7	L	N	N	N	N	L	.50	N
ACA-428	14-13-23	N	N	N	100	300	N	L	N	N	N	N	L	.35	N
ACA-468	13-13-29	N	L	20	15	20	15	20	N	N	N	N	L	.03	N
ACA-472	13-13-29	N	L	N	20	30	N	20	N	N	N	N	.6	.18	10
ACA-476	13-13-30	N	N	N	30	70	7	N	N	N	N	N	L	.13	N
ACA-478	13-13-30	N	L	10	70	20	N	150	15	N	N	N	L	.16	N
ACA-480	13-13-19	N	L	10	150	15	L	30	N	N	N	N	L	.22	N
ACA-482	13-13-19	N	L	L	30	10	N	150	N	N	N	N	L	.06	N
ACA-494	14-13-17	N	L	N	500	700	L	20	N	N	N	N	L	.07	N
ACA-499	14-13-26	N	L	N	100	700	N	20	N	N	N	N	L	.04	N
ACA-602	12-19- 4	3	1	N	50	500	30	30	N	N	N	9	L	.05	10
ACA-615	12-19- 9	N	L	N	50	70	10	100	N	N	N	L	.6	.80	N
ACA-620	12-19-16	N	L	N	50	10	30	30	N	N	N	L	.6	.20	L
ACA-653	13-18-11	.7	2	N	5	100	50	15	N	N	N	L	L	.10	N
ACA-672	12-18-29	N	L	N	15	2,000	N	15	N	N	N	.04	L	.10	N
ACA-795	10-14-33	N	7	N	5	300	5	50	10	N	N	L	L	.18	N
ACA-796	10-17-33	N	L	10	5	30	30	L	N	N	N	L	L	L	N
ACA-797	10-17-33	N	L	L	5	50	70	30	N	N	N	L	L	.03	10
ACA-809	12-19- 5	N	2	N	70	1,000	N	20	N	N	500	L	L	.05	N
ACA-810	12-19- 4	N	7	N	70	700	20	15	N	N	200	.02	L	.02	N
ACA-831	13-16-26	N	7	N	30	500	L	15	N	N	N	L	L	.14	N
ACA-874	13-18- 3	.7	3	N	15	50	150	15	N	N	N	2.10	L	1.80	N
AGR-017	14-13-17	N	L	70	50	70	N	30	N	N	N	L	.4	.40	N
AGR-018	14-13-29	N	L	N	10	3,000	N	L	N	N	N	L	L	.28	N
AGR-019	14-13-29	N	L	N	15	3,000	N	15	N	N	N	L	L	.16	N
AGR-022	13-13- 3	N	L	N	10	15	N	L	N	N	N	N	L	.50	N
AGR-083	14-13- 8	N	L	N	30	15	7	15	N	N	N	L	.4	.11	L
AGR-084A	14-13- 8	B	B	B	B	B	B	B	B	B	B	B	B	.40	B
AGR-085	14-13- 9	N	N	N	50	10	5	L	N	N	N	L	1.5	.17	L
AGR-086	14-13- 8	N	1	L	20	30	5	10	N	N	N	L	L	.40	L
AGR-087	14-13- 8	N	1	N	15	30	7	20	N	N	N	L	.4	.18	L
AGR-088	14-13- 8	N	L	N	7	100	N	N	N	N	N	L	L	2	L
AGR-088A	14-13- 8	B	B	B	B	B	B	B	B	B	B	B	B	4.50	B
AGR-089	14-13- 8	N	1	N	30	50	10	15	N	N	N	L	L	.28	L
AGR-089A	14-13- 8	B	B	B	B	B	B	B	B	B	B	B	B	.50	B
AGR-090	14-13- 8	N	N	N	30	10	7	L	N	N	N	L	.3	4	L
AGR-090A	14-13- 8	B	B	B	B	B	B	B	B	B	B	B	B	4.50	B
AGR-091	14-13- 8	N	1	N	20	30	7	N	N	N	N	L	.5	.40	L
AGR-091A	14-13- 8	B	B	B	B	B	B	B	B	B	B	B	B	.80	B
AGR-092	14-13- 9	N	N	N	50	20	5	L	N	N	N	L	L	.70	L
AGR-092A	14-13- 9	B	B	B	B	B	B	B	B	B	B	B	B	.80	B
AGR-093A	14-13- 4	B	B	B	B	B	B	B	B	B	B	B	B	.40	B
AGR-094	14-13- 4	N	L	N	30	20	N	L	N	N	N	L	.4	.50	L
AGR-095	14-13- 8	N	2	N	20	20	10	10	N	N	N	L	.2	.26	L
AGR-096	14-13- 8	N	N	N	30	30	5	N	N	N	N	L	.5	.45	L
AGR-096A	14-13- 8	B	B	B	B	B	B	B	B	B	B	B	B	.40	B
AGR-097	14-13- 8	N	N	N	50	10	50	N	N	N	N	L	L	.35	L
AGR-099	14-13-20	N	2	L	7	200	10	30	N	N	N	L	L	.20	L
AGR-100	14-13- 9	N	N	N	30	70	N	N	N	N	N	L	.5	1.10	L
AGR-101	14-13- 9	N	N	N	20	30	10	N	N	N	N	L	.6	.18	15
AGR-103	14-13- 9	N	N	N	10	30	20	N	N	N	N	L	.7	.24	L
AGR-105	14-13- 9	N	N	N	100	20	7	10	N	N	N	L	4	.18	L
AGR-106	14-13- 8	N	N	N	100	20	20	10	N	N	N	L	.4	.22	150
AGR-108	14-13-17	N	N	30	30	70	5	30	N	N	200	L	1	.16	10
AGR-109	14-13-17	N	N	N	10	200	N	15	N	N	N	L	2.3	.14	L
AGR-110	14-13-17	N	L	L	50	100	5	15	N	N	L	L	2.3	.22	L
AGR-111	14-13-17	N	L	N	50	200	N	20	N	N	N	L	1.4	.19	20
AGR-131	11-19-20	N	L	N	5	2,000	N	N	N	N	N	L	L	.19	L
AGR-154	11-19-32	N	L	10	50	100	N	70	N	N	N	L	4.6	.14	L
AGR-155	11-19-32	N	N	N	10	10	20	10	N	N	N	L	L	.35	N
AGR-176	11-19- 5	N	2	N	15	300	15	30	N	N	N	L	L	.07	10
AGR-190	11-19- 4	.7	5	N	30	150	N	10	N	N	N	.02	L	.20	80
AGR-197	11-19-28	L	3	N	20	150	N	15	N	N	N	L	L	.10	N
AGR-204	11-19-29	.5	2	N	10	100	N	15	N	N	N	L	L	.07	N
AGR-205	11-19-29	N	2	N	L	3,000	N	10	N	N	N	3.50	L	.10	10
AGR-207	12-19- 3	N	2	N	L	3,000	N	20	N	N	N	.02	L	.10	80
AGR-208	12-19- 3	N	2	N	L	5,000	N	15	N	N	N	L	L	.10	100
AGR-212	12-19- 9	N	L	N	50	70	N	20	N	N	N	L	2	.10	10
AGR-214	12-19- 9	N	L	N	70	1,500	N	15	N	N	N	L	.3	.05	N
AGR-215	12-19- 8	N	1	N	10	200	10	15	N	N	N	L	.8	.03	N
AGR-221	12-19- 9	N	1	N	20	150	10	L	N	N	N	L	L	.40	N
AGR-223	13-18-11	N	2	N	L	G	N	10	N	N	N	L	.3	.08	10
AGR-224	12-18-11	N	L	N	15	5,000	N	10	N	N	N	L	L	.06	N
AGR-228	12-18- 7	L	1	N	15	100	N	10	N	N	N	L	.3	.05	N
AGR-230	12-18- 7	.5	2	N	20	150	10	150	N	N	200	L	2	.04	10
AGR-231	12-18- 7	3	1	N	1,000	700	100	7,000	N	N	2,000	.04	11	.40	N

Table 4B.--Continued

Sample	T. S. R.	Ag (.5)	Be (1)	Bi (10)	Cu (5)	Mn (10)	Mo (5)	Pb (10)	Sn (10)	W (50)	Zn (200)	Au (.02)	Te (.2)	Hg (.01)	As (10)
AGR-232	12-18- 7	1.5	2	N	20	1,000	5	700	N	N	500	L	1.5	0.10	N
AGR-233[3/]	12-19-12	2	2	N	20	1,000	200	5,000	N	N	5,000	L	.6	.05	N
AGR-234[4/]	12-19-12	100	1	N	2,000	300	10	G	N	N	G	L	4	.20	N
AGR-238	12-19-13	.7	3	N	30	2,000	N	500	N	N	200	.10	.6	.20	N
AGR-242	12-19- 4	.7	2	N	20	700	70	100	N	N	N	L	1.2	.60	N
AGR-243	12-19- 4	L	2	N	20	300	N	20	N	N	N	L	.4	.05	N
AGR-244	12-19- 4	.5	N	20	30	70	N	100	N	N	N	L	2.2	.05	80
AGR-245	12-19- 4	N	L	L	30	30	N	100	N	N	N	L	3	.05	N
AGR-246	12-19- 4	L	N	N	50	100	20	N	N	N	N	L	1.4	.07	L
AGR-247	12-19- 4	N	N	N	10	L	N	50	N	N	N	L	.7	.10	N
AGR-248	12-18-29	.5	1	N	20	70	100	N	N	N	N	L	.4	.20	L
AGR-249	12-18-29	N	2	N	1,000	100	N	20	N	N	N	L	1.8	.30	N
AGR-250	12-18-29	N	2	L	70	70	10	150	N	N	N	L	1.2	.10	80
AGR-251	12-18-29	N	2	10	150	70	70	100	N	N	N	L	2	.10	L
AGR-253	12-18-20	5	3	N	2,000	2,000	N	1,500	N	N	300	L	.8	.09	N
AGR-259	12-18-29	N	N	10	50	100	20	50	N	N	N	L	2.5	.09	N
AGR-260	12-18-30	N	1	N	15	70	5	L	N	N	N	L	2	.09	10
AGR-263	12-18-29	N	2	N	70	100	20	20	N	N	N	L	.9	.04	N
AGR-266	12-18-29	1	L	L	15	70	200	50	N	N	N	L	L	.50	L
AGR-267	12-18-20	N	2	N	5	70	N	10	N	N	N	.36	.9	.04	N
AGR-268	12-18-20	L	1	L	L	150	N	20	N	N	N	L	6	.05	N
AGR-269	12-18-20	5	1	G	20	50	30	100	N	N	N	L	3,000	5.10	N
AGR-270	12-18-20	N	2	10	20	70	50	100	N	N	N	L	800	.09	N
AGR-278	13-17- 7	N	L	N	L	70	N	30	N	N	N	.30	2.1	.06	N
AGR-283	12-19-15	N	2	N	10	1,500	N	20	N	N	N	.04	1.4	.04	N
AGR-285	12-19-14	1	2	N	10	70	10	30	N	N	N	.04	3	.09	60
AGR-286	12-19-14	.7	2	N	5	100	N	150	N	50	N	.08	.6	.10	10
AGR-287	12-19-14	.5	2	N	5	100	N	100	N	50	N	.04	1.2	.08	10
AGR-344	13-17-18	N	5	N	15	100	N	50	N	N	N	.08	L	.11	N
AGR-345	13-17-18	.7	5	N	10	150	15	50	L	N	N	.20	L	.42	N
AGR-347	13-17-18	N	L	N	N	20	N	N	N	N	N	.02	L	.41	N
AGR-348	12-18-20	7	10	300	30	150	20	100	N	N	L	32	1,000	G	N
AGR-349	12-18-20	N	3	L	10	1,500	5	20	10	N	L	.02	3.6	1.80	N
AGR-350	12-18-20	N	3	N	70	500	70	20	N	N	L	L	.8	.16	N
AGR-351	12-18-20	N	2	N	30	150	200	10	N	N	N	.02	.6	.22	N
AGR-352	12-18-20	N	1	N	20	50	10	20	L	N	N	.02	4	1.20	N
AGR-377	13-17- 4	N	1	N	50	1,500	N	20	N	N	N	L	L	.24	N
AGR-412	14-16-21	N	1	N	50	200	L	20	N	L	N	.20	L	.20	N
AGR-413	14-16-21	N	2	N	30	300	L	15	N	L	N	.10	L	.28	N
AGR-417	14-16-21	N	2	N	20	1,000	N	10	N	50	N	.30	L	.18	N
AGR-428	14-16-24	N	1	N	L	500	N	2	N	N	N	L	.2	.60	N
AGR-433	14-16-28	N	1	N	5	50	15	30	N	N	N	L	L	.30	N
AGR-434	14-16-28	N	1	N	5	70	100	20	N	N	N	L	2	.26	N
AGR-438	14-16-28	N	L	N	L	20	10	20	L	N	N	L	L	.24	N
AGR-444	14-16-28	N	L	N	L	20	10	10	N	N	N	L	1	.36	N
AGR-445	14-16-21	N	L	N	L	20	7	30	N	N	N	L	1	.30	N
AGR-446	14-16-28	N	2	N	5	30	7	10	N	N	N	L	.2	.36	N
AGR-450	14-16-20	N	2	N	20	200	N	20	N	N	N	L	L	.52	N
AGR-453	14-16-29	N	1	N	15	150	7	10	N	N	N	L	L	.15	N
AGR-456	14-16-28	.7	2	N	10	70	5,000	15	L	N	N	.10	.2	.28	N
AGR-514	13-16-34	N	5	L	50	1,000	L	20	N	N	N	N	L	.04	N
AGR-515	14-16-28	N	L	N	L	50	10	15	N	N	N	L	.2	.03	L
AGR-517[5/]	14-16-21	5	5	N	70	200	10	50	N	200	N	1.40	.2	.50	100
AGR-520	14-16-21	N	2	N	7	200	N	15	N	N	N	.10	L	1	10
AGR-521	14-16-21	N	3	N	10	500	N	15	N	L	N	.10	L	.22	20
AGR-522	14-16-21	N	2	N	10	300	N	10	N	N	N	.16	L	.05	20
AGR-523	14-16-21	N	2	N	7	500	N	L	N	N	N	.14	L	.09	10
AGR-524	14-16-16	L	2	N	10	200	N	20	N	N	N	.30	L	.20	10
AGR-536	11-19-32	2	1	N	7	70	70	10	N	N	N	L	L	.02	L
AGR-538	11-19-32	.5	2	N	7	200	50	15	N	N	N	L	L	.04	L
AGR-540	12-19- 4	2	L	N	30	200	500	100	N	N	N	11	L	0.06	L
AGR-541	12-19- 4	N	2	N	30	1,000	N	L	N	N	N	2.6	L	.03	L
AGR-552	12-18-29	.5	1	N	200	100	100	10	N	N	N	L	.3	4.50	L
AGR-553	12-18-29	N	2	N	L	300	50	20	N	N	N	L	.2	.02	L
AGR-554	12-18-29	.7	15	N	10,000	5,000	10	70	N	N	200	L	1	7	40
AGR-555	12-18-29	N	N	N	20	15	15	L	N	N	N	L	.4	.07	10
AGR-556	12-18-29	.7	5	N	50	100	15	70	N	L	N	.38	.8	.05	L
AGR-557	12-18-29	N	7	N	15	100	7	20	N	L	N	L	.2	.03	L
AGR-558[6/]	12-18-20	30	50	N	300	1,000	70	G	N	N	G	L	7	.12	L
AGR-559	12-18-19	.5	3	N	5	500	N	100	N	N	500	L	L	1.30	L
AGR-560	12-18-19	20	2	N	5	200	N	15	N	N	N	L	L	.80	L
AGR-561	12-18-19	.5	2	N	5	300	N	15	N	N	N	L	L	.09	L
AGR-565	14-16-28	N	L	N	20	300	20	30	N	L	N	L	.5	.01	L
AGR-566	14-16-28	N	2	N	30	700	5	15	N	L	N	.02	L	.03	L
AGR-567	14-16-33	N	1	N	5	500	50	30	N	N	N	L	.2	.03	10
AGR-568	14-16-33	N	1	N	L	100	7	15	N	N	N	L	L	.01	L
AGR-637	12-18- 5	.5	5	N	L	2,000	10	20	N	N	N	L	L	.05	10
AGR-639	12-18- 5	L	2	N	10	1,000	L	20	N	N	N	.08	L	.01	L
AGR-647	11-18-32	.5	1	N	5	300	15	15	N	N	N	L	L	.03	20
AGR-653	11-18-34	L	3	N	7	1,500	N	30	N	L	N	L	L	.10	L
AGR-655	11-18-33	N	1	L	5	100	5	70	10	N	N	L	L	.05	L
AGR-657	11-18-33	N	2	10	L	150	7	70	L	N	N	L	L	.03	10
AGR-658	11-18-33	N	5	N	15	2,000	N	15	N	50	200	L	L	.05	20
AGR-659	11-18-33	.5	2	N	5	100	N	15	N	50	N	L	L	.02	20
AGR-660	11-18-33	N	1	N	L	1,500	N	15	N	N	N	L	L	.03	40
AGR-661	11-18-33	N	5	N	7	G	N	N	N	N	N	L	L	.04	10
AGR-662	11-18-33	N	15	N	10	5,000	N	L	N	N	200	L	L	.02	10
AGR-675	12-18- 5	N	2	L	N	5,000	N	N	N	N	N	L	L	.01	L
AGR-677	12-18- 5	N	3	N	L	500	N	20	N	N	N	.16	L	.03	10
AGR-678	12-18- 5	N	2	N	L	300	15	15	10	N	N	.02	.2	.01	L
AGR-679	12-18- 5	N	1	N	50	700	N	20	N	N	200	L	L	.02	L
AGR-681	12-18- 5	N	2	N	5	200	50	100	10	N	N	L	1.5	.03	10
AGR-682	12-18- 5	1	7	N	7	200	1,000	50	10	L	N	.12	2.5	.04	10
AGR-683	12-18- 5	L	2	L	7	200	200	20	10	N	N	L	1.8	.02	L
AGR-685	12-18- 6	N	3	N	5	700	N	20	N	N	L	L	L	.02	L
AGR-686	12-18- 6	20	2	N	5,000	200	30	500	N	N	200	L	13	.03	10
AGR-696	12-18-30	L	1	N	L	200	N	20	N	N	N	L	L	.06	10
AGR-697	12-18-30	1	2	15	700	300	7	1,500	10	N	N	L	.3	.01	20
AGR-698	12-18-30	1	3	15	5,000	100	5	1,500	N	N	N	L	4	.07	L
AGR-699	12-18-30	.5	3	15	20	200	N	30	N	50	N	L	1	.09	20
AGR-700	12-18-30	L	2	N	15	2,000	N	50	N	N	200	L	L	.02	L
AGR-706	12-18- 3	N	3	N	5	500	N	L	N	N	N	.06	L	.03	L
AGR-712	12-18-12	.5	3	N	L	200	N	15	N	N	N	.14	L	.05	L
AGR-718	12-18-13	N	2	N	L	500	N	10	N	N	N	.28	L	.02	L
AGR-727	12-18-20	N	1	N	L	500	N	30	10	N	N	.06	L	.05	L
AGR-741	11-19-10	N	2	N	N	5,000	N	N	N	N	N	L	L	.03	L
AGR-752	11-19-16	N	10	N	L	G	N	L	N	N	N	L	L	.05	40
AGR-753	11-19-16	N	10	N	L	2,000	N	N	N	N	N	L	L	.08	L
AGR-754	11-19- 9	N	5	N	L	5,000	N	L	N	N	N	L	L	.07	20
AGR-755	11-19- 9	N	1	N	100	3,000	N	N	N	N	N	L	L	.02	L
AGR-757	12-19-13	N	5	N	5	G	N	300	N	N	N	L	L	.03	20
AGR-758	12-19-13	N	10	N	L	G	N	50	N	N	200	L	L	.03	10
AGR-759	12-19-13	1.5	L	N	L	300	N	30	N	N	N	.04	L	.04	10
AGR-760	12-19-13	1.5	1	N	7	300	20	50	N	N	N	.04	L	.02	20
AGR-777	12-19-14	N	2	N	7	300	N	70	N	50	N	L	L	.02	80
AGR-778	12-19-13	30	5	N	1,000	500	15	5,000	N	N	2,000	.50	18	.03	L
AGR-779	12-19-13	1	5	N	150	1,000	10	500	N	N	700	.50	.4	.01	L
AGR-780[7/]	12-19-13	5	1	N	700	2,000	50	3,000	N	N	2,000	L	.8	.05	20
AGR-781[7/]	12-19-13	15	1	N	700	5,000	150	5,000	N	N	3,000	.02	.6	.09	10
AGR-782[8/]	12-19-13	3	1	N	300	2,000	100	3,000	N	N	5,000	.04	.9	.05	20

3/ Cd = 30 ppm.

4/ Cd = G(500)

6/ Cd = 200 ppm.

7/ Cd = 50 ppm.

8/ Cd= 100 ppm

Table 4B.--Continued

Sample	T. S. R.	Ag (.5)	Be (1)	Bi (10)	Cu (5)	Mn (10)	Mo (5)	Pb (10)	Sn (10)	W (50)	Zn (200)	Au (.02)	Te (.2)	Hg (.01)	As (10)
AGR-784	12-19-13	1	5	N	100	2,000	N	200	N	L	500	0.02	L	0.07	10
AGR-792	12-18- 6	N	3	N	L	100	N	15	N	N	N	.08	L	.07	L
AGR-793[9/]	12-19-12	5	N	N	150	100	10	70	N	L	N	L	3	.09	40
AGR-810	12-18-20	N	2	N	70	100	5	15	N	N	N	L	1.4	.10	L
AGR-812	12-14-23	N	L	N	15	30	N	N	N	L	N	L	L	.06	N
AGR-813	12-19-23	N	L	N	7	70	N	N	N	L	N	L	L	.08	N
AGR-815	12-14-22	N	1	N	50	70	N	L	N	L	N	L	L	.08	N
AGR-835	13-15-17	N	3	N	5	100	7	20	N	N	N	L	L	.06	L
AGR-838	13-15-17	N	5	N	20	300	7	15	N	N	N	L	L	.06	N
AGR-862	14-14-16	N	1	N	5	1,500	N	L	N	N	N	L	L	.03	N
AGR-911	13-15-21	N	5	N	7	200	L	10	N	L	N	L	L	.06	N
AGR-912	13-15-21	N	3	N	5	100	5	10	N	L	N	L	L	.02	N
AGR-918	13-13-19	N	N	N	L	30	20	L	N	N	N	L	4	.10	L
AGR-919	13-13-19	N	1	N	50	20	5	20	N	N	N	L	2	.08	10
AGR-920	13-13-19	N	1	70	10	20	5	70	20	N	N	L	1	.07	10
AGR-921	13-13-19	L	N	20	15	100	N	20	N	L	N	L	1.8	.07	L
AGR-922	13-13-19	N	N	N	20	100	10	15	N	L	N	L	.3	.11	L
AGR-924	13-15-13	N	5	N	15	200	N	20	N	L	N	L	L	.04	N
AGR-932	13-14-27	.5	2	N	20	2,000	N	L	N	L	N	L	L	.08	N
AGR-933	13-14-27	.5	1	N	20	500	N	N	N	L	N	L	L	.07	N
AGR-934	13-14-34	N	1	N	20	150	N	N	N	L	N	L	L	.07	N
AGR-936	14-14- 3	N	L	N	10	50	N	N	N	L	N	L	L	.03	N
AGR-963	13-14-24	N	2	N	15	200	N	15	N	L	N	L	L	.09	L
AGR-965	13-14-24	N	L	N	30	20	7	10	N	N	N	L	L	.10	N
AGR-966	13-14-24	L	1	N	70	100	50	10	N	N	N	L	L	.09	N
AGR-970	14-14-18	N	L	N	70	1,000	N	N	N	N	N	L	L	.45	N
AGR-972	14-15-13	N	L	N	150	1,000	N	30	N	N	N	L	L	.40	N
AGR-979	14-15- 1	N	2	10	50	200	N	50	L	N	N	L	L	.18	N
AGR-980	14-14- 6	N	3	15	100	500	N	70	L	N	N	L	L	.12	N
AMF-196	12-14-14	N	10	N	L	20	N	N	N	N	N	L	L	.12	N
AMF-355	11-14- 3	N	5	N	15	150	N	30	N	N	N	L	L	.60	15
AMF-361	10-14-33	N	7	N	L	500	N	50	10	N	N	L	L	.30	N
AMZ-010	14-16-12	N	7	10	20	500	N	70	10	N	N	.16	L	.09	N
AMZ-011	14-16-12	N	2	10	30	700	N	50	N	N	N	L	L	.07	N
AMZ-030	13-13-30	N	N	50	15	N	20	150	70	N	N	L	2	.20	N
AMZ-031	13-13-30	L	N	30	10	10	15	70	10	N	N	L	L	.25	N
AMZ-032	13-13-19	N	N	N	100	50	L	N	L	N	N	.08	L	.60	N
AMZ-033	13-13-19	N	N	N	30	15	L	N	N	N	N	.02	.2	.70	N
AMZ-034	14-13-29	N	2	N	50	30	N	50	N	N	N	L	L	.40	10
AMZ-043	14-15-23	L	2	L	15	700	N	70	10	N	N	L	L	.12	N
AMZ-079	13-16-36	N	2	N	10	50	15	70	L	N	N	L	.5	.09	N
AMZ-083	14-14- 3	N	2	N	15	700	N	70	L	N	N	L	L	.18	N
AMZ-115	14-17- 1	N	1	N	10	500	N	70	10	N	N	L	L	.12	N
AMZ-118	14-17- 1	L	2	N	10	700	N	70	L	N	N	L	L	.07	N
AMZ-125	14-17- 1	N	L	N	L	2,000	N	10	N	N	N	L	L	.45	100
AMZ-128	12-18-22	10	20	N	5	100	N	N	N	N	N	2	L	.30	N
AMZ-129	12-18-22	30	2	N	30	150	N	70	N	N	N	.25	L	.55	N
AMZ-130	12-18-22	30	1	N	100	200	N	150	N	N	L	.85	L	.45	N
AMZ-131	13-17- 7	.7	L	N	30	500	30	20	N	N	N	L	L	.35	10
AMZ-132	13-17- 7	.5	2	N	20	50	20	N	N	N	N	.04	L	.40	L
AMZ-133	13-17- 7	N	2	N	30	70	L	10	N	N	N	.30	L	.90	20
AMZ-137	14-16-16	N	L	N	5	5,000	N	N	N	N	N	L	L	.09	L
AMZ-138	14-16-16	N	L	N	15	5,000	N	N	N	N	N	.02	L	.09	N
AMZ-139	14-16-16	N	N	N	5	2,000	N	N	N	N	N	L	L	.05	N
AMZ-140	14-16-16	N	N	N	5	5,000	N	N	N	N	N	L	L	.05	N
AMZ-144	11-19- 6	L	2	N	20	300	N	100	N	N	N	N	2	.30	10
AMZ-145	11-19- 5	N	3	N	5	200	N	20	N	N	N	N	L	.55	L
AMZ-146	11-19- 4	N	2	N	10	300	N	30	N	N	N	N	L	.45	N
AMZ-147	11-19- 4	N	3	N	70	300	N	30	N	N	L	N	L	.11	N
AMZ-149	11-19- 9	N	2	N	5	150	N	20	N	N	N	N	L	1.60	N
AMZ-151	11-19- 7	.7	2	N	5	150	N	20	N	N	N	.06	L	.85	20
AMZ-152	11-19-21	N	2	N	5	100	N	20	N	N	N	.06	L	.28	L
AMZ-153	11-19-21	.5	2	N	L	200	N	50	N	N	N	.02	.2	.20	10
AMZ-154	11-19-21	2	2	N	L	150	50	70	N	N	N	.50	.2	.15	10
AMZ-155	11-19-21	N	2	N	L	1,000	N	30	N	N	N	N	.4	.18	N
AMZ-156	11-19-21	N	2	N	L	300	N	30	N	N	N	0.15	0.4	0.22	N
AMZ-157	11-19-21	N	2	N	L	200	N	30	N	N	N	N	.6	.28	L
AMZ-158	11-19-28	N	2	N	5	200	N	30	N	N	N	N	.4	.16	10
AMZ-159	12-19- 4	N	2	N	50	700	10	20	N	N	N	.15	1.2	7.50	L
AMZ-160	12-19- 4	N	1	N	70	500	N	20	N	N	N	N	.4	G	L
AMZ-161	12-19- 4	.7	1	N	50	1,000	N	30	N	N	N	N	.2	1.60	L
AMZ-162	12-19- 4	L	2	N	L	200	200	L	N	N	N	N	L	.35	L
AMZ-164	12-18-21	N	5	N	50	1,000	N	L	N	N	N	N	L	.18	N
AMZ-165	13-18-11	N	5	N	L	200	N	10	N	N	N	N	.2	.18	N
AMZ-169	11-19-29	.5	5	N	10	500	5	20	N	N	N	.35	L	.26	L
AMZ-170	11-19-29	N	1	N	50	5,000	5	20	N	N	200	N	L	.16	50
AMZ-171	11-19-29	N	L	N	200	1,500	N	15	N	N	N	N	N	.26	N
AMZ-172	11-19-29	15	20	N	N	700	N	15	N	N	N	1.20	N	.23	N
AMZ-174	11-19-29	N	7	N	30	1,000	N	20	N	N	N	.06	L	.35	80
AMZ-176	11-19-29	N	2	N	20	200	N	15	N	N	N	N	.2	.40	N
AMZ-180	11-19-29	N	3	N	7	200	N	10	N	N	N	N	L	.50	N
AMZ-182	11-19-32	N	3	N	N	5,000	N	15	N	N	N	N	1.8	.13	L
AMZ-183	11-19-33	N	2	N	N	300	20	10	N	N	N	N	2	.20	N
AMZ-184	11-19-33	.5	L	N	30	700	20	20	N	N	N	N	.2	.30	N
AMZ-186	11-19-33	N	L	N	70	50	50	20	N	N	N	N	L	.20	10
AMZ-188	13-17-17	N	2	N	5	500	N	30	N	N	N	N	.2	.45	L
AMZ-190	12-18-28	N	2	N	5	200	20	20	N	N	N	N	4.8	.20	10
AMZ-191	12-18-33	N	3	N	1,000	1,000	N	200	N	50	N	.04	.4	.24	L
AMZ-192	12-18-33	30	1	10	G	1,500	N	5,000	N	50	N	.04	.6	.50	N
AMZ-193	12-19-23	N	2	N	30	G	N	70	N	N	N	N	.6	.22	10
AMZ-194	12-19-24	.5	N	N	70	70	100	20	N	N	N	N	.2	.80	20
AMZ-195	12-19-24	N	3	N	100	300	N	50	N	N	N	N	.2	.16	L
AMZ-200	11-12- 5	N	10	N	10	700	N	100	50	N	L	L	.8	.26	L
AMZ-201	11-19- 6	N	1	N	20	G	N	10	N	N	N	L	.4	.20	L
AMZ-202	11-19- 5	N	2	N	15	70	N	20	N	N	L	L	.8	.30	40
AMZ-203	11-19- 5	N	5	N	15	G	N	30	N	N	L	L	.8	.13	L
AMZ-204	11-19- 5	N	7	N	30	1,500	50	100	N	N	N	L	.6	.22	60
AMZ-205	11-19- 5	N	5	N	70	2,000	100	50	N	N	L	L	1	.08	10
AMZ-206	11-19- 5	N	5	N	30	100	N	10	N	N	L	L	.8	.15	L
AMZ-207	11-10- 5	2	3	N	100	500	30	200	N	N	L	L	1	.08	10
AMZ-208	11-19- 5	N	2	N	50	500	L	20	N	N	L	L	.8	.05	L
AMZ-209	12-19- 4	N	N	N	70	20	L	50	N	N	L	L	.8	.24	40
AMZ-210	12-19- 4	N	N	N	15	10	N	L	N	N	L	L	.8	.15	10
AMZ-211	12-19-12	N	L	N	30	20	L	L	N	N	300	L	.8	.24	40
AMZ-212	12-19-12	N	1	N	20	G	L	300	N	N	L	L	.6	.04	L
AMZ-213	12-18- 3	N	2	N	5	200	N	20	N	N	L	L	.8	.06	L
AMZ-214	11-18-32	N	5	N	15	100	N	10	N	N	L	.50	.6	.13	L
AMZ-215	11-18-33	3	5	N	20	200	N	30	N	N	L	.30	.8	.12	40
AMZ-216	11-18-28	N	3	N	20	70	N	20	N	N	L	L	.6	.16	10
AMZ-217	11-18-33	10	7	N	20	200	N	100	N	N	N	.80	1	.15	40
AMZ-218	12-18- 5	N	1.5	N	10	G	N	N	N	N	N	.60	.8	.07	10
AMZ-219	12-18- 5	N	10	N	20	G	N	N	N	N	N	L	.6	.11	L
AMZ-220	12-19-15	N	N	10	100	30	100	50	N	N	N	L	60	.60	80
AMZ-221	12-19- 9	N	L	N	20	30	L	50	N	N	N	L	.8	.35	200
AMZ-222	12-19- 9	N	N	N	20	10	L	30	N	N	N	L	.8	.26	10
AMZ-223	12-19- 9	N	3	N	100	30	L	L	N	N	N	L	.8	.50	40
AMZ-224	12-19- 9	N	L	N	30	100	30	L	N	N	N	L	7	.22	10
AMZ-225	12-19- 9	N	N	N	20	20	N	70	N	N	N	L	1	.11	L
AMZ-226	12-19- 9	N	N	N	L	L	20	N	N	N	N	L	1	.10	L
AMZ-227	12-18-16	N	5	N	50	1,000	N	500	N	N	3,000	L	.4	.14	L
AMZ-228	12-18-20	N	3	N	30	700	N	30	N	N	N	L	.8	.08	L
AMZ-229	12-18-20	N	5	N	15	700	N	50	N	N	N	L	.8	.82	10
AMZ-230	14-16- 7	N	L	N	15	G	N	N	N	N	N	L	.6	.07	L
AMZ-231	14-16- 7	N	3	N	50	1,000	N	20	N	N	N	L	.4	.05	L
AMZ-232	12-18-33	N	2	N	10	700	N	20	N	N	N	L	.8	.08	60
AMZ-233	12-18-20	10	1.5	N	5,000	1,000	N	2,000	N	N	500	L	1.2	.35	L

[9/] Sb = 100 ppm.

Table 4C.--Analyses of geochemical samples having anomalous metal contents in stream sediments

Sample	T. S. R.	Ag (.5)	Be (1)	Cu (5)	Mn (20)	Mo (5)	Pb (10)	Sn (10)	Zn (200)	Au (.02)	Te (.2)	Hg (.01)	As (10)
ABZ-708	13-13-11	N	N	30	1,500	N	15	N	N	N	L	0.06	N
ABZ-711	13-13-14	N	L	100	1,000	N	15	N	N	N	H	.06	N
ABZ-712	13-13-23	N	L	100	700	N	30	N	N	.04	H	.06	N
ABZ-713	13-13-14	N	2	100	700	N	20	N	N	N	H	.02	N
ABZ-715	13-13- 4	N	L	100	700	N	20	N	N	N	L	.03	N
ABZ-716	13-13- 4	N	2	150	1,000	N	30	N	N	N	L	.04	N
ABZ-717	13-13- 9	N	2	100	700	N	30	N	N	.02	.4	.04	N
ABZ-718	13-13- 9	N	1	100	700	N	30	N	N	N	L	.06	N
ABZ-724	13-13-16	N	2	150	1,000	N	50	N	N	N	L	.07	N
ABZ-726	13-13-16	N	1	70	1,500	N	30	N	N	N	.4	.06	N
ABZ-727	13-13-16	N	1	100	1,000	N	50	N	N	N	L	.01	N
ABZ-731	13-13-21	N	L	150	1,000	N	70	N	N	N	L	.04	N
ABZ-734	13-13- 4	N	2	30	500	N	30	N	N	.45	.3	.02	N
ABZ-772	13-13-25	.5	1	50	700	N	30	N	N	N	H	.08	N
ABZ-798	13-13-32	N	L	70	300	7	70	N	N	.02	H	.06	N
ABZ-802	13-13-20	N	L	50	1,500	N	20	N	N	N	H	.05	N
ABZ-804	13-13-29	N	L	100	300	N	30	N	N	N	H	.08	N
ABZ-820[10]	13-13-30	N	L	50	300	5	50	N	N	.03	H	.10	N
ABZ-821	13-13-19	N	L	70	1,500	5	70	N	300	.02	H	.03	N
ABZ-830	14-13- 8	N	L	100	1,000	N	30	N	N	.03	H	.07	N
ABZ-843	14-13-20	N	L	70	1,500	N	30	N	N	.02	H	.02	N
ABZ-854	14-13-19	N	L	50	700	N	30	N	200	.02	L	.03	N
ABZ-855	14-13-19	N	L	70	1,000	N	30	N	300	N	H	.03	N
ABZ-895	14-13-32	N	L	30	2,000	N	15	N	500	N	H	.07	N
ABZ-906	14-13-34	N	L	30	2,000	N	30	N	N	.03	L	.02	N
ABZ-912	14-14-35	N	L	30	300	N	20	N	200	.02	H	.04	N
ABZ-920	15-12- 2	L	L	15	300	N	20	N	N	N	L	.03	N
ABZ-926	15-12- 9	N	15	20	500	N	30	N	N	N	L	.07	N
ABZ-927	15-12- 9	L	L	10	700	L	20	N	N	N	L	.01	N
ABZ-929	10-19-30	L	L	15	700	N	20	N	N	N	L	.04	L
ABZ-931	10-20-36	.7	1	20	500	N	20	N	N	N	.4	.13	N
ABZ-932	10-20-36	50	3	20	700	N	70	N	N	.20	L	.18	N
ABZ-934	11-20- 1	5	1	100	1,000	N	150	N	N	.04	L	.15	N
ABZ-936	11-20- 1	10	L	30	500	N	30	N	N	N	L	.04	N
ABZ-947	12-18-29	N	1	70	1,500	N	70	N	N	N	L	.06	L
ABZ-957	14- 7-23	.5	1	20	500	N	30	N	N	N	L	.06	N
ABZ-974	14-12-13	N	L	70	1,500	N	30	N	N	N	L	.04	N
ACA-310	12-13-31	N	L	30	1,500	N	30	N	N	N	H	.04	N
ACA-311	12-13-19	N	L	15	1,500	7	30	N	N	N	H	.03	N
ACA-312	12-13-19	N	L	20	2,000	N	30	N	N	N	H	.02	N
ACA-313	12-13-31	N	L	30	2,000	N	50	N	N	N	H	.02	N
ACA-316	12-13-26	N	L	50	2,000	N	10	N	N	N	H	.01	N
ACA-317	12-13-26	N	L	30	1,500	N	15	N	N	N	H	.02	N
ACA-318	12-13-26	N	L	30	1,500	N	L	N	N	N	H	.01	N
ACA-319	12-13-26	N	L	100	3,000	N	L	N	N	N	H	.02	N
ACA-320	12-13-35	N	L	30	2,000	N	70	N	N	N	L	.02	N
ACA-321	12-13-25	N	L	20	1,500	N	20	N	N	N	L	.01	N
ACA-323	12-13-35	N	L	150	3,000	N	L	N	N	N	L	.02	N
ACA-324	13-13- 2	N	L	100	3,000	N	L	N	N	N	L	.03	N
ACA-325	13-13- 2	N	L	100	2,000	N	10	N	N	N	L	.04	N
ACA-326	13-12-19	N	L	70	1,500	N	15	N	N	N	H	.02	N
ACA-344	13-12-26	N	3	30	500	7	70	N	N	N	L	.04	N
ACA-345	13-12-26	N	2	20	700	7	50	N	N	N	L	.04	N
ACA-351	13-13-29	N	L	50	300	N	70	N	N	N	H	.06	N
ACA-357	13-13-29	N	L	50	500	10	30	N	N	N	L	.04	N
ACA-363	13-13-28	N	1	30	700	N	70	N	N	N	H	0.02	N
ACA-376	14-13-16	N	L	30	300	7	30	N	N	N	L	.05	N
ACA-379[11]	14-13-21	N	L	30	500	N	15	N	N	N	L	.07	10
ACA-380[11]	14-13-21	N	L	50	150	15	50	N	N	L	.2	.15	N
ACA-383	14-13-16	N	L	70	500	10	50	N	N	N	L	.04	N
ACA-388	14-13-22	N	L	200	1,500	N	30	N	N	N	L	.05	N
ACA-389	14-13-22	N	L	50	3,000	N	30	N	300	N	H	.07	N
ACA-392	14-13-22	N	L	70	2,000	N	10	N	N	N	L	.04	N
ACA-398	14-13-28	20	L	50	700	5	20	N	N	N	L	.10	N
ACA-404	14-13- 8	N	L	30	500	N	15	N	N	N	L	.05	10
ACA-408	14-13-33	N	L	20	1,500	15	70	N	N	N	L	.04	N
ACA-409	14-13-34	N	L	30	500	N	15	N	N	N	L	.04	10
ACA-411[12]	14-13-32	N	L	50	1,500	N	L	N	700	N	H	.06	N
ACA-412	14-13-33	N	L	30	1,500	N	30	N	N	N	L	.03	N
ACA-413	14-13-26	N	L	100	3,000	N	L	N	N	N	H	.02	N
ACA-414	14-13-26	N	L	30	1,500	N	20	N	N	N	H	.05	N
ACA-415	14-13-14	N	L	100	1,000	N	30	N	N	N	H	.02	N
ACA-419	14-13-25	N	L	70	1,500	N	20	N	N	N	L	.02	N
ACA-420	14-13-25	N	L	50	1,500	N	20	N	N	N	L	.01	N
ACA-421	14-13-25	N	L	70	1,500	N	30	N	N	N	L	.04	N
ACA-422	14-13-26	N	L	50	1,500	N	30	N	N	N	L	.01	L
ACA-423	14-13-35	N	L	50	1,500	N	30	N	N	N	L	.03	N
ACA-430	14-12-36	N	L	150	700	N	20	N	N	N	L	.04	N
ACA-438	13-12- 9	N	2	70	700	7	30	N	N	N	L	.04	N
ACA-448	12-13-25	N	1	20	1,500	L	30	N	N	N	L	.03	N
ACA-453	12-13-21	N	L	70	2,000	L	20	N	N	N	L	.03	N
ACA-454	12-13-21	N	L	100	2,000	N	30	N	N	N	.4	.02	N
ACA-456	12-13-15	N	L	70	1,500	N	30	N	N	N	.4	.04	N
ACA-457	12-13-10	N	L	100	1,500	N	30	N	N	N	L	.03	N
ACA-458	12-13-14	N	L	150	2,000	N	30	N	N	N	L	.02	N
ACA-460	12-13-10	N	1	70	1,500	N	30	N	N	N	L	.02	N
ACA-461	12-13-11	N	1	70	1,500	5	30	N	N	N	.3	.02	N
ACA-464	12-13- 2	N	1	70	1,500	N	30	N	N	N	L	.04	N
ACA-465	12-12-27	N	L	30	1,500	N	30	N	N	N	B	.03	N
ACA-466	14-13-36	N	L	30	1,500	N	50	N	N	N	L	.04	N
ACA-486	11-13-36	N	1	5	2,000	N	30	N	300	L	L	.03	N
ACA-487	11-13-36	N	2	5	2,000	N	30	N	300	L	L	.06	N
ACA-523	11-13- 4	N	1	50	1,500	N	50	N	N	L	L	.18	N
ACA-527	11-13- 3	N	2	30	1,500	N	50	N	N	L	L	.10	N
ACA-528	11-13- 2	N	1	30	1,000	N	50	N	N	.20	L	.06	N
ACA-529	11-13- 2	N	1	30	1,500	N	30	N	N	L	L	.10	N
ACA-533	11-13- 1	N	1	30	1,500	N	30	N	N	L	L	.12	N
ACA-539	12-14-13	N	2	15	1,500	N	20	N	N	L	L	.05	N
ACA-549	11-14- 4	N	L	50	1,500	N	20	N	N	L	L	.08	N
ACA-553	11-15- 6	N	2	5	700	N	30	N	N	L	L	L	30
ACA-556	11-16- 2	N	1	20	700	N	20	20	N	L	L	.10	N
ACA-563	10-16-34	L	1	20	1,000	N	20	N	N	L	L	.06	N
ACA-567	11-15- 5	N	1	10	1,500	N	20	N	200	L	L	.03	N
ACA-572	11-15-11	N	2	30	1,000	N	50	N	N	.10	L	.10	N
ACA-573	11-15-11	.5	2	20	1,000	N	30	N	N	L	L	.08	N
ACA-607	12-19- 7	N	1	50	700	7	20	N	N	L	L	.03	N
ACA-610	11-19- 2	N	2	20	1,500	N	30	N	N	L	L	.20	N
ACA-624	12-19-16	N	2	30	700	N	30	N	N	L	L	.10	10
ACA-628	12-19-15	N	2	30	1,500	L	30	N	N	L	L	.10	L
ACA-631	12-18-21	N	5	30	1,500	N	30	N	N	L	L	.07	N
ACA-635	12-18-28	N	3	20	1,500	N	50	N	N	L	L	.05	N
ACA-659	13-17-28	N	2	20	1,500	N	20	N	N	L	L	.05	N
ACA-663	13-17-21	N	2	50	1,500	N	50	N	N	L	L	.09	N
ACA-670	13-17-19	N	2	20	1,500	N	20	N	N	L	L	.05	L
ACA-674	11-13-14	N	1	30	1,500	N	50	N	N	L	L	.10	N

10/ Bi = L(10).

11/ Bi = L(10).

12/ Cd = 20 ppm.

Table 4C.--Continued

Sample	T. S. R.	Ag (.5)	Be (1)	Cu (5)	Mn (20)	Mo (5)	Pb (10)	Sn (10)	Zn (200)	Au (.02)	Te (.2)	Hg (.01)	As (10)
ACA-675	11-13-11	N	2	30	1,500	N	50	N	N	L	L	0.10	N
ACA-743	14-16- 3	N	1	30	1,500	N	20	N	200	L	L	.15	N
ACA-745	14-16-10	N	2	15	1,000	N	20	15	N	L	L	.07	N
ACA-750	12-12- 8	N	2	7	1,500	5	30	15	200	L	L	.05	N
ACA-755	12-12-17	N	2	10	1,500	5	30	N	L	L	L	L	N
ACA-756	12-12- 8	N	2	10	1,000	7	20	N	N	L	L	L	N
ACA-758	12-12- 8	N	2	20	G	10	20	100	1,000	L	L	.02	N
ACA-764	12-13-13	N	N	30	5,000	N	20	N	700	L	L	.05	N
ACA-768	10-13-36	N	1	50	1,500	N	30	N	N	L	L	.13	N
ACA-769	10-12-31	N	2	50	1,500	5	30	N	N	L	L	.06	N
ACA-771	10-13-26	N	1	50	1,500	N	30	N	N	L	L	.28	N
ACA-772	10-13-26	N	1	50	1,500	N	50	N	N	L	L	.22	N
ACA-773	10-13-27	N	2	50	1,500	N	50	N	N	L	L	.20	N
ACA-776	10-13-28	N	1	50	1,500	N	50	N	N	L	L	.22	N
ACA-777	10-13-32	N	2	50	1,000	N	50	N	N	B	L	.40	N
ACA-784 13/	10-15-32	N	1	50	1,000	10	50	N	N	L	L	.13	N
ACA-786	10-15-31	N	2	30	1,000	N	70	N	N	L	L	.10	N
ACA-787	11-15- 3	N	2	20	1,500	N	70	N	200	L	L	.10	N
ACA-788	11-15- 3	N	2	15	700	N	70	N	N	L	L	.05	N
ACA-801	10-17-34	N	L	30	1,500	N	30	N	L	L	L	.05	N
ACA-802	10-17-34	N	L	10	1,000	7	15	N	L	L	L	.06	N
ACA-807	12-19- 5	N	1	50	500	10	20	N	N	L	L	.06	N
ACA-815	14-16-24	N	3	15	700	N	30	15	N	L	L	.12	N
ACA-825 14/	13-16-15	N	3	L	1,000	5	15	10	N	L	L	.12	N
ACA-829	13-16-26	N	1	30	1,500	N	15	N	N	L	L	.07	N
ACA-833	12-17- 2	N	3	30	1,000	N	30	N	L	B	L	.65	N
ACA-837	12-16- 4	N	L	50	1,000	N	15	N	200	B	L	.13	N
ACA-839	12-16-11	N	1	20	1,500	N	20	N	200	B	L	.15	N
ACA-840	12-16-11	N	2	5	2,000	N	15	50	200	B	L	.24	N
ACA-845	12-16- 1	N	L	30	1,500	N	15	N	300	L	L	.10	N
ACA-865	12-14-18	N	1	5	1,000	N	15	10	200	B	L	.11	N
ACA-866	12-14-18	N	1	L	700	N	15	30	N	B	L	.09	N
ACA-867	12-14-17	N	1	20	1,000	N	15	15	N	B	L	.07	N
ACA-893	11-14-31	N	2	10	1,500	N	30	10	N	B	L	.14	N
ACA-894	11-15-36	N	2	15	1,500	N	20	L	N	B	B	B	N
ACA-895	12-14-13	N	N	20	G	N	20	30	N	L	L	.05	L
ACA-972	12-14-13	N	N	15	5,000	N	15	N	N	L	L	.09	L
ACA-989 13/	11-14-32	N	2	100	1,000	N	50	N	N	B	B	.40	N
ACA-990	11-14-33	N	2	70	1,000	N	50	15	N	B	B	.40	N
ACA-992	11-14-34	N	2	70	700	N	30	L	N	B	B	.40	N
ACA-994	12-14- 9	N	L	50	5,000	N	15	20	300	L	L	.05	L
ACA-999 13/	12-15-15	N	3	30	700	N	30	N	N	L	L	.08	N
AGR-005	14-12- 6	N	L	30	300	50	20	N	N	L	L	.16	N
AGR-028	15-14- 8	N	L	50	1,500	N	20	N	200	L	.2	.16	L
AGR-029	15-14- 8	N	L	50	1,500	N	20	N	200	L	.2	.15	L
AGR-033	14-14-33	N	L	50	1,500	N	15	N	N	L	L	.12	L
AGR-036	14-14-29	N	L	20	700	N	20	N	N	L	L	.45	L
AGR-039	14-14-29	N	L	50	1,500	N	15	N	200	L	L	.10	L
AGR-046	14-14-28	N	L	30	1,500	N	20	N	L	L	L	.11	L
AGR-053	14-14- 3	N	L	50	1,000	N	20	N	200	L	L	.10	L
AGR-054	14-15- 3	N	L	30	1,000	10	15	N	L	L	L	.08	L
AGR-056	15-14-10	N	L	50	1,500	N	10	N	200	L	L	.11	L
AGR-058	15-14-15	N	L	50	2,000	N	20	N	200	L	L	.07	L
AGR-065	14-14-26	N	L	20	1,000	10	20	N	N	L	L	.10	L
AGR-068	14-14-34	N	L	20	1,500	N	30	N	N	L	L	.02	L
AGR-069	14-14-34	N	1	30	1,500	N	15	N	200	L	L	.08	L
AGR-070	14-14-34	N	L	50	1,500	N	20	N	L	L	L	.08	L
AGR-073	14-14-22	N	L	30	1,500	N	15	N	N	L	L	.10	L
AGR-075	14-14-22	N	L	20	1,500	N	20	N	L	L	L	.11	L
AGR-082	14-13-17	N	1	50	300	5	30	N	N	L	1	.25	L
AGR-135	11-19-20	N	1	30	1,500	N	50	N	N	0.02	L	0.08	N
AGR-139	11-19-19	N	1	30	1,000	30	30	N	N	.02	L	.06	N
AGR-142	11-19-32	N	1	50	700	10	30	N	N	.02	L	.18	N
AGR-146	12-20-12	N	1	30	1,500	N	30	15	200	.70	L	.08	N
AGR-150	12-20- 1	N	1	15	1,500	N	30	N	200	.02	L	.03	N
AGR-153	11-20-36	N	2	20	700	15	30	N	N	N	L	.03	N
AGR-159	11-19-29	N	1	50	1,500	N	50	N	200	.02	L	.08	N
AGR-160	11-20-35	N	N	30	2,000	N	20	N	700	N	L	.06	N
AGR-181	11-19-12	N	5	30	1,500	N	50	N	N	.02	L	.40	N
AGR-183	11-19-12	N	3	15	1,500	N	30	N	N	L	L	.18	N
AGR-187	11-19-10	N	3	30	1,000	L	50	N	N	.06	L	.16	N
AGR-209	12-19- 3	N	3	30	1,500	N	20	N	N	L	L	.22	N
AGR-216	12-19- 9	N	2	100	300	5	30	N	N	L	L	.14	N
AGR-217	12-19- 8	N	2	70	1,500	5	30	N	N	L	L	.11	N
AGR-218	12-19- 8	N	2	50	700	7	20	N	N	L	L	.09	N
AGR-219	12-19-18	N	2	50	700	7	20	N	N	L	L	.15	N
AGR-227	13-18-11	N	2	30	1,000	N	30	N	N	.06	L	.20	N
AGR-236	12-19-13	N	2	15	1,000	L	30	N	N	L	L	.20	10
AGR-237	12-19-13	N	2	50	1,500	N	70	N	N	L	L	.18	N
AGR-279	13-17- 7	N	2	20	2,000	N	15	N	N	L	L	.15	N
AGR-355	13-17-15	N	1	70	1,500	N	20	N	N	L	L	.06	N
AGR-360	13-17-15	N	1	30	1,500	N	30	N	N	L	L	.10	N
AGR-361	13-17-15	N	1	70	1,500	N	30	N	N	L	L	.35	N
AGR-362	13-17-15	N	1	50	1,500	N	30	N	N	L	L	.24	N
AGA-364	13-17-22	N	1	30	1,500	N	15	N	N	L	L	.24	N
AGR-368	13-17-22	N	1	50	1,500	N	20	N	N	L	L	.10	N
AGR-373	13-17- 8	N	1	30	1,500	N	20	N	N	L	L	.15	N
AGR-374	13-17- 4	N	1	50	1,500	N	20	N	N	L	L	.15	N
AGR-375	13-17- 4	N	1	15	1,500	N	20	N	N	L	L	.18	N
AGR-376	13-17- 4	N	1	70	1,500	N	20	N	N	L	L	.35	N
AGR-378	13-17-17	N	1	30	1,500	N	30	N	N	L	L	.22	N
AGR-380	13-17-21	N	1	70	1,500	N	20	N	N	.02	.3	.40	N
AGR-383	13-17-27	N	1	30	1,500	N	20	N	N	L	L	.24	N
AGR-386	12-17-18	N	2	20	1,500	N	30	L	N	L	L	.20	N
AGR-390	13-17-36	N	1	50	1,500	N	20	N	N	L	.3	.18	N
AGR-391	13-17-36	N	1	50	1,500	N	20	N	N	L	.3	.30	N
AGR-395	14-17- 2	N	2	20	1,500	N	30	N	N	L	L	.11	N
AGR-396	14-17- 2	N	2	30	1,500	N	20	N	N	L	L	.20	N
AGR-461	14-16-20	N	1	20	300	7	20	N	N	L	L	.22	N
AGR-463	12-17-21	N	2	30	1,500	N	30	N	N	L	L	.20	N
AGR-468	12-17- 8	N	2	15	700	N	30	N	200	L	L	.11	N
AGR-485	12-17-33	3	2	50	1,500	N	30	N	200	L	L	.15	N
AGR-491	12-17-36	N	2	20	1,000	10	30	N	N	L	L	.12	N
AGR-498	13-16- 4	N	2	20	1,500	N	20	N	N	L	.2	.20	N
AGR-502	13-16- 4	N	2	15	1,500	N	20	N	200	L	L	.10	N
AGR-510	13-16-22	N	2	30	1,500	N	20	N	200	L	L	.12	N
AGR-518	14-16-28	N	2	20	500	7	10	N	N	L	.4	.12	L
AGR-618	11-18- 7	N	2	15	1,000	N	10	N	N	L	L	.28	L
AGR-625	11-18-15	N	1	7	1,000	N	20	N	N	.30	L	.08	L
AGR-693	12-19-11	N	2	20	700	N	30	N	N	L	L	.07	10
AGR-761	12-19-12	N	2	5	700	N	20	N	N	L	L	.90	10
AGR-787	12-19-12	N	2	30	1,500	10	50	N	N	L	L	.03	L
AGR-800	13-15-20	N	3	7	1,000	L	30	15	N	L	L	.02	L
AGR-804	13-15-19	N	2	10	5,000	N	20	20	500	L	L	.03	L
AGR-807	13-16-25	N	5	10	1,500	N	50	L	N	L	L	.06	L
AGR-809	13-16-36	N	3	15	1,500	N	30	L	N	L	L	.03	L
AGR-981	14-15-12	N	3	10	1,000	N	20	20	N	L	L	.15	N
AGR-985	14-15-12	N	2	15	700	N	70	N	N	L	L	.15	N
AGR-994	14-15- 3	N	2	15	700	N	50	N	N	L	L	.70	N
AGR-996	14-15-10	N	2	20	700	N	70	N	N	L	L	.30	N
AGR-997	14-15-10	N	1	20	500	N	20	N	N	B	L	.50	N
AMF-030	11-17-20	N	L	10	1,000	N	20	N	300	L	L	.03	L
AMF-060	11-18- 4	N	2	5	2,000	N	20	N	N	.02	.2	.02	L
AMF-065	11-16-11	N	1	20	1,500	N	20	N	N	.02	L	.13	L
AMF-077	12-15-22	N	7	15	1,000	5	30	N	N	L	L	.05	L

13/ W = L(50).

14/ Sb reported as L(100) was not detected in a repeat analysis.

Table 4C.--Continued

Sample	T. S. R.	Ag (.5)	Be (1)	Cu (5)	Mn (20)	Mo (5)	Pb (10)	Sn (10)	Zn (200)	Au (.02)	Te (.2)	Hg (.01)	As (10)
AMF-086	12-15-13	N	1	20	1,500	N	30	N	N	L	L	0.03	L
AMF-092	12-14-28	N	7	50	700	N	30	N	N	L	L	.05	L
AMF-093	12-14-22	N	2	10	700	N	70	N	N	L	L	.13	N
AMF-130	11-17-20	N	2	5	2,000	N	20	10	300	L	L	.03	L
AMF-137	11-17- 3	N	1	10	1,500	N	20	10	N	L	L	.05	L
AMF-146	12-16-17	N	3	7	1,500	N	15	10	N	L	.3	.05	L
AMF-147	12-16-16	N	3	L	1,500	N	20	10	N	L	.2	.04	L
AMF-150	12-16-15	N	3	L	1,500	N	10	N	N	L	L	.04	L
AMF-155	[illegible]	N	6	7	2,000	N	30	L	N	L	.1	[illegible]	L
AMF-156	12-16-28	N	5	10	2,000	N	30	L	N	L	L	.04	L
AMF-190	12-14-20	N	2	30	1,500	N	30	N	N	B	B	.13	L
AMF-230	13-14- 8	N	3	50	700	10	30	N	N	L	L	.09	N
AMF-231	13-14- 8	N	2	100	1,000	N	30	N	N	B	B	.24	N
AMF-232[15/]	13-14- 9	N	2	50	1,000	N	15	N	N	L	L	.08	N
AMF-249	12-15-26	N	5	15	2,000	N	15	N	N	L	L	.04	N
AMF-250	12-15-25	N	3	5	1,500	N	15	N	N	L	L	.05	N
AMF-270[15/]	13-14- 6	N	5	L	700	N	10	N	N	L	L	L	N
AMF-309	12-16-16	N	3	50	1,500	N	20	20	N	L	.2	.02	L
AMF-310	12-16-15	N	2	5	1,500	N	15	10	N	L	L	.01	L
AMF-317[16/]	12-15-30	L	3	15	700	L	70	15	N	L	B	.06	N
AMF-318	12-15-21	N	2	15	700	N	100	15	N	L	B	.08	N
AMF-321	12-15-30	N	2	15	500	N	70	10	N	L	L	.16	N
AMF-323	12-14-19	N	L	15	1,500	N	20	N	300	L	B	.20	N
AMF-325	12-14-15	N	1	15	700	N	30	N	N	L	B	.45	N
AMF-338	12-15- 8	N	2	5	500	N	30	10	N	L	B	1	N
AMF-349	13-14-19	N	2	20	2,000	N	30	30	L	L	B	.09	N
AMZ-012	14-16-12	N	2	30	1,000	N	70	20	N	L	L	.26	N
AMZ-013	14-16-36	N	2	30	700	N	70	N	N	L	L	.20	N
AMZ-014	14-16-36	N	2	30	700	N	70	10	N	L	L	.20	N
AMZ-015	14-16-36	N	2	30	700	N	70	10	N	L	L	.20	N
AMZ-016	14-16-23	N	2	30	700	N	70	10	N	L	L	.24	N
AMZ-017	14-16-23	N	2	20	700	N	70	10	N	L	L	.18	N
AMZ-078	13-15-31	N	2	15	1,000	N	50	20	L	L	L	.15	N
AMZ-085	13-16- 6	N	2	10	700	N	50	N	N	L	L	.05	10
AMZ-196	12-14-27	.5	3	L	700	N	70	N	N	N	.2	.02	L
AMZ-197	12-14-27	N	2	5	1,000	N	50	N	200	N	.2	.03	N
AMZ-199	12-14-27	N	2	5	2,000	N	50	10	300	N	.2	.03	N

15/ W = L(50).

16/ Bi = L(10).

Table 4D.--Analyses of geochemical samples having anomalous metal contents in panned concentrates

Sample	T. S. R.	Ag (.5)	Be (1)	Bi (10)	Cu (5)	Mo (5)	Pb (10)	Sn (10)	Au (.02)	Te (.2)	Hg (.01)	As (10)
ABZ-879	14-13-31	N	L	N	30	N	20	N	0.02N	L	0.09	15
ABZ-880	14-13-31	N	L	N	70	N	15	N	.02N	.6	.16	15
ABZ-885	14-13- 8	N	1	N	100	N	10	N	.04N	4	.09	10
ABZ-886	14-13-20	N	1	N	70	N	20	N	.02N	3	.30	30
ABZ-887	14-13-20	N	L	N	100	N	20	N	.02N	1	.11	10
ABZ-890	14-13-32	N	1	10	100	N	20	N	.02N	3	.20	20
ABZ-894	14-13-32	N	1	N	70	N	20	N	.02N	1	.16	15
ABZ-907	14-13-34	N	1	N	50	N	100	N	.04N	L	.22	10
ABZ-925	15-12-10	N	2	N	70	N	20	10	.02N	1.5	.10	L
ABZ-930	10-20-36	2	1	N	200	N	70	20	.02N	.2	.34	20
ABZ-933	10-20-36	200	2	N	1,000	N	500	100	.10N	L	1.63	120
ABZ-935	11-20- 1	150	2	N	1,500	N	200	50	.02N	L	1.80	60
ABZ-937	11-20- 1	2	5	N	150	N	100	N	.10N	L	.31	40
ABZ-940	13-18-11	2	2	N	100	N	70	N	.04N	L	.39	50
ABZ-942	13-18- 7	N	2	N	50	N	50	N	.90	L	.10	20
ABZ-946	12-18-29	N	2	N	150	.10	70	N	1.70	1.5	.14	40
ACA-443	13-12-17	N	L	N	15	N	N	20	.80	B	.08	10
ACA-451	12-13-22	N	2	N	30	N	20	N	.02N	.6	.10	10
ACA-452	12-13-22	N	L	N	70	N	10	N	.02N	.6	.06	L
ACA-455	12-13-22	N	L	N	15	5	N	30	.10N	B	.10	10
ACA-459	12-13-15	N	L	N	100	N	N	30	B	B	.10	10
ACA-504	13-13-11	N	L	N	20	N	N	150	.02N	B	.04	L
ACA-506	13-13-24	N	N	N	20	N	N	50	.02N	B	.04	L
ACA-512	13-13- 6	N	1	N	50	N	30	70	.30	1	.08	20
ACA-557	11-16- 2	N	L	N	30	N	10	15	B	B	.40	N
ACA-568	11-15- 4	N	1	N	20	N	30	L	.02L	.7	.05	N
ACA-575	11-15-14	N	2	N	15	N	20	N	.02L	.7	.09	N
ACA-579	11-15-10	N	2	N	20	N	20	N	.02L	.7	.05	N
ACA-582	11-15- 3	N	1	N	20	N	15	N	.02L	.8	.05	N
ACA-623	12-19-17	N	2	N	30	N	30	N	.06	1	.09	10
ACA-629	12-19-22	N	2	N	20	N	20	N	.02L	.8	.20	20
ACA-637	12-18-38	N	3	N	15	N	30	N	.02L	.8	.10	N
ACA-645	12-18-33	N	2	N	50	N	50	N	.02L	1.2	.10	N
ACA-678	11-15- 4	N	L	N	30	N	15	10	.06	B	.10	N
ACA-687	12-12- 8	N	L	N	30	N	15	50	B	B	.05	N
ACA-757	12-12- 8	N	1	N	30	N	20	100	B	B	.05	N
ACA-759	12-12- 8	N	1	N	30	N	30	200	.02L	B	.07	N
ACA-791	11-14- 5	N	1	N	50	N	30	50	B	B	B	L
ACA-796	10-17-33	N	L	10	5	30	L	N	.02L	L	L	N
ACA-803	10-17-34	N	1	N	100	N	15	15	.02L	1.4	.05	N
ACA-806	12-19- 5	N	2	N	50	10	30	N	.30	1	.05	N
ACA-908	11-15-24	N	N	N	15	N	15	150	.02L	L	.09	L
ACA-917	11-14-29	N	1	N	7	N	20	N	.02L	L	.80	L
AGR-117	11-19-29	N	1	N	30	N	50	20	.02L	2	.05	N
AGR-120	11-19-30	N	2	N	30	N	50	15	.02L	2	.05	N
AGR-122	11-20-24	N	2	N	70	N	70	20	B	B	.10	L
AGR-141	11-19-32	N	1	N	100	N	50	15	B	B	.20	40
AGR-148	12-20- 1	N	2	N	70	N	30	30	B	B	.20	N
AGR-170	11-19- 7	N	2	N	50	N	100	20	B	B	.20	L
AGR-225	13-18-11	N	2	N	20	N	30	N	.40	.8	.09	N
AGR-261	12-18-30	N	2	N	30	N	20	N	.40	B	.10	N
AGR-281	11-19- 6	N	2	N	20	N	70	10	.06	B	.20	N
AGR-290	11-19-30	N	N	N	20	N	30	15	.02L	2.2	.05	N
AGR-294	12-20- 1	N	1	N	30	N	70	15	B	B	.08	N
AGR-296	11-19- 7	N	L	N	20	N	150	20	B	B	.10	N
AGR-407	14-17-14	N	N	N	20	N	70	N	0.04	B	0.10	30
AGR-415	14-16-21	N	L	N	30	N	30	N	.04	B	.11	20
AGR-519	14-16-28	N	2	N	15	N	70	10	.04	.4	.12	L
AGR-584	14-15-24	N	N	N	30	N	15	50	.02L	L	.04	L
AGR-602	14-15-21	N	N	N	50	N	15	150	.02L	L	.22	L
AGR-607	14-15-20	N	N	N	30	N	10	30	.02L	L	.02	L
AGR-610	14-15-20	N	N	N	30	N	15	30	.02L	L	.02	L
AGR-613	14-15-20	N	N	N	70	N	30	100	.02L	L	.04	L
AGR-664	11-18-32	N	1	N	7	N	100	50	.04	L	.10	10
AGR-666	12-18- 4	N	2	N	5	N	50	20	.02L	L	.03	20
AGR-668	12-18- 4	N	2	N	7	N	50	20	.02L	L	.30	80
AGR-673	12-18- 5	N	2	N	10	N	70	20	.10	L	.05	10
AGR-674	12-18- 5	N	2	N	5	N	50	20	.02L	L	.05	20
AGR-843	14-14-21	N	N	N	150	N	15	N	L	L	.24	N
AGR-850	14-14-16	N	N	N	100	N	30	N	.02L	L	.22	L
AGR-861	14-14- 4	N	N	N	150	N	10	N	.04L	L	.13	N
AGR-864	14-14- 3	N	N	N	100	N	20	N	.04L	L	.11	N
AGR-869	13-14-34	N	N	N	150	N	15	N	B	B	.28	N
AGR-874	13-14-34	N	N	N	50	N	15	N	.02L	L	G	N
AMF-235 17/	13-14- 3	N	2	N	15	N	10	N	.02L	L	.11	L
AMF-255	13-14- 4	N	1	N	15	N	15	20	.10	L	.03	L
AMF-256	13-14- 4	N	1	N	30	N	N	50	.04L	L	.07	L

17/ W = L(50).

Geochemical patterns

The purpose of geochemical surveys is to outline concentrations of metals that may be related to ore deposits; these concentrations need not be of the primary ore metals, but may include indicator elements as well. Indicator elements can be identified by careful perusal of the geochemical data, and by histograms and other statistical procedures. However, variable concentrations of metals determined by a geochemical survey may be related to distribution factors other than mineralization. In the Gila study area, as elsewhere, some trace metals are known to be concentrated in some igneous rock types in preference to others; thus chromium, cobalt, nickel, and copper are more abundant in basaltic rocks than in rhyolitic rocks, and conversely berryllium and tin are more abundant in rhyolitic rocks. High copper values, therefore may signal only the presence of basaltic rocks, rather than a copper deposit. Even though the distribution pattern of a metal indicates that anomalous concentrations of the metal cut across rock type, it does not necessarily indicate a minable ore body of that metal, or any other metal. On the other hand, an indicator element or combination of indicator elements may lead to the discovery of an ore deposit of one or more of the indicator elements, or to a deposit of another metal that is less mobile than the indicator elements with which it is associated. It is also possible that anomalous values related to non-economic veins or other mineralized structures may represent leakage above a larger deposit that is not otherwise represented at the surface.

The following metals and groups of metals have been selected as possible indicator elements of ore deposits in the Gila study area: beryllium, tin and tungsten; mercury, bismuth, antimony and arsenic; gold, silver and tellurium; and copper, molybdenum, lead, zinc, and manganese.

Beryllium, tin, and tungsten.--Beryllium, tin and tungsten commonly are associated in the geologic environment, and they occur in greater abundance in silicic, rather than mafic igneous rocks.

Beryllium.--Beryllium is of interest in the resource appraisal of the Gila study area not only because of its possible role as an indicator element of polymetallic ore deposits, but also because the world's largest known resources of beryllium occur in rhyolite tuffs associated with topaz-bearing rhyolite at Spor Mountain, Utah (Shawe, 1968, p. 1148). Similar rhyolitic rocks are present in the Mogollon volcanic area where tin and topaz-bearing rhyolites have been described by Fries (1940), Fries and others (1942), and Ericksen and others (1970, p. 36; 72-74).

In the Gila study area, geochemical samples containing 5 ppm or more beryllium (tables 4, 5) are related to the distribution of flow-banded rhyolite throughout the study area. At the 7 ppm level, however, beryllium is found to be concentrated in the younger rhyolitic rocks and stream sediment samples in the northeastern part of the area, and in mineralized or altered rocks in the northwestern part of the area (fig. 28). All of the geochemical samples contain amounts of beryllium much below ore grade.

