CONTACT INFORMATION
Mining Records Curator
Arizona Geological Survey
3550 N. Central Ave, 2nd floor
Phoenix, AZ, 85012
602-771-1601
http://www.azgs.az.gov
inquiries@azgs.az.gov

The following file is part of the Cambior Exploration USA Inc. records

LIGHT AND OTHERS—MINERAL RESOURCE POTENTIAL MAP,
CROSSMAN PEAK WILDERNESS STUDY AREA, ARIZ.

SCALE 1:48 000

MAP MF-1602-A

2.20

AREA OF MAP

USBM open-file report on min. eval.
on-file at ABM library, Tucson

Check Kingman sheet.

DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

TO ACCOMPANY MAP MF-1602-A

MINERAL RESOURCE POTENTIAL OF THE CROSSMAN PEAK WILDERNESS STUDY AREA (5-7B), MOHAVE COUNTY, ARIZONA

SUMMARY REPORT

By

Thomas D. Light[1,2], Jane E. Pike[1], Keith A. Howard[1],
John R. McDonnell, Jr.[2], Robert W. Simpson [1], Gary L. Raines[1],
Richard D. Knox[1,3], Howard G. Wilshire[1], and Martha A. Pernokas[1]

STUDIES RELATED TO WILDERNESS

Bureau of Land Management Wilderness Study Areas

The Federal Land Policy and Management Act (Public Law 94-579, October 21, 1976) requires the U.S. Geological Survey and the U.S. Bureau of Mines to conduct mineral surveys on certain areas to determine their mineral resource potential. Results must be made available to the public and be submitted to the President and the Congress. This report presents the results of a mineral survey of the Crossman Peak Wilderness Study Area (5-7B), Mohave County, Arizona.

SUMMARY

Mining history, results of recent mineral investigations, and geologic, geochemical, and geophysical data collected and evaluated by the U.S. Geological Survey and U.S. Bureau of Mines as of 1982 indicate that the Crossman Peak Wilderness Study Area has potential for several mineral resources. The wilderness study area has high potential for small deposits of lode gold, silver, and tungsten, and for placer gold. Sixteen sites in or adjacent to the wilderness study area contain from 100 to 8,000 tons of indicated or inferred gold or silver resources at grades of 0.05 to 0.62 oz gold per ton and 0.19 to 2.1 oz silver per ton. Favorable geologic terrane suggests that much of the wilderness study area has at least moderate potential for additional resources of lode gold and silver and placer gold. Positive geochemical anomalies and patterns of alteration in the central part of the wilderness study area provide evidence for speculating that there is moderate to low potential for additional deposits of base metals. There is high potential for deposits of riprap and of sand and gravel, and moderate potential for small deposits of perlite, opal, and manganese in the wilderness study area. The potential for uranium, oil and gas, and geothermal resources is low.

INTRODUCTION

The Crossman Peak Wilderness Study Area (fig. 1) is in western Arizona 3 mi east of Lake Havasu City, Ariz., and 45 mi southwest of Kingman, Ariz. The wilderness study area covers approximately 38,000 acres in the topographically rugged center and flanking foothills of the Mohave Mountains, which are sometimes included as part of the Chemehuevi Mountains. The Chemehuevi Mountains are in California adjacent to the northwest Mohave Mountains but across the Colorado River. The Mohave Mountains form a northwest-trending range adjacent to Lake Havasu (elevation 448 ft) on the Colorado River. Both the Mohave Mountains and the wilderness study area are dominated by Crossman Peak, which has an elevation of 5,148 ft. The area is accessible from the north and west by numerous jeep trails that intersect either Interstate 40, State Highway 95, or some residential streets of Lake Havasu City. From the south, southeast, and northeast access to the area is by jeep trails that intersect the unimproved Dutch Flat Road, which skirts the south flank of the mountains. Several small areas of mines and roads excluded from the wilderness study area proper are within the approximate boundary shown for the study area in figures 2-7.

GEOLOGY

The Crossman Peak Wilderness Study Area lies in the Sonoran Desert section of the Basin and Range geologic province. Before the present study the Crossman Peak area was known geologically only from very general reconnaissance (Wilson and Moore, 1959). Preliminary results of the present geologic investigation have been reported by Pike and Hansen (1982), Nakata (1982), Howard and others (1982a), John and Howard (1982), Pike (1983), Wilshire and others (1983), and Howard and John (1983).

Rocks in the wilderness study area are dominantly Proterozoic metamorphic and igneous rocks intruded by Proterozoic and Tertiary igneous dikes (fig. 2). Mineralized veins within the Proterozoic gneisses probably are Mesozoic and may be related to Cretaceous(?) granitoid rocks such as occur in the Mohave Mountains near the north boundary of

[1]U.S. Geological Survey
[2]U.S. Bureau of Mines: Light began his part of the investigation while with USBM, and continued the investigation after transferring to the USGS.
[3]U.S. Bureau of Land Management: Knox contributed to the investigation while on detail to the USGS.

the wilderness study area. Tertiary volcanic and sedimentary rocks overlie the Proterozoic rocks at the south and southwest margins of the study area. Several faults of Tertiary age cut these rocks. Quaternary alluvial deposits occur around the flanks and in drainages within the range.

Proterozoic rocks and Mesozoic mineralization

Proterozoic granite gneisses and amphibolite are the dominant rock types in the wilderness study area; steeply dipping foliation in these rocks generally strikes northeast. Granite and related quartz monzodiorite of probable Middle Proterozoic age crop out in the southern part of the wilderness study area, mostly to the south of a major low-angle fault, the Crossman Peak fault. Diabase dikes that trend northwest intrude the gneiss and granite (Nakata, 1982); the dikes are similar to diabase dikes elsewhere in Arizona and southeastern California that are assigned a Middle Proterozoic age (Wrucke and Shride, 1972; Hendricks and Lucchitta, 1974; Davis and others, 1980; Howard and others, 1982a, 1982b).

Potassium-argon (K-Ar) radiometric dating of Proterozoic gneiss and granite of the wilderness study area and other parts of the Mohave Mountains yields ages that range from 57 to 800 m.y. B.P. These ages probably indicate argon loss due to later tectonic or heating events. Proterozoic gneisses similar to those of the Crossman Peak Wilderness Study Area, and granite like that in the southern part of the area, occur in the Hualapai Mountains 30 mi to the northeast. There, the gneisses are associated with massive sulfide copper-zinc deposits that have lead isotopic ratios suggestive of an Early Proterozoic age (Stensrud and More, 1980).

The Crossman Peak Wilderness Study Area is near the northeast limit of the Cretaceous magmatic arc (Burchfiel and Davis, 1980; John, 1981). Granite plutons of known and inferred Cretaceous age are widespread to the west (Armstrong and Suppe, 1973; John, 1981, 1982; Davis and others, 1980, 1982), but are rare to the northeast. Granite and diorite of inferred Cretaceous age form dikes and stocks immediately north of the wilderness study area, and a small granite body of inferred Cretaceous age occurs within the wilderness study area. A northeast-trending rhyolite dike in the wilderness study area yielded a K-Ar age (biotite) of 60 m.y. B.P., suggestive of a Laramide (Late Cretaceous and early Tertiary) age. The stocks yielded apparently reset K-Ar ages of 18 m.y. (biotite from granite) and 32 m.y. (hornblende from diorite). The granites contain biotite and sphene and generally resemble biotite granites in the nearby Chemehuevi Mountains described by John (1982). Exposures in several nearby ranges appear to represent different structural levels. The evidence suggests that the granitic stocks in the Mohave Mountains are apophyses of deeper batholithic complexes (Howard and others, 1982a, 1982b). Mineralized quartz veins in the wilderness study area contain sulfides and precious metals, and may be related to the regional Cretaceous magmatism. The veins cut the Proterozoic diabase and are cut by Tertiary dikes. White mica in the veins and in bordering altered rocks at four localities in the wilderness study area was dated to investigate the age of mineralization. Medium-grained white mica yielded ages of 87 to 97 m.y., while fine-grained white mica, some from the same localities, produced ages of 52 to 68 m.y. This dependence of apparent age upon grain size suggests partial argon loss from the finer-grained samples. Thus, a minimum age of Late Cretaceous is indicated for the mineralization. The degree to which these ages may have been reset is uncertain, because no dates have been obtained from unaltered Proterozoic rocks near the dated veins.