In the Indian Creek area (pl. 1B), the distribution of altered and unaltered rhyolite suggests a local vent; lithophysal rhyolite in this area contains fluorite, and crystals of the rare minerals bixbyite, $(Mn,Fe)_2O_3$, and pseudobrookite, $Fe_2O_3 \cdot TiO_2$, which also are found in the tin and topaz-bearing rhyolites east of the study area. The rare minerals in the rhyolite of Indian Creek were confirmed by X-ray (Sherman Marsh, personal commun., 1969), but topaz has not been identified. The highest beryllium content from the Indian Creek area is 20 ppm in samples of rhyolitic tuff.

The beryllium content of samples of vein materials in the Mogollon district, and in the Spruce Creek, Big Dry and Little Dry Creek areas indicates that beryllium is associated with mineralized rocks as well as with unaltered rhyolites in the northwestern part of the study area. The highest beryllium values were found in samples of the outcrop of the Little Fanney vein in the Mogollon district (30 ppm, Be) and in a small shear in the rhyolite of Sacaton Mountain west of Little Dry Creek (50 ppm, Be). Anomalous beryllium values are notably absent however in the other major areas of mineralization in the Gila fluorspar district, Alum Mountain and Copperas Canyon areas. U. S. Bureau of Mines samples (table 9) confirm this distribution pattern; 38 samples containing 7 to 100 ppm beryllium are distributed from Seventyfour Mountain northwest to the Mogollon district. Different ages of mineralization may account for these differences.

Table 5.--Frequency distribution of the analyses of certain elements in the Gila study area

[F, numerical frequency; CF, cumulative frequency, in percent; GM, geometric mean; NC, not computed; ---, no values. Tabulations include 34 samples of altered rock that were not included in the computations of the geometric mean. Totals may include rocks from the Gila Conglomerate or sediments interlayered with the volcanic igneous rocks, and thus igneous rock columns, when summed may be less than totals]

Table 5.--Continued

Values (ppm)	Unaltered rocks								Altered and mineralized rock		Stream sediments		Panned concentrates	
	Felsic		Intermediate		Mafic		Total							
	F	CF	F	CF	F	CF	F	CF	F	CF	F	CF	F	CF
							Beryllium							
N	---	---	2	1.65	4	8.33	6	1.2	49	9.40	14	1.02	52	29.71
L	14	4.35	50	42.97	29	68.75	93	20.2	149	38.00	351	26.53	49	57.71
1.0	40	16.77	47	81.81	15	100.00	102	40.9	80	53.40	349	51.87	37	78.85
1.5	53	33.23	11	90.90	---	---	64	53.9	69	66.50	241	69.38	19	89.71
2.0	87	60.25	9	98.34	---	---	96	73.5	72	80.30	263	88.49	16	98.85
3.0	88	87.58	1	99.17	---	---	89	91.5	42	88.50	122	97.36	1	99.42
5.0	29	96.59	---	99.17	---	---	29	97.4	36	95.50	32	99.69	1	100.00
7.0	6	98.45	---	99.17	---	---	6	98.7	11	97.50	3	99.91	---	---
10	4	99.69	1	100.00	---	---	5	99.8	7	98.90	---	99.91	---	---
15	---	99.69	---	---	---	---	---	99.8	2	99.30	1	100.00	---	---
20	1	100.00	---	---	---	---	1	100.0	2	99.60	---	---	---	---
30	---	---	---	---	---	---	---	---	1	99.80	---	---	---	---
50	---	---	---	---	---	---	---	---	1	100.00	---	---	---	---
GM-------	2.1	---	NC	---	NC	---	1.5	---	1.1	---	1.2		NC	
							Tin							
N	203	63.04	117	96.69	46	99.96	366	74.4	477	91.50	1,286	[illegible]	71	41.71
L	74	86.02	4	100.00	2	100.00	80	90.9	24	96.30	28	95.49	2	42.85
10	43	99.37	---	---	---	---	43	99.6	16	99.20	41	98.47	22	55.42
15	---	99.37	---	---	---	---	---	99.6	1	99.40	9	99.12	31	73.14
20	1	99.68	---	---	---	---	1	99.8	1	99.60	7	99.63	27	88.56
30	1	100.00	---	---	---	---	1	100.0	---	99.60	3	99.85	5	91.42
50	---	---	---	---	---	---	---	---	1	99.80	1	99.92	7	95.42
70	---	---	---	---	---	---	---	---	1	100.00	---	99.92	1	95.99
100	---	---	---	---	---	---	---	---	---	---	1	100.00	3	97.70
150	---	---	---	---	---	---	---	---	---	---	---	---	3	99.41
200	---	---	---	---	---	---	---	---	---	---	---	---	1	100.00
GM-------	NC	---	NC	---	NC	---	Nc	---	NC	---	NC	---	NC	---
							Tungsten							
N	321	99.70	121	100.00	48	100.00	490	99.8	486	93.30	1,369	99.88	174	99.43
L	1	100.00	---	---	---	---	1	100.0	25	4.80	5	100.00	1	100.00
50	---	---	---	---	---	---	---	---	9	1.70	---	---	---	---
70	---	---	---	---	---	---	---	---	---	1.70	---	---	---	---
100	---	---	---	---	---	---	---	---	---	1.70	---	---	---	---
150	---	---	---	---	---	---	---	---	---	1.70	---	---	---	---
200	---	---	---	---	---	---	---	---	1	.20	---	---	---	---
GM-------	NC	---	NC	---	NC	---	NC	---	NC	---	NC	---	NC	---
							Mercury							
N	---	---	---	---	---	---	---	---	---	---	1	0.10	---	---
L	7	2.10	---	---	1	2.00	8	1.6	3	0.50	17	1.30	---	---
.01	18	7.60	8	6.10	2	6.10	28	6.7	11	2.60	31	3.60	8	4.60
.015	---	7.60	---	6.10	---	6.10	---	6.7	---	2.60	---	3.60	---	4.60
.02	25	15.20	13	16.00	3	12.20	41	14.7	21	6.50	96	10.60	6	8.10
.03	33	25.20	16	28.20	4	20.40	53	25.2	35	13.00	143	21.00	12	14.90
.05	53	41.30	7	33.60	4	28.60	64	37.8	66	25.20	281	41.40	32	33.30
.07	57	58.70	20	48.90	6	40.80	83	54.1	63	36.90	309	63.90	20	44.80
.1	50	73.90	18	62.60	9	53.20	77	69.2	64	48.80	245	81.70	52	74.70
.15	31	83.30	7	67.90	5	69.40	43	77.7	50	58.10	117	90.30	10	80.50
.2	37	94.50	17	80.90	10	89.80	64	90.2	95	75.90	96	97.30	19	91.40
.3	10	97.60	9	87.80	2	93.90	21	94.4	45	84.00	24	99.00	9	96.60
.5	5	99.10	8	93.90	2	98.00	16	97.6	34	90.50	10	99.80	2	97.70
.7	3	100.00	7	99.20	1	100.00	12	99.8	20	94.20	1	99.90	1	98.30
1.0	---	---	---	99.20	---	---	---	99.8	10	96.00	1	100.00	---	98.30
1.5	---	---	1	100.00	---	---	1	100.0	6	97.10	---	---	1	98.90
2.0	---	---	---	---	---	---	---	---	7	98.40	---	---	1	99.40
3.0	---	---	---	---	---	---	---	---	---	98.40	---	---	---	99.40
5.0	---	---	---	---	---	---	---	---	5	99.40	---	---	---	99.40
7.0	---	---	---	---	---	---	---	---	2	99.70	---	---	---	99.40
10.0	---	---	---	---	---	---	---	---	---	99.70	---	---	---	99.40
G10.0	---	---	---	---	---	---	---	---	2	100.00	---	---	1	100.00
GM-------	.06	---	.09	---	.09	---	.07	---	.13	---	.06	---	.08	---

Table 5.--Continued

Values (ppm)	Unaltered rocks: Felsic		Intermediate		Mafic		Total		Altered and mineralized rock		Stream sediments		Panned concentrates	
	F	CF	F	CF	F	CF	F	CF	F	CF	F	CF	F	CF
							Bismuth							
N	308	95.60	121	100.00	47	97.90	476	96.9	429	87.60	1,371	99.00	174	99.00
L	11	99.00	---	---	1	100.00	12	99.4	28	93.30	4	100.00	---	99.00
10	3	100.00	---	---	---	---	3	100.0	13	95.90	---	---	1	100.00
15	---	---	---	---	---	---	---	---	8	97.60	---	---	---	---
20	---	---	---	---	---	---	---	---	3	98.00	---	---	---	---
30	---	---	---	---	---	---	---	---	2	98.40	---	---	---	---
50	---	---	---	---	---	---	---	---	2	98.80	---	---	---	---
70	---	---	---	---	---	---	---	---	2	99.20	---	---	---	---
100	---	---	---	---	---	---	---	---	---	99.20	---	---	---	---
200	---	---	---	---	---	---	---	---	1	99.60	---	---	---	---
300	---	---	---	---	---	---	---	---	1	99.80	---	---	---	---
G1,000	---	---	---	---	---	---	---	---	1	100.00	---	---	---	---
GM-------	NC	---	NC	---	NC	---	NC	---	NC	---	NC	---	NC	---
							Antimony							
N	320	99.40	120	100.00	48	100.00	488	99.6	500	96.40	1,374	100.00	175	100.00
L	2	100.00	---	---	---	---	2	100.0	16	99.80	---	---	---	---
100	---	---	---	---	---	---	---	---	2	100.00	---	---	---	---
GM-------	NC	---	NC	---	NC	---	NC	---	NC	---	NC	---	NC	---
							Arsenic							
N	193	60.00	87	71.90	39	81.30	319	66.2	282	54.10	983	71.50	63	36.20
L	117	96.30	30	96.90	9	100.00	147	96.7	144	81.90	383	99.40	66	74.20
10	6	98.20	3	99.20	---	---	9	98.6	51	91.50	8	99.90	25	88.60
15	---	98.20	---	99.20	---	---	---	98.6	2	91.90	---	99.90	3	90.30
20	4	99.40	1	100.00	---	---	5	99.6	16	95.00	---	99.90	8	94.80
30	---	99.40	---	---	---	---	---	99.6	---	95.00	1	100.00	2	96.00
50	1	99.70	---	---	---	---	1	99.8	11	97.10	---	---	4	98.30
70	1	100.00	---	---	---	---	1	100.0	10	99.10	---	---	2	99.40
100	---	---	---	---	---	---	---	---	3	99.60	---	---	1	100.00
150	---	---	---	---	---	---	---	---	1	99.80	---	---	---	---
200	---	---	---	---	---	---	---	---	1	100.00	---	---	---	---
GM-------	NC	---	NC	---	NC	---	NC	---	NC	---	NC	---	NC	---
							Gold							
N	25	78.40	14	11.60	3	6.70	42	8.5	121	24.80	297	24.70	26	19.40
L	273	93.40	106	99.10	43	95.90	422	94.1	282	82.50	774	89.10	89	85.80
.02	14	97.80	---	99.10	---	95.90	14	97.6	19	86.20	105	97.80	---	85.80
.03	---	97.80	---	99.10	---	95.90	---	97.6	1	86.40	11	98.80	---	85.80
.05	2	98.40	---	99.10	---	95.90	2	98.2	13	89.00	7	99.30	7	91.00
.07	3	99.40	1	100.00	---	95.90	4	99.0	10	91.10	2	99.50	3	93.30
.1	---	99.40	---	---	---	95.90	---	99.0	6	92.40	1	99.60	2	94.80
.15	---	99.40	---	---	---	95.90	---	99.0	7	93.70	---	99.60	---	94.80
.2	1	99.60	---	---	1	97.90	2	99.4	4	94.60	2	99.80	---	94.80
.3	1	99.80	---	---	1	100.00	2	99.8	7	95.90	1	99.80	2	96.20
.5	---	99.80	---	---	---	---	---	99.8	4	96.80	1	99.90	2	97.70
.7	---	99.80	---	---	---	---	---	99.8	2	97.20	1	100.00	---	97.70
1.0	---	99.80	---	---	---	---	---	99.9	3	97.80	---	---	2	99.20
1.5	1	100.00	---	---	---	---	1	100.0	1	98.00	---	---	1	100.00
2.0	---	---	---	---	---	---	---	---	4	98.80	---	---	---	---
3.0	---	---	---	---	---	---	---	---	1	99.00	---	---	---	---
10	---	---	---	---	---	---	---	---	2	99.50	---	---	---	---
30	---	---	---	---	---	---	---	---	2	100.00				
GM-------	NC	---	NC	---	NC	---	NC	---	NC	---	NC	---	NC	---
							Silver							
N	298	92.50	119	98.40	47	97.90	464	94.4	415	79.60	1,360	98.80	170	97.10
L	13	96.60	1	99.20	---	97.90	14	97.2	23	84.10	6	99.30	---	97.10
.5	6	98.50	1	100.00	1	100.00	8	98.9	24	88.60	4	99.60	---	97.10
.7	2	99.10	---	---	---	---	2	99.3	15	91.50	1	99.70	---	97.10
1.0	3	100.00	---	---	---	---	3	100.0	7	92.70	---	99.70	---	97.10
1.5	---	---	---	---	---	---	---	---	3	93.40	---	99.70	---	97.10
2.0	---	---	---	---	---	---	---	---	5	94.40	---	99.70	3	98.90
3.0	---	---	---	---	---	---	---	---	5	95.30	---	99.70	---	98.90
5.0	---	---	---	---	---	---	---	---	5	96.30	1	99.70	---	98.90
7.0	---	---	---	---	---	---	---	---	1	96.50	---	99.70	---	98.90
10.0	---	---	---	---	---	---	---	---	4	97.30	1	99.80	---	98.90
15.0	---	---	---	---	---	---	---	---	2	97.70	---	99.80	---	98.90
20	---	---	---	---	---	---	---	---	3	98.30	1	99.80	---	98.90
30	---	---	---	---	---	---	---	---	5	99.20	1	99.90	---	98.90
50	---	---	---	---	---	---	---	---	1	99.40	1	100.00	---	98.90
70	---	---	---	---	---	---	---	---	---	99.40	---	---	---	98.90
100	---	---	---	---	---	---	---	---	3	100.00	---	---	---	98.90
150	---	---	---	---	---	---	---	---	---	---	---	---	1	99.40
200	---	---	---	---	---	---	---	---	---	---	---	---	1	100.00
GM-------	NC	---	NC	---	NC	---	NC	---	NC	---	NC	---	NC	---

Table 5.--Continued

Values (ppm)	Unaltered rocks								Altered and mineralized rock		Stream sediments		Panned concentrates	
	Felsic		Intermediate		Mafic		Total							
	F	CF	F	CF	F	CF	F	CF	F	CF	F	CF	F	CF
							Tellurium							
N	---	---	---	---	---	---	---	---	2	0.04	---	---	1	0.90
L	311	96.50	115	96.70	44	93.60	470	96.4	337	65.80	1,147	96.50	86	76.30
.2	7	98.60	1	97.40	3	100.00	11	98.6	30	71.60	26	98.50	2	78.10
.3	---	98.60	---	97.40	---	---	---	98.6	10	73.60	13	99.50	---	78.10
.5	2	99.20	1	98.40	---	---	3	99.2	26	78.60	6	99.90	1	79.00
.7	1	99.60	2	100.00	---	---	3	99.8	44	87.00	---	99.90	10	87.60
1.0	1	100.00	---	---	---	---	1	100.0	19	91.00	1	100.00	6	93.50
1.5	---	---	---	---	---	---	---	---	7	92.60	---	---	3	95.70
2.0	---	---	---	---	---	---	---	---	19	95.90	---	---	3	97.90
3.0	---	---	---	---	---	---	---	---	4	96.70	---	---	2	99.20
5.0	---	---	---	---	---	---	---	---	7	98.10	---	---	1	100.00
7.0	---	---	---	---	---	---	---	---	3	98.70	---	---	---	---
10.0	---	---	---	---	---	---	---	---	1	98.90	---	---	---	---
15	---	---	---	---	---	---	---	---	1	99.10	---	---	---	---
20	---	---	---	---	---	---	---	---	1	99.30	---	---	---	---
70	---	---	---	---	---	---	---	---	1	99.50	---	---	---	---
700	---	---	---	---	---	---	---	---	1	99.70	---	---	---	---
1,000	---	---	---	---	---	---	---	---	1	99.90	---	---	---	---
3,000	---	---	---	---	---	---	---	---	1	100.00	---	---	---	---
GM-------	NC	---	NC	---	NC	---	NC	---	NC	---	NC	---	NC	---
							Copper							
N	7	---	1	0.80	---	---	8	1.8	9	1.70	---	---	---	---
L	131	---	2	2.50	1	2.10	134	28.9	63	13.80	26	1.90	---	---
5	50	---	4	5.80	---	2.10	54	39.9	55	24.40	74	7.30	7	4.00
7	18	---	---	5.80	---	2.10	18	43.6	30	30.10	96	14.30	7	8.00
10	27	---	5	9.90	---	2.10	32	50.1	52	40.10	113	22.50	9	13.10
15	36	---	7	15.70	1	4.20	44	59.0	61	51.80	149	33.40	17	22.90
20	26	---	14	27.30	4	12.50	44	68.1	62	63.60	252	51.60	29	39.40
30	21	---	32	53.70	10	33.30	63	80.9	77	78.40	377	79.00	38	61.10
50	3	---	31	79.30	23	81.30	57	92.5	38	85.90	198	93.50	32	79.40
70	3	---	21	96.70	7	95.80	31	98.7	29	91.40	62	98.00	19	90.30
100	---	---	4	100.00	2	100.00	6	100.00	13	93.90	20	99.50	9	95.40
150	322	---	---	---	---	---	---	---	9	95.60	6	99.90	5	98.30
200	---	---	---	---	---	---	---	---	4	96.40	1	100.00	1	98.90
300	---	---	---	---	---	---	---	---	3	97.00	---	---	---	98.90
500	---	---	---	---	---	---	---	---	1	97.20	---	---	---	98.90
700	---	---	---	---	---	---	---	---	4	98.00	---	---	---	98.90
1,000	---	---	---	---	---	---	---	---	4	98.80	---	---	1	99.40
1,500	---	---	---	---	---	---	---	---	---	98.80	---	---	1	100.00
2,000	---	---	---	---	---	---	---	---	2	99.20	---	---	---	---
3,000	---	---	---	---	---	---	---	---	---	99.20	---	---	---	---
5,000	---	---	---	---	---	---	---	---	3	99.70	---	---	---	---
7,000	---	---	---	---	---	---	---	---	---	99.70	---	---	---	---
10,000	---	---	---	---	---	---	---	---	1	99.90	---	---	---	---
G20,000	---	---	---	---	---	---	---	---	1	100.00	---	---	---	---
GM-------	5.0	---	32.2	---	41.5	---	9.8	---	22.5	---	22.1	---	30.8	---

Table 5.--Continued

Values (ppm)	Unaltered rocks								Altered and mineralized rock		Stream sediments		Panned concentrates	
	Felsic		Intermediate		Mafic		Total							
	F	CF	F	CF	F	CF	F	CF	F	CF	F	CF	F	CF
								Molybdenum						
N	266	82.60	91	76.50	47	97.90	404	82.6	312	59.80	1,247	90.60	172	98.30
L	34	93.20	17	90.80	---	97.90	51	93.1	41	67.60	37	93.30	---	98.30
5	13	97.20	9	98.30	1	100.00	23	98.0	35	74.50	63	97.90	1	98.90
7	4	98.50	2	100.00	---	---	6	99.0	30	80.10	13	98.80	---	98.90
10	3	99.60	---	---	---	---	3	99.6	27	85.40	11	99.60	2	100.00
15	2	100.00	---	---	---	---	2	100.0	11	87.80	3	99.90	---	---
20	---	---	---	---	---	---	---	---	18	90.80	---	99.90	---	---
30	---	---	---	---	---	---	---	---	10	92.90	1	99.90	---	---
50	---	---	---	---	---	---	---	---	13	95.40	1	100.00	---	---
70	---	---	---	---	---	---	---	---	7	96.60	---	---	---	---
100	---	---	---	---	---	---	---	---	8	98.30	---	---	---	---
150	---	---	---	---	---	---	---	---	1	98.40	---	---	---	---
200	---	---	---	---	---	---	---	---	5	99.40	---	---	---	---
300	---	---	---	---	---	---	---	---	---	99.40	---	---	---	---
500	---	---	---	---	---	---	---	---	1	99.60	---	---	---	---
700	---	---	---	---	---	---	---	---	---	99.60	---	---	---	---
1,000	---	---	---	---	---	---	---	---	1	99.80	---	---	---	---
1,500	---	---	---	---	---	---	---	---	---	99.80	---	---	---	---
2,000	---	---	---	---	---	---	---	---	---	99.80	---	---	---	---
3,000	---	---	---	---	---	---	---	---	---	99.80	---	---	---	---
5,000	---	---	---	---	---	---	---	---	1	100.00	---	---	---	---
GM-------	NC	---	NC	---	NC	---	NC	---	NC	---	NC	---	NC	---
								Lead						
N	3	0.93	---	---	4	8.30	7	1.40	67	12.8	---	---	13	7.40
L	3	1.90	4	3.30	6	20.80	13	4.10	69	26.0	18	1.30	3	9.20
10	11	5.30	33	30.60	16	54.20	60	16.30	71	39.6	62	5.80	16	18.30
15	56	22.70	43	66.10	14	83.30	113	39.30	65	52.0	210	21.10	41	41.70
20	125	61.5	26	87.60	7	97.90	158	71.40	95	70.3	420	51.60	35	61.90
30	73	84.20	13	98.40	1	100.00	87	89.30	59	81.5	510	88.70	22	74.30
50	34	94.70	2	100.00	---	---	36	96.40	28	86.8	126	98.10	29	90.90
70	12	98.40	---	---	---	---	12	99.00	23	91.0	26	99.00	9	95.90
100	4	99.70	---	---	---	---	4	99.80	16	94.1	1	99.50	4	98.40
150	---	99.70	---	---	---	---	---	99.80	7	95.5	1	100.00	1	98.90
200	---	99.70	---	---	---	---	---	99.80	3	96.1	---	---	1	99.50
300	1	100.00	---	---	---	---	1	100.00	2	96.5	---	---	---	99.50
500	---	---	---	---	---	---	---	---	4	97.3	---	---	1	100.00
700	---	---	---	---	---	---	---	---	1	97.5	---	---	---	---
1,000	---	---	---	---	---	---	---	---	---	97.5	---	---	---	---
1,500	---	---	---	---	---	---	---	---	3	98.1	---	---	---	---
2,000	---	---	---	---	---	---	---	---	1	98.3	---	---	---	---
3,000	---	---	---	---	---	---	---	---	2	98.7	---	---	---	---
5,000	---	---	---	---	---	---	---	---	4	99.5	---	---	---	---
7,000	---	---	---	---	---	---	---	---	1	99.7	---	---	---	---
10,000	---	---	---	---	---	---	---	---	---	99.7	---	---	---	---
15,000	---	---	---	---	---	---	---	---	---	99.7	---	---	---	---
20,000	---	---	---	---	---	---	---	---	---	99.7	---	---	---	---
G20,000	---	---	---	---	---	---	---	---	2	100.0	---	---	---	---
GM-------	23.7	---	15.3	---	11.7	---	19.9	---	NC	---	23.9	---	22.1	---
								Zinc						
N	318	98.76	120	99.99	47	99.98	500	99.99	472	90.7	1,285	93.40	128	73.10
L	4	100.00	1	100.00	1	100.00	6	100.00	20	94.4	49	97.00	---	73.10
200	---	---	---	---	---	---	---	---	12	96.6	26	98.80	12	80.00
300	---	---	---	---	---	---	---	---	2	97.0	10	99.60	14	88.00
500	---	---	---	---	---	---	---	---	5	98.0	2	99.70	16	97.10
700	---	---	---	---	---	---	---	---	1	98.2	3	99.90	5	100.00
1,000	---	---	---	---	---	---	---	---	---	98.2	1	100.00	---	---
1,500	---	---	---	---	---	---	---	---	---	98.2	---	---	---	---
2,000	---	---	---	---	---	---	---	---	3	98.8	---	---	---	---
3,000	---	---	---	---	---	---	---	---	2	99.2	---	---	---	---
5,000	---	---	---	---	---	---	---	---	2	99.6	---	---	---	---
7,000	---	---	---	---	---	---	---	---	---	99.6	---	---	---	---
10,000	---	---	---	---	---	---	---	---	---	99.6	---	---	---	---
G10,000	---	---	---	---	---	---	---	---	2	100.0	---	---	---	---
GM-------	NC	---	NC	---	NC	---	NC	---	NC	---	NC	---	NC	---

Table 5.--Continued

Values (ppm)	Unaltered rocks								Altered and mineralized rock		Stream sediments		Panned concentrates	
	Felsic		Intermediate		Mafic		Total							
	F	CF	F	CF	F	CF	F	CF	F	CF	F	CF	F	CF
							Manganese							
N	---	---	---	---	---	---	---	---	1	0.20	---	---	---	---
L	1	0.30	---	---	---	---	1	0.2	5	1.10	---	---	---	---
10	---	.30	---	---	---	---	---	.2	10	3.10	---	---	---	---
15	---	.30	---	---	---	---	---	.2	11	5.20	---	---	---	---
20	1	.60	---	---	---	---	1	.4	26	10.10	---	---	---	---
30	1	.90	---	---	---	---	1	.6	22	14.80	---	---	---	---
50	---	.90	---	---	---	---	---	.6	31	20.70	---	---	---	---
70	6	2.80	---	---	---	---	6	1.8	49	30.10	---	---	---	---
100	3	3.70	2	1.70	---	---	5	2.9	52	40.00	1	0.10	---	---
150	14	8.10	---	1.70	---	---	14	5.7	39	47.60	1	.20	---	---
200	29	17.10	2	3.30	1	2.10	32	12.2	52	57.60	5	.50	---	---
300	72	39.40	10	11.60	3	8.30	85	29.6	41	65.40	70	5.60	---	---
500	102	71.10	44	47.90	3	14.60	149	59.8	42	73.40	191	19.50	6	3.40
700	81	96.30	[illegible]	81.80	20	56.30	142	88.8	41	81.40	481	54.40	5	6.30
1,000	8	98.70	16	95.00	21	100.00	45	98.0	39	88.90	470	88.60	22	18.90
1,500	4	100.00	6	100.00	---	---	10	100.0	10	90.60	121	97.40	23	32.00
2,000	---	---	---	---	---	---	---	---	16	93.80	24	99.10	52	61.70
3,000	---	---	---	---	---	---	---	---	5	94.80	5	99.50	29	78.30
5,000	---	---	---	---	---	---	---	---	13	97.30	4	99.80	26	93.10
G1,500	---	---	---	---	---	---	---	---	14	100.00	3	100.00	12	100.00
GM-------	402	---	596	---	740	---	468	---	1/ 193	---	1/ 790	---	1/ 2,000	---

1/ Geometric mean does not include G5,000 values.

Tin.--Tin is of interest in the Gila study area because rhyolites in the area are similar to, and locally continuous with those in the Taylor Creek tin district, east and northeast of the study area. Also, tin is a mineral commodity for which the United States is largely dependent upon foreign resources, and the Taylor Creek district is one of the very few in the United States where tin has been mined as a primary mineral product, albeit on a negligible scale. Most large economic tin deposits are placers or eluvial deposits because in most lode deposits, cassiterite, the only important ore mineral of tin, is very sparsely disseminated in the host rock. Natural concentrations of cassiterite, based on its high specific gravity, may raise the tin content of stream gravels or residual weathered debris to ore grade.

The distribution of tin in geologic materials of the Gila study area, determined by geochemical sampling, is summarized in table 5. Tin was detected in a total of 360 samples, and was measurable in 226 of these samples analyzed by semiquantitative spectrographic methods having a lower detection limit of 10 ppm. Maximum tin values in the samples range from 30 ppm in the unaltered rocks to 200 ppm in panned concentrates of stream sediments.

The average abundance of tin in igneous rocks of the earth's crust is estimated to be 2-3 ppm, and in silicic igneous rocks to be 3-4 ppm (Wedepohl, 1960, chap. 50). These values, however, are weighted toward the composition of granitic plutonic rocks rather than rhyolitic volcanic rocks, and the tendency for tin to be enriched in the residual pneumatolytic and hydrothermal fluids of magmas suggests that average values for the tin content of rhyolitic rocks is somewhat greater. A threshold value of 10 ppm tin would seem to be reasonable in relation to the figures for average igneous rocks cited above, but fully a third of the unaltered felsic rocks sampled in the study area (table 5) show detectable tin at the 10 ppm level, and a map showing the distribution of all samples with tin greater than or equal to 10 ppm would serve only to outline the areas of rhyolitic rocks. Accordingly, we have chosen a threshold of 15 ppm for anomalous tin in rocks and stream sediment samples in this area (fig. 29).

It is noteworthy that the altered and mineralized rocks have a lower tin content than the unaltered rocks in most parts of the study area. Only three altered or mineralized rock samples were found to contain 15 ppm or more tin; all three are from the Alum Mountain altered and mineralized area (fig. 29). Thus it seems that tin either is not an important trace element in most mineralized rocks in the study area, or its value as an indicator element is diluted by the relatively high background of tin in the rhyolitic rocks of the area.

Stream sediment samples containing 15 ppm or more tin and panned concentrates with 30 ppm or more tin show a distribution pattern (fig. 29) related to the outcrops of tin-bearing rhyolite (pls. 1A, 1B). Our samples do not indicate the presence of commerical tin deposits in the study area, and the values we obtained are generally lower than those reported by Ericksen and others (1970) for samples in and adjacent to the Taylor Creek district. We found no evidence of veins or other tin lodes in the study area. The most reliable indication of the submarginal tenor of this weak tin mineralization comes from the Taylor Creek district where the placer and lode deposits have been intensively studied by Volin and others (1947) and by Fries (1940). According to these earlier investigations, the placer deposits, which have been found only adjacent to the bedrock outcrops, generally average less than 0.05 pounds tin per cubic yard of gravel, and large portions average less than 0.005 pounds per cubic yard. The best placer deposit sampled contains about 4,000 cubic yards of gravel that averages about 2 pounds per cubic yard. Lodes in the district consist of cassiterite in widely spaced stringers and veinlets and disseminated in rhyolite, which would require mining by bulk methods. In the areas sampled in previous studies, no sizable deposit was found to contain as much as one pound of tin per ton. Total tin production from the district has been about 11 tons of concentrates. As concluded by Ericksen and others (1970, p. 74), the potential for significant future production of tin from the Taylor Creek district would seem to be negligible, and this conclusion applies also to adjacent areas including the Gila study area where tin-bearing rhyolites occur; however, the possibility of exploitable placers along the Gila River, as below the mouth of Sapillo Creek has not been adequately tested during this investigation.

Tungsten.--There is no indication of, nor likelihood for tungsten deposits in the study area. However, tungsten, which may be concentrated in hypogene manganese minerals (Hewett and Fleischer, 1960, p. 28), could be an indicator of other metal deposits. Its usefulness as an indicator element is inhibited somewhat in this study by the relatively high, lower limit of detection (50 ppm) of the semiquantitative spectrographic analyses, relative to its average abundance in crustal rocks of between 0.5 and about 2 ppm. However, as tungsten has a tendency to be slightly enriched in the more silicic rocks (Wedepohl, 1970, chap. 72), it is not surprising that it was detected in 42 samples from the study area, table 5, including one sample of supposedly unaltered rhyolite, one panned concentrate, 5 stream sediment samples, and 35 samples of altered or mineralized rocks. The tungsten was measurable in only 10 of these samples, none with approximately 50 ppm and one with about 200 ppm. Samples with detectable or measurable tungsten came mainly from the mineralized areas in Big Dry, Spruce, and Little Dry Creeks, Minton Canyon and Gila fluorspar district, and in scattered fault and vein samples in the eastern part of the wilderness (fig. 30). Tungsten might be a more useful indicator element in this area if a more sensitive analytical method were used.

Mercury, bismuth, antimony, and arsenic.--Mercury bismuth, antimony, and arsenic are similar elements geochemically because they tend to form sulfides rather than occurring in the more common rock-forming minerals. Also, they are present in amounts averaging only a few tenths of a part per million in igneous rocks, except for arsenic, which averages about 6 ppm in rhyolitic glasses (Wedepohl, 1969, chap. 33; 1970, chaps. 51, 80, 83). Mercury, antimony and arsenic, and probably also bismuth are common in volcanic exhalations, and around hot springs.

There is little possibility that economic deposits of these metals alone are present in the study area, but their common association with metallic ore deposits, either as trace constituents, or major elements of ore minerals, accounts for their value as indicator elements.

Mercury.--The mercury content of geochemical samples in the study area is shown in table 5, and in histograms on figure 31. The high sensitivity of the mercury detector into the parts per billion range enabled the mercury in nearly every sample to be measured. The distribution of samples containing 0.25 ppm or more mercury largely mimics the sample locality map for mineralized and altered rocks (fig. 28), and brings out a minor concentration of mercury in samples along the Gila Hot Springs graben. The distribution of samples containing 0.4 ppm or more mercury is shown in figure 31, where the samples high in mercury are concentrated mainly in the areas of mineralized and intensely altered rocks. Mercury is being deposited in many modern hot-spring environments (Wedepohl, 1970, chap. 80) and in some of the areas of altered rock in the study area, particularly in the Copperas Canyon and Alum Mountain erosional windows, silicified pipe-like structures with porous breccia may have been the orifices of paleo-hot springs. Although mercury may be concentrated in the vent areas of volcanic centers not necessarily associated with ore deposits, the highest mercury contents in samples from the study area are associated with mineralized structures in the Gold Hill and Lone Pine Mine areas, showing the usefulness of this element as an indicator of mineralization.

Bismuth.--The abundance of bismuth in average igneous rock is only a few tenths ppm, considerably less than its lower limit of detection (10 ppm) by the semiquantitative spectrographic method. Bismuth was detected in about 80 geochemical samples in the study area, but was present in measurable amounts in only four samples other than rocks that were visibly altered or mineralized, table 5. Bismuth was not detected in samples from the Gila fluorspar district, but its presence in the Copperas Canyon-Alum Mountain area, and in the areas of strongest mineralization in the northwestern part of the study area (fig. 32), show that it is related to mineralization and should be an even more useful indicator mineral if a more sensitive analytical method were utilized.

Antimony.--Inasmuch as the lower limit of detection of antimony by the semiquantitative spectrographic method is 100 ppm, compared to the average antimony content of igneous rocks of about 0.2 ppm, antimony was measured in only two samples, table 6. One of the samples was from the Watson Mountain mine in the Gila fluorspar district, and the other from a prospect pit on a siliceous pyritic fault zone near the head of the ridge between the North Fork and Big Dry Creek (fig. 32). A number of other samples originally were reported to have detectable antimony but where checked, the values were found to be questionable. Antimony, like bismuth, might be a more useful indicator element in this area if measured by a more sensitive method.

Arsenic.--The abundance of arsenic in igneous rocks ranges mainly between 1 and 6 ppm but is as much as 12 ppm in some glassy rocks (Wedepohl, 1969, chap. 33). The distribution of arsenic values in the geochemical samples is tabulated in table 5. Regardless of sample type, samples with 15 ppm or more arsenic are restricted almost entirely to the known areas of major mineralization and alteration (fig. 33). Because arsenic may be deposited in volcanic sublimates and from hot springs, its presence may be accounted for locally by a proximity to volcanic vents. Here however, arsenic appears to be a significant indicator of mineralization.

Gold, silver, and tellurium.--Gold, silver, and tellurium are common associates in epithermal precious metal deposits. In addition tellurium is sufficiently abundant in the Lone Pine mine area to be a potential resource.

Gold.--The range of gold values in geochemical samples of the study area is summarized in table 5, and the more significant gold-bearing samples are located on figure 34. Although gold was reported down to a lower detection limit of 0.02 ppm if a 10 gram sample was analyzed, analytical error and sampling error combine to make values below 0.05 ppm particularly questionable, and values between 0.05 and 0.1 ppm are not consistently reproducible. Therefore nearly all of the reliable gold values were found in the mineralized and altered rock sample set, largely in the northwestern part of the study area (fig. 34). The four highest values obtained were in samples from veins in the Holt Gulch-Gold Hill and Lone Pine mine areas.

Silver.--Very little silver was found in the geochemical samples, except in the mineralized and altered rocks, table 5, where it is particularly prevalent in the northwestern part of the area (fig. 35). In the eastern part of the study area trace amounts of silver were detected in a number of samples of mostly silicic rocks in which there was no visual evidence of alteration or mineralization. Some of these were collected near minor faults having no noticeable vein. There seems to be no further evidence of significant mineralization associated with these trace amounts of silver.

Tellurium.--Tellurium is an important indicator element in the Gila study area as it is associated with the known mineralized and altered rocks throughout the area. Values reported as less than 0.5 ppm are not considered to be reliable, and values between 0.5 and 1.0 ppm also may not be reproducible. Finely dispersed organic matter or other foreign material gave interference in the measurement of tellurium in over 100 stream sediment samples, but it is unlikely that any important tellurium concentrations were missed in the eastern part of the study area because of this factor. Tellurium not only is associated with mineralized rocks, but itself has been the object of extensive exploration in the Lone Pine district, where our geochemical samples showed as much as 3,000 ppm tellurium (tables 4B and 5). Tellurium was reported in analyses of panned concentrates, stream sediments, and a few rocks that were not visibly altered, but nearly all such occurrences are within the areas of known mineralization and alteration (fig. 36). Outside the Lone Pine district maximum values are 3-4 ppm in the Copperas Canyon-Alum Mountain area and 2.5 ppm in the Gila fluorspar district.

Copper, molybdenum, lead, zinc and manganese.--Copper, molybdenum, lead, zinc and manganese are the base metals most likely to be found in important mineral deposits in the Gila study area.

Copper.--The frequency distribution of copper values in the geochemical samples of the study area is tabulated in table 5, and shown by histograms in figure 37. For unaltered rocks, the histograms show a bimodal distribution of copper values which reflects the relative abundance of copper (geometric mean, 30-40 ppm) in intermediate and mafic rocks, compared with felsic rocks (geometric mean, 5 ppm). The copper values range up to 100 ppm in the unaltered rocks.

The major features of interest in the copper distribution are: 1) the many high copper values in geochemical samples of mineralized and altered rocks from Big Dry Creek to Haystack Mountain, and to a lesser extent in the Alum Mountain-Copperas Canyon area; 2) the absence of anomalous copper values in the Gila fluorspar district; and 3) the presence of a belt of anomalous copper values in stream sediment samples in the western part of tract 1 of the Gila Primitive Area, which does not seem to be explained by the distribution of mafic volcanic rocks. Other drainages in and adjacent to tract 1 contain the same or similar rock formations but do not show such high copper values. The southwestern part of this belt includes the relatively high copper values in altered and mineralized rock samples in the Copperas Canyon-Alum Mountain area (fig. 37).

Molybdenum.--Perhaps more than any other element considered here, molybdenum is associated with known areas of mineralized and altered rocks. The distribution of values in the various types of geochemical samples is shown in table 5, and the location of samples containing 7 ppm or more molybdenum is shown in fig. 38. Samples having the highest molybdenum values are concentrated in the Little Dry Creek-Big Dry Creek area, within the wilderness and primitive area tract 7, as well as along the edge of the study area; near the wilderness boundary between Whitewater and Little Whitewater Creeks; and in the altered rocks of the volcanic complex of Brock Canyon in the Gila fluorspar district (fig. 38). Little significance is attributed to the isolated samples of unaltered rocks and stream sediments with slightly anomalous values.

Lead.--Lead is known to be concentrated preferentially in the more silicic igneous rocks, and this is borne out by the geochemical samples in the study area. Lead in unaltered rocks varies from a geometric mean of about 12 ppm in rocks classed as mafic to about 24 ppm in the more silicic rocks, table 5. Thus many of the unaltered rock samples and stream sediment samples that contain lead at 70 ppm or more, may merely reflect the lead normally present in highly silicic rhyolitic rocks in this area, as for example in the samples between lower Turkey Creek and the Gila River, figure 39. Otherwise lead is concentrated mainly in the northwestern part of the study area in mineralized and altered rocks, particularly from Big Dry Creek to Haystack Mountain. A minor concentration of lead occurs in the Alum Mountain area, and several stream sediment samples with moderately high lead values are in the belt of anomalous copper-bearing stream sediment samples in the western part of tract 1 of the primitive area. Lead seems not to be an indicator element in the Gila fluorspar district.

Zinc.--Zinc has a lower detection limit of 200 ppm by the semi-quantitative spectrographic method, which limits the usefulness of this element in detecting subtle geochemical anomalies. Table 5 summarizes the geochemical data on zinc from the study area, and the locations of samples having the highest zinc values are shown on figure 40. The greatest concentrations of zinc are in the mineralized and altered rocks in the Big Dry Creek and Little Cry Creek areas.

Six of the geochemical samples contain 20 to 200 ppm cadmium. This metal is produced as a by-product of zinc ores, and the samples from the study area in which cadmium was measured were all rich in zinc or lead.

Manganese.--The range of manganese values in the geochemical samples is shown in table 5. Among the mineralized and altered rocks are many high manganese values, but there are many very low ones also, so that sample set has the lowest geometric mean of any of the sample groups. This is shown graphically by the histograms on figure 41.

Figure 41.--Near here

The high manganese values in the mineralized and altered rocks are clustered predictably in the main mineralized and altered areas, but manganese in stream sediment samples is highest where copper is also high in the belt along the western side of tract 1 of the Gila Primitive Area (fig. 37).

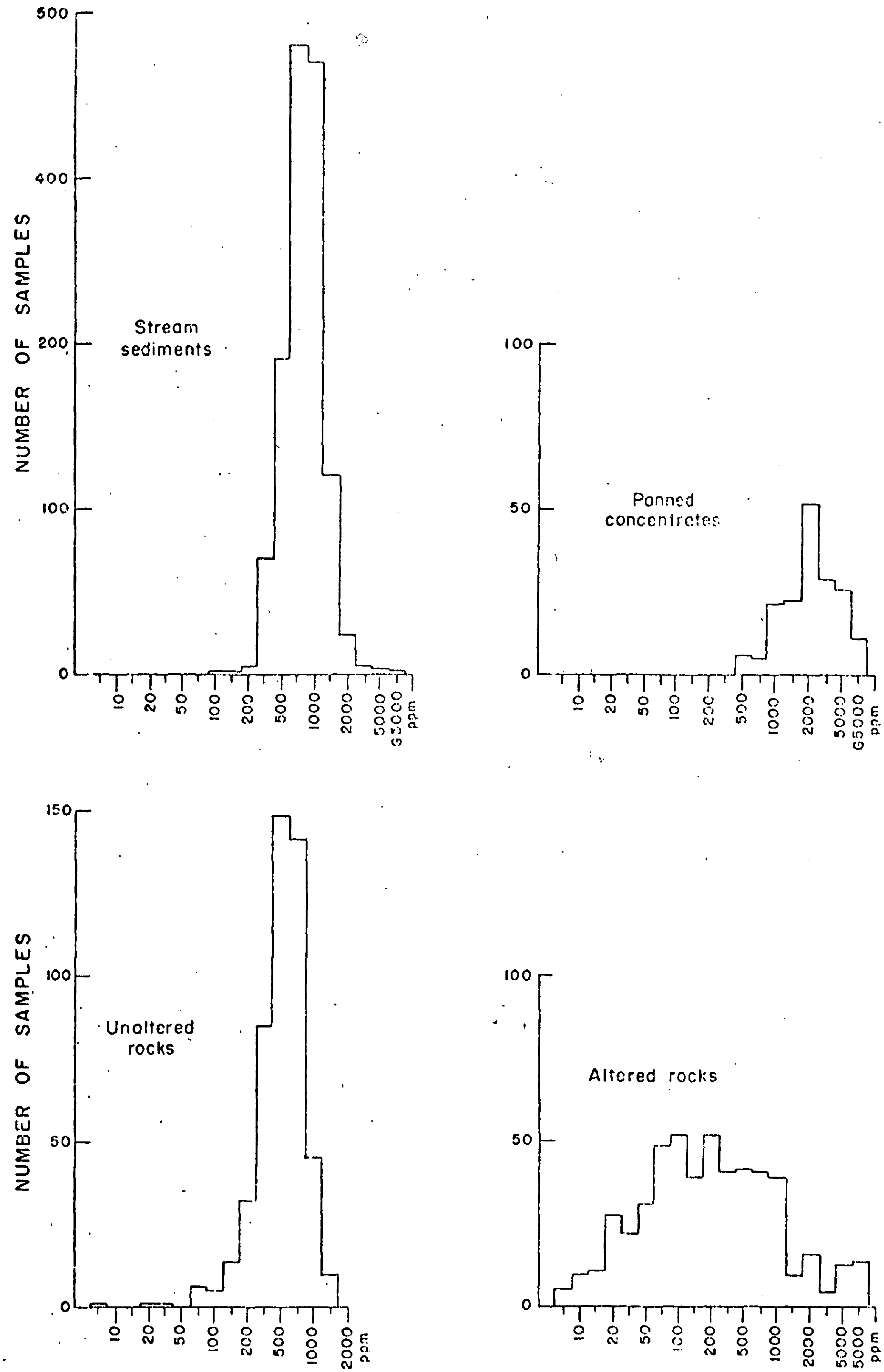

Figure 41.--Histograms of manganese values in samples from the Gila study area.

In summary, no new areas of mineral deposits potential seem to have been revealed by the geochemical sampling program, with the possible exception of the unexplained copper and manganese anomalies in the northern and western parts of tract 1 of the Gila Primitive Area. Mainly, the geochemical survey has served to define more clearly the geochemical character and geographic limits of the mineralized and altered rocks previously known.

Relationship between geophysical and geochemical anomalies

If, as was done in a previous section, the geophysical data can be used to locate buried bodies of rock or to infer the shape at depth of partly exposed bodies, plutons or structures may be inferred that could facilitate the search for mineral deposits. Similarly, geochemical anomalies alone may give a clue to the existence of buried mineral deposits. However, the coincidence of geophysical anomalies with geochemical anomalies may have significance greater than could be attributed to either one alone.

Geochemical anomalies associated with gravity anomalies are shown in table 6, and those associations with aeromagnetic anomalies are shown in table 7. For this comparison the areas of geophysical anomalies were defined arbitrarily. Many of the correlations indicated in the tables were apparent from the relation between geochemical anomalies and surface geology. Some are more subtle, however, and in these the geophysical data give added significance to scattered geochemical anomalies that seemed to have no other unifying explanation.

Table 6.--Areal correlation of geochemical anomalies with gravity anomalies

Gravity anomaly	Alt. or mineralized rocks	Ag	Au	Te	Cu	Mo	Pb	Zn	As	Bi	Hg	Be	Sn	W
1A		X			X									
1B	XXX	XX	X	XXX	X	XXX	XX	X	XXX	XXX	XXX		X	X
1C					X			X						
2A	XXX	X	XX	X		XXX			X		XX			XX
2B	XX	X	XXX		X	XX	X		X	X	X			X
2C	XXX	XX	XXX	XXX		XXX	X	X	XXX	X	XX			
2D														
2E			X								X			
3														X
4														
5				X										
6		XXX	XXX			X	X		X	X		XX	X	XX
7														

XXX = strong correlation XX = moderate correlation X = weak correlation

Table 7.--Areal correlation of geochemical anomalies with magnetic anomalies

Magnetic anomaly	Alt. or mineralized rocks	Ag	Au	Te	Cu	Mo	Pb	Zn	As	Bi	Hg	Be	Sn	W
A a/	XXX	X	X	XXX	X	XXX	X	X	XXX	XXX	XXX		X	
B	X	X												
Area northwest of B	XXX	X	X	X		XXX			X					X
C b/	X	X	XX	X	X	XXX	X		X		XX			X
Area between C and D	XXX	XX	XXX	X	XX	XX	XXX	X	X		XX	XX		X
D	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XXX	XX	XX	XX	X	XX
E		NO GEOCHEMICAL DATA												
F c/	X	XX	X	X						X		X		
G	X			X		X	X	X		X	X	X	X	XX
H	XX			X				X			X	X	XX	X
I	X				X					X			X	

XXX = strong correlation; XX = moderate correlation; X = weak correlation

a/ Includes both the northern and western extensions of magnetic anomaly A.

b/ Geochemical samples were collected only from the northeast flank and northern end of the anomaly.

c/ Geochemical samples were collected only at the southwest end of the anomaly.

Mineral claim investigations

Mining history and production

Mineral development in the Gila Primitive Area and Gila Wilderness dates from discoveries in 1875 of gold and silver in the Mogollon district northwest of the wilderness, and of meerschaum at the Sapillo district in the southwest corner of tract 1 of the Gila Primitive Area. In 1879, gold was discovered on Little Dry Creek near the present wilderness boundary in what is now known as the Wilcox mining district. In the 1880's additional minor gold discoveries were made in the district, and tellurium was discovered at the head of Pine Creek. Also in that decade, claims for aluminum salts were located at Alum Mountain in the Alunogen district, and the first mining of fluorspar in New Mexico began at the Foster mine near apoint where the Gila River leaves the Gila Wilderness. In the 1920's fluorspar claims were located in the Little Whitewater Creek area. Excluding the Mogollon district and the 61 claims on Alum Mountain that were purchased by the Forest Service, there are 16 patented mining claims in the area studied. These include ten in the wilderness, one in tract 7 of the Gila Primitive Area, and five within 1 mile of the primitive area or wilderness (pl. 3). A list of mining claims within the Gila study area has been compiled in table 8.

Table.8.--Mining claims of the Gila Study Area

Location[3] T. R. S.	Claim	Mining District	Location filed: Claimant	Date	Book	Page	Remark Number
			Catron County				
10-12-31	Paradox No. 7-8[3]	Taylor Creek	Rodham, et al	02-27-56	6	13	
10-13-29	TS #3-5[3]	(Unorganized)[4]	Sandison, et al	07-25-55	5	108	
10-13-29	TS #8	-----do------	Tatum, et al	07-28-55	5	130	
10-13-30	TS #1-2[3]	-----do------	Baker, et al	07-25-55	5	108	
10-13-30	TS #6-7	-----do------	Tatum, et al	07-28-55	5	130	
10-14-20	Hope Claims 15-28[3]	-----do------	Moore, et al	10-18-54	4	57-70	1
10-14-29	Hope Claims 1-14[3]	-----do------	-----do-------	10-18-54	4	57-70	1
10-14-29	Hope Claims 1-9	-----do------	-----do-------	11-14-55	5	568-571	
10-14-29	Lonesome #1 (Lode & Placer)	Loco Mountain	Millhouse, et al	06-23-61	7	205	
10-17-31	Higgins, Higgins No. 2	Unorganized	Gibson	04-26-54	4	484	
10-17-34	Willow Creek	Willow Creek	Higgins, et al	08-23-54	1	312	
10-19-34	Bills No. 1, No. 2 Placer	Kooney	Fox, et al	05-11-49	2	558-559	
11-10-31	Paradox No. 3-4 Placer[3]	Taylor Creek	Grainger, et al	12-05-58	6	594	
11-12- 1	Candy 8[3]	-----do------	Boyer	02-14-63	7	340	
11-12- 1	Taylor Creek Placer 5-6[3]	-----do------	Dawson	06-26-39	1	636	
11-12- 2	Candy 4[3]	-----do------	Boyer	02-14-63	7	338	
11-12- 2	Candy 6-7	-----do------	-----do-------	02-14-63	7	339	
11-12- 2	Taylor Creek Placer 3-4[3]	-----do------	Dawson	06-26-39	1	628-629	
11-12- 2	Taylor Creek Tin 1-8[3]	-----do------	Jones, et al	10-05-37	1	536-539	
11-12- 3	Candy 5[3]	-----do------	Boyer	02-14-63	7	339	
11-12- 3	Taylor Creek Placer 1[3]	-----do------	Dawson	06-26-39	1	628	
11-12- 3	Taylor Creek Tin 17-24[3]	-----do------	Jones, et al	06-01-39	1	621-625	
11-12- 4	The Tin & Platinum Min. Claims 1-8[3]	-----do------	Fitzmaurice	02-06-25	1	54-56	
11-12- 5	Beaver 1 (Placers)	-----do------	Fenton, et al	02-04-63	7	337	
11-12- 5	Candy 3[3]	-----do------	Boyer	02-14-63	7	338	
11-12- 5	Chamberlain No. 2	-----do------	McCarty, et al	07-02-27	1	89	
11-12- 5	Chamberlain No. 2	-----do------	McCarty	12-14-33	1	262	
11-12- 5	Cigaro No. 11	-----do------	McCarty, et al	07-02-27	1	84	
11-12- 5	Coli No. 4	-----do------	-----do-------	07-02-27	1	88	
11-12- 5	Duck No. 1[3]	-----do------	Acker, et al	01-19-42	2	213	
11-12- 5	Duck No. 1-2	-----do------	-----do-------	01-19-42	2	213-214	
11-12- 5	Evening Star	-----do------	Dawson	12-12-42	2	273	
11-12- 5	F.D.R.	-----do------	Acker	03-21-42	2	221	
11-12- 5	F.D.R. Lode	-----do------	-----do-------	11-27-45	2	407	
11-12- 5	Hawk No. 1-2	-----do------	Acker, et al	01-19-42	2	214	
11-12- 5	Hawk	-----do------	-----do-------	11-27-45	2	406	
11-12- 5	Indian No. 10	-----do------	McCarty, et al	07-02-27	1	83	
11-12- 5	Lander No. 8	-----do------	-----do-------	07-02-27	1	87	
11-12- 5	Lindberg No. 1	-----do------	-----do-------	07-02-27	1	86	
11-12- 5	Little Beaver	Taylor Creek	Davis	11-27-45	2	406	
11-12- 5	Lucky Oscar Group 1-11	Beaverhead	Becker, et al	01-01-48	2	502-509	
11-12- 5	Maitland No. 6	Taylor Creek	McCarty, et al	07-02-27	1	88	
11-12- 5	Mesa Placers[3]	Beaverhead	Deerksen, et al	06-30-37	1	504	
11-12- 5	Stannic	Taylor Creek	Rarey, et al	07-06-39	1	640	
11-12- 5	Sydney No. 12	-----do-----	McCarty, et al	07-02-27	1	84	
11-12- 5	Taylor Creek Tin 25[3]	-----do-----	Dawson	10-08-56	6	197	
11-12- 5	The Tin & Platinum Min. Claims No. 9-18[3]	-----do-----	Fitzmaurice	02-06-25	1	57-61	
11-12- 5	Wild Horse	Beaverhead	Moore, et al	03-21-42	2	221	
11-12- 6	Mitchell No. 5	Taylor Creek	McCarty, et al	07-02-27	1	85	
11-12- 6	Nugget No. 9	-----do-----	-----do-------	07-02-27	1	86	
11-12- 6	Nungesser No. 3	-----do-----	-----do-------	07-02-27	1	86	
11-12- 6	Paradox 9-10[3]	-----do-----	Rodham, et al	02-27-56	6	14	
11-12- 7	Beaver Creek Placers[3]	Beaverhead	Deerksen, et al	06-30-37	1	503	
11-12- 7	Candy 1-2[3]	Taylor Creek	Boyer	02-14-63	7	337-338	
11-12- 7	Mesa Placers[3]	Beaverhead	Deerksen, et al	06-30-37	1	504	
11-12- 7	Stannous[3]	Taylor Creek	Rarey, et al	07-06-39	1	640	
11-12- 8	Beaver Creek Placers[3]	Beaverhead	Deerksen, et al	06-30-37	1	503	
11-12- 8	Candy 1-2[3]	Taylor Creek	Boyer	02-14-63	7	337-338	
11-12- 8	Duck[3]	-----do-----	Acker	11-27-45	2	407	
11-12- 8	Mesa Placers[3]	Beaverhead	Deerksen, et al	06-30-37	1	504	
11-12- 8	Stannous[3]	Taylor Creek	Rarey, et al	07-06-39	1	640	
11-12- 9	The Tin & Platinum Min. Claims No. 19-20[3]	-----do-----	Fitzmaurice	02-06-25	1	61	
11-12- 9	Utah 1-2[3]	-----do-----	Fenton, et al	02-06-63	7	334-335	
11-12-10	Taylor Creek Tin 11-16[3]	-----do-----	Jones, et al	06-01-39	1	618-621	
11-12-11	Taylor Creek Placer 2[3]	-----do-----	Dawson	06-26-39	1	628	
11-12-11	Taylor Creek Tin 9-10[3]	-----do-----	Jones, et al	10-05-37	1	535	
11-12-12	Sylvia 1-8	Beaverhead	Freed	07-20-36	1	460-464	
11-12-13	Utah 5-6[3]	Taylor Creek	Fenton, et al	02-04-63	7	336	
11-12-14	Utah 3[3]	-----do-----	-----do-------	02-06-63	7	335	
11-12-14	Utah 4-5	-----do-----	-----do-------	02-04-63	7	336	
11-12-16	Byrd No. 7	-----do-----	McCarty, et al	07-02-27	1	87	
11-12-16	Sumter 1-6	(Taylor Creek)[4]	Sumter, et al	06-29-55	4	638-640	
11-12-16	Utah 1[3]	Taylor Creek	Fenton, et al	02-06-63	7	335	
11-12-17	Candy 1[3]	-----do-----	Boyer	02-14-63	7	337	
11-12-18	Utah 7[3]	-----do-----	Fenton, et al	02-04-63	7	337	
11-13-12	Anna Finnis 1-4	Beaverhead	Frank	07-20-36	1	447-449	
11-13-12	Beatrice 1-4	-----do-----	Melvikoff	07-20-36	1	458-460	
11-13-12	Beatrice 5-8	-----do-----	Metnekoff	07-20-36	1	445-447	
11-13-12	Freed 1-8	-----do-----	Freed	07-20-36	1	454-457	
11-13-12	Wleiscter 1-8	-----do-----	Wleiscter	07-20-36	1	450-453	
11-15- 6	Bobcat	(Wilderness)[4]	Hulse	05-14-56	6	70	
11-15- 6	Elam	-----do-----	-----do-------	05-14-56	6	70	
11-16- 2	Luck	Mogollon	McKee	04-10-42	2	225	
11-16- 7	Rosalie 1-4	(Wilderness)[4]	Aruta	07-23-58	6	581-582	
11-16-27	Millionaire #1-2[3]	West Fork	Lyons, et al	08-01-66	9	148-149	
11-17-30	Cindy Lou	(Wilderness)[4]	Crowe, et al	10-05-55	5	464	
11-17-36	Montoya #2-3[3]	Mogollon	Montoya	02-03-67	9	220-221	

See footnotes and remarks at end of table.

Location[1] T. R. S.	Claim	Mining District	Location filed				Remark Number
			Claimant	Date	Book	Page	
			Catron County - - Continued				
11-18- 4	Hidden Treasure[3]	Mogollon	Benson, et al	10-06-50	2	637	
11-18- 4	Reception No. 8 Placer[3]	Cooney	Skidmore, et al	09-18-52	3	151	2
11-18- 4	Reception No. 8	- - - - - do - - - - - -	Lightfoot, et al	09-18-52	3	152	3
11-18- 5	Hidden Treasure[3]	Mogollon	Benson, et al	10-06-50	2	637	
11-18- 5	Reception No. 8 Placer[3]	Cooney	Skidmore, et al	09-18-52	3	151	
11-18- 5	Silver Creek 6[3]	Mogollon	Buchner, et al	05-09-56	6	65	
11-18- 6	Silver Creek 2[3]	- - - - - do - - - - - -	- - - - - do - - - - - - -	05-04-56	6	61	
11-18- 6	Silver Creek 3-5	- - - - - do - - - - - -	- - - - - do - - - - - - -	05-09-56	6	65-66	
11-18- 7	New Nickel No. 2-4[3]	Cooney	Mitchell, et al	11-08-39	2	44-45	
11-18-18	New Nickel No. 5[3]	- - - - - do - - - - - -	- - - - - do - - - - - - -	11-08-39	2	45	
11-18-18	North Star #1	- - - - - do - - - - - -	Phister, et al	07-11-66	9	137	
11-18-29	Big Pumpkin	Wilcox	Sleeper	09-12-36	1	472	
11-18-29	Mary Elisabeth	- - - - - do - - - - - -	Christensen	09-30-24	1	51	
11-18-32	Black Jack No. 1	- - - - - do - - - - - -	Dodge	07-02-36	1	434	
11-18-32	Defiance[3]	- - - - - do - - - - - -	Christensen	09-30-24	1	51	4
11-18-32	Defiance Extension No. 3	- - - - - do - - - - - -	- - - - - do - - - - - - -	09-30-24	1	51	
11-18-32	Mammoth	- - - - - do - - - - - -	Dorsey	12-18-27	1	80	
11-18-32	Marie 1-3	- - - - - do - - - - - -	Montoya	02-03-67	9	222-224	
11-18-32	Mountain View	- - - - - do - - - - - -	Dorsey	10-02-28	1	137	
11-18-32	Mountain View	- - - - - do - - - - - -	Frymire	09-23-40	2	157	5
11-18-32	Nana Chief	- - - - - do - - - - - -	Alexander	06-30-53	3	217	
11-18-32	Nana Chief	- - - - - do - - - - - -	- - - - - do - - - - - - -	06-28-54	3	395	
11-18-32	Pauline Ledge	- - - - - do - - - - - -	- - - - - do - - - - - - -	07-16-51	3	67	
11-18-32	Quartz	- - - - - do - - - - - -	Dorsey, et al	08-14-28	1	135	
11-18-32	Quartz No. 2	- - - - - do - - - - - -	- - - - - do - - - - - - -	10-02-28	1	137	
11-18-32	Quartz No. 1-2	- - - - - do - - - - - -	Frymire	09-23-40	2	158-159	5
11-18-32	Radio Wave No. 1	- - - - - do - - - - - -	Johnson	12-05-28	1	139	
11-18-32	Red Man No. 1-2	- - - - - do - - - - - -	Brock	06-13-35	1	366	
11-18-32	Royal Gorge	- - - - - do - - - - - -	Frymire	09-23-40	2	160	5
11-18-32	Skipper	- - - - - do - - - - - -	Woodruff	11-04-36	1	475	
11-18-32	Western Star	- - - - - do - - - - - -	Lauderbaugh	09-30-24	1	51	6
11-18-32	Yellow Ocra 1	- - - - - do - - - - - -	Briedenback, et al	06-13-36	1	469	
11-18-32	Yellow Ocra 2	- - - - - do - - - - - -	- - - - - do - - - - - - -	06-13-36	1	469-470	7
11-18-33	California	- - - - - do - - - - - -	Stockbridge, et al	07-22-30	1	163	
11-18-33	C.O.D.	- - - - - do - - - - - -	Dorsey	09-29-31	1	193	8
11-18-33	Daisy	- - - - - do - - - - - -	Dodge, Jr.	12-01-36	1	474	
11-18-33	Gold Bar (Amended)[3]	- - - - - do - - - - - -	Leach, et al	06-20-23	1	36	9
11-18-33	Golden Link #3[3]	- - - - - do - - - - - -	- - - - - do - - - - - - -	12-03-22	1	31	
11-18-33	Great Eastern	- - - - - do - - - - - -	Lauderbaugh	09-30-24	1	50	10
11-18-33	Hillcrest	- - - - - do - - - - - -	Carlson	12-15-59	7	134	
11-18-33	Lucky Bill	- - - - - do - - - - - -	Frymire	07-18-41	2	203	5
11-18-33	Mary Ann	- - - - - do - - - - - -	Dodge	04-20-37	1	482	
11-18-33	Mary Ann No. 2	- - - - - do - - - - - -	- - - - - do - - - - - - -	04-20-37	1	482	
11-18-33	Nadine	- - - - - do - - - - - -	- - - - - do - - - - - - -	09-12-36	1	471	
11-18-33	Paymaster	Wilcox	Dorsey	02-18-27	1	79	
11-18-33	Red Bird	- - - - - do - - - - -	Lauderbaugh	09-30-24	1	50	
11-18-33	Red Bullion	- - - - - do - - - - -	O'Neal	07-20-31	1	182	
11-18-33	Red Cave No. 1	- - - - - do - - - - -	- - - - - do - - - - - - -	08-01-31	1	186	
11-18-33	Red Hill	- - - - - do - - - - -	Bostrom	04-13-59	7	10	
11-18-33	Red Hill No. 2	- - - - - do - - - - -	Goetz	08-02-60	7	163	
11-18-33	Red Lake	- - - - - do - - - - -	Lauderbaugh	09-30-24	1	50	
11-18-33	Rockie No. 1-2	- - - - - do - - - - -	Moore	10-10-46	2	449	11
11-18-34	Cinnamon	- - - - - do - - - - -	Hightower, et al	08-05-29	1	150	
11-18-34	Washington	- - - - - do - - - - -	- - - - - do - - - - - - -	09-05-29	1	152	
11-19- 1	Silver Creek 1[3]	Mogollon	Buchner, et al	05-04-56	6	61	
11-19- 2	Kordic	- - - - - do - - - - -	Wray, et al	05-09-55	4	559	
11-19- 3	Black Rock	- - - - - do - - - - -	Decrow	08-24-39	2	25	
11-19- 3	Black Rock	- - - - - do - - - - -	Johnson	08-10-42	2	264	
11-19- 3	Bluff[3]	Cooney	King	08-23-24	1	48	
11-19- 3	Dripping Gold[3]	- - - - - do - - - - -	East, et al	08-02-54	3	525	
11-19- 3	Dripping Gold (Amended)[3]	- - - - - do - - - - -	East	08-03-54	3	526	
11-19- 3	Dripping Gold No. 1 Claim	- - - - - do - - - - -	Bostrom	03-24-67	9	231	
11-19- 3	Eagle Peak	Wilcox	Bostrom, et al	05-13-57	6	283	
11-19- 3	Eastern Star	Mogollon	Darwin, et al	08-15-39	2	14	
11-19- 3	Eastern Star	- - - - - do - - - - -	Darwind	08-10-42	2	264	
11-19- 3	Gold Bar No. 4[3]	Cooney	Charles	09-27-38	1	607	12
11-19- 4	Blue Jay No. 1	- - - - - do - - - - -	Bearup	09-19-51	3	78	13
11-19- 4	Bluff No. 2-3[3]	- - - - - do - - - - -	King	08-23-24	1	48	
11-19- 4	Dripping Gold (Lode) #2-3[3]	- - - - - do - - - - -	Whiteside, et al	08-03-54	3	527-528	
11-19- 4	Dripping Gold No. 2 Claim	- - - - - do - - - - -	Bostrom	12-19-66	9	215	14
11-19- 4	Gold Bar No. 1-2[3]	- - - - - do - - - - -	Charles	09-10-31	1	189-190	
11-19- 4	Gold King No. 1-2	- - - - - do - - - - -	King, et al	09-30-29	1	154	
11-19- 4	Gold Smith	- - - - - do - - - - -	Bagge	03-16-34	1	275	
11-19- 4	Golden Hope	- - - - - do - - - - -	- - - - - do - - - - - - -	03-16-34	1	276	
11-19- 4	Golden Princess	- - - - - do - - - - -	- - - - - do - - - - - - -	12-14-33	1	261	
11-19- 4	Golden Queen	- - - - - do - - - - -	- - - - - do - - - - - - -	12-14-33	1	261	
11-19- 4	Lillian No. 1	Mogollon	Herbert	06-30-42	2	247	
11-19- 4	Lillian No. 2	- - - - - do - - - - -	- - - - - do - - - - - - -	02-07-45	2	344	
11-19- 4	Luna C	Wilcox	Roberts	08-07-47	2	495	
11-19- 4	Pine Flat	White Water	Caraway, et al	05-04-50	2	604	
11-19- 4	Pine Flats	Cooney	Bagge	03-16-34	1	276	
11-19- 4	Western Star	Mogollon	Darwin, et al	08-15-39	2	14	
11-19- 4	Western Star	- - - - - do - - - - -	Darwind	08-10-42	2	264	
11-19- 5	Amarillo #1	Cooney	Warren, et al	07-30-54	3	517	
11-19- 5	Betty Mack	Wilcox	Tirey, et al	11-10-34	1	336	
11-19- 5	Buddy Rogers	- - - - - do - - - - -	- - - - - do - - - - - - -	11-10-34	1	337	
11-19- 5	Evelyn #1-2	Cooney	Harms, et al	07-28-54	3	514-515	
11-19- 5	Joy May Flo	Mogollon	Hughes	10-17-66	9	197	
11-19- 5	King of Steel No. 1-4	- - - - - do - - - - -	King, et al	04-19-48	2	512-513	
11-19- 5	Lee Sissone	Wilcox	Tirey, et al	11-10-34	1	336	
11-19- 5	Leola	- - - - - do - - - - -	- - - - - do - - - - - - -	02-07-35	1	352	
11-19- 5	Lorraine	- - - - - do - - - - -	- - - - - do - - - - - - -	02-07-35	1	352	
11-19- 5	Lubbock #1	Cooney	Warren, et al	07-30-54	3	516	
11-19- 5	Margaret	Wilcox	Tirey, et al	11-10-34	1	337	

See footnotes and remarks at end of table.