Cenozoic rocks and deposits

Dense swarms of northeast-dipping Tertiary mafic to silicic dikes intrude the Proterozoic gneiss throughout the wilderness study area north of the Crossman Peak fault. The dike swarms, including a dike-on-dike complex, account for about 20 percent of the rock volume in this area and represent a major series of intrusive events (Nakata, 1982). Biotite K-Ar ages of dike rocks are 18 to 20 m.y.

Tertiary volcanic and sedimentary strata of early and middle Miocene ages nonconformably overlie Proterozoic granite and gneiss at the southwest and southeast margins of the wilderness study area (Pike and Hansen, 1982). These strata consist of mafic and silicic lava flows and volcaniclastic flows and breccia that are interbedded with air-fall tuff and tuff breccia, and with sedimentary rocks. Some silicic lava flows and breccia contain zones of manganese oxide. The base of a few flows contains perlite, a material used for insulation and filler. The sedimentary units include arkosic conglomerate and conglomeratic sandstone derived from Proterozoic sources, sandstone and sedimentary breccia derived solely from reworked volcanic rocks, and fanglomerate, sandstone, and claystone from mixed sources. South of the Crossman Peak fault and outside the wilderness study area the Tertiary volcanic and sedimentary strata are intruded by silicic and mafic dikes that may be feeders for some of the younger lava flows.

K-Ar dates indicate that the lowermost Tertiary lava flows are at least 20 m.y. old (Conoco, Inc., unpub. data, 1982). Dates on silicic flows about 3,000 ft above the base of the section, and on silicic dikes, range from 19 to 16 m.y. Basalt flows that cap the Tertiary sequence have been dated at 10.8 to 9 m.y. (Suneson, 1980; M. A. Pernokas, unpub. data, 1983).

Quaternary deposits of the wilderness study area are fanglomerates which mantle the periphery of the Mohave Mountains, and sand and gravel in washes (dry stream beds). These deposits are composed of unsorted to poorly sorted coarse, angular to subangular clastic debris derived from Tertiary and pre-Tertiary rock units exposed in the Mohave Mountains. The fanglomerates interfinger with river-laid sand and gravel along the Colorado River to the west of the wilderness study area.

Structure

The Crossman Peak Wilderness Study Area lies within a terrane characterized by major low-angle normal faults, commonly called detachment faults, of Tertiary age. This terrane has been described by various authors, for example, Carr and others (1980), Davis and others (1980), and Carr (1981) for the Whipple-Rawhide-Buckskin Mountains. Tertiary detachment and related faults 15-20 mi southeast of the study area are mineralized by specular hematite and associated gold, copper, and manganese related to the faulting (Wilkins and Heidrick, 1982).

The Proterozoic-Tertiary unconformity dips southwest 50-60° at the southwest margin of the study area. The lowermost Tertiary strata are steeply tilted and overlying units have progressively shallower dips (Pike and Hansen, 1982), while uppermost Miocene flows, Pliocene deposits near the study area, and overlying Quaternary fanglomerate and river deposits have very gentle or negligible dips. Structural relations in the upended Tertiary sequence indicate that the main mass of the high Mohave Mountains including most of the wilderness study area (Crossman plate of Howard and others, 1982a) was tilted along with the volcanic and sedimentary rocks as a block, probably in the middle Miocene. Tilting of the Crossman plate probably resulted from movement on the Whipple Mountains detachment fault, which projects under the study area. The Crossman Peak fault projects above the Crossman plate. The plate thus represents a crustal block truncated by the Whipple Mountains detachment fault at its base and by the higher level Crossman Peak detachment fault at the top. In the southeastern part of the wilderness study area, the Crossman Peak fault dips southward under numerous small blocks of Proterozoic granite and Tertiary strata that are steeply tilted on apparently northeast-dipping normal faults. Progressive Tertiary deformation is recorded by several unconformities within the Miocene section and by a progressive decrease in dips of younger Miocene units. Relatively mild faulting and tilting in upper Miocene strata postdates major movement on the Whipple Mountains and Crossman Peak faults.

The evidence for tilting of the Crossman plate implies that all features, including mineralized structures and

Tertiary dike swarms, are exposed in an oblique cross section that represents progressively greater crustal depths from southwest to northeast. This section represents about 7.5 mi of crustal thickness if the Crossman plate is an unbroken block tilted 55° to the southwest. A crustal reconstruction by Howard and others (1982a) suggests that before Tertiary detachment and rotation, the deepest Proterozoic rocks exposed in the study area were underlain at depth by voluminous Cretaceous granite plutons and sheets, now exposed in the Whipple and Chemehuevi Mountains (Anderson and others, 1979; Davis and others, 1980; 1982; Anderson and Rowley, 1981; Anderson, 1981; John, 1982).

Dike swarms and Proterozoic gneisses in the Crossman plate may have been translated from a footwall of similar rocks in Chemehuevi Valley or the western Whipple Mountains area below the Whipple Mountains detachment fault (Davis and others, 1980, 1982; Carr and others, 1980; Dickey and others, 1980; Howard and others, 1982a). Thus, mineralized areas in the Crossman plate possibly represent the upper levels of a mineralized system of which the lower parts may occur in the lower plate of the Whipple Mountains (Marsh and others, 1982).

GEOCHEMISTRY AND REMOTE SENSING

A reconnaissance geochemical survey of the Crossman Peak Wilderness Study Area was conducted using stream sediments, panned concentrates, and rock samples (Light and others, 1983). Sediments and concentrates were collected from 130 drainages in the area. A total of 87 rock samples was taken from unmineralized outcrops and from mining areas to determine the mineral suites and trace-element signatures. The minus-30-mesh fraction of sediment samples, the nonmagnetic heavy fraction ($>$ 2.86 sp. gr.) of the concentrate samples, and the rock samples were each analyzed for 31 elements by a semiquantitative emission spectrographic method (Grimes and Marranzino, 1968). Rock samples were also analyzed for gold, mercury, zinc, cadmium, bismuth, antimony, and arsenic by atomic absorption. Because of the limited number of samples and the small size of the area, anomalous chemical contents of these samples are defined by comparison to normal crustal abundances (Taylor, 1964), or from inspection of histograms. For this study anomalous elemental abundances are taken as equal to or greater than the following values: 100 ppm copper, 100 ppm lead, 1,500 ppm barium, 150 ppm lanthanum. Further, any values above the lower detection limits of the semiquantitative emission spectrographic method for gold (10 ppm), silver (0.5 ppm), molybdenum (5 ppm), tungsten (50 ppm), zinc (200 ppm) bismuth (10 ppm), tin (10 ppm), cadmium (20 ppm), and arsenic (200 ppm), were considered anomalous.

Rock, sediment, and panned-concentrate samples from the Crossman Peak Wilderness Study Area characteristically contain anomalously high concentrations of silver, copper, lead, zinc, molybdenum, tungsten, barium, and lanthanum. In rock and panned-concentrate samples, gold and bismuth commonly accompany this assemblage. Numerous panned-concentrate samples contained anomalous tin values between 20 and 150 ppm, and several rock samples contained high cadmium and arsenic values. The gold-silver-tungsten-copper-lead-zinc metal assemblage is distributed throughout the wilderness study area and is considered to represent mineralization derived from a large hydrothermal system, probably of Cretaceous age. Both the common association of these elements across the wilderness study area and a general tendency for the dominant species in the assemblage to vary with respect to geographic location suggest that mineralization is related to a single system. Local secondary mineralization along dikes suggests some local redistribution of metals by Miocene dike magmatism.

As a part of this study, limonitic materials (limonite, hematite, goethite, etc.) were identified in Landsat images using a color-ratio-composite method (Rowan and others, 1974). Field examination of several limonitic areas associated with mineral deposits revealed that patches of argillic alteration occur within an area of approximately 7 mi^2 in the central and eastern parts of the wilderness study area (fig. 3). The alteration in this area (G. L. Raines, unpub. data, 1981) is characterized by an assemblage that contains kaolinite-white mica-hematite-chlorite. An area of about 1/4 mi^2 near the Jupiter East mine (no. 33, fig. 4) has intensely altered feldspars and represents a more advanced stage of argillic alteration. The area of argillic alteration is bounded on the north and west by a propylitic alteration assemblage including chlorite, epidote, albite, and quartz at the Pittsburg (no. 41), J & J (no. 15), Scotts Well (no. 18), and Arrastra Well (no. 8) areas. At some of these sites the assemblage includes minor amounts of pyrite. Abundant sericitic alteration with associated pyrite was observed at the Sunrise mine (no. 20). The mapped limonitic areas and observed alteration suggest a crudely zoned pattern of hydrothermal alteration from intermediate argillic at the Dutch Flat mines outward to sericitic alteration at the Sunrise mine and then to propylitic alteration along the western and northern parts of the wilderness study area.

The distribution of base and precious metals forms a crudely zoned, overlapping pattern that roughly correlates with the zones of alteration defined by remote sensing (fig. 3). The area of the Dutch Flat mines (nos. 30-38, fig. 4) is the most intensely altered and mineralized, and appears to be the center of mineralization. Samples have a high concentration of tungsten, copper, and gold (fig. 3). Outward from this area to the west and northwest, tungsten and copper values diminish and gold, in association with lead, zinc, silver, and arsenic, forms the dominant metal concentration in a zone that includes the Sunrise (no. 20) and Osiris (in no. 28) mines, and the adits in the south-center of sec. 24, T. 14 N., R. 19 W. (no. 26). Peripheral to this zone, the metal assemblage in analyzed samples is dominated by silver and is accompanied by lead, zinc, gold, and barium in a zone that contains the Pittsburg (no. 41) and J & J (no. 15) mines. At the Wing mine (no. 11) 2 1/2 mi northwest of the J & J mine, a gold, silver, lead, zinc assemblage is associated with arsenic, barium, and secondary copper and molybdenum.

GEOPHYSICS

Gravity

The Bouguer gravity field as defined by regional coverage (approximately 1 station per square mile) does not reveal any major anomalous features within the Crossman Peak Wilderness Study Area. A broad area of relatively high Bouguer gravity values (-62 to -70 mGals) overlies the northern and central parts of the area that expose Proterozoic gneisses. Slightly lower gravity values (-70 to -85 mGals) occur in the southeastern part of the wilderness study area, partly over Proterozoic gneisses and partly over Tertiary volcanic and sedimentary deposits south of the Crossman Peak fault. The portion of the gravity low over the gneisses could be related to the alteration of the gneisses in this area detected by geochemical and remote-sensing data (Light and others, 1983; G. L. Raines, unpub. data, 1981). Lithologic changes could also produce the lower gravity values. The portion of this gravity low to the south of the Crossman Peak fault and another low to the southwest of the wilderness study area are probably caused by the presence of low-density Tertiary volcanic and sedimentary rocks. A steep gravity gradient occurs along the east and north flanks of the Mohave Mountains just outside the wilderness study area; it is probably caused both by the presence under the Dutch Flat valley of low-density Tertiary and Quaternary sedimentary deposits and by density changes across a major structural boundary within the crust. Modeling suggests that this boundary dips westward and southward under the rocks of the wilderness study area above lower density rocks.

Aeromagnetic data

Aeromagnetic anomaly values (U.S. Geological Survey, 1981) range from a high of 5,047 gammas in the northwest corner of the study area to a low of 4,438 gammas in the north. (A datum of 5,000 gammas has been added to the survey after removal to the International Geomagnetic Reference Field.) Both highs and lows occur over exposures of Proterozoic gneiss. An elongate northwest-trending belt of magnetic highs extends through the center of the wilderness study area on the west side of the range. The highest values in the belt occur over outcrops of Proterozoic augen gneiss, though not all exposures of this unit have associated high anomalies. A circular high anomaly at the extreme east edge of the wilderness study area occurs over exposures of magnetic Proterozoic augen gneiss and diorite. Proterozoic amphibolite bodies may cause several high anomalies of small extent. The numerous mafic and felsic dikes are generally neither magnetic enough nor large enough to produce significant anomalies.

A region of low aeromagnetic values lies over the northeastern and southeastern parts of the wilderness study area, overlapping areas that are altered (fig. 3). These magnetic lows may be produced by the destruction of magnetic minerals during alteration, or may simply be located over gneisses that are not very magnetic even if unaltered. Mapped exposures of the magnetic Proterozoic augen gneiss unit are absent from the area of the low (Howard and others, 1982a), which is consistent with the latter possibility.

Small aeromagnetic highs and lows in the southern part of the study area and similar anomalies to the north, northwest, southwest, and southeast of the wilderness study area boundaries are associated with Tertiary volcanic rocks. The northwest elongation of many of these anomalies reflects the strike of the rocks and the trends of normal faults that cut the Tertiary section. A large magnetic high with an amplitude of approximately 500 gammas occurs about 3 mi south of the wilderness study area and overlies very magnetic Tertiary volcanic units and moderately magnetic Proterozoic augen gneiss. Both lithologies probably contribute to the anomaly.

MINING DISTRICTS AND MINERALIZED AREAS

The Crossman Peak Wilderness Study Area contains numerous occurrences of gold, silver, tungsten, lead, and zinc, which have been prospected and mined intermittently during the past 120 years. The first claims were filed in the early 1860's on placer gold deposits in the washes that drain the Crossman Peak Wilderness Study Area. The mines of Dutch Flat (or Kampff mines) on the southeast side of the range were discovered in 1870 and were the first lode claims to be worked in the area. Placer mining activity reached its peak during the years between 1929 and 1933, and has periodically been rejuvenated during times when gold prices were high. By 1982, numerous individuals and companies were evaluating the lode and placer deposits throughout the wilderness study area with the expressed intention of processing the mine dumps and reopening several of the old mines (Light and McDonnell, 1983).

The Crossman Peak Wilderness Study Area is in the Chemehuevi mining district, which has also been referred to as the Mohave, Gold Wing, or Owens district. Several thousand mining claims are located in and around the study area. During this investigation, all the known mines and prospects were mapped and sampled where accessible. The U.S. Bureau of Mines collected 1,131 samples, including chip, select, dump, stream-sediment, and panned-concentrate samples (Light and McDonnell, 1983).

The Crossman Peak Wilderness Study Area and immediate environs contain 43 separate mineralized occurrences that have been mined or prospected (fig. 4, table 1). These sites range from patented lode mining claims with several thousand feet of workings to areas with numerous shallow pits and short adits. Sixteen of these areas are reported to have produced some ore (Light and McDonnell, 1983) and several other areas probably produced some high-grade ore. However, only limited data are available on the tonnage and grade of ore produced from the mines.

Resource estimates have been calculated for 16 deposits within and adjacent to the wilderness study area that contain indicated or inferred resources of gold, silver, or tungsten (table 2). Estimates for the individual deposits were determined from detailed surveys of the workings. One-half of the measured length of mineralization was projected as the depth for calculating inferred resources. The assay width of all samples across a mineralized structure was weighted with respect to the sample interval and all samples, including those which were not mineralized, were used to calculate the tonnage and average grade (Light and McDonnell, 1983).

ASSESSMENT OF MINERAL RESOURCE POTENTIAL

Mineral resource potential is classified in this report according to definitions of high, moderate, and low potential, suggested by R. B. Taylor and T. A. Steven of the U.S. Geological Survey (written commun., 1983). High mineral resource potential exists where all conditions of a genetic model have been satisfied and the necessary geologic processes and mineral concentration took place. Moderate mineral resource potential exists where conditions of a genetic model have been satisfied, but mineral concentrations are ambiguous or have not yet been found. Low mineral resource potential exists where evidence to support a favorable genetic model is lacking and there is an unfavorable combination of geologic factors, or mineral concentrations are nonexistent. Estimates of identified resources were calculated using measurements and analytical data for samples from mine workings and mineralized outcrops.