Location[1] T. R. S.	Claim	Mining District	Location filed: Claimant	Date	Book	Page	Remark Number
			Catron County - - Continued				
11-19- 5	Ted	Wilcox	Tirey, et al	02-07-35	1	351	
11-19- 6	Black Bird Placer	Cooney	Walton, et al	06-30-55	4	644	
11-19- 6	Confidence Placer	- - - - - do - - - - - -	- - - - - do - - - - - - -	06-30-55	4	644	
11-19- 8	Bessie No. 1	- - - - - do - - - - - -	Massey, et al	02-04-32	1	204	15
11-19- 8	Ida Bell No. 1	- - - - - do - - - - - -	- - - - - do - - - - - - -	06-27-38	1	585	
11-19- 9	Happy Days #1-2	- - - - - do - - - - - -	Jennings	04-13-34	1	278	
11-19- 9	Queen Mary	Wilcox	Boulden	06-03-47	2	472	
11-19- 9	South Fork No. 1	- - - - - do - - - - - -	- - - - - do - - - - - - -	05-10-46	2	413	
11-19- 9	Yakui	White Water	Leonard, et al	03-27-35	1	360	
11-19-12	Hard Rock No. 1	Cooney	Mitchell, et al	11-08-39	2	43	
11-19-12	New Nickel No. 1[3]	- - - - - do - - - - - -	- - - - - do - - - - - - -	11-08-39	2	43	
11-19-21	Birthdays	Wilcox	Salisburg, et al	02-28-28	1	116	
11-19-21	Black Tail Buck	- - - - - do - - - - - -	Campbell, et al	02-27-28	1	114	
11-19-21	Deer Hunter	- - - - - do - - - - - -	Campbell	02-28-28	1	115	16
11-19-21	Jews Hat	- - - - - do - - - - - -	Stone, et al	02-28-28	1	116	
11-19-21	John C. Fremont	- - - - - do - - - - - -	Campbell, et al	07-13-29	1	149	
11-19-21	King Solomon	- - - - - do - - - - - -	- - - - - do - - - - - - -	02-27-28	1	113	
11-19-21	Lineman	- - - - - do - - - - - -	- - - - - do - - - - - - -	07-13-29	1	149	
11-19-21	New Discovery	- - - - - do - - - - - -	- - - - - do - - - - - - -	02-27-28	1	114	
11-19-21	Nimrod	- - - - - do - - - - - -	Campbell	07-18-30	1	163	
11-19-21	Queen of Sheba	- - - - - do - - - - - -	Campbell, et al	02-27-28	1	113	
11-19-21	Stella	- - - - - do - - - - - -	York, et al	10-11-22	1	24	
11-19-21	Twin Peaks	- - - - - do - - - - - -	Campbell, et al	03-29-28	1	124	
11-19-24	Fable #1	- - - - - do - - - - - -	Morrison	08-30-60	7	170	
11-19-28	Anna May	- - - - - do - - - - - -	Stone, et al	03-29-28	1	126	
11-19-28	Big John	- - - - - do - - - - - -	Karavano, et al	12-02-24	1	53	
11-19-28	Big Johnson	- - - - - do - - - - - -	Campbell, et al	07-17-22	1	13	
11-19-28	Blackhawk No. 1	- - - - - do - - - - - -	Massey, et al	10-06-34	1	317	
11-19-28	Buckeye	- - - - - do - - - - - -	Campbell, et al	09-29-28	1	137	
11-19-28	Eleventh Hour	- - - - - do - - - - - -	- - - - - do - - - - - - -	09-29-28	1	136	
11-19-28	Helen Rae No. 1-2	- - - - - do - - - - - -	Massey, et al	04-08-42	2	224	
11-19-28	Hoosier	- - - - - do - - - - - -	George	03-29-28	1	123	
11-19-28	Horse Shoe No. 2[3]	- - - - - do - - - - - -	Massey, et al	10-03-34	1	315	
11-19-28	Horse Shoe No. 2	- - - - - do - - - - - -	- - - - - do - - - - - - -	10-03-34	1	317	
11-19-28	Horse Shoe No. 5-6	- - - - - do - - - - - -	- - - - - do - - - - - - -	10-06-34	1	317-318	
11-19-28	Little John	- - - - - do - - - - - -	Karovano, et al	12-02-24	1	53	
11-19-28	Mary Ruth	- - - - - do - - - - - -	Kaykendall	03-20-28	1	122	
11-19-28	North Star	- - - - - do - - - - - -	Karavanos, et al	07-12-26	1	77	
11-19-28	Odd Number	- - - - - do - - - - - -	Karavinos, et al	07-12-26	1	77	
11-19-28	Omar	- - - - - do - - - - - -	Anderson	03-31-28	1	127	
11-19-28	Palares	- - - - - do - - - - - -	Campbell, et al	09-29-28	1	136	
11-19-28	Salisbury	- - - - - do - - - - - -	Salisbury	03-29-28	1	126	
11-19-28	Skyline	- - - - - do - - - - - -	Stone, et al	03-29-28	1	123	
11-19-28	Southern Cross	- - - - - do - - - - - -	Campbell	09-04-26	1	241	17
11-19-28	South Pole	Wilcox	Campbell, et al	09-29-28	1	136	
11-19-28	Stone	- - - - - do - - - - -	Stone	03-29-28	1	126	
11-19-28	Tenderfoot	- - - - - do - - - - -	McCargish, et al	03-29-28	1	123	
11-19-28	Tres Grandes	- - - - - do - - - - -	Kavanow, et al	09-23-24	1	49	
11-19-28	Tres Grandes No. 2	- - - - - do - - - - -	Karavano, et al	12-02-24	1	53	
11-19-28	Windjammer	- - - - - do - - - - -	Campbell, et al	07-17-22	1	13	
11-19-29	Big Spur (Spar)	- - - - - do - - - - -	- - - - - do - - - - - - -	06-19-22	1	9	
11-19-29	Bingham 1	- - - - - do - - - - -					18
11-19-29	Bingham 2-3	- - - - - do - - - - -	Massey, et al	01-24-38	1	551-552	
11-19-29	Bingham No. 2	- - - - - do - - - - -	Menges, et al	08-23-46	2	446	
11-19-29	Bingham No. 3	- - - - - do - - - - -	Massey, et al	07-15-46	2	443	
11-19-29	Buffalo No. 1	- - - - - do - - - - -	- - - - - do - - - - - - -	10-01-39	2	36	
11-19-29	Bummers Placer	- - - - - do - - - - -	Campbell	12-27-22	1	32	
11-19-29	Doughboy	- - - - - do - - - - -	Campbell, et al	03-29-28	1	126	
11-19-29	Ell	- - - - - do - - - - -	Campbell	12-02-24	1	52	
11-19-29	Glenwood No. 1-2	Mogollon	Wear, et al	08-11-52	3	135	
11-19-29	Gold Dike	Wilcox	Campbell	12-15-22	1	32	
11-19-29	Horseshoe No. 1[3]	- - - - - do - - - - -	Massey, et al	10-03-34	1	316	19
11-19-29	Horse Shoe No. 3-4	- - - - - do - - - - -	- - - - - do - - - - - - -	10-03-34	1	316	
11-19-29	Horse Shoe No. 7	- - - - - do - - - - -	- - - - - do - - - - - - -	10-06-34	1	318	
11-19-29	Jaybird	- - - - - do - - - - -	Campbell	02-28-28	1	115	
11-19-29	Keystone	- - - - - do - - - - -	Campbell, et al	09-04-26	1	242	17
11-19-29	Log Cabin 1-2	- - - - - do - - - - -	Menges, et al	01-24-38	1	552-553	
11-19-29	Log Cabin No. 3-4	- - - - - do - - - - -	Massey, et al	10-01-39	2	36-37	
11-19-29	Log Cabin No. 1-4	- - - - - do - - - - -	Menges, et al	08-23-46	2	446-448	
11-19-29	Marvel 1-2	- - - - - do - - - - -	Cunningham	10-05-59	7	128	
11-19-29	Missing Link	- - - - - do - - - - -	Campbell	10-10-26	1	234	17
11-19-29	New Strike	- - - - - do - - - - -	Campbell, et al	06-19-22	1	9	
11-19-29	North Extension 1-3	- - - - - do - - - - -	Massey, et al	04-11-38	1	561-562	
11-19-29	North Extension No. 1-3	- - - - - do - - - - -	- - - - - do - - - - - - -	07-15-46	2	443-444	
11-19-29	North Side	- - - - - do - - - - -	Campbell, et al	07-17-22	1	13	
11-19-29	Old Log Cabin	- - - - - do - - - - -	- - - - - do - - - - - - -	06-19-22	1	10	
11-19-29	Pathfinder	- - - - - do - - - - -	- - - - - do - - - - - - -	03-29-28	1	124	
11-19-29	Patricia Ann	- - - - - do - - - - -	Myrick, et al	08-18-33	1	256	
11-19-29	Shannon Doe	- - - - - do - - - - -	Massey, et al	04-11-38	1	561	
11-19-29	Silver Bar No. 1	- - - - - do - - - - -	Massey	01-01-35	1	344	20
11-19-29	Silver Boe (Bar ?) No. 1-2	- - - - - do - - - - -	Wytcherly, et al	12-13-41	2	211	
11-19-29	South Side	- - - - - do - - - - -	Campbell, et al	07-17-22	1	13	
11-19-29	Spar 1	- - - - - do - - - - -	Menges, et al	12-09-37	1	548	21
11-19-29	Spar 2	- - - - - do - - - - -	- - - - - do - - - - - - -	01-24-38	1	551	
11-19-29	Spar No. 1	- - - - - do - - - - -	Massey, et al	07-15-46	2	442	
11-19-29	Spar No. 2	- - - - - do - - - - -	Menges, et al	08-24-46	2	448	
11-19-29	White Flag	- - - - - do - - - - -	Campbell, et al	10-06-22	1	24	
11-19-32	Colorado	- - - - - do - - - - -	Massey, et al	04-04-28	1	127	
11-19-32	Daisy Placer	- - - - - do - - - - -	Salisburg	02-27-28	1	113	22
11-19-32	Grand View No. 2	- - - - - do - - - - -	Menges, et al	10-10-34	1	334	
11-19-32	Grand View No. 1-2	- - - - - do - - - - -	- - - - - do - - - - - - -	10-24-34	1	333	
11-19-32	Holt 3-4	- - - - - do - - - - -	Mengis, et al	06-27-61	7	206-207	
11-19-32	Holt 10-11	- - - - - do - - - - -	- - - - - do - - - - - - -	01-14-63	7	332	
11-19-32	Idaho	- - - - - do - - - - -	Massey, et al	04-23-28	1	128	

See footnotes and remarks at end of table.

Location[2] T. R. S.	Claim	Mining District	Claimant	Location filed Date	Book	Page	Remark Number
			Catron County - - Continued				
11-19-32	Iva	Wilcox	Menges, et al	10-24-34	1	334	
11-19-32	Moose No. 3[3]	----- do -----	Massey, et al	01-20-28	1	109	
11-19-32	Moose No. 5	----- do -----	----- do -------	01-21-28	1	110	
11-19-32	Moose No. 7-8	----- do -----	----- do -------	02-28-28	1	117	
11-19-33	Crested Jay	----- do -----	McCargish, et al	07-03-29	1	148	
11-19-33	Equinox	----- do -----	Arnold	03-29-28	1	124	
11-19-33	Lone Pine	----- do -----	Caylor, et al	03-13-42	2	219	
11-19-33	Lone Star No. 8[3]	----- do -----	Menges, et al	06-29-33	1	236	
11-19-33	Lone Star No. 9	----- do -----	----- do -------	10-24-34	1	334	
11-19-33	Ona	----- do -----	Pierce	03-10-28	1	122	
11-19-33	Silver King	----- do -----	Massey, et al	02-28-28	1	117	
11-19-33	Thunder Hill No. 1-4	----- do -----	Bishop	07-08-22	1	12	6
12-11- 1	Paradox No. 5-8 Placer[3]	Taylor Creek	Grainger, et al	12-05-58	6	595	
12-14-14	Lone Wolf 1[3]	Mogollon	Bolton, et al	06-15-66	9	112	
12-14-14	New Moon	West Gila	Beasley	06-15-37	1	495	
12-14-14	Northeast	----- do -----	----- do -------	06-15-37	1	495	
12-14-14	Oak	----- do -----	----- do -------	06-14-37	1	493	
12-14-14	Rock Island 1-3[3]	(West Gila)[4]	Anderson, et al	05-11-56	6	68	
12-14-22	Cedar	West Gila	Beasley	06-12-37	1	492	
12-14-22	Lone Wolf 5[3]	Mogollon	Bolton, et al	06-15-66	9	116	
12-14-22	Rock Island 5-7[3]	(West Gila)[4]	Anderson, et al	05-11-56	6	69-70	
12-14-22	Sunset	West Gila	Beasley	06-14-37	1	494	
12-14-23	Dobie 1-2	Mogollon	Bolton, et al	06-15-66	9	117-118	
12-14-23	Doby Canyon	West Gila	Beasley	05-20-37	1	488	
12-14-23	Doby Canyon	----- do -----	----- do -------	06-15-37	1	497	
12-14-23	Dobie Canyon # One	Mogollon	Longbottem, et al	08-03-55	5	131	
12-14-23	Dobie Canyon #2	----- do -----	----- do -------	08-03-55	5	131	
12-14-23	East Slope	West Gila	Beasley	06-12-37	1	491	
12-14-23	Extra Lode	----- do -----	----- do -------	06-12-37	1	491	
12-14-23	Juniper	----- do -----	----- do -------	06-14-37	1	493	
12-14-23	Lone Wolf 2-4[3]	Mogollon	Bolton, et al	06-15-66	9	113-115	
12-14-23	Maverick No. 1-2	Alum Mountain	Waters	04-21-41	2	179	
12-14-23	Northwest	West Gila	Beasley	06-14-37	1	494	
12-14-23	Pinon	----- do -----	----- do -------	06-12-37	1	492	
12-14-23	Pointer	----- do -----	----- do -------	06-15-37	1	496	
12-14-23	Rock Island 4[3]	(West Gila)[4]	Anderson, et al	05-11-56	6	69	
12-14-23	South Doby	West Gila	Beasley	06-15-37	1	498	
12-14-23	Southeast	----- do -----	----- do -------	06-15-37	1	496	
12-14-23	Southwest	----- do -----	----- do -------	06-15-37	1	498	
12-14-23	Sunday No. 1-4[3]	(Wilderness)[4]	Longbottom, et al	10-20-50	2	640-642	
12-14-23	West Fork 1-3	----- do -----	Goza	04-24-39	1	614-615	
12-14-23	West Slope	West Gila	Beasley	06-15-37	1	497	
12-14-26	Sunday No. 5-6[3]	(Wilderness)[4]	Longbottom, et al	10-20-50	2	642-643	
12-16-17	West Fork No. 1	West Fork	Campbell, et al	09-02-53	3	225	
12-17- 1	Montoya #1[3]	Mogollon	Montoya	02-03-67	9	219	
12-18- 3	Apache	Wilcox	Alexander	07-11-28	1	133	
12-18- 3	Arizona No. 1-2	----- do -----	Harbour	12-17-34	1	343-344	
12-18- 3	Arizona No. 3	----- do -----	Frymire	10-12-35	1	408	
12-18- 3	Gold and Silver No. 1-2	----- do -----	Gould, et al	11-21-27	1	108	
12-18- 3	HHH No. 1-4	----- do -----	Harbour	09-24-29	1	152-153	
12-18- 3	HHH 1-4	----- do -----	----- do -------	10-06-31	1	193-195	
12-18- 3	HHH #4	----- do -----	Harbour, et al	10-12-35	1	408	
12-18- 3	Lucky Strike	----- do -----	Hightower	07-22-30	1	163	
12-18- 3	Old Cabin	----- do -----	Foreman	10-20-30	1	168	
12-18- 3	Silver Bar No. 1-2	----- do -----	Messick	09-01-23	1	40	23
12-18- 3	Silver Drip No. 1-2	----- do -----	Frymire	09-23-37	1	531-532	
12-18- 3	Silver Drip Cabin	----- do -----	----- do -------	09-23-37	1	532	
12-18- 4	Betty Jane	----- do -----	----- do -------	09-23-37	1	533	
12-18- 4	Gold Dome No. 1-2	----- do -----	Messick	06-19-29	1	146	
12-18- 4	Golden Link #1[3]	----- do -----	Leach, et al	07-01-21	1	3	
12-18- 4	Golden Link No. 2	----- do -----	----- do -------	09-16-21	1	3	
12-18- 4	Golden Link #4-5	----- do -----	----- do -------	12-03-22	1	31	
12-18- 4	Golden Link (Amended)	----- do -----	----- do -------	06-20-23	1	35	9
12-18- 4	HHH	----- do -----	Frymire	09-23-37	1	534	
12-18- 4	Indiana No. 1-2	----- do -----	Foreman, et al	07-26-29	1	149	
12-18- 4	Ruth Ann	----- do -----	Frymire	09-23-37	1	534	
12-18- 4	Silver Dike	----- do -----	----- do -------	09-23-37	1	533	
12-18- 4	Willow No. 3-4[3]	----- do -----	Foreman, et al	02-03-30	1	159	
12-18- 5	Arizona Girl	----- do -----	Frymire	10-12-35	1	407	
12-18- 5	Dutchmen No. 1-2	----- do -----	Hawkins, et al	07-20-31	1	187	
12-18- 5	86 No. 1-2	----- do -----	Messick, et al	12-06-39	2	65	
12-18- 5	Hope	----- do -----	Foreman, et al	02-03-30	1	159	
12-18- 5	Keystone No. 1	----- do -----	Swartz, et al	05-10-22	1	8	
12-18- 5	Keystone No. 2	----- do -----	----- do -------	05-10-22	1	9	
12-18- 5	Silver Saddle	----- do -----	Landry, et al	05-13-57	6	282	
12-18- 5	Willow[3]	----- do -----	Foreman, et al	11-17-28	1	138	
12-18- 5	Willow No. 2	----- do -----	----- do -------	02-03-30	1	159	
12-18- 6	Defiance Extension No. 1[3]	----- do -----	Christensen	09-30-24	1	52	24
12-18- 6	Homestake	----- do -----	Frymire	07-18-41	2	204	5
12-18- 7	Big John Group 1-8	----- do -----	Samora, et al	11-05-67	10	267	25
12-18- 7	Complex No. 1	----- do -----	Johnson, et al	11-05-30	1	169	
12-18- 7	Defiance No. 2	----- do -----	Moore	02-18-35	1	357	26
12-18- 7	Defiance No. 5 (3 ?)	----- do -----	----- do -------	02-18-35	1	357	
12-18- 7	Gelena No. 1-2	----- do -----	Frymire	11-14-46	2	456-457	
12-18- 7	Paradise	----- do -----	Sutton	12-11-59	7	134	
12-18- 7	Pilgram	----- do -----	Anderson	09-10-31	1	189	
12-18- 7	Uncle John[3]	----- do -----	Salars, et al	07-24-44	2	332	27
12-18- 7	Uncle John Extension	----- do -----	----- do -------	11-14-46	2	454	
12-18- 7	Uncle John No. 1-2	----- do -----	Frymire	08-17-45	2	383-384	
12-18- 7	Uncle John No. 2-3	----- do -----	----- do -------	08-17-45	2	383-384	
12-18- 7	Uncle John No. 2	----- do -----	Johnson	11-22-48	2	553	
12-18- 7	Uncle John No. 1	----- do -----	Brown, et al	05-26-52	3	114	
12-18- 7	Uncle John Extension	----- do -----	----- do -------	05-26-52	3	114	
12-18- 9	Buckhorn No. 1	----- do -----	Hightower	08-05-29	1	150	

See footnotes and remarks at end of table.

Location[3] T. R. S.	Claim	Mining District	Claimant	Location filed Date	Book	Page	Remark Number
			Catron County - - Continued				
12-18-10	Hightower	Wilcox	Hightower	12-29-31	1	201	
12-18-15	Man - O - War	- - - - - do - - - - -	Alexander, et al	09-13-27	1	97	
12-18-18	Right Way No. 2[3]	- - - - - do - - - - -	Rittenberry, et al	08-19-41	2	207	28
12-18-19	Betsy Harbour No. 2	- - - - - do - - - - -	Harbour	12-28-29	1	158	
12-18-19	Crown No. 1[3]	- - - - - do - - - - -	Gould	07-01-21	1	4	
12-18-19	Crown No. 1	- - - - - do - - - - -	- - - - - do - - - - - - -	08-13-25	1	67	
12-18-19	Eureka	- - - - - do - - - - -	Foreman	10-20-30	1	168	
12-18-19	Extension No. 2	- - - - - do - - - - -	La Corona	11-22-29	1	157	
12-18-19	Look Off No. 1	- - - - - do - - - - -	Messick	12-28-29	1	158	29
12-18-19	Margaret Stewart	- - - - - do - - - - -	Frymire	09-23-37	1	531	29
12-18-19	Margarite Stewart No. 1	- - - - - do - - - - -	Harbour	12-28-29	1	158	
12-18-19	New Eureka	- - - - - do - - - - -	Rittenberry, et al	06-15-36	1	429	28
12-18-19	North West	- - - - - do - - - - -	McCarville, et al	11-22-29	1	157	
12-18-19	Red Dog No. 2	- - - - - do - - - - -	Roberts, et al	10-01-21	1	5	
12-18-19	Regal[3]	- - - - - do - - - - -	Rittenberry, et al	06-15-36	1	429	28
12-18-19	Stella Mae	- - - - - do - - - - -	Miller	10-12-32	1	222	
12-18-20	Black Bear	- - - - - do - - - - -	Swartz	06-26-24	1	44	
12-18-20	Camp Sight	- - - - - do - - - - -	Roberts, et al	09-11-22	1	23	
12-18-20	Crown No. 2[3]	- - - - - do - - - - -					30
12-18-20	Extension Lode	- - - - - do - - - - -	Foreman	10-12-29	1	156	
12-18-20	Gold Bar No. 2 (1 ?)	- - - - - do - - - - -	McEuen, et al	09-24-29	1	153	31
12-18-20	Gold Bar No. 2-3	- - - - - do - - - - -	- - - - - do - - - - - - -	09-24-29	1	153	
12-18-20	Gold Bar No. 4-5	- - - - - do - - - - -	- - - - - do - - - - - - -	09-24-29	1	154	32
12-18-20	Gold Bar	- - - - - do - - - - -	Frymire	07-18-41	2	203	
12-18-20	Gold Telluride No. 4[3]	- - - - - do - - - - -	Messick, et al	10-02-34	1	319	
12-18-20	Golden Fleece	- - - - - do - - - - -	Swartz	10-06-32	1	219	
12-18-20	Lone Pine #6[3]	- - - - - do - - - - -	Rice	06-15-60	7	156	
12-18-20	Lucretia	- - - - - do - - - - -	Carper	11-09-55	5	565	
12-18-20	Maverick	- - - - - do - - - - -	Rittenberry	06-15-36	1	429	33
12-18-20	Montie Carlo No. 1[3]	- - - - - do - - - - -	Messick	10-08-21	1	4	
12-18-20	Queen Crown 1	- - - - - do - - - - -	Harbour, et al	01-11-36	1	413	
12-18-20	Queen Crown 1	- - - - - do - - - - -	Frymire	09-23-37	1	530	
12-18-20	Queen Crown 2	- - - - - do - - - - -	Harbour, et al	01-11-36	1	413	34
12-18-20	Queen Crown 3	- - - - - do - - - - -	- - - - - do - - - - - - -	01-11-36	1	414	
12-18-20	Queen Crown 3	- - - - - do - - - - -	Frymire	09-23-37	1	530	
12-18-20	Regal No. 2[3]	- - - - - do - - - - -	Rittenberry, et al	06-15-36	1	430	28
12-18-20	Regal No. 3	- - - - - do - - - - -	- - - - - do - - - - - - -	08-19-41	2	206	
12-18-20	Right Way No. 1[3]	- - - - - do - - - - -	Rice, et al	04-30-41	2	180	28
12-18-20	Rocky Ford #1	- - - - - do - - - - -	Mittle	10-26-31	1	197	
12-18-20	Tightwad	- - - - - do - - - - -	Rittenberry, et al	08-02-38	1	602	35
12-18-21	Cave Rock 1-2	- - - - - do - - - - -	Rice, et al	08-17-61	7	216	
12-18-21	Cave Rock No. 1-3	- - - - - do - - - - -	Hightower, et al	09-16-33	1	257-258	
12-18-21	Fluorite 1	- - - - - do - - - - -	Lee, et al	12-27-51	3	83	
12-18-21	Hightower No. 2	- - - - - do - - - - -	Drummand, et al	08-08-50	2	630	
12-18-22	Aspin	Wilcox	Cranmar, et al	05-23-30	1	161	36
12-18-22	Aztec	- - - - - do - - - - -	Cranmer	08-16-22	1	17	
12-18-22	Fair View	- - - - - do - - - - -	Hightower, et al	03-18-29	1	142	
12-18-22	Recovery	- - - - - do - - - - -	Wytcherly	03-25-42	2	222	
12-18-26	Big Butte	- - - - - do - - - - -	Shelbey, et al	02-27-29	1	141	
12-18-26	Butte No. 2-3	- - - - - do - - - - -	Shelley, et al	02-27-29	1	141-142	
12-18-27	Mammoth	- - - - - do - - - - -	Starr, et al	09-23-31	1	192	
12-18-28	Lone Pine	- - - - - do - - - - -	Lee, et al	01-24-52	3	86	
12-18-28	Pine Creek	- - - - - do - - - - -	Rice, et al	09-17-61	7	217	
12-18-28	Pine Knot	- - - - - do - - - - -	Cranmar	11-15-24	1	52	
12-18-28	Pine View No. 1-2	- - - - - do - - - - -	Clark, et al	12-21-32	1	225-226	
12-18-28	Sacaton No. 1-2[3]	- - - - - do - - - - -	Hightower, et al	12-29-31	1	201-202	37
12-18-28	Sacatone No. 4	- - - - - do - - - - -	Starr, et al	04-12-32	1	207	
12-18-28	West Dike	- - - - - do - - - - -	Hightower	10-05-32	1	216	
12-18-29	Black Jack No. 1	- - - - - do - - - - -	Halt	11-29-24	1	52	
12-18-29	Blue Rock #1	- - - - - do - - - - -	Moore	12-08-38	1	608	37
12-18-29	Blue Rock No. 2	- - - - - do - - - - -	- - - - - do - - - - - - -	12-08-38	1	608	
12-18-29	Blue Rock #3-6	- - - - - do - - - - -	- - - - - do - - - - - - -	06-27-41	2	191-193	
12-18-29	Blue Rock No. 3-6	- - - - - do - - - - -	- - - - - do - - - - - - -	06-27-41	2	191-193	
12-18-29	Copper Vein No. 1	- - - - - do - - - - -	- - - - - do - - - - - - -	06-19-40	2	130	
12-18-29	Gold Telluride No. 1[3]	- - - - - do - - - - -	Messick, et al	10-02-34	1	319	
12-18-29	Gold Telluride No. 2-3	- - - - - do - - - - -	- - - - - do - - - - - - -	10-02-34	1	318-319	
12-18-29	Good Hope	- - - - - do - - - - -	Swartz	06-10-26	1	73	
12-18-29	Grubstake	- - - - - do - - - - -	- - - - - do - - - - - - -	09-12-47	2	497	
12-18-29	Harvest No. 4[3]	- - - - - do - - - - -	- - - - - do - - - - - - -	12-03-34	1	342	
12-18-29	Homestead #1	- - - - - do - - - - -	Moore	06-27-41	2	192	
12-18-29	Lausen	- - - - - do - - - - -	Carper	11-09-55	5	565	
12-18-29	Lexington	- - - - - do - - - - -	Goode, et al	08-14-28	1	135	
12-18-29	Lone Pine #1-2[3]	- - - - - do - - - - -	Rice, et al	07-30-59	7	73-74	38
12-18-29	Lone Pine #3-5	- - - - - do - - - - -	Rice	06-15-60	7	154-155	
12-18-29	Montie Carlo No. 2[3]	- - - - - do - - - - -	Messick	10-08-21	1	4	
12-18-29	Mountain Lion	- - - - - do - - - - -	Foreman	08-23-28	1	135	
12-18-29	Rough Canyon No. 1-2	- - - - - do - - - - -	Moore, et al	06-19-40	2	129	
12-18-29	Tilerium No. 1	- - - - - do - - - - -	Swartz	09-03-24	1	49	
12-18-29	Tilurium No. 2	- - - - - do - - - - -	- - - - - do - - - - - - -	10-28-29	1	156	
12-18-30	Great Wealth No. 1	- - - - - do - - - - -	Messick	06-13-38	1	567	
12-18-30	Great Western 1-4	- - - - - do - - - - -	- - - - - do - - - - - - -	04-24-35	1	361-362	
12-18-30	Harvest No. 1[3]	- - - - - do - - - - -	Swartz	06-25-33	1	231	
12-18-30	Harvest No. 2	- - - - - do - - - - -	Swartz, et al	01-02-34	1	266	
12-18-30	Harvest No. 3	- - - - - do - - - - -	- - - - - do - - - - - - -	08-04-34	1	305	
12-18-30	Harvest No. 5	- - - - - do - - - - -	Swartz	02-06-35	1	351	
12-18-30	Red Lode	- - - - - do - - - - -	Roberts	02-12-23	1	33	
12-18-30	Reward	- - - - - do - - - - -	Swartz	04-26-33	1	227	
12-18-30	Ruth #1-2	- - - - - do - - - - -	Boddy, et al	10-19-37	1	542	
12-18-30	Ruth No. 1-2	- - - - - do - - - - -	George	12-04-39	2	61	
12-18-32	Nobel No. 3	- - - - - do - - - - -	Hightower, et al	04-20-33	1	227	
12-18-32	Snow Drift 1-2	- - - - - do - - - - -	Moore	12-06-39	2	64	
12-18-33	Cabin	- - - - - do - - - - -	Hightower, et al	10-05-32	1	215	
12-18-33	Hightower, Jr.	- - - - - do - - - - -	Hightower	06-27-39	2	4	
12-18-33	King Pin No. 1	- - - - - do - - - - -	Sheshire	02-15-52	3	87	

See footnotes and remarks at end of table.

Location[3] T. R. S.	Claim	Mining District	Location filed: Claimant	Date	Book	Page	Remark Number
			Catron County - - Continued				
12-18-33	Peckerwood No. 1[3]	Wilcox	Hayes	07-01-36	1	458	39
12-18-33	Point Rock No. 2[3]	----- do ------	Keenan	06-27-42	2	240	
12-18-33	Sacaton No. 3[3]	----- do ------	Hightower, et al	12-29-31	1	203	
12-18-33	Sacaton	----- do ------	Crumbley	08-26-38	1	605	
12-18-33	Sacaton No. 2	----- do ------	Wytcherley, et al	05-29-39	1	617	
12-18-33	Sparton No. 1	----- do ------	Stewart	03-15-54	3	253	
12-18-33	Wamgas #1	----- do ------	Foster, et al	06-26-24	1	44	
12-18-34	Lake View No. 1-2	----- do ------	Wytcherly, et al	03-29-43	2	274	
12-18-35	Just In Time	----- do ------	Rice, et al	09-24-30	1	166	
12-19- 4	Ben Harrison	----- do ------	McCargish, et al	07-03-29	1	148	
12-19- 4	Capitol Hill 1-4[3]	----- do ------	Bishop	07-08-22	1	12	40
12-19- 4	Chapear De Fer	----- do ------	McCargish, et al	07-03-29	1	148	
12-19- 4	Iren Gold	----- do ------	Zook, et al	01-09-22	1	5	
12-19- 4	Iron Clad 1-3	----- do ------	Bishop	07-08-22	1	12	6
12-19- 4	Lone Star No. 2[3]	----- do ------	Mengis, et al	02-03-28	1	111	
12-19- 4	Lone Star No. 4	----- do ------	Menges, et al	02-03-28	1	111	
12-19- 4	Lone Star No. 6	----- do ------	Mengis, et al	06-29-33	1	236	
12-19- 4	Lone Star No. 7	----- do ------	----- do -------	09-28-34	1	336	
12-19- 4	Morning Star #1	----- do ------	----- do -------	08-26-66	9	17	
12-19- 4	Red Paint	----- do ------	Hackley, et al	11-07-39	2	68	
12-19- 4	Texas 1	----- do ------	Mengis, et al	10-10-34	1	331	
12-19- 4	Texas No. 2	----- do ------	Menges, et al	10-24-34	1	335	
12-19- 4	Texas 3	----- do ------	Mengis, et al	10-29-31	1	199	
12-19- 4	Thunderhead 1-4	----- do ------	Bishop	07-08-22	1	12	6
12-19- 4	Thunderhead No. 1	----- do ------	Menges, et al	10-10-34	1	332	
12-19- 4	Thunderhead No. 2	----- do ------	----- do -------	10-10-34	1	335	
12-19- 5	Arizona No. 1-2	----- do ------	McCullock	02-17-28	1	112	
12-19- 5	Capitol Hill 5[3]	----- do ------	Bishop	07-08-22	1	12	
12-19- 5	Dixon	----- do ------	Anderson	05-28-28	1	129	
12-19- 5	Gold Eagle	----- do ------	Menges	10-24-34	1	335	
12-19- 5	Hundinger	----- do ------	Turner	03-07-28	1	121	
12-19- 5	Katherine	----- do ------	Hinninger	03-07-28	1	121	
12-19- 5	Liberty Bell	----- do ------	Massey, et al	04-23-28	1	127	
12-19- 5	Liberty Bell 2-3	----- do ------	Mengis, et al	10-29-31	1	198	
12-19- 5	Liberty Bell 4-5	----- do ------	----- do -------	01-14-63	7	331	
12-19- 5	Lone Star No. 1[3]	----- do ------	Menges, et al	02-03-28	1	110	
12-19- 5	Lone Star No. 3	----- do ------	Mengis, et al	02-03-28	1	111	
12-19- 5	Lone Star No. 5	----- do ------	----- do -------	06-29-33	1	237	
12-19- 5	Lucky Strike 6-7	----- do ------	----- do -------	01-15-63	7	332-333	
12-19- 5	Moose 1-2[3]	----- do ------	----- do -------	01-20-28	1	109	
12-19- 5	Moose No. 4	----- do ------	Massey, et al	01-20-28	1	110	
12-19- 5	Moose No. 6	----- do ------	----- do -------	02-28-28	1	116	
12-19- 5	Moose No. 9	----- do ------	----- do -------	02-27-28	1	115	
12-19- 5	Sunset Glow	----- do ------	Kenmore	03-07-28	1	121	
12-19- 5	Two Bobs Placer	Wilcox	Campbell	02-27-28	1	114	
12-19- 5	Willcox Peak	----- do -----	McCurdy	03-07-28	1	122	
12-19- 5	Wyoming	----- do -----	Jones	03-14-28	1	112	
12-19- 8	Crescent #1-2	----- do -----	Ward, et al	01-26-60	7	136	
12-19- 8	Glenwood No. 1	----- do -----	Gleason	03-07-28	1	118	
12-19- 8	Glenwood No. 2	----- do -----	Jones, et al	03-07-28	1	118	
12-19- 8	Goddard #1[3]	----- do -----	Ward, et al	01-26-60	7	136	
12-19- 8	Kattey	----- do -----	Jones	03-07-28	1	120	
12-19- 8	Lost Chance	----- do -----	Jones, et al	03-07-28	1	120	
12-19- 8	Overlooked No. 1[3]	----- do -----	Higgins, et al	06-20-42	2	235	
12-19- 8	Red Colt	----- do -----	Ward, et al	01-26-60	7	135	
12-19- 9	Four Horseman	----- do -----	Ford, et al	03-07-28	1	120	
12-19- 9	Goddard #2[3]	----- do -----	Ward, et al	01-26-60	7	137	
12-19- 9	Jakas	----- do -----	Ford	03-07-28	1	119	
12-19- 9	Overlooked No. 2[3]	----- do -----	Higgins, et al	06-20-42	2	235	
12-19- 9	Prospector	----- do -----	Jones	03-07-28	1	119	
12-19- 9	Wilcox #1	----- do -----	Kelly, et al	05-04-61	7	196	
12-19- 9	Wilcox #2-4	----- do -----	----- do -------	05-04-61	7	197-198	
12-19- 9	Wild Ox	----- do -----	Higgins	03-07-28	1	119	
12-19-12	Big Dipper	----- do -----	McCullar, et al	05-11-34	1	284	
12-19-12	Big Dipper No. 2 (Amended)	----- do -----	Wilson, et al	06-14-34	1	292	
12-19-12	Canara No. 1-3	----- do -----	McCullor, et al	08-17-34	1	311-312	
12-19-12	Jonny L	----- do -----	Wilson, et al	06-14-34	1	290	
12-19-12	Pepiance No. 1	----- do -----	Moore	11-13-34	1	339	
12-19-12	Ruth E. (Amended)	----- do -----	Wilson, et al	06-14-34	1	292	
12-19-12	Uncle John No. 5[3]	----- do -----	Hackley	03-17-49	2	557	
12-19-12	Uncle John No. 4-5	----- do -----	Denham	08-01-61	7	213	
12-19-13	Ammie E.	----- do -----	Wilson, et al	06-14-34	1	291	
12-19-13	Andicite No. 1	----- do -----	McCullor	05-21-34	1	283	
12-19-13	Beaver Tail Placer	----- do -----	Piper	06-13-50	2	605	
12-19-13	Big Chief No. 1	----- do -----	McCullar, et al	08-03-33	1	246	
12-19-13	Big Chief No. 2	----- do -----	----- do -------	06-05-34	1	286	
12-19-13	Black Gold No. 1	----- do -----	McCullen, et al	08-23-33	1	257	
12-19-13	Black Gold No. 3-4	----- do -----	----- do -------	05-21-34	1	284-285	
12-19-13	Blue Bird	----- do -----	McCullor, et al	05-11-34	1	283	
12-19-13	Blue Bird (Amended)	----- do -----	Everest	06-14-34	1	290	41
12-19-13	Blue Bird	----- do -----	Frymire	08-14-45	2	381	
12-19-13	Catherine	----- do -----	Wright	05-23-34	1	286	
12-19-13	Hardscrabble No. 1	----- do -----	Johnson, et al	11-05-30	1	169	41
12-19-13	Hard Scrabble No. 1-2	----- do -----	Frymire	08-14-45	2	381-382	
12-19-13	Independence #1	----- do -----	Johnson, et al	05-01-34	1	279	
12-19-13	Independence No. 1 (Amended)	----- do -----	Tirey, et al	06-13-34	1	288	
12-19-13	Independence No. 2	----- do -----	----- do -------	06-13-34	1	288	
12-19-13	Independence No. 3 (Amended)	----- do -----	----- do -------	06-13-34	1	289	
12-19-13	Independence No. 4 (Amended)	----- do -----	----- do -------	06-13-34	1	289	
12-19-13	Independence No. 1	----- do -----	Frymire	08-14-45	2	382	
12-19-13	Independence No. 2	----- do -----	----- do -------	08-14-45	2	383	

See footnotes and remarks at end of table.

Location[3] T. R. S.	Claim	Mining District	Claimant	Location filed Date	Book	Page	Remark Number
			Catron County - - Continued				
12-19-13	Juanita	Wilcox	Dodge, et al	07-02-36	1	433	
12-19-13	99 No. 1	- - - - - do - - - - - -	Messick	06-13-35	1	366	
12-19-13	Pearl No. 1	- - - - - do - - - - - -	Whitacre	08-19-39	2	15	
12-19-13	Petty Ann Placer	- - - - - do - - - - - -	Saunders, et al	08-07-61	7	214	
12-19-13	Rainbow	- - - - - do - - - - - -	Tedford	10-06-34	1	338	
12-19-13	Seminole Group 1-8	- - - - - do - - - - - -	Samora, et al	11-05-67	10	267	
12-19-13	Welcome Stranger No. 1-3	- - - - - do - - - - - -	Newman	03-20-39	1	613-614	41
12-19-14	Enchantment Development Company No. 1-2	- - - - - do - - - - - -	Grant, et al	06-13-50	2	606	
12-19-14	Red Rose No. 1	- - - - - do - - - - - -	McCullen, et al	07-28-33	1	245	
12-19-14	Red Rose No. 2	- - - - - do - - - - - -	- - - - - do - - - - - - -	05-21-34	1	283	
12-19-23	Isabell No. 1-4	- - - - - do - - - - - -	Higgins, et al	08-21-48	2	545-547	
12-19-26	Del Rio No. 1-4 Placer	Big Dry Creek	Everest, et al	10-15-34	1	327	
12-19-27	Laredo No. 1-4 Placer	- - - - - do - - - - - -	- - - - - do - - - - - - -	10-15-34	1	325-326	
12-19-33	Florence Placer	- - - - - do - - - - - -	- - - - - do - - - - - - -	10-15-34	1	321	
12-19-33	San Diego No. 1-5 Placer	- - - - - do - - - - - -	- - - - - do - - - - - - -	10-15-34	1	322-323	
12-19-33	Sheridan Placer	- - - - - do - - - - - -	- - - - - do - - - - - - -	10-15-34	1	321	
12-19-34	San Saba No. 1-7 Placer	- - - - - do - - - - - -	- - - - - do - - - - - - -	10-15-34	1	323-325	
12-20-24	Hooten & Clark	Wilcox	Hooten, et al	07-22-49	2	580	
13-17- 6	Hill & Banister III[3]	- - - - - do - - - - - -	Hill, et al	11-30-59	7	131	
13-17- 7	Cook & Hill 1-2	- - - - - do - - - - - -	- - - - - do - - - - - - -	09-02-59	7	85	
13-17- 7	Hill & Banister I-II[3]	- - - - - do - - - - - -	- - - - - do - - - - - - -	11-30-59	7	131	
13-18- 2	Gold Bug	- - - - - do - - - - - -	Campbell	07-02-21	1	3	
13-18- 3	Katy C 1-4	Mogollon Mtns.	Monroe	05-07-68	11	368-371	
13-18- 3	Poly C 1-4	Wilcox	- - - - - do - - - - - - -	05-07-68	11	372-375	
13-18- 4	Point Rock No. 1&3[3]	- - - - - do - - - - - -	Keenan	06-27-42	2	240-241	
13-19- 4	Leola Placer	Big Dry Creek	Everest, et al	10-15-34	1	321	
13-19- 4	Margaret Placer	- - - - - do - - - - - -	- - - - - do - - - - - - -	10-15-34	1	322	
			Socorro County[5]				
10-17-29	Wolf	Cooney	Wolf	10-28-99	23	40	
11-12- 5	Arcade	Taylor Creek	Kemp, et al	06-28-20	92	587	
11-12- 5	Castle Butte	- - - - - do - - - - - -	- - - - - do - - - - - - -	06-28-20	92	588	
11-12- 5	Polar Bear	- - - - - do - - - - - -	- - - - - do - - - - - - -	06-28-20	92	587	
11-12- 6	Beaver	- - - - - do - - - - - -	- - - - - do - - - - - - -	06-28-20	92	589	
11-12- 6	White Rock	- - - - - do - - - - - -	- - - - - do - - - - - - -	06-28-20	92	590	
11-18- 4	Wilson	Cooney	Welch	03-06-13	75	119	
11-18- 8	Benzett	- - - - - do - - - - - -	Tipton, et al	01-09-17	71	529	
11-18-29	Captain Ab	Wilcox	Kirkpatrick	05-15-06	59	19	
11-18-29	Iron Cap No. 1[3]	- - - - - do - - - - - -	Zook	11-06-18	81	135	
11-18-32	Baner	- - - - - do - - - - - -	Johnson, et al	11-31-89	16	490	
11-18-32	Beatsy	Wilcox	Johnson	05-21-90	16	564	
11-18-32	Buckhorn	- - - - - do - - - - -	Seedenberg, et al	07-19-97	36	306	
11-18-32	Defiance	- - - - - do - - - - -	Johnson	01-23-92	16	749	42
11-18-32	Defiance No. 2	- - - - - do - - - - -	Lauderbaugh	03-23-08	61	200	
11-18-32	Defiance No. 3	- - - - - do - - - - -	- - - - - do - - - - - - -	03-23-08	61	199	
11-18-32	Evening Star	- - - - - do - - - - -	Finnell	03-12-91	16	652	
11-18-32	First Chance	- - - - - do - - - - -	Zook, et al	11-11-89	16	475	
11-18-32	Florence	- - - - - do - - - - -	Sipe	05-21-90	16	564	
11-18-32	Franklin	- - - - - do - - - - -	Zook, et al	06-28-90	16	582	
11-18-32	Gilt Edge	- - - - - do - - - - -	Kirkpatrick	05-15-06	59	20	
11-18-32	Golden Age	- - - - - do - - - - -	Allison	08-06-98	36	412	
11-18-32	Golden Chariot Mine	- - - - - do - - - - -	Judd, et al	03-18-93	35	80	43
11-18-32	Golden Chariot No. 2	- - - - - do - - - - -	- - - - - do - - - - - - -	03-18-93	35	81	44
11-18-32	Golden Chariot No. 3	- - - - - do - - - - -	- - - - - do - - - - - - -	03-18-93	35	80	45
11-18-32	Golden Chariot No. 3 Ext.	- - - - - do - - - - -	Zook, et al	03-12-96	36	61	46
11-18-32	Golden Chariot No. 4	- - - - - do - - - - -	Zuck, et al	01-27-94	14	616	
11-18-32	Golden Chariot No. 5	- - - - - do - - - - -	French, et al	07-12-97	36	303	
11-18-32	Ida E	- - - - - do - - - - -	Finnell, et al	01-02-90	16	493	
11-18-32	Iron Cap	- - - - - do - - - - -	Zook	09-24-10	61	450	
11-18-32	Iron Cap No. 2	- - - - - do - - - - -	- - - - - do - - - - - - -	09-24-10	61	451	
11-18-32	Iron Cap No. 2	- - - - - do - - - - -	- - - - - do - - - - - - -	11-06-18	81	135	
11-18-32	I.S.	- - - - - do - - - - -	Siggins	02-05-90	16	510	
11-18-32	J.A.J.	- - - - - do - - - - -	Newland	09-03-07	64	114	
11-18-32	Jettie	- - - - - do - - - - -	Finnell	12-12-89	16	483	
11-18-32	Lilly	- - - - - do - - - - -	Zook, et al	11-11-89	16	474	
11-18-32	Log Cabin	- - - - - do - - - - -	- - - - - do - - - - - - -	04-17-01	23	301	
11-18-32	Morning Star	- - - - - do - - - - -	Finnell	03-12-91	16	652	
11-18-32	Mountain View	- - - - - do - - - - -	Gilpin	10-12-96	36	210	
11-18-32	Nettie	- - - - - do - - - - -	Gilpin, et al	10-12-96	36	209	
11-18-32	Radford No. 3-4[3]	- - - - - do - - - - -	Sharp, et al	07-06-04	50	503-504	
11-18-32	Red Cross	- - - - - do - - - - -	Lauderbaugh	04-09-12	75	50	
11-18-32	Red Top	- - - - - do - - - - -	- - - - - do - - - - - - -	06-05-07	61	93	
11-18-32	Silver Prize	- - - - - do - - - - -	Zook, et al	11-11-89	16	473	
11-18-32	Spy No. 2	- - - - - do - - - - -	Judd, et al	03-18-93	35	81	
11-18-32	Summer Roze	- - - - - do - - - - -	Zook, et al	03-24-04	50	429	
11-18-32	Timberline	- - - - - do - - - - -	Seedenberg, et al	07-19-97	36	306	
11-18-32	Uncle Billey	- - - - - do - - - - -	Finnell	12-12-89	16	484	
11-18-32	Vantension	- - - - - do - - - - -	Lauderbaugh	11-02-01	23	433	
11-18-32	Wells	- - - - - do - - - - -	Wells, et al	04-14-04	50	455	
11-18-32	Western Star	- - - - - do - - - - -	Zook, et al	04-17-01	23	304	
11-18-32	Yellow Jacket	- - - - - do - - - - -	Johnson, et al	11-31-89	16	491	
11-18-33	Butterfly No. 4-5[3]	- - - - - do - - - - -	Zook, et al	07-23-03	50	287	
11-18-33	Butterfly No. 6	- - - - - do - - - - -	- - - - - do - - - - - - -	03-24-04	50	430	
11-18-33	California	- - - - - do - - - - -	- - - - - do - - - - - - -	06-28-90	16	581	
11-18-33	E. C. Boyer	- - - - - do - - - - -	Rockwell, et al	03-31-04	50	443	47
11-18-33	Gold Bar Mine	- - - - - do - - - - -	Zook	04-12-18	82	47	
11-18-33	Gold Ledge	- - - - - do - - - - -	Harvey, et al	11-08-94	35	394	
11-18-33	Golden Hook #1[3]	- - - - - do - - - - -	Case, et al	03-02-12	71	170	
11-18-33	Golden Link 1[3]	- - - - - do - - - - -	Zook, et al	05-18-07	61	74	
11-18-33	Golden Link 4	- - - - - do - - - - -	- - - - - do - - - - -	05-18-07	61	76	

See footnotes and remarks at end of table.

Location[3] T. R. S.	Claim	Mining District	Location filed Claimant	Date	Book	Page	Remark Number
			Socorro County - - Continued				
11-18-33	Golden Link 6	Wilcox	Zook, et al	05-18-07	61	77	
11-18-33	Granit Mountain	- - - - - do - - - - -	Johnson, et al	11-31-89	16	490	
11-18-33	Granite Mountain	- - - - - do - - - - -	Seedenberg, et al	07-19-97	36	307	48
11-18-33	Great Eastern	- - - - - do - - - - -	Zook, et al	04-17-01	23	302	10
11-18-33	Grubstake	- - - - - do - - - - -	Zook	04-26-04	50	463	
11-18-33	Radford No. 1-2[3]	- - - - - do - - - - -	Rockwell, et al	06-08-04	50	489-490	
11-18-33	Red Bird	- - - - - do - - - - -	Zook, et al	04-17-01	23	303	
11-18-33	Summett	- - - - - do - - - - -	Finnell, et al	01-02 90	16	492	
11-18-33	Tuch Me Not	- - - - - do - - - - -	Lauderbaugh	07-28-04	50	515	
11-18-34	Big Chief	- - - - - do - - - - -	Case, et al	11-11-08	64	288	
11-18-34	Costello	- - - - - do - - - - -	Rockwell, et al	03-21-04	50	444	
11-18-34	Golden Hook No. 2[3]	Willcox	Case, et al	03-02-12	71	171	
11-18-34	Golden Hook #3	- - - - - do - - - - -	- - - - - do - - - - - - -	03-02-12	71	172	
11-18-34	Golden Hook N. 4	- - - - - do - - - - -	- - - - - do - - - - - - -	03-02-12	71	173	
11-18-34	Montezuma	Wilcox	- - - - - do - - - - - - -	11-11-08	64	289	
11-18-34	Uncle Ben	- - - - - do - - - - -	- - - - - do - - - - - - -	07-29-10	61	424	
11-18-35	Dixie	- - - - - do - - - - -	- - - - - do - - - - - - -	07-29-10	61	425	
11-18-35	Gold King	- - - - - do - - - - -	- - - - - do - - - - - - -	07-29-10	61	422	
11-18-35	Grey Eagle	- - - - - do - - - - -	- - - - - do - - - - - - -	07-29-10	61	423	
11-18-35	Lion	- - - - - do - - - - -	- - - - - do - - - - - - -	07-29-10	61	424	
11-18-35	Lions Den	- - - - - do - - - - -	- - - - - do - - - - - - -	07-29-10	61	423	
11-18-35	Socorro Territory of New Mexico	- - - - - do - - - - -	Zook, et al	06-27-07	64	39	
11-18-35	Solo Grande	- - - - - do - - - - -	Case, et al	11-11-08	64	289	
11-19- 1	Michigan	Mogollon	Beebe, et al	08-09-20	93	28	
11-19- 1	Monarch	Cooney	McKinney	04-28-14	75	291	
11-19- 1	Silver Loop	- - - - - do - - - - -	Kirkpatrick, et al	09-26-11	71	86	
11-19- 1	Why Not	- - - - - do - - - - -	McKinney	02-17-14	71	299	
11-19- 2	Cliff	- - - - - do - - - - -	Peterson	08-13-12	71	198	
11-19- 2	Cliff No. 2	- - - - - do - - - - -	- - - - - do - - - - - - -	08-13-12	71	199	
11-19- 2	Crystal	- - - - - do - - - - -	Dotson	05-29-16	75	517	
11-19- 2	Little Emma	- - - - - do - - - - -	Cook, et al	08-17-11	71	78	
11-19- 2	Rain - Bow	Mogollon	Beebe, et al	08-20-20	93	31	
11-19- 2	Superior	- - - - - do - - - - -	- - - - - do - - - - - - -	08-09-20	93	29	
11-19- 3	Amole	Cooney	Peterson, et al	01-31-06	53	357	
11-19- 3	Aviator	- - - - - do - - - - -	Peterson	02-18-13	71	223	
11-19- 3	Iron No. 2[3]	- - - - - do - - - - -	Gamblin, et al	11-28-11	71	102	49
11-19- 3	Iron Bar	- - - - - do - - - - -	Hambert, et al	03-23-95	36	584	49
11-19- 3	Iron Chain	- - - - - do - - - - -	Lambert, et al	02-28-02	23	538	49
11-19- 3	Iron Crown	- - - - - do - - - - -	Hambert, et al	03-23-95	36	584	49
11-19- 3	Iron Ring	- - - - - do - - - - -	Lambert, et al	02-28-02	23	537	49
11-19- 3	Lime Kiln	- - - - - do - - - - -	Schiff, et al	02-15-06	53	369	
11-19- 3	Lime Kiln	- - - - - do - - - - -	Ernestine	06-11-13	75	165	50
11-19- 4	Burro No. 3	- - - - - do - - - - -	Brownell, et al	07-10-07	61	113	
11-19- 4	Iron[3]	Cooney	Gamblin, et al	11-28-11	71	102	
11-19- 4	Iron Bar No. 2	- - - - - do - - - - -	Evans, et al	06-13-10	64	595	
11-19- 4	Iron Cross	- - - - - do - - - - -	Hambert, et al	03-23-95	36	584	
11-19- 4	Iron Hasp[3]	- - - - - do - - - - -	Evans, et al	12-26-10	61	521	
11-19- 4	Iron Link	- - - - - do - - - - -	Evans	03-28-13	71	233	
11-19- 4	Iron Mask	- - - - - do - - - - -	Evans, et al	06-13-10	64	596	
11-19- 4	Iron Rule	- - - - - do - - - - -	- - - - - do - - - - - - -	06-13-10	64	595	
11-19- 4	Iron Rule No. 2	- - - - - do - - - - -	- - - - - do - - - - - - -	08-16-11	71	78	
11-19- 4	Iron Wedge	- - - - - do - - - - -	Lambert, et al	06-07-02	50	33	
11-19- 4	Raw Hide	- - - - - do - - - - -	Irish, et al	02-04-99	36	473	
11-19- 5	Cooney Placer	- - - - - do - - - - -	Weatherby, et al	01-28-05	53	161	
11-19- 5	Iron Wedge[3]	- - - - - do - - - - -	Evans	03-28-13	71	233	
11-19- 8	Silverado No. 1-2	- - - - - do - - - - -	Tipton, et al	01-09-17	71	530	
11-19- 8	Wall Street	- - - - - do - - - - -	York, et al	02-24-06	53	375	51
11-19- 9	Arthur K	- - - - - do - - - - -	Krans	03-24-09	61	313	
11-19- 9	Bunker Hill	- - - - - do - - - - -	Rowe	05-09-88	16	320	
11-19- 9	Fourth of July	- - - - - do - - - - -	Rowe, et al	01-14-87	16	146	
11-19- 9	Oak Grove	- - - - - do - - - - -	Krauss	06-27-08	64	240	
11-19-14	Sant Edubgen	Wilcox	Ayon, et al	11-06-14	75	335	
11-19-28	Golden Queen	Cooney	Kilt	12-12-08	61	295	
11-19-28	Golden Queen (No. 1 ?)	- - - - - do - - - - -	- - - - - do - - - - - - -	12-12-08	61	295	
11-19-28	Golden Queen No. 2-3	- - - - - do - - - - -	- - - - - do - - - - - - -	12-12-08	61	296	
11-19-28	Golden Queen (No. 4 ?)	- - - - - do - - - - -	- - - - - do - - - - - - -	12-12-08	61	297	
11-19-28	Golden Queen No. 5	- - - - - do - - - - -	- - - - - do - - - - - - -	12-12-08	61	297	
11-19-28	Juniper Cottage	- - - - - do - - - - -	- - - - - do - - - - - - -	12-12-08	61	293	
11-19-28	Juniper Cottage No. 1-3	- - - - - do - - - - -	- - - - - do - - - - - - -	12-12-08	61	293-294	
11-19-28	Standard	- - - - - do - - - - -	Johnson, et al	11-05-97	36	324	
11-19-29	Bowie	- - - - - do - - - - -	Krauss	11-06-96	36	213	
11-19-29	John Corbell	- - - - - do - - - - -	Wells, et al	06-08-96	36	156	
11-19-29	Missouri	- - - - - do - - - - -	Dorsey, et al	10-29-01	23	431	
11-19-29	Sunny Side	- - - - - do - - - - -	Shaw, et al	12-10-96	36	223	
11-19-32	Bank	Wilcox	Sipe, et al	03-17-94	35	303	
12-18- 3	Elkdome	- - - - - do - - - - -	Stockbridge, et al	04-12-04	50	450	
12-18- 3	Hard Travel	- - - - - do - - - - -	Jones, et al	01-01-04	50	567	
12-18- 3	Homecase	- - - - - do - - - - -					52
12-18- 3	Hoosier No. 1-2	- - - - - do - - - - -	Kirkpatrick	11-04-04	50	556	
12-18- 3	Red Cave	- - - - - do - - - - -					52
12-18- 3	Silver Drip 1-2	- - - - - do - - - - -	Jones Bros., et al	08-09-07	64	104	53
12-18- 3	Silver Drip 3-4	- - - - - do - - - - -					52
12-18- 4	Butterfly No. 1-3[3]	- - - - - do - - - - -	Zook, et al	03-17-03	50	200-202	
12-18- 4	Combination	Willcox	Case, et al	03-02-12	71	173	
12-18- 4	Golden Gate	Wilcox	Johnson, et al	06-28-90	16	580	
12-18- 4	Golden Link 2[3]	- - - - - do - - - - -	Zook, et al	05-18-07	61	74	
12-18- 4	Golden Link 3	- - - - - do - - - - -	- - - - - do - - - - - - -	05-18-07	61	75	54
12-18- 4	Golden Link 5	- - - - - do - - - - -	- - - - - do - - - - - - -	05-18-07	61	76	
12-18- 4	Golden Link No. 7	- - - - - do - - - - -	- - - - - do - - - - - - -	08-07-07	61	122	
12-18- 4	Golden Link No. 8	- - - - - do - - - - -	- - - - - do - - - - - - -	10-05-07	61	140	
12-18- 4	Mountain Chief	- - - - - do - - - - -	- - - - - do - - - - - - -	06-28-90	16	581	
12-18- 4	3 Stamp Mill	- - - - - do - - - - -	Zook	04-12-18	82	47	
12-18- 5	Pilgrim	- - - - - do - - - - -	Briggs, et al	11-03-87	16	237	

See footnotes and remarks at end of table.

Location[2] T. R. S.	Claim	Mining District	Claimant	Date	Book	Page	Remark Number
			Location filed				
			Socorro County - - Continued				
12-18- 5	Rosey	Wilcox	Briggs, et al	11-03-87	16	238	
12-18- 5	Silver Bell	- - - - - do - - - - - -	Dorsey	11-30-03	50	355	
12-18- 5	Winter Home	- - - - - do - - - - - -	Jones Bros., et al	09-12-06	59	110	
12-18- 6	Defiance Extension[3]	- - - - - do - - - - - -	Lauderbaugh, et al	07-29-97	36	314	
12-18- 6	Spider	- - - - - do - - - - - -	Johnson	01-24-90	16	503	
12-18- 7	Beauty	- - - - - do - - - - - -	Campbell, et al	10-29-19	82	428	55
12-18- 7	Brite Meatl	- - - - - do - - - - - -	Zook	09-08-17	81	17	
12-18- 7	Deer Trail	- - - - - do - - - - - -	Cooney, et al	12-05-84	9	550	
12-18- 7	Gimey	- - - - - do - - - - - -	Campbell, et al	10-29-19	82	428	27
12-18- 7	Lead Bulion	- - - - - do - - - - - -	Zook, et al	07-05-17	71	596	27
12-18- 7	Northern Belle	- - - - - do - - - - - -	Cooney	12-05-84	9	550	
12-18- 7	Uncle John	- - - - - do - - - - - -	Cooney, et al	12-05-84	9	550	27
12-18- 9	Bell	- - - - - do - - - - - -	Jones, et al	01-01-04	50	567	
12-18-13	No. 1	- - - - - do - - - - - -	Thorlston	06-30-15	71	416	
12-18-19	Annex	- - - - - do - - - - - -	Foreman, et al	01-26-18	81	91	
12-18-19	Bloomer Girl	- - - - - do - - - - - -	Roberts, et al	06-02-21	93	145	56
12-18-19	Coyote	- - - - - do - - - - - -	Swartz	01-27-21	93	115	56
12-18-19	Eureka	- - - - - do - - - - - -	Roberts, et al	01-27-21	93	116	
12-18-19	Rainstorm	- - - - - do - - - - - -	Foreman, et al	08-30-16	71	518	
12-18-19	Red Bird	- - - - - do - - - - - -	Roberts, et al	08-02-17	81	5	
12-18-19	Red Dog	- - - - - do - - - - - -	- - - - - do - - - - - - -	05-20-20	92	584	
12-18-20	Billiken	- - - - - do - - - - - -	Swartz, et al	05-09-17	71	564	
12-18-20	Combination No. 1	- - - - - do - - - - - -	- - - - - do - - - - - - -	02-08-17	75	574	
12-18-20	Crown No. 2	- - - - - do - - - - - -	Foreman, et al	06-01-21	93	144	
12-18-20	Gold Lode 1-3	- - - - - do - - - - - -	Messick, et al	11-10-15	71	440-441	57
12-18-20	Little Dog	- - - - - do - - - - - -	Harbour, et al	01-28-16	75	470	
12-18-20	Lone Pine No. 3[3]	- - - - - do - - - - - -	Foster, et al	10-19-10	61	467	
12-18-20	Lone Pine No. 1	- - - - - do - - - - - -	Swartz, et al	02-08-18	81	96	
12-18-20	Lone Pine No. 2	- - - - - do - - - - - -	- - - - - do - - - - - - -	03-11-18	82	35	
12-18-20	Lucky	- - - - - do - - - - - -	Foreman	02-28-17	75	586	
12-18-20	May Apple	- - - - - do - - - - - -	Harbour	01-01-15	75	436	58
12-18-20	Mose	- - - - - do - - - - - -	Swartz, et al	12-04-17	82	13	56
12-18-20	Oro Altos No. 1-2	- - - - - do - - - - - -	Nigh, et al	09-17-15	75	417-418	
12-18-20	Single Standard	Tellurium	Sheridan, et al	12-07-99	23	55	
12-18-20	Sky Terrier	Wilcox	Johnston	01-20-16	75	468	
12-18-20	Superior	- - - - - do - - - - - -	Whiteside, et al	08-28-06	59	97	
12-18-21	Gladys #1-2	- - - - - do - - - - - -	Durham, et al	10-19-10	61	464-465	
12-18-22	Bonanze No. 1-2	- - - - - do - - - - - -	Malone, et al	04-14-15	71	409-410	
12-18-22	Fair View	- - - - - do - - - - - -	Hightower, et al	08-10-14	75	311	59
12-18-22	Grand View	- - - - - do - - - - - -	- - - - - do - - - - - - -	09-29-21	93	171	
12-18-22	Jumbo	- - - - - do - - - - - -	- - - - - do - - - - - - -	08-10-14	75	311	
12-18-22	Plain View	- - - - - do - - - - - -	- - - - - do - - - - - - -	09-24-21	93	168	
12-18-26	Big Butte	- - - - - do - - - - - -	Masters, et al	07-26-11	71	66	
12-18-26	Big Butte (Amended)	- - - - - do - - - - - -	- - - - - do - - - - - - -	05-15-16	75	511	60
12-18-26	Butte No. 2	Wilcox	Masters, et al	12-22-11	71	113	
12-18-26	Butte No. 2 (Amended)	- - - - - do - - - - -	- - - - - do - - - - - - -	05-15-16	75	510	60
12-18-26	Butte No. 3	- - - - - do - - - - -	- - - - - do - - - - - - -	12-22-11	71	113	
12-18-26	Butte No. 3 (Amended)	- - - - - do - - - - -	- - - - - do - - - - - - -	05-15-16	75	512	60
12-18-26	Colon No. 1-2	- - - - - do - - - - -	Alexander, et al	08-04-14	75	308-309	
12-18-26	Grant Reef	- - - - - do - - - - -	Foster, et al	10-30-16	75	532	61
12-18-26	Hiden Treasure	- - - - - do - - - - -	Hightower	10-04-16	71	521	
12-18-26	Lone Star No. 1-2	- - - - - do - - - - -	Alexander, et al	05-05-14	71	330-331	
12-18-26	Lone Star No. 3-4	- - - - - do - - - - -	- - - - - do - - - - - - -	07-14-14	71	345	
12-18-26	Minnie Ha Ha No. 1-2	- - - - - do - - - - -	- - - - - do - - - - - - -	08-12-14	75	312	
12-18-26	Ruby Silver Queen	- - - - - do - - - - -	Masters, et al	11-06-11	71	97	
12-18-26	Ruby Silver Queen (Amended)	- - - - - do - - - - -	- - - - - do - - - - - - -	05-15-16	75	509	62
12-18-26	Silver Bill No. 1-3	- - - - - do - - - - -	Alexander, et al	07-12-21	93	153-155	
12-18-26	Silver Queen	- - - - - do - - - - -	Masters	10-29-13	75	191	
12-18-26	Silver Tip	- - - - - do - - - - -	Foster, et al	10-30-16	75	533	63
12-18-26	Tip Top	- - - - - do - - - - -	- - - - - do - - - - - - -	10-30-16	75	534	61
12-18-29	Anything	Little Dry Creek	McGuire, et al	10-03-95	35	630	
12-18-29	Big Bonanza No. 1	Monte Cristo	Sheridan, et al	12-07-99	23	50	
12-18-29	Black Gold No. 1	Wilcox	Foreman	05-18-18	82	50	56
12-18-29	Black Gold No. 2	- - - - - do - - - - -	- - - - - do - - - - - - -	06-18-18	82	66	56
12-18-29	Blue Copper	- - - - - do - - - - -	Brooks, et al	03-27-02	23	620	
12-18-29	Blue Jay	- - - - - do - - - - -	Roberts, et al	06-02-21	93	145	56
12-18-29	Blunk	Little Dry Creek	Stegman	10-31-95	35	637	
12-18-29	Connection	- - - - - do - - - - -	Lambert, et al	01-09-96	36	28	
12-18-29	Cripple Creek No. 1-2	Monte Cristo	Sheridan, et al	12-07-99	23	52-53	
12-18-29	Diogenes	Tellurium	- - - - - do - - - - - - -	12-07-99	23	58	
12-18-29	Diluth	Wilcox	Whiteside, et al	06-29-06	59	94	
12-18-29	Gold Bug	Tellurium	Sheridan, et al	12-07-99	23	57	
12-18-29	Homestake	Wilcox	Meader, et al	10-14-10	61	462	
12-18-29	Ida Mabel	- - - - - do - - - - -	Whiteside, et al	08-28-06	59	99	
12-18-29	Lila #1[3]	- - - - - do - - - - -	Moore, et al	05-20-14	71	335	
12-18-29	Little Dry	Little Dry Creek	Henderson, et al	07-15-95	35	613	
12-18-29	Little Dwarf No. 2	Wilcox	David	07-06-17	71	597	
12-18-29	Lone Pine	- - - - - do - - - - -	Whiteside, et al	08-28-06	59	100	64
12-18-29	Lone Pine No. 1-3	- - - - - do - - - - -	Foster, et al	10-19-10	61	466-467	
12-18-29	Mesaba	- - - - - do - - - - -	Whiteside, et al	06-29-06	59	94	
12-18-29	Pine Hill	Little Dry Creek	Peterson, et al	07-15-95	35	616	
12-18-29	Pine Slope	- - - - - do - - - - -	Henderson, et al	07-15-95	35	615	
12-18-29	Sacattoon	Tellurium	Lambert, et al	04-26-97	36	276	
12-18-29	Snake	Little Dry Creek	Henderson, et al	07-15-95	35	614	
12-18-29	Spring	Tellurium	Sheridan, et al	12-07-99	23	54	
12-18-29	Sunshine	Wilcox	Martin	05-10-19	82	111	
12-18-29	Tellurium	Little Dry Creek	Lambert, et al	10-24-93	35	159	65
12-18-29	Tellurium Extension	Tellurium	Sheridan, et al	06-28-00	36	598	
12-18-29	Tellurium No. 2	Little Dry Creek	Lambert, et al	01-09-96	36	27	
12-18-29	Texite	Wilcox	Whiteside, et al	08-28-06	59	98	
12-18-29	Warrior	Little Dry Creek	Lambert, et al	10-24-93	35	158	
12-18-29	Yellow Peril	Wilcox	Swartz, et al	05-09-17	71	564	56
12-18-29	Yellow Peril No. 1	- - - - - do - - - - -	- - - - - do - - - - - - -	05-09-17	92	1	56
12-18-29	Yellow Peril No. 2	- - - - - do - - - - -	- - - - - do - - - - - - -	05-09-17	71	564	56

See footnotes and remarks at end of table.