Gold, silver, and tungsten have been mined from quartz veins and faults with widths ranging from a few inches to 3 ft at several localities within the wilderness study area. As discussed above, regional relations together with K-Ar ages on white mica from mineralized areas suggest that the hydrothermal mineralization in the Proterozoic gneiss probably occurred in Cretaceous time, and may have been related to Cretaceous intrusive igneous activity that was common throughout southern Arizona and southern California.

A Cretaceous granite that intruded Proterozoic gneiss and granite 15 mi to the south in the Whipple Mountains is believed by Anderson and Frost (unpub. data, 1981) to be responsible for initial mineralization of the adjacent Copper Basin copper deposit (Marsh and others, 1982). Similar plutonic sources are inferred to be responsible for the base- and precious-metal mineralization observed in the Crossman Peak Wilderness Study Area.

The mining history, results of recent mineral investigations, and the geologic, geochemical, and geophysical data acquired during this study show that the Crossman Peak Wilderness Study Area has areas of high and moderate potential for lode deposits of gold and silver in pods and veins, for placer gold deposits, and an area of high potential for lode tungsten deposits. Several lines of evidence, including the distribution of base and precious metals and geochemically related elements in rocks and sediments, the pattern of hydrothermally altered zones, and chemical compositions and petrographic characteristics of rocks from mineralized veins, suggest that a low-fluorine porphyry-type system was the source of mineralization, and may still be present at depth in the wilderness study area. This area of possible porphyry mineralization lies above the Whipple Mountains detachment fault; it has a moderate to low potential for disseminated base-metal resources. Resources of gravel, riprap, and possibly perlite, opal, and manganese exist within the wilderness study area; however, abundant quantities of these materials are readily available outside the area. The potential for resources of uranium, oil and gas, and geothermal energy is low in the Crossman Peak Wilderness Study Area.

Lode gold and silver

All of the pre-Tertiary terrane in the Crossman Peak Wilderness Study Area has high to moderate potential for lode deposits of gold and silver in quartz veins and pods. Areas GS-1a to d (fig. 5) are considered to have high potential; areas GS-2 and GS-3 are considered to have moderate potential (fig. 5). The criteria used to define the resource potential of areas GS-1, GS-2, and GS-3 are listed in table 3.

Area GS-1—High potential for lode deposits of gold and silver.—Areas containing numerous deposits that are known to have produced gold and silver or for which indicated or inferred resources have been calculated (Light and McDonnell, 1983) are designated as GS-1a to GS-1d on figure 5. These areas have the highest potential in the wilderness study area for gold and silver deposits related to a Cretaceous(?) hydrothermal system. Additional deposits will most likely be in high-grade pockets in the veins previously mined and prospected, or along the same structural trends which controlled these veins. Such deposits are expected to range in grade from 0.005 to 1.0 oz gold per ton and in size from 100 tons to 8,000 tons or possibly greater. Four areas meet the criteria for GS-1. The largest area, GS-1a, is 6 mi long and as much as 4 mi wide, covering the central and north-central quarter of the wilderness study area. Smaller areas labeled GS-1b, GS-1c, and GS-1d encompass the vicinity of the Wing, J & J, and Pittsburg mines.

Area GS-1a—Area GS-1a encompasses numerous deposits that are known to have produced some gold or silver and includes the Arrastra Well area, Green Feather mine, Scotts Well area, Sunrise mine, Ra claims, Dutch Flat group, and numerous unnamed workings. Lode production from the Arrastra Well area (no. 8, fig. 4) probably came from an adit and a decline in the ridge approximately one-quarter mile northwest of Arrastra Well. Six samples with an average width of 9 in. from the mineralized quartz vein in these workings contained as much as 0.6 oz silver per ton and 0.328 oz gold per ton. Inferred resources are 350 tons at an average grade of 0.32 oz silver per ton and 0.21 oz gold per ton (Light and McDonnell, 1983).

The Green Feather mine (no. 9, fig. 4) is in an area of propylitic alteration and consists of an adit with 150 ft of drifts and a 35-ft inclined shaft cut along a gently dipping northwest-striking quartz vein. Seven samples having an average width of 8 in. from the mineralized vein contained values as high as 0.407 oz gold per ton. Inferred resources are 210 tons averaging 0.05 oz gold per ton.

Two unnamed adits, 110 and 90 ft long, cut along a quartz vein in sec. 14, T. 14 N., R. 19 W. (no. 16, fig. 4) contained values as much as 1.54 oz gold per ton and 2.4 oz silver per ton as detected in seven samples that average 2 ft wide. This deposit contains 610 tons of inferred resources averaging 0.41 oz gold per ton and 1.3 oz silver per ton.

An unnamed adit (no. 17, fig. 4) cut along a quartz vein in the SW 1/4 sec. 12, T. 14 N., R. 19 W., contains as much as 0.872 oz gold per ton and 0.7 oz silver per ton as detected in four samples that average 1.3 ft wide. Approximately 120 tons of inferred resources averaging 0.24 oz gold per ton and 0.45 oz silver per ton have been calculated for this deposit.

The Scotts Well area (no. 18, fig. 4) consists of 13 adits, ranging in size from 10 to 130 ft long, and numerous prospect pits and trenches. A total of 73 samples were collected from the various workings cut along quartz veins and faults; these contained as much as 4.0 oz silver per ton, 1.702 oz gold per ton, and 11.0 percent lead. Calculations based on 14 samples with an average width of 1 ft from one group of workings define inferred resources of 770 tons at average values of 0.19 oz gold per ton and 0.62 oz silver per ton. Resource estimates could not be made for the remainder of the Scotts Well area because of limited access or extent of the workings.

The Sunrise mine (no. 20, fig. 4) is on a patented claim which produced gold from a 2-ft-wide quartz vein that trends about N. 20° E. Galena, blackjack sphalerite, pyrite, and an unidentified silver-bearing mineral also occur in the vein. The amount and grade of ore produced is not known. However, more than 2000 ft of drift on three levels with extensive stoping between the levels and a winze of unknown depth indicate that at least several thousands of tons of material were removed.

Sericitic alteration adjacent to the vein and propylitic alteration in the country rock were observed at the Sunrise mine; resource estimates are confidential to the private ownership. However, analyses were obtained from ten samples taken from a deposit 1/4 mi west of the main mine workings, and beyond the boundary of the patented claim. In these samples gold concentrations in the quartz vein ranged from a trace to 2.04 oz per ton. This deposit has an estimated 480 tons of inferred resources averaging 0.20 oz gold per ton and 0.18 oz silver per ton.

A group of 3 adits, 2 trenches, and several prospect pits were cut on a northeast-trending quartz vein in sec. 18, T. 14 N., R. 18 W. (no. 21, fig. 4). Seven samples with an average width of 2.5 ft contained gold concentrations from trace amounts to 0.294 oz per ton. This deposit has an estimated 750 tons of inferred resources at an average of 0.08 oz gold per ton.

Two adits in south-central sec. 24, T. 14 N., R. 19 W. (no. 21, fig. 4) were driven along a quartz vein. Analyses of eight samples, with an average width of 2 ft, detected gold concentrations from trace amounts to 0.475 oz per ton. This deposit contains 920 tons of inferred resources that average 0.14 oz gold per ton.

A 15-ft adit and 2 trenches expose a mineralized quartz vein in the NE 1/4 sec. 24, T. 14 N., R. 19 W. (no. 27, fig. 4). Four vein samples with an average width of 1.6 ft contained as much as 0.55 oz gold per ton; inferred resources are 1,330 tons averaging 0.05 oz gold per ton.