Location[2] T. R. S.	Claim	Mining District	Location field Claimant	Date	Book	Page	Remark Number
			Socorro County - - Continued				
12-18-30	Black Copper	Wilcox	Hartzog, et al	07-10-99	23	5	
12-18-30	Black Oxide	- - - - - do - - - - - -	Brooks, et al	04-18-02	50	13	66
12-18-30	Copper Glance No. 3[3]	- - - - - do - - - - - -	Hartzog, et al	09-05-01	23	394	
12-18-30	Copper Glance	- - - - - do - - - - - -	Hartzog	11-09-01	23	437	
12-18-30	Copper Glance No. 1	- - - - - do - - - - - -	Foraker, et al	04-30-02	50	15	67
12-18-30	Copper Glance No. 2	- - - - - do - - - - - -	- - - - - do - - - - - - -	04-30-02	50	15	
12-18-30	Cramp	- - - - - do - - - - - -	Davis, et al	04-02-09	61	319	
12-18-30	Lillian	Tellurium	Sheridan, et al	12-07-99	23	58	
12-18-30	Lone Star	Wilcox	Hartzog, et al	09-18-01	23	405	
12-18-30	Rita	Tellurium	Sheridan, et al	12-07-99	23	56	
12-18-32	Copper Glance No. 2[3]	Wilcox	Hartzog, et al	09-05-01	23	393	
12-18-32	Copper Glance No. 3	- - - - - do - - - - - -	Foraker, et al	04-18-02	50	15	
12-18-32	Copper Glance No. 4	- - - - - do - - - - - -	Brooks, et al	03-27-02	23	619	
12-18-32	Copper Hill	- - - - - do - - - - - -	- - - - - do - - - - - - -	03-18-02	23	612	
12-18-32	Lila #2-3[3]	- - - - - do - - - - - -	Moore, et al	05-20-14	71	336	
12-18-33	Copper Glance[3]	- - - - - do - - - - - -	Foster, et al	09-12-17	81	21	
12-18-33	Copper King #1[3]	- - - - - do - - - - - -	Johnston, et al	05-20-14	71	334	
12-18-33	Goldindina	- - - - - do - - - - - -	Brooks, et al	04-18-03	50	244	
12-18-33	Jacaton (Amended)	- - - - - do - - - - - -	Dwyer, et al	02-17-05	53	52	68
12-18-33	Little Georgia	- - - - - do - - - - - -	Johnston, et al	05-20-14	71	334	
12-18-33	Sacaton	- - - - - do - - - - - -	Gunther, et al	03-30-01	23	290	
12-18-33	Sacaton No. 2	- - - - - do - - - - - -	Shannon	04-05-02	23	628	
12-18-33	Wonderfull	- - - - - do - - - - - -	York, et al	02-18-09	64	362	
12-18-33	Zacaton (Amended)	- - - - - do - - - - - -	Dwyer, et al	02-17-05	53	59	69
12-18-34	Bull Extension	- - - - - do - - - - - -	Foster, et al	10-24-16	75	530	
12-18-34	Bull of the Woods	- - - - - do - - - - - -	- - - - - do - - - - - - -	10-24-16	75	530	
12-18-34	Copper Bill (Bell) No. 1[3]	- - - - - do - - - - - -	- - - - - do - - - - - - -	09-12-17	81	21	
12-18-34	Copper King #2[3]	- - - - - do - - - - - -	Johnston, et al	05-20-14	71	335	70
12-18-34	Grey Copper	- - - - - do - - - - - -	Foraker, et al	07-11-02	50	53	71
12-18-34	Grey Eagle	- - - - - do - - - - - -	Deering	09-05-01	23	395	
12-18-34	Little Jessie	- - - - - do - - - - - -	- - - - - do - - - - - - -	03-08-01	23	275	
12-18-34	North Star	- - - - - do - - - - - -	Jones, et al	12-16-08	68	55	
12-18-34	White Rock Spring	- - - - - do - - - - - -	Williams, et al	02-18-09	64	362	
12-18-34	White Rock Spring No. 2	- - - - - do - - - - - -	- - - - - do - - - - - - -	02-18-09	64	363	
12-18-35	Bonanza	- - - - - do - - - - - -	Masters, et al	01-16-12	71	128	
12-18-35	Bonanza (Amended)	- - - - - do - - - - - -	- - - - - do - - - - - - -	05-15-16	75	507	60
12-18-35	Gulch	- - - - - do - - - - - -	York, et al	02-18-09	64	361	
12-18-35	Silver Tip	- - - - - do - - - - - -	Masters, et al	11-06-11	71	97	
12-18-35	Silver Tip (Amended)	- - - - - do - - - - - -	- - - - - do - - - - - - -	05-15-16	75	508	72
12-19- 4	Big Indian	- - - - - do - - - - - -	Holt	01-15-02	23	502	
12-19- 4	Black Cow	- - - - - do - - - - - -	Goddard, et al	08-04-05	53	189	
12-19- 4	Capitol Hill[3]	- - - - - do - - - - - -	Starkweather	03-22-04	50	426	73
12-19- 4	Capitol Hill Mine No. 4[3]	- - - - - do - - - - - -	Bishop	01-02-19	81	182	
12-19- 4	Colorado	- - - - - do - - - - - -	Zook, et al	06-02-93	35	117	
12-19- 4	Colorado Springs	Wilcox	Cady, et al	03-27-00	23	127	
12-19- 4	Colorado Springs No. 1	- - - - - do - - - - -	- - - - - do - - - - - - -	03-27-00	23	128	
12-19- 4	Colorado Springs No. 2	- - - - - do - - - - -	- - - - - do - - - - - - -	03-27-00	23	125	
12-19- 4	Evergreen No. 1	- - - - - do - - - - -	McKinney	10-23-08	64	279	
12-19- 4	Evergreen No. 2	- - - - - do - - - - -	- - - - - do - - - - - - -	10-23-08	64	280	
12-19- 4	Hardscrabble	- - - - - do - - - - -	Foster, et al	10-23-93	35	156	
12-19- 4	Iron Clad	- - - - - do - - - - -	Sipe, et al	04-27-93	35	104	
12-19- 4	Iron Clad (No. 2 ?)	- - - - - do - - - - -	Foster, et al	05-08-93	35	108	
12-19- 4	Iron Clad No. 3-4	- - - - - do - - - - -	Bishop	01-02-19	81	182-183	
12-19- 4	Iron Clad No. 5	- - - - - do - - - - -	- - - - - do - - - - - - -	01-02-19	81	181	
12-19- 4	Iron Mask	- - - - - do - - - - -	Foster, et al	05-08-93	35	107	
12-19- 4	Jesse James	- - - - - do - - - - -	Burns	03-28-10	64	573	
12-19- 4	May Bell	- - - - - do - - - - -	Sipe, et al	04-27-93	35	105	74
12-19- 4	May Flower	- - - - - do - - - - -	Zuck, et al	06-30-92	35	15	
12-19- 4	May Flower	- - - - - do - - - - -	- - - - - do - - - - - - -	11-12-92	35	47	
12-19- 4	Placer Lode	- - - - - do - - - - -	Sipe	09-28-08	61	275	
12-19- 4	Revenue No. 1-2	- - - - - do - - - - -	McKinney	05-15-13	71	256	
12-19- 4	Thunderhead	- - - - - do - - - - -	Sipe	12-22-06	59	212	
12-19- 4	Thunder Head Mine No. 2	- - - - - do - - - - -	Bishop	01-02-19	81	182	
12-19- 4	Tip Top	- - - - - do - - - - -	Zook, et al	06-02-93	35	116	
12-19- 4	Tip Top	- - - - - do - - - - -	McKinney	02-28-11	61	597	
12-19- 4	Treasurer	- - - - - do - - - - -	Goddard, et al	06-04-04	50	482	
12-19- 4	Treasury Box	- - - - - do - - - - -	Bush, et al	10-23-93	35	155	
12-19- 5	Capital Hill No. 2[3]	- - - - - do - - - - -	Sipe	09-28-08	61	276	
12-19- 5	Capital Hill No. 3	- - - - - do - - - - -	Bishop	01-02-19	81	183	
12-19- 5	Crain	- - - - - do - - - - -	Crain, et al	12-05-10	61	497	75
12-19- 5	Golden King	- - - - - do - - - - -	Bush	10-23-93	35	157	
12-19- 5	John Brown	- - - - - do - - - - -	Burns, et al	10-27-10	61	472	
12-19- 5	Lost Goose	- - - - - do - - - - -	- - - - - do - - - - - - -	10-27-10	61	471	
12-19- 9	Bonanza[3]	- - - - - do - - - - -	Crames, et al	06-04-04	50	487	
12-19- 9	Bonanza Extension	- - - - - do - - - - -	Goddard, et al	06-04-04	50	486	
12-19- 9	Christmas	- - - - - do - - - - -	Cady, et al	03-27-00	23	127	
12-19- 9	Independent	- - - - - do - - - - -	Goddard	06-04-04	50	481	
12-19- 9	John Greene	- - - - - do - - - - -	- - - - - do - - - - - - -	06-04-04	50	484	
12-19- 9	Moonshine	Willcock	Goddard, et al	03-27-93	35	93	
12-19- 9	Mountain Key	Wilcox	- - - - - do - - - - - - -	06-04-04	50	483	
12-19- 9	New Years	- - - - - do - - - - -	Cady, et al	03-27-00	23	126	
12-19- 9	Old Shaft	- - - - - do - - - - -	Goddard, et al	06-04-04	50	484	
12-19- 9	Summit	- - - - - do - - - - -	Goddard	06-04-04	50	485	
12-19- 9	Tin Cup	- - - - - do - - - - -	Goddard, et al	03-27-93	35	92	
12-19- 9	Wilcox	- - - - - do - - - - -	Goddard	06-04-04	51	482	
12-19-12	Aunt Sally	- - - - - do - - - - -	York, et al	11-26-00	23	211	
12-19-12	Combination	- - - - - do - - - - -	Campbell, et al	03-10-20	92	565	
12-19-12	Conquest	- - - - - do - - - - -	Robinson, et al	12-05-84	9	549	
12-19-12	Solid Man	- - - - - do - - - - -	- - - - - do - - - - - - -	12-05-84	9	547	76
12-19-12	Spy	- - - - - do - - - - -	Judd, et al	03-18-93	35	82	
12-19-13	Bonanza No. 1-3[3]	(Wilcox)[4]	Sheridan, et al	06-27-81	3	366-368	
12-19-13	Bonanza No. 4	- - - - - do - - - - -	- - - - - do - - - - - - -	10-05-81	3	419	
12-19-13	Bonanza No. 2	Monte Cristo	- - - - - do - - - - - - -	12-07-99	23	51	
12-19-13	Camp Bird	Wilcox	Thorlston	06-26-11	71	55	

See footnotes and remarks at end of table.

Location[2] T. R. S.	Claim	Mining District	Location filed: Claimant	Date	Book	Page	Remark Number
			Socorro County - - Continued				
12-19-13	Grandview	Wilcox	Thorlston, et al	12-17-00	36	617	41
12-19-13	Hardscrabble	----- do -----	McCarthy, et al	03-15-87	16	180	41
12-19-13	Hecla	----- do -----	Thorlston	05-30-10	61	404	41
12-19-13	Little Nell	----- do -----	Deloach, et al	03-24-87	16	183	
12-19-13	North Extension Bonanza No. 1-2[3]	(Wilcox)[4]	Sheridan, et al	06-27-81	3	367	
12-19-13	Rattler	Wilcox	Zook, et al	09-07-20	93	54	
12-19-13	Rescue	----- do -----	Deloach, et al	03-24-87	16	182	
12-19-13	Socorro Chief	----- do -----	Robinson, et al	12-05-84	9	548	
12-19-13	Spanish	----- do -----	Judd, et al	03-18-93	35	83	
12-19-14	Bonanza No. 5[3]	(Wilcox)[4]	Sheridan, et al	10-20-81	3	419	
12-19-14	North Extension Bonanza No. 3[3]	----- do -----	----- do -------	06-27-81	3	368	
12-19-24	Contention	Wilcox	Wheeler, et al	12-14-85	9	684	77
12-19-24	Copper Gold	----- do -----	Cooper, et al	02-14-01	23	261	78
12-19-24	Copper-Gold Extension	----- do -----	Thorlston	05-07-08	61	229	79
12-19-24	Copper Gold No. 2	----- do -----	Thorlston, et al	06-27-01	23	341	
12-19-24	Eureka	----- do -----	Judd	01-23-92	16	750	
12-19-24	Gold	----- do -----	Thorlston	05-07-08	61	228	
12-19-24	True Blue	----- do -----	McCarty	08-09-90	16	589	
13-18- 3	Copper Bell	----- do -----	Brooks, et al	02-19-02	23	530	80
13-18- 3	Copper Bell No. 2	----- do -----	Foster, et al	09-12-17	81	22	81
13-18- 3	Copper Bell No. 3	----- do -----	----- do -------	09-12-17	81	22	
13-18- 3	Copper Fraction	----- do -----	Brooks, et al	03-18-02	23	613	82
13-18- 3	Copper Queen	----- do -----	York, et al	12-28-99	23	73	
13-18- 3	Copper Queen No. 2	----- do -----	York	02-12-09	64	357	
13-18- 3	Cuprite	----- do -----	Foster, et al	09-12-17	81	20	
13-18- 3	Golden Gate	----- do -----	----- do -------	01-15-16	75	464	
13-18- 3	Grand Central	Pehlurium	Zook, et al	01-27-98	36	351	
13-18- 3	Grand Central No. 2	Wilcox	Jones, et al	12-16-08	64	301	
13-18- 3	Little Lucky	----- do -----	Brooks, et al	09-06-01	23	396	
13-18- 3	Lucky	----- do -----	Hartzog, et al	09-18-01	23	404	
13-18- 3	Tip Top	----- do -----	York	02-12-09	64	357	
13-18- 3	White Tailed Deer	----- do -----	Deering	08-26-01	23	388	
13-18-10	LCF #1[3]	----- do -----	Foster, et al	01-12-16	71	464	
13-18-11	Green Horn	----- do -----	Hightower, et al	10-07-18	82	80	
13-18-11	LCF #2[3]	----- do -----	Foster, et al	01-12-16	71	465	
13-18-14	Skinner	Rain Creek	Rice, et al	08-13-00	36	604	
			Grant County				
12-18-20	Oakley	Wilcox	Rice	03-28-30	37	452	
12-18-28	Pearl 1-2	----- do -----	Heldt, et al	09-26-55	46	241-242	
12-18-28	Whiperwill 1-2	Wilcox	Thompson	03-02-33	38	158-159	
12-18-33	Blue Jay No. 1-3	----- do -----	Higgins, et al	09-02-37	39	124-125	
12-18-33	Copper Ridge No. 1[3]	Dry Creek	Caudill, et al	05-06-19	33	621	
12-18-33	Copper Ridge No. 3	----- do -----	----- do -------	05-06-19	33	622	
12-18-33	Deadman 3[3]	Wilcox	Henderson, et al	11-03-55	46	288	
12-18-33	Deadman #3	----- do -----	----- do -------	09-21-56	47	131	
12-18-33	Deadman No. 2	Mogollon	Brewer, et al	11-05-62	49	236	
12-18-33	Jewell 1-2	Wilcox	Bunkston	10-01-60	48	485	
12-18-33	Live Oak #1-2	----- do -----	Collins, et al	10-15-56	47	166-167	
12-18-33	Peckerwood 2-4[3]	----- do -----	Hayes	07-13-36	38	571-572	83
12-18-33	Silver Hill No. 1[3]	Dry Creek	Mardis, et al	09-27-21	35	418	
12-18-33	Silver Hill No. 3	----- do -----	----- do -------	09-27-21	35	419	
12-18-33	Terrell 1[3]	Wilcox	Clark, et al	01-10-56	46	380	
12-18-33	Terrell 3	----- do -----	----- do -------	01-10-56	46	381	
12-18-34	Copper Ridge No. 2[3]	Dry Creek	Caudill, et al	05-06-19	33	622	
12-18-34	Copper Ridge No. 4-7	----- do -----	----- do -------	05-06-19	33	623-625	
12-18-34	Copper Ridge No. 10-12	----- do -----	----- do -------	05-06-19	33	626-627	
12-18-34	Copper Ridge 13-14	----- do -----	----- do -------	09-15-19	34	581-582	
12-18-34	Deadman 1-2[3]	Wilcox	Henderson, et al	11-03-55	46	287	
12-18-34	Deadman 7-8	----- do -----	----- do -------	11-03-55	46	288-289	
12-18-34	Deadman #4	----- do -----	----- do -------	09-21-56	47	132	
12-18-34	Deadman 1	----- do -----	Clark	06-20-60	48	446	
12-18-34	Deadman 3	----- do -----	----- do -------	06-20-60	48	447	
12-18-34	Deadman 5	----- do -----	----- do -------	06-20-60	48	448	
12-18-34	Deadman No. 1	Mogollon	Brewer, et al	11-01-62	49	235	
12-18-34	Peckerwood 5[3]	Wilcox	Hayes	07-13-36	38	573	
12-18-34	Silver Hill No. 2[3]	Dry Creek	Mardis, et al	09-27-21	35	418	
12-18-34	Silver Hill No. 4	----- do -----	----- do -------	09-27-21	35	419	
12-18-34	Terrell 2[3]	Wilcox	Clark, et al	01-10-56	46	380	
12-18-34	Terrell 4	----- do -----	----- do -------	01-10-56	46	381	
13-11- 7	Caverna	Black Canyon	Smith	05-01-50	43	186	
13-11-18	Janet	----- do -----	Street	05-01-50	43	187	
13-11-18	Janet No. 1	----- do -----	----- do -------	05-01-50	43	187	
13-12-12	Nina[3]	----- do -----	Runkle	05-01-50	43	182	
13-12-13	Helen	----- do -----	Johnson	05-01-50	43	184	
13-12-13	Nina No. 1[3]	----- do -----	Runkle	05-01-50	43	183	
13-12-13	Polyxgni	----- do -----	Meletis	05-01-50	43	185	
13-12-13	Polyxgni No. 1	----- do -----	----- do -------	05-01-50	43	185	
13-13-17	Sulphate No. 3[3]	Alumina	Johnston	11-15-07	24	220	
13-13-18	Kaolin No. 2[3]	----- do -----	Sowers	03-18-93	15	346	
13-13-19	Alunogen 2[3]	----- do -----	Woodruff, et al	12-23-89	14	163	84
13-13-19	Alunogen 25-32	----- do -----	----- do -------	12-23-89	14	176-183	
13-13-19	Alunogen 33-40	----- do -----	----- do -------	03-14-90	14	240-246	
13-13-19	Alunogen 59	----- do -----	Sowers	04-28-92	14	725	
13-13-19	Kaolin No. 1[3]	----- do -----	----- do -------	03-18-93	15	345	
13-13-20	Alunogen 1[3]	----- do -----	Woodruff, et al	12-23-89	14	163	84
13-13-20	Alunogen 3	----- do -----	----- do -------	12-23-89	14	164	
13-13-20	Alunogen 60	----- do -----	Sowers	04-28-92	14	725	
13-13-20	Alunogen 68 (Amended)	----- do -----	----- do -------	10-17-92	15	232	
13-13-20	Alunogen 69	----- do -----	----- do -------	10-17-92	15	232	

See footnotes and remarks at end of table.

Location[2] T. R. S.	Claim	Mining District	Location filed: Claimant	Date	Book	Page	Remark Number
			Grant County - - Continued				
13-13-20	Sulphate No. 1-2[3]	Alumina	Johnston	11-15-07	24	218-219	
13-13-20	Sulphate 4	Alunogen	- - - - - do - - - - - - -	01-08-08	24	279	
13-13-29	Alunogen 5[3]	Alumina	Woodruff, et al	12-23-89	14	166	84
13-13-29	Alunogen 7-8	- - - - - do - - - - -	- - - - - do - - - - - - -	12-23-89	14	168-169	
13-13-29	Alunogen 9-16	- - - - - do - - - - -	- - - - - do - - - - - - -	12-23-89	15	1-6	
13-13-29	Alunogen 43-47	- - - - - do - - - - -	- - - - - do - - - - - - -	03-14-90	14	249-252	
13-13-29	Alunogen 61-67	- - - - - do - - - - -	Sowers	04-28-92	14	726-730	
13-13-29	Sulphate 5-6[3]	Alunogen	Johnston	01-08-08	24	280-281	
13-13-30	Alunogen 4[3]	Alumina	Woodruff, et al	12-23-89	14	165	84
13-13-30	Alunogen 6	- - - - - do - - - - -	- - - - - do - - - - - - -	12-23-89	14	167	
13-13-30	Alunogen 17-18	- - - - - do - - - - -	- - - - - do - - - - - - -	12-23-89	15	7-8	
13-13-30	Alunogen 19-24	- - - - - do - - - - -	- - - - - do - - - - - - -	12-23-89	14	170-175	
13-13-30	Alunogen 48-52	- - - - - do - - - - -	- - - - - do - - - - - - -	03-14-90	14	253-257	
13-13-30	Alunogen 53-57	- - - - - do - - - - -	Sowers	06-07-92	14	757-759	
13-13-30	Sulphate 8-11[3]	Alunogen	Johnston	01-08-08	24	282-284	
13-13-31	Alunogen 58[3]	Alumina	Sowers	06-07-92	14	760	84
13-13-31	Sulphate 7[3]	Alunogen	Johnston	01-08-08	24	281	
13-13-33	Agate Pete	Gila Wilderness	Gnatkowski, et al	10-23-61	49	105	
13-13-33	Gila Wilderness Agate	(Alumina)[4]	Lusk, et al	12-09-60	48	496	
13-13-33	Gila Wilderness Agate 1-2	- - - - - do - - - - -	Tafia, et al	02-28-61	48	512-513	
13-14-24	Alunogen 41-42[3]	Alumina	Woodruff, et al	03-14-90	14	247-248	84
13-14-25	Kaolin No. 3-6[3]	- - - - - do - - - - -	Sowers	03-15-93	15	346-349	
13-14-25	Sulphate 12[3]	Alunogen	Johnston	01-08-08	24	284	
13-15-26	Iron Circle	Mogollon	Anderson, et al	09-27-44	41	55	
13-15-27	Iron Major	- - - - - do - - - - -	- - - - - do - - - - - - -	09-27-44	41	56	
13-16-26	Bighorne 1[3]	(Wilderness)[4]	Howell, et al	06-02-67	56	214	
13-16-26	Bighorne 2-4	- - - - - do - - - - -	- - - - - do - - - - - - -	06-02-67	56	216-218	
13-16-26	Bighorne 6 (?)	- - - - - do - - - - -	- - - - - do - - - - - - -	06-02-67	56	215	85
13-16-26	Big Horne Mine #15[3]	- - - - - do - - - - -	Powers, et al	06-28-67	56	230	
13-16-26	Big Horne Mine #16	- - - - - do - - - - -	Knight, et al	06-28-67	56	231	
13-16-26	Golden Eagle No. 2[3]	Brock Canyon	Power	07-21-67	56	241	
13-16-26	Little Bethsheba	Turkey Creek	Moore	03-08-99	17	433	
13-16-26	Little Katherine	- - - - - do - - - - -	- - - - - do - - - - - - -	03-08-99	17	433	
13-16-27	Big Horne Mine #17[3]	(Wilderness)[4]	Knight, et al	06-28-67	56	231-232	
13-16-34	Golden Eagle No. 1[3]	Brock Canyon	Power	07-21-67	56	240	
13-16-35	Bighorne 5[3]	(Wilderness)[4]	Howell, et al	06-02-67	56	219	
13-17- 7	Big Boulder	Sacaton	Campbell	09-02-20	35	275	
13-17- 7	Cook - Hill 1-3	(Wilderness)[4]	Hill, et al	09-16-59	48	191-192	
13-17- 7	Dolly Z	Sacaton	Campbell	09-02-20	35	275	
13-17-11	Blue Bird 1-2	Mogollon	Moss, et al	08-15-23	36	121	
13-17-18	Crystal	Sacaton	Campbell, et al	02-09-18	33	76	
13-17-18	Golden Spar	Wilcox	Wytcherly, et al	06-17-41	40	81	
13-17-18	Juniper	Sacaton	Campbell, et al	02-09-18	33	76	
13-17-18	Michigan 1-4	74	Blatterman, et al	07-03-24	36	214-217	
13-17-18	Pot O Gold	Sacaton	Campbell	03-15-18	33	96	
13-17-18	Rain Bow	Saccaton	- - - - - do - - - - - - -	01-10-16	33	60	
13-17-18	Rainbow	Wilcox	Wytcherly, et al	06-17-41	40	82	37
13-17-18	Rain Bow Trail	Sacaton	Campbell	07-13-20	35	256	
13-17-18	Rastus	- - - - - do - - - - - -	Campbell, et al	02-09-18	33	77	
13-17-18	"74"	Wilcox	Thompson, et al	04-22-38	39	179	86
13-18- 2	J. M. Caudill 6[3]	- - - - - do - - - - - -	Clark, et al	06-20-60	48	452	
13-18- 2	Sacketon No. 4	- - - - - do - - - - - -	Cranmar	09-25-46	42	24	
13-18- 3	Boone	- - - - - do - - - - - -	Douglas	07-14-15	31	24	
13-18- 3	Buckhorn 1-3	- - - - - do - - - - - -	Hightower, et al	08-24-35	38	460-461	
13-18- 3	Chance	- - - - - do - - - - - -	Hightower	09-25-46	42	25	
13-18- 3	Chance	- - - - - do - - - - - -	- - - - - do - - - - - - -	09-05-51	113	374	
13-18- 3	Columbus 1	- - - - - do - - - - - -	Hightower, et al	02-10-36	38	535	
13-18- 3	Columbus 2	- - - - - do - - - - - -	- - - - - do - - - - - - -	05-02-36	38	551	
13-18- 3	Columbus #1-2	- - - - - do - - - - - -	Drummond, et al	08-14-51	43	402	
13-18- 3	Columbus	- - - - - do - - - - - -	Berg	07-21-66	55	238	
13-18- 3	Copper Ridge No. 8[3]	Dry Creek	Caudill, et al	05-06-19	33	625	
13-18- 3	Copper Ridge 9	- - - - - do - - - - - -	- - - - - do - - - - - - -	09-15-19	34	581	
13-18- 3	Cornell	Wilcox	Douglas	07-14-15	31	24	
13-18- 3	Deadman 8[3]	- - - - - do - - - - - -	Sanders	08-02-59	48	172	
13-18- 3	Deadman 2	- - - - - do - - - - - -	Clark	06-20-60	48	447	
13-18- 3	Deadman 4	- - - - - do - - - - - -	- - - - - do - - - - - - -	06-20-60	48	448	
13-18- 3	Deadman 6	- - - - - do - - - - - -	- - - - - do - - - - - - -	06-20-60	48	449	
13-18- 3	Hall 1-7	- - - - - do - - - - - -	Hall, et al	08-26-59	48	168-171	87
13-18- 3	J. M. Caudill 1-5[3]	- - - - - do - - - - - -	Clark, et al	06-20-60	48	449-451	
13-18- 3	Lone Star 1-3	- - - - - do - - - - - -	Williams	04-09-42	40	276-278	
13-18- 3	Margie Ann No. 1	- - - - - do - - - - - -					88
13-18- 3	Sacaton	- - - - - do - - - - - -	Hightower	08-12-38	39	265	
13-18- 3	Sacketon No. 1	- - - - - do - - - - - -	Cranmar	09-25-46	42	23	
13-18- 3	Saginaw 3[3]	- - - - - do - - - - - -	Foster	05-21-24	36	195	
13-18- 3	Silver Dollar 1-2	- - - - - do - - - - - -	Clark	06-20-60	48	442	
13-18- 3	Silver Dollar 3-9	- - - - - do - - - - - -	- - - - - do - - - - - - -	06-20-60	48	443-446	
13-18- 4	Deadman 7[3]	- - - - - do - - - - - -	Sanders	08-02-59	48	172	
13-18-11	Dorsey	Gila	Goodier	08-14-25	36	376	
13-18-11	Gold Spar	Wilcox	Rice, et al	07-01-52	43	513	89
13-18-11	Good Hope 1	Mogollon	Barnum, et al	09-30-30	37	503	
13-18-11	Good Hope 2	(Wilcox)[4]	- - - - - do - - - - - - -	09-30-30	37	504	
13-18-11	Green Horn 1-2	Wilcox	Hightower, et al	05-13-19	34	12-13	
13-18-11	Locoed Prospector 1-2	- - - - - do - - - - - -	Rittenberry, et al	12-09-32	38	140	
13-18-11	Mamoth Cave	Mogollon	Clark, et al	01-28-08	24	337	
13-18-11	Rain Creek 1-2	- - - - - do - - - - - -	Reidlinger	10-11-28	37	272-273	
13-18-11	Saginaw 1-2[3]	Wilcox	Foster	05-21-24	36	193-194	
13-18-11	Silver Spar	- - - - - do - - - - - -	Rice, et al	03-10-52	43	472	90
13-18-11	Skinner	Rain Creek	Rice Bros.	06-08-00	19	7	
13-18-13	Box	Wilcox	Bell	07-27-08	25	87	
13-18-13	June Bug	- - - - - do - - - - - -	Campbell, et al	07-02-21	35	385	
13-18-13	Master	- - - - - do - - - - - -	Cheshire	04-15-52	43	476	37
14-11- 5	Mission #1-2	Black Canyon	Seran	08-24-56	47	114-115	
14-11- 5	V. P. Allspaugh	- - - - - do - - - - - -	Allspaugh	07-11-55	46	102	
14-13- 4	Big M #1-3	Copperas	Herdman, et al	10-22-57	47	448-449	

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Location[3] T. R. S.	Claim	Mining District	Claimant	Location filed Date	Book	Page	Remark Number
				Grant County - - Continued			
14-13- 8	Great Eastern #111-120[3]	Alumina	Great Eastern	09-02-64 to 09-17-64	51	458-557	
14-13- 8	Great Eastern #156-160	- - - - - do - - - - - -	- - - - - do - - - - - - -	09-02-64 to 09-17-64	51	458-557	
14-13- 8	Mallows #29-36[3]	Copperas Canyon	Reese, et al	09-08-65	54	336-461	
14-13- 8	Mallows #65-72	- - - - - do - - - - - -	- - - - - do - - - - - - -	09-08-65	54	336-461	
14-13- 8	Mallows #101-108	- - - - - do - - - - - -	- - - - - do - - - - - - -	09-08-65	54	336-461	
14-13- 9	Great Eastern #91-100[3]	Alumina	Great Eastern	09-02-64 to 09-17-64	51	458-557	
14-13- 9	Great Eastern #186-195	- - - - - do - - - - - -	- - - - - do - - - - - - -	09-02-64 to 09-17-64	51	458-557	
14-13- 9	Mallows #137-144[3]	Copperas Canyon	Reese, et al	09-08-65	54	336-461	
14-13- 9	Mallows #173-180	- - - - - do - - - - - -	- - - - - do - - - - - - -	09-08-65	54	336-461	
14-13- 9	Mallows #209-216	- - - - - do - - - - - -	- - - - - do - - - - - - -	09-08-65	54	336-461	
14-13- 9	Mallows #245-252	- - - - - do - - - - - -	- - - - - do - - - - - - -	09-08-65	54	336-461	
14-13- 9	Ridge Crest #1-2	Sapillo	- - - - - do - - - - - - -	06-17-59	48	159-160	
14-13-16	Black Bird	Alunogen	Gillispie	04-29-12	28	504	
14-13-16	Blue Jay	- - - - - do - - - - - -	- - - - - do - - - - - - -	04-29-12	28	504	
14-13-16	Buena Fortuna	- - - - - do - - - - - -	- - - - - do - - - - - - -	04-29-12	28	503	
14-13-16	Great Eastern #73-84[3]	Alumina	Great Eastern	09-02-64 to 09-17-64	51	458-557	
14-13-16	Great Eastern #85-90	- - - - - do - - - - - -	- - - - - do - - - - - - -	09-02-64 to 09-17-64	51	458-557	
14-13-16	Great Eastern #177-185	- - - - - do - - - - - -	- - - - - do - - - - - - -	09-02-64 to 09-17-64	51	458-557	
14-13-16	Great Eastern #196-200	- - - - - do - - - - - -	- - - - - do - - - - - - -	09-02-64 to 09-17-64	51	458-557	
14-13-16	Last Hope	Alunogen	Gillispie	04-29-12	28	504	
14-13-16	Lost Fortune	- - - - - do - - - - - -	- - - - - do - - - - - - -	04-29-12	28	503	
14-13-16	Mallows #128-136[3]	Copperas Canyon	Reese, et al	09-08-65	54	336-461	
14-13-16	Mallows #164-172	- - - - - do - - - - - -	- - - - - do - - - - - - -	09-08-65	54	336-461	
14-13-16	Mallows #200-208	- - - - - do - - - - - -	- - - - - do - - - - - - -	09-08-65	54	336-461	
14-13-16	Mallows #236-244	- - - - - do - - - - - -	- - - - - do - - - - - - -	09-08-65	54	336-461	
14-13-17	Great Eastern #33-40[3]	Alumina	Great Eastern	09-02-64 to 09-17-64	51	458-557	
14-13-17	Great Eastern #101-110	- - - - - do - - - - - -	- - - - - do - - - - - - -	09-02-64 to 09-17-64	51	458-557	
14-13-17	Great Eastern #147-155	- - - - - do - - - - - -	- - - - - do - - - - - - -	09-02-64 to 09-17-64	51	458-557	
14-13-17	Hills 6-11[3]	Alumegen	Hill, et al	03-27-93	15	358-376	
14-13-17	Hills 17-21	- - - - - do - - - - - -	- - - - - do - - - - - - -	03-27-93	15	358-376	
14-13-17	Lyons & Watson 6-17[3]	Alunogen	Lyons, et al	06-30-06	22	281-294	
14-13-17	Mallows #20-28[3]	Copperas Canyon	Reese, et al	09-08-65	54	336-461	
14-13-17	Mallows #56-64	- - - - - do - - - - - -	- - - - - do - - - - - - -	09-08-65	54	336-461	
14-13-17	Mallows #92-100	Copperas Canyon	Reese, et al	09-08-65	54	336-461	
14-13-17	Skycrest 13-19[3]	Sapillo	- - - - - do - - - - - - -	12-09-58	48	86-90	
14-13-19	Black Horse	Sapello	Moulton	08-14-97	17	122	
14-13-19	Catherine	Alunogen	Osterheld	06-03-11	28	184	
14-13-19	Dorothy	- - - - - do - - - - - -	- - - - - do - - - - - - -	06-03-11	28	183	
14-13-19	Emma	- - - - - do - - - - - -	Hutchinson	09-05-11	28	228	
14-13-19	Harriett	- - - - - do - - - - - -	Osterheld	06-03-11	28	182	
14-13-19	Hills 25[3]	Alumegen	Hill, et al	03-27-93	15	358-376	
14-13-19	Hope 1[3]	Copperas Canyon	Reed	12-01-49	43	116	
14-13-19	Margaret	Alunogen	Osterheld	06-03-11	28	181	
14-13-19	Poor Boy	Sapello	Moulton	08-14-97	17	123	
14-13-19	White Bird	Alunogen	Moulton, et al	04-24-08	24	552	
14-13-20	Concrete	Alum Mountain	Dorsey	09-03-29	37	405	
14-13-20	Corral	- - - - - do - - - - - -	Head	08-22-40	39	608	
14-13-20	Edith	Alunogen	Hutchinson	09-05-11	28	227	
14-13-20	Grace	- - - - - do - - - - - -	Osterheld	06-03-11	28	183	
14-13-20	Great Eastern #15-32[3]	Alumina	Great Eastern	09-02-64 to 09-17-64	51	458-557	
14-13-20	Great Eastern #138-146	- - - - - do - - - - - -	- - - - - do - - - - - - -	09-02-64 to 09-17-64	51	458-557	
14-13-20	Hills 1-5[3]	Alumegen	Hill, et al	03-27-93	15	358-376	
14-13-20	Hills 12-16	- - - - - do - - - - - -	- - - - - do - - - - - - -	03-27-93	15	358-376	
14-13-20	Hills 22-24	- - - - - do - - - - - -	- - - - - do - - - - - - -	03-27-93	15	358-376	
14-13-20	Hope 2[3]	Copperas Canyon	Reed	12-01-49	43	116	
14-13-20	Logas 8[3]	Sapillo	Reese, et al	07-02-58	48	23	91
14-13-20	Logas 10	- - - - - do - - - - - -	- - - - - do - - - - - - -	07-02-58	48	24	
14-13-20	Log Cabin	Alum Mountain	Head	08-22-40	39	607	
14-13-20	Log Cabin #2	- - - - - do - - - - - -	- - - - - do - - - - - - -	08-22-40	39	608	
14-13-20	Log Cabin No. 3	- - - - - do - - - - - -	Dorsey	09-03-29	37	404	
14-13-20	Lone Pine	- - - - - do - - - - - -	Head	08-22-40	39	609	
14-13-20	Lucky Boy	(Alunogen)[4]	Acosta	03-23-61	48	522	
14-13-20	Lyons & Watson 1-2[3]	Alunogen	Lyons, et al	06-30-06	22	281-294	
14-13-20	Lyons & Watson 3-5	- - - - - do - - - - - -	- - - - - do - - - - - - -	06-30-06	22	281-294	
14-13-20	Lyons & Watson 18-22	- - - - - do - - - - - -	- - - - - do - - - - - - -	06-30-06	22	281-294	
14-13-20	Mallows #11-19[3]	Copperas Canyon	Reese, et al	09-08-65	54	336-461	
14-13-20	Mallows #47-55	- - - - - do - - - - - -	- - - - - do - - - - - - -	09-08-65	54	336-461	
14-13-20	Mallows #83-91	- - - - - do - - - - - -	- - - - - do - - - - - - -	09-08-65	54	336-461	
14-13-20	Plug No. #1-2	Sapillo	- - - - - do - - - - - - -	05-15-58	48	6	
14-13-20	Plug #1-2	- - - - - do - - - - - -	- - - - - do - - - - - - -	05-15-58	48	6-7	
14-13-20	Skycrest 1-6[3]	- - - - - do - - - - - -	- - - - - do - - - - - - -	09-18-58	48	51-54	
14-13-20	Wanderer #1-2	- - - - - do - - - - - -	- - - - - do - - - - - - -	07-14-58	48	29	
14-13-21	Constantinople	Alunogen	Bush, et al	02-08-17	23	163	
14-13-21	Great Eastern #55-72[3]	Alumina	Great Eastern	09-02-64 to 09-17-64	51	458-557	
14-13-21	Great Eastern #168-176	- - - - - do - - - - - -	- - - - - do - - - - - - -	09-02-64 to 09-17-64	51	458-557	
14-13-21	Kaolin #1-2	Merschaum	Rains	07-09-57	47	340	
14-13-21	Khedive	Alunogen	Boyer	11-26-06	22	550	
14-13-21	Khedive (Amended)	- - - - - do - - - - - -	Osterheld	05-09-11	28	121	92
14-13-21	Lyons & Watson 23-25[3]	- - - - - do - - - - - -	Lyons, et al	06-30-06	22	281-294	

See footnotes and remarks at end of table.

Location[2] T. R. S.	Claim	Mining District	Location filed: Claimant	Date	Book	Page	Remark Number
			Grant County - - Continued				
14-13-21	Mallows #119-127[3]	Copperas Canyon	Reese, et al	09-08-65	54	336-461	
14-13-21	Mallows #155-163	- - - - - do - - - - - -	- - - - - do - - - - - - -	09-08-65	54	336-461	
14-13-21	Mallows #191-199	- - - - - do - - - - - -	- - - - - do - - - - - - -	09-08-65	54	336-461	
14-13-21	Mallows #227-235	- - - - - do - - - - - -	- - - - - do - - - - - - -	09-08-65	54	336-461	
14-13-21	Mandalay	Alunogen	Bush, et al	02-08-17	23	162	
14-13-21	Omar	- - - - - do - - - - - -	- - - - - do - - - - - - -	02-08-17	23	164	
14-13-21	Pasha	- - - - - do - - - - - -	Boyer	11-26-06	22	551	
14-13-21	Pasha (Amended)	- - - - - do - - - - - -	Osterheld	05-09-11	28	124	92
14-13-21	Pipe	- - - - - do - - - - - -	Bush, et al	02-08-17	23	164	
14-13-21	Pop Boyer	- - - - - do - - - - - -	Boyer	11-26-06	22	548	
14-13-21	Pop Boyer (Amended)	- - - - - do - - - - - -	Osterheld	09-21-11	28	233	92
14-13-21	Sapillo	- - - - - do - - - - - -	Hill	03-29-06	22	76	
14-13-21	Sapillo (Amended)	- - - - - do - - - - - -	Osterheld	05-09-11	28	123	92
14-13-21	Skycrest 7-12[3]	Sapillo	Reese, et al	09-18-58	48	55-58	
14-13-21	Sultana	Alunogen	Bush, et al	02-08-17	23	163	
14-13-27	Amen #1	Meerschaum	Raines, et al	05-19-62	49	193	
14-13-27	Arrival	Alunogen	Watson, et al	07-30-38	39	247	
14-13-27	Atlantic	- - - - - do - - - - - -	Hill	03-29-06	22	78	
14-13-27	Atlantic (Amended)	- - - - - do - - - - - -	Osterheld	05-09-11	28	121	92
14-13-27	Burgess	- - - - - do - - - - - -	Hutchinson	09-05-11	28	227	
14-13-27	Departure	- - - - - do - - - - - -	Watson, et al	07-30-38	39	247	
14-13-27	Eureka	- - - - - do - - - - - -	Hill	03-29-06	22	77	
14-13-27	Eureka (Amended)	- - - - - do - - - - - -	Osterheld	05-09-11	28	119	92
14-13-27	Eureka	- - - - - do - - - - - -	Bates	06-17-36	38	561	
14-13-27	Fortuna	- - - - - do - - - - - -	Hutchinson	05-09-11	28	126	
14-13-27	Iceland Spar #1	(Sapillo)[4]	Rains, et al	11-17-53	44	189	
14-13-27	Log Cabin No. 1	Alunogen	Bates	07-13-39	39	442	
14-13-27	Luella	- - - - - do - - - - - -	Hutchinson	09-05-11	28	226	
14-13-27	Margaret	- - - - - do - - - - - -	- - - - - do - - - - - - -	11-21-11	28	260	
14-13-27	Mariposa	- - - - - do - - - - - -	- - - - - do - - - - - - -	05-09-11	28	127	
14-13-27	Marmona	- - - - - do - - - - - -	- - - - - do - - - - - - -	05-09-11	28	127	
14-13-27	Marmona Premero	- - - - - do - - - - - -	- - - - - do - - - - - - -	11-21-11	28	256	
14-13-27	Marmona Secundo	- - - - - do - - - - - -	- - - - - do - - - - - - -	11-21-11	28	256	
14-13-27	Paloma Blanca	- - - - - do - - - - - -	- - - - - do - - - - - - -	06-03-11	28	184	
14-13-27	Sea Foam	- - - - - do - - - - - -	Quin	05-23-04	21	85	
14-13-27	Shoemaker 3-4[3]	- - - - - do - - - - - -	Bates	09-07-48	42	591-592	
14-13-27	Shoemaker No. 4	- - - - - do - - - - - -	- - - - - do - - - - - - -	09-07-48	42	592	
14-13-27	Vienna	- - - - - do - - - - - -	Quin	05-23-04	21	85	
14-13-28	Americana	- - - - - do - - - - - -	Hutchinson	05-09-11	28	128	
14-13-28	Asia Minor	- - - - - do - - - - - -	Hill	08-27-06	22	379	
14-13-28	Asia Minor (Amended)	- - - - - do - - - - - -	Osterheld	05-09-11	28	122	92
14-13-28	Brooklyn	- - - - - do - - - - - -	Hill	03-29-06	22	77	
14-13-28	Brooklyn (Amended)	- - - - - do - - - - - -	Osterheld	05-09-11	28	125	92
14-13-28	Esperanza	- - - - - do - - - - - -	Hutchinson	05-09-11	28	129	
14-13-28	Great Eastern #41-54[3]	Alumina	Great Eastern	09-02-64 to 09-17-64	51	458-557	
14-13-28	Great Eastern #161-167	- - - - - do - - - - - -	- - - - - do - - - - - - -	09-02-64 to 09-17-64	51	458-557	
14-13-28	Hill & Waldorf 3-4[3]	(Sapillo)[4]	Hill, et al	03-14-61	48	519-520	
14-13-28	Little Victor	Alunogen	Boyer	01-15-07	23	24	93
14-13-28	Little Victor (Amended)	- - - - - do - - - - - -	Osterheld	05-09-11	28	124	92
14-13-28	Mallows #110-118[3]	Copperas Canyon	Reese, et al	09-08-65	54	336-461	
14-13-28	Mallows #146-154	- - - - - do - - - - - -	- - - - - do - - - - - - -	09-08-65	54	336-461	
14-13-28	Mallows #182-190	- - - - - do - - - - - -	- - - - - do - - - - - - -	09-08-65	54	336-461	
14-13-28	Mallows #218-226	- - - - - do - - - - - -	- - - - - do - - - - - - -	09-08-65	54	336-461	
14-13-28	Meerschaum 1-2	Alumina	Walters	06-28-97	17	95-96	
14-13-28	Micheal	Alunogen	Fleming	04-24-08	24	552	
14-13-28	New Mexico	- - - - - do - - - - - -	Quin	05-23-04	21	85	
14-13-28	New York	- - - - - do - - - - - -	- - - - - do - - - - - - -	05-23-04	21	84	
14-13-28	Old Blue	Meerschaum	Jackson, et al	05-08-62	49	182	
14-13-28	Phillipine	Alunogen	Boyer	01-15-07	23	25	93
14-13-28	Phillipine (Amended)	- - - - - do - - - - - -	Osterheld	05-09-11	28	126	92
14-13-28	Sapello 1	- - - - - do - - - - - -	Bates	03-11-35	38	401	
14-13-28	Sapello No. 2	(Alunogen)[4]	- - - - - do - - - - - - -	02-16-35	38	392	
14-13-28	Sapillo No. 1 (Amended)	Alunogen	- - - - - do - - - - - - -	03-07-52	43	470	
14-13-28	Shoemaker 1-2[3]	- - - - - do - - - - - -	- - - - - do - - - - - - -	09-07-48	42	590	
14-13-28	Shoemaker No. 1	- - - - - do - - - - - -	- - - - - do - - - - - - -	09-07-48	42	590	
14-13-28	Shoemaker No. 3	- - - - - do - - - - - -	- - - - - do - - - - - - -	09-07-48	42	591	
14-13-28	Sultan	- - - - - do - - - - - -	Hill	08-27-06	22	378	
14-13-28	Sultan (Amended)	- - - - - do - - - - - -	Osterheld	05-09-11	28	123	92
14-13-28	Teddy	- - - - - do - - - - - -	Hutchinson	11-21-11	28	257	
14-13-28	Wellington	- - - - - do - - - - - -	Boyer	11-26-06	22	549	
14-13-28	Wellington (Amended)	- - - - - do - - - - - -	Osterheld	05-09-11	28	120	92
14-13-29	American Eagle	- - - - - do - - - - - -	MCA	05-09-11	28	126	
14-13-29	Great Eastern #1-14[3]	Alumina	Great Eastern	09-02-64 to 09-17-64	51	458-557	
14-13-29	Great Eastern #121	- - - - - do - - - - - -	- - - - - do - - - - - - -	09-02-64 to 09-17-64	51	458-557	
14-13-29	Great Eastern #130-137	- - - - - do - - - - - -	- - - - - do - - - - - - -	09-02-64 to 09-17-64	51	458-557	
14-13-29	High Top	Pinos Altos	Reese, et al	09-18-58	48	50	
14-13-29	Hill 1	(Sapillo)[4]	Hill	11-27-59	48	243	
14-13-29	Hill & Waldorf 2[3]	- - - - - do - - - - - -	Hill, et al	03-14-61	48	518	
14-13-29	Logas 1-6[3]	Sapillo	Reese, et al	07-02-58	48	16-19	91
14-13-29	Logas 7	- - - - - do - - - - - -	- - - - - do - - - - - - -	07-02-58	48	22	
14-13-29	Logas 9	- - - - - do - - - - - -	- - - - - do - - - - - - -	07-02-58	48	23	
14-13-29	Mallows #2-10[3]	Copperas Canyon	- - - - - do - - - - - - -	09-08-65	54	336-461	
14-13-29	Mallows #38-46	- - - - - do - - - - - -	- - - - - do - - - - - - -	09-08-65	54	336-461	
14-13-29	Mallows #74-82	- - - - - do - - - - - -	- - - - - do - - - - - - -	09-08-65	54	336-461	
14-13-30	Eureka	Alunogen	Hill	07-12-02	20	263	
14-13-32	Enterprise	- - - - - do - - - - - -	- - - - - do - - - - - - -	07-12-02	20	264	
14-13-32	Excelsior	- - - - - do - - - - - -	- - - - - do - - - - - - -	07-12-02	20	264	
14-13-32	Great Eastern #122-129[3]	Alumina	Great Eastern	09-02-64 to 09-17-64	51	458-557	

See footnotes and remarks at end of table.

Location[7] T. R. S	Claim	Mining District	Claimant	Location filed Date	Book	Page	Remark Number

Grant County - - Continued

Location[7] T. R. S	Claim	Mining District	Claimant	Date	Book	Page	Remark Number
14-13-32	Mallows #1[3]	Copperas Canyon	Reese, et al	09-08-65	54	336-461	
14-13-32	Mallows #37	- - - - - do - - - - - -	- - - - - do - - - - - - -	09-08-65	54	336-461	
14-13-32	Mallows #73	- - - - - do - - - - - -	- - - - - do - - - - - - -	09-08-65	54	336-461	
14-13-32	North Star	Alunogen	Hill	07-12-02	20	265	
14-13-33	Mallows #109[3]	Copperas Canyon	Reese, et al	09-08-65	54	336-461	
14-13-33	Mallows #145	- - - - - do - - - - - -	- - - - - do - - - - - - -	09-08-65	54	336-461	
14-13-33	Mallows #181	- - - - - do - - - - - -	- - - - - do - - - - - - -	09-08-65	54	336-461	
14-13-33	Mallows #217	- - - - - do - - - - - -	- - - - - do - - - - - - -	09-08-65	54	336-461	
14-13-33	Meerschaum 1	Alunogen	Laney	07-18-53	44	130	
14-13-33	Shoemaker No. 2[3]	- - - - - do - - - - - -	Bates	09-07-48	42	590	
14-13-33	White Swan	Pinos Altos	Emerick	10-24-11	28	244	
14-13-34	Big Tom	Alunogen	Hutchinson	11-21-11	28	258	
14-13-34	Catherine	- - - - - do - - - - - -	- - - - - do - - - - - - -	11-21-11	28	259	
14-13-34	Consuelo	- - - - - do - - - - - -	- - - - - do - - - - - - -	05-09-11	28	128	
14-13-34	Little Jack	- - - - - do - - - - - -	- - - - - do - - - - - - -	11-21-11	28	257	
14-13-34	Little Tom	- - - - - do - - - - - -	- - - - - do - - - - - - -	11-21-11	28	258	
14-13-34	Mary	- - - - - do - - - - - -	- - - - - do - - - - - - -	11-28-11	28	262	
14-16- 6	B&G #1-2	Wilcox	Boddy	10-18-37	39	138	
14-16-10	Turkey Creek 1	Gila	Anderson, et al	10-12-45	41	434	
14-16-11	Big Fissure	Sycamore Creek	Duran	11-18-03	20	570	
14-16-14	Hard Luck #1	Gila Fluorspar	Wilson	04-08-55	45	477	
14-16-14	Ola Goat #1	- - - - - do - - - - - -	- - - - - do - - - - - - -	04-08-55	45	477	
14-16-14	Ronnie #1	- - - - - do - - - - - -	- - - - - do - - - - - - -	04-08-55	45	477	
14-16-14	Saina #1-4	- - - - - do - - - - - -	Johnson, et al	03-11-55	45	346-348	
14-16-14	Saina #5	- - - - - do - - - - - -	- - - - - do - - - - - - -	04-08-55	45	478	
14-16-14	Wawa 1	(Wilderness)[4]	Alexander, et al	06-28-55	46	72	
14-16-16	Green Dragon	Pinos Altos	Lottritz	04-08-39	39	403	
14-16-20	Adams 1-2[3]	(Brock Canyon)[4]	Power, et al	06-01-61	49	46	
14-16-20	Cedar Hill No. 2[3]	Brock Canyon	Loyd	05-16-39	39	421	94
14-16-20	Crippled Burro No. 2[3]	- - - - - do - - - - - -	Shelley, et al	06-18-37	39	80	
14-16-20	Ola Habit 2[3]	(Brock Canyon)[4]	Dooley, et al	08-08-55	46	141	
14-16-20	SIS 91-98[3]	Gila	Smith, et al	12-14-64	52	135-245	
14-16-21	Adams	- - - - - do - - - - - -	Sidmon, et al	11-07-03	20	557	
14-16-21	Cedar No. 1-2	(Brock Canyon)[4]	Hansen	04-13-40	39	567	
14-16-21	Dominique	Pinos Altos	Sanders	06-26-43	40	482	
14-16-21	Fawn	Gila River	Evans	02-07-42	40	176	95
14-16-21	Fawn (Amended)	Pinos Altos	- - - - - do - - - - - - -	10-30-42	40	424	
14-16-21	Gila No. 1-2[3]	- - - - - do - - - - - -	Vinson, et al	04-14-39	39	404	
14-16-21	Gila No. 4-6	- - - - - do - - - - - -	- - - - - do - - - - - - -	04-14-39	39	404	
14-16-21	Gila Monster 1-3	- - - - - do - - - - - -	Lee, et al	02-26-54	44	220-222	
14-16-21	Gila Monster 4-5	- - - - - do - - - - - -	- - - - - do - - - - - - -	11-13-58	48	82	
14-16-21	Gila Mountes	- - - - - do - - - - - -	Harvey	10-23-53	44	183	37
14-16-21	Hooker	- - - - - do - - - - - -	Hooker	03-25-49	43	47	
14-16-21	Last Chance	- - - - - do - - - - - -	Simpson	10-30-42	40	426	96
14-16-21	Last Chance No. 1	Gila Fluorspar	Simpson	02-05-40	39	547	
14-16-21	Poor Devil	Gila	Evans	02-07-42	40	177	
14-16-21	SIS 32-90[3]	- - - - - do - - - - - -	Smith, et al	12-14-64	52	135-245	
14-16-21	SIS 99-107	- - - - - do - - - - - -	- - - - - do - - - - - - -	12-14-64	52	135-245	
14-16-21	Silex 1-2	- - - - - do - - - - - -	Lottritz	09-12-41	40	132-133	
14-16-21	Stanley	- - - - - do - - - - - -	Sidmon, et al	11-07-03	20	557	
14-16-21	Watson Mountain No. 1	Brock Canyon	Chappell, et al	09-30-38	39	296	37
14-16-28	Alum Queen	Wilcox	Lister, et al	06-03-03	20	476	
14-16-28	Alum Rock	- - - - - do - - - - - -	Woodrow, et al	06-03-03	20	475	
14-16-28	Alma Bell	Willcox	Lister, et al	06-03-03	20	476	
14-16-28	Black Tail Doe	Brock Canyon	Shelley, et al	07-24-23	36	100	
14-16-28	Blue Benny	Pinos Altos	Sanders	05-26-43	40	482	97
14-16-28	Blue Bottle	Brock Canyon	Shelley	11-26-24	36	279	
14-16-28	Blue Bottle No. 1	- - - - - do - - - - - -	- - - - - do - - - - - - -	03-23-37	39	45	
14-16-28	Blue Bottle No. 1 (Amended)	- - - - - do - - - - - -	- - - - - do - - - - - - -	06-10-37	39	73	
14-16-28	Blue Bottle No. 2	- - - - - do - - - - - -	- - - - - do - - - - - - -	03-23-37	39	45	
14-16-28	Blue Bottle No. 2 (Amended)	- - - - - do - - - - - -	- - - - - do - - - - - - -	06-10-37	39	74	
14-16-28	Blue Jay	- - - - - do - - - - - -	- - - - - do - - - - - - -	11-26-24	36	280	
14-16-28	Brock Canyon Mine	- - - - - do - - - - - -	Northrup, et al	08-11-16	32	149	
14-16-28	Fluor	- - - - - do - - - - - -	Dimmick	08-16-18	33	218	
14-16-28	Fluorspar, 2	Gila River	Ellis	02-06-37	39	30	
14-16-28	Fluor Spar No. 1-2	Pinos Altos	Hackley	02-24-51	43	358	
14-16-28	Fluor Spar No. 3	- - - - - do - - - - - -	- - - - - do - - - - - - -	02-24-51	43	359	
14-16-28	Fluorspar Pit	(Brock Canyon)[4]	Harvey	09-29-53	44	167	
14-16-28	Gila No. 3[3]	- - - - - do - - - - - -	Vinson, et al	04-14-39	39	404	
14-16-28	Green Jade #1[3]	Gila	Lottritz	07-14-39	39	443	
14-16-28	Green Spar (Amended)[3]	Pinos Altos	Evans	10-30-42	40	421	37
14-16-28	Green Spar 2 (Amended)	- - - - - do - - - - - -	Simpson	10-30-42	40	422	
14-16-28	Green Spar	- - - - - do - - - - - -	Hooker	05-20-52	43	490	98
14-16-28	Green Spar	Brock Canyon	Cardenas, et al	10-05-53	44	174	
14-16-28	Happy Jack	Pinos Altos	Simpson	01-14-47	42	122	
14-16-28	Lady Bug	- - - - - do - - - - - -	- - - - - do - - - - - - -	10-14-43	40	552	
14-16-28	Last Hope	Brushy Canyon	- - - - - do - - - - - - -	05-18-43	40	479	
14-16-28	Last Strike	Pinos Altos	- - - - - do - - - - - - -	05-18-43	40	479	
14-16-28	Lucky Strike	Brock Canyon	Shelley	03-23-37	39	45	
14-16-28	Mary 1-2	- - - - - do - - - - - -	Blatterman, et al	07-03-24	36	213-214	
14-16-28	Plain View Mine No. 1-2	- - - - - do - - - - - -	Shelley	03-23-37	39	46	
14-16-28	Quadruplets	- - - - - do - - - - - -	- - - - - do - - - - - - -	03-23-37	39	45	
14-16-28	Quadruplets (Amended)	- - - - - do - - - - - -	- - - - - do - - - - - - -	06-10-37	39	75	
14-16-28	SIS 29-37[3]	Gila	Smith, et al	12-14-64	52	135-245	
14-16-28	SIS 74-81	- - - - - do - - - - - -	- - - - - do - - - - - - -	12-14-64	52	135-245	
14-16-28	Silver Lode #1-2	- - - - - do - - - - - -	Lottritz, et al	04-29-39	39	413	
14-16-28	South Blue Bottle	Brock Canyon	Winslow	06-16-38	39	227	
14-16-28	Sta 30-31[3]	Gila	Goldsmith	03-10-65	53	232-262	
14-16-28	Willow	Brock Canyon	Shelley, et al	07-24-23	36	101	
14-16-29	Adams 3-4[3]	- - - - - do - - - - - -	Power, et al	05-08-62	49	191-192	
14-16-29	Big Bird	(Brock Canyon)[4]	McFarland, et al	04-21-59	48	150	99
14-16-29	Blue Bird	Gila	Johnson, et al	04-09-23	36	37	
14-16-29	Blue Bird 2	- - - - - do - - - - - -	Goodier	10-17-23	36	153	
14-16-29	Blue Bird No. 1 (Amended)	Pinos Altos	Prim	01-10-53	43	582	37

See footnotes and remarks at end of table.

Location[2] T. R. S.	Claim	Mining District	Location filed: Claimant	Date	Book	Page	Remark Number
			Grant County - - Continued				
14-16-29	Blue Bird No. 2 (Amended)	Pinos Altos	Prim	01-10-53	43	582	
14-16-29	Cedar Hill No. 1[3]	Brock Canyon	Loyd	05-16-39	39	421	100
14-16-29	Cedar Hill No. 3	- - - - - do - - - - - -	- - - - - do - - - - - - -	05-16-39	39	421	
14-16-29	Crippled Burro No. 1[3]	- - - - - do - - - - - -	Shelley, et al	06-18-37	39	80	
14-16-29	Florita	Gila	Dorsey	06-04-23	36	73	
14-16-29	Howard & Duriez	- - - - - do - - - - - -	Duriez, et al	12-14-26	36	538	101
14-16-29	Jimmy Johnson	- - - - - do - - - - - -	Goodier	08-14-25	36	375	
14-16-29	Long Day No. 2[3]	Brock Canyon	Kuykendall	06-21-38	39	229	
14-16-29	Mother Lode	Gila	Dempsey, et al	04-09-23	36	35	
14-16-29	Mother Lode	- - - - - do - - - - - -	Johnson, et al	04-09-23	36	36	
14-16-29	North Blue Bottle	Brock Canyon	Winslow	06-16-38	39	227	
14-16-29	Nuts 1-2	- - - - - do - - - - - -	Blatterman, et al	07-03-24	36	212-213	
14-16-29	Old Habit 1[3]	(Brock Canyon)[4]	Dooley, et al	08-08-55	46	140	
14-16-29	Poor Devil	Brock Canyon	Rogers	12-19-39	39	53	102
14-16-29	Providence No. 1-3	- - - - - do - - - - - -	Gutierrez	10-12-39	39	495	103
14-16-29	Riverside	Gila	Dempsey, et al	04-09-23	36	35	
14-16-29	Riverside	Brock Canyon	Shelley, et al	06-18-37	39	79	
14-16-29	SGS 38-53[3]	Gila	Smith, et al	12-14-64	52	135-245	
14-16-29	SGS 108-112	- - - - - do - - - - - -	- - - - - do - - - - - - -	12-14-64	52	135-245	
14-16-29	Star 17-29[3]	- - - - - do - - - - - -	Goldsmith	03-10-65	53	232-262	
14-16-29	Thanksgiving #2	Brock Canyon	Coffey, et al	02-19-40	39	552	
14-16-29	Thanksgiving #2[3]	- - - - - do - - - - - -	Coffey	02-07-53	43	597	
14-16-30	BB 5-8[3]	Gila	USL&M	09-07-65	54	300-303	
14-16-30	BB 13-16	- - - - - do - - - - - -	- - - - - do - - - - - - -	09-07-65	54	304-305	
14-16-30	Green Crystal	Mogollon	Coquat	06-09-23	36	74	
14-16-30	Long Day No. 1[3]	Brock Canyon	Kuykendall	06-21-38	39	229	
14-16-30	Thanksgiving	- - - - - do - - - - - -	Coffey	01-24-44	40	621	104
14-16-32	Ada	Wilcox	Rice	03-28-57	47	259	105
14-16-32	BBC	Gila	Quarrell	09-10-25	36	382	106
14-16-32	BBC 1	- - - - - do - - - - - -	- - - - - do - - - - - - -	09-10-25	36	383	
14-16-32	Belle Spar #1	Gila Fluorspar	Candelaria, et al	12-27-51	43	459	
14-16-32	Big Burro	Pinos Altos	Florez, et al	12-10-57	47	469	
14-16-32	Big Fluor Spar No. 1-2	Brock Canyon	Loyd	02-15-40	39	550	
14-16-32	Big Six	Gila	Sublett	04-11-23	36	46	
14-16-32	Big Trail	- - - - - do - - - - - -	Barka	01-28-44	40	623	
14-16-32	Charlie Horse	- - - - - do - - - - - -	Shaber	02-23-29	37	325	
14-16-32	Fluorspar 1-2	- - - - - do - - - - - -	Howard, et al	03-26-27	36	568-569	107
14-16-32	Foster Fluorspar	Pinos Altos	Wallace	12-30-48	43	30	
14-16-32	Golden Chariot No. 1-3	Bare Mountain	Zook	10-26-12	29	39-40	
14-16-32	Golden Hook No. 1-2	- - - - - do - - - - - -	- - - - - do - - - - - - -	10-26-12	29	40	
14-16-32	Green Somboreo 1-2	Gila River	Dinwiddie, et al	09-13-65	54	510-511	
14-16-32	Iron Cap 1-2	Bare Mountain	Zook	10-26-12	29	41-42	
14-16-32	Lame Duck	Gila	Shaber	02-23-29	37	325	
14-16-32	L.C.F. #101-102	Gila River	Foster, et al	11-06-16	32	42-43	
14-16-32	L.C.F. #103	Gila River	Foster, et al	02-23-17	32	217	
14-16-32	Little Burro	Pinos Altos	Florez, et al	12-10-57	47	469	
14-16-32	Little Marty	(Brock Canyon)[4]	McFarland, et al	04-21-59	48	150	
14-16-32	Rattler	Bare Mountain	Zook	10-26-12	29	42	
14-16-32	SGS 10-19[3]	Gila	Smith, et al	12-14-64	52	135-245	
14-16-32	Star 4-13[3]	- - - - - do - - - - - -	Goldsmith	03-10-65	53	232-262	
14-16-32	Thanksgiving #1[3]	Brock Canyon	Coffey	02-07-53	43	597	
14-16-32	Washington	Gila	Ryan, et al	03-07-29	37	329	
14-16-32	Washington's Brother	- - - - - do - - - - - -	- - - - - do - - - - - - -	03-07-29	37	327	
14-16-32	Washington Extension	- - - - - do - - - - - -	- - - - - do - - - - - - -	03-07-29	37	328	
14-16-33	Albert	- - - - - do - - - - - -	Sachse, et al	02-01-04	20	623	
14-16-33	BB 1-4[3]	- - - - - do - - - - - -	USL&M	09-07-65	54	296-299	
14-16-33	BB 17-21	- - - - - do - - - - - -	- - - - - do - - - - - - -	09-07-65	54	306-308	
14-16-33	Big Lode	Pinos Altos	Simpson	10-30-42	40	421	108
14-16-33	Blue Bell	- - - - - do - - - - - -	- - - - - do - - - - - - -	05-18-43	40	480	
14-16-33	Blue Bessey	Brock Canyon	Howard, et al	04-24-53	44	66	37
14-16-33	Blue Bessy	- - - - - do - - - - - -	Key	07-01-55	46	98	
14-16-33	Blue Bessey	(Brock Canyon)[4]	Howard	03-09-57	47	244	
14-16-33	Blue Jan 1	Pinos Altos	George	06-17-47	42	214	
14-16-33	Blue Jay	- - - - - do - - - - - -	Barka	09-14-43	40	532	
14-16-33	Blue Spar	Gila	Bliss, et al	09-01-39	39	467	
14-16-33	Blue Spar #2	- - - - - do - - - - - -	- - - - - do - - - - - - -	09-01-39	39	467	
14-16-33	Blue Spar 1-3	Pinos Altos	George	06-01-42	40	303-304	37
14-16-33	Blue Spar 4	- - - - - do - - - - - -	- - - - - do - - - - - - -	01-28-43	40	444	
14-16-33	Blue Spar #II	Gila Fluorspar	Candelaria, et al	12-27-51	43	458	
14-16-33	Dark Horse	Brock Canyon	Eakin, et al	10-06-23	36	150	
14-16-33	Geronimo 1-2	Gila River	Dinwiddie, et al	09-13-65	54	509	
14-16-33	Gila Spar #1-4	Pinos Altos	Placencio	10-25-57	47	451-453	
14-16-33	Gila Spar 5	Brock Canyon	Placencio, et al	10-28-58	48	80	
14-16-33	Gila Spar 5 (Amended)	- - - - - do - - - - - -	- - - - - do - - - - - - -	04-01-59	48	146	
14-16-33	Gila Spar 6	- - - - - do - - - - - -	- - - - - do - - - - - - -	10-28-58	48	80	
14-16-33	Gila Spar 6 (Amended)	- - - - - do - - - - - -	- - - - - do - - - - - - -	04-01-59	48	147	
14-16-33	Gila Spar 7	- - - - - do - - - - - -	- - - - - do - - - - - - -	10-28-58	48	81	
14-16-33	Gila Spar 8	- - - - - do - - - - - -	- - - - - do - - - - - - -	12-01-58	48	86	
14-16-33	Green Jade #2[3]	Gila	Lottritz	07-14-39	39	443	
14-16-33	Green Spar 3 (Amended)	Pinos Altos	Evans	10-30-42	40	423	
14-16-33	Hilda	Gila	Sachse, et al	01-15-04	20	611	
14-16-33	Jane No. 1-2	Pinos Altos	Clum	10-16-39	39	499-500	
14-16-33	Luck 1-2[3]	Brock Canyon	Thomas	03-25-59	48	143-144	
14-16-33	Luck 4	- - - - - do - - - - - -	- - - - - do - - - - - - -	03-25-59	48	145	
14-16-33	No. II	Gila Fluorspar	Candelaria, et al	12-27-51	43	459	
14-16-33	Overlooked No. 1	Pinos Altos	Hooker	09-08-52	43	538	
14-16-33	SGS 1-9[3]	Gila	Smith, et al	12-14-64	52	135-245	
14-16-33	SGS 20-28	- - - - - do - - - - - -	- - - - - do - - - - - - -	12-14-64	52	135-245	
14-16-33	Spar No. 1-2[3]	Pinos Altos	George, et al	01-18-39	39	354-355	
14-16-33	Spar 4-6	- - - - - do - - - - - -	- - - - - do - - - - - - -	01-18-39	39	357	
14-16-33	Spar 1-2[3]	- - - - - do - - - - - -	- - - - - do - - - - - - -	10-29-42	40	415-416	109
14-16-33	Spar 4-6	- - - - - do - - - - - -	- - - - - do - - - - - - -	10-29-42	40	418-420	
14-16-33	Star 1-3[3]	Gila	Goldsmith	03-10-65	53	232-262	
14-16-33	Star 14-16	- - - - - do - - - - - -	- - - - - do - - - - - - -	03-10-65	53	232-262	

See footnotes and remarks at end of table.

Table 8.--Continued

Location[1] T. R. S.	Claim	Mining District	Claimant	Location filed Date	Book	Page	Remark Number
			Grant County - - Continued				
14-16-33	Sugar Spar	(Brock Canyon)[4]	Sanders, et al	02-20-47	42	166	
14-16-33	Tana	Pinos Altos	Clum	09-11-39	39	479	
14-16-33	Thomas	Brock Canyon	Minick, et al	01-09-59	48	95	
14-16-33	Tom & John	----- do ------	Power, et al	04-15-63	49	364	
14-16-33	Winnie	Pinos Altos	Clum	09-11-39	39	479	
15-13- 5	Patric Henry 2-4[3]	Copperas Canyon	Alsupt, et al	05-13-60	48	329-332	
15-13- 5	Rains Meerschaum 1	Sapillo	Rains, et al	08-11-54	44	365	
15-13- 6	Mi - Louise	Meerschaum	O'Donnell, et al	08-16-56	47	98	
15-13- 6	Patric Henry 5-7[3]	Copperas Canyon	Alsupt, et al	05-13-60	48	329-332	
15-13- 7	Patric Henry 8[3]	----- do ------	----- do -------	05-13-60	48	329-332	
15-13- 8	Patric Henry 1[3]	----- do ------	----- do -------	05-13-60	48	329-332	
15-13-19	Christmas #6-7[3]	Pinos Altos	Reynolds	02-15-55	45	138	
15-13-19	North Star #2-3[3]	----- do ------	Morgan	02-18-55	45	157-158	
15-13-19	White Rock #1-3	----- do ------	Reynolds	02-15-55	45	140-141	
15-13-20	Meerschaum King	----- do ------	Emerick, et al	01-18-12	28	297	
15-13-30	Buck #1	----- do ------	Reynolds	02-15-55	45	139	
15-13-30	Joe Mason #1	----- do ------	----- do -------	02-18-55	45	159	
15-13-30	Nelly Gray	Juniper	Rice	03-04-55	45	330	
15-13-30	North Star #1[3]	Pinos Altos	Morgan	02-18-55	45	157	
15-13-30	Ruby Jewell	----- do ------	Harrison	06-05-48	42	516	
15-13-30	Scrambled Egg 1&2	----- do ------	Chambers, et al	03-12-46	41	528-529	
15-13-30	Vingegaroon	----- do ------	Harrison	06-11-46	41	568	
15-13-30	White Crow	----- do ------	----- do -------	06-11-46	41	568	
15-14-16	Pumice 4-5[3]	----- do ------	Chenowth	08-22-41	40	124-125	
15-14-18	Altos	----- do ------	Dorsey	03-25-96	16	320	110
15-14-18	Benton	----- do ------	----- do -------	03-25-96	16	317	111
15-14-18	Comet	----- do ------	----- do -------	03-25-96	16	316	112
15-14-18	London	----- do ------	----- do -------	03-25-96	16	319	113
15-14-18	Nomad	----- do ------	----- do -------	03-25-96	16	316	114
15-14-21	Pumice 1-3[3]	----- do ------	Chenowth	08-22-41	40	123-124	
15-14-24	Christmas #1-5[3]	----- do ------	Reynolds	02-15-55	45	135-137	
15-14-24	Tommy Jean	----- do ------	----- do -------	02-18-55	45	160	
15-14-25	Star Dust No. 1 Placer	----- do ------	Clary, et al	02-10-65	53	12	
15-15-13	Monitor	----- do ------	Dorsey	03-25-96	16	318	115
15-16- 3	Nina 1[3]	----- do ------	Holstein	01-28-66	55	7-14	
15-16- 3	Nina 3	----- do ------	----- do -------	01-28-66	55	7-14	
15-16- 3	Nina 5	----- do ------	----- do -------	01-28-66	55	7-14	
15-16- 3	Nina 7	----- do ------	----- do -------	01-28-66	55	7-14	
15-16- 3	Nina 9	----- do ------	----- do -------	01-28-66	55	7-14	
15-16- 3	Nina 11	----- do ------	----- do -------	01-28-66	55	7-14	
15-16- 4	Luck 3[3]	Brock Canyon	Thomas	03-25-59	48	144	
15-16- 4	Mary	----- do ------	Minick, et al	01-09-59	48	95	
15-16- 4	Nina 2[3]	Pinos Altos	Holstein	01-28-66	55	7-14	
15-16- 4	Nina 4	----- do ------	----- do -------	01-28-66	55	7-14	
15-16- 4	Nina 6	Pinos Altos	Holstein	01-28-66	55	7-14	
15-16- 4	Nina 8	----- do ------	----- do -------	01-28-66	55	7-14	
15-16- 4	Nina 10	----- do ------	----- do -------	01-28-66	55	7-14	
15-16- 4	Nina 12-16	----- do ------	----- do -------	01-28-66	55	7-14	
15-16- 4	Spar No. 3[3]	----- do ------	George, et al	01-18-39	39	356	
15-16- 4	Spar 3	----- do ------	----- do -------	10-29-42	40	417	
15-16- 4	Spar 3	----- do ------	Guerra	07-01-53	44	102	

[1]Mining claim locations are filed for record subsequent to field location dates.

[2]Many recorded claim descriptions are so vague that the location is only approximate. Also, some claims are in more than one section.

[3]Other claims (claim) in the group are located in adjacent sections.

[4]District names in parentheses were added by the authors.

[5]Catron County was formed from a part of Socorro County in 1921.

REMARKS

1. Intermediate locations of Hope claims in Book 5, p. 177-180, 08-15-55.
2. Also called Myrtle Mine Fire Clay.
3. Also called Willow Mountain Fire Clay.
4. The Defiance group also located in Socorro County.
5. Patent No. 1126373 of 06-20-49, by Frymire.
6. Also located in Socorro County.
7. Location recorded twice on 06-13-36.
8. Also located as Nadine and Red Bullion.
9. Patent No. 942569 of 08-08-24, by Leach. Patent transferred to USSR&M 02-05-69, Deed Book 2. See remark 59.
10. Probably relocation of Zook's Great Eastern, Socorro County.
11. Proof of labor filed as Rocket, Rockie, and Rocky at intermediate dates.
12. No location record found for No. 3.
13. Also located as Dripping Gold, part of Gold Bar group, Golden Queen, and as part of Iron Bar group in Socorro County.
14. Relocated Book 9, p. 216, 12-19-66 and Book 9, p. 229, 03-20-67.
15. Known as Old York mine.
16. Also located as Nimrod.
17. Location notice in Misc. Book 1.
18. No location record found.
19. Gold and silver production reported for this group.
20. Also located as White Flag.
21. Called the Huckleberry mine.
22. Formerly located as one of the Reception Placers in Socorro County.
23. Also located as Silver Drip group in Catron and Socorro Counties.
24. The Defiance location notice refers to this claim as the Defiance No. 1.
25. Also located as Uncle John group.
26. This Defiance group is not the same as Christensen's Defiance claims.
27. Uncle John group also located as Big John group, and as Uncle John, Gimey, and Lead Bulion in Socorro County. Production of gold, silver, copper, lead, and zinc reported.
28. Proof of labor filed in Grant County.
29. Patent No. 1136894 of 11-19-52, by Frymire.
30. No location record found.
31. Patent No. 1133670 of 01-18-52, by Frymire.
32. Gold Bar 4, 5 were surveyed for patent in 1948 (M.S. 2140 A & B), as were the Queens Crown No. 2 millsite and the Gold Bar No. 2 millsite.
33. Proof of labor filed in Grant County; gold, silver, copper, and lead production reported.
34. Patent No. 1136894 of 11-19-52 as the Queens Crown No. 2, by Frymire.
35. Proof of labor filed in Grant County; also located as May Apple in Socorro County.
36. Also located as Fairview in Catron and Socorro Counties.
37. Fluorspar production reported for claim or group.
38. Gold and tellurium production reported.
39. Claims 2-5 listed in Grant County.
40. Also located as Mayflower and Tip Top group in Socorro County.
41. Located as Blue Bird, Hardscrabble, and Welcome Stranger in Catron County, and as Hecla, Grandview, and Hardscrabble in Socorro County.
42. The Defiance was also located as the Lilly, and the Defiance No. 3 was located as the First Chance and I.S. The Defiance group locations also filed in Catron County.
43. Also located as Morning Star.
44. Also located as Spy No. 2 and Jettie.
45. Also located as Uncle Billey.
46. Also located as Yellow Jacket.
47. Recorded as C. E. Boyer.
48. Also located as Grubstake.
49. The Iron (Bar) group also located as Blue Jay No. 1, Dripping Gold, Gold Bar group, and Golden Queen all in Catron County; gold and silver production reported.
50. Patent No. 483968 of 07-26-15.
51. Also located as Bessie No. 1 in Catron County.
52. No location record found.
53. Silver Drip group also located as Silver Bar group and probably as Silver Drip group in Catron County.
54. The Golden Link 3 was relocated as the 3 Stamp Mill claim and patented as the Golden Link. Golden Link 1 was patented as the Gold Bar; remark 8.
55. Also located as Deer Trail.
56. Proof of labor filed in Catron County.
57. Location notices are not indexed at the courthouse.
58. Also located as Tightwad in Catron County. May Apple 1936 proof of labor filed in Catron County.
59. Also located as Aspin and Fairview in Catron County.
60. Surveyed for patent 08-14-16 to 08-16-16 (M.S. 1716).
61. The Grant Reef, Silver Tip, and Tip Top were relocations of the Lone Star group. Probable production of copper ore.
62. Patent No. 728479 of 01-27-20, by Masters. Reported production of copper-silver ore.
63. Probably not the same as the patented Silver Tip in sec. 35.
64. Also located as Tellurium.
65. Reported output of gold and tellurium ore.
66. Also located as Copper Glance 3.
67. Also located as Cramp and Lone Star.
68. Also located as Sacaton and Zacaton.
69. Reported output of copper ore.
70. Called the Minton Tunnel.
71. Also located as Grey Eagle.
72. Patent No. 728479 of 01-27-20, by Masters.
73. Also located as May Flower and Tip Top, and as Capitol Hill in Catron County. The Capitol Hill proof of labor is indexed as the Chapel Hill.
74. Called May Flower Group No. 2.
75. Also located in Catron County.
76. Also located as Spy.
77. Possible proof of labor as Coureusian, 11-18-19.
78. Also located as True Blue and Eureka.
79. Also located as Copper Gold 2.
80. Also located as Lucky.
81. Proof of labor was for claims 1, 2, and 4.
82. Also located as Little Lucky.
83. Claim 1 listed in Catron County.
84. In Alunogen group, 61 claims were patented 12-04-94, Patent No. 25051.
85. The location notice on p. 215 had no claim name.
86. Probable fluorite production.
87. Proof of labor for claims 1 and 6 only, but claims 1-7 are contiguous.
88. No location record found. The claimant reported that location notices and proofs of labor were filed in Catron and Grant Counties.
89. Also located as Good Hope and Rain Creek. Also known as Blue Bird (no claim location record found).
90. Part of Gold Spar group. Remark 37.
91. Proof of labor was for the Logus claims.
92. T. W. Osterheld relocated a group of meerschaum claims as the legal agent for Meerschaum Company of America. Proof of labor for the claims actually represented a transfer of ownership to Windsor Trust. Claims are in various sections. Osterheld was also agent for some claims located by Daniel J. Hutchinson.
93. Proof of labor is a Quit-Claim.
94. Known as the Howard.
95. Known as the Poor Devil.
96. Amendment filed; remark 37.
97. Also located as Brock Canyon mine; remark 37.
98. Known as the Big Lode.
99. Also located as Nuts 1.
100. Also known as the Howard.
101. Also known as the Cedar Hill.
102. Part of Last Chance group.
103. Fluorite production was reported for the Victoria --a possible later relocation of the Providence.
104. No earlier location record found.
105. Known as the Foster, the oldest fluorspar mine in New Mexico.
106. Also located as the L.C.F. group.
107. Known as the Foster Fluorspar. See Ada.
108. Part of the Green Spar group.
109. Spar group is also known as the Clum mine; remark 37.
110. Also located as Stonewall (unrecorded).
111. Also located as Big Buzzle (unrecorded).
112. Also located as Slate Hill (unrecorded).
113. Also located as Custer (unrecorded).
114. Also located as Tallahasee (unrecorded).
115. Also located as Merrimack (unrecorded).

From about 1909 to 1916, the miners and merchants of the Mogollon area published "The Mogollon Mines", a yearly magazine issued to promote the mines and prospects of the Mogollon and Wilcox mining districts. R. S. Allen was editor. During the wilderness investigation, prospects mentioned by him in the area were examined near Powerplant Road, Cunningham Ranch, Little Whitewater Creek, Holt Gulch, Wilcox Peak, Big Dry Creek, and Little Dry Creek. Samples taken by the Bureau of Mines did not substantiate assay widths nor values reported by Allen.

Significant mineral production from the Gila study area has been limited to some widely scattered fluorspar mines and the meerschaum deposits in the Sapillo district. Recorded metal production from the study area has been very minor; sorted-ore shipments totaled 61.5 tons, of which 5 tons were tellurium ore. Gold and silver production was listed at less than 100 ounces. Small, unrecorded amounts of gold, silver, and other metals probably were recovered from some of the other deposits in the study area, and sold to merchants, banks, and mining companies in nearby districts.

Total recorded output of fluorite in and near the Gila study area was about 58,700 tons from 20 operations. This included about 29,000 tons from the Clum mine and about 4,000 tons from the Foster mine (both in the Gila fluorspar district), 1,100 tons from the Gold Spar mine on Rain Creek, and 8,800 tons from the Little Whitewater Creek area. With the exception of about 250 tons of output from the Seventyfour Mountain area, all of the fluorspar production was from operations outside the Gila Primitive Area and Gila Wilderness. Approximately 1,000 tons of meerschaum is estimated to have been produced in the Sapillo district early in the century.

Sand, gravel, pumicite, perlite, scoria, and obsidian, occur here and there within the study area, but are remote from potential markets and the economics of extraction would be such that the deposits probably could not be profitably mined in the foreseeable future.

An oil and gas lease was issued in 1958 for parts of secs. 30 and 31, T. 12 S., R. 14 W. (Lease 036863 A-E). This is in the Little Creek area in the interior of the wilderness west of the Gila Cliff Dwellings (pl. 3). The lease was applied for by the Reverend J. H. Blackstone of Glendale, California. He segmented the lease and assigned parts of it to five other parties. The lease was terminated on January 31, 1962, under Public Law 555, which allows the government to automatically terminate a lease for nonpayment of fees, provided there had been no significant development for oil or gas. There is no surface indication of an oil or gas potential in the area.

At the time of the investigation, mining activity in the area was limited to prospecting, locating of claims, assessment work, transferring of claim ownership, consolidating fluorite claims, and rehabilitating the Clum fluorspar mine and preparing for renewed mining at the Huckleberry property in Little Whitewater Creek. There were no producing properties in the area.

Sampling and analytical results

A total of 573 samples were taken by Bureau of Mines engineersfrom veins, mineralized zones, altered zones, and dumps. For the most part, samples were taken to obtain representative portions of the material making up the deposit. Locally, however, selected samples or specimens were taken to obtain the maximum values present in the deposit. This was done on the premise that, if assays of the richest material are low, the deposit has little mineral potential. Such selected samples are qualified as such in the text of the report.

The samples listed in table 9 were analyzed for 29 elements by semiquantitative spectrographic analysis and for tellurium by atomic absorption. All samples were fire assayed for gold and silver, and chemical analyses were made on samples which spectrographically showed elements in concentrations above those generally found in igneous rocks. In addition, all samples were scanned for radioactivity.

Assay values were considered negligible or of no consequence when they were below the following values: 0.03 ounce of gold per ton, 0.70 ounce of silver per ton, 0.10 percent copper, 0.40 percent lead, 0.35 percent zinc, and 80 ppm (0.008 percent) tellurium. At mid-1971 prices, each of the above values was worth about $1.00 per ton. Fluorite values below 20 percent are considered of no economic consequence. See table 10 for conversion of parts per million to percent and to ounces. Width of mineralization is an additional economic consideration, and even a relatively high combination of reported values does not necessarily indicate ore if the deposit is too narrow.

In the descriptions that follow, the sample results are used to determine the economic feasibility of individual mines and prospects. Although few of the mines or prospects investigated appear to represent an important mineral deposit, it is not contradictory to conclude that, collectively, the many small veins and prospects may indicate a high potential for undiscovered deposits in certain areas. The analytical data from the Bureau of Mines samples were intended primarily to assess the economic potential of specific deposits, and are not included with the geochemical data considered in the previous sections of this report. The distribution of Bureau of Mines samples taken from known mineralized areas, plate 3, reinforces the broader geochemical patterns presented previously.

TABLE 9. - Analyses of samples from prospects, mines, and outcrops collected by the U.S. Bureau of Mines from the Gila Wilderness and vicinity, New Mexico

Samples were analyzed by six-step semiquantitative spectrographic analysis for 30 elements; by fire assay for Au and Ag; by chemical analysis for Cu, Pb, Zn, and CaF_2; and by atomic absorption (AA) for Te. Numbers in parentheses indicate lower limits of sensitivity. Symbols used: ---, not determined; >, more than number shown; <, less than number shown; L, detected but below sensitivity limit; N, not detected; Tr, trace; P, width of sample taken perpendicular to strike; *, identifies remarks at the end of table; REO in remarks refers to total rare earth oxides. Location is shown by Township (T), Range (R), and Section (S); for example, T. 11 S., R. 14 W., sec. 18 is shown as 11-14-18; all townships are south and all ranges are west. Analyses for As, Bi, Cd, Nb, Sb, Sc, Sn, and W were insignificant except as shown in remarks at end of table. Spectrographic analyses by E. L. Mosier, K. C. Watts, G. W. Day, and E. Cooley, U.S. Geological Survey; fire assay and chemical analyses by C. O. Parker & Co., Denver, Colo.; tellurium determinations by New Mexico Bureau of Mines and Mineral Resources, Socorro, N. Mex. The sample site and sample types are coded as follows:

A. Prospect pit or open cut	a. Face	1. Channel
B. Adit	b. Back	2. Chip
C. Shaft or winze	c. Right side	3. Grab (various grids)
D. Dump	d. Left side	4. Select
E. Stockpile	e. Composite of irregular zones	5. Concentrate
F. Outcrop		
G. Placer		

Table 9.--Continued

Sample	Chemical analyses, Ounces/ton Au	Ag	Chemical analyses (percent) Cu	Pb	Zn	CaF2	AA (ppm) Te	Semiquantitative spectrographic analyses (percent) Fe (.05)	Mg (.02)	Ca (.05)	Ti (.002)	(ppm) Mn (10)	B (10)
1*	Tr	Tr	---	---	---	---	2.1	1.5	0.2	0.7	0.07	300	L
2*	Tr	Tr	---	---	---	---	N	1.5	.07	.1	.05	700	L
3*	0.005	Tr	---	---	0.048	---	N	1.5	.2	.15	.05	>5,000	N
4	.01	0.34	---	---	---	---	N	3	.07	.05	.1	1,000	N
5	.01	.33	---	---	---	---	.5	.7	.5	.2	.1	1,000	L
6	.01	.19	---	---	---	---	1.3	.7	.2	.1	.07	2,000	L
7*	.005	.06	---	---	---	---	N	1	.15	.15	.07	2,000	10
8*	.005	.46	0.03	---	---	---	1.3	1	.15	.1	.1	>5,000	L
9*	.01	.09	.03	---	---	---	.5	.7	.15	.07	.07	>5,000	L
10*	.01	.17	---	---	---	---	3.3	1	.1	.05	.07	>5,000	L
11*	.005	Tr	---	---	---	---	2.5	.3	.15	20	.02	5,000	N
12*	.01	Tr	---	---	---	---	.4	2	.2	7	.07	2,000	N
13	.005	.04	---	---	---	---	N	2	.3	7	.07	2,000	N
14*	.01	.10	---	---	---	---	N	5	1	.3	.3	700	N
15	.005	.19	---	---	---	---	2.5	2	1.5	.1	.1	2,000	10
16	.01	1.39	---	Tr	Tr	---	Tr	5	.2	.2	.1	2,000	20
17	.40	14.38	.031	Tr	Tr	---	1.4	7	.05	.07	.07	300	10
18*	.01	.05	---	.24	Tr	---	2.5	3	1	3	.3	>5,000	10
19	.01	.21	---	---	---	---	.6	3	.7	1	.3	1,000	10
20	.06	1.41	---	---	---	---	3.58	1.5	.2	.7	.05	1,000	15
21	.018	Tr	---	---	---	---	N	5	1	1.5	.3	1,000	L
22	.025	Tr	---	---	---	---	N	3	1	.7	.3	500	N
23	Tr	Tr	.11	---	---	---	N	2	.7	.3	.3	700	N
24	.08	1.12	1.08	---	---	---	N	2	1	2	.2	1,500	10
25	.005	.06	.088	---	---	---	N	2	.7	.1	.2	200	10
26	.01	Tr	---	---	---	---	.5	1.5	.5	.1	.2	1,500	20
27	.01	.35	---	---	---	---	1.2	.5	.3	.07	.1	700	10
28	.005	.08	---	---	---	---	1.5	.7	.15	.05	.07	500	L
29	.01	Tr	---	---	---	---	N	1	.3	1	.2	200	20
30	.005	.10	---	---	---	---	1.5	.7	.3	.1	.15	200	10
31	.005	.08	---	---	---	20.29	1	.5	.2	15	.07	150	L
32*	.01	Tr	---	---	---	---	.5	1	.2	7	.1	100	15
33	.02	.06	---	---	---	---	N	.7	.1	.2	.07	300	L
34	Tr	Tr	---	---	---	---	N	1.5	.5	.1	.15	300	20
35	Tr	Tr	---	---	---	---	N	2	.2	.07	.15	200	10
36	.005	Tr	---	---	---	---	N	1.5	.5	.1	.1	200	10
37*	.01	.30	.03	---	---	---	N	3	.5	.5	.3	500	10
38	.005	.32	---	---	---	---	N	.7	.2	.2	.1	150	L
39	Tr	.30	---	---	---	---	N	2	.7	.5	.3	700	L
40	.005	.24	---	---	---	---	N	2	.5	.1	.3	300	L
41	Tr	Tr	---	---	---	---	2	2	.7	.5	.15	500	10
42	Tr	.36	---	---	---	---	2.5	3	.7	1	.3	700	L
43	.005	.20	---	---	---	---	N	1	1	.3	.1	700	10
44*	.01	.11	---	---	---	---	.6	2	.2	.1	.3	200	10
45*	.01	.09	---	---	---	---	N	1	.1	1.5	.1	150	20
46	.01	.07	---	---	---	---	N	1	.1	.1	.1	150	30
47	.005	.10	---	---	---	---	.5	1.5	.5	.5	.2	1,000	15
48	.01	.49	---	---	---	---	.3	1	.03	.07	.05	300	L
49	.01	.33	---	---	---	---	1.1	1	.1	2	.07	300	L
50*	.01	Tr	---	---	---	---	1.7	1	.1	.7	.15	200	L
51*	.01	.20	---	---	---	21.80	3.1	1	.2	20	.1	200	L
52	.01	.28	---	---	---	35.32	2.85	2	.3	15	.15	1,000	L
53	Tr	Tr	---	---	---	40.54	.51	2	1	>20	.3	1,000	L
54	.02	Tr	---	---	---	---	.7	1	1	.1	.15	1,000	10
55	Tr	Tr	---	---	---	---	N	3	.7	1	.3	700	10
56	Tr	Tr	---	---	---	---	Tr	2	.1	.05	.15	500	10
57	.01	.30	---	.14	.20	42.14	N	1	.2	>20	.2	150	L
58	Tr	.22	---	---	---	76.51	1.8	.5	.2	>20	.05	15	N
59	Tr	.14	---	.06	---	---	.5	7	5	1.5	.5	700	L
60	.01	.38	---	.04	.015	---	.4	1	.5	2	.1	700	L

Sample	Semiquantitative spectrographic analyses (ppm) Ba (20)	Be (1)	Co (5)	Cr (10)	La (20)	Mo (5)	Ni (5)	Sr (100)	V (10)	Y (10)	Zr (10)	Location	Site	Type	Width (feet)
1*	30	3	N	15	N	N	7	200	L	15	150	11-19-12	A,a	2	6
2*	50	1.5	N	20	N	N	10	N	10	20	100	11-19-12	F	2	3.5
3*	1,000	30	L	100	70	N	70	300	70	20	70	11-19-11	F,e	2	3.5
4	100	1.5	L	20	30	N	15	N	30	15	100	11-19- 2	A,e	2	
5	100	3	5	15	50	N	15	100	30	20	100	11-19- 1	D	1	10
6	100	2	N	L	50	7	5	L	30	20	70	11-19- 1	A,a	2	4
7*	500	3	L	10	50	10	7	100	50	20	100	11-19- 2	A,a	2	3
8*	3,000	100	20	N	N	N	30	3,000	70	15	70	11-19- 2	A,a	2	4
9*	1,500	3	30	N	30	N	30	1,500	150	20	50	11-19- 2	A,e	2	10
10*	1,000	5	7	10	30	5	15	1,000	70	20	70	11-19- 2	E	3	15
11*	70	N	N	10	N	N	N	500	L	10	10	11-19- 3	A,a	2	25
12*	300	3	5	20	N	N	20	200	30	15	70	11-19- 3	A,a	2	4
13	70	10	N	70	L	N	10	300	10	N	30	11-19- 3	A,e	3	
14	300	1	20	100	30	N	100	150	100	20	200	11-19- 4	B,b	2	5
15	200	5	L	30	30	10	10	N	100	30	200	11-19- 4	B,c	2	15
16	500	3	N	10	20	N	15	N	300	20	150	11-19- 4	B,e	2	10
17	200	5	N	20	N	7	10	N	200	20	100	11-19- 4	D	3	
18*	5,000	5	5	N	70	15	5	200	100	50	300	11-19- 4	B,b	2	6
19	1,000	1	5	5	30	N	10	N	100	20	300	11-19- 4	A,e	2	
20	100	100	N	N	30	N	15	N	20	30	50	11-19- 4	B,a	2	7
21	700	2	15	20	20	N	20	150	70	15	200	11-19- 6	A,a	2	4
22	700	1.5	L	N	30	N	L	150	30	15	200	11-19- 6	A,a	2	3
23	300	2	L	L	30	N	7	150	50	20	200	11-19- 6	D	3	
24	700	1.5	15	N	70	N	20	200	100	50	150	11-19- 4	B,b	2	0.1
25	700	2	20	10	50	N	20	100	70	30	200	11-19- 4	B,b	2	.1
26	500	3	5	10	50	20	15	L	50	50	150	11-19- 9	B,a	2	4
27	70	3	L	L	50	N	L	N	30	20	100	11-19- 9	B,c	2	1.3
28	70	1.5	5	10	20	5	5	N	50	15	70	11-19- 9	B,c	2	.8
29	150	2	7	N	50	L	10	L	30	50	150	11-19- 9	B,c	2	1.5
30	30	3	L	10	50	N	5	N	70	30	150	11-19- 9	B,c	2	.5
31	50	2	L	L	50	N	L	N	50	70	70	11-19- 9	B,c	2	.8
32*	200	2	5	10	70	50	10	100	30	70	100	11-19- 9	B,e	2	
33	N	1.5	5	10	N	5	5	N	50	20	70	11-19- 9	B,c	2	2
34	150	5	N	N	50	N	5	N	50	30	300	11-19- 9	A,a	2	7
35	100	2	N	N	N	N	5	N	50	10	100	11-19- 9	A,a	2	4
36	500	3	N	70	20	N	10	N	70	20	100	11-19- 8	B,a	2	.8
37*	700	3	10	100	20	N	20	N	70	20	20	11-19- 8	B,a	2	2
38	300	1.5	N	L	20	N	5	N	30	10	10	11-19- 8	B,b	2	2
39	150	5	10	10	20	N	15	N	50	20	20	11-19- 8	B,b	2	3
40	300	1.5	10	L	20	N	15	N	70	15	15	11-19- 8	C,a	2	2
41	150	2	5	5	30	N	15	N	50	20	200	11-19- 8	B,a	2	1.3
42	300	1.5	10	10	30	N	20	N	50	30	300	11-19- 8	B,a	2	2
43	200	7	10	15	50	N	20	L	15	30	100	11-19-21	B,a	2	5
44*	1,000	3	7	300	30	N	15	100	50	30	200	11-19-21	B,b	2	.2
45*	700	1	5	100	30	N	15	100	20	30	150	11-19-21	B,a	2	4
46	500	2	5	30	50	N	10	100	15	20	150	11-19-21	D	3	
47	300	3	10	30	50	N	15	L	50	30	150	11-19-21	D	3	
48	50	1	N	10	20	N	L	N	L	15	70	11-19-28	A,e	2	
49	300	3	5	10	20	7	5	100	30	50	70	11-19-28	B,c	2	.5
50*	500	2	L	10	20	10	L	200	30	30	200	11-19-28	B,b	2	4
51*	300	L	N	10	50	N	5	N	20	100	300	11-19-29	A,e	3	
52	1,000	1	7	N	50	20	5	N	50	200	500	11-19-29	A,a	2	3
53	500	2	5	10	70	N	10	N	100	150	300	11-19-29	B,a	2	2
54	300	5	7	10	50	N	7	N	70	30	200	11-19-29	B,a	2	.5
55	1,000	3	5	N	50	10	7	N	100	30	500	11-19-29	A,a	2	5
56	150	2	N	5	20	10	10	N	15	20	150	11-19-29	A,e	3	
57	150	1.5	5	L	50	N	L	100	30	100	100	11-19-29	A,a	2	1.9
58	100	N	N	L	50	N	L	100	10	200	150	11-19-29	A,a	2	3.5
59	500	1.5	30	50	N	N	30	200	150	20	150	11-19-29	D	3	
60	200	L	5	L	N	N	5	N	30	10	50	11-19-29	E	3	

Table 9.--Continued

Sample	Chemical analyses: Ounces/ton Au	Ag	(percent) Cu	Pb	Zn	CaF2	AA (ppm) Te	Semiquantitative spectrographic analyses (percent) Fe (.05)	Mg (.02)	Ca (.05)	Ti (.002)	(ppm) Mn (10)	B (10)
61	0.01	Tr	---	---	---	---	1.2	20	1.5	.3	.3	700	N
62	.005	Tr	---	---	---	30.23	N	2	.2	15	.07	300	N
63	.01	Tr	---	---	---	24.24	N	3	.3	10	.07	300	N
64	.005	Tr	---	---	---	28.09	2	2	.5	10	.15	200	N
65	.02	0.08	---	---	---	4.40	2.14	1.5	.07	1	.1	300	10
66*	.01	.15	---	---	---	1.16	2.8	1.5	.05	.3	.1	300	10
67	.01	.07	---	---	---	---	4.26	5	.05	.05	.2	200	L
68	Tr	.16	---	---	---	---	.58	7	.5	10	.2	300	10
69*	.02	16.16	---	---	---	52.60	Tr	5	1	10	.15	1,000	L
70	1.30	7.90	---	---	---	---	Tr	3	.5	.5	.15	500	N
71	.02	.44	0.031	Tr	Tr	---	5.6	5	2	2	.2	1,000	N
72	.38	.92	.062	0.16	Tr	---	N	2	.5	.7	.1	500	N
73	.40	.56	---	---	---	---	N	5	2	.7	.3	700	N
74	.25	.20	---	---	---	---	N	3	1.5	5	.2	700	N
75	.04	.22	---	---	---	---	N	3	1	.1	.2	500	L
76	.005	.22	.02	Tr	---	---	N	5	1	.5	.2	500	L
77	Tr	Tr	---	---	---	---	N	2	.7	.15	.15	200	N
78	.005	.08	---	---	---	43.82	4.08	2	1	>20	.15	1,500	L
79	Tr	.16	---	---	---	---	Tr	2	.5	7	.15	300	10
80	.005	Tr	---	---	---	---	N	1.5	.2	.07	.1	150	N
81	.005	.14	---	---	---	---	N	1.5	.2	.1	.1	150	N
82*	.03	.25	---	---	---	---	.12	3	1.5	2	.3	700	N
83	.04	.26	---	---	---	---	.5	3	1.5	2	.2	500	10
84	.01	.11	---	---	---	---	.36	3	1.5	3	.2	700	L
85	.01	.12	---	---	---	1.12	.12	3	1.5	7	.2	1,500	N
86	.01	.31	---	---	---	---	N	3	1.5	1.5	.3	700	L
87*	.01	.15	---	---	---	1.05	N	3	1	10	.15	700	N
88*	Tr	.26	---	---	---	---	N	2	.7	.5	.2	300	10
89	Tr	Tr	---	---	---	---	2	7	2	2	.5	1,000	10
90*	.01	.04	---	---	---	---	N	5	1	1	.3	500	20
91	Tr	.20	---	---	---	---	N	10	1.5	.05	.5	300	10
92	.005	.20	---	---	---	---	.8	7	1.5	.2	.5	700	N
93	.005	.04	---	---	---	---	2.1	7	1	.2	.5	700	N
94	.03	.10	---	---	---	---	.4	5	.5	.1	.5	100	N
95*	.03	.24	---	---	---	---	.3	5	.15	.1	.5	100	N
96*	.005	.10	---	---	---	---	.2	3	.3	.1	.3	200	N
97*	.02	.08	---	---	---	---	N	2	.2	.07	.2	50	15
98	.01	.30	---	---	---	---	2.5	10	.02	.07	.3	150	L
99	.01	Tr	---	---	---	---	N	7	1	.3	.3	700	10
100*	.03	.26	---	---	---	---	.5	5	.07	.15	.5	150	L
101	Tr	Tr	.02	Tr	---	---	2.2	10	.02	.05	.5	50	10
102*	.01	Tr	.03	---	---	---	4.2	15	N	.07	.3	200	10
103	.005	Tr	---	---	---	31.94	3.9	2	.15	15	.05	150	L
104	Tr	Tr	---	---	---	58.50	2.4	2	.5	>20	.1	200	L
105*	Tr	Tr	---	---	---	62.74	N	2	.2	>20	.1	150	N
106	.01	.10	---	---	---	41.64	1.1	3	.3	20	.07	200	N
107	.02	.38	---	---	---	---	1	5	.15	.05	.5	30	20
108*	.015	.29	---	---	---	---	.2	1.5	L	.05	.3	100	N
109*	Tr	.06	---	---	---	---	2	10	.07	.07	.5	50	L
110	.005	.14	---	---	---	---	N	5	1.5	1	.3	700	10
111	.005	.26	---	---	---	---	N	3	.07	.1	.3	150	N
112*	.01	.05	---	---	---	---	12.5	10	L	.05	.5	70	L
113	Tr	Tr	.025	.04	---	---	N	1	.5	.2	.15	150	10
114*	Tr	Tr	.93	1.24	.18	---	3	3	.7	.5	.3	1,000	L
115*	Tr	Tr	2.15	.14	.14	---	2.5	5	.7	.15	.5	1,000	L
116	Tr	Tr	.70	.26	.11	---	N	7	1	.7	.5	1,500	L
117*	.005	Tr	.61	2.10	.068	---	1.3	5	.7	.7	.5	1,500	10
118	Tr	Tr	.04	.04	.03	---	N	3	.7	.5	.3	1,000	L
119	Tr	Tr	.06	.10	.099	---	.5	2	.5	.7	.2	1,000	L
120	Tr	Tr	---	.02	.04	---	2.5	3	.5	1	.3	1,000	L
121*	Tr	Tr	.18	---	---	---	.7	1	.3	.2	.1	300	10
122	.005	.20	---	---	---	---	2.3	2	.5	.1	.1	500	L
123	Tr	.26	---	.04	---	---	4.4	15	.3	.7	.2	1,000	N
124	.005	.28	---	---	---	---	1.6	3	1	3	.2	1,000	L
125	Tr	.80	.041	.24	.15	---	.58	5	2	1	.3	700	10

Sample	Semiquantitative spectrographic analyses (ppm) Ba (20)	Be (1)	Co (5)	Cr (10)	La (20)	Mo (5)	Ni (5)	Sr (100)	V (10)	Y (10)	Zr (10)	Location	Site	Type	Wi (f
61	200	1	70	50	N	N	30	100	200	10	70	11-19-32	F,e	2	
62	150	1.5	5	15	20	20	15	N	20	20	70	11-19-32	E	3	
63	100	1.5	7	15	20	30	15	L	15	10	100	11-19-32	A,d	2	4
64	200	L	L	15	30	5	10	L	15	15	150	11-19-32	A,a	2	10
65	150	L	N	5	30	N	50	N	20	20	200	12-19- 5	A,e	2	10
66*	150	1	N	N	30	N	7	N	15	20	200	11-19-32	A,e	2	15
67	300	L	N	20	N	7	15	200	200	20	100	11-19-32	A,e	3	
68	700	L	20	70	20	10	50	500	150	30	100	12-19- 5	D	3	
69*	700	1.5	10	30	30	150	20	N	100	70	150	12-19- 5	A,a	2	4
70	300	3	5	20	N	50	20	N	30	10	70	12-19- 4	A,d	1	0.
71	2,000	L	7	30	30	10	20	150	200	20	200	12-19- 4	A,a	1	3.
72	300	2	L	5	N	50	10	N	30	10	70	12-19- 4	D	3	
73	1,500	1	10	20	30	10	20	150	150	20	300	12-19- 4	B,c	2	4
74	1,000	L	7	10	20	30	15	200	100	20	200	12-19- 4	D	3	
75	700	1	7	20	N	50	15	N	100	15	200	12-19- 4	A,e	2	1.
76	2,000	1	L	10	N	70	15	N	100	10	200	12-19- 4	A	3	
77	100	1	5	L	N	50	10	L	70	10	100	12-19- 4	A,a	2	4
78	500	L	5	20	50	N	7	150	150	100	100	12-19- 4	A,a	2	7
79	500	3	N	15	N	N	15	N	30	20	100	12-19- 4	B,e	2	
80	200	3	5	15	50	N	10	N	20	30	150	12-19- 4	A,a	2	2
81	150	2	L	L	N	N	7	N	10	15	100		A,a	2	.3
82*	700	L	30	100	20	30	50	200	100	20	200	12-19- 4	B,a	2	4
83	300	2	20	20	50	7	30	N	100	20	150	12-19- 4	B,b	2	1
84	300	1	30	20	30	70	30	200	150	20	150	12-19- 4	B,d	2	.1
85	300	1	30	20	50	10	30	300	100	30	150	12-19- 4	B,b	2	3
86	700	1	30	20	30	N	70	300	150	20	200	12-19- 4	B,b	2	4
87*	200	L	30	150	30	L	70	300	70	20	70	12-19- 4	B,b	2	.8
88*	1,500	1	5	5	30	100	7	100	50	30	300	12-19- 4	B,b	2	
89	300	2	10	50	30	20	20	100	200	30	300	12-19- 4	A	2	4
90*	500	1	20	50	20	300	20	100	100	30	300	12-19- 4	D	3	
91	500	L	5	150	20	7	10	N	300	20	500	12-19- 4	F	2	1.5
92	700	2	30	70	50	N	50	N	150	20	200	12-19- 4	B,a	2	3.5
93	500	2	30	50	30	N	50	N	150	20	200	12-19- 4	B,b	2	3
94	300	N	5	70	50	N	10	300	200	30	200	12-19- 4	B,c	2	P .2
95*	300	N	N	50	50	N	15	1,500	200	20	150	12-19- 4	B,a	2	2
96*	300	N	10	50	50	N	10	1,000	200	15	150	12-19- 4	B,a	2	2.5
97*	300	L	N	15	20	100	7	L	70	30	150	12-19- 4	A,a	2	1.5
98	700	L	10	50	70	10	20	1,500	200	30	200	12-19- 4	E	3	
99	300	1	50	30	20	15	30	L	100	20	150	12-19- 4	A,e	2	10
100*	100	L	5	20	N	N	15	N	50	10	300	12-19- 4	E	3	
101	500	N	15	100	30	20	50	500	300	N	300	12-19- 9	F,e	2	15
102*	200	N	70	70	N	20	100	200	70	10	200	12-19- 9	E	3	
103	150	1.5	5	30	20	15	15	100	15	50	70	12-19- 9	A	2	1
104	100	1	7	10	30	15	5	N	100	200	50	12-19-10	E	3	
105*	100	L	7	20	50	L	7	100	30	150	100	12-19-10	A,a	2	3.8
106	70	1.5	5	50	L	15	20	N	L	30	50	12-19-10	A,a	2	2
107	500	L	10	70	20	15	50	300	200	50	200	12-19- 9	A,e	2	40
108*	150	N	N	50	30	7	15	1,000	100	L	200	12-19-10	F	2	4
109*	200	N	N	70	L	100	5	200	100	20	700	12-19- 9	D	3	
110	300	1.5	20	50	20	N	30	300	150	20	150	12-19- 9	A,a	2	2
111	200	1	20	20	50	N	20	N	15	30	150	12-19- 9	E	3	
112*	700	N	50	70	20	50	50	700	150	30	300	12-19-15	B,d	2	.5
113	70	5	N	10	30	5	L	N	50	30	100	12-19-24	B,a	2	1
114*	300	3	10	15	30	N	20	L	70	50	200	12-19-24	B,b	2	3.5
115*	500	1	10	20	20	150	20	100	100	30	200	12-19-24	B,b	2	4.5
116	500	1.5	20	20	20	N	70	200	150	30	200	12-19-24	B,b	2	6.9
117*	200	1.5	10	20	50	100	20	N	5,000	100	300	12-19-24	B,b	2	2.3
118	300	3	7	15	50	N	10	N	70	100	300	12-19-24	B,c	2	1.5
119	200	3	5	20	30	10	15	L	50	70	20	12-19-24	B,a	2	2.2
120	200	2	7	15	50	7	15	100	70	100	100	12-19-24	B,a	2	2.5
121*	100	5	N	L	50	15	L	N	20	20	20	12-19-24	B,a	2	2.8
122	50	2	N	L	N	N	5	N	50	15	100	12-19-13	A,a	2	.3
123	200	1.5	15	15	10	50	50	N	30	20	100	12-19-13	A,a	2	1
124	500	3	15	70	30	N	50	100	100	50	150	12-19-13	A	2	4
125	500	2	5	50	20	N	10	N	50	50	500	12-19-13	A,e	2	

Table 9.--Continued

Sample	Chemical analyses: Ounces/ton Au	Ag	(percent) Cu	Pb	Zn	CaF2	AA (ppm) Te	Semiquantitative spectrographic analyses (percent) Fe (.05)	Mg (.02)	Ca (.05)	Ti (.002)	(ppm) Mn (10)	B (10)
126	Tr	Tr	0.02	Tr	0.20	---	Tr	5	2	1	0.5	1,500	L
127*	Tr	Tr	.041	Tr	.32	---	7.8	7	3	.2	.5	5,000	N
128	Tr	0.20	---	Tr	Tr	---	4.5	7	1.5	.7	.5	1,000	10
129	0.005	.34	---	0.10	.05	---	.9	2	.5	.2	.2	700	N
130	Tr	Tr	---	---	---	---	1.8	7	1.5	.7	.5	1,500	10
131	Tr	0.26	---	.04	.023	---	.6	3	1	1	.3	1,000	N
132	Tr	Tr	---	.03	---	---	.9	3	.7	.5	.3	700	N
133	Tr	.28	---	Tr	Tr	---	Tr	5	1	1	.2	1,000	10
134	.02	.26	---	---	---	---	2.5	5	1	.5	.2	700	10
135	.005	Tr	---	---	.22	---	N	3	1	.5	.2	700	10
136	Tr	.28	---	.05	.059	---	1	1.5	.1	1	.1	200	N
137	Tr	.24	---	.04	.05	---	.7	2	.5	.2	.2	500	L
138	.02	.22	---	---	---	---	N	3	.5	1	.15	700	10
139	Tr	.22	---	---	---	---	.6	3	.5	.7	.2	700	N
140*	.02	.26	.083	1.28	.25	2.99	1.3	10	3	5	.7	2,000	N
141*	.005	.04	.044	.36	.40	4.42	2.6	7	2	10	.5	2,000	N
142*	.02	.12	.085	.21	.41	2.80	2	10	2	5	.5	1,500	N
143*	.02	.38	.87	.17	.63	---	.4	10	3	.5	1	1,500	N
144*	.03	.13	.08	.05	.25	3.42	5	7	2	5	.5	2,000	N
145*	.14	1.80	.612	2.78	.74	30.80	10	.2	.15	20	.05	200	N
146*	.04	1.76	.27	.56	.30	43.68	4.2	3	.7	>20	.15	2,000	N
147*	.03	.27	---	---	.093	---	.5	7	1	.5	.5	2,000	L
148	Tr	.06	---	---	---	---	.3	2	.2	.05	.2	200	N
149	Tr	Tr	---	---	---	---	Tr	1	.2	.15	.15	700	10
150	Tr	.44	---	---	.007	---	1.4	2	.2	.5	.2	700	N
151	Tr	.16	---	---	.031	---	1.3	3	.5	.1	.2	700	N
152	Tr	.30	.005	.08	.02	---	2.3	1	.2	.05	.2	100	N
153*	Tr	.70	.15	.44	1.30	---	.6	2	.5	.05	.2	500	N
154*	Tr	1.06	.44	9.90	9.01	---	7.7	2	.1	1	.1	200	N
155*	.03	2.37	.70	8.74	8.79	---	14.3	7	1	.5	.2	200	N
156*	.01	1.35	.762	5.76	3.47	---	.6	3	.07	.5	.15	1,500	L
157*	.02	3.94	.587	7.10	7.95	---	35	2	.3	7	.2	500	L
158	.005	.60	.20	3.80	.30	---	2.8	1	.1	1	.15	100	N
159*	Tr	.18	.02	.66	.05	---	.6	2	.1	1	.2	100	N
160	Tr	.30	.03	.30	.24	---	.8	2	.1	.5	.5	700	N
161	Tr	.26	---	.32	---	---	.81	5	.3	.2	.5	1,000	L
162	Tr	Tr	---	---	---	---	1.2	2	.7	1	.2	500	L
163	Tr	Tr	---	---	---	---	1.5	3	.7	1.5	.5	1,500	L
164	.01	.26	.10	.06	.086	---	15.6	5	.2	.1	.2	200	L
165	Tr	Tr	.15	.06	---	---	9.4	3	.15	.2	.15	200	10
166	Tr	Tr	---	---	---	---	.5	.2	.02	.1	.1	100	L
167	.005	.14	---	---	---	---	N	1.5	.2	L	.1	150	15
168	.04	.26	---	---	---	---	.4	.7	.05	2	.02	150	L
169	.11	.45	---	---	---	---	1.2	.7	.05	3	.015	150	L
170	.03	Tr	---	---	---	---	.7	1	.3	.15	.07	200	L
171	.02	.12	---	---	---	---	.4	1.5	.15	.15	.07	200	L
172	.04	.26	---	---	---	---	1.4	1	.05	.3	.03	200	L
173	.015	.06	---	---	---	---	N	.7	.1	.07	.07	500	L
174	.005	.10	---	---	.044	---	N	1	.3	.2	.07	500	L
175	.01	.14	---	---	---	---	N	2	.1	.07	.2	200	L
176	.02	.24	---	---	---	---	.4	1	.05	.1	.07	70	L
177	.005	.30	---	---	---	---	1.4	1	.07	.1	.1	150	L
178	.005	.05	---	---	---	---	.4	1.5	.07	.7	.15	300	L
179	.005	.14	---	---	---	---	.4	1	.1	.02	.1	200	L
180	.31	.40	---	---	---	---	1.4	1	.15	.02	.07	500	L
181	.005	.18	---	---	---	---	1.3	1.5	.2	.7	.1	500	L
182	.005	.34	---	---	---	---	.8	1.5	.2	.1	.15	200	L
183	Tr	.30	---	---	---	---	.5	1.5	.15	.7	.1	500	L
184	.02	Tr	---	---	---	---	1.4	1.5	.2	.15	.1	500	L
185	.03	.11	---	---	---	---	N	1	.15	.02	.07	500	L
186	.01	.19	---	---	---	31.81	.4	1.5	.02	10	.01	700	L
187	.01	.43	---	---	---	19.40	.5	.7	.02	10	.02	300	L
188	.02	.34	---	---	---	21.59	N	.7	.02	15	.02	1,500	L
189	.03	.13	---	---	---	9.38	.4	1.5	.03	2	.15	150	L
190	.02	.18	---	---	---	16.92	N	.5	L	.3	.005	150	L

Sample	Semiquantitative spectrographic analyses (ppm) Ba (20)	Be (1)	Co (5)	Cr (10)	La (20)	Mo (5)	Ni (5)	Sr (100)	V (10)	Y (10)	Zr (10)	Location	Site	Type	Width (feet)
126	500	3	10	20	150	N	30	N	70	100	500	12-19-13	B,a	2	3
127*	500	3	20	70	200	N	100	N	150	200	500	12-19-13	B	3	
128	1,000	3	10	20	70	30	20	100	100	70	500	12-19-13	D	3	
129	300	2	10	20	50	N	10	N	30	20	150	12-19-13	D	1	25
130	1,000	5	5	20	20	7	15	100	150	70	700	12-19-13	B,e	2	
131	500	5	5	L	50	15	5	100	70	70	200	12-19-13	B,d	2	1.5
132	500	1.5	10	30	20	10	20	100	50	30	150	12-19-13	B,e	2	
133	1,500	2	7	30	30	30	20	N	70	50	300	12-19-13	B,e	2	
134	300	3	10	70	30	15	30	L	100	70	200	12-19-13	B,a	2	4
135	300	2	7	50	30	10	20	N	70	30	200	12-19-13	B,a	2	4
136	1,000	1.5	N	L	N	N	5	100	20	20	100	12-19-13	B,b	2	2
137	1,000	1.5	5	15	20	7	10	100	30	20	150	12-19-13	B,b	2	0.9
138	1,500	1.5	5	30	50	70	15	N	70	30	200	12-19-13	B,a	2	4
139	200	2	5	10	N	5	15	100	30	20	150	12-19-13	D	1	15
140*	150	1	50	200	N	70	70	200	200	30	100	12-19-13	B,a	2	3
141*	500	1	30	200	N	50	70	300	150	30	70	12-19-13	B,a	2	2.2
142*	200	1	50	150	N	100	70	100	100	30	70	12-19-13	B,b	2	2
143*	500	2	50	300	20	10	100	300	200	50	150	12-19-13	A,a	2	.5
144*	500	1.5	30	150	20	30	7	200	150	50	150	12-19-13	C	2	.2
145*	70	.2	N	5	N	10	7	N	10	30	50	12-19-13	E	3	
146*	500	7	10	50	50	10	15	100	50	100	150	12-19-13	A,a	2	.8
147*	700	2	20	150	N	10	50	L	150	20	100	12-19-13	A	2	3
148	100	1	5	L	N	L	5	N	20	20	150	12-19-13	A,a	2	6
149	300	1	N	N	50	N	5	N	15	20	200	12-19-13	F,e	2	
150	300	1	5	L	20	N	5	N	30	20	100	12-19-12	A,a	2	4
151	700	1.5	10	10	30	N	15	N	70	50	200	12-19-12	A,a	2	1.3
152	300	1	N	L	10	30	5	N	50	50	150	12-19-12	A,d	2	2.5
153*	100	2	N	15	30	70	5	N	50	70	150	12-19-12	A,d	2	.5
154*	150	1	10	L	20	15	15	N	30	20	100	12-19-12	A,d	2	.5
155*	300	1	7	70	30	50	7	N	15	50	700	12-19-12	Concentrates		
156*	5,000	3	5	10	N	20	30	100	20	30	100	12-19-12	D	3	
157*	200	2	7	N	50	150	5	N	50	50	300	12-19-12	B,e	2	3
158	200	1.5	5	L	N	70	10	N	20	20	150	12-19-12	B,b	2	2
159*	500	1.5	N	L	N	150	5	N	50	30	100	12-19-12	B,a	2	2.5
160	1,000	1	5	L	50	N	5	N	50	50	200	12-19- 7	B,e	2	
161	500	2	5	20	20	N	15	100	100	100	700	12-18- 7	F,e	2	
162	300	N	10	30	20	N	15	N	150	15	100	12-18- 7	B,a	2	2.3
163	300	2	10	15	30	5	15	150	100	30	300	12-18- 7	B,a	2	3.5
164	30	1	20	30	30	500	50	N	100	10	100	12-18- 6	B,b	2	2.5
165	20	1.5	10	20	20	500	15	N	50	15	70	12-18- 6	B,b	2	3
166	N	1.5	N	10	N	500	L	N	L	30	100	12-18- 5	F	2	2
167	N	1.5	N	15	20	10	L	N	50	50	200	11-18-32	B,a	2	10
168	N	3	N	10	N	N	5	N	10	20	20	11-18-32	B,c	3	
169	N	5	N	10	N	N	5	N	15	20	20	11-18-32	B,b	2	5
170	70	3	L	10	N	N	5	N	20	50	100	11-18-32	B,b	2	5
171	50	7	5	15	20	20	7	N	50	30	70	11-18-32	B,b	2	5
172	20	1.5	N	10	N	N	7	N	15	15	30	11-18-32	B,a	1	4
173	70	5	L	10	N	N	7	N	30	20	70	11-18-32	B,b	2	4
174	50	5	5	10	N	L	7	N	50	50	100	11-18-32	B,b	1	5
175	300	L	5	15	50	N	5	N	70	30	300	11-18-32	A	3	
176	100	L	L	10	30	N	5	N	70	50	100	11-18-32	A,c	2	4
177	100	L	5	15	30	L	5	N	100	50	150	11-18-32	A,e	2	35
178	150	1.5	5	15	30	15	7	N	50	50	150	11-18-32	D	3	
179	100	1	5	15	20	N	7	N	70	50	100	11-18-32	F	2	2.5
180	70	2	7	15	50	N	10	N	50	100	150	11-18-32	C,d	2	1.5
181	100	3	5	15	30	5	10	N	50	70	100	11-18-32	D	3	
182	50	5	L	10	30	N	5	N	50	50	150	11-18-32	B,a	2	1
183	100	2	7	15	30	5	15	N	50	70	100	11-18-32	B,b	1	10
184	100	1.5	7	15	20	5	10	N	50	50	100	11-18-32	B,a	2	1.3
185	70	2	5	15	20	N	7	N	30	50	100	11-18-32	A,a	2	4
186	20	3	5	10	N	N	10	N	10	70	10	11-18-32	A,c	2	5
187	50	3	L	10	N	N	5	N	L	70	15	11-18-32	A,d	2	P .5
188	N	2	L	10	N	N	5	100	L	50	15	11-18-32	A,b	2	10
189	200	2	5	10	30	N	5	N	30	30	150	11-18-32	C	2	4
190	N	1	L	L	N	N	L	N	L	20	10	11-18-32	A,a	2	5

Table 9.--Continued

Sample	Chemical analyses, Ounces/ton, Au	Ag	(percent) Cu	Pb	Zn	CaF2	AA (ppm) Te	Semiquantitative spectrographic analyses (percent) Fe (.05)	Mg (.02)	Ca (.05)	Ti (.002)	(ppm) Mn (10)	B (10)
191	0.08	0.22	---	---	---	3.50	N	2	0.02	0.7	0.1	200	L
192	Tr	Tr	---	---	---	---	N	2	.2	.1	.3	1,000	L
193*	Tr	.20	---	---	---	---	N	2	.2	.1	.2	1,000	L
194	.005	.10	---	---	---	---	.4	1.5	.02	1	.1	200	L
195*	.03	.06	---	---	---	---	N	1.5	.07	.5	.1	5,000	L
196	.04	.26	---	---	0.025	---	N	1.5	.05	1	.07	700	L
197	.04	.26	---	---	---	---	1.7	1	.02	.5	.03	300	L
198	.05	Tr	---	---	---	---	.4	.7	.02	.5	.05	100	L
199	.005	Tr	---	---	---	---	1.6	1.5	.07	.1	.1	200	L
200	.12	.38	---	---	---	---	.7	1	.05	.7	.07	200	L
201	.04	.16	---	---	---	---	.8	1	.05	.07	.07	1,000	L
202	.07	.26	---	---	---	---	.7	.5	.03	.2	.015	70	L
203	.09	.61	---	---	---	---	1	1	.03	.3	.015	150	L
204	.18	.20	---	---	---	---	1.1	.7	.07	L	.07	300	L
205	.09	.68	---	---	---	---	1.1	1	.1	.05	.07	3,000	L
206	.05	.75	---	---	---	---	.9	1	.05	L	.03	1,500	L
207	.04	Tr	---	---	---	---	.3	1	.05	L	.1	100	L
208	.005	.20	---	---	---	---	1.7	3	.3	.1	.2	500	L
209	.005	.20	---	---	---	4.30	1.4	2	.07	1.5	.2	200	L
210	.03	.08	---	---	---	9.48	.8	3	.03	5	.3	300	L
211	.04	.06	---	---	---	13.00	.4	1.5	.05	10	.2	200	L
212	.02	.08	---	---	---	1.28	1.7	2	.07	.1	.5	150	L
213	.01	.75	---	---	---	---	.4	2	.1	.1	.3	200	L
214	.01	.07	---	---	---	---	.8	4	.1	.1	.5	300	L
215	.02	.08	---	---	---	---	N	1.5	.1	.7	.1	200	L
216	.04	.10	---	---	---	---	N	.7	.02	1	.02	150	L
217	.05	.25	---	---	---	23.34	.6	1	.1	7	.07	500	L
218	.015	Tr	---	---	---	7.15	.9	1.5	.1	1.5	.1	300	L
219	.02	.64	---	---	---	---	N	1.5	.2	.15	.07	200	L
220	.04	.26	---	---	---	---	N	1.5	.03	2	.1	300	L
221	.06	.08	---	---	---	---	1.4	.7	.02	.7	.05	100	L
222*	.005	.14	---	---	---	2.14	N	1.5	.07	L	.15	1,000	L
223*	.04	.26	---	---	---	43.19	N	.7	.02	15	.03	200	L
224	Tr	Tr	---	---	---	---	1.4	2	.3	.1	.3	700	L
225	.005	.14	---	---	---	---	1.1	1.5	.07	.1	.1	300	L
226	.005	Tr	---	---	---	---	.6	1.5	.07	.07	.15	200	L
227	.005	Tr	---	---	---	---	.4	2	.3	.03	.15	300	L
228	.01	Tr	---	---	---	---	N	1.5	.2	1	.2	150	L
229	.02	.14	---	---	---	2.92	1.3	1.5	.1	.7	.1	100	L
230	.04	.37	---	---	---	27.00	N	.7	.05	.7	.03	200	L
231	.005	Tr	---	---	---	---	1.4	1.5	.2	15	.15	500	L
232	.01	.19	---	---	---	---	2.5	2	.2	.07	.2	500	L
233	.02	.18	---	---	---	---	N	.7	.05	L	.2	200	L
234*	.07	.25	---	---	---	---	N	1	.07	.05	.2	5,000	L
235	.20	.44	---	---	---	---	.4	1	.1	.05	.15	300	L
236	.36	.58	---	---	---	---	N	2	.07	.07	.1	200	L
237	.05	.21	---	---	---	---	N	1	.05	.05	.07	200	L
238	.005	Tr	---	---	---	---	.9	1	.2	2	.07	500	L
239	.08	.38	---	---	---	---	1.8	1	.05	.5	.1	500	L
240*	.01	.07	---	---	---	9.79	1.3	.7	.15	10	.1	1,500	L
241*	.01	.07	---	---	---	13.90	19.2	1	.3	20	.07	>5,000	L
242*	.02	.24	---	---	---	5.70	N	3	.5	3	.2	1,500	L
243*	.02	.24	---	---	---	18.60	1.5	.7	.2	20	.1	5,000	L
244*	.02	.16	---	---	---	18.44	N	.7	.1	15	.07	3,000	L
245*	.02	.24	---	---	0.015	13.90	N	.7	.1	5	.07	300	L
246	.01	Tr	---	---	---	---	N	3	1.5	.3	.3	500	20
247	.005	Tr	---	---	---	---	.3	3	.3	.2	.07	300	10
248*	.01	.60	0.25	0.16	.019	15.75	1.3	1	.1	10	.07	150	L
249*	.005	.22	.06	.05	---	---	1.1	5	.05	5	.05	150	L
250*	.01	.23	---	---	---	79.45	N	.2	.7	>20	.03	70	N
251*	.01	Tr	.026	.06	---	10.57	N	3	.5	7	.2	500	10
252	.005	.26	.025	.08	.026	---	3.2	7	1.5	2	.5	1,000	10
253	.01	.46	2.70	.04	---	---	N	5	1.5	3	.3	2,000	10
254	.01	16.46	1.77	.06	---	---	1	10	2	1	.5	1,000	L
255*	.01	Tr	.052	.05	---	---	.1	7	2	7	.3	1,500	15

Sample	Semiquantitative spectrographic analyses (ppm) Ba (20)	Be (1)	Co (5)	Cr (10)	La (20)	Mo (5)	Ni (5)	Sr (100)	V (10)	Y (10)	Zr (10)	Location	Site	Type	Width (feet)
191	150	1.5	5	10	20	N	7	N	20	15	100	11-18-32	A,a	2	5
192	300	2	7	20	70	5	15	N	50	70	200	11-18-32	B,a	1	1.3
193*	300	5	7	20	150	50	15	N	30	70	300	11-18-32	B,a	1	0.8
194	200	1.5	5	10	30	15	7	N	15	20	200	11-18-32	B,b	2	5
195*	200	7	5	10	50	N	7	N	15	20	150	11-18-32	B,b	2	5
196	150	5	5	L	20	5	7	N	10	15	200	11-18-32	B,b	2	5
197	50	3	L	10	N	15	5	N	10	10	50	11-18-32	B,d	2	P .1
198	70	1.5	L	10	N	15	5	N	10	15	50	11-18-32	B,a	2	3
199	100	1.5	5	15	N	L	10	N	20	30	100	11-18-32	B,c	2	P .2
200	70	2	5	10	N	50	10	N	10	15	50	11-18-32	B,d	2	P .2
201	50	1.5	5	15	N	5	7	N	20	50	70	11-18-32	B,d	2	P .3
202	30	2	L	L	N	N	5	N	10	10	30	11-18-32	B,b	2	5
203	70	1.5	5	10	N	N	7	N	10	15	50	11-18-32	B,e	2	8
204	70	3	L	10	N	N	L	N	15	15	70	11-18-32	A,a	2	5
205	150	5	10	15	N	10	10	N	20	30	100	11-18-32	A,a	2	6
206	100	7	5	15	N	L	7	N	L	20	50	11-18-32	A,c	2	10
207	100	1	N	20	N	5	5	N	15	30	100	11-18-32	A,d	2	6
208	300	1	7	20	100	10	10	N	70	70	100	11-18-32	B,e	2	
209	150	1	5	15	50	5	10	N	30	50	50	11-18-32	F	2	1.8
210	300	1.5	7	10	50	N	5	N	30	50	200	11-18-32	F	2	6
211	150	2	5	15	50	7	7	N	50	50	150	11-18-32	A,a	2	.7
212	300	1.5	5	10	70	N	L	N	70	50	300	11-18-32	A,a	2	5
213	300	1.5	5	20	70	N	15	100	50	70	300	11-18-33	B,a	2	1.3
214	500	3	5	15	100	15	15	100	50	50	500	11-18-33	B,b	[illegible]	4
215	100	2	5	15	30	N	7	N	30	50	100	11-18-33	B,a	2	2
216	30	15	N	10	N	N	5	N	L	15	50	11-18-33	B,a	2	2
217	50	1	L	10	50	10	5	N	50	70	70	11-18-33	A,a	1	2
218	150	1	10	15	50	7	7	N	50	70	100	11-18-33	A,a	1	3
219	70	2	L	15	N	N	7	N	15	30	70	11-18-33	D	3	
220	200	L	5	15	50	N	7	N	30	70	150	11-18-33	B,a	2	1
221	100	3	N	10	N	N	5	N	L	15	70	11-18-33	D	3	
222*	200	1.5	20	15	150	N	10	N	30	70	200	11-18-33	A,c	2	.5
223*	100	1	N	10	100	N	5	N	10	200	30	11-18-33	A,d	2	3
224	500	1	7	20	70	N	20	N	70	70	500	11-18-33	B,e	2	
225	200	5	L	10	50	L	5	N	20	20	300	11-18-33	A,a	2	2
226	300	1.5	L	L	70	N	5	N	30	30	200	11-18-33	A,e	2	
227	300	L	5	10	70	N	5	N	70	50	300	11-18-33	B,a	2	4
228	300	1.5	5	10	100	N	5	N	30	70	300	11-18-33	B,b	2	1.2
229	150	1	L	L	50	N	5	N	20	30	200	11-18-33	A,a	2	1
230	50	1	L	L	20	N	5	N	L	100	70	11-18-33	A,a	2	4
231	150	10	5	10	30	N	7	N	30	15	100	11-18-33	F	2	2
232	300	1.5	5	15	50	N	10	N	50	50	200	12-18- 5	D	3	
233	200	1	L	10	70	N	L	N	30	50	300	12-18- 5	A,a	2	3
234*	300	3	5	L	70	5	L	200	50	70	200	12-18- 4	A,a	2	.1
235	200	1.5	L	10	20	N	L	N	20	20	100	12-18- 4	A,a	2	4
236	70	1.5	L	L	30	N	L	N	20	30	200	12-18- 4	A,e	4	
237	50	1	L	L	20	N	5	N	15	20	70	12-18- 4	A,e	2	
238	70	1.5	5	15	30	5	10	N	30	30	70	12-18- 4	A,a	2	1
239	70	2	L	10	N	N	5	N	15	30	70	12-18- 3	A,e	2	
240*	70	3	L	10	N	N	5	N	15	30	100	12-18- 3	B,a	2	4
241*	50	7	L	L	N	N	5	200	15	50	50	12-18- 3	B,b	2	5
242*	300	2	15	30	20	N	20	100	70	30	150	12-18- 3	B,c	2	P .3
243*	70	5	5	10	N	N	L	200	30	50	70	12-18- 3	B,b	2	4
244*	70	3	L	10	N	N	5	200	30	50	50	12-18- 3	B,b	2	10
245*	150	2	5	10	20	L	5	N	20	30	70	12-18- 3	F	2	2
246	500	1.5	15	70	20	N	30	200	150	30	200	12-17-19	F,e	2	
247	100	L	5	10	N	N	10	N	70	N	50	13-18- 2	D	3	
248*	200	L	N	L	N	N	5	N	200	20	20	12-18-35	E	3	
249*	300	L	N	L	N	N	5	N	70	10	20	12-18-35	E	3	
250*	30	L	N	N	30	N	N	N	20	>200	70	12-18-34	A,a	2	5
251*	700	2	N	5	100	10	5	N	30	200	500	12-18-34	A,c	2	.7
252	700	3	20	15	30	N	30	300	100	50	100	12-18-26	B,a	1	2.5
253	500	7	20	15	50	N	20	500	200	30	100	12-18-26	B,d	2	.5
254	1,000	1.5	30	30	30	N	50	300	100	50	100	12-18-26	B,c	2	.9
255*	300	5	20	50	100	N	50	300	200	150	200	12-18-26	B,b	1	.2

Table 9.--Continued

Sample	Chemical analyses: Ounces/ton Au	Ag	Chemical analyses (percent): Cu	Pb	Zn	CaF2	AA (ppm): Te	Semiquantitative spectrographic analyses (percent): Fe (.05)	Mg (.02)	Ca (.05)	Ti (.002)	(ppm): Mn (10)	B (10)
256*	Tr	0.14	0.237	0.06	---	---	1.6	7	1.5	7	0.2	2,000	10
257*	0.01	.13	.428	---	---	---	.1	7	2	7	.3	1,500	L
258*	.01	4.23	2.828	---	---	---	.4	7	1.5	3	.3	1,500	10
259*	.01	23.80	4.985	---	---	---	.2	7	1.5	1.5	.3	700	10
260*	.01	11.02	19.06	---	---	2.57	.2	5	1	10	.15	1,500	N
261	.005	.24	.005	.06	0.21	---	3.4	3	1	1.5	.5	700	L
262*	Tr	.16	.03	---	.015	---	1.6	5	2	1.5	.5	1,000	L
263*	.01	.16	2.52	---	---	---	1	2	.2	7	.2	500	L
264*	Tr	.26	.025	---	---	---	2.5	3	2	1	.5	1,000	L
265	.03	3.17	1.962	.08	---	---	N	3	.2	.5	.2	200	10
266	.01	Tr	---	---	---	---	.5	2	.3	2	.2	300	10
267*	Tr	.26	---	---	---	---	N	1	.3	.2	.2	300	10
268*	Tr	1.50	---	---	---	---	N	2	.3	.2	.2	700	30
269	.005	.30	.03	---	---	---	N	1	.15	.2	.15	150	L
270	.01	.30	.02	---	---	---	N	1	.15	.2	.2	700	L
271	.01	Tr	---	---	---	---	N	2	.2	.1	.15	300	10
272*	.005	.26	---	---	---	---	N	2	.1	.5	.3	500	L
273	.01	Tr	---	---	---	---	.5	3	.3	.2	.3	500	10
274	.005	.40	---	---	---	---	N	.5	.2	.2	1	200	L
275	.20	2.90	---	---	---	---	N	3	.3	.3	.3	300	10
276	.01	2.00	---	---	---	---	N	2	1	.1	.2	500	L
277	.01	2.80	---	---	---	---	N	3	.5	.5	.5	500	L
278	.01	Tr	Tr	---	---	---	N	3	.3	.2	.3	500	15
279	Tr	.62	---	---	---	---	N	1	.2	.5	.2	700	L
280	.03	1.96	.031	---	---	---	.1	2	.5	.3	.2	500	15
281	.01	1.76	.02	---	---	---	N	1	.2	.1	.2	1,000	L
282	.02	.06	---	---	---	---	N	3	.5	.15	.3	700	10
283*	.005	.10	.242	.06	.052	---	N	3	.5	.2	.2	500	10
284	.005	Tr	---	---	---	---	N	5	.2	.2	.3	100	10
285	Tr	Tr	---	---	---	---	N	5	.5	.3	.5	100	L
286	.005	Tr	---	---	---	---	.7	7	.7	.5	.5	200	10
287	.01	.78	---	---	---	---	N	1.5	.2	.3	.15	300	L
288	.03	.40	---	---	---	---	3.5	1	.1	.3	.15	300	L
289	Tr	Tr	---	---	---	---	N	.7	.05	.15	.07	300	10
290	.01	Tr	---	---	---	---	1.3	2	.15	.15	.3	700	L
291*	.02	.44	---	---	---	---	N	1.5	.1	.1	.3	300	L
292*	.01	Tr	---	---	---	---	1.3	2	.1	.07	.3	300	L
293*	.02	1.40	---	---	---	11.53	N	7	.15	10	.5	500	10
294	.01	.20	---	---	---	---	N	5	.1	.7	.5	300	L
295*	.01	Tr	---	---	---	33.27	N	3	.07	20	.3	200	L
296	.02	5.68	---	---	---	9.52	.5	3	.2	5	.5	1,500	L
297	.08	4.92	.03	.08	---	---	.9	1.5	.1	3	.15	300	L
298	.01	.33	.03	---	---	19.43	.3	1.5	.15	5	.1	1,000	L
299	.01	.35	---	---	---	14.90	.3	2	.2	10	.3	1,000	L
300	.01	.27	---	---	---	---	1.5	2	.2	.15	.3	300	L
301*	.01	.17	---	---	---	42.56	N	3	.7	10	.1	3,000	15
302	.01	.05	---	---	---	13.83	1.5	1.5	.07	20	.07	300	L
303	.01	1.99	---	---	---	---	1.8	1.5	.1	1.5	.15	1,000	L
304*	.01	.35	---	---	---	---	1	2	.2	1.5	.15	5,000	L
305	.01	1.30	---	---	---	17.71	3.3	2	.2	7	.2	700	L
306	.02	.92	---	---	---	---	N	1.5	.3	.3	.5	500	L
307	.01	Tr	---	---	---	---	N	1.5	.1	.2	.2	200	L
308*	Tr	.16	---	---	---	38.57	2	5	1.5	10	.5	3,000	N
309	.01	.06	---	---	---	---	.8	3	.3	.5	.5	1,000	L
310	.01	.13	---	---	---	---	.4	1.5	.3	.15	.2	700	L
311	.005	.21	---	---	---	---	1	3	1.5	.7	.2	1,500	L
312	.005	.12	---	---	---	---	N	2	.3	.3	.3	1,500	L
313*	.005	.32	---	---	---	---	1.0	3	.3	.2	.3	500	L
314	.01	.35	---	---	---	---	N	2	.3	.2	.3	500	L
315	.005	.16	---	---	---	---	N	2	.7	.2	.2	2,000	L
316*	.03	4.37	---	---	---	---	1.2	7	.3	7	.7	700	L
317	.02	.44	---	---	---	6.44	.9	5	.7	10	.3	1,500	L
318	Tr	Tr	---	---	---	---	6	3	.2	2	.3	500	10
319	.02	Tr	---	---	---	---	.3	.7	.03	.7	.015	300	L
320	.01	Tr	---	---	.015	---	.9	1	.1	.15	.2	300	L

Sample	Semiquantitative spectrographic analyses (ppm): Ba (20)	Be (1)	Co (5)	Cr (10)	La (20)	Mo (5)	Ni (5)	Sr (100)	V (10)	Y (10)	Zr (10)	Location	Site	Type	Widt (fee
256*	500	7	20	30	70	N	30	500	300	70	150	12-18-26	C	2	0.3
257*	700	2	30	30	20	N	30	300	150	30	150	12-18-26	C,e	2	
258*	300	5	20	30	50	N	30	300	150	50	150	12-18-26	C,c	2	.1
259*	500	2	20	30	N	N	30	200	150	30	150	12-18-26	D	4	
260*	100	1.5	10	70	N	N	50	200	150	20	50	12-18-26	B,b	2	.1
261	700	1.5	10	30	50	N	30	300	50	50	150	12-18-26	D	1	20
262*	500	3	20	150	70	N	100	300	70	70	100	12-18-26	A,a	2	1.5
263*	300	7	N	10	100	N	10	200	30	200	100	12-18-26	A,a	2	.5
264*	700	2	20	150	20	N	100	300	70	20	150	12-18-26	A,a	2	.9
265	300	2	N	10	70	N	10	N	50	100	200	12-18-26	B,e	2	
266	300	2	N	N	50	5	10	N	30	70	300	12-18-26	B,b	2	1.8
267*	100	2	N	L	20	N	5	N	20	50	150	12-18-26	B,e	3	17
268*	150	2	5	L	20	N	5	N	20	50	150	12-18-26	B,b	2	1
269	100	1.5	N	L	L	N	5	N	20	30	150	12-18-26	B,b	2	1
270	150	2	5	L	N	N	5	N	20	20	150	12-18-26	B,b	2	1
271	200	2	N	5	30	N	10	N	20	70	200	12-18-26	B,b	2	2
272*	500	1	5	L	20	N	5	N	30	20	500	12-18-26	A,a	2	6
273	500	7	5	5	20	N	7	N	50	30	300	12-18-22	A,e	2	
274	150	2	N	L	N	N	5	N	20	10	100	12-18-22	F	2	.2
275	700	2	5	5	50	N	5	N	50	50	500	12-18-22	A,a	2	.1
276	300	2	5	L	N	N	5	N	20	20	150	12-18-22	A,a	2	.8
277	700	1.5	10	L	50	N	5	N	30	50	500	12-18-22	A,a	2	.1
278	700	5	10	20	70	10	10	N	30	70	500	12-18-22	B,b	2	.2
279	300	10	N	L	20	N	5	N	20	20	100	12-18-22	B,b	2	.5
280	300	20	5	10	50	N	10	N	30	50	200	12-18-22	B,e	2	
281	200	30	N	L	N	N	5	N	15	20	150	12-18-22	B,b	2	.5
282	500	7	10	30	100	N	15	N	50	70	300	12-18-22	B,c	2	.2
283*	500	2	7	10	30	10	15	N	70	30	200	12-18-22	D	4	
284	300	1	5	5	N	15	5	N	50	20	300	12-18-21	D	3	
285	700	1.5	5	15	30	N	7	N	150	30	300	12-18-21	A,c	2	1.5
286	1,000	1	10	30	50	5	15	200	150	50	500	12-18-21	A,e	2	36
287	200	1.5	N	10	70	N	L	N	20	70	300	12-18-15	B,a	2	2.5
288	150	2	L	10	50	N	L	N	20	30	300	12-18-15	B,b	2	4
289	70	7	N	10	50	N	L	N	20	20	50	12-18- 9	F	2	.5
290	200	5	5	10	70	N	L	N	50	100	500	12-18-19	C,a	2	1.6
291*	300	1.5	5	10	70	7	L	N	70	70	300	12-18-19	B,c	2	1
292*	200	2	5	10	70	N	L	N	70	150	500	12-18-19	F	2	.7
293*	500	7	5	10	70	N	L	N	100	150	500	12-18-19	D	3	
294	500	2	5	10	70	N	L	N	100	70	300	12-18-19	C,d	2	2.5
295*	300	1	L	10	50	N	L	N	70	150	200	12-18-19	F	2	4
296	700	3	5	N	50	10	5	100	100	70	500	12-18-19	B,a	2	1.2
297	300	3	7	L	50	N	L	N	50	50	200	12-18-19	B,a	2	1.2
298	200	1	5	L	50	N	L	N	30	30	100	12-18-19	B,b	2	1.9
299	300	5	5	L	70	N	L	N	50	100	300	12-18-19	B,b	2	1.3
300	300	L	7	L	50	N	5	N	70	30	300	12-18-19	B,a	2	1.4
301*	200	10	10	30	100	N	15	100	70	100	100	12-18-19	B,b	1	.3
302	150	1	5	10	50	N	5	N	30	150	70	12-18-19	B,b	2	1.1
303	200	1	7	L	50	N	5	N	30	30	100	12-18-19	B,a	2	2.4
304*	300	5	10	L	70	N	10	100	50	70	100	12-18-19	B,d	2	1
305	200	2	L	N	50	7	5	N	50	70	200	12-18-19	B,a	2	3
306	300	2	5	L	70	N	L	N	50	50	300	12-18-19	B,b	1	.5
307	200	1	5	L	50	N	L	N	50	30	150	12-18-19	B,b	2	1.6
308*	700	1	10	10	50	5	5	150	100	70	500	12-18-19	B,a	2	3
309	500	1.5	10	15	70	N	5	100	100	50	300	12-18-19	B,d	2	1.8
310	300	L	7	L	50	N	L	N	70	30	200	12-18-19	B,c	2	1
311	300	1	10	15	50	N	10	L	70	50	300	12-18-19	B,c	2	1
312	300	1	10	10	50	N	5	L	70	50	300	12-18-19	B,b	2	2
313*	500	1.5	10	10	70	N	5	L	70	50	300	12-18-19	B,a	2	1.4
314	300	2	7	L	70	N	5	100	70	50	300	12-18-19	B,b	1	.2
315	300	1	10	L	70	N	5	N	70	30	150	12-18-19	B,b	2	.5
316*	1,000	1.5	7	10	100	5	5	L	100	100	500	12-18-20	B,b	2	3
317	700	1	10	20	70	7	10	L	70	100	500	12-18-20	B,a	2	4
318	700	1.5	5	N	50	5	10	N	70	50	200	12-18-20	A,a	2	3
319	20	2	L	10	N	N	5	N	10	10	10	12-18-20	A,a	2	1
320	200	3	5	15	50	N	7	N	50	30	200	12-18-20	A,a	2	1