At the Ra mine (at no. 28, fig. 3), seven samples with an average width of 1.3 ft were taken from a 90-ft adit and from a winze that was flooded at 45 ft. Sample analyses detected metal concentrations to 3.2 oz silver per ton, 0.058 oz gold per ton, 1.30 percent copper, 5.6 percent lead, and 0.65 percent zinc. There are 490 tons of indicated and 330 tons of inferred resources averaging 0.01 oz gold per ton and 0.57 oz silver per ton.

The Little Maud mine in the Dutch Flat group (no. 30, fig. 4; see also area T, below) comprises three adits driven along a northeast-trending quartz vein. Eight samples with an average width of 2.6 ft from the largest adit (220 ft in length) contained gold values from trace amounts to 0.618 oz per ton. This adit has 5,600 tons of inferred resources averaging 0.05 oz gold per ton.

The irregular distribution of gold in mineralized veins and the tendency for gold to be concentrated in high-grade pockets is well demonstrated in two adits at the Lost Dutchman mine in the Dutch Flat group (no. 36, fig. 4). Eight samples with an average width of 1.6 ft contained 0.006 to 8.82 oz gold per ton and trace amounts to 2.0 oz silver per ton. Adit No. 1 has 140 tons of inferred resources containing an average of 0.02 oz gold per ton and 0.20 oz silver per ton, and adit No. 2 has 470 tons of inferred resources containing a weighted average of 1.74 oz gold per ton and 0.47 oz silver per ton. The high average gold value in adit No. 2 is due to one sample that contained 8.82 oz gold per ton.

Area GS-1b—Area GS-1b surrounds the Wing mine (no. 11, fig. 4). This area is known to have had some minor high-grade gold production (Light and McDonnell, 1983). Resource estimates could not be calculated for the mine because the main workings were inaccessible for sampling. However, the quartz vein and fault at the Wing mine both contain gold, silver, lead, zinc, and molybdenum mineralization and meet the remaining criteria used to define GS-1 (table 3).

Area GS-1c—Area GS-1c surrounds the J & J mine (no. 15, fig. 4) in sec. 16, T. 14 N., R. 19 W. The J & J mine was originally called the Golden Gate mine and produced some gold-bearing ore in 1934 (Malach, 1977). Maximum values of 0.362 oz gold per ton, 9.3 oz silver per ton, 1.64 percent copper, 4.3 percent lead, and 0.57 percent zinc were detected in the 21 samples of 1.9 ft average width collected from the J & J mine. A few tens of tons of base and precious metal-bearing resources are present at this site, but the irregular distribution of samples with anomalously high metal values precludes calculation of a resource estimate.

Area GS-1d—Area GS-1d surrounds the Pittsburg mine (no. 41, fig. 4) which is located about 3 mi northeast of Lake Havasu City, on the west side of the wilderness study area in sec. 27, T. 14 N., R. 19 W. The Pittsburg mine was developed during the interval from 1933 to 1939, when a shaft was sunk more than 200 ft and drifts were cut at several levels. The workings are in a quartz-bearing fault zone that trends northeast and contains silver, galena, sphalerite, barite, and gold. High-grade ore shipments from the mine contained as much as 126 oz silver per ton, 6.5 oz gold per ton, and 2.0 percent lead (Arizona Department of Mineral Resources, file data).

Analytical data from 27 samples averaging 2.7 ft wide from the Pittsburg mine were used to calculate inferred resources of 8,000 tons averaging 3.1 oz silver per ton, 0.06 oz gold per ton, 0.8 percent lead, and 0.6 percent zinc. A nearby area has inferred resources of 1,125 tons averaging 0.64 oz silver per ton (Light and McDonnell, 1983).

Area GS-2—Moderate potential for lode deposits of gold and silver.—Area GS-2 comprises the remainder of the pre-

Tertiary terrane north of the Crossman Peak fault. This area has neither known past production nor deposits for which resources could be calculated. However, the geologic and tectonic setting is the same as area GS-1, and, although area GS-2 may have lower potential for gold and silver deposits than area GS-1, area GS-2 has a moderate potential for the occurrence of additional deposits of the same type and size as in area GS-1. The criteria used to define area GS-2 are listed in table 3.

Area GS-3—Moderate potential for lode deposits of gold and silver.—This area lies south of and structurally above the Crossman Peak fault. It contains numerous fault-bounded blocks that expose Proterozoic granitoid rocks like those at the Manitowoc mine (no. 43, fig. 4) one-half mile outside the wilderness study area. Gold mineralization similar to that at the Manitowoc mine may be found inside the wilderness study area in this area. In addition, low dips measured on the Crossman Peak fault project Proterozoic gneiss of the Crossman plate southward to shallow depths beneath the rocks exposed in the overlying plate; therefore, deposits of gold and silver, similar to those described for areas GS-1 and GS-2, may exist at depths of a few hundred to a few thousand feet in area GS-3. The criteria used to define area GS-3 are listed in table 3.

Placer gold

All of the areas underlain by Tertiary and Quaternary alluvial and fanglomerate material within the Crossman Peak Wilderness Study Area have a potential for gold-bearing placer deposits. The designation of areas P-1, P-2, and P-3 (fig. 6) are based on geographic relations to known gold-bearing lode deposits. The criteria used to define P-1, P-2, and P-3 are listed in table 4.

Area P-1—High potential for deposits containing placer gold.--Placer gold has been mined from many of the washes draining the Proterozoic gneiss of the central Mohave Mountains, notably from the Arrastra Well and Scotts Well drainages in the north central wilderness study area, the Falls Springs Wash area in the west-central wilderness study area, from near the Wing mine (sec. 6, T. 14 N., R. 19 W.), and several drainages in the southern part of the wilderness study area. These areas are all downstream from sites of lode gold mining (fig. 6).

The Quail Placers (no. 2, fig. 4) comprise numerous pits and trenches dug on placer gold claims in secs. 29, 30, 31, and 32, T. 15 N., R. 18 W., along the north flank of the Mohave Mountains. Much of the activity is focused near the center of sec. 30. In 1980 the deposit was staked by John Pasak and others. Pasak and associates have worked the small drainages by dry-washer techniques to define the areas of highest gold concentration. They have recovered several ounces of small flake gold and several small nuggets as much as 0.25 oz. In 1982, Pasak was cutting backhoe trenches and test pits to determine the feasibility of establishing a several-hundred-ton-per-day pilot leach plant.

Analytical data for placer samples collected from the Quail Placers and from major washes draining the wilderness study area (Light and McDonnell, 1983) suggest that the approximately 31 mi of alluvial drainage, designated area P-1 on figure 6, have a high potential for placer gold resources in several gravel deposits, each containing from 1,000 to 1.0 million cubic yards with gold contents that range from \$0.01 to \$0.50 per cubic yard (based on a gold price of \$500 per oz). Smaller pockets that contain higher concentrations of gold can be expected within these deposits. Some samples from the Quail Placers are derived from isolated gold concentrations along the bedrock surface. Gold values in these pockets may reach \$500 per cubic yard or higher where small nuggets are found.

Area P-2—Moderate potential for deposits containing placer gold.—Area P-2 has moderate potential for placer gold deposits because the drainages and hill slopes in this area lie downstream from areas in GS-1 that contain known gold-bearing lode deposits; also, gold has been found in rock samples from several localities within this area. Because lode sources for area P-2 are scattered and because the area includes much hillside material as well as stream beds, this area is less favorable than area P-1 for additional placer deposits. The area south of the Crossman Peak fault has a similar potential for placer gold deposits because of the known lode gold mineralization at the Manitowoc mine (no. 43, fig. 4) and placer gold at the El Campo mine (no. 42, fig. 4). Burro Canyon, in the northeastern part of the wilderness study area, is also included in P-2 because placer occurrences are reported in deposits farther downstream, north of the wilderness study area. These deposits probably were derived from bedrock areas of Burro Canyon and vicinity.

Area P-3—Moderate potential for deposits containing placer gold.—Placer gold deposits are as yet unknown in area P-3, which covers most of the flanks of the Crossman Peak Wilderness Study Area (fig. 6). However, areas of moderate potential for lode gold deposits lie topographically above P-3, and any such deposits likely shed placer gold into parts of area P-3.