Table 9.--Continued

Sample	Chemical analyses: Ounces/ton Au	Ag	(percent) Cu	Pb	Zn	CaF2	AA (ppm) Te	Semiquantitative spectrographic analyses (percent) Fe (.05)	Mg (.02)	Ca (.05)	Ti (.002)	(ppm) Mn (10)	B (10)
321*	0.005	0.12	---	0.08	0.32	---	N	1.5	0.3	0.2	0.1	500	10
322*	.005	Tr	---	---	---	11.48	7.5	3	.5	10	.2	>5,000	L
323	.01	Tr	---	---	---	---	.6	2	.5	1	.3	2,000	10
324*	.005	Tr	---	---	---	1.17	N	0.7	.07	>20	.07	5,000	N
325	.005	Tr	---	---	---	---	6	5	1	1.5	.5	700	N
326*	.02	.22	---	---	.04	---	4.3	5	.7	1.5	.7	500	L
327*	.005	Tr	---	---	---	---	1	7	.15	.15	.7	500	L
328*	.02	.18	---	---	---	---	.6	5	1	2	.5	700	L
329*	.03	1.01	---	---	---	---	1.2	7	1	1	1	3,000	L
330	Tr	.12	---	---	---	7.00	N	2	.1	10	.15	300	L
331*	.005	.06	---	---	---	---	N	1.5	.1	.3	.2	300	10
332*	.02	.80	---	---	---	---	3.1	5	.05	.2	.2	1,000	L
333*	.01	.22	---	---	---	3.79	.8	7	.05	10	.07	5,000	15
334*	.01	Tr	---	---	---	---	.6	5	1	.3	.5	700	15
335*	.02	.84	0.078	2.64	10.10	4.76	2.8	2	.7	15	1	>5,000	N
336	.03	.17	.20	.32	.33	---	7	5	.5	.7	.5	700	L
337*	.07	22.17	2.40	3.72	2.40	---	54	7	.3	1.5	.3	500	L
338*	.02	.30	.016	.012	.010	22.12	2.9	3	.3	15	.15	1,000	L
339	Tr	.04	---	---	---	---	N	5	.7	1	.7	300	L
340	Tr	Tr	.008	---	---	---	N	5	.7	1	.5	300	L
341	.01	Tr	---	---	---	---	1	10	1	L	.3	300	10
342*	Tr	Tr	.003	---	---	---	.4	10	1.5	.7	.1	1,500	L
343	Tr	.06	---	---	---	---	N	5	.7	.7	.7	1,000	10
344	Tr	Tr	---	---	---	---	N	3	.3	.2	.5	2,000	L
345	.005	Tr	---	---	---	---	2.5	1.5	.2	.07	.15	100	10
346	.04	.22	---	---	---	---	.4	5	.5	.05	.15	200	L
347*	.02	.20	.07	---	---	---	.9	10	.5	.2	.2	700	10
348*	Tr	Tr	---	---	.06	---	N	15	1.5	.3	.1	5,000	10
349	.005	Tr	---	---	---	---	N	3	.7	L	.2	100	50
350*	.01	.24	---	---	---	---	.8	5	.2	.2	.1	150	20
351	.005	.04	.051	---	---	---	N	5	1	.05	.3	100	70
352*	.005	Tr	.102	---	---	---	2.6	7	.3	.05	.1	30	700
353*	Tr	.16	.010	---	---	---	1.7	7	2	.5	.5	1,000	15
354	.005	.32	Tr	---	---	---	.8	15	.5	.05	.3	150	50
355	.005	Tr	---	---	---	---	N	7	.7	L	.5	200	70
356*	.01	.23	---	.012	---	59.08	.9	3	1	>20	.15	500	N
357	.03	.21	---	---	---	---	.6	1.5	.1	.1	.05	500	10
358*	.02	.18	10.25	---	---	---	1.2	5	.5	1	.5	500	15
359*	.02	.06	---	---	---	---	N	1.5	.1	.3	.07	5,000	N
360*	.01	.27	---	---	---	---	.2	7	.3	1	.07	200	L
361*	Tr	.18	---	---	---	---	.38	1.5	.5	.7	.07	500	10
362	Tr	Tr	---	---	---	30.94	N	1.5	.5	10	.07	1,500	L
363*	Tr	Tr	---	---	---	49.91	6	3	1	10	.3	1,000	10
364*	Tr	Tr	---	---	---	1.47	.8	2	1	10	.2	200	L
365*	.01	.13	---	---	---	---	.4	15	.5	.1	.5	200	50
366	.005	Tr	---	---	---	---	6	2	.5	.05	.1	200	50
367*	.01	.13	Tr	---	.028	---	.8	15	.1	.1	.7	200	10
368*	.01	Tr	---	---	---	---	N	10	.1	.1	.5	100	L
369*	.005	Tr	---	---	---	---	.2	5	1	1	.5	300	20
370	.01	.11	---	---	---	---	N	2	.5	.5	.2	150	10
371*	Tr	Tr	---	---	---	---	10	5	1	.7	.5	300	L
372	.01	.11	---	---	---	---	4.69	1.5	.2	.05	.15	150	10
373*	Tr	.20	---	---	---	---	2.7	5	.07	.05	.5	70	10
374	.02	.06	---	---	---	---	.38	1.5	.15	.07	.15	100	10
375	.01	.07	---	---	---	---	131	1.5	.07	N	.3	30	N
376*	1.28	.40	---	---	---	---	4,560	3	.07	L	.1	50	10
377*	.005	Tr	---	---	---	---	9.5	2	.1	.05	.3	50	L
378*	Tr	Tr	---	---	Tr	---	5	7	.5	.1	.2	150	L
379*	.005	Tr	---	.05	---	---	1,130	3	.07	1	.1	50	10
380	.22	.52	---	---	---	---	15	1.5	.1	.05	.1	300	15
381*	.005	.34	---	---	---	---	80	2	.02	L	.07	70	20
382*	.02	.40	---	---	---	---	134	1	.03	.07	.1	70	L
383	.005	.30	---	---	---	---	7.5	2	.15	1	.15	150	L
384	Tr	.28	---	---	---	---	N	1.5	.2	.2	.1	150	10
385	.02	.30	---	---	---	---	N	5	.2	.05	.3	30	N

Sample	Semiquantitative spectrographic analyses (ppm) Ba (20)	Be (1)	Co (5)	Cr (10)	La (20)	Mo (5)	Ni (5)	Sr (100)	V (10)	Y (10)	Zr (10)	Location	Site	Type	Width (feet)
321*	200	50	L	N	20	N	7	N	20	20	100	12-18-20	A,a	2	3
322*	3,000	7	5	20	100	N	20	500	100	100	100	12-18-20	B,e	3	
323	300	7	10	10	100	N	30	N	20	70	300	12-18-20	B,a	2	2.6
324*	N	2	N	N	N	N	L	300	15	30	70	12-18-20	B,d	2	1.7
325	700	1	5	5	70	N	5	150	100	50	200	12-18-20	B,a	2	4
326*	700	7	7	20	100	5	10	L	70	70	300	12-18-20	B,b	2	4
327*	300	5	5	10	100	N	L	100	70	100	700	12-18-20	A,c	2	0.5
328*	1,000	3	7	10	100	N	5	L	100	100	700	12-18-19	B,a	2	4
329*	1,500	2	15	30	100	N	10	100	100	100	700	12-18-19	B,b	2	4
330	150	5	5	10	70	N	5	150	30	70	200	12-18-19	A,a	2	1.5
331*	200	2	L	10	70	N	L	N	50	70	300	12-18-19	A,a	2	1.2
332*	300	2	5	10	50	N	5	N	70	50	200	12-18-19	E	3	
333*	300	15	L	N	50	N	5	300	70	100	70	12-18-19	A,a	2	3
334*	1,000	1.5	7	10	70	5	10	200	100	50	700	12-18-19	A,a	2	4
335*	700	7	70	N	200	1,000	L	500	50	200	700	12-18-20	B,c	2	.3
336	700	5	5	N	70	N	7	N	100	50	500	12-18-20	A,a	2	4
337*	700	5	10	15	70	N	7	100	150	70	300	12-18-20	B,c	2	.3
338*	200	2	5	20	50	30	15	N	50	200	150	12-18-20	A,e	2	3
339	300	1	15	30	20	N	30	200	200	20	300	12-18-20	A,a	2	2
340	300	L	15	50	30	N	30	200	200	20	300	12-18-20	A,a	2	3.5
341	1,000	1.5	N	30	70	15	10	N	70	50	500	12-18-20	B,e	2	3
342*	1,000	5	30	30	50	N	50	N	300	30	300	12-18-20	A,a	2	2.6
343	700	10	10	20	50	N	20	100	150	30	300	12-18-20	A,a	2	3
344	700	5	10	20	50	N	15	100	100	30	300	12-18-20	A,a	2	1.5
345	30	2	N	10	30	N	7	N	50	10	70	12-18-29	F	2	6
346	500	3	10	20	30	20	20	N	50	50	300	12-18-29	B,a	2	4
347*	500	2	20	70	N	20	50	100	150	100	150	12-18-29	B,a	2	3
348*	200	10	70	5	30	50	20	N	30	50	100	12-18-29	B,a	2	6
349	150	3	5	50	20	5	7	N	70	20	100	12-18-29	F	3	
350*	700	L	N	10	50	700	10	N	70	70	100	12-18-29	B,b	2	6
351	700	1	30	15	30	N	30	N	100	30	300	12-18-29	B,a	2	3
352*	200	2	30	50	70	5	50	N	70	20	50	12-18-29	B,c	3	
353*	500	N	20	20	30	N	30	300	300	20	100	12-18-29	A,a	2	4.5
354	700	1.5	20	70	30	30	50	100	200	30	200	12-18-29	A,a	2	3
355	700	N	30	50	20	15	50	N	150	20	200	12-18-29	F	3	
356*	200	L	10	70	50	50	20	100	150	200	100	12-18-30	A,e	2	2.5
357	100	1.5	N	10	20	N	10	N	70	20	70	12-18-30	A,a	2	4
358*	200	5	20	200	N	5	50	300	200	20	100	12-18-30	D	4	
359*	200	3	50	5	30	N	30	N	30	15	100	12-18-30	A,a	2	4
360*	20	2	N	L	30	N	L	1,500	10	20	100	12-18-30	B,a	2	3
361*	300	1.5	N	5	20	N	15	1,000	20	20	100	12-18-30	F	2	20
362	1,000	1.5	N	5	30	5	N	100	30	50	100	12-18-29	A,a	2	6
363*	300	1	10	5	30	N	N	100	50	100	100	12-18-29	A,c	2	7
364*	100	2	7	5	20	N	N	N	50	100	70	12-18-29	A	2	25
365*	300	1	7	15	15	150	10	L	150	15	200	12-18-29	A,a	2	1.2
366	300	3	5	N	30	N	15	N.	15	20	100	12-18-29	A,a	2	2
367*	1,000	1	N	50	50	20	7	700	150	30	500	12-18-20	A,e	2	
368*	700	N	N	70	50	10	20	1,000	100	15	300	12-18-20	A,e	2	
369*	700	L	15	30	30	N	30	150	200	30	100	12-18-29	B,a	4	2.5
370	150	2	15	7	30	N	20	100	50	20	150	12-18-29	B,e	2	
371*	700	2	20	30	30	5	30	N	150	50	200	12-18-29	B,a	4	2.5
372	150	2	L	5	70	15	15	N	20	50	200	12-18-29	B,e	2	
373*	300	L	30	50	20	10	70	500	200	10	100	12-18-29	B,c	2	P .5
374	150	1.5	L	5	30	N	15	N	30	15	100	12-18-29	D	3	
375	100	L	N	20	50	70	7	N	70	20	200	12-18-29	D	3	
376*	50	2	5	N	20	200	7	N	30	15	70	12-18-20	D	3	
377*	150	L	N	10	20	5	5	500	70	10	70	12-18-20	A,a	2	.5
378*	300	2	10	10	20	20	30	N	150	20	100	12-18-20	B,e	2	
379*	70	1	N	N	70	200	7	N	50	100	50	12-18-20	B,e	3	
380	100	3	N	N	20	30	7	N	20	20	150	12-18-20	D	3	
381*	50	1	N	N	70	300	5	N	10	100	30	12-18-20	D	3	
382*	100	L	N	10	100	1,000	10	100	30	100	70	12-18-20	D	4	
383	200	2	N	N	30	50	7	N	20	50	300	12-18-20	D	3	
384	150	1	N	5	30	15	5	N	20	50	150	12-18-29	D	3	
385	150	1.5	N	15	30	7	10	N	100	20	200	12-18-20	C,c	2	1

Table 9.--Continued

Sample	Ounces/ton		Chemical analyses (percent) Cu	Pb	Zn	CaF2	AA (ppm) Te	Semiquantitative spectrographic analyses (percent) Fe (.05)	Mg (.02)	Ca (.05)	Ti (.002)	(ppm) Mn (10)	B (10)
386	0.01	0.19	---	---	---	---	1.3	10	0.3	0.07	0.15	150	N
387*	.005	Tr	---	---	---	---	1.3	1	.3	.07	.1	200	L
388	.005	.16	---	---	---	---	8.4	.3	.1	.05	.1	100	10
389	.01	.07	---	---	---	---	4	5	.3	1.5	.3	300	10
390	.01	Tr	---	---	---	---	11.5	1	.1	.05	.15	200	L
391	.01	Tr	---	---	---	3.73	N	2	.7	.7	.3	700	10
392	.01	Tr	---	---	---	2.01	.17	1.5	.5	1	.15	300	10
393*	.01	.05	---	---	---	50.68	.16	3	.2	15	.07	30	N
394	.02	.36	---	---	---	---	23.5	1	.3	.3	.07	200	L
395	.02	.08	---	---	---	---	99	1	.15	1.5	.07	70	N
396	.02	Tr	---	---	---	---	244	.7	.05	.7	.07	50	L
397*	.03	.19	---	---	---	---	620	1.5	.03	.05	.07	70	L
398*	.80	.32	---	---	---	---	3,500	5	.03	.7	.07	100	L
399	.02	.12	---	---	0.044	1.87	N	3	.7	.7	.3	700	10
400	.01	.05	---	---	---	---	49	1	.1	.05	.1	70	10
401*	.04	.04	---	---	---	---	97	3	.5	.5	.2	500	10
402*	.20	.26	0.143	---	---	---	2,730	5	.07	.3	.07	150	10
403	.005	.16	---	---	---	---	N	2	.2	.05	.15	500	10
404*	.01	.19	---	---	---	---	118	3	.5	.05	.3	200	30
405	.005	.28	---	---	---	---	N	1	.3	.3	.1	150	10
406*	Tr	.22	.255	---	.055	---	.2	2	.3	.07	.05	>5,000	30
407	.01	.19	---	---	---	3.02	1.9	3	.5	>20	.15	300	15
408*	.01	.07	.024	---	---	---	1.8	.7	1.5	.15	.5	300	100
409	.01	.15	---	---	---	---	.58	5	.7	1	.2	200	20
410	.01	Tr	---	---	---	---	.4	3	.2	.3	.15	100	10
411*	.01	Tr	---	---	---	---	.2	3	.2	.05	.2	100	10
412	.005	Tr	---	---	---	---	N	3	.7	.15	.3	700	10
413*	.005	Tr	---	---	---	---	N	3	.7	.3	.3	200	15
414	.005	Tr	---	---	---	76.72	N	.7	.3	>20	.1	3,000	L
415	.005	Tr	---	---	---	---	.5	3	.7	2	.21	300	10
416	.01	Tr	.05	---	---	58.73	N	1.5	.5	>20	.1	200	L
417	.01	Tr	---	---	---	40.39	1.4	3	1	20	.2	300	L
418	.01	Tr	---	---	---	26.39	N	5	1	.5	.5	300	L
419	.01	Tr	---	---	---	38.35	N	.7	.2	20	.03	50	L
420*	.01	.11	.031	---	---	5.60	N	10	2	10	.2	1,500	L
421*	.01	.49	1.473	0.46	.061	---	N	15	3	2	1	1,500	10
422*	.02	Tr	.036	---	---	49.06	N	3	.7	>20	.3	200	10
423*	.01	Tr	.01	---	---	57.26	.1	5	.5	>20	.2	500	L
424*	.01	Tr	1.262	.04	---	---	.1	3	.3	.5	.2	300	10
425*	.03	.21	.18	.02	---	9.87	N	7	1.5	7	.3	1,500	L
426*	.03	.41	6.68	.92	---	---	.4	10	1.5	1	.3	1,000	L
427*	.01	Tr	2.204	.04	---	---	.3	10	1	1	.3	1,000	10
428*	.01	.33	4.40	.08	.31	---	.9	3	.15	.2	.1	200	10
429*	Tr	.34	.98	.08	---	---	N	1	.3	.1	.2	500	L
430	.01	Tr	Tr	---	---	---	.3	3	.15	.2	.15	150	10
431*	.01	Tr	.283	.06	---	---	N	5	1	.2	.15	5,000	15
432*	1.36	.10	8.82	1.04	.063	---	4.75	10	.2	.15	.07	1,500	10
433*	.04	3.66	7.05	.06	---	---	1	15	.5	.2	.1	1,500	10
434*	.01	Tr	1.17	.04	---	1.69	.6	5	.5	15	.15	1,000	N
435	.01	Tr	---	---	---	13.93	N	2	.2	10	.15	150	10
436	.01	Tr	---	---	---	18.83	N	1.5	.2	10	.1	300	10
437*	.03	Tr	---	---	---	23.87	N	2	.2	20	.1	200	L
438	Tr	Tr	---	---	---	---	.96	5	1.5	1	.3	1,500	10
439*	.12	.36	.041	.22	---	---	1.1	10	.3	.1	.15	1,000	L
440*	.02	.42	.031	.11	---	---	.3	5	.3	.15	.2	1,000	L
441	.01	.21	---	---	---	---	N	3	1	.3	.2	1,000	10
442	Tr	.20	Tr	---	---	---	.8	3	.7	.2	.3	700	N
443	Tr	.16	---	---	---	---	.5	2	1	.15	.2	1,000	10
444*	Tr	.20	---	---	---	---	N	3	1	.15	.2	500	10
445	Tr	.50	---	---	---	---	.4	2	.5	.05	.1	200	N
446	Tr	.30	---	---	---	---	.5	1	.7	.2	.1	500	N
447	.005	.18	.061	---	---	---	.9	2	.2	.3	.05	200	10
448*	.005	.52	---	---	---	3.57	.2	3	1	5	.15	2,000	20
449	.005	.12	---	---	---	---	.1	3	.3	.1	.2	700	L
450	.005	.14	---	---	---	---	.1	3	.2	.1	.2	200	10

Sample	Semiquantitative spectrographic analyses (ppm) Ba (20)	Be (1)	Co (5)	Cr (10)	La (20)	Mo (5)	Ni (5)	Sr (100)	V (10)	Y (10)	Zr (10)	Location	Site	Type	Width (feet)
386	200	2	L	15	30	30	10	N	70	15	200	12-18-20	D	3	
387*	70	1.5	7	L	50	10	7	N	50	30	200	12-18-20	B,b	2	3
388	50	1.5	N	L	30	N	L	N	30	20	150	12-18-20	B,b	2	0.5
389	300	1.5	20	15	50	15	15	N	150	20	200	12-18-20	B,a	2	1.5
390	100	1.5	L	L	50	7	L	N	30	70	200	12-18-20	D	3	
391	300	1.5	50	10	70	N	50	200	70	30	300	12-18-20	B,a	2	3.5
392	300	1.5	20	5	70	N	30	100	70	30	150	12-18-20	B,e	2	
393*	100	1	30	7	50	100	20	N	50	100	70	12-18-20	B,b	2	.5
394	100	3	7	L	30	5	20	N	30	50	100	12-18-20	B,b	2	.8
395	30	3	N	5	20	N	15	N	20	70	150	12-18-20	B,e	2	3.5
396	N	1	5	L	30	10	10	N	30	30	70	12-18-20	B,a	2	3
397*	30	3	7	L	N	15	10	N	30	30	100	12-18-20	B,b	2	1
398*	200	1.5	20	L	70	30	30	N	70	30	100	12-18-20	B,b	2	2
399	500	3	30	15	50	7	50	N	70	50	200	12-18-20	B,e	2	
400	30	2	L	5	30	7	10	N	30	70	150	12-18-20	B,e	2	
401*	200	2	5	N	30	30	10	N	50	50	200	12-18-20	D	3	
402*	100	3	7	N	100	50	7	N	20	50	150	12-18-20	D	4	
403	150	1.5	N	N	20	N	7	N	30	50	200	12-18-29	D	3	
404*	20	1	N	5	100	30	7	N	30	20	500	12-18-29	B,e	2	3
405	150	5	N	N	30	100	5	N	15	50	100	12-18-28	A,a	2	8
406*	5,000	10	150	N	20	70	50	700	50	50	70	12-18-28	D	3	
407	200	1.5	N	15	70	10	10	N	70	50	100	12-18-28	A,e	3	
408*	1,000	2	N	50	50	100	5	100	200	20	200	12-18-29	C	2	.8
409	200	3	N	15	N	70	10	N	70	30	200	12-18-29	C	2	2
410	300	3	N	10	30	5	5	N	70	20	150	12-18-28	B,e	2	.3
411*	300	3	N	10	50	N	5	N	100	15	150	12-18-28	B,a	2	1.5
412	700	5	5	5	100	N	5	N	100	30	300	12-18-28	B,b	2	.3
413*	500	3	5	5	30	5	5	200	150	30	300	12-18-28	B,a	2	.5
414	300	1	5	5	50	N	L	150	100	70	30	12-18-33	A,a	2	1
415	500	3	10	20	N	N	20	N	70	20	70	12-18-32	D	3	
416	70	1.5	N	10	30	N	L	N	100	70	50	12-18-33	A,a	1	3
417	150	7	10	70	20	N	50	N	150	70	70	12-18-33	A	2	8
418	500	3	20	50	30	N	50	N	200	50	100	12-18-33	A,a	2	5
419	70	1	N	N	30	N	5	N	30	50	30	12-18-33	E	3	
420*	700	2	50	200	50	N	70	100	200	50	150	12-18-33	B,c	2	.2
421*	1,500	3	50	300	30	N	100	200	300	50	200	12-18-33	A,c	2	1.5
422*	700	1.5	10	150	100	N	30	100	150	>200	100	12-18-33	A,a	2	4
423*	300	1.5	5	30	70	N	5	100	150	>200	100	12-18-33	A,a	2	1
424*	1,000	1	N	5	30	100	5	100	50	20	300	12-18-33	D	4	
425*	1,000	5	20	20	50	N	15	100	150	100	300	12-18-33	B,a	2	.8
426*	1,500	2	15	20	30	10	10	150	150	50	200	12-18-33	A	3	
427*	2,000	2	15	20	20	10	15	150	150	30	200	12-18-34	D	4	
428*	500	3	N	20	N	500	10	N	20	20	100	13-18- 3	D	4	
429*	700	1.5	5	L	20	150	5	100	20	20	100	13-18- 3	E	3	
430	200	5	N	30	N	70	20	N	50	10	100	13-18- 3	D	3	
431*	1,500	7	5	50	100	N	20	100	100	70	150	13-18- 3	B,a	1	4
432*	300	10	N	10	N	70	5	N	700	50	70	13-18- 3	B,c	2	.3
433*	2,000	7	10	20	N	100	15	N	200	30	100	13-18- 3	B,b	2	3
434*	1,100	1.5	L	30	20	50	15	200	100	20	100	13-18- 3	D	4	
435	500	2	N	50	N	N	15	N	50	50	50	13-18- 3	F,e	2	
436	700	2	N	30	20	N	15	N	20	50	50	13-18- 3	D	3	
437*	200	2	N	30	20	150	10	N	30	50	20	13-18- 3	A,a	2	4
438	1,500	1	10	20	30	N	10	150	150	30	200	13-18- 3	F,e	2	
439*	700	5	5	N	20	10	5	N	100	30	100	13-18- 3	A,a	2	1.3
440*	1,000	3	5	N	20	5	7	100	70	20	100	13-18- 3	D	3	
441	1,000	2	5	5	30	N	7	150	100	20	150	13-18- 3	B,a	2	1
442	700	2	10	L	50	N	5	200	50	30	100	13-18- 3	B,a	2	1
443	1,000	3	5	L	70	N	5	N	30	50	150	13-18- 3	B,b	1	2
444*	1,000	2	5	N	70	N	7	100	150	30	100	13-18- 3	B,b	2	.8
445	1,500	1.5	5	L	30	N	5	N	20	20	100	13-18- 3	B,d	1	P .3
446	1,000	1.5	N	L	50	N	L	N	50	20	100	13-18- 3	B,d	1	P .3
447	200	2	N	N	50	N	7	N	30	15	70	13-18- 3	B,e	4	
448*	100	1	N	5	N	N	10	300	150	L	70	13-18- 2	F,e	3	
449	500	2	N	5	20	N	10	100	30	50	150	13-18- 2	F,e	2	
450	500	3	N	5	N	50	7	N	70	10	100	13-18- 2	A,a	2	3

Table 9.--Continued

Sample	Chemical analyses: Ounces/ton Au	Ag	(percent) Cu	Pb	Zn	CaF2	AA (ppm) Te	Semiquantitative spectrographic analyses (percent) Fe (.05)	Mg (.02)	Ca (.05)	Ti (.002)	(ppm) Mn (10)	B (10)
451	0.005	0.14	---	---	---	---	7	2	0.15	0.1	0.07	200	10
452	.005	.20	---	---	---	---	0.1	1.5	.15	.1	.1	70	10
453*	.01	.27	---	---	---	---	.4	2	.07	.2	.03	50	L
454	.005	.06	---	---	---	21.07	6	1.5	.3	10	.15	100	10
455	.005	.16	---	---	---	5.70	N	2	.3	5	.2	200	10
456	.005	.16	---	---	---	3.78	N	1	.07	1	.02	70	10
457	Tr	.04	---	---	---	70.28	7.6	1	.3	>20	.05	100	L
458	.01	Tr	---	---	---	27.65	N	2	.3	15	.15	200	10
459	Tr	.34	---	---	---	50.96	.9	1	.3	>20	.07	1,500	N
460*	.01	.04	---	---	---	---	N	1	.2	2	.07	300	10
461	.01	Tr	---	---	---	95.20	N	.1	.05	>20	.02	70	N
462	.02	.12	0.031	---	---	29.75	N	3	.7	15	.2	500	10
463*	.005	Tr	---	---	---	88.90	.6	.5	.07	>20	.3	20	N
464*	.005	.18	---	---	---	72.38	.2	.3	.1	>20	.03	30	N
465*	.01	Tr	.014	---	0.011	97.16	1.1	.15	.05	>20	.01	15	N
466	.01	.03	---	---	---	4.93	N	3	.3	5	.3	200	15
467*	.01	.13	---	---	---	48.44	1	1.5	.15	>20	.03	100	10
468	.005	.40	---	---	---	79.38	.9	.3	.15	>20	.05	30	L
469*	.005	.24	---	---	---	56.77	N	.7	.3	20	.05	50	10
470	.02	Tr	---	---	---	---	N	1.5	.2	.5	.1	200	10
471	.01	.03	---	---	---	---	N	3	.5	.2	.2	700	10
472*	.01	Tr	---	---	---	---	N	1.5	.2	.2	.07	>5,000	10
473*	.03	Tr	.031	---	---	44.38	N	3	.2	20	.15	5,000	10
474	Tr	.14	---	---	---	---	N	2	.7	2	.1	200	30
475	.01	.09	---	---	---	63.84	1.1	.7	.2	>20	.05	50	L
476	.02	.22	---	---	---	44.66	1	1	.2	>20	.07	70	10
477	.005	.24	---	---	---	---	.2	.3	.15	1	.5	70	15
478	.01	.11	---	---	---	---	.2	2	.3	1.5	.1	200	10
479*	.01	.04	---	---	---	26.32	N	15	.15	20	.07	150	10
480*	.005	.20	.008	0.01	---	---	.44	3	.5	5	.15	1,000	10
481	.005	.40	---	---	---	92.96	.1	.2	.07	>20	.02	20	N
482*	.025	Tr	---	---	---	33.25	N	1.5	.1	7	.07	30	10
483	.01	.11	---	---	---	5.74	.36	.7	.2	2	.1	50	20
484	.01	.07	---	---	---	50.89	N	1.5	.15	20	.05	20	N
485	.01	Tr	---	---	---	44.17	.79	.7	.15	10	.07	30	N
486	.01	Tr	---	---	---	62.23	.8	.7	.1	20	.05	20	N
487	.02	Tr	---	---	---	30.10	N	1	.15	10	.07	30	N
488	Tr	.14	---	---	---	---	.9	3	.1	.1	.10	100	15
489	.01	.23	---	---	---	50.40	1	3	.7	20	.15	100	L
490	.005	.42	---	---	---	---	N	5	.5	2	.5	500	L
491*	.005	.14	---	---	---	---	1.1	10	5	5	>1	1,000	L
492*	.005	.40	---	---	---	---	.4	15	2	5	1	1,000	L
493*	Tr	.08	---	---	---	1.82	.9	10	3	15	1	500	L
494	Tr	.14	---	---	---	6.16	1	1.5	1	>20	.2	20	N
495*	Tr	.32	---	---	---	---	1.94	5	1.5	7	.5	700	L
496*	.02	.52	---	---	---	---	N	10	3	5	.7	1,000	L
497*	Tr	Tr	---	---	---	---	N	7	3	3	.5	700	10
498	.015	Tr	---	---	---	---	.2	1	.1	1	.03	300	20
499	.005	.28	---	---	---	---	N	2	.5	.2	.2	700	20
500*	.01	.13	---	---	---	---	N	10	1.5	2	.7	500	10
501*	.01	.33	---	---	---	---	.4	5	.7	.7	.50	1,000	10
506	Tr	Tr	---	---	---	---	.5	.5	.5	>20	.07	200	N
507	.005	Tr	---	---	---	---	N	3	.5	.5	.3	200	30
508*	.01	.13	---	---	---	---	N	2	.3	>20	.15	1,000	10
509	.01	.26	---	---	---	---	.8	10	.7	.15	.3	100	50
510*	.005	.14	---	---	---	---	2.9	10	.7	.2	.5	30	200
511	.01	.29	---	---	---	---	N	5	1.5	.5	.5	500	20
512	.01	.17	---	---	---	---	.5	5	1.5	.5	.3	200	L
513*	.005	.16	---	---	---	---	4.75	7	.2	.2	.5	50	L
514*	Tr	.18	.028	---	---	---	N	10	.3	.1	.3	200	L
515*	Tr	.10	.034	---	---	---	.2	2	.5	.5	.5	150	10
516*	Tr	Tr	---	---	---	---	N	5	.1	.05	.5	10	10
517*	.02	.48	---	---	---	---	N	2	.7	.1	.5	30	30
518	.005	.14	---	---	---	---	N	5	.1	.1	.7	50	L
519*	.005	.16	---	---	---	---	N	7	.2	.1	1	50	10

Sample	Semiquantitative spectrographic analyses (ppm) Ba (20)	Be (1)	Co (5)	Cr (10)	La (20)	Mo (5)	Ni (5)	Sr (100)	V (10)	Y (10)	Zr (10)	Location	Site	Type	Width (feet)
451	300	3	N	5	N	50	10	N	30	15	70	13-18-11	A,a	2	1.3
452	200	3	N	N	N	15	7	N	30	10	70	13-18-11	A,e	4	
453*	200	3	N	N	N	200	5	N	10	10	50	13-18-11	D	3	
454	700	3	N	N	30	7	5	N	70	50	200	13-18-11	A,e	2	3.1
455	1,000	3	N	N	30	N	7	100	100	30	100	13-18-11	A,e	2	
456	150	3	7	N	N	N	5	N	10	20	10	13-18-11	A,a	2	1.7
457	50	1	N	5	20	N	5	100	70	15	20	13-18-11	A,a	2	3
458	300	2	N	N	20	15	15	N	50	30	100	13-18-11	A,e	2	2
459	300	2	N	N	20	N	N	200	50	50	100	13-18-11	A,e	3	
460*	200	7	N	N	30	N	5	2,000	L	20	70	13-18-12	F,e	2	
461	20	N	N	N	70	N	N	100	N	100	10	13-18-13	E	3	
462	1,000	1.5	7	50	70	N	10	200	70	70	300	13-18-13	A,a	2	0.7
463*	10	L	N	N	20	N	N	N	30	200	10	13-17- 7	A,a	2	7
464*	20	L	N	N	30	N	N	100	15	150	50	13-17-18	E	3	
465*	N	N	N	N	30	N	N	100	15	200	20	13-17-18	A,e	2	.7
466	300	2	N	30	30	50	5	N	70	70	300	13-17-18	B,a	2	1.1
467*	150	1	N	10	30	20	5	100	100	150	50	13-17-18	A,a	2	1.2
468	100	1	N	5	50	N	N	200	30	15	70	13-17-18	A,a	2	2.2
469*	100	1	N	N	50	N	L	100	50	50	50	13-17-18	A,a	2	2.5
470	500	3	N	5	20	30	5	N	50	20	150	13-17-18	A,a	2	.5
471	1,000	1.5	5	5	30	N	10	N	70	30	200	13-17-18	F	2	5
472*	>5,000	30	15	20	30	15	20	700	70	20	50	13-17-19	F,e	2	
473*	2,000	5	5	20	30	N	15	150	100	70	70	13-17-19	A,a	2	5
474	200	1.5	10	50	N	N	50	100	50	N	70	13-17-23	F,e	2	
475	3,000	1	N	N	50	20	L	150	50	30	70	14-16-29	A,a	2	1
476	300	L	N	5	50	N	5	100	70	70	70	14-16-29	A,a	2	3
477	300	1	15	10	30	N	15	300	200	30	300	14-16-20	F,e	2	
478	500	1	5	5	N	N	10	N	50	L	100	14-16-21	F	2	3
479*	300	2	7	70	30	10	20	300	100	30	100	14-16-16	F	2	1
480*	>5,000	5	5	20	N	10	20	1,000	30	10	100	14-16-15	F,e	2	12
481	20	N	N	N	70	N	N	200	20	10	50	14-16-21	E	3	
482*	50	1	N	L	30	150	7	N	20	10	50	14-16-28	B,a	2	1
483	150	1.5	N	L	30	7	L	L	30	15	150	14-16-28	E	3	
484	50	N	N	L	30	10	L	100	30	20	50	14-16-28	A,a	2	1
485	70	L	N	N	20	5	L	100	30	15	70	14-16-28	C,a	2	3
486	30	N	N	L	20	L	5	100	30	15	30	14-16-28	A,a	2	1
487	200	L	N	L	30	10	5	150	30	30	70	14-16-28	A,a	2	2
488	300	1	7	5	N	30	7	N	30	L	100	14-16-28	B,a	2	2.5
489	500	L	10	20	70	N	10	150	200	30	100	14-16-33	C,b	2	3.5
490	1,000	L	5	5	30	N	5	700	200	20	200	15-16- 4	F,e	2	9
491*	1,000	N	70	500	20	N	100	1,000	300	50	200	14-16-26	F	2	22
492*	1,000	1	30	70	70	N	50	1,000	200	50	200	14-16-23	F	2	25
493*	1,000	L	30	70	70	N	30	1,000	200	50	300	14-16-14	F,e	2	
494	150	N	5	30	N	N	5	300	100	30	100	14-16-14	F,e	2	
495*	700	L	20	100	N	N	50	1,000	150	20	150	13-16-26	F,e	2	
496*	700	N	30	200	N	N	70	700	300	30	150	13-16-26	F,e	2	
497*	1,500	L	20	70	30	N	50	3,000	150	30	150	13-15-27	A,a	2	1.1
498	100	2	N	5	N	N	7	N	L	15	50	13-15-27	F,e	2	
499	150	5	5	10	30	N	7	N	15	70	300	15-14-17	A,a	2	5
500*	700	1	50	150	70	N	100	700	100	30	300	15-14-20	A,e	2	
501*	1,000	1	30	100	50	N	50	200	100	20	200	15-14-23	F,e	2	
506	100	L	N	10	N	N	5	150	10	10	20	14-13-28	D	3	
507	700	2	N	30	50	N	15	N	70	30	500	14-13-29	F,e	2	
508*	200	L	10	50	N	N	15	500	50	15	70	14-13-29	E	2	
509	700	1.5	7	50	50	N	15	500	200	20	150	14-13-29	F,e	2	
510*	1,500	L	N	100	50	L	10	500	150	30	200	14-13-29	D	3	
511	1,000	1.5	30	70	70	N	70	200	100	30	200	14-13-20	D	3	
512	500	2	30	50	20	10	50	100	70	20	150	14-13-20	D	3	
513*	700	N	10	100	70	20	20	700	150	30	150	14-13-20	B,b	2	3.5
514*	1,000	N	100	100	30	7	100	300	200	50	200	14-13-20	F,e	2	
515*	700	N	50	100	50	N	100	300	100	50	200	14-13-20	A,e	2	
516*	700	L	N	200	50	5	10	500	200	10	200	14-13-20	B,b	2	4
517*	1,000	L	N	50	50	N	7	300	150	30	300	14-13-20	D	3	
518	500	L	N	50	N	N	7	300	70	10	200	14-13-17	A,a	2	4
519*	500	1	N	150	70	5	15	700	200	30	500	14-13- 9	A,a	2	3.5

Table 9.--Continued

Sample	Chemical analyses: Ounces/ton Au	Ag	(percent) Cu	Pb	Zn	CaF2	AA (ppm) Te	Semiquantitative spectrographic analyses (percent) Fe (.05)	Mg (.02)	Ca (.05)	Ti (.002)	(ppm) Mn (10)	B (10)
520*	0.005	0.10	---	---	---	---	N	1.5	0.2	0.1	1	50	N
521*	.01	.09	---	---	---	---	N	5	.2	.5	.3	100	50
522	Tr	.12	---	---	---	---	.4	3	.05	.2	.5	30	10
523	Tr	Tr	---	---	---	---	N	2	.02	.1	.5	70	L
524	Tr	Tr	0.021	---	---	---	.6	10	.3	.05	.2	30	10
525	Tr	.04	---	---	---	---	.3	5	.5	.05	.3	20	15
526	.005	.04	---	---	---	---	N	5	.5	.05	.5	20	10
527	Tr	.10	---	---	---	---	N	5	.3	.1	.5	30	10
528*	.28	.36	---	---	---	---	N	20	.1	.2	.7	100	20
529*	Tr	.16	.042	---	---	---	.5	5	.02	.07	.05	20	N
530*	Tr	.14	.177	---	---	---	N	3	L	.07	.05	L	L
531	Tr	.10	---	---	---	---	N	.5	L	.1	.5	L	10
532	Tr	Tr	---	---	---	---	.3	.5	L	.1	.15	10	L
533	Tr	.04	---	---	---	---	N	7	.7	.5	.5	100	10
534	.04	3.06	---	---	---	---	N	1	L	.07	.5	10	30
535*	Tr	Tr	---	---	---	---	.9	1	L	.07	.5	15	15
536*	Tr	.20	---	---	---	---	.8	3	L	.05	.3	30	10
537	Tr	.06	---	---	0.026	---	.5	.7	.05	.07	.5	50	10
538*	Tr	.20	---	---	---	---	N	5	L	.05	.5	30	L
539*	.005	.19	---	---	---	---	5.37	10	.07	.07	.5	20	L
540*	Tr	Tr	---	---	---	---	.5	10	.02	.1	.3	100	10
541	Tr	.05	---	---	---	---	N	5	L	.2	.5	30	L
542*	.005	Tr	---	---	---	---	N	10	.5	1	.5	150	50
543	Tr	Tr	---	---	---	---	N	1	.2	1	.15	200	20
544*	Tr	Tr	---	---	---	---	N	.5	.1	5	.03	50	15
545*	Tr	.04	---	---	---	---	1.3	7	2	3	.5	100	L
546*	Tr	Tr	---	---	---	---	N	.3	.1	10	.05	50	L
547	Tr	Tr	---	---	---	---	.9	1	.07	.2	.1	500	15
548	Tr	.38	---	---	---	---	.2	1	.1	.3	.15	500	10
549*	Tr	Tr	---	---	---	---	N	1	.1	.1	.1	200	15
550*	.005	Tr	---	---	---	---	N	15	2	.5	>1	2,000	L
551	.01	Tr	---	---	---	---	1.4	2	.5	.7	.2	500	N
552	.01	Tr	---	---	---	---	N	2	.5	.7	.3	1,500	N
553A*	Tr	.20	---	---	---	---	.2	2	.3	.3	.3	700	15
553B*	Tr	.09	---	---	.03	---	N	10	.5	.3	1	3,000	10
554	.01	Tr	---	---	---	---	1.3	3	.7	.7	.3	500	L
555A*	.005	.34	---	---	---	---	.4	1.5	.2	.2	.1	200	15
555B*	.01	.15	---	---	---	---	N	3	.3	.3	.3	700	15
556A*	.005	.16	---	---	---	---	1.3	2	.7	1	.2	300	30
556B*	.005	.10	---	---	---	---	N	3	.5	.7	.3	1,000	20
557*	.005	Tr	---	---	---	---	.5	3	.15	.1	.1	700	10
558*	.005	Tr	---	---	.033	---	N	10	.2	.15	.1	1,500	15
559	.01	Tr	---	---	---	---	N	2	.5	1	.15	700	10
560	.005	Tr	---	---	---	---	.4	7	1.5	2	.7	700	N
561	.005	.06	---	---	---	---	N	1.5	.5	.7	.2	200	N
562	.005	Tr	---	---	---	---	.4	1	.05	.1	.1	150	N
563	.01	Tr	---	---	---	---	N	1	L	.05	.07	150	10
564	.005	Tr	---	---	---	---	3.5	1.5	.07	.1	.05	500	10
565	.01	.07	---	---	---	---	.44	1.5	.2	.5	.07	300	10
566	.005	.22	---	---	---	---	.35	3	1	7	.3	300	N
567	.01	.19	---	---	---	---	N	1	.1	.2	.05	300	N
568	.005	Tr	---	---	---	---	N	1	.05	.07	.03	100	N
569	.01	Tr	---	---	---	---	N	1.5	.03	.15	.15	200	10
570	.005	Tr	---	---	---	---	.3	1	.03	.1	.15	300	10
571	.01	.11	---	---	---	---	.57	1	.3	1	.07	300	N
572*	.01	.15	---	---	---	---	1.9	1.5	.2	.07	.07	700	10
573	.01	.05	---	---	---	---	N	.5	.02	.05	.01	100	L

Sample	Semiquantitative spectrographic analyses (ppm) Ba (20)	Be (1)	Co (5)	Cr (10)	La (20)	Mo (5)	Ni (5)	Sr (100)	V (10)	Y (10)	Zr (10)	Location	Site	Type	Width (feet)
520*	700	1	N	100	N	N	15	700	100	50	500	14-13- 9	A,e	2	10
521*	300	1.5	20	7	20	L	15	1,000	150	15	150	14-13- 4	F,e	2	
522	500	N	30	20	30	N	50	500	200	30	200	13-13-32	A,e	2	
523	700	N	L	50	30	10	7	500	150	10	200	13-13-30	F,e	3	
524	700	L	50	10	20	5	20	500	70	20	100	13-13-29	B,b	3	
525	500	L	20	15	30	L	15	200	100	20	150	13-13-29	B,b	3	
526	700	L	10	15	30	N	15	100	100	30	300	13-13-29	B,b	2	4
527	700	L	N	15	50	L	10	300	150	30	200	13-13-29	D	3	
528*	700	L	7	150	50	15	15	500	500	20	300	13-13-20	F,e	2	
529*	50	L	70	15	N	N	100	L	70	L	100	13-13-29	B,d	2	
530*	500	N	30	10	30	N	70	1,000	150	15	150	13-13-29	B,a	2	4
531	700	N	N	20	70	N	5	500	100	20	200	13-13-29	D	3	
532	150	L	20	15	N	N	30	150	50	10	100	13-13-29	F,e	2	
533	1,000	L	20	20	30	L	20	300	150	30	200	13-13-20	D	3	
534	700	N	N	70	30	N	L	500	70	10	200	13-13-19	F,e	2	
535*	500	N	N	70	50	7	10	500	100	20	200	13-13-19	F,e	2	
536*	500	L	30	50	20	5	50	300	70	20	150	13-13-30	B,e	2	
537	1,000	L	20	50	70	N	30	300	100	30	200	13-13-19	B,a	2	2.5
538*	500	L	50	30	20	5	70	200	70	30	200	13-13-19	B,e	2	
539*	1,000	L	N	150	50	10	10	500	150	100	200	13-13-30	F,e	2	
540*	700	N	5	100	20	20	20	500	200	20	150	13-13-19	A,e	3	
541	1,000	N	N	50	50	5	7	700	200	30	300	13-13-19	D	3	
542*	700	2	15	50	50	N	15	1,000	200	20	200	13-13-20	F,e	2	
543	500	1	5	20	30	N	20	150	20	20	100	12-14-23	A,e	2	
544*	150	L	L	10	N	N	300	L	L	L	20	12-14-23	F,e	2	
545*	1,000	1	50	300	150	N	100	1,000	100	50	300	12-14-23	F,e	2	
546*	20	L	N	10	N	N	L	L	15	L	20	12-14-23	F	2	3
547	70	2	N	10	70	N	7	N	10	50	150	14-11- 5	F,e	2	
548	70	2	N	10	50	N	5	N	10	50	150	14-11- 5	F,e	2	
549*	100	3	N	10	50	N	10	N	10	50	150	14-11- 5	A,e	3	
550*	1,000	1	70	70	50	N	100	500	200	50	200	13-12-12	F,e	2	
551	500	N	7	20	30	N	20	200	30	10	100	11-12- 9	F,e	2	20
552	700	N	7	10	20	N	15	100	20	10	100	11-12- 9	F,e	2	6
553A*	300	5	7	30	50	N	10	200	50	70	200	11-12- 9	G	1	2.5
553B*	300	3	10	70	100	L	7	150	100	100	1000	11-12- 9		5	
554	700	1.5	7	15	50	L	15	150	50	50	200	11-12- 5	D	3	
555A*	300	5	N	L	50	N	7	150	20	30	150	11-12- 5	A,d	3	1
555B*	500	3	7	30	70	L	10	200	70	70	300	11-12- 5		5	
556A*	500	3	7	30	50	N	10	300	50	50	150	11-12- 5	D	1	10
556B*	500	5	10	50	100	L	15	200	70	70	300	11-12- 5		5	
557*	70	3	N	10	50	N	7	N	N	70	100	11-12- 5	A,a	2	0.7
558*	70	3	N	15	70	N	7	N	50	>200	150	11-12- 5	A,a	2	.5
559	500	3	5	15	30	N	10	100	30	30	150	11-12- 5	D	3	
560	1,500	N	30	50	50	N	50	500	150	20	500	10-13-30	D	3	
561	1,000	5	L	L	50	N	10	1,000	30	20	150	10-14-29	D	3	
562	L	1.5	N	N	20	N	L	N	N	10	150	10-14-33	F,e	2	2
563	70	N	N	N	N	N	L	N	N	20	300	10-14-33	F,e	2	
564	50	3	N	10	L	N	L	N	N	N	100	10-14-33	F,e	2	
565	70	2	N	L	30	N	7	300	L	10	150	11-15- 6	F,e	2	
566	300	N(1)	30	15	20	N	30	300	70	15	150	11-16-27	F,e	2	
567	20	2	N	5	20	N	10	N100	L10	15	70	11-16- 2	F,e	2	
568	70	N	N	L	N	7	L	N	15	N	20	10-17-34	F,e	2	4
569	70	2	N	N	50	N	L	N	N	30	200	10-17-29	A,a	2	4
570	70	1	L	N	70	N	N	N	N	10	200	10-17-29	A,a	2	1
571	N	3	N	L	20	N	5	N	15	30	150	11-18-28	D,e	3	
572*	N	1.5	L	15	30	L	5	N	10	20	200	11-18-35	B,a	2	6
573	N	1	N	L	N	N	L	N	L	10	20	11-18-35	B,b	2	.5

Table 9.--Continued

Footnote to Table 9 (all values are percent except Pt, which is in ounces per ton)

1. 0.002 Sn
2. 0.017 Sn
3. 19.73 Mn, 0.025 Cr, 0.094 W, 0.036 As, 0.20 Sb
6. 0.035 W
7. 0.006 Sb
8. 11.84 Mn, 0.018 Be, 0.70 Sr, <0.005 W, 0.056 As, 0.24 Sb, <0.001 Pt
9. 7.77 Mn, 0.41 Sr, 0.022 Sb
10. 0.94 Mn, 0.14 Sr, <0.005 W, 0.012 Sb, <0.001 Pt
11. 46.88 CaO, 0.053 Mn
12. 12.25 CaO
14. 0.013 Cr, 0.027 Ni
18. 0.97 Mn
32. 14.74 CaO
37. 0.011 Bi, <0.001 Cr
44. 0.029 Cr
45. 0.035 Cr
50. <0.005 W
51. 0.011 Y, <0.001 all other REO
66. 0.012 Y, <0.001 all other REO
69. 0.012 Mo
82. 0.005 Cr
87. 0.017 Cr
88. 0.008 Mo
90. 0.021 Mo
95. 0.21 Sr
96. 0.18 Sr
97. 0.008 Mo
100. 0.18 Sr
102. 0.015 Ni, 0.008 Sn
105. 0.014 REO
108. 0.12 Sr
109. <0.002 Bi, 0.012 Mo
112. 0.002 Bi
114. 0.009 Cd
115. 0.009 Mo
117. 0.003 Cd, 0.001 Mo, 0.168 V, 0.054 W, 0.008 As
121. 0.045 W
127. 0.014 Ni
140. 0.005 Ga, 0.003 Cd, 0.001 Cr
141. 0.002 Ga, 0.006 Cd, 0.001 Cr
142. 0.002 Ga, 0.016 Cd, 0.001 Cr, 0.016 Mo
143. 0.002 Ga, 0.001 Cr, 0.024 Ni, 0.73 Ti, <0.001 Pt
144. 0.003 Ga, 0.003 Cd, 0.001 Cr
145. 0.010 Ga, 0.031 Cd
146. 0.002 Ga, 0.004 Cd
147. 0.011 Cr, <0.005 W
153. 0.0014 Ga
154. 0.0018 Ga, 0.72 Cd
155. 0.057 Cd
156. 0.026 Cd
157. 0.061 Cd, 0.015 Mo
158. 0.004 Cd
159. 0.013 Mo
164. 0.035 Mo
165. 0.045 Mo
166. 0.038 Mo
195. 0.40 Mn
222. <0.001 REO
223. 0.029 REO
234. 0.32 Mn
240. 0.17 Mn, <0.005 W
241. 0.29 Mn
242. 0.56 Mn, <0.005 W
243. 0.36 Mn
244. 0.24 Mn
245. <0.005 W
248. <0.003 Bi
249. 0.009 Bi
250. 0.022 REO, principally Y
251. 0.016 REO, principally Y
255. <0.005 W, 0.011 REO
256. 0.055 V, 0.005 W
257. 0.013 W
258. <0.005 W
259. 0.023 W
260. 0.048 Bi
262. <0.001 Cr, 0.033 Ni, <0.001 Pt
263. <0.003 Bi, 0.031 Y
264. 0.001 Cr, 0.014 Ni, <0.001 Pt
267. <0.003 Bi, <0.002 Sn
268. 0.003 Sn
272. <0.002 Sn
283. 0.022 Bi
291. 0.001 Mo
292. 0.013 Y
293. 0.018 Y, 0.016 Sb
295. 0.045 Y, 0.003 Sb
301. 0.042 REO
304. 0.53 Mn
308. 0.37 Mn
313. <0.005 W
316. 0.026 REO
321. 0.005 Bi, 0.044 W
322. 2.80 Mn, 0.002 W; 0.021 Y
324. 0.26 Mn
327. 0.014 W, 0.013 REO
328. 0.012 Nb, 0.036 REO
329. 0.39 Ti, 0.014 W, 0.022 REO
331. 0.028 W
332. 0.033 W, 0.014 Sb
333. 0.96 Mn, 0.019 W, 0.011 Sb
334. 0.018 REO
335. 0.27 Ti, 0.008 Ga, 0.008 BeO, 0.020 Sr, 0.53 Mn, 0.026 Cd, 0.014 Co, 0.054 Mo, 0.109 REO
337. 0.012 Ga, 0.010 Cd, <0.005 W
338. 0.022 REO
342. 0.77 Ti, 0.039 V
347. 0.063 Sr, <0.005 W
348. 0.53 Mn, 0.002 Co
350. 0.14 Mo, 0.008 Sn
352. 0.34 B
353. 0.014 V, 0.034 W
356. 0.014 REO
358. 0.03 Cr
359. 1.38 Mn
360. 0.24 Sr
361. 0.19 Sr
363. 0.025 V
364. 0.004 V
365. 0.011 Mo
367. 0.10 Sr
368. 0.002 Bi, 0.12 Sr
369. 0.033 V
371. 0.025 V
373. 0.057 V
376. 0.020 Bi, 0.027 Mo
377. 0.002 Mo
378. 0.057 V
379. 0.043 Mo, 0.017 Y
381. 0.002 Bi, 0.043 Mo, 0.014 Y
382. <0.002 Bi, 0.055 Mo, 0.007 REO
387. 0.003 Sn
393. 0.017 Mo
397. 0.008 Bi, <0.005 W
398. 0.11 Bi, <0.005 W
401. 0.025 Bi
402. 0.10 Bi
404. 0.018 Nb, 0.002 Sn
405. 0.007 Mo
406. 7.77 Mn, 0.016 Co
408. 0.004 Mo
411. <0.005 W
413. 0.002 Sn
420. 0.001 Cr
421. 0.006 Bi, 0.093 Cr, 0.021 Ni, 0.047 V, 0.48 Ti, <0.001 Pt
422. 0.001 Cr
423. 0.009 REO
424. 0.003 Bi, 0.010 Mo
425. <0.005 W
426. 0.019 Bi
427. 0.005 W
428. 0.004 Bi, 0.05 Mo, <0.005 W
429. <0.003 Bi, 0.019 Mo
431. 0.54 Mn, 0.15 V, 0.007 W
432. 0.016 Bi, 0.15 V, <0.005 W
433. 0.006 Bi, 0.014 Mo, <0.005 W
434. 0.004 Bi, 0.005 W
437. 0.010 Mo
439. 0.029 W
440. 0.018 W
444. 0.025 V
448. 0.017 V
453. 0.026 Mo
460. 0.27 Sr
463. 0.08 REO
464. 0.032 REO
465. 0.012 Sr, 0.016 Y, 0.018 Ni
467. 0.014 REO
472. 2.60 Ba, 4.70 Mn, 0.029 W
473. 0.28 Mn, <0.005 W
479. <0.005 W
480. 0.74 Ba, 0.002 Sn, 0.039 Sr
482. 0.012 Mo
491. 0.51 Ti, 0.004 Co, <0.002 Cr, 0.026 Ni, 0.003 Sn, 0.024 V, 0.084 Sr, <0.001 Pt
492. 0.55 Ti, 0.092 Sr
493. 0.42 Ti, 0.09 Sr
495. 0.048 Cr, 0.076 Sr
496. <0.002 Cr, 0.047 V
497. 0.29 Sr
500. 0.004 Cr, 0.010 Ni
501. 0.015 Cr
508. 44.91 CaO
510. 0.072 B, <0.002 Bi, 0.019 Cr
513. 0.002 Bi, 0.027 Cr
514. 0.003 Bi, 0.005 Co, 0.034 Cr, 0.019 Ni, <0.001 Pt
515. 0.002 Bi, 0.014 Cr, 0.014 Ni
516. <0.005 Bi, 0.017 Cr
517. 0.002 Bi
519. 0.54 Ti, 0.005 Bi, 0.032 Cr
520. 0.59 Ti, 0.006 Cr
521. 0.16 Sr
528. 0.021 Cr, 0.095 V
529. 0.009 Co, 0.018 Ni
530. 63.40 SiO_2, 0.12 Sr
535. <0.002 Bi
536. 0.002 Bi
538. 41.60 CaO
539. 0.041 Cr
540. 0.013 Cr
542. 0.16 Sr
544. 8.52 CaO, 0.038 Ni
545. 0.009 Cr, 0.014 Ni, 0.072 Sr, 0.054 REO, <0.001 Pt
546. 20.00 CaO
550. 0.40 Ti, 0.002 Co, 0.018 Ni, <0.001 Pt
553A. 0.005 Sn
553B. 0.65 Ti, 0.046 Sn, 0.003 Nb, 0.018 REO
555A. 0.002 Sn
555B. 0.002 Sn, 0.004 Nb
556A. 0.003 Sn
556B. 0.002 Sn
557. 0.049 Sn
558. 0.004 Sn, 0.064 REO
572. <0.005 W

Table 10.--Conversion of parts per million to percent and to ounces per ton and vice versa

[Conversion factors: 1 lb avoirdupois = 14.583 oz troy; 1 ppm = 0.0001 percent = 0.0291667 oz troy per short ton = 1 gram per metric ton; 1 oz per ton (Au or Ag) = 34.286 ppm = 0.0034286 percent]

Parts per million to percent to ounces per ton			Ounces per ton to percent to parts per million		
Ppm	Percent	Oz per ton	Oz per ton	Percent	Ppm
0.01	0.000001	0.0003	0.01	0.00003	0.3
.02	.000002	.0006	.02	.00007	.7
.05	.000005	.0015	.05	.00017	1.7
.10	.00001	.003	.10	.00034	3.4
.20	.00002	.006	.20	.00069	6.9
.30	.00003	.009	.30	.00103	10.3
.40	.00004	.012	.40	.00137	13.7
.50	.00005	.015	.50	.00171	17.1
.60	.00006	.017	.60	.00206	20.6
.70	.00007	.020	.70	.00240	24.0
.80	.00008	.023	.80	.00274	27.4
.90	.00009	.026	.90	.00309	30.9
1.0	.0001	.029	1.0	.00343	34.3
10.0	.001	.292	10.0	.03429	342.9
20.0	.002	.583	20.0	.06857	685.7
50.0	.005	1.458	50.0	.17143	1,714.0
100.0	.01	2.917	100.0	.34286	3,429.0
500.0	.05	14.583	500.0	1.71	17,143.0
1,000.0	.10	29.167	1,000.0	3.43	34,286.0
10,000.0	1.00	291.667	10,000.0	34.29	342,857.0

Mines, prospects, and mineralized areas

Bureau of Mines personnel examined eleven areas where claim location notices were evident. The area of the investigation included the Gila Wilderness, the nine tracts designated as Gila Primitive Area, and those adjacent areas where any type of mineral exploration activity was thought to have taken place. The reader is referred to figure 2 for some geographic localities that could not be shown on plate 3. Sample numbers on the figures of the report serve to show approximate locations of the mines, prospects, and mineralized areas that were investigated. The results of analyses are in tables 9 and 11.

Most of the samples were taken of altered volcanic rocks, mostly andesites and rhyolites, or from structures within these rocks. Because of the high degree of alteration, it was impossible in most cases to accurately identify the rocks in the field.

Southern Mogollon (Cooney) mining district

The area within and adjacent to the northwest corner of the wilderness has been designated the southern Mogollon district. This designation was made to distinguish the area investigated from the main part of the Mogollon (Cooney) district that lies just north of the wilderness boundary. Gold-silver ore, containing copper and lead, was first shipped in 1879 from the Mogollon district, and peak output was in 1913. Since World War II, mining has been sporadic; in mid-1970, there was little activity in the district. Total mineral production from the main Mogollon district is valued at $25 million (Anderson, 1957, p. 32), but only minor production has been reported from what is herein called the southern Mogollon district.

The southern Mogollon district is mainly in secs. 3, 4, 8, and 9, T. 11 S., R. 19 W. (pl. 3). Locations of the showings examined are given in the text. The geologic setting of some of the prospects of the district is shown on plate 1A. The major prospects are along the Queen fault (Ferguson, 1927, p. 26, 34, 87-88) and other faults that extend south from the Mogollon district. The probable continuation of the Queen fault has been traced at least 4 miles south of Whitewater Creek (pl. 1A) and is occupied by a 2-4 foot calcite vein at the crest of the ridge extending northwest from Nabours Mountain. South of Whitewater Creek the Queen fault appears to dip steeply; displacement is down to the east, placing flow-banded rhyolite against Cooney Quartz Latite ash-flow tuff. The fault may mark the approximate structural margin of the Bursum caldera (pl. 1A).

Ten prospects, mines, or groups of mines were examined and 42 samples were taken in the southern Mogollon district. With only a few exceptions, assay values are negligible. A 4-foot-wide zone in a prospect on Silver Creek contained 11.84 percent manganese (sample 8). A selected sample (No. 17) of development rock from a shaft on the Iron Bar prospect assayed 0.40 ounce of gold and 14.38 ounces of silver per ton. A sample (No. 24) taken from a 1-inch mineralized band in a short adit on South Fork of Whitewater Canyon contained 0.08 ounce of gold per ton, 1.12 ounces of silver per ton, and 1.08 percent copper. Another sample (No. 31), chipped from a 10-inch vein in an adit on South Fork, contained 20.3 percent fluorite.

Silver Creek Divide

Several mining-claim locations at the head of Silver Creek were recorded (pl. 3). The area is about one mile north of the wilderness boundary in secs. 4, 5, and 6, T. 11 S., R. 18 W. Investigation of the area revealed claim notices and corners but no significant mineralization.

Deloche Trail (Samples 1-2)

The southeastern-most claims of the south Mogollon district were located along a fault that roughly parallels the Deloche Trail on the north slope of Whitewater Canyon. The claims are within the wilderness in sec. 12, T. 11 S., R. 19 W., and in sec. 7, T. 11 S., R. 18 W.

A prospect pit about 4-feet deep and 6 feet in diameter was the only excavation noted in the area. A 4-foot chip sample (No. 1) was taken across a brecciated zone. About 30 feet southeast of the pit, a 3.5-foot chip sample (No. 2) was cut across an outcrop of the same material. Analyses of the samples showed no significant mineral values.

North slope of Whitewater Canyon (Sample 3)

According to a local resident claims had been located for manganese in the vicinity of sample 3 (pl. 3) in sec. 11, T. 11 S., R. 19 W. just within the wilderness. One claim corner was found; calcite veins, some several feet wide, were noted in the area. These occurrences are not uncommon in the wilderness, but none of the calcite vein material was found to contain significant amounts of other minerals. Sample 3 is made up of manganese oxides and quartz float. The only significant values from the analyses were 19.73 percent manganese and 0.118 percent tungsten oxide (WO_3); no outcrop of manganese-bearing material was observed. Tungsten is commonly present in hypogene manganese minerals, and thus is not necessarily an indication of a tungsten deposit (Hewett, 1961, p. 28).

Deloche Canyon (Samples 4-6)

Several prospects on the Black Jack and other claims were found in a tributary gulch about one-fourth mile above the mouth of Deloche Canyon. The claims are in secs. 1 and 2, T. 11 S., R. 19 W., and are outside the wilderness as shown on existing maps.

Three of the workings were examined; others are caved or are filled with debris. On the south side of the gulch, an L-shaped cut exposes several quartz stringers no more than an inch wide. Dump material and chips from the quartz stringers on the trench walls were combined to make up sample 4. Sample 5 was taken from the dump of a 50-foot-inaccessible shaft. On the north slope, near the canyon bottom, a 20-foot adit was driven N. 60° W. on several small quartz stringers. A 4-foot chip sample (No. 6) was taken across the face of the drift. Assay results from the three samples indicated no important mineral deposit.

Silver Creek at Spring Canyon (Samples 7-10)

A manganese showing is covered by the Kordic claim of Mrs. James Wray of Mogollon. The claim is in sec. 2, T. 11 S., R. 19 W. and is a little more than a mile north of the wilderness boundary. According to Mrs. Wray, the property qualified for the government manganese-buying program during World War II, but the program ended before the property could be developed.

A 3-foot quartz vein and a 4-foot manganese showing were sampled (Nos. 7 and 9) in a short adit (fig. 42). Sample 9 was taken for 10 feet along a 6-inch manganese showing exposed in a trench. In addition, a grab sample (No. 10) was taken from an "ore" pile on the dump. Except for manganese (11.84 percent in sample 8 and 7.77 percent in sample 9), assay results were negligible.

South Fork of Silver Creek (Samples 11-12)

The Lime Kiln, an isolated patented claim on the South Fork of Silver Creek in sec. 3, T. 11 S., R. 19 W., was probably a source of lime for smelters in Mogollon. The workings are about a mile north of the wilderness boundary at a rock-filled crib dam built across Silver Creek.

Two chip samples were taken from the faces of an open pit. Sample 11 was taken across a 25-foot calcite vein that bears N. 10° W., and sample 12 was from a 4-foot calcite-cemented breccia that strikes N. 30° W. A larger pit to the north was not sampled because it is caved. Other than for the calcite, no mineral potential is indicated.

Powerplant Road (Samples 13-20 and 24-25)

The workings on several unpatented claims were examined in the Powerplant Road area, which is north of the northwest corner of the wilderness. The claims extend for about one-half mile north of the boundary and are mainly in secs. 3 and 4, T. 11 S., R. 19 W.

The principal claims are those of the Iron Group that are east of the Powerplant Road near Pine Flat where the road begins a steep descent to Whitewater Creek. Although it is reported that several prospects were operated on the Iron Group at various times, production was probably small and probably was included with output from other mines in the Mogollon district. The major output was from the Iron Bar and Iron Crown claims. Relocated under various names over the years, the properties are currently known as the Dripping Gold Group.

The lowest working of the Iron Bar is an adit of undetermined length (fig. 42B). Because of caving conditions and deep water, only one sample (No. 14) was taken. This was a chip sample across 5 feet of uncemented breccia. In the upper adit (fig. 42C), a chip sample (No. 15) was taken along 15 feet of fault gouge, and sample 16 was a 10-foot chip sample of iron-stained altered rock on which a winze had been sunk. The highest value obtained from the three samples was 1.39 ounces of silver per ton in sample 16. No. 17 was a selected sample of development rock near a shaft collar that is up the hill from the upper adit. Assay results were 0.40 ounce of gold per ton and 14.38 ounces of silver per ton. The inaccessible shaft is about 250-feet deep.

A 150-foot adit just east of the Powerplant Road and west of the Iron Bar workings was driven northward from Pine Flat in an apparent effort to cut mineralized rock associated with a west-trending fault at the base of the rhyolite cliffs upslope. Ferguson (1927, p. 87) reported massive psilomelane along the fault. The last 40 feet of the adit contained brown veinlets from one-eighth to 4 inches in width. Analysis of a 6-foot chip sample (No. 18) revealed 0.97 percent manganese. Altered rock was sampled (No. 19) from a prospect pit northwest of sample locality 18 and just west of the Powerplant Road, but the analyses showed no mineral values of consequence.

A 30-foot calcite vein was examined on the north slope of Whitewater Canyon about one-fourth mile north of the wilderness. A 20-foot prospect trench, bearing N. 10° E., had been excavated along the east wall of the vein. A grab sample (No. 13) of development rock contained insignificant values.

Two small prospects just north of the wilderness boundary near the confluence of Whitewater Creek and South Fork of Whitewater Creek were sampled. One of the workings is a 10-foot adit that was driven on a 1-inch quartz veinlet that strikes S. 50° W. and dips 85° SE. Sample 24 taken from the veinlet contained small quantities of gold (0.08 ounce per ton), silver (1.12 ounces per ton), and copper (1.08 percent). The other working is a 7-foot opening that had been excavated on another quartz veinlet trending S. 80° W. and dipping 80° NW. A sample (No. 25) of the quartz showed negligible values of gold, silver, and copper.

At the creek junction the Little Fannie millsite, which was patented February 12, 1918 (Patent No. 616423), occupies 3.518 acres.

South Fork of Whitewater Creek (Samples 26-35)

The Lauderbaugh prospect lies a short distance within the wilderness on South Fork of Whitewater Creek in sec. 9, T. 11 S., R. 19 W. The property is probably covered by the Oak Grove and Arthur K claims.

The main working is an adit that was driven along a N. 70° E. fault zone in Cooney Quartz Latite for about 150 feet (fig. 43A). Gouge 4-feet wide was sampled in the face (No. 26) and 6 chip samples (Nos. 27, 28, 29, 30, 32, and 33) were taken on quartz stringers and gouge seams at various places along the drift. Assay results were negligible. Fluorspar was identified in one 10-inch vein, and a chip sample (No. 31) taken on it contained 20.3 percent fluorite. Two prospect pits, one 15-feet deep, on opposite sides of the South Fork south of the adit, are along the same structure. Chip samples (Nos. 34 and 35) from the pits assayed traces of gold and silver.

Whitewater Campground area (Samples 21-23)

A caved prospect pit about 1,000 feet north of Whitewater Campground in sec. 6, T. 11 S., R. 19 W. is about 1.5 miles northwest of the northwest corner of the wilderness. Fractured andesite from the dump is copper stained. A sample of the mineralized material (No. 23) contained 0.11 percent copper and traces of gold and silver. Two chip samples (Nos. 21 and 22) taken across a 7-foot fracture zone that is exposed in the south side of the pit assayed very low gold values and traces of silver.

Additional prospects east of Whitewater Campground (pl. 1A) include 3 prospect pits and a 20-foot prospect adit driven along the contact between Cooney Quartz Latite and a siliceous rhyolite dike about 5-feet wide. The adit and two of the pits are on or adjacent to a strong west-northwest trending fault zone that is occupied in part by an andesitic dike at least 10-feet thick. U. S. Geological Survey samples AMZ-201 to 208 from this area show traces of gold, silver, tellurium, molybdenum, arsenic and lead (table 4B).

Placer claims have been located at various times along Whitewater Creek in the vicinity of the campground. The Confidence and Black Bird patented millsites, 17.07 and 23.1 acres, respectively, are in this area. During the wilderness investigation, the vicinity around the Confidence mill ruins was being mined on a small scale for placer gold and mercury that had not been recovered during previous milling operations.

Cunningham Ranch area (Samples 36-42)

There are two prospects about a mile east of the Cunningham (Sanders) ranch, which is a mile south of Whitewater Campground. Access to the diggings is by foot trail along the south rim of the tributary canyon extending east from the ranch. The workings are about three-fourths of a mile west of the wilderness in sec. 8, T. 11 S., R. 19 W. The area probably was located as the Wall Street claim prior to 1909. Later locations were the Bessie group, first recorded in 1931, and the Ida Bell group recorded in 1938. The area was again located In 1970.

The Ida Bell prospect (fig. 42D) was driven on 5-15 feet of silicified and brecciated Cooney Quartz Latite between slip surfaces that strike N. 10° E.-N. 10° W. and dip 75°-85° east. Two smaller shears of similar trend were intersected by a short crosscut into the footwall of the main structure. Four chip samples (Nos. 36-39) were taken across quartz vein and silicified rock. Six feet above the sump of a 42-foot winze, a drift had been started on a 2-foot vein, which was sampled (No. 40). Assay results from the five samples were negligible. The Bessie #1 prospect (fig. 42E) is on a similar silicified breccia zone on the south side of the gulch opposite the Ida Bell. Here the structure trends about N. 45° E. and dips 75° SE. Two chip samples (Nos. 41 and 42) were taken from the face. No significant mineral concentrations were detected in the analyses.

Wilcox Mining district

Approximately 1,500 mining claims have been located over the years in the Wilcox mining district. The claims straddle the western boundary of the wilderness for a distance of approximately 5 miles and the southwestern boundary for more than 10 miles, and include two blocks of claims within the western part of the wilderness (pl. 3). A panoramic view of part of the district is shown in the frontispiece. There are 16 patented mining claims and two patented millsites in the district. The millsites and 10 of the claims are within the wilderness; five of the claims are adjacent to tract 7 of the primitive area, and one claim extends into the primitive area.

Thirty-six groups of mines or prospects were examined and 431 samples were taken in the district. Mineral production from the district is known to be at least 10,912 tons of fluorite, 1.23 ounces of gold, 19.0 ounces of silver, 50 tons of copper ore, 5 tons of copper-silver ore, 1.5 tons of copper-lead-zinc ore, and 5 tons of tellurium ore.

The geology of the district is shown on plate 1A.

Little Whitewater Creek area (samples 43-60)

The Little Whitewater Creek area occupies secs. 21, 28, and 29, T. 11 S., R. 19 W. in the northern part of the Wilcox district. Prospects and mine workings were examined at Deer Park Canyon, Little Whitewater Canyon, and Shelton Canyon and 18 samples were taken. With the exception of fluorite values in five samples from workings outside the wilderness, assay values were negligible.

Recorded production for the area includes 8,800 tons of fluorspar, probably all of which was from the Huckleberry mine, and very small amounts of gold and silver from the Horse Shoe group of claims. The Huckleberry mine is west of the wilderness boundary, but the Horse Shoe group may be within the wilderness.

Deer Park Canyon (Samples 43-47).--Four prospects were examined in Deer Park Canyon about a half mile inside the wilderness. Workings in the area are caved or filled with detritus and it was not possible to examine them thoroughly. One of the prospects is a 20-foot opencut connected to an adit that bears N. 60° E. for 15 feet and then N. 60° W. for another 6 feet. Chip samples (Nos. 43-44) were from a 5-foot fault zone in the face and from a 3-inch quartz stringer at the portal. A 4-foot chip sample (No. 45) was cut across a silicified zone in a 12-foot adit that bears S. 60° W. Grab samples were taken from the dumps of a 10-foot filled shaft (No. 46) and from a 70-foot caved adit (No. 47). The assays were very low; no important mineral deposit was detected.

Little Whitewater Canyon (Samples 48-56).--Most of the mine workings in Little Whitewater Canyon are near the end of a road that ends at the Menges cabin. Except for two or three minor excavations, most of the workings are outside the wilderness. The Kitt cabin a short distance upstream from the Menges cabin was built by Ernest Kitt about 1900 and has been used as a landmark in locating dozens of mining claims.

The most extensive mine in the area is the Huckleberry (fig. 42F) on the north side of Little Whitewater Canyon in NE 1/4 sec. 29, T. 11 S., R. 19 W., about one-fourth mile west of the wilderness boundary.

The first mining claims on the Huckleberry fluorspar deposit were probably those located by Campbell (table 8). J. C. Massey and Felix F. Menges relocated the area beginning in 1937. The Spar 1, Bingham 3, and North Extensions 1-3 were sold to J. H. Huckleberry and R. L. Nichols in 1939. Huckleberry sold the mine to Ray S. Dunbar in 1945. C. F. Johnson leased the mine from Huckleberry in 1945 and from Dunbar in 1946; T. D. Benjovsky operated the mine for Huckleberry in 1942-44. The area was again relocated by Massey and Menges in 1946; Felix F. Menges, Glenwood, and Arment Menges, Reserve, are the present claimants, and in 1972 the mine was being developed under lease to Ira Young of Winston, New Mexico.

According to Sur (1947, p. 3) the Huckleberry property had produced about 7,300 tons of fluorspar up to 1945. It is probable that later production of about 1,500 tons also was from this property. The mine is the largest fluorspar deposit in Catron County and has accounted for 78.5 percent of the county's production (Williams, 1966, p. 14).

The Huckleberry property was drilled and examined by the Bureau of Mines in 1944. Exploration disclosed a nearly horizontal 6-foot thick ore body, 180 feet by 420 feet in extent, of which about half had been mined (Rothrock and others, 1946, p. 46). A short distance southeast of the present open pit, specimens of fluorspar (Sample 51) were taken along an outcrop to determine if minerals other than fluorspar were present in significant quantities. The sample assayed 0.01 ounce of gold per ton and 0.20 ounce of silver per ton.

Two adits in the gulch below the mine were examined. Figure 42G shows the longer (slightly over 100 feet) of the two; a chip sample (No. 53) across a 2-foot vein in the face contained 40.5 percent fluorite. The second adit extends 30 feet alonga N. 35° E. bearing; it cuts 6 inches of fault gouge that trends N. 60° W. and dips 25° SE. A chip sample (No. 54) of the material gave negligible assay results.

A 3-foot fluorspar-bearing vein is exposed in a shallow prospect pit on the canyon wall east of the Huckleberry mine. A chip sample (No. 52) contained 35.3 percent fluorite.

The Huckleberry fluorspar deposit appears to be controlled by the intersection of 2 faults and a rhyolite dike. The major ore shoot developed in the mine is at the intersection of a northerly trending fault, which dips 55° west in the gulch below the open cut, an unusually low dipping fault that strikes about N. 30° E. and dips 15° SE, and the rhyolite dike, which dips moderately northward. The nearly horizontal ore body may continue beneath the wilderness boundary, only a few hundred yards to the east. Fluorite is not confined to the Huckleberry Mine but is found in minor quantities in cross fractures all along the outcrop of the rhyolite dike, and in shears in the next major gulch north of the Huckleberry Mine.

Figure 43B shows the 70-foot adit at the Juniper Cottage prospect, which is the largest working inside the wilderness on Little Whitewater Creek. A chip sample (No. 49) was taken from a 6-inch quartz vein near the face. Another chip sample (No. 50) was cut across 4 feet of altered rock in the back. Both samples contained insignificant values.

Six prospect pits south of Kitt Cabin are located near an irregular cliff that is referred to as Jay Bird Dike on many claim location notices. A 5-foot chip sample (No. 55) was taken from a brecciated zone in one of the pits. A composite sample (sample 56) was made of brecciated altered volcanic rock from the other five pits. Both samples assayed traces of gold and silver.

A minor gold rush is reported to have occurred about 1894 when rich float was found on Little Whitewater Creek. The only prospect found at the purported site was a caved adit bearing N. 35° E. The adit is within the wilderness about a mile upstream from the Huckleberry mine. Because floods had washed away all traces of the dump, it was not possible to estimate the extent of the working. A grab sample (No. 48) of development rock from around the portal assayed 0.01 ounce of gold per ton and 0.49 ounce of silver per ton.

Shelton Canyon (Samples 57-60).--Three prospects on the north slope of Shelton Canyon just west of the wilderness boundary were examined. These include the White Flag (table) and the recently located Silver Boe (or Bar) group.

A nearly filled pit near the canyon bottom is thought to have been the White Flag prospect. Two grab samples (Nos. 59 and 60) were taken from a dump and from a stock pile of altered volcanic rock. Extremely low values of gold, silver, lead, and zinc were contained in the samples.

A 30-foot caved trench bearing N. 30° W. on the Silver Boe No. 1 claim has exposed a 2-foot fracture zone containing fluorspar and quartz. A chip sample (No. 57) across the zone contained 42.14 percent fluorite.

The Silver Boe No. 2 prospect is a nearly filled 40-foot trench in which a N. 10° W. striking fluorspar-quartz vein about 3-1/2 feet wide is exposed. A chip sample of this vein (No. 58) contained high-grade fluorite (76.5) percent). Down the gulch from this trench about 100-200 yards are 3 more workings, including a 20 foot inclined shaft on the east side of the gulch and a 20 foot prospect adit and pit on the west side. The prospects show several small fluorite-bearing fractures, the largest of which is exposed in the inclined shaft, where a 4-6 inch fluorite vein follows the footwall of a north-trending fault.

Holt Gulch-S Dugway Canyon area (Samples 61-112)

The Holt Gulch-S Dugway Canyon area is south of the Little Whitewater Creek area in secs. 32 and 33, T. 11 S., R. 19 W. and in secs. 4, 5, 8, and 9, T. 12 S., R. 19 W. It straddles the western boundary of the wilderness for a distance of nearly 3 miles. Access to the area, as far as the wilderness boundary, is by two ranch roads that begin at the Smith Ranch in Pleasanton. The geologic setting in this area is shown on plate 1A. The important features include the dacitic intrusive(?) rocks of Holt Gulch and many dikes and irregular intrusions of rhyolite on and adjacent to Wilcox Peak. The rocks in this area are pervasively altered; the dacite of Holt Gulch is propylitically altered, whereas the rhyolitic rocks are silicified and argillized. The mineralization probably is all associated with the rhyolitic intrusions.

Fifty-two samples were taken from nine workings or groups of workings in the area. Eight samples contained significant (more than 20 percent) fluorite, but only one of these samples (No. 78) was from within the wilderness. Five samples assayed relatively high in gold and silver; two of these (Nos. 70 and 72) were from the Lone Star claims within the wilderness. The assay values are listed below.

Sample No.	Gold (ounces/ton	Silver (ounces/ton)	Sample width (feet)
69	0.02	16.16	4.0
70	1.30	7.90	.2
72	.38	.92	
73	.40	.56	4.0
74	.25	.20	

Holt Gulch (Samples 61-67).--The Holt Gulch area is just west of the wilderness in SE 1/4 sec. 32, T. 11 S., R. 19 W. Three workings were examined in a tributary arroyo north of Holt Gulch where the jeep road crosses the gulch. A major fault is inferred to follow the gulch (pl. 1A). A ten-foot adit has been driven in limonitic material along a N. 35° W. shear zone, about 800 feet above the mouth of the arroyo. A 20-foot chip sample (No. 61) was taken from the altered rock, which is exposed for several hundred feet along the arroyo bank. Iron (20.0 percent) is the only element in significant amounts in the analyses.

About halfway down the gulch from the oxidized zone there is a newly discovered fluorspar showing that has been claimed by Felix Menges. The fluorspar is in a 10- to 20-foot thick rhyolitic dike that strikes about north up the east slope of the arroyo. A 125-foot trench 2.5 feet wide and 2-feet deep was dug along the lower part of the north wall of the dike. A sample (No. 62) was taken of development rock from the trench. One end of the outcrop has been blasted to expose fresh vein material. A sample (No. 63) was chipped for 4 feet along the north wall of the blasted area and another (No. 64) for 10 feet along the east wall. Fluorite values were 30.2 percent, 24.2 percent, and 28.1 percent respectively.

The Moose group of claims are at Boulder Camp, about one-fourth mile down Holt Gulch from the arroyo having the fluorspar showing. The only working on the property is a trench 100-feet long, 30-feet wide, and 15-feet deep, that bears N. 10° E. and appears to be in landslide debris. Two samples were taken in the trench; sample 65 was a chip across 10 feet of a white silicified zone, and No. 66 was a 15-foot chip sample from a silicified zone that is reddish in color. A random chip sample (No. 67) of dike material was taken from a 30-foot basic dike exposed a short distance northeast of the trench. Assay values for the three samples were negligible.

Red Shaft area (Samples 68-69).--The Red Shaft lies about one-half mile west of the wilderness boundary in sec. 5, T. 12 S., R. 19 W. A 400-foot shaft was reportedly sunk by a man named Hofus in an effort to locate the source of rich float. A shallow depression and a large dump of weathered material are all that remain of the workings. A grab sample (No. 68) of material from the dump assayed a trace of gold and 0.16 ounce of silver per ton.

About 1,000 feet east of the Red Shaft, on the Liberty Bell #1 mining claim, claimed by Felix Menges, a prospect pit was dug on the intersection of two quartz veins. One of the veins is nearly vertical and strikes N. 50° E.; and the other strikes N. 15° W. and dips 65° to the northeast. A 4-foot chip sample (No. 69) contained 0.02 ounce of gold per ton, 16.2 ounces of silver per ton, and 52.6 percent fluorite. This sample assayed the highest silver value of 52 samples taken between Holt Gulch and Goddard Canyon.

Lone Star claims (Samples 70-88).--The Lone Star group of claims are in Holt Gulch and Goddard Canyon in secs. 4 and 5, T. 12 S., R. 19 W. within the wilderness.

Three openings were sampled on the Lone Star 2 claim above a fork of Goddard Canyon. Near the center of the claim a trench exposes a 3.3-foot quartz vein, which strikes N. 45° E. and dips 75° NW. A channel sample (No. 70) taken along a band on the hanging wall of the vein contained 1.30 ounces of gold per ton and 7.90 ounces of silver per ton, but the sample represents a width of only 2 inches. A chip sample (No. 71) across the vein contained 0.02 ounce of gold per ton and 0.44 ounce of silver per ton; a sample taken earlier by the Forest Service at the same location assayed 0.8 ounce of gold per ton. A grab sample (No. 72) of development rock assayed 0.38 ounce of gold per ton and 0.92 ounce of silver per ton.

An adit and 30-foot inclined shaft partially filled with water is northeast of the trench (fig. 43U). A 4-foot chip sample (No. 73) was cut along the northeast wall of the adit. The true width of mineralization represented by this sample could not be ascertained. Assay values of 0.40 ounce of gold per ton and 0.56 ounce of silver were obtained. A grab sample (No. 74) from the dump contained 0.25 ounce of gold and 0.20 ounce of silver per ton.

At the northeast end of the Lone Star 2 claim a 12-foot trench has been excavated S. 60° E. along a 1.5-foot quartz vein that dips 50° NW. A chip sample (No. 75) returned very low gold and silver values.

A prospect was examined on the south slope of Holt Gulch a short distance within the wilderness. An 8-foot siliceous zone, locally called the Juniper vein, trends N. 85° E. and dips 75° north and is exposed in a 20-foot trench. A 4-foot chip sample (No. 77) from the siliceous zone and a grab sample (No. 76) of development rock assayed only very low values in gold and silver.

A 7-foot-wide vein of fluorspar crops out several hundred feet up the north slope of Holt Gulch at a point about one-fourth mile within the wilderness. The vein strikes N. 25° W., and dips 30° NE. A 7-foot chip sample contained 43.8 percent fluorite. The width and grade of this vein suggest that the property may have potential as a producer of fluorspar. It is believed that the property is the Lone Star No. 7 described by Rothrock and others (1946, p. 46), but the section number is different than the one he cited.

The Thunderhead workings are near the creek level of Holt Gulch about three-fourths of a mile within the wilderness. Figure 43C shows the most extensive working, an 80-foot adit. The back of the working was dangerously loose and parts caved so that only a small area could be sampled. A sample (No. 79) was taken from quartz seams from one-fourth to 3 inches in width exposed in the back. Ten feet above the main portal is a 6-foot adit in a cemented breccia zone. A 2-foot chip sample (No. 80) was taken across the zone, and another sample (No. 81) was taken from a 4-inch quartz veinlet. Assay values of the three samples were of no significance.

The Holt Tunnel (fig. 43D) is the largest mine working in the Holt Gulch area. The generally straight trend of the adit and the absence of a significant vein indicate that the Holt Tunnel was driven in the south bank of Holt Gulch to explore the downward continuation of the outcrops on Gold Hill, a name given locally to the ridge area south of Holt Gulch. Analyses of seven chip samples (Nos. 82-88) from fractures and shear zones along the crosscut contained no significant mineral concentrations, other than gold assays of 0.03 ounce and 0.04 ounce per ton in samples 82 and 83, respectively.

North Fork of Goddard Canyon (Samples 89-91).--Three zones of altered and iron-stained volcanic rock were sampled in a fork of Goddard Canyon and across the ridge that lies south of Holt Tunnel. The area, which is in the wilderness, was probably first claimed in 1893, when two of the Iron Clad claims were located (table 8). O. B. Bishop located a new group of Iron Clad claims in the same area in 1922.

A 4-foot chip sample (No. 89) was taken in an altered zone at the discovery site of the Lone Star 3 claim which originally may have been part of the Iron Clad group. Assay results show traces of gold and silver.

Near the head of the canyon, an old working that was called the Wilcox is now covered by one of the Texas claims. A grab sample (No. 90) was taken from the dump near an inaccessible 30-foot inclined shaft but no important mineral deposit was indicated.

A 1.5 foot chip sample (No. 91) was taken across an iron-stained quartz vein that is up the canyon about one-fourth mile from the Wilcox working. The sample assayed extremely low gold and silver values.

Wilcox Peak (Samples 92-100).--A group of prospects on the east and west slopes of Wilcox Peak probably marks the location of the Evergreen claims. The prospects are about one-fourth mile inside the wilderness.

The largest working is a 150-foot adit (fig. 43E) that was driven along a zone made up of fault gouge and loosely cemented breccia. Five chip samples (Nos. 92-96) taken at different locations along the drift assayed almost negligible values. Caving and erosion have obscured the portal of the adit.

Two prospects were examined near the top of Wilcox Peak. A 1.5-foot chip sample (No. 97) was taken across a quartz vein that is exposed in a pit on the north side of the ridge. A grab sample (No. 98) was taken of the leached and iron-stained development rock from a 20-foot trench on the south side. Assay values were nil.

Two prospect shafts on the west side of the peak were sampled. A 10-foot chip sample (No. 99) was taken across an area of quartz and specular hematite veinlets near a caved shaft. A grab sample (No. 100) was taken from a small dump near the other caved shaft. The samples contained negligible values.

South Fork of Goddard Canyon (Samples 101-106).--An occurrence of disseminated pyrite is exposed a short distance inside the wilderness on the canyon cliffs in upper Goddard Canyon. The area is covered by the Wilcox claims located by James T. Kelley of Pleasanton, New Mex. A 15-foot chip sample of the mineralized material assayed only traces of gold and silver. Some native sulfur has precipitated in cracks and fissures. The claimant excavated a diamond-drill station into the cliff base and reportedly drilled a 15-foot hole. Chips of unweathered rock from the station were combined to make up Sample 102. Assay results did not indicate the presence of an important mineral deposit.

The Goddard fluorspar claims are just west of the wilderness boundary downstream from the pyrite occurrence. On the Goddard No. 1, a chip sample (No. 103) was taken across a 12-inch quartz-fluorspar vein that is exposed in a 6-foot prospect pit. A few feet south of the pit a 20-foot trench has exposed the vein, which is nearly 4-feet wide at this point. A grab sample (No. 104) was taken of material from the trench, and a chip sample (No. 105) was cut across the vein. What is thought to be a continuation of the vein crops out in the creek bottom, where it is reported to be 6-feet wide; at present stream gravels have covered all but 2 feet of it. A chip sample (No. 106) was taken of the exposed vein material. Fluorite analyses were 31.9 percent, 62.7 percent, and 41.6 percent respectively for samples 103, 105, and 106. Sample 104 was not analyzed for fluorite. Under favorable market conditions, the Goddard Canyon fluorspar showings may warrant further exploration and development.

Red Colt Canyon (Samples 107-108).--A 125-foot trench, 10-feet wide and 4-feet deep with a bearing of N. 30° W., was found just inside the wilderness on the divide between Goddard Canyon and the north fork of Red Colt Canyon. A chip sample (No. 107) of altered rock exposed in the trench assayed 0.02 ounce of gold per ton and 0.38 ounce of silver per ton.

The south fork of Red Colt Canyon dissects an intensely leached and altered zone just outside the wilderness boundary. A 4-foot chip sample (No. 108) was taken across a brecciated zone that is exposed in a small prospect pit. Assay results were 0.015 ounce of gold per ton and 0.29 ounce of silver per ton.

Goat Corral Canyon (Samples 109-111).--A northwest-trending 20-foot cut was found near the top of Round Mountain, which is the prominent peak on the north slope of Goat Corral Canyon. The working appears to be about on the wilderness boundary line. A grab sample of oxidized volcanic rock (No. 109) from the cut contained minor gold and silver values. Altered rhyolite on Round Mountain also contains fracture fillings and vug linings of a greenish clay identified by X-ray as very pure dickite (R. Van Loenen, personal commun., 1971). Massive pods 2-3 feet wide were observed at a few places. This material might represent a minor economic mineral resource.

In the bottom of the canyon east of Round Mountain and a short distance within the wilderness, a 20-foot cut has exposed a blue-tinted quartz vein that has a north-south strike. A 2-foot sample (No. 110) was chipped across the vein, and a grab sample (No. 111) was taken from the cut. Assay results from both samples were negligible.

S Dugway Canyon (Sample 112).--A 15-foot adit in S Dugway Canyon, just south of the wilderness boundary, was driven on a 6-inch quartz vein that strikes S. 60° E. A chip sample (No. 112) contained no significant values.

Big Dry Creek below Spider Creek (Samples 113-166)

Five mineralized areas were examined in the primitive area and wilderness in the canyon of lower Big Dry Creek above and below Johnson Cabin at the mouth of the North Fork of Big Dry Creek. Mining-claim coverage is mainly in sec. 7, T. 12 S., R. 18 W. and in secs. 12, 13, and 14, T. 12 S., R. 19 W. The area extends northward across tract 7 of the Gila Primitive Area into the wilderness. Access is by Forest Service trails that begin at Sheridan corral west of Sheridan Mountain. Horses can be ridden to the Uncle John mine, but the rest of the areas can be reached only on foot up the rugged canyon.

Of the five areas, one is outside the primitive area and wilderness, two are within the primitive area, and two are within the wilderness. Of nine samples taken from the outside area, four contained copper values ranging from 0.61 to 2.15 percent, lead from 0.14 to 2.10 percent, and zinc from 0.07 to 0.18 percent.

Forty-five samples were taken from groups of workings in the four areas that are within the Gila Primitive Area and Gila Wilderness. Gold values were mostly traces, but the highest recorded value was 0.14 ounce of gold per ton. Assay results gave mostly very low values for silver; six samples contained more than 1.00 ounce per ton, and the highest value obtained was 3.94 ounces of silver per ton. Five samples contained more than 0.5 percent copper; six more than 2.0 percent lead; and four more than 2.0 percent zinc.

The geologic setting of this area is shown on plate 1A. The main mineralized structures are down canyon from Johnson Cabin at the True Blue, Hardscrabble and Independence properties. All are along the margins of the Sheridan Mountain rhyolite plug dome, and are closely associated with a swarm of rhyolite dikes and related fractures. The Uncle John prospect above Johnson Cabin is on a strong northeast-trending fault zone that may be near the southwest end of the Spruce Creek graben of the Bursum resurgent dome. A number of mineralized faults, mainly of northeast to northwest trend are exposed between the Uncle John Mine and Spider Creek (fig. 2), in the canyon of Big Dry Creek. They show minor sulfide mineralization and a little fluorite was noted in fractures in the west canyon wall at the top of a 10-15-foot waterfall just above the Pilgrim Camp area. The Pilgrim Camp is a name given locally to a camping area below the mouth of Spider Creek.

Lower Big Dry Creek (Samples 113-121).--The True Blue property, also called the Copper-Gold group, is developed by two adits (fig. 42H) on the east bank of Big Dry Creek about 1,500 feet south of the primitive area boundary. Nine chip samples were taken from mineralized areas and from fracture zones in the two workings. Four samples contained the following values:

	Percent				Sample width
Sample No.	Copper	Lead	Zinc	Vanadium	(feet)
114	0.93	1.24	0.18		3.5
115	2.15	.14	.14		4.5
116	.70	.26	.11		6.9
117	.61	2.10	.07	0.30	2.3

East slope of Big Dry Creek (Samples 122-139).--The Independence workings are within tract 7 of the Gila Primitive Area on the east slope of Big Dry Creek Canyon about one-fourth mile downstream from Johnson Cabin. The area is claimed as the Seminole group by Dan Watkins of Cliff, New Mexico.

The portal of the Indepencence No. 1 adit (fig. 44B) is nearly obscured by brush, and most of the dump has been washed away. Nine chip samples (Nos. 130-132 and 134-138) and one composite from three faces (Sample 133) were taken across quartz stringers and fracture zones in the 350-foot adit. In addition, two grab samples (Nos. 128 and 129) were taken of dump material. The winze was filled with water. Three other workings follow a rhyolite dike that extends southeasterly up the slope from the main adit. The lowest working is a 40-foot adit that bears S. 75° E.; because of the dangerous condition of the back, the only sample taken was a grab (No. 127) from a muck pile within the adit. The middle working (Independence No. 3 adit, fig. 44A) consists of a crosscut and drift about 100-feet long. A chip from the northeast face and loose material from the drift floor make up Sample 126. The uppermost of the Independence workings are a small open cut and an 8-foot shaft that expose a 1.2-foot quartz vein from which a chip sample (No. 125) was taken. Assay values from all the Independence samples (Nos. 125-127 and 130-138) were negligible, except for minor showings of silver and zinc.

Southeast of the Independence, a trench has exposed a 4-inch quartz stringer that strikes S. 60° E. A chip sample (No. 122) was taken. Another showing, a 1-foot quartz vein that strikes N. 65° E. and dips 75° NW, was sampled (Nos. 123 and 124) in a prospect pit that is downstream from the portal of the main Independence adit. Assay values were of no significance.

Hardscrabble area (Samples 140-147).--The Hardscrabble workings are within the Gila Primitive Area on the west wall of the canyon of Big Dry Creek (fig. 45). They line up with the Independence workings

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Figure 45.--Near here

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east of Big Dry Creek and probably are on the same structural zone; both are associated with rhyolite intrusive bodies. A diamond drill hole was found at creek level between the two sets of workings, but no information on the drill hole was obtained.

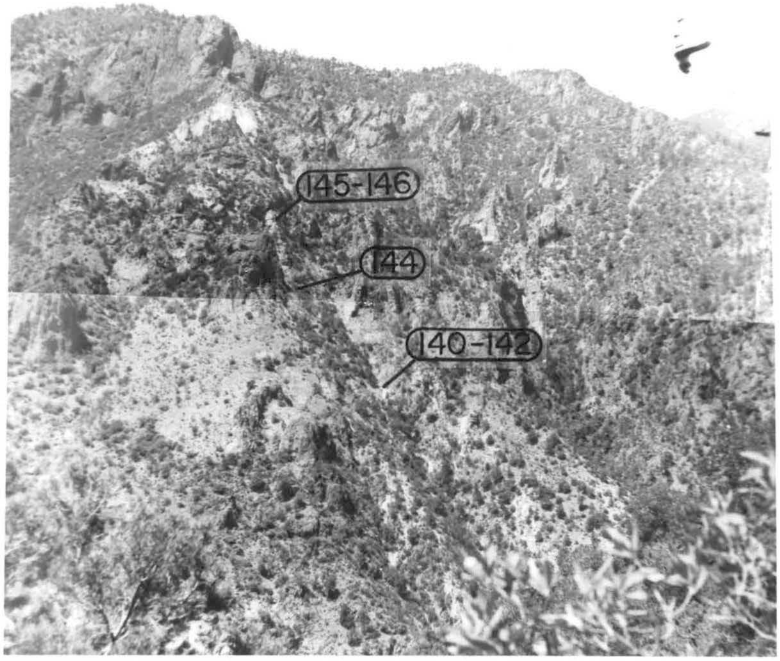

Figure 45.--View of Hardscrabble prospects looking west across Big Dry Creek from Independence Mine area. Sample localities 140-142 at main 60-foot adit; 144 at collar of 30-foot shaft, and 145-146 in 20-foot trench.

The main adit (fig. 44C) is a 60-foot drift on a quartz vein that ranges from 2 to 3 feet in width. Significant assay values from three chip samples (Nos. 140-142) were 1.28 percent lead in sample 140, and 0.40 and 0.41 percent zinc in samples 141-142, respectively. Above the adit, a 3-inch quartz stringer was sampled (No. 144) at the collar of a 30-foot shaft, and a chip sample (No. 146) was taken on a 10-inch quartz vein in a 20-foot trench. Sample 144 assayed low metal values, but sample 146 contained 1.76 ounces of silver per ton, 0.04 ounce of gold per ton, 0.27 percent copper, 0.56 percent lead, and 0.30 percent zinc; sample 146 also yielded 43.68 percent fluorite. A sample (No. 145) taken from a pile of sorted ore near the trench contained 30.80 percent fluorite, 0.14 ounce of gold per ton, 1.80 ounces of silver per ton, 0.61 percent copper, 2.78 percent lead, 0.74 percent zinc, and 0.03 percent cadmium.

A 6-inch quartz vein in andesitic rock was sampled (No. 143) in a pit that is a short distance north of the Hardscrabble vein. Metal values were low except for copper (0.87 percent) and zinc (0.63 percent). A prospect along the trail from the Hardscrabble to Johnson Cabin was examined. Only low metal concentrations were detected in the sample (No. 147) from the face of the pit.

Johnson Cabin area (Samples 148-150).--Over the years, several claims have been located in the Johnson Cabin area, but no production has been recorded. The claims straddle the boundary between the Gila Primitive Area and the Wilderness. A shallow pit at the base of the bluff behind the cabins, an iron-stained quartz outcrop along Big Dry Creek, and a 10-foot cut on the east slope of North Fork were examined. Chip samples (Nos. 148-150) were taken across quartz exposures in the three showings. Assay results were insignificant. In addition, a recent claim, the Dig More No. 1, was located by Dan Watkins, Ed Samora, and R. W. Mathis, west of the North Fork on July 17, 1968. Traces of tellurium, lead, and zinc were found in U. S. Geological Survey samples AMZ-211 and 212 (table 4B).

Uncle John Mine area (Samples 151-161).--Several prospects and mineralized areas were examined along Big Dry Creek upstream from Johnson Cabin.

One of the major prospects found within the Gila Wilderness was the Uncle John (fig. 43F). Located in 1884, the mine was also known as the Lead Bulion (1917), Gimey (1919), and Complex (1930). The Bureau of Mines conducted a reconnaissance investigation of the property in 1950, which disclosed considerable tonnage of indicated and inferred copper-lead-zinc ore. Production from the property has been minor.

Figure 43F shows the sample localities at the Uncle John mine. Ten samples (Nos. 152-161) were taken: three in the main adit, three from a 15-foot opencut, two from dumps, one from some bagged concentrates at the site of a small mill, and one from a quartz vein exposed about 100 yards upstream from the portal of the main adit. Gold values from all samples were negligible, but six of the samples contained significant values as listed below:

Sample No.	Location	Silver oz/ton	Percent Copper	Percent Lead	Percent Zinc	Percent Cadmium	Width (feet)
153	Open cut----------	0.70	0.15	0.44	1.30		0.5
154	-----do----------	1.06	.44	9.90	9.01	0.72	.5
155	Mill concentrates-	2.37	.70	8.94	8.79	.06	
156	Main adit dump----	1.35	.76	5.76	3.47	.03	
157	Main adit---------	3.94	.59	7.10	7.95	.06	3.0
158	-----do-----------	.60	.20	3.80	.30		2.5

About 1,500 feet downstream from the Uncle John mine, a 10-foot adit was driven N. 75° E. on a narrow (6 to 15 inches) silicified band of altered volcanic rock. Assay results from a 1.3-foot chip sample (No. 151) were of no significance.

Deer Trail tunnel (Samples 162 and 163).--A 110-foot adit, thought to be the Deer Trail Tunnel, is shown on figure 43G. The prospect is about one-half mile within the wilderness near the center of sec. 7, T. 12 S., R. 18 W. Two chip samples (Nos. 162 and 163) taken across 2.3 and 3 feet of quartz assayed traces of gold and silver. Galena, sphalerite, chalcopyrite and pyrite are present in a 2-inch quartz vein along the footwall, which strikes N. 40° E. and dips 65° NW.

Pilgrim Camp (Samples 164-166).--A 10-foot adit in an area known as Pilgrim Camp was driven on a quartz vein that bears N. 40° E. and dips 70° SE. The prospect is about one mile within the wilderness in the extreme northeast corner of sec. 7, T. 12 S., R. 18 W. A chip sample (No. 164) was taken across 2.5 feet of quartz in the back. A 30-foot channel sample (No. 165) was taken of altered rock adjacent to the vein. About one-half mile upstream, a 2-foot chip sample (No. 166) was taken from an altered area. Assay results on the three samples showed 0.10 percent and 0.15 percent copper, and 0.03 and 0.05 percent molybdenum in samples 164 and 165, respectively, and 0.04 percent molybdenum in sample 166. Low-grade lead and zinc values were found in sample 164.

Big Dry-Spruce-Spider Creeks (Samples 167-245)

The claimed and prospected area near the headwaters of Big Dry Creek is about 2-4 miles inside the western part of the Gila Wilderness (fig. 46). Mining claim coverage is mainly in secs. 32, 33, 34, T. 11 S., R. 18 W. and in secs 3, 4, and 5, T. 12 S., R. 18 W.

Seventy-nine samples were taken from about 50 mines, prospects, and mineralized areas. Six samples assayed more than 0.10 ounce of gold per ton: sample 169 (0.11 ounce), sample 180 (0.31 ounce), sample 200 (0.12 ounce), sample 204 (0.18 ounce), sample 235 (0.20 ounce), and sample 236 (0.36 ounce). None of the samples assayed in excess of 1.00 ounce of silver per ton, and only five contained significant (more than 20 percent) fluorite.

The area includes six patented mining claims, and 2 patented millsites; dozens of other claims have been located in the district over the years. However, no production has been recorded for the area, and there was no mining activity at the time of the investigation.

Some of the mines and prospects in this area are shown in relation to the geologic structure on plate 1A. The northeast-trending faults have been described earlier (p. 143) as defining a complex graben on the crest of the Bursum resurgent dome (pl. 1A). The major mineralized structures in the graben are the Royal Gorge and Gold Links faults, both of which contain strong brecciated quartz veins, commonly 5-10-feet wide. The Camp Creek fault, which trends west-northwest likely offsets the Royal Gorge fault, and the quartz breccia near the intersection of the two faults is at least 20-feet wide (pl. 1A). Traces of metals in gossan and quartzose vein materials at the intersection of the Royal Gorge and Camp Creek faults are listed in table 4B, samples AGR-647, 658-662 and AMZ-214. South of the Camp Creek fault, only mildly chloritized rock and disseminated pyrite were seen associated with the quartz vein material. North of the Camp Creek fault, the inferred continuation of the Royal Gorge fault and vein is marked by a narrow zone of oxidized outcrops formed by weathering of disseminated pyrite along the fault zone. The Silver Drip tunnel, south of upper Big Dry Creek, also is along a strongly silicified structure that may be part of the Spruce Creek graben, but the fault was not traced far from the tunnel site.

Patented mining claims (Samples 167-174, 186-191, and 194-207).--Six of the patented mining claims in the upper Big Dry Creek area are the Homestake, Quartz No. 2, Quartz No. 1, Mountain View, Royal Gorge, and Lucky Bill (fig. 46). At the time of the wilderness investigation, the patents were owned by the Frymire estate, Mrs. Ruth Ann McBride of Silver City, executrix, who was offering them for sale. The Golden Link and the Gold Bar patented claims (fig. 46) were owned by the United States Smelting Refining and Mining Company, which did not grant permission to examine the properties.

No evidence of workings was found on the Homestake and Lucky Bill claims. Erosion may have obliterated traces of any excavations. One 70-foot adit was found on the Quartz No. 2 (fig. 43H). A chip sample (No. 167) taken across a 10-foot quartz vein in the face assayed extremely low values in gold and silver. Four samples were taken along a 350-foot adit (fig. 43I) that is on the west side of Spider Creek on the Quartz No. 1 claim. The adit was driven west in a quartz vein. Number 168 was a grab sample of loose material near the face. Numbers 169, 170, and 171 were 5-foot chip samples across the quartz vein. Assay values for gold ranged from 0.02 to 0.11 ounce per ton. On the same claim on the east side of Spider Creek, a 100-foot adit (fig. 43J) follows a quartz vein from 4- to 5-feet wide. Two channel samples (Nos. 172 and 174) and one chip sample (No. 173) contained low gold and silver values.

Fluorspar-bearing quartz veins are exposed in four caved adits and an open cut that are near the center of the Mountain View claim (fig. 46). Six chip samples (Nos. 186-191) were taken across the veins that were generally about 5-feet wide. Gold values ranged from 0.01 ounce to 0.08 ounce per ton, silver values ranged from 0.13 ounce to 0.43 ounce per ton, and fluorite values ranged from 3.50 to 31.81 percent.

The Royal Gorge adits (fig. 47), on the east slope of Spruce

Figure 47.--Near here

Creek Canyon, are the most extensive workings on these patented claims. The lower adit (fig. 43M) is a 300-foot drift on a 3- to 5-foot wide quartz vein that strikes N. 70° E. The upper adit (fig. 43N) is a 300-foot drift on a quartz vein as much as 8-feet wide that strikes N. 75° W. Four chip samples (Nos. 194-197) were taken in the lower adit, and six (Samples 198-203) are from the upper adit. Assay results were from 0.01 to 0.12 ounce of gold per ton and from traces to 0.61 ounce of silver per ton.

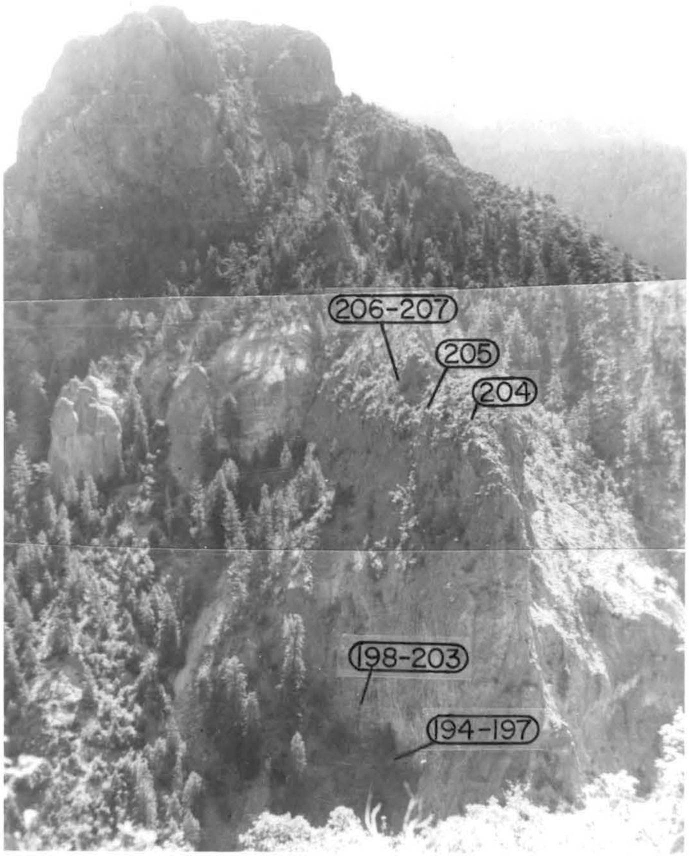

Figure 47.--View of the area of the Royal Gorge patented claim on east side of Spruce Creek, looking eastward from USMM No. 2 on ridge west of Spruce Creek. Numbers denote sample sites.

On the patented claims, some of the mine workings had been driven entirely in quartz, and the maximum vein width could not be determined.

Upper Spider Creek (Samples 175-185).--A prospect on Spider Creek, about one-half mile upstream from the Quartz No. 1 claim, was examined, and quartz specimens (Sample 175) were collected from a small pit on the west bank of the creek and from a 12-foot trench on the east bank. Assay values were insignificant.

Two chip samples (Nos. 176 and 177) of iron-stained brecciated material were taken from a prospect pit on a tributary of Spider Creek about 1,000 feet N. 30° E. of sample locality 175. Gold and silver values were negligible.

Four workings were found at the Kirkpatrick prospect, which is near the forks of Spider Creek about one-half mile upstream from sample locality 175. The west adit is caved, but the size of the dump indicates nearly 200 feet of workings. Sample 178 was taken from the dump, and quartz specimens were collected near the caved portal to make up sample 179. This working probably was on the old Captain Ab claim. The other three showings are on the east bank of the creek. The lowest working is a caved shaft where a 1.3-foot quartz vein is exposed. A chip sample (No. 180) taken across the vein assayed 0.31 ounce of gold per ton. The middle excavation, known as the Gilt Edge (fig. 43K), is a 150-foot adit that was driven S. 50° E. on a 1-foot wide vein of quartz. Three chip samples (Nos. 182-184) were taken in the working. Above the Gilt Edge adit, a 12- by 4-foot trench exposes 4 feet of altered rock. A chip sample (No. 185) was taken across the trench. Except for Number 180, samples showed low-grade amounts of gold and silver. A panned grab sample (No. 181) of the dump showed many very small gold colors.

Spruce Creek (Samples 192-193 and 208-231).--Fourteen prospect sites were examined in the vicinity of Spruce Creek outside the patented claims (fig. 46). Each site is identified below by sample number and is located on figure 46.

(192-193): The "86" prospect consists of an adit (fig. 43L) that exposes two narrow (16 and 10 inches) quartz veins. The samples (Nos. 192 and 193) were taken from stopes that extended 12 feet and 5 feet, respectively, above the roof. No significant mineralization was detected in the analyses.

(208): An adit 6-feet long was driven east on the Camp Creek fault (pl. 1A). A chip sample (No. 208) assayed minor amounts of gold and silver.

(209): An excavation on an open fissure, probably the Camp Creek fault, that bears N. 80° E. The walls of the fissure are lined with a crust of calcite and fluorspar. A sample of the material indicated no important mineral occurrences.

(210): A 6-foot zone of quartz and fluorspar stringers crops out for 100 feet and strikes N. 65° E. A chip sample across the zone assayed negligible gold and silver values.

(211): A prospect pit 4-feet square exposes an 8-inch quartz-fluorspar vein that bears N. 85° W. and dips 80° SE. A chip sample across the vein assayed 0.04 ounce of gold per ton and 0.06 ounce of silver per ton. A panned sample showed a few gold colors.

(212): A 20-foot trench at this locality bears N. 80° E. Fluorspar, up to 2-inches thick, lines the walls of the trench. A chip sample (No. 212) of the fluorspar and of a fracture zone in the face of the trench contained no significant metal concentrations.

(213-214): Two 15-foot adits about 150 feet apart are on the south bank of Spruce Creek. The west adit was driven S. 15° E. on a 1.3-foot quartzose zone. The east adit bears S. 50° W. on a 4-foot zone with quartz veins. Assay results of the two samples were negligible.

(215-223): Six workings are high on the south slope of Spruce Creek, apparently 100-200 feet north of the Lucky Bill patent. The largest working (fig. 43-0), the C. O. D. prospect, consists of a 70-foot crosscut to a 100-foot drift that was driven along a 2-foot quartz vein that strikes N. 65° E. Chip samples (Nos. 215-216) were taken across the vein in each face. The second working is an excavation that has exposed a quartz-fluorspar vein that varies from 2 to 3 feet in width. Two chip samples (Nos. 217 and 218) were taken. The third showing is a filled 10- by 6-foot prospect pit; grab sample No. 219 was taken from the dump. The fourth working is a 20-foot adit that was driven on a 1-foot fault zone that strikes S. 60° W. and dips 70° NW. A chip sample (No. 220) was taken across the fault zone. A grab sample (No. 221) was taken from the small dump of a caved adit. The easternmost working is a 27-foot cut that bears S. 30° W. The cut has exposed a 6-inch fracture zone dipping 70° NW and a 3-foot quartz-fluorspar vein. Chip samples (Nos. 222 and 223) were taken across the two exposures. Values of the eight samples ranged from 0.005 to 0.06 ounce of gold per ton and from traces to 0.64 ounce of silver per ton. One sample (No. 223) contained 23.34 percent fluorite.

(224): A 20-foot adit was driven N. 20° E. along a zone of silified rock. Chip sample 224 contained only traces of gold and silver.

(225): A prospect pit on the creek bank was sunk on a 2-foot quartz vein that strikes N. 80° E. A chip sample of the quartz contained nothing of significant mineral value.

(226): A 10- by 10-foot pit was sunk to a depth of 10 feet in a fracture zone that strikes N. 45° E. Chip sample 226 taken across the east face of the pit contained traces of gold and silver.

(227-229): A 70-foot adit that bears S. 20° W. is thought to be the Case mine (fig. 43P). Chip samples 227-229 were taken from quartz-fluorspar showings. Assay results show no important mineral values.

(230): A 3-foot fracture zone containing quartz and fluorspar is exposed in a pit. The zone strikes N. 75° E. A chip sample (No. 230)contained 27.00 percent fluorite and assayed 0.04 ounce of gold per ton and 0.37 ounce of silver per ton.

(231): A 2-foot quartz-rich zone is exposed in a cliff face. The zone strikes N. 25° W. A 2-foot chip sample (No. 231) did not contain significant mineral values.

Big Dry Creek west of Golden Link Claim (Samples 232-233).--On Big Dry Creek at the foot of the trail from Spruce Creek the inferred southwest extension of the Gold Links fault zone (pl. 1A) is marked by narrow calcite veins and pyritic and chloritic altered rocks. Traces of gold, silver and molybdenum are present in samples AGR-637 and 639 from this area (table 4B). About one-quarter mile above the mouth of Spruce Creek two workings along an ill-defined portion of this fault zone were examined (fig. 46). Samples (Nos. 232 and 233) of silicified rock were taken from these small filled pits. Assay results of both samples were almost nil. From the number of claims located in the area (table), it is possible that other workings may have caved or have been covered by rock slides.

Upper Big Dry Creek and Silver Drip Trail (Samples 234-238).--Four prospects were examined near the Silver Drip Trail on the headwaters of Upper Big Dry Creek (fig. 46).

(234-235): An open cut, 20-feet long and 10-feet wide, exposes a 4-foot width of breccia that contains a 1-inch seam of fault gouge. Sample 234 of the gouge assayed 0.07 ounce of gold per ton and 0.25 ounce of silver per ton. Chip sample 235 across the breccia contained 0.20 ounce of gold per ton and 0.44 ounce of silver per ton.

(236): Several quartz stringers bearing N. 25° W. are exposed in a shallow prospect pit. Sample 236 of quartz from the stringers assayed 0.36 ounce of gold per ton and 0.58 ounce of silver per ton.

(237): A shallow 20-foot trench exposes a number of narrow quartz stringers at this locality. A random chip sample (No. 237) assayed 0.05 ounce of gold per ton and 0.21 ounce of silver per ton.

(238): Low gold and silver values were recorded for a 1-foot chip sample taken from a quartz-cemented breccia exposed in a small prospect pit at this site.

Silver Drip Mine area (Samples 239-245).--Three showings were sampled on prospects known as the Silver Drip Cabin claim and the Silver Drip mine. The prospects are within the wilderness in the central part of sec. 3, T. 12 S., R. 18 W. (fig. 25).

(239): Near the ruins of Silver Drip cabin, a quartz-cemented breccia zone is exposed in a discovery trench. A random chip sample (No. 239) assayed 0.08 ounce of gold per ton and 0.38 ounce of silver per ton.

(240-244): The 250-foot adit (fig. 43Q) at this location is the only underground working that was found on the property. The drift has a general bearing of S. 65° W., and it was driven entirely in quartzose vein material. Five chip samples (Nos. 240-244) were taken across the quartz at various places along the drift. Assay results ranged from 0.01 to 0.02 ounce of gold per ton and from 0.07 to 0.24 ounce of silver per ton. Fluorite values ranged from 5.70 to 18.60 percent.

(245): The Silver Drip vein is only 2-feet wide in the creek bed below the adit. Chip sample 245 contained 13.90 percent fluorite. About one-hundred yards down gulch from the Silver Drip vein a 2-foot fault zone with silicified rock and gouge trends east-west and dips 74° south. A trace of gold and tellurium were found in sample AMZ-213 (table 4B).

Haystack Mountain to Upper Sacaton Creek

(Samples 247-283 and 287-288)

The Haystack Mountain-Upper Sacaton Creek area in secs. 15, 22, 23, 26, and 27, T. 12 S., R. 18 W. is wholly within the wilderness near its southwestern boundary. Game trails are the only means of access to the area, and travel is extremely difficult.

Forty-one samples from three groups of workings assayed from traces to 0.03 ounce of gold per ton except for sample 275 that contained 0.20 ounce per ton. Twelve samples assayed in excess of 1.00 ounce of silver per ton, including three of definite economic interest: No. 254 contained 16.46 ounces per ton, No. 259, 23.80 ounces per ton, and No. 260, 11.02 ounces per ton. Also, the following seven samples contained more than 1.0 percent copper: No. 253, 2.70 percent, No. 254, 1.77 percent, No. 258, 28.28 percent, No. 259, 4.99 percent, No. 260, 19.06 percent, No. 263, 2.52 percent, and No. 265, 1.96 percent. Only one sample (No. 250) contained significant fluorite.

Two patented mining claims in the area are owned by A. J. Thompson and R. L. Senn of Socorro, N. Mex. Several tons of copper-silver ore have been produced from these claims. Numerous other claims have been located in the area through the years, but there was no prospecting or mining activity in the area at the time of the wilderness investigation.

The Haystack Mountain area is along the southern margin of the Bursum Caldera, in a zone of complex intrusion and faulting (pl. 1A). The noteworthy gold, silver, and copper values in this area are largely localized in a zone northeast of Haystack Mountain where rhyolitic intrusive rocks have invaded caldera-fill conglomerate and breccia.

Haystack Mountain (Samples 247-265).--Eight mineralized showings were examined in the vicinity of Haystack Mountain (pl. 3). Workings dug in them are identified by sample numbers in the descriptions that follow.

(247): Grab sample 247 was taken from a dump near a 20-foot long filled trench that is on the southeast slope of Haystack Mountain. Assay results were negligible.

(248-249): A 70-foot trench also on the southeast slopes of Haystack Mountain, has been excavated to a depth of 8 feet in silicified rock. Grab samples 248 and 249 of development rock contained slight amounts of gold, silver, copper, lead and zinc.

(250-251): An 80-foot cut was excavated on small fluorspar veins that strike N. 45° W. on the Lakeview claim. Sample 250 was taken from two of the veins with widths of 4 and 7 inches. Chip sample 251 was taken across a fracture zone. There were no values of consequence except for 79.45 percent fluorite in sample 250.

(252-255): A caved adit on patented ground was driven S. 15° E. for an undetermined distance. A 2.5-foot channel sample (No. 252) was cut across a fracture zone at a point 6 feet inside the adit, and a chip sample (No. 253) was taken from 6 inches of gouge at the same point. At the portal, samples were taken from a 10-inch copper-bearing quartz vein (No. 254) and from a 2-inch band of fault gouge (No. 255). The principal values are 2.70 percent copper contained in sample 253 and 16.46 ounces of silver per ton plus 1.77 percent copper in sample 254.

(256-259): At this location, also on patented ground, a room had been cut into the side of a cliff and a shaft had been sunk from it. The shaft is caved to within 10 feet of the collar. The size of the dump indicates that more than 500 feet of underground exploration had been done. Samples were taken from a 3-inch seam of fault-gouge (No. 256), from several quartz and calcite stringers (No. 257), and from a one-inch seam of fault gouge (No. 258). The principal values from the three samples were 4.23 ounces of silver per ton and 2.83 percent copper in sample 258. Mineral specimens selected from the dump make up sample 259; as anticipated, assay values were high--23.80 ounces of silver per ton and 4.99 percent copper. Hand sorting the several hundred tons of material from the dump might yield a few tons of shipping ore.

(260): On the Big Butte claim, a 25-foot adit was driven N. 15° W. along a 1-inch veinlet of chalcocite. Sample 260, taken along the veinlet over the length of the drift, contained 11.02 ounces of silver per ton and 19.06 percent copper.

(261-264): Three prospect pits were found at the base of the bluffs on the north slope of Copper Canyon. At one pit, chip sample 262 was taken from a 1.5-foot breccia zone and channel sample 261 was taken down the face of the dump. Narrow (6 inches and 10 inches) quartz veins were sampled (Nos. 263 and 264) in the other two pits. The only significant value contained in the four samples was 2.52 percent copper in sample 263, which was from the 6-inch vein.

(265): A 30-foot adit was driven N. 30° W. on narrow quartz stringers. Sample 265, of quartz chipped from the stringers and picked from development rock, assayed 3.17 ounces of silver per ton, 0.03 ounce of gold per ton, and 1.96 percent copper.

Alexander mine (Samples 266-272).--Three workings were sampled on a prospect known as the Alexander mine. The property is a little more than a mile within the wilderness in NW 1/4 sec. 26, T. 12 S., R. 18 W. Access is by foot from Minton Canyon between Cherry Canyon and Sacaton Creek, across a high ridge that extends south from Sacaton Mountain.

(267-271): The main adit of the property (fig. 43R) was driven N. 35° W. for some 200 feet along a fault zone in the porphyritic rhyolite flows of Sacaton Mountain. The fault shows pronounced iron staining and red fault gouge several feet thick at some spots. Collapsed timber and caving ground prevented examination of the two raises, the face, and a winze and a determination of the true vein width. A composite sample (No. 267) was taken of vein quartz from around the two raises. Four chip samples (Nos. 268-271) were taken across 1- and 2-foot widths of vein quartz along the drift. Gold and silver values ranged from traces to 0.01 ounce per ton and from traces to 1.50 ounces per ton, respectively.

(266): East of the main adit, there is a 37-foot combined trench and caved adit that bears N. 20° W. The working is on a 20-inch fracture zone containing quartz veinlets. A chip sample (No. 266) across the zone contained extremely low amounts of gold and silver.

(272): A pit above the main adit exposes a 6-foot fracture zone containing quartz veinlets. Insignificant gold and silver values were contained in a 6-foot chip sample (No. 272).

The Fairview mine and vicinity (Samples 273-283 and 287-288).--A prospect known as the Fairview mine and four other workings nearby is at an elevation of 9,400 feet, about three-fourths of a mile within the wilderness in SE 1/4 sec. 22, T. 12 S., R. 18 W.

(278-282): The Fairview mine is a 150-foot adit (fig. 43S) that was driven N. 35° E. on a narrow (3 to 6 inches) quartz vein. Five chip samples (Nos. 278-282) were taken across the vein at various places along the drift. The highest values were contained in sample 280: 0.03 ounce of gold per ton and 1.96 ounces of silver per ton. Sample 281 contained 1.76 ounces of silver per ton.

(275-277): About 150 feet southeast of the Fairview portal, a 1-inch quartz stringer is exposed in a 35-foot vertical cut that was excavated in the cliff face. A 10-inch chip sample (No. 276) was taken from a fracture zone in the upper part of the cut, and samples 275 and 277 were taken from the stringer in the lower part. Assay results are shown below.

Sample No.	Ounces per ton		Width of sample (feet)
	Gold	Silver	
275	0.20	2.90	0.1
276	.01	2.00	.8
277	.01	2.80	.2

(Semiquantitative spectrographic analysis of sample 275 showed 70 parts per million or approximately 2 ounces per ton gold.)

(273-274): On the Fairview No. 2 claim, south of the Fairview No. 1, a 2-inch quartz stringer was sampled in a pit (sample 273) and at an outcrop (sample 274). Gold and silver values were negligible.

(283): Southwest of the Fairview prospect, a pit 5-feet deep was sunk on a 6-foot breccia zone. Copper-stained specimens (sample 283) contained only 0.24 percent copper.

(287-288): A 60-foot adit was driven N. 25° W. on fault breccia (fig. 43T) along Sacaton Creek. It is in NW 1/4 sec. 15, T. 12 S., R. 18 W. about 1-1/2 miles north-northwest of the Fairview prospect. A 2.5-foot chip sample (No. 287) and a 4-foot chip sample (No. 288) were taken across the back. Significant assay values were 0.78 ounce of silver per ton in sample 287, and 0.03 ounce of gold per ton in sample 288.

Little Dry-Pine-Sacaton Creeks area

(Samples 284-286 and 290-415)

Most of the Little Dry-Pine-Sacaton Cteeks area (fig. 48) is just south and west of the wilderness boundary. One working is within the wilderness, and six were examined within tract 7 of the Gila Primitive Area. The area is mainly in secs. 19, 20, 29 and 30, T. 12 S., R. 18 W.

Six patented mining claims and numerous unpatented claims have been located within the area. On existing maps, patented claims are shown to be in the Gila Primitive Area in sec. 17, and the Gila Wilderness in sec. 8, T. 12 S., R. 18 W. However, errors were made in the original surveys, and all but one of the patented claims (the Margaret Stewart) are actually south of the primitive area in sec. 20. Some maps show two patented millsites adjoining the patented mining claims. These were never patented, however, and instead the area is covered by the Maverick and May Apple unpatented maining claims.

The greatest concentration of mineralized structures in the study area, including nearly all the significant occurrences of copper, lead, and zinc, as well as noteworthy gold, silver, tellurium and molybdenum values, and known fluorspar resources is located between the rhyolite intrusive centers at Sheridan Mountain and Seventyfour Mountain (pl. 1A). This zone of rhyolite intrusions and extensive northwest-trending faults and fractures along the present wilderness boundary is one of the 3 or 4 major areas with a potential for important mineral deposits within the study area, and on the basis of surface evidence of mineralization would appear to be the most promising exploration target area.

Eighty-five samples were taken from six areas of mining activity. Only one of the samples assayed high in gold; a specimen sample (No. 376) from a dump contained 1.28 ounces of gold per ton. Four samples contained more than 4.00 ounces of silver per ton: sample 296 contained 5.68 ounces per ton; sample 297, 4.92 ounces per ton; sample 316, 4.37 ounces per ton; and sample 337, 22.17 ounces per ton. The high silver value of sample 337 was from a vein less than 4 inches wide; this sample also contained significant values in copper (2.40 percent), lead (3.72 percent), and zinc (2.40 percent). In the Lone Pine Hill area, four of thirty-seven samples contained more than 1,000 ppm (0.10 percent) tellurium: sample 376 contained 4,560 ppm; 379, 1,130 ppm; 398, 3,500 ppm; and 402, 2,730 ppm. The only other sample containing high metal values is No. 335 taken across a 3-inch vein; it assayed 2.64 percent lead and 10.10 percent zinc. Eight samples (Nos. 295, 301, 338, 356, 362, 363, and 414) contained significant fluorite. The only recorded production is a small amount of silver mined in 1941 from the Maverick prospect. At the time of the wilderness investigation, there was no mining activity in the area other than claim assessment work.

Rainstorm Gulch and Upper Little Dry Creek (Samples 290-322).--
Eleven localities were examined in the Rainstorm Gulch area (fig. 48). The workings are identified by sample numbers in the descriptions that follow:

(290-292): The Upper New Eureka prospect (fig. 44D) is developed by a split level adit that was driven 40 feet N. 70° W. along a narrow (8 to 18 inches) quartz vein. The property apparently lies just within tract 7 of the Gila Primitive Area. The highest values obtained on assay of three chip samples (Nos. 290-292) were 0.02 ounce of gold per ton and 0.44 ounce of silver per ton.

(293-307): The main workings of the prospect known as the Lower New Eureka mine are shown on figure 44E. Twelve chip samples (Nos 296-307), with widths varying from 4 inches to 3 feet, were taken at various places across quartz veins, quartz-fluorspar veins, fracture zones, and gouge seams. The highest metal values are 5.68 ounces of silver per ton in sample 296 (width of 1.2 feet), and 4.92 ounces of silver and 0.08 ounce of gold per ton in sample 297 (width of 6 inches). Samples 293, 299, 303, 305, and 306 assays ranged from 0.95 to 1.99 ounces of silver per ton.

Two caved shafts on the canyon slope above the New Eureka adit were sampled by grab sample 293, taken from the dump of the south shaft, and chip sample 294 taken across a 2.5-foot vein that is exposed on the rim of the north shaft. About 50 feet north of the north shaft, a 4-foot chip sample (No. 295) was taken across quartz-fluorspar veinlets. The highest assay values were 0.02 ounce of gold per ton and 1.40 ounces of silver per ton contained in sample 293. Sample 295 contained 33.27 percent fluorite.

(308-315): At the Regal prospect (fig. 44F) a 220-foot adit that bears N. 45° W. connects with a 120-foot crosscut. The property evidently is just south of the Gila Primitive Area boundary. Eight chip samples (Nos. 308-315) were taken across narrow (one foot or less wide) shear zones, zones of quartz-fluorspar veinlets, and gouge seams. Gold values range from traces to 0.02 ounce per ton, and silver values are from 0.06 to 0.35 ounce of silver per ton. One sample (No. 308), a 3-foot chip, contained 38.57 percent fluorite. According to the claimant, the adit had been driven to cut mineralization cropping out on the hillside above.

(316-317): Above and southwest of the Regal portal, a 25-foot adit was driven S. 60° W. on a 3-foot breccia zone containing quartz stringers. Two chip samples (Nos. 316-317) were taken and sample 316 contained 4.37 ounces of silver per ton.

(318): Near the mouth of Rainstorm Gulch a short distance south of the primitive area boundary, a 15-foot adit was driven N. 40° W. on a 3-foot shear zone. A chip sample (No. 318) across the zone yielded traces of gold and silver.

(319-320): Two shallow prospect pits are located a short distance inside the primitive area on the east bank of Little Dry Creek. The pits expose a narrow (4 to 6 inches) quartz vein that bears N. 60° E. and dips 80° SE. Assay results from two chip samples (Nos. 319 and 320) were of no significance.

(321): A 15-foot adit was driven S. 55° E. on a 2-inch quartz stringer approximately on the primitive area boundary. A 3-foot chip sample (No. 321) across the face assayed negligible values, except for minor zinc.

(322): A 125-foot adit was driven S. 35° E. (fig. 42J) a short distance south of the primitive area, probably on the Maverick prospect. The workings were partially caved and were in a dangerous condition. A grab sample (No. 322) of loose material from the floor of the drift gave very low assay values for gold and silver. Manganese assayed 2.80 percent.

Dog Canyon-Upper Little Dry Creek (Samples 323-340).--Sixteen prospects and mine workings were examined in the Dog Canyon-Upper Little Dry Creek area (fig. 48). In the descriptions that follow, the workings are identified by sample numbers.

(323-324): On the west bank of Little Dry Creek, downstream from Rainstorm Gulch, a 10-foot adit bears N. 70° W., and is thought to be the May Apple prospect. Chip samples (Nos. 323 and 324) were taken across a loosely cemented 2.6-foot wide breccia in the face and across a 1.7-foot thick calcite lens on the left side of the portal. Assays showed very low gold values and traces of silver.

(325-326): Two short adits were driven at the west end of the Gold Bar No. 1 patented claim. Near the northwest corner of the claim, a 25-foot adit was driven S. 70° E. along some quartz veinlets. A 4-foot chip sample (No. 325) was taken across the veinlets in the face of the drift. The second adit is about 400 feet southeast of the first and is about 300 feet above Little Dry Creek. The adit was driven N. 80° E. for 90 feet (fig. 42K). The only evidence of mineralization found was a series of quartz stringers along the walls of the adit. A random chip sample (No. 326) was taken where the stringers were exposed. Very low gold and silver values were contained in the samples. However, about 100 yards southwest of this adit, along the cliff face, an iron-stained fracture zone as much as 14 inches wide trends

N. 45° E. and dips 70° northwest. A 5-foot prospect adit was dug where a 6-inch iron-stained breccia contains fluorspar and sulfides. Copper, lead, and traces of other metals are shown in sample AMZ-233 (table 4B).

(327): This working is approximately 800 feet up Dog Canyon on the Queens Crown No. 2 patented claim. A 10-foot prospect cut exposes a north-trending quartz vein 6 inches wide. A chip sample (No. 327) across the vein contained negligible values.

(328): A 20-foot adit driven north from Dog Canyon, is the only working found on the Margaret Stewart patented claim. A 4-foot chip sample (No. 328) taken in the face across several quartz stringers did not indicate an important mineral deposit.

(329-334): Six workings were sampled on the Look Off No. 1 patented claim. A caved adit, probably the discovery working, was driven south from Dog Canyon. A chip sample (No. 329) was taken near the portal across a 4-foot fracture zone that contains quartz veins and stringers. On the slope above the adit, four prospect pits expose a quartz vein with widths ranging from 1.2 to 4.0 feet. Four chip samples (Nos. 330-333) were taken from the vein in each pit. In the southeast corner of the mining claim, a chip sample (No. 334) was taken across 4 feet of altered volcanic rock that is exposed in a shallow pit. Assay values of the six samples ranged from traces to 0.03 ounce of gold per ton and from traces to 0.01 ounces of silver per ton.

(335-337): Two adits were examined on the Gold Bar No. 3 patented claim. On the west bank of Little Dry Creek, a 10-foot adit was driven on a 3-inch mineralized quartz vein that strikes S. 70° W. and dips 60° SE. Sample 335 of the mineralized material contained 10.10 percent zinc, 2.64 percent lead, 0.84 ounce of silver per ton, and 0.05 percent molybdenum. The deposit would not be economically minable because of the narrow width of the vein.

Near the central part of the northern boundary of the claim, a 40-foot adit (fig. 42L) was driven north to crosscut a 1-4 inch wide mineralized quartz stringer. A sample (No. 337) of the mineralized material contained 0.07 ounce of gold per ton, 22.17 ounces of silver per ton, 2.40 percent copper, 3.72 percent lead, and 2.40 percent zinc. The values have little significance in view of the very narrow width of mineralization. A crosscut from the adit was timbered shut; no estimate could be made of the extent of workings behind the timber.

About 150 feet east of the Gold Bar No. 3 prospect, a cut was excavated on a 4-foot siliceous zone containing numerous quartz stringers. The working is the only one that was found on the Gold Bar No. 2 patented claim. The strike of the zone is N. 80° E., and it dips 70° N. A 4-foot chip sample (No. 336) contained very low values of gold, silver, copper, lead, and zinc.

(338-340): Two prospect pits were sampled south of the Gold Bar No. 3 claim. A 3-foot chip sample (No. 338) was taken across a quartz-fluorspar showing in one pit, and chip samples (Nos. 339-340) were taken across 2 and 3.5 feet of altered volcanic rock in the other pit. Except for 22.12 percent fluorite in sample 338, no important mineral concentrations were detected.

Lower Little Dry Creek (Samples 342-361).--Prospects and small mine workings that were examined in the Lower Little Dry Creek area below Swartz cabin (fig. 48) are identified by sample numbers in the descriptions that follow:

(342-344): A prospect pit (the Rice prospect) in the bank of Little Dry Creek is located about 1,000 feet downstream from Swartz cabin. Three types of altered volcanic rock were sampled (Nos. 342-344) in the pit. None of the types showed economic mineralization.

(345): About 500 feet downstream from the Rice prospect, the trail crosses the caved part of an old adit on the west bank of Little Dry Creek. A 6-foot chip sample (No. 345) was taken of altered rock near the adit. Assay results were negligible.

(346-349): An area of intensely altered rock resembling gossan is along the north side of the lower part of Whiteside Canyon. Iron and manganese oxide minerals are abundant. Three adits driven in the altered material were sampled. A 4-foot chip sample (No. 346) was taken across the face of a 40-foot adit that bears N. 75° E. Another adit extends N. 75° E. for 27 feet along a rhyolite dike contact, a 3-foot chip sample (No. 347) was taken across the back. Figure 42N shows the Good Hope adit where a 6-foot sample (No. 348) was chipped along the adit wall. At the mouth of Whiteside Canyon, a sample (No. 349) of altered rock was collected from float. Gold values of the four samples ranged from traces to 0.04 ounce per ton, silver values from traces to 0.22 ounce per ton.

(350-352): The Little Dry Creek trail crosses the dump of one of two short adits that are opposite the mouth of Whiteside Canyon. An adit at the Harvest prospect (fig. 42-O) was driven 30 feet N. 45° W. in altered rock containing disseminated pyrite. A 6-foot chip sample (No. 350) was taken across the back. The Reward prospect (fig. 42P) is a partially caved working that was driven in a fault zone containing disseminated pyrite. A 3-foot chip sample (No. 351) was taken across the face, and a grab sample (No. 352) was taken from a muck pile within the working. The highest assay values were 0.14 percent molybdenum in sample 250 and 0.10 percent copper in sample 352.

(353): Chip sample 353 was taken across 4 feet of strongly pyritized altered rock in a prospect pit 150 feet before the end of Little Dry Creek road. Assay results were insignificant.

(354-359): Five workings were found above the road on the west slope of Little Dry Creek about one-fourth mile from the end of the road. A 3-foot chip sample (No. 354) and a grab sample (No. 355) were taken at a 35-foot cut where iron-stained altered rock is exposed. Two other workings are on top of the divide between Little Dry Creek and Red Hair Canyon to the west. One consists of a shallow trench on a 12-foot silicified zone that contains numerous fluorspar stringers. Secondary copper minerals were noted coating the fracture surfaces of altered rhyolite in the area. A selected sample (No. 356) of the stringers assayed 59.08 percent fluorite. A caved shaft, probably the Copper Glance claim, is about one-fourth mile southeast of the workings on top of the divide. Specimens (sample 358) with coatings and fillings of malachite, azurite, and chrysocolla in fractured andesite were collected from the small dump (estimated at 60 tons). On the ridge northeast of the shaft, a 4-foot chip sample (No. 359) was taken of altered rock exposed in a small prospect pit.

Metal values in all six samples were negligible except for 10.25 percent copper in the specimen sample (No. 358). It is estimated that the dump contains less than one-half ton of such material.

(360-361): The southernmost working that was examined on Little Dry Creek is a 20-foot adit (fig. 42Q) with a west bearing. Sample 360 was chipped for 3 feet across an exposure of volcanic glass, and sample 361 was cut from a shear zone near the portal of the adit. Assay results were negligible.

Pine Creek (Samples 362-366 and 408-409).--Several prospects were examined along the headwaters of Pine Creek in SE 1/4 sec. 29, T. 12 S., R. 18 W. The area investigated is about one-half mile southwest of the wilderness boundary, and can be reached by a pickup-truck road that crosses the Burrell ranch and ends at Moore cabin.

Workings are identified by sample numbers (fig. 48).

(362-363): According to Rothrock and others (1946, p. 48), 9 tons of fluorspar have been shipped from the prospect known as the Blue Rock mine, which is claimed by J. F. Moore of Gila, N. Mex. The working is a 35-foot trench that bears N. 70° E. Chip samples 362 and 363 were taken across a 6-foot quartz-fluorspar vein and an adjacent 7-foot brecciated zone. The samples assayed 30.94 and 49.91 percent fluorite, respectively.

(364): At this site, a 4-foot fluorspar vein is exposed in a bulldozer cut. A 25-foot random chip sample (No. 364) was taken across the structure to test for minerals other than fluorite. No significant metal concentrations were detected in the analyses.