Tungsten (area T)

Tungsten has been mined from scheelite-bearing quartz veins with locally abundant sulfides in an area of sericitic to argillic alteration at the Dutch Flat mines. The area encompassing these mines is shown as area T on figure 7, and has high potential for the occurrence of additional tungsten resources.

The Little Maud mine (no. 30, fig. 4) is one of the Dutch Flat group, and comprises 3 adits driven on a northeast-trending quartz vein. Twenty-five samples, averaging 2.3 ft long, collected from the mine workings contained anomalously high concentrations of gold, silver, lead, zinc, and tungsten. Individual analytical values are as high as 0.618 oz gold per ton, 2.0 oz silver per ton, 5.3 percent lead, 2.11 percent zinc, and 0.11 percent tungsten, but samples with high metal values were too widely spaced to permit calculation of identified resources. However, Farnham (1951) calculated approximately 100 tons of inferred resources containing 100-150 units (2,000 to 3,000 lb) of WO_3 for the Little Maud mine.

The Evelyn mine (no. 34, fig. 4), also one of the Dutch Flat group, comprises two interconnecting adits and numerous prospect pits on a northwest-trending vein. Analytical data for 18 samples with an average length of 1.8 ft from these workings revealed metal values as high as 2.0 oz silver per ton, 0.060 oz gold per ton, 1.16 percent lead, 0.94 percent tungsten, and 0.29 percent zinc. Insufficient data prevented calculation of current resources for the workings, but Farnham (1951) identified approximately 200 tons of inferred resources containing 250-300 units (5,000 to 6,000 lb) of WO_3.

Resource calculations could not be made for the other mines in the Dutch Flat group because of either inaccessibility of workings or widely spaced sampling. However, the known presence of tungsten mineralization indicates that there is a high potential for tungsten resources in extensions of previously worked deposits or in similar but previously undiscovered veins. Resource estimates based on the tungsten content of chip samples from the veins in the Dutch Flat mines area suggest a potential for several deposits containing 50 to 500 tons averaging 0.05 to 0.5 percent WO_3 (Bishop, 1942; Light and McDonnell, 1983).

Resources associated with a buried hydrothermal mineralizing system (area C)

An interpretation of the alteration and the distribution and concentrations of selected base and precious metals in the Crossman Peak Wilderness Study Area was proposed by Light and others (1982): gold, silver, copper, lead, zinc, and tungsten occurrences represent mineralization by a single large hydrothermal system that may be related to a porphyry-type intrusion at depth.

In support of this possibility are (1) the consistent assemblage of metals throughout the study area, (2) apparent geographic variation of the dominant metals from a central zone (Dutch Flat mines area) of gold-tungsten-copper mineralization outward to gold with minor silver, lead, and zinc mineralization and more distal silver-lead-zinc with minor gold, (3) argillic alteration in the central area and more distal propylitic alteration, (4) the Cretaceous K-Ar ages on mineralized rock in the wilderness study area consistent with the Laramide age of many copper porphyries in Arizona, and (5) the setting in a region of widespread Cretaceous intrusive bodies. Examination of fluid inclusions in quartz veins and wallrocks from the Dutch Flat mines area provides additional support for this hypothesis. The presence of abundant CO_2 and the lack of halite-group minerals in the fluid inclusions are consistent with the presence at depth of a fluorine-deficient porphyry molybdenum system (Theodore, 1982). The concentrations of various metals in this area are also consistent with zonation patterns near the top of such systems. Chemical analyses of rock samples support the low-fluorine nature of the mineralizing fluids.

Area C, (fig. 7) encompasses the most intensely altered and mineralized portion of the wilderness study area, and has moderate to low potential for disseminated base and precious metals related to a low-fluorine porphyry-type mineralized system. Geologic arguments (Howard and others, 1982a) suggest that the Crossman plate was detached and transported away from a substratum that now may lie 20 to 30 mi to the southwest, either in the western Whipple Mountains or buried beneath Chemeheuvi Valley in California. If the mineralized system lies buried in the Crossman plate, area C would have moderate potential for disseminated base and precious metals at depth. If the mineralizing system was beheaded, leaving the porphyry body and associated mineralization to the southwest, the potential of area C would be low. The potential therefore depends on the (unknown) depth to the detachment fault that defines the base of the Crossman plate.

Miscellaneous resources

Uranium: Aeroradiometric data gathered by the National Uranium Resource Evaluation program (Geodata International, Inc., 1979) and supplemental field reconnaissance by J. K. Otton (written commun., 1981), indicate that there is low potential for uranium resources in the Crossman Peak Wilderness Study Area. Tertiary lacustrine claystone, tuff, and sandstone similar to those of the Anderson mine in the Date Creek basin, Arizona, occur in the southern wilderness study area. However, the chemical environment indicated by the assemblage in the wilderness study area differs from that at Date Creek and appears to have been unfavorable for the deposition of uranium minerals.

Manganese: Manganese mineralization is not known within the Crossman Peak Wilderness Study Area; however, Tertiary volcanic and sedimentary rocks contain three small vein deposits of very limited tonnage nearby to the west, southwest, and northwest of the wilderness study area. Where Tertiary rocks occur within the west and south boundaries of the wilderness study area (fig. 2) there is moderate potential for small vein manganese deposits.

Sand, gravel, and rock: The wilderness study area has high potential for sand, gravel, and riprap. Sand and gravel are present in the study area in washes, and potentially are resources for local construction. However, large quantities of these materials occur outside the wilderness study area all around its margin. Hard dike rocks, potentially useful for riprap for dam and other local water projects, are abundant in the Crossman plate; similar dike rocks are available in smaller quantities in the Crossman plate outside the wilderness study area.

Opal: Opal of non-gem quality occurs locally in Tertiary volcanic rocks within the southern and southwestern parts of the wilderness study area. Geodes are found 3 mi south of the wilderness study area and may occur in Tertiary volcanic rocks within the study area. The wilderness study area therefore has a moderate potential for small deposits of opal and geodes. Higher quality sources for these materials occur in Tertiary volcanic rocks in the nearby Black Mountains.

Perlite: Perlite of untested quality occurs in Tertiary volcanic rocks 1-4 mi northwest and west of the wilderness study area, and in very small amounts within the southwest and south boundaries of the wilderness study area. There is moderate potential for small deposits of useful perlite in the wilderness study area.

Oil and gas: The Crossman Peak Wilderness Study Area is considered unfavorable for resources of oil and gas. The Mohave Mountains are near the extrapolated position of the overthrust belt, which elsewhere in the United States contains oil and gas in Paleozoic and Mesozoic strata. Interpretation of gravity data allows the possiblity that lower density rocks underlie the gneiss and dikes of the Mohave Mountains beneath a southwest-dipping structure. However, geologic relations in the Mohave Mountains and surrounding ranges suggest that, if present, Paleozoic or Mesozoic strata would likely be metamorphosed to greenschist grade or higher, and therefore barren of oil and gas.

Geothermal resources: The wilderness study area lies in the Basin and Range province of greater than average heat flow (Lachenbruch and Sass, 1981), and warm springs occur 20 mi north of the wilderness study area in the Black Mountains. However, no geothermal resources are known or suspected in the Crossman Peak Wilderness Study Area and the potential for geothermal resources is considered to be low.

REFERENCES CITED

Anderson, J. L., 1981, Conditions of mylonitization in a Cordilleran metamorphic complex, Whipple Mountains, California, in Tectonic framework of the Mojave and Sonoran Deserts, California and Arizona: U.S. Geological Survey Open-File Report 81-503, p. 1-3.

Anderson, J. L., Davis, G. A., and Frost, E. G., 1979, Field guide to regional Miocene detachment faulting and early Tertiary(?) mylonitization, Whipple-Buckskin-Rawhide Mountains, southeastern California and western Arizona, in Geologic excursions in the southern California area, Abbott, P. L., ed.: San Diego State University, San Diego, California.

Anderson, J. L., and Rowley, M. C., 1981, Synkinematic intrusion of peraluminous and associated metaluminous granitoids, Whipple Mountains, California: Canadian Mineralogist, v. 19, p. 83-101.

Armstrong, R. L., and Suppe, John, 1973, Potassium-argon geochronometry of Mesozoic igneous rocks in Nevada, Utah, and southern California: Geological Society of America Bulletin, v. 84, p. 1375-1392.

Bishop, O. M., 1942, The tungsten deposits of Dutch Flat Chemehuevi Mountains, Mohave County, Arizona: U.S. Bureau of Mines Field Engineers Report, 12 p.

Burchfiel, B. C., and Davis, G. A., 1981, Mojave Desert and environs, in Ernst, W. G., ed., The geotectonic development of California, Rubey Volume I: Englewood Cliffs, N. J., Prentice-Hall, Inc., p. 217-252.

Carr, W. J., 1981, Tectonic history of the Vidal-Parker region, California and Arizona, in Tectonic framework of the Mojave and Sonoran Deserts, California and Arizona: U.S. Geological Survey Open-File Report 81-503, p. 18-20.

Carr, W. J., Dickey, D. D., and Quinlivan, W. D., 1980, Geologic map of the Vidal NW, Vidal Junction, and parts of the Savahia Peak SW and Savahia Peak quadrangles, San Bernardino County, California: U.S. Geological Survey Miscellaneous Investigations Series Map I-1126.

Davis, G. A., Anderson, J. L., Frost, E. G., and Shackelford, T. J., 1980, Mylonitization and detachment faulting in the Whipple-Buckskin Rawhide Mountains terrane, southeastern California and western Arizona, in Cordilleran metamorphic core complexes: Geological Society of America Memoir 153, p. 79-130.

Davis, G. A., Anderson, J. L., Martin, D. L., Krummenacher, Daniel, Frost, E. G., and Armstrong, R. L., 1982, Geologic and geochronologic relations in the lower plate of the Whipple detachment fault, Whipple Mountains, southeastern California: A progress report, in Frost, E. G., and Martin, D. L., 1982, Mesozoic-Cenozoic tectonic evolution of the Colorado River region, California, Arizona, and Nevada: San Diego, Cordilleran Publishers, p. 408-432.

Dickey, D. D., Carr, W. J., and Bull, W. B., 1980, Geologic map of the Parker NW, Parker, and parts of the Whipple

Mountains SW and Whipple Wash quadrangles, California and Arizona: U.S. Geological Survey Miscellaneous Investigations Series Map I-1124.

Farnham, L. L., 1951, Shelton Heath's Evelyn, Little Maud, and Pioneer tungsten claims, Dutch Flat area, Mohave County, Arizona: U.S. Bureau of Mines DMA Docket 62X, 11 p.

Geodata International, Inc., 1979, Aerial radiometric and magnetic survey, Needles national topographic map, California and Nevada: U.S. Department of Energy Report No. GJ BX-114 (79).

Grimes, D. J., and Marranzino, A. P., 1968, Direct-current arc and alternating current spark emission spectrographic field methods for the semiquantitative analysis of geologic materials: U.S. Geological Survey Circular 591, 6 p.

Hendricks, J. D., and Lucchitta, I. O., 1974, Upper Precambrian igneous rocks of the Grand Canyon, Arizona, in Karlstrom, N. V., and Swann, G. A., eds., Geology of northern Arizona, Part I, Regional studies: Geological Society of America, Rocky Mountain Section Meeting, Flagstaff, Arizona, p. 65-86.

Howard, K. A., Goodge, J. W., and John, B. E., 1982a, Detached crystalline rocks of the Mohave, Buck, and Bill Williams Mountains, western Arizona, in Frost, E. G., and Martin, D. L., 1982, Mesozoic-Cenozoic tectonic evolution of the Colorado River region, California, Arizona, and Nevada: San Diego, Cordilleran Publishers, p. 377-392.

Howard, K. A., Stone, Paul, Pernokas, M. A., and Marvin, R. F., 1982b, Geologic and geochronologic reconnaissance of the Turtle Mountains, California: West border of the Whipple Mountains detachment terrane, in Frost, E. G., and Martin, D. L., 1982, Mesozoic-Cenozoic tectonic evolution of the Colorado River region, California, Arizona, and Nevada: San Diego, Cordilleran Publishers, p. 341-355.

Howard, K. A. and John, B. E., 1983, Extensional faulting through the upper crust, California-Arizona border: Geological Society of America Abstracts with Programs, v. 15, no. 5, p. 309.

John, B. E., 1981, Reconnaissance study of Mesozoic plutonic rocks in the Mojave Desert region, in Tectonic framework of the Mojave and Sonoran Deserts, California and Arizona: U.S. Geological Survey Open-File Report 81-503, p. 48-50.

John, B. E., 1982, Geologic framework of the Chemehuevi Mountains, southeastern California, in Frost, E. G., and Martin, D. L., 1982, Mesozoic-Cenozoic tectonic evolution of the Colorado River region, California, Arizona, and Nevada: San Diego, Cordilleran Publishers, p. 317-325.

John, B. E., and Howard, K. A., 1982, Multiple low-angle Tertiary faults in the Chemehuevi and Mohave Mountains, California and Arizona: Geological Society of America Abstracts with Programs, v. 14, p. 175-176.

Lachenbruch, A. H., and Sass, J. H., 1981, Heat flow and its implications for tectonics and volcanism in the Basin and Range province, in Tectonic framework of the Mojave and Sonoran Deserts, California and Arizona: U.S. Geological Survey Open-File Report 81-503, p. 56-58.

Light, T. D., Chazin, B., and Detra, D. E., 1983, Geochemical data for the Crossman Peak Wilderness Study Area (5-7B), Mohave County, Arizona: U.S. Geological Survey Open-File Report, 83-581, 31 p.

Light, T. D., Marsh, S. P., and Raines, G. L., 1982, Mineralization in the Crossman Peak area, Mohave Mountains, Arizona: Geological Society of America Abstracts with Programs, v. 14, no. 4, p. 180-181.

Light, T. D., and McDonnell, J. R., Jr., 1983, Mineral investigation of the Crossman Peak Wilderness Study Area, Mohave County, Arizona: U.S. Bureau of Mines Open-File Report, MLA 82-83, 133 p.

Malach, R., 1977, Mohave County mines, Mohave County Board of Supervisors, Graphicopy, New York, 63 p.

Marsh, S. P., Ridenour, James, Raines, G. L., Howard, K. A., Simpson, R. W., Moyle, P. R., Willett, S. L., and Hoover, D. P., 1982, Mineral resource potential of the Whipple Mountains Wilderness Study Area (CDCA-312), San Bernardino County, California: U.S. Geological Survey Open-File Report 82-956, p. 36.

Nakata, J. K., 1982, Preliminary report on diking events in the Mohave Mountains, Arizona, in Frost, E. G., and Martin, D. L., 1982, Mesozoic-Cenozoic tectonic evolution of the Colorado River region, California, Arizona, and Nevada: San Diego, Cordilleran Publishers, p. 85-90.

Pike, J. E. N., 1983, Composition of Tertiary volcanic rocks, Mohave Mountains, Arizona: Geological Society of America Abstracts with Programs, v. 15, no. 5, p. 304.

Pike, J. E. N., and Hansen, V. L., 1982, Complex Tertiary stratigraphy and structure, Mohave Mountains, Arizona: A preliminary report, in Frost, E. G., and Martin, D. L., 1982, Mesozoic-Cenozoic tectonic evolution of the Colorado River region, California, Arizona, and Nevada: San Diego, Cordilleran Publishers, p. 91-96.

Rowan, L. C., Wetlaufer, P. H., Goetz, A. F. H., Billingsley, F. C., and Stewart, J. H., 1974, Discrimination of rock types and detection of hydrothermally altered areas in south-central Nevada by the use of computer enhanced ERTS images: U.S. Geological Survey Professional Paper 883, 35 p.

Stensrud, H. L., and More, Syver, 1980, Precambrian geology and massive sulfide environments of the west-central preliminary report: Arizona Geological Society Digest, v. XII, p. 155-165.

Suneson, N. H., 1980, The origin of bimodal volcanism, west-central Arizona: University of California, Santa Barbara, Ph. D. thesis, 293 p.

Taylor, S. R., 1964, Abundance of chemical elements in the continental crust: Geochim. et Cosmochim. Acta, v. 28, p. 1280-1281.

Theodore, T. G., 1982, Preliminary model outline for fluorine-deficient porphyry molybdenum deposits, in Erickson, R., ed., Characteristics of mineral deposit occurrences, U.S. Geological Survey Open-File Report 82-295, 37-42.

U.S. Geological Survey, 1981, Aeromagnetic map of the Needles 1^{o} x 2^{o} quadrangle, California and Arizona: U.S. Geological Survey Open-File Report 81-85, scale 1:250,000.

Wilkins, Joe, and Heidrich, T. L., 1982, Base and precious metal mineralization related to low-angle tectonic features in the Whipple Mountains, California, and Buckskin Mountains, Arizona, in Frost, E. G., and Martin, D. L., 1982, Mesozoic-Cenozoic tectonic evolution of the Colorado River region, California, Arizona, and Nevada: San Diego, Cordilleran Publishers, p. 182-204.

Wilshire, H. G., Reneau, S. L., Schellentrager, G. W., and Barmore, R. L., 1983, Quaternary geomorphology of the Mohave Mountains, western Arizona: Geological Society of America Abstracts with Programs, v. 15, no. 5, p. 387.

Wilson, E. D., and Moore, R. T., 1959, Geologic map of Mohave County, Arizona: Arizona Bureau of Mines.

Wrucke, C. T., and Shride, A. R., 1972, Correlation of Precambrian diabase in Arizona and southern California: Geological Society of America Abstracts with Programs, v. 4, p. 265-266.

Table 1.--Mineral deposits and occurrences in and near the Crossman Peak Wilderness Study Area (see fig. 4)

Location no.	Name	Location	Resource(s)	Deposit type	Development category[1]	Brief description
1	Buzzy Tail (Mohave Chief)	SE1/4 sec. 25, T. 15 N., R. 19 W.	Ag	Lode	P/A	Inclined shaft 75 ft deep; sulfide boxwork with minor silver in quartz vein emplaced along fault in gneiss.
2	Quail Placers	Sec. 29-32, T. 15 N., R. 18 W.	Au	Placer	M/A	Placer gold concentrated on caliche and bedrock surfaces.
3	G.I.	NE1/4 sec. 31, T. 15 N., R. 18 W.	Au	Placer	P/A	Shaft 10 ft deep in alluvium; minor silver and barium concentrations, no anomalous gold in samples analyzed.
4	Unnamed prospect	SE1/4 sec. 29, T. 15 N., R. 18 W.	Ag, Cu, Pb	Lode and placer	P/A	Prospect pit in highly weathered gneiss; minor concentrations of silver, copper, and lead.
5	Unnamed prospects	W1/2 sec. 36, T. 15 N., R. 19 W.	Au, Ag, Cu, Pb, Zn	Lode	P/I	Inclined shaft 35 ft deep, adit 10 ft long, open cut 10 ft long, and trench 30 ft long; locally moderate concentrations of gold and silver, and minor copper and lead.
6	Jet	SW1/4 sec. 31, T. 15 N., R. 18 W.	Ag, Cu	Lode and placer	P/A	Adit 11 ft long and prospect pit; minor silver and moderate copper concentrations; abundant malachite and azurite staining.
7	Crystal	NE1/4 sec. 1, T. 14 N., R. 19 W.	Au, Ag, Pb, Zn	Lode	P/A	Shaft about 60 ft deep, and prospect pit; minor concentrations of gold, silver, lead, and zinc in northeast-trending quartz vein.
8	Arrastra Well	SW1/4 sec. 1, SE1/4 sec. 2, NE1/4 sec. 11, and NW1/4 sec. 12, T. 14 N., R. 19 W.	Au, Ag, Pb, Zn	Lode and placer	M/I, P/A	Inclined shafts 75 and 20 ft deep, adit 75 ft long, and numerous prospect pits; locally high concentrations of gold and minor concentrations of silver, lead, and zinc in quartz veins and faults; high concentrations of gold and silver in placer deposits. Inferred vein resources of approximately 350 tons averaging 0.21 oz gold per ton and 0.32 oz silver per ton.
9	Green Feather	NW1/4 sec. 11, T. 14 N., R. 19 W.	Ag, Cu, Pb	Lode	M/I, P/A	Adit 150 ft long, shaft 35 ft deep, and several prospect pits; locally high concentrations of gold with minor silver and lead in quartz veins. Inferred resources of approximately 210 tons averaging 0.05 oz gold per ton.
10	Unnamed prospects	SW1/4 sec. 6, T. 14 N., R. 18 W.	Au, Ag	Lode	P/I	Adit 25 ft long and shaft 15 ft deep; minor concentrations of silver and copper in small northwest-trending faults.
11	Wing	SE1/4 sec. 6, T. 14 N., R. 19 W.	Au, Ag, Cu, Pb, Zn, Mo	Lode and placer	M/I, P/A	Shaft, inaccessible, adits 55 and 75 ft long, and numerous prospect pits; irregular concentrations of gold, silver, copper, lead, zinc, and molybdenum associated with sulfides in northeast-trending quartz veins.
12	Unnamed prospects	NW1/4 sec. 17, T. 14 N., R. 19 W.	Au, Ag, Ba, Zn	Lode	P/I	Shaft 12 ft deep with 30-ft drift and several prospect pits; anomalous gold and silver concentrations disseminated in host rhyolite. Inferred resources of approximately 5,500 tons averaging 0.03 oz gold per ton and 0.19 oz silver per ton.

Table 1.--Continued

Location no.	Name	Location	Resource(s)	Deposit type	Development category[1]	Brief description
13	Unnamed prospects	SE1/4 sec. 17, T. 14 N., R. 19 W.	Au, Cu, Zn, Ba	Lode	P/I	Prospect pit cut in porphyritic andesite with calcite veins and anomalous silver and copper concentrations.
14	Unnamed prospects	NW1/4 sec. 16, T. 14 N., R. 19 W.	Au, Ag, Cu, Pb, Zn	Lode	P/I	Adit 35 ft long and several prospect pits; anomalous concentrations of gold, silver, copper, lead, and zinc in quartz vein along fault zone.
15	J & J (Golden Gate)	SE1/4 sec. 16, T. 14 N., R. 19 W.	Au, Ag, Cu, Pb, Zn	Lode	M/I, P/A	Adit 150 ft long with winze 130 ft deep, shaft approximately 50 ft deep, and several prospect pits; anomalous concentrations of gold, silver, copper, lead, and zinc in a fault zone.
16	Unnamed prospects	NW1/4 sec. 14, T. 14 N., R. 19 W.	Au, Ag, Cu, Pb	Lode	P/I	Adits 110 and 90 ft long; locally high concentrations of gold, silver, copper, and lead in northwest-trending quartz vein. Inferred resources of approximately 610 tons averaging 0.41 oz gold per ton and 1.3 oz silver per ton.
17	Unnamed prospects	SW1/4 sec. 12, NW1/4 sec. 13 and NE1/4 sec. 14, T. 14 N., R. 19 W.	Au, Ag, Cu, Pb, Zn	Lode	P/I	Adits 45 and 30 ft long and several prospect pits; anomalous concentrations of gold, silver, copper, lead, and zinc along fault and quartz vein. Inferred resources of approximately 120 tons averaging 0.24 oz gold per ton and 0.45 oz silver per ton.
18	Scotts Well (Moon Wash)	W1/2 sec. 7, T. 14 N., R. 18 W., and E1/2 sec. 12, T. 14 N., R. 19 W.	Au, Ag, Cu, Pb, Zn	Lode and placer