(365): A 1.2-foot pyrite-bearing quartz vein striking N. 25° W. is exposed in a small prospect pit. Chip sample 365 across the vein contained very low gold and silver values.

(366): Negligible gold and silver values were obtained from a 2-foot chip sample (No. 366) of altered rock that is exposed in a small pit at this location.

(408-409): An 8-inch seam of fault gouge striking S. 55° E. is exposed in a 10-foot prospect pit. Sample 408 was taken of the gouge material, and sample 409 was chipped across 2 feet of altered volcanic rock near the fault zone.

Lone Pine Hill (Samples 341 and 367-407).--The Lone Pine Hill area (fig. 49) is at the head of Pine Creek about 1/4 mile southwest of the

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Figure 49.--Near here

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wilderness boundary. Most of the workings are in NE 1/4 sec. 29, T. 12 S., R. 18 W. A rough, steep road extends from the north end of Cactus Flat northeasterly to the workings.

John Lambert and Dan Lannon discovered tellurium in the district in September 1889, and recorded the Tellurium claim in 1893. Over the years, claims in the area have been relocated under various names (table 8). Most of the area is now claimed by Lee Rice of Oracle, Ariz.

Ballmer (1932) reported that native tellurium occurs in small irregular, ovoid bodies; the maximum size reported was 18 millimeters long and 8 millimeters wide. Native gold, pyrite, and bismuthinite accompanied the tellurium. Crawford (1937) reported the ore mineral was a mixture of tellurium and bismuthinite.

Production from the area has been about 5 tons of tellurium ore; reportedly some gold has also been produced.

(341): On the south slope of an east tributary to Little Dry Creek, a 25-foot adit (fig. 42M) was driven S. 25° E. on a zone of altered rock that contains disseminated pyrite. A 3-foot chip sample across the face assayed insignificant gold and silver values.

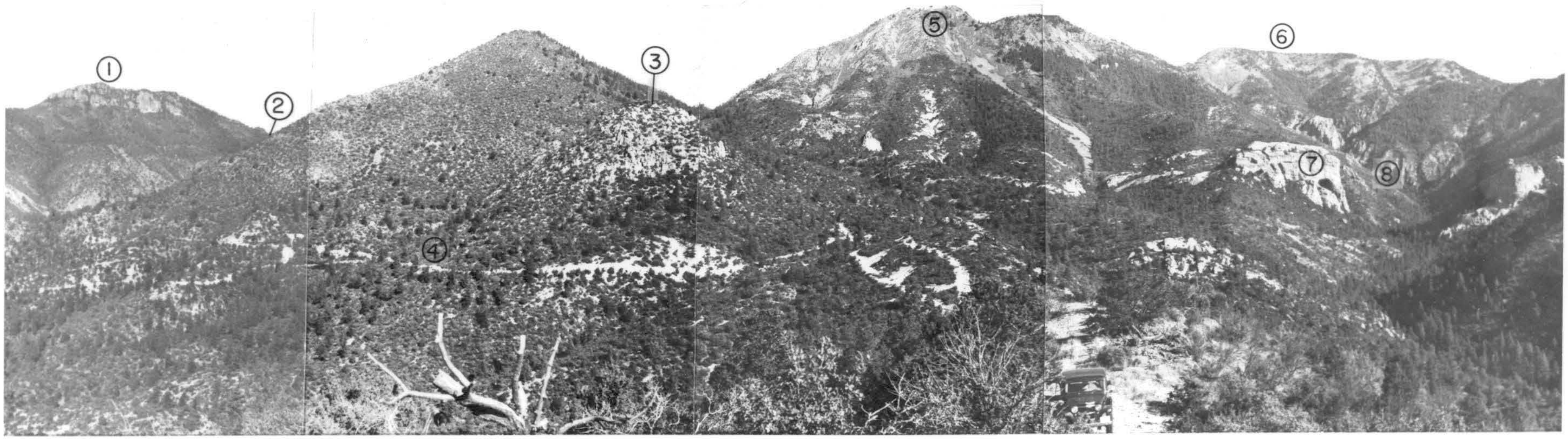

Figure 49.--Panoramic view of the Lone Pine Mine area. West Baldy and Sacaton Mountain are on the resurgent dome of the Bursum caldera; rest of view to west and in front of Cave Rock probably is all within the moat area of the resurgent caldera.

(367): One of the westernmost prospects in the Lone Pine area is a shallow pit in iron-stained altered rock; chip sample 367 yielded very low gold and silver values.

(368): At this site, a 6-foot pit was sunk in a fracture zone showing specular hematite. Chip sample 368 indicated no important mineral deposit.

(369-374): The prospect known as the Yellow Peril, or the Stirrup, consists of about 300 feet of adit (fig. 42R) that was driven in a generally northerly direction in intrusive rhyolite. Material was chipped from various fractures and alteration zones in the working to make up samples 369-373. In addition, grab sample 374 was taken from the dump. The highest value obtained in analyses of the samples was 10 ppm tellurium. Aluminum-sulfate crusts as much as several inches thick line part of the walls. These crusts also were noted in workings at S Dugway Canyon, Little Dry Creek, and Alum Mountain.

(375): A 30-foot shaft was sunk on a highly silicified outcrop resembling jasperoid, and which contained numerous quartz stringers. The only significant value was 131 ppm tellurium in a grab sample (No. 375) taken from the dump.

(376): A selected specimen sample 376 taken from the dump of a 40-foot shaft contained 1.28 ounces per ton gold and 4,560 ppm tellurium. This is the third highest gold value and the highest tellurium value obtained in the wilderness investigation.

(377-379): Three small prospects were sampled a short distance east of sample location 376. A 10-foot shallow caved cut exposes 6 inches of a quartz vein across which chip sample 377 was taken. At the Gold Telluride prospect, a 50-foot adit (fig. 42S) was driven north on several quartz veinlets. A chip sample (No. 378) was taken across the face of the adit. Sample 379 was a composite grab from the dump of an inaccessible 25-foot shaft and from mineralized rock around the portal of a flooded adit connecting with the shaft. Tellurium values were 9.5 ppm, 5 ppm, and 1,130 ppm in samples 377, 378, and 379, respectively.

(380-384): A caved adit and three shafts were dug on what probably was the original Tellurium property (fig. 50). Sample 380 was

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Figure 50.--Near here

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a grab sample from the dump of the topmost shaft, which is about 20-feet deep. Grab sample 381 and specimen sample 382 were taken from the dump of a second shaft, which is just above the adit. The size of the dump at the caved adit represents several hundred feet of underground workings; sample 383 was a grab from this dump. A grab sample (No. 384) was taken from the dump of a third shaft, which is more than 100-feet deep. Assay values for gold and silver were negligible except for sample 380 which

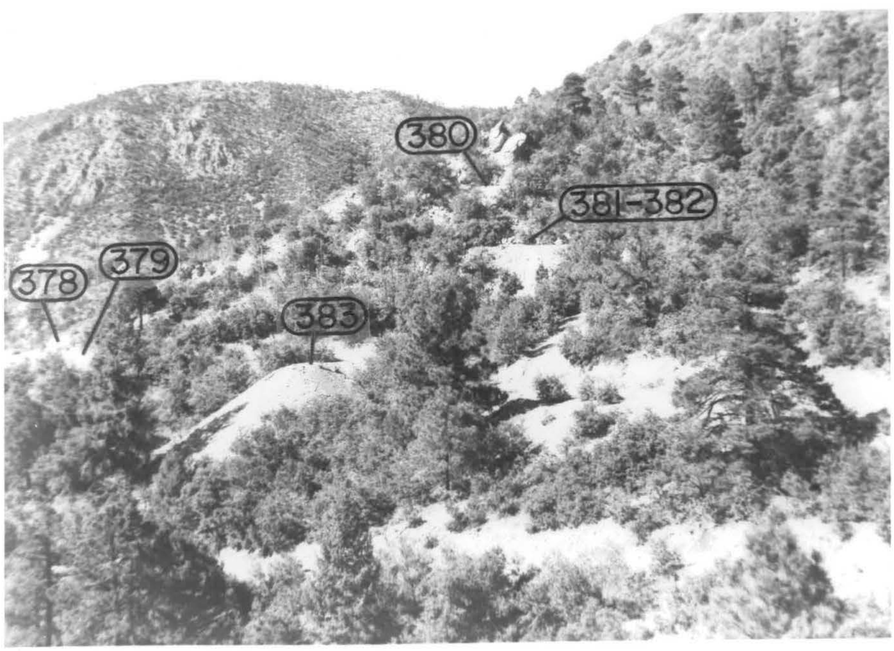

Figure 50.--Dumps of Telluride group of claims, Lone Pine Hill area. Numbers denote sample localities. View northwest from Lone Pine tunnel.

yielded 0.22 ounce of gold per ton and 0.52 ounce of silver per ton. Tellurium values were 15 ppm, 80 ppm, 134 ppm, 8 ppm, and nil, respectively. Molybdenum assays were 0.04 percent and 0.06 percent in samples 381 and 382.

(385-386): Chip sample 385 was taken across a 3-foot shear zone at the collar of a caved shaft, and grab sample 386 was taken from the small dump of a caved adit. Assay results were of no significance.

(387-402): The Lone Pine tellurium mine consists of an upper adit (fig. 42T), and a lower adit (fig. 42U), and two lower levels (the 45-foot and 160-foot) that were inaccessible at the time of the investigation. A small tonnage of gold ore was supposedly shipped from the property in the 1930's, and about 3 tons of high-grade tellurium ore was recovered during shaft sinking. In 1961, 2 tons of tellurium ore were recovered during scavenging work in the shaft (Everett, 1964, p. 14). Minnesota Mining & Manufacturing Company did some drilling on the property in 1961-62 to test its potential as a tellurium producer, but only spotty showings of native tellurium were found. Drilling data were not made available to the Bureau of Mines, but hole locations are shown in Everett's report. Three chip samples (Nos. 387-389) taken across quartz vein showings in the upper adit assayed negligible values. Ten chip samples (Nos. 391-400) were taken at various places in the lower adit, and a grab sample (No. 401) and a selected sample (No. 402) were taken from its dump. The samples with significant metal values are listed below:

Sample No.	Gold (ounces/ton)	Copper (percent)	Tellurium (ppm)	Width (feet)
395			99	3.5
396			244	3.0
397	0.03		620	1.0
398	.80		3,500	2.0
401	.04			
402	.20	0.14	2,730	

The mineralized fractures and discontinuous shears in the Lone Pine mine appear to be within rhyolite intrusive rock (fig. 42U).

(403-405): Three other workings were sampled in the vicinity of the Lone Pine mine. Sample 403 was a grab from a small dump. Sample 404 was a 3-foot chip sample from the face of a 20-foot adit that has been driven N. 5° E. along a fault zone containing quartz stringers. Sample 405 was a chip from a fault zone that is exposed in a 10-foot trench. Assay results were of no consequence, except for 118 ppm tellurium in sample 404.

(406-407): Two grab samples (Nos. 406-407) were taken from the dumps of two prospect pits that are southeast of the Lone Pine mine. The only significant values were 7.77 percent manganese and 0.26 percent copper contained in sample 406.

Sacaton Creek (Samples 284-286 and 410-415).--Six prospects were examined along Sacaton Creek downstream from Cave Rock, which is a prominent feature on Upper Sacaton Creek (fig. 49). Access to the workings is by trail from the end of a pickup-truck road at Virgin (L.C.) Dam. One prospect (284-286) is about 500 feet within the wilderness in SW 1/4 sec. 21, T. 12 S., R. 18 W. (fig. 43). Four workings (410-414) are south of the wilderness boundary in SW 1/4 sec. 28, T. 12 S., R. 18 W., and one prospect (No. 415) is at Virgin Dam in W. 1/2 sec. 32, T. 12 S., R. 18 W.

Williams (1966, p. 17) and Rothrock and others (1946, p. 47) describe the Sacaton workings in the area. Rothrock reported that mining was done for fluorspar in open cuts aggregating about 430 feet in length and ranging from 2 to about 20 feet in depth. The fluorspar occurs in branching veins that are separated by altered andesite; the shipped ore contained only 50 to 55 percent fluorite. Total production was estimated at 400 tons prior to 1943.

(284-286): The Cave Rock claims are about 1,500 feet south of Cave Rock. The only working found is an "L"-shaped cut about 500 feet inside the wilderness. A 1.5-foot chip sample (No. 285) was taken across a quartz vein, a random chip (sample 286) of altered rock was taken along one side of the cut, and a grab sample (No. 284) was taken from the dump. Assay results were negligible.

(410-413): Four samples were taken from three workings. A 30-foot cut and a 30-foot adit have exposed a fault or shear zone along a rhyolite dike that strikes N. 50° W. The zone contains quartz fragments and iron-stained gouge. A 4-inch quartz stringer was sampled (No. 410), and a 1.5-foot chip sample (No. 411) was taken across part of the zone. The second working is a caved 70-foot adit that was driven N. 50° W. along a shear zone. A 4-inch iron-stained quartz veinlet was sampled (No. 412). The third working is a 75-foot adit that was driven east on a 6-inch fractured quartz vein (fig. 42V). A 6-inch chip sample (No. 413) was taken in the face. The samples assayed traces of silver, and the highest gold value was 0.01 ounce per ton. No evidence was seen that fluorite had been mined here.

(414): This working is a 150-foot open cut that exposes two 6-inch fluorspar veins striking N. 35° W. Chip sample 414 across 18 inches of the zone contained 76.72 percent fluorite. This showing may be one of the Sacaton fluorspar workings.

(415): The southernmost working on Sacaton Creek is a shallow caved shaft, about 100 feet west of Virgin Dam. Grab sample 415 assayed negligible values.

Area from Minton Canyon to Seventyfour Mountain (Samples 416-462)

The area from Minton Canyon to Seventyfour Mountain extends southeast for a distance of approximately 6 miles along the southwestern boundary of the wilderness (pl. 3). The area is about 1-mile wide and is mainly in sec. 33, T. 12 S., R. 18 W.; and in secs. 2, 3, 11, and 13, T. 13 S., R. 18 W.; and in sec. 18, T. 13 S., R. 17 W.

Fifty eight samples were taken from mines and prospects in the area during the investigation. Of these, only the samples listed below contained more than negligible values in metal content.

Sample No.	Gold (ounces per ton)	Silver (ounces per ton)	Percent Copper	Percent Lead	Width (feet)
421			1.47	0.46	1.0
424			1.26		4.0
425	0.03		.18		.8
426	.03		6.68	.92	Selected grab
427			2.20		Selected grab
428			4.40		Selected grab
429			.98		3.0
431			.28		4.0
432	1.36		8.82	1.04	.3
433	.04	3.66	7.05		3.0
434			1.17		Selected grab
437	.03				4.0
439	.12				4.0
473	.03				5.0

The following samples contained fluorite in excess of 20 percent:

Sample No.	Fluorite (percent)	Width (feet)	Location
416	58.73	3.0	Out of wilderness.
417	40.39	8.0	Do.
418	26.39	5.0	Do.
419	38.35	Grab	Do.
422	49.06	4.0	Do.
423	57.26	1.0	Do.
437	23.87	4.0	Do.
454	21.07	3.1	Do.
457	70.28	3.0	Do.
458	27.65	2.0	Do.
459	50.96		Do.
461	95.20		Do.
462	29.75	.7	Do.
463	88.90	7.0	In wilderness.
464	72.38		Do.
465	97.16	.7	Do.
467	48.44	1.2	Do.
468	79.38	2.2	Do.
469	56.77	2.5	Do.
473	44.38	5.0	In primitive area.

Minton Canyon area (Samples 416-430).--Six areas of mining or prospecting activity were examined in the Minton Canyon area between Sacaton Creek and Cherry Creek (pl. 3). Only one of the workings (sample 427) appears to be within the wilderness.

(416-419): These workings are probably on the Wycherly prospect described by Williams (1966, p. 18). Reportedly 512 tons of fluorspar were mined in 1939 and 10 tons produced in 1942. The main working is a 350-foot trench that exposes a fluorspar vein as much as 8-feet wide. Two chip samples (Nos. 417- and 418) were taken across widths of 8 and 5 feet in the trench, and a grab sample (No. 419) was taken from development ore near the trench. North of the main trench, a channel sample (No. 416) was taken across a 3-foot fluorspar vein that is exposed in a 60-foot cut. Fluorite assays ranged from 26.39 to 58.73 percent

(420-422): The Silver Dollar prospect consists of a 70-foot adit (fig. 42W) and two open cuts. One of the cuts and the adit are on a fracture zone 2-1/2 -3 feet wide that strikes N. 45° W. and 75°-80° NE, and cuts epidotized andesitic rocks. The structure dies out to the northwest and was not seen beyond the adjacent gulch. Chip sample 420 was taken from the quartz, calcite, and fluorspar stringers exposed in the adit. About 100 feet above the adit, a 20-foot open cut shows copper mineralization (principally malachite) on one of the walls. A random chip sample of material next to the wall and specimens from the dump were combined to make up sample 421. The third working is a 50-foot cut that exposes a fluorspar vein varying from 1 to 4 feet in width. Chip sample 422 was taken across 4 feet of the vein. The only significant assay values were 1.47 percent copper and 0.46 percent lead contained in specimen sample 421, and 49.06 percent fluorite from sample 422. About one-quarter mile above the Silver Dollar prospect the gulch bends sharply along a brecciated fault zone as much as 8-feet wide, which trends about N. 10° W. and dips 65° southwest. Veinlets of fluorite 1 to 2 inches wide occur along the fracture zone, and cross fractures contain fluorite veins as much as 8-inches wide. No evidence was seen to indicate that this had been staked or prospected.

(423): The Hightower, Jr., prospect is a 40-foot trench along a 6-foot fracture zone that strikes northwest. The zone contains abundant fluorspar. A 1-foot chip sample (No. 423) contained 57.26 percent fluorite. Williams (1966, p. 18) reported that there had been no production.

(424-426): The Minton, or Deadman, prospect consists of a shaft of unknown depth and 150-foot adit (fig. 42X) that is caved 30 feet in from the portal. Specimen sample 424 taken from the small dump of the shaft contained 1.26 percent copper. A 10-inch sample (No. 425) taken of gouge material in a cross fault near the face of the adit contained 0.03

ounce per ton gold, and 0.18 percent copper. A specimen (sample 426) from a pile of caved muck at the end of the accessible section of the adit contained 6.68 percent copper and 0.92 percent lead. The Zacaton group of thirteen claims was located in the area at the turn of the century; and it may be that output of 50 tons of copper carbonate ore reported in 1902, was from the Minton property. Bad air in the adit makes it dangerous.

(427): About one-fourth of a mile east of the Minton prospect and just within the wilderness, a 75-foot shaft, now inaccessible, was sunk on a 3-foot copper-bearing quartz vein. The strike of the structure is N. 29° W. and the dip is 80° NE. Specimen sample 427 from the shaft's dump assayed 2.20 percent copper.

(428-430): Three workings were sampled on the Foster prospect, just south of the wilderness boundary. Specimen sample 428 was taken from the dump of an inaccessible shaft that had been sunk on a 6-foot fracture zone with a N. 10° W. strike. The sample contained 4.40 percent copper and 0.31 percent zinc. Molybdenum and lead are also present in small amounts. Southwest of the shaft, a prospect pit was sunk on the continuation of the structure. The pit is covered with debris, a grab sample (No. 429) taken from the dump assayed 0.98 percent copper. Grab sample 430 taken from the dump of a small caved shaft on a hilltop between Minton and Cherry Canyons contained no significant mineral concentrations.

Cherry Canyon (Samples 431-447).--Five prospect sites were examined on Foster Mountain at the head of Cherry Canyon (pl. 3). All of the prospects are just outside the wilderness in sec. 3, T. 13 S., R. 18 W. Access is by horse or foot from a pickup-truck road that ends at the lower part of the canyon.

(431-435): The main workings of the Margie Ann mine (fig. 42Y) consist of a northwest-trending adit 150 feet long, a 60-foot winze that was sunk from the adit, two exploration levels of unknown extent that were driven from the winze, and a small stoped area. This may be the Tennessee mine referred to on claim locations recorded in the late 1800's. A 4-foot channel sample (No. 431) taken across altered rock in the face contained 0.28 percent copper. Sample 432 taken from a high-grade copper-bearing quartz vein exposed along the east wall of the adit contained 1.36 ounces of gold per ton, 8.82 percent copper, and 1.04 percent lead, but the width of the mineralization is only 3 inches. A 3-foot chip sample (No. 433) taken across a small lens containing copper minerals exposed above the winze contained 0.04 ounce of gold per ton, 3.66 ounces of silver per ton, and 7.05 percent copper.

An inaccessible shaft on the slope below the Margie Ann workings is estimated to be 70-feet deep. Specimen sample 324 from the dump contained 1.17 percent copper.

Chip sample 435 was taken from some narrow (as much as 12 inches wide) quartz-fluorspar veins that crop out in the arroyo wall above the forks of Cherry Canyon. A small dump was noted, but floods had destroyed any mine workings. Assay results showed only small amounts of fluorite.

(436): A small pit on the east side of the arroyo bottom exposes 2 feet of silicified material containing fluorspar; sample 436 contained 18.83 percent fluorite.

(437): A 4-foot fluorspar-bearing fracture zone at the forks of Cherry Canyon, strikes N. 45° W. Chip sample 437 across the zone yielded 0.03 ounce of gold per ton and 23.87 percent fluorite.

(438): In the first drainage west of Cherry Canyon, an "L"-shaped excavation exposes clay containing very narrow quartz stringers. Quartz chipped from the stringers (sample 438) assayed traces of gold and silver.

(439-447): The workings on lower Cherry Canyon are thought to be on the Columbus group of claims. The main working is some 200 feet of adit that was driven in a general southeast direction along the hanging wall contact of a rhyolite dike that dips about 70° southwestward (fig. 42Z). Seven samples (Nos. 441-446) were taken across narrow (from 4 inches to 2 feet) quartz veins and fractures in the adit. No significant metal values were detected. Fragments of altered rock (sample 447) were taken from a 15-foot adit above the main adit. Assay results were negligible.

On the Chance claim, west of the Columbus adit, a 30-foot trench was dug on the canyon wall. Chip sample 439 was taken across 1.3 feet of vein quartz exposed in the trench, and grab sample 440 was taken from the dump. Assay results in sample 439 were 0.12 ounce of gold per ton and 0.36 ounce of silver per ton; assays were insignificant in sample 440.

Head of Rain Creek Mesa (Samples 448-456).--Several prospects were examined on the mountain slopes north of the Sacaton landing strip on Rain Creek Mesa. Three of the workings (samples 448-450) are about one-fourth mile within the wilderness in SW 1/4 sec. 2, T. 13 S., R. 18 W.; the others are south of the wilderness boundary in N 1/2 sec. 11, T. 13 S., R. 18 W. The workings are reached by trails from the north end of the landing strip.

(448-449): These showings are on the peak that is 1 mile north of the east end of the landing strip. Random chip samples (Nos. 448 and 449) were taken from what appears to be a gossan and from a zone of silicified rock. Extremely low gold and silver values resulted from assay.

(450-456): Seven prospects were examined along a southeast-trending fault(?) and rhyolite dike system north of the landing strip. The western workings are at the head of each of three small gulches. In the west gulch, a 3-foot quartz vein exposed in a 20-foot trench and a 1.3-foot quartz vein in a small pit were sampled (Nos. 450-451). In the middle gulch, a selected sample (No. 452) of loose material was taken from two small cuts in an 8-foot fracture zone. A grab sample (No. 453) was taken from the dump of a 10-foot shaft in the east gulch. No significant assay values were found.

Three showings were sampled on the mountain slope just north of the Sacaton landing strip. A 3.1-foot chip sample (No. 454) was taken across a quartz-fluorspar vein in a small prospect pit. Random chip samples (Nos. 455 and 456) were taken in two trenches where parallel quartz veinlets are exposed. The only significant value was 21.07 percent fluorite in sample 454.

Rain Creek (Samples 457-462).--Five localities were examined on the slopes of Rain Creek. Three of the sites (457, 458 and 459) are just west of the wilderness boundary in E. 1/2 sec. 11, T. 13 S., R. 18 W.; one prospect (461-462) is south of the wilderness in the center of sec. 13, T. 13 S., R. 18 W.; and the fifth showing (460) is just within the wilderness in SW 1/4 sec. 12, T. 13 S., R. 18 W. About 1,000 tons of fluorspar has been produced in the area. A jeep road provides access to the old Gold Spar mine (459).

(459): The major fluorspar occurrence in the Rain Creek area is the Gold Spar mine, which has been described in detail by Williams (1966, p. 55-59). The mine is claimed by Lee Rice of Oracle, Arizona. Total production is reported to have been 922 tons. The underground workings shown by Williams were inaccessible at the time of the wilderness investigation. A composite grab sample (No. 459) from ore stockpiles contained 50.96 percent fluorite.

(457): About one-half mile upstream from the Gold Spar mine, chip sample 457 was taken across the outcrop of a 2-foot quartz-calcite-fluorspar vein that may be the continuation of the Gold Spar vein. The sample contained 27.65 percent fluorite.

(458): Slightly less than one-fourth mile upstream from the Gold Spar mine, chip sample 458 was taken from a 3-foot fluorspar vein exposed in a 15-foot trench. The sample contained 70.27 percent fluorite.

(460): A claim notice for the White Frog No. 1 claim was found along the West Fork Trail at a point just within the wilderness. An outcrop of olive-green volcanic glass may have been the reason for locating the claim. A sample (No. 460) of this material did not contain significant mineral concentrations.

(461-462): The workings of the Master claim, which was mistakenly located on private ground, consist of two short caved adits that were probably driven on narrow fluorspar veins. Grab sample 461 of sorted fluorspar ore contained 95.20 percent fluorite. A second grab sample (No. 462) of development rock from the shorter adit contained only 29.75 percent fluorite. Recorded production is 9 tons.

Seventyfour Mountain and vicinity (Samples 463-471)

Five mineral showings were examined in the vicinity of Seventyfour Mountain, four on Seventyfour Mountain itself and one north of it (pl. 3). Three of the showings (the Rainbow, Fairview, and Seventyfour Mountain prospects) are fluorspar occurrences in sec. 18, T. 13 S., R. 17 W. Another fluorspar showing is in a prospect north of the mountain in NW 1/4 sec. 7, T. 13 S., R. 17 W. The fifth showing is in a prospect pit and outcrop on the south slope of Seventyfour Mountain in S. 1/2 sec. 18, T. 13 S., R. 17 W. All of the prospects are within the wilderness, and can be reached on foot or by horse from the vicinity of the 74 Ranch on Mogollon Creek. Access to the fluorspar showing north of the mountain is difficult, and use of a guide is advisable. Production from the area is recorded as 250 tons of fluorspar.

(463): A nearly vertical 7-foot zone of fluorspar veins strikes N. 15° E. at this locality. Difficult access probably accounts for the lack of workings on the property. A chip sample (No. 463) across the vein contained 88.90 percent fluorite.

(464-466): The Rainbow prospect is on the northwest slope of Seventyfour Mountain. The mineralization is described by Williams (1966, p. 59-60) as being three narrow (1 to 3 feet wide) fissure veins of fluorspar that can be traced for only short distances on the surface. The fluorspar occurs as fissure fillings along cross fractures in a rhyolite dike. The property is credited with a production of 250 tons, but production from the Fairview and Seventyfour Mountain prospects may have been included in this figure.

At the time of the wilderness study the workings consisted of two caved adits and an open cut. A grab sample (No. 464) of stockpiled ore contained 72.38 percent fluorite. The 50-foot open cut exposes a 1.1-foot mud seam and 4 inches of fluorspar as linings on the walls. A sample (No. 466) of mud seam contained low fluorite (4.93 percent), but the fluorspar lining the walls (sample 465) yielded 97.16 percent fluorite.

(467-468): The Fairview prospect, high on the southwestern slope of Seventyfour Mountain, has been described by Williams (1966, p. 60). No courthouse data on the property were found, and no production has been recorded. Two chip samples (Nos. 467-468) were taken. One was across the outcrop of a 1.2-foot fluorspar vein, and the other was from a 2.2-foot fluorspar vein that is exposed in a 25-foot trench. Fluorite values were 48.44 and 79.38 percent, respectively.

(469): At what is presumed to be the Seventyfour Mountain prospect described by Williams (1966, p. 59), fluorite veins are in Cooney Quartz Latite ash-flow tuff adjacent to the footwall of a 30-foot wide rhyolite dike, and in a crossfault that offsets the dike. A 2.5-foot chip sample (No. 469) taken across a vein that is partly exposed in a 75-foot open cut contained 56.77 percent fluorite.

(470-471): A 6-inch quartz vein exposed in a prospect pit and a 5-foot shear zone containing quartz stringers were sampled (Nos. 470 and 471). Assay values were negligible.

Tract 8, Gila Primitive Area (Samples 472-473)

Two prospects were sampled in the northern part of tract 8 of the Gila Primitive Area just south of the wilderness boundary (pl. 3). The prospects are in the extreme northern part of sec. 19, T. 13 S., R. 17 W. The area can be reached on foot or by horseback from the 74 Ranch on Mogollon Creek below the mouth of Rain Creek.

On the Black Eagle claim, a silicified zone about 100-feet long and 25-feet wide contains veinlets as much as 3-inches wide of barite and pyrolusite. Random chip sample 472 from the veinlets contained 4.70 percent manganese and 2.60 percent barium.

In an arroyo about 1,700 feet east of the Black Eagle prospect, a 5- by 10-foot trench was dug along a fault zone that strikes S. 60° W. Fluorspar and quartz veinlets with some manganese mineralization (pyrolusite) are exposed in the cut. A 5-foot chip sample contained 0.03 ounce of gold per ton, 44.38 percent fluorite, and low manganese (0.28 percent).

Gila Fluorspar (Brock Canyon) Mining District

The Gila Fluorspar (Brock Canyon mining district (fig. 51) is in

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Figure 51.--Near here

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a mineralized area where the Gila River leaves the wilderness, about 5 miles upstream from the town of Gila. The district is mainly in secs. 21, 28, 29, 32, and 33, T. 14 S., R. 16 W., and in secs. 3 and 4, T. 15 S., R. 16 W.

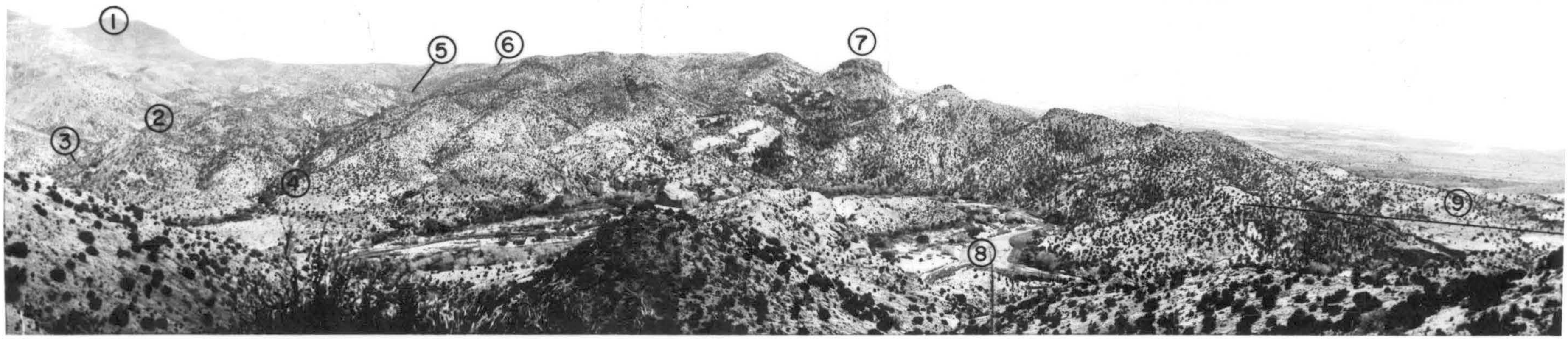

Figure 51.--Panorama of Gila Fluorspar district from Watson Mountain. (1) Cliff Dweller Peak; (2) Brock Canyon; (3) Blue Benny Mine; (4) Brushy Canyon; (5) Blue Bessey prospect; (6) Clum Mine; (7) Geronimo Peak; (8) Gila River; (9) Proposed Hooker Dam site.

According to Gillerman (1964, p. 170), the earliest reported fluorspar production in New Mexico was from the Foster mine (pl. 1B) in the early 1880's. Output was used as a flux in the silver-lead smelters in Silver City. Mining and prospecting were conducted in the district intermittently up to the present, but the principal production was during World Wars I and II. During World War II, the government constructed the present road to service the mines, and the Bureau of Mines examined various properties in the district. These investigations are summarized by Russell (1947). During the production period of the early 1940's, a fluorspar mill was placed into operation at Gila by Metal Reserves Company. The government fluorspar program was terminated at the end of World War II, and activities in the district ceased except for occasional small shipments. By 1970, rising prices had stimulated new exploration in the district, and the Clum mine was being reopened when this investigation was made.

Williams (1966, p. 38) reported total fluorspar production of 47,586 tons for the Gila district. Of this amount, about 29,000 tons was from the Clum mine, 4,000 tons from the Foster, and the remainder was mainly from the Green Spar, Watson Mountain, Blue Benny, and Victoria (Providence?) mines. Minor fluorspar production was recorded for the Blue Bessey, Blue Spar, Gila Montes, and Last Chance. All of the properties are outside the wilderness.

The site of the proposed Hooker Dam is shown on figure 51. The reservoir would inundate a number of fluorspar occurrences.

Eight localities in three areas were examined in the wilderness investigation. The investigation was limited to prospects and workings that are within or fairly close to the Gila Primitive Area and Wilderness. All of the mines and prospects are within the volcanic complex of Brock Canyon, which was described in an earlier section of the report and is shown on plate 1B.

North bank of the Gila River (Samples 475-480)

Five samples were taken from prospects on the north bank of the Gila River in secs. 21 and 29, T. 14 S., R. 16 W. Except for fluorite, assay results were negligible.

Cedar Hill prospect (Samples 475-477).--The Cedar Hill prospect is on the north side of the Gila River in NW 1/4 sec. 29, T. 14 S., R. 16 W. (pl. 1A). The main showing is described by Williams (1966, p. 41-42). Fluorspar occurs with quartz in a vein that ranges from 1 to 4 feet wide over a strike length of 250 feet; the vein is adjacent to a northwest trending rhyolite porphyry dike about 20 feet wide. A sample (No. 475) taken of a 1-foot wide section of the vein exposed in a pit contained 63.84 percent fluorite. A 3-foot chip sample (No. 476) was taken across an exposure of several veinlets of fluorspar from 0.3 to 1.5 feet wide in a pit that is about 1,000 feet southeast of the main workings. The sample contained 44.66 percent fluorite. The Hooker Reservoir would inundate these workings.

Northeast of the Cedar Hill workings, a random chip sample (No. 477) was taken across an area of leached volcanic rock. No significant mineral concentrations were detected in the analysis.

Last Chance prospect (Samples 478-479).--The Last Chance prospect is west of the Gila River in N. 1/2 sec. 21, T. 14 S., R. 16 W. (pl. 1B). The property is described by Rothrock and others (1946, p. 88-89) and by Williams (1966, p. 46). Forty tons of fluorspar reportedly was shipped during exploration work in about 1943. Rothrock and others, described in detail the property and the work done by the Bureau of Mines in 1943. Chip samples 478 and 479 were taken from two outcrops near the workings to check for minerals other than fluorspar. Assay values were negligible. The Last Cahnce workings would be inundated by the Hooker Reservoir.

Mouth of Turkey Creek (Sample 480).--A 12-foot fracture zone containing quartz stringers is located on private land near the mouth of Turkey Creek. Random chip sample 480 was taken across the zone; assay results were of no significance.

Brock and Spar Canyons (Samples 481-490)

The Brock and Spar Canyons area is about one-half mile west of tract 9 of the Primitive Area and east of the road from the Clum mine to Turkey Creek. Mining claim coverage is mainly in secs. 15, 21, 28, and 33, T. 14 S., R. 16 W. Data regarding properties east of the mine road are contained in references cited below. Ten samples were taken from five localities; vein widths ranged from 1.0 to 3.5 feet. Seven samples contained more than 30.00 percent fluorite. Estimated production from the area is approximately 550 tons of fluorspar from three workings.

Watson Mountain mine (Sample 481).--Williams (1966, p. 48) lists production from the Watson Mountain mine as about 250 tons of metallurgical grade fluorspar. The property was examined by the Bureau of Mines in 1943 (Russell, 1947), but no tonnage of minable fluorspar was found. The proposed Hooker Reservoir would inundate the property.

Sample 481 was taken from a 2.5 foot vein of high-grade fluorspar that is exposed in a prospect pit. The strike of the vein is N. 85° W. and the dip is 30° N. The sample contained 92.96 percent fluorspar.

Mouth of Brock Canyon (Samples 482-487).--Williams (1966, p. 41) reports that 236 tons of fluorspar was produced in 1944-1945 from the workings at the mouth of Brock Canyon. At that time the property was known as the Blue Benny.

The assay values listed below show the results of the sampling that was done on the property.

Sample No.	Location or source	Width (feet)	Fluorite (percent)
482	20-foot open cut and adit	1.0	33.25
483	Piles of screen rejects	Grab	5.74
484	17-foot trench	1.0	50.89
485	Shaft collar	3.0	44.17
486	50-foot trench	1.0	62.23
487	Outcrop	2.0	30.10

Crow Canyon (Sample 488).--In Brock Canyon, about one-fourth mile from the mouth of Crow Canyon (pl. 1B), there is a short adit that was driven N. 75° E. in a highly altered and leached zone. A 2.5-foot chip sample (No. 488) from the face yielded extremely low gold and silver values.

The Blue Bessey mine (Sample 489).--The property known as the Blue Bessey mine is near the head of Brock Canyon. Production of fluorspar has been minor. A 3.5-foot chip sample was taken across the fluorspar vein just above waterline near the bottom of an inclined, 25-foot shaft that had been sunk on the vein. The sample contained 50.40 percent fluorite.

Spar Canyon (Sample 490).--A zone of altered rock in the Spar Canyon area is covered by the Nina group of 16 claims. Random chip sample 490 across 9 feet of the zone where alteration was intense indicated no significant mineral potential.

Cave Canyon area (Samples 491-494)

Cave Canyon is within the wilderness in secs. 14, 23, and 26, T. 14 S., R. 16 W. The area was investigated to determine if mineralization was associated with lineaments that show on aerial photographs. Four samples were taken from two localities; assay results were negligible.

Cave Canyon (Samples 491-492).--Sample 491 is made up of andesitic dike rock and altered rhyolite wall rock along a strong joint that controls tributary drainage in the upper part of Cave Canyon. Very low gold and silver values were detected on analysis.

At the intersection of the two main forks of Cave Canyon, a 25-foot random chip sample was taken from an 80-foot fault zone. Assay results were of no significance.

Gila River (Samples 493-494).--On the south bank of the Gila River opposite the mouth of Hidden Pasture Canyon, a 25-foot fault zone strikes N. 40° E. Claim staking in the area in 1955 (table 8) was probably for uranium. Random chip sample 493 taken across the zone indicated no important mineral deposit.

Several claims were located on calcite showings on the north bank of the Gila River west of Hidden Pasture Canyon. The calcite occurrences in places are stained green by algae, and prospectors apparently mistook the coloration to be a mineral of interest. Sample 494 of the material contained nothing of economic value.

Sapillo (Meerschaum) mining district

Meerschaum is a rare, very lightweight, white, tough, clay material that can be carved and shaped. Because of its absorbent and insulating qualities it has been used over the years mainly in making pipes for smokers, but also in a variety of other ways.

Meerschaum was discovered in the Sapillo mining district in 1875; this was the first reported occurrence in the United States (Northrup, 1959, p. 454). Another discovery was made later at the Dorsey mine in the Bear Creek (Juniper) district 12 miles to the south. Both deposits are discussed by Sterrett (1908, p. 466-473), but most of his work was on the Dorsey occurrence. The meerschaum in the Sapillo district forms steeply dipping narrow veins as much as 3-feet wide in Gila Conglomerate and basaltic andesite (pl. 1B). Impurities include considerable quartz and calcite. The deposits are low grade and are scattered widely in narrow veins that require underground mining methods; thus it is unlikely that the meerschaum in this area has any appreciable economic potential. However, the meerschaum will probably continue to be of interest to mineral collectors and to those who might investigate it for scientific purposes.

Various claims in the Sapillo district were consolidated under ownership of the Meerschaum Company of America in 1905 (Bush, 1915, p. 941-943). The company went into receivership in 1912 and was reorganized as American Meerschaum and Pipe Company with a factory at Ogdenburg, N. Y.; Windsor Trust Company was probably the legal agent (table 8, remark No. 92). Evidently the operations again went into receivership in 1914. An estimated 1,000 tons of meerschaum was mined and manufactured into finished products.

The only other production from the Salt Creek area was about 1,000 pounds shipped in 1943 for use in pipe liners and radio insulators (Northrup, 1959, p. 455).

Meerschaum Canyon (Samples 502-505)

Several inaccessible mine workings, including three shafts, are in Meerschaum Canyon, a short drainage that is just east of Salt Creek. The diggings are in the vicinity of Meerschaum Spring (sec. 28, T. 14 S., R. 13 W.). From mining claim data, it is thought that the shafts are Sapillo No. 3, Sapillo No. 2, and the Meerschaum, at sample localities 502, 503, and 504, respectively. Three specimen samples were taken from outcrops of veins as much as 7-inches wide, and one (No. 503) was from a pile of meerschaum near the No. 2 shaft, which indicated a vein width of at least 3 feet at depth.

Salt Creek (Sample 506)

A caved adit estimated to have been about 300-feet long is east of Meerschaum Tank on Salt Creek in the center of sec. 28, T. 14 S., R. 13 W. A grab sample (No. 506) was taken from a dump of altered volcanic rock. Assay results were of no importance.

Alunogen (Alumina) mining district

The Alunogen district includes the Copperas Canyon and Alum Mountain areas in the southeastern part of the area studied. The narrow corridor that contains the highway to Gila Cliff Dwellings National Monument crosses mining claims in Copperas Canyon and passes just east of the block of 61 patented mining claims over Alum Mountain. Some of the claims of the district are in Tract 1 of the Gila Primitive Area, some are in Tract 2, and others are in the Gila Wilderness. The only known mineral production from the district is a small tonnage of clay that was mined in Copperas Canyon. Although claim staking was extensive recently in the Copperas Canyon area, assessment work was the only mining activity noted during the investigation.

Copperas Canyon (Samples 507-521)

Most of the claims in the Copperas Canyon area lie in the corridor of excluded land in secs. 4, 9, 17, 20, and 29, T. 14 S., R. 13 W. Some, however, extend east into Tract 1 or west into Tract 2 of the Gila Primitive Area. To the east these claims merge with the Sapillo district.

Claim locations in Copperas Canyon can probably be attributed to the widespread hydrothermally altered rocks, which produced clay deposits and which may indicate the presence of metallic mineral deposits. Under the auspices of the Area Redevelopment Act, the clay potential of the district was investigated by the U. S. Bureau of Mines in 1963. A small tonnage of clay was mined for the manufacture of brick at a plant in Silver City, N. Mex. The plant discontinued operation in 1965. At the present time, there is no market for the apparently limited amount of clay.

No samples were taken to evaluate the quality of the clay, but fifteen samples were taken from several localities to check for possible metal values in the altered rocks. Traces of metals were detected, but assay results showed nothing approaching economic significance.

The area of sample No. 508 consists of deeply weathered and altered volcanic flows containing veins of white calcite. The sites of several exploratory drill holes were located, and bulldozer cuts crisscross the altered bedrock in many places within a 1,000-foot radius of the sample site. The sample was from dump material and from the face of a 10-foot long cut that was excavated on a 12-inch wide calcite vein striking N. 50° W. Other than calcite, no mineral concentrations were detected. Exploration in the area was probably done to uncover clay deposits but was unsuccessful.

The main clay deposit, shown as a gravel pit on most maps, was examined to determine if minerals other than kaolinite were present. Sample 514 was of iron-stained float scattered about the pit, and sample 515 was a composite of the various alteration products exposed in the face of the principal mining bench. No exploitable deposit of minerals was found. Since the wilderness investigation, the Forest Service has bulldozed the benches to the original surface contour.

Above the benches of the clay pit a 33-foot long adit, the longest found in Copperas Canyon, was driven S. 30° E. into a silicified outcrop. A sample (No. 516) of fractured and iron-stained rock in the first 15 feet of the adit contained no significant assay values.

Near the highway, about 500 feet south of the clay pit, an adit was driven N. 55° E. for 10 feet into intensely oxidized rock. Sample 513 yielded no economic mineral concentrations.

Three locations were sampled near the head of Copperas Canyon. A composite sample (No. 521) consisted of chips of hematite-stained rock, chips from an olivine-rich dike in the arroyo, and material from a siliceous breccia containing opal, red hematite and oolitic black hematite. Other materials sampled in the Copperas Canyon area included exposures of altered rocks in road cuts (samples 507 and 509) and prospect pits (samples 510-512 and 517-520). No significant values were indicated in sample analyses.

Alum Mountain (Samples 522-542)

The Alum Mountain area is along the Gila River 2 to 3 miles south of the mouth of the East Fork. Most of the claims are in secs. 19, 20, 29, and 30, T. 13 S., R. 13 W.; access is by horse trail.

In the period 1889-1892, the claims on Alum Mountain were located for alum (aluminum sulfate), and subsequently 61 of these were patented. The block of 61 claims was purchased by the Forest Service in 1969, and the area became part of the Gila National Forest.

The lack of excavations indicates that only test shipments of alum were made; short adits are the only workings in the area. No production was reported by Blake (1894) or by Hayes (1907). Possible uses for alum from the district are discussed by Talmage and Wootton (1937).

Twenty-one samples were taken from 14 localities. The analyses in table show that the Alum Mountain area cannot be considered as a source of aluminum or of alum at this time.

Because gallium occurs with aluminum ores, the samples were analyzed for this metallic element. The highest value obtained was 0.0075 percent gallium. The only significant metal values were contained in sample 528 (0.28 ounce of gold per ton), sample 530 (0.18 percent copper), and sample 534 (3.60 ounces of silver per ton).

An alum prospect, where sample 522 was collected, is high on the east slope of Alum Creek; it lies in the Gila Wilderness near the southeast corner of the block of patented claims (pl. 3). Alunogen, a hydrous aluminum sulfate, occurs as crusts under overhanging cliffs in the vicinity of the prospect. These crusts are a foot or more thick locally.

TABLE 11.- Analyses of various samples from Copperas Canyon-Alum Mountain, Grant County, N. Mex. (in percent)

Sample	Acid soluble SO_3	Acid soluble Al_2O_3	Ga
507	0.27	0.72	0.0016
509	1.88	.70	.0018
510	1.48	2.01	.0017
516	7.55	2.74	.0017
517	.36	.47	.0017
518	1.73	.60	.003
519	1.22	.45	.0014
520	.27	.77	.0015
522	4.30	1.42	.0075
523	3.48	1.70	.0032
524	13.69	4.01	.0018
525	5.21	2.17	.0017
526	4.46	1.49	.0017
527	1.22	.73	.003
529	32.81	11.82	.0017
530	12.57	4.71	.0017
531	11.34	4.43	.0015
532	21.45	9.80	.0032
533	2.17	1.48	.0036
534	7.39	2.10	.0015
535	2.57	.88	.0031
536	21.27	6.97	.0016
537	6.88	2.47	.0014
538	22.23	6.12	.003
539	2.92	.98	.0019
540	4.89	2.78	.0035
541	2.48	1.12	.0018

Random chip sample 523 was taken of various outcrops on the summit of Alum Mountain.

About three-fourths mile upstream from the mouth of Alum Creek, Tunnel 4 (fig. 44G) was driven for at least 100 feet into the east side of Alum Mountain on a bearing of S. 45° W. The adit has caved to within a foot of the roof about 50 feet from the portal. Samples taken included a grab of halotrichite, a hydrous-iron-aluminum sulfate, from the caved pile (No. 524); alum-bearing rock from the pile (No. 525), alum-bearing rock from around the portal (No. 526), and dump material (No. 527). Other than a trace of copper in sample 524, only "alum" minerals were detected.

Rock outcrops were sampled on the ridge running easterly from Tunnel No. 2. Fractures in a leached and silicified zone comprising the ridge were stained with iron and manganese oxides. A random sample (No. 528) of these mineralized areas was found to have a relatively high gold content (0.28 ounce per ton). Silver assayed 0.36 ounce per ton.

Tunnel 2, the longest of the four adits in the Alum Mountain district (fig. 44H), was driven from the east bank of Alum Creek on a bearing of N. 65° E. About 125 feet from the portal, a winze, now inaccessible, was sunk 30 feet. Sample 529 was a composite of the crust of alunogen and halotrichite lining the adit at thicknesses of as much as 12 inches; sample 530 consists of alum-bearing rock from the face; sample 531 was a dump sample; and sample 532 was part of the alunogen crust as much as 6-feet thick that covered the face of the cliff into which the adit had been driven. Other than 0.18 percent copper in sample 530, no metal concentrations were detected.

A dump sample (No. 533) was taken near the mouth of Alum Canyon where a 12-foot square shaft had been sunk about 8 feet. Assay results were negligible. An outcrop sample (No. 534) of a breccia zone of alum-bearing rock cemented by soft clay from high on Alum Mountain contained 3.06 ounces per ton silver, and 0.04 ounce per ton gold. Alum-bearing rock samples (Nos. 535-539) were taken at Tunnel 1 (fig. 41-I), Tunnel 3 (fig. 41J), and from float and outcrops (samples 535 and 539, respectively). Only "alum" minerals were noted. In the northwest corner of the Alum Mountain patents, the Alunogen claim No. 30 discovery pit was sampled at location 540. The dump was sampled (No. 541) at the caved and filled shaft No. 2 of Alunogen claim No. 35. A reddish alteration area in the northeast corner of the Alum Mountain mineralization was sampled (No. 542). Assays were insignificant.

Scattered mining claims and mineralized areas

Scattered mining claims have been located at various places in the Gila Wilderness, in tract 6 of the Gila Primitive Area, and in bordering areas. In none of the localities examined was there any indication of significant mineral deposits.

Gila Wilderness

Thirteen areas of mining and prospecting activity were examined at scattered locations in the wilderness. Fifteen samples were taken from nine of the localities. No significant mineral concentrations were contained in the analyses of the samples.

Windy Gap (Sample 289).--An isolated zone of altered rock near Windy Gap near the head of Little Dry Creek, in sec. 9, T. 12 S., R. 18 W. was sampled (No. 389), but assay results indicated no significant mineral potential.

West Fork of Mogollon Creek (Sample 246).--The floor of a cave about 5 miles from the mouth of the West Fork of Mogollon Creek in sec. 19, T. 12 S., R. 17 W. is covered by a thin film of mineral matter that was leached from rocks in the ceiling and precipitated on the floor. No noteworthy concentrations were detected in a sample (No. 246) of the mineral film.

Fall Canyon (Sample 474).--An area of deeply weathered amygdaloidal andesite (sample 474) was examined in an east tributary of Fall Canyon in sec. 23, T. 13 S., R. 17 W. The almond-shaped amygdales are up to 4 inches in diameter and are lined mainly with quartz crystals. The area has no significant gem stone potential for the type of occurrence is common in many volcanic fields.

Rough Canyon.--A search was made for possible workings in an altered area extending from Rough Canyon southeasterly across Indian Canyon in sec. 1, T. 14 S., R. 17 W. A rancher reported having seen men digging high on the east slope of Rough Canyon in the 1930's or 1940's. A cache of dynamite was found in the vicinity during the investigation, but no prospect was found.

Turkey Creek (Samples 495 and 496).--An area of greenish altered andesitic lava flows along the Turkey Creek trail, between Brush and Sycamore Canyons in sec. 26, T. 13 S., R. 16 W., was covered by the two Golden Eagle claims located in 1967. The only apparent mineralization consists of quartz amygdales. Various outcrops were randomly sampled (No. 495). The center of the Bighorne claim group is near Sycamore Canyon where a sample (No. 496) was taken from rock similar to that on the Golden Eagle claims.

Miller Spring Canyon (Samples 497 and 498).--Miller Spring Canyon (sec. 27, T. 13 S., R. 15 W.) was investigated in an effort to find mineralization covered by the Iron Circle and Iron Major claims located in 1944. A 15-foot long trench one-foot deep was found that may have been dug as a discovery pit. Sample 497 from the pit did not indicate any mineral potential. Outcrop sample 498 from a silicified zone also was barren.

Gila River at Sapillo Creek.--Records of claim locations for the 60 Fortune claims indicate that they were possibly located in the area around the mouth of Sapillo Creek. No evidence of prospecting was found.

Gila Cliff Dwellings area (Samples 543-546).--Mining claims were located at different times in Adobe Canyon immediately north of Gila Cliff Dwellings National Monument in sec. 23, T. 12 S., R. 12 W. According to residents in the area, the claims were for clay, but no shipments were ever made. The mining claims encompass a small area of altered rock in Gila Conglomerate intruded by one or more basaltic dikes. No surface indications were seen of any valuable mineral deposits.

At the north boundary of the national monument, a shallow trench 12-feet long, 3-feet wide, and 6-inches deep was dug in an area containing quartz float (sample 543). In Adobe Canyon, sample 544 was taken from float and outcrops(?) of quartz and calcite near the claim corner common to the Lone Wolf 6, 7, and 9 and the Dobe No. 1 claims. Sample 545 was taken across a mafic dike. Iron, chromium, nickel, and strontium were present in amounts expected in mafic rocks. One of the calcite veins crossing the area was sampled (No. 546); no significant metal concentrations were detected. The vein was 1- to 3-feet wide and could be traced over a strike length of 1/4 mile on a bearing of N. 75° W.

West Fork of Gila River (Sample 566).--Mining claims were examined on West Fork near the mouth of White Rocks Canyon (sec. 17, T. 12 S., R. 14 W.). No samples were taken here by the Bureau of Mines during the wilderness investigation, but it was noted that the lava flows weather into slabs suitable for construction stone. Because of the remoteness of the area, however, the stone cannot be economically quarried.

The area along the West Fork trail, between the mouths of Packsaddle Canyon and Cub Creek, was examined, where the Millionaire claims are believed to be (sec. 27, T. 11 S., R. 16 W.). Random chip sample 566 was taken from near the top of an amygdoloidal basalt flow and from a 50-foot thick sandy conglomerate on top of the basalt. No mineral concentration was detected except for minor calcite.

The claimant of the Millionaire claims also located the Montoya group somewhere near the head of Cub Creek in T. 11 S., R. 17 W. No evidence of excavations or of significant mineralization was noted in the area.

Turkeyfeather Pass.--No samples were taken from the claimed area at Turkeyfeather Pass (sec. 7, T. 11 S., R. 16 W. at the head of Turkeyfeather Creek. A reddish-brown vesicular basalt flow covers the entire vicinity of the claims.

Whitewater Baldy (Sample 571).--The Cindy Lou prospect was examined on the ridge peak between Center Baldy and Whitewater Baldy at an elevation of 10,400 feet in sec. 30, T. 11 S., R. 17 W. A pit was excavated in rhyolite containing pink streaks, probably iron stains. No significant mineral concentrations were detected in the sample (No. 571).

Spruce Creek Saddle (Samples 572 and 573).--A 15-foot adit bearing N. 15° E. had been driven into a quartz-cemented breccia about 100 yards from Spruce Creek Saddle at the head of Spruce Creek in sec. 25, T. 11 S., R. 18 W. Sample 572 was taken at the face, another, No. 573, was taken of a quartz and chalcedony vein in the roof 5 feet from the face.

Nabours Spring and Tennessee Cabin.--A prospect hole that was reported to be near Nabours Spring on the south slope of Grouse Mountain was not found. No mining claims are known in the area, and the only mineralized rock seen was a weak altered zone along the trail west of Nabours Spring.

No mine workings were found at Tennessee Cabin site near the junction of East and South Forks of Whitewater Creek. Two mill site location notices were the only evidence that prospectors had been in the area.

Tract 6, Gila Primitive Area

Trotter Cabin.--Sample locality 565 is near Trotter Cabin on Middle Fork Gila River in sec. 6, T. 11 S., R. 15 W. Volcanic rocks in the area were randomly sampled at three places, and the samples combined. Perlite was the principal material noted, but the grade is considered too low to allow profitable mining.

Middle Fork at Iron Creek.--Mining claims have been located on upper Middle Fork of the Gila River near the mouth of Iron Creek in sec. 2, T. 11 S., R. 16 W. The area claimed was a northerly striking silicified zone in rhyolite, several hundred feet long. This zone contains numerous east-west-trending quartz veinlets and masses of popcorn-shaped quartz and chert nodules. Some iron staining was noted. A random chip sample (No. 567) from the zone did not reveal any mineral concentration.

Areas adjacent to the wilderness and primitive area

Snow Creek Road (Samples 499-501.--According to information referred to in table 8, mining claims have been located at various times in or near the area north of the Snow Creek road and south of lower Sapillo Creek. No field evidence of any of the recorded claims was found, and only one unrecorded claim at a prospect pit was noted in the field investigation.

A claim notice for the Beautiful Bonnie No. 3 claim, located in September 195?, was found near a prospect pit on the ridge east of Sheep Corral Canyon in sec. 17, T. 15 S., R. 14 W. No record of these claims was found at the courthouse. The pit had been sunk in soft rhyolite tuff that appears to cover several square miles in this vicinity. No mineral potential was detected in the analysis of sample 499 taken of this tuff.

Sample 500 was taken from an oxidized zone north of the corrals where the Snow Creek Road crosses Sheep Corral Canyon in sec. 20, T. 15 S., R. 14 W. The zone is 10-feet wide and is laced by quartz stringers as much as 1/2-inch wide. A random chip sample assayed insignificant values. Some maps show a shaft symbol southeast of the sample location; it should be a building symbol as there is a ranch house at the site.

An area along the Snow Creek Road, about 3-1/2 miles from New Mexico Highway 15 (formerly Highway 25) contains no trace of mine workings although claim descriptions place several mining claims in this location (sec. 23, T. 15 S., R. 14 W.). Random chip sample 501 was taken in an effort to find mineral anomalies. It is likely that the claims were for pumicite; low-grade deposits of this construction material were noted throughout the area.

Rocky Canyon (Samples 547-549).--Several mining claims were located near the Outer Loop Road north of Rocky Canyon Campground in sec. 5, T. 14 S., R. 11 W. Black perlite was sampled at location 547. It is 3-feet wide where exposed, and appears to trend N. 75° W. The perlite is of low quality and only a small tonnage is indicated. Sample 548 was taken along 20 feet of iron-stained clay in a road cut. The silver assay was 0.38 ounce per ton, but the mineralized area is too small to indicate a potentially valuable mineral deposit. Six prospect pits in flow-banded rhyolite were found clustered in an area about 100-feet square; random chip sampling (sample 549) showed no indication of valuable minerals.

Black Canyon (Sample 550).--A group of claims was located in the vicinity of the Black Canyon Campground. According to the claimants, no economic mineral deposits were discovered as a result of prospecting activities.

Sample 550 was obtained west of the northern claim (sec. 12, T. 13 S., R. 12 W.) where a basalt flow appears to be intruded by an andesitic dike. The top 4 feet of the reddish brown intrusion was exposed for about 100 feet along the cliff base. The sample analyses gave results that were insignificant.

West Taylor Creek tin mining district (Samples 551-559).--The western part of the Taylor Creek district was investigated to determine if mineralization associated with the tin deposits extended into the Beaver Creek area west of Wall Lake. It was concluded that economically minable deposits may exist as far as Beaver Creek but there has been no indication of exploitable tin deposits farther west.

The Taylor Creek district is one of the few areas in the United States where tin has actually been produced, other than as a by-product. However, production has been slight, amounting to only about 11 tons of concentrates (Anderson, 1957, p. 31). Both low-grade lode and placer deposits occur over an area of about 450 square miles, mostly on the west slope of the Black Range east of the area considered in this report. The lack of water in most of the district has probably been the critical factor preventing development of the richer deposits.

As part of the strategic-minerals program, the U. S. Bureau of Mines sampled the district in 1939, and resampled part of it in 1942 and 1943. In summarizing the exploration project, Volin and others (1947), reported that no sizable lode deposit had been found that contained as much as 1 pound of tin per ton. The best placer deposit sampled contained about 2 pounds of tin per cubic yard.

During the present investigation of the wilderness, only the western part of the Taylor Creek district was examined. Samples were taken at outcrops and prospects not sampled during the earlier Bureau of Mines investigations during 1939-1943. The mining claims shown on plate 3 are only the westernmost of the thousands of claims located at various times in the district.

The largest, and most western, excavation found was the opening reported as Adit 8 by Volin and others (1947, p. 22). It had been driven 150 feet into the east bank of Beaver Creek. Trenches had been excavated for a distance of 200 feet uphill from the portal of the adit. No important tin deposit was found.

The Utah 1 discovery outcrop was examined on the north bank of Taylor Creek in sec. 9, T. 11 S., R. 12 W. Sample 551 was from numerous quartz veinlets intersecting in an area 20-feet square, and sample 552 was from four flatlying, parallel quartz veins striking N. 40° E. The veins were from 1/4 inch to 4 inches wide over a vertical distance of 6 feet. No mineral deposit was indicated by the sample analyses.

A placer sample (No. 553) was taken in a tributary arroyo 1,000 feet northwest of Wall Lake Campground on Taylor Creek, also in section 9. The mouth of the arroyo is in the campground. Erosion had produced a 30-inch high step in the gravels of the stream bed, and the placer sample was taken from this exposure in a channel cut 15-inches wide and 6-inches deep. Bedrock was not reached. The concentrates (553B) assayed the highest tin (0.046 percent) of the three placer samples taken in the district. Considering that this was a concentrate assay, the tin tenor is too low to profitably recover the tin. Richer pockets may occur on bedrock, however. The zirconium content was high as would be expected in a gravity-process concentrate.

On Kemp Mesa (sec. 5, T. 11 S., R. 12 W.) at the western edge of the observed tin mineralization, dump sample 554 was taken at one of four prospect pits on the south slope of the mesa. On the mesa top, two pits had been excavated on a bed of cemented mesa gravels. Sample 555 was from a channel cut in the south face of Pit 7 (Volin and others, 1947) and sample 556 was from the dump. An 8-inch wide zone containing two cassiterite-bearing and specular hematite-bearing stringers was sampled (No. 557) in a prospect pit bearing S. 65° E. The pit is on the south bank of the gulch. Tin was anomalous, but of too low grade to be mined. A prospect pit 10-feet square and 6-feet deep was examined (No. 558) on the slope west of Crosscut 1. The sample was from across a vein, mainly specular hematite, that had a strike of N. 75° W. in the west face of the pit. The northernmost prospect pit found on Kemp Mesa is east of Shaft 4, and had been excavated in the mesa gravels. No mineral deposit was evident in the sample (No. 559) analyses.

Wolf Hollow (Sample 560).--A prospect pit on the mountain slope west of Wolf Hollow about 2-1/2 miles north of Black Mountain and the north wilderness boundary (sec. 30, T. 10 S., R. 13 W.) exposed quartz stringers (sample 560) in a weak altered zone. There is no mineral potential indicated in the vicinity.

Indian Creek East (Samples 561-564.--A zone of leached and altered rock that contains massive outcrops of quartz occurs in the rhyolite of Indian Creek mainly at the junction of Indian Creek and Bull Pass Canyon in sec. 29 and 30, T. 10 S., R. 14 W. As a maximum the zone is about 1/2-mile wide in an east-west direction, and extends from north of the Loco Mountain Road into tract 5 of the Gila Primitive Area a distance of 2 miles. Alteration is weak in the north half of the zone, but is intense along Indian Creek near the mouth of Bull Pass Canyon, where the rhyolite is reddish from iron-oxide staining. The Hope group of 28 claims was located on the zone in 1954, and nine of the claims were relocated in 1955 (table 8). A shallow bulldozed bench about 50 feet in diameter north of the Loco Mountain Road probably is the discovery pit for the Hope #1 claim. No significant mineral anomalies were detected (sample 561).

Other than for claim corners, no evidence of prospecting was found in the southern part of the altered area. Sample 562 was from a fracture zone on the west side of Indian Creek Canyon. The zone consisted of leached and altered country rock, quartz veins, and bright red hematite. A random chip sample (No. 563) was taken at a quartz outcrop occurring over a 100-foot square area. Sample 564 was from outcrops of leached rock. No mineral anomalies were shown by the sample analyses.

Willow Creek and Gilita Creek (Sample 568).--Placer mining claims had been located along Willow and Gilita Creeks in the area occupied by Willow Creek Lodge, the three campgrounds, and Willow Creek Guard Station (table 8). An examination of the area revealed no significant mineralization. The upper Willow Creek drainage is not sufficiently mineralized to have provided gold for possible placer deposits on lower Willow Creek.

A chip sample (No. 568) was taken in a road cut above the New Mexico Department of Game and Fish cabin in sec. 34, T. 10 S., R. 17 W. The Pine Top claim was located in the vicinity in 1935. A 4-foot square hole was found in a quartz vein or lens that is exposed in a cut along 0.2 mile of the road. No valuable mineral concentration was found.

Indian Creek West (Samples 569-570).--A small area of altered rock was examined on Indian Creek near Gilita Creek in sec. 29, T. 10 S., R. 17 W. The altered rock had been covered by two Higgins claims located in 1954. Sample 569 was from a fracture zone in a trench 10-feet long, 6-feet wide, and about 4-feet deep. The zone contained quartz and alteration minerals. Across the gulch, another small prospect was found in an area that had been fractured almost to a gouge. Sample 570 was taken across part of this zone. No mineral deposit is indicated in the area, and the altered rocks do not extend into the wilderness.

Appraisal of findings

Mineral deposits occur in the officially designated Gila Wilderness, segments of the Gila Primitive Area, and contiguous areas where past claim locating activities were most intense, as shown on plate 3. Some of these deposits could possibly be developed under present economic conditions; additional engineering and geologic studies would be required to determine mining feasibility. Extensive surface and subsurface exploration could result in the discovery of minable deposits at depth in the various areas of altered rocks. Any significant rise in the prices of gold, silver, or fluorite would prompt increased exploration and reopening of the old mines. Future metallurigical techniques could make exploitation of some of the low-grade deposits economical.

Samples taken by the Bureau of Mines from locations in the study area on the north slope of Whitewater Canyon, and at the junction of South Fork and Whitewater, gave assays as high as 19.73 percent manganese (sample 3) in a specimen of float, 14.38 ounces of silver per ton (sample 17) in a development rock stockpile, 0.40 ounce of gold per ton (sample 17) in a development rock stockpile, and 1.08 percent copper (sample 24). Although veins associated with the samples are not of an economically minable width, there is a potential for mineral development.

Along the western boundary of the wilderness, between Deer Park Canyon and S Dugway Canyon, samples assaying a maximum of 1.3 ounces per ton in gold (sample 70) and 16 ounces per ton in silver (sample 69) were taken. These represented sample widths of 2 inches and 4 feet, respectively. The occurrences are just inside the designated wilderness, as is a significant outcrop of fluorspar in Holt Gulch (sample 78). Other potentially important deposits of fluorspar occur just outside the wilderness in Little Whitewater, Holt, and Goddard Canyons.

Base-metal veins cropping out along Big Dry Creek Canyon are 1,000 feet south of tract 7 of the Primitive Area; one-fourth mile south of Johnson Cabin within tract 7 of the Primitive Area; and at the Uncle John mine about a mile inside the wilderness. Assays showed lead and zinc tenors in excess of 9 percent each (sample 154), copper at a maximum of 2.15 percent (sample 115), and cadmium tenors as high as 0.72 percent (sample 154). Gold and silver are associated with the deposits. These are marginal deposits owing to the narrowness of the veins, but there is a possibility that additional work might expose larger mineralized bodies.

The area of the patented claims at the headwaters of Big Dry Creek contains wide quartz veins of low-grade gold content. The exposures sampled are not economically minable at present gold prices, but high-grade pockets no doubt occur. In the area, a maximum assay of 0.36 ounce of gold per ton (sample 236) was obtained from quartz stringers in a prospect near the Silver Drip Trail.

Assays indicate a potential for minable deposits of metals, including tellurium, from veins in the Little Dry Creek-Pine Creek area. The area of greatest potential extends about 2,000 feet into tract 7 of the primitive area. Of note in the Little Dry Creek mineralized zone is the presence of intense oxidation effects including limonitic boxwork and pseudomorphs of sulfides. Small amounts of tellurium in gold ores commonly affect gold-metallurgy processes adversely, but in the Pine Creek area, the element occurs in amounts of sufficiently high grade to constitute a tellurium resource. The highest tellurium assay in the samples was 0.46 percent (sample 376); one hand specimen assayed 0.75 percent tellurium. Selected sample 376 also assayed 1.28 ounces of gold per ton. A sample (No. 337) assaying 22.17 ounces of silver per ton was taken from a very narrow (1- to 40inch) vein on the patented claims.

Fluorite was the principal product from small mines operated at various times in a mineral belt extending from Pine Creek to Seventyfour Mountain on both sides of the wilderness boundary. Metals, particularly copper and silver, were produced from small operations including those in the patented claims on Haystack Mountain. In that vicinity, a 1-inch wide vein assayed 19.06 percent copper (sample 260) over a strike length of 25 feet. A specimen sample (No. 259) in the same general area assayed 23.80 ounces of silver per ton. Semiquantitative spectrographic analysis of a sample (No. 275) from a quartz stringer in a prospect northwest of Haystack Mountain showed a gold content of 70 parts per million, or about 2 ounces per ton. In the Minton-Cherry Canyons area, a sample (No. 432) from a 4-inch vein assayed 8.82 percent copper, 1.36 ounces of gold per ton, and 1.04 percent lead. A sample (No. 433) across a 3-foot lens of copper minerals assayed 7.05 percent copper and 3.66 ounces of silver per ton.

Although there are no proved or measured reserves, the presence of anomalous copper in samples taken throughout the mineral belt from Big Dry Creek to Seventyfour Mountain, suggests the possibility of deposits at depth. Minable resources of fluorite occur in this area, but their exploitation depends on market conditions.

Fluorite is being produced from deposits along the Gila River near the proposed site of Hooker Dam. Alteration and leaching effects, and the presence of metal anomalies, also indicate a possible deep-seated metal deposit in that area. The old mines in the vicinity do not occur in the primitive area or wilderness.

With the exception of the meerschaum veins, no potentially minable mineral concentrations were found in the altered rocks that extend from Meerschaum Canyon to Alum Mountain, or in the similarly altered rocks north of Gila Cliff Dwellings National Monument. However, metal anomalies were detected in the Alum Mountain altered rocks, including gold (0.28 ounce per ton), silver (3.06 ounces per ton), and copper (0.18 percent) in samples 528, 530, and 534, respectively. These were random chip samples; no specific width is represented.

Stream beds in the area studied have been prospected for gold and tin placer deposits. However, the stream gradient is too steep and the canyons too narrow for important deposits to have been formed in the interior of the area. Reportedly, some pockets were worked along the bottom of Dog Canyon in the Little Dry Creek patented-claim vicinity. Placers in the Holt Gulch area were never successfully exploited, probably because of the lack of water.

Several storm periods in November and December 1965 caused the highest floods in 25 to 40 years in parts of the Gila River basin, and the highest in memory on Big Dry Creek. Conditions could have been such that the entire bed load of gravels was shifted or agitated where Big Dry Creek leaves the study area. This may have resulted in a concentration on bedrock of gold that had previously been scattered throughout the gravels.

There will probably be continued efforts to mine the tin deposits near Wall Lake, but the potentially exploitable resources extend westward only to Beaver Creek, that is, a few miles east of tract 4 of the primitive area.

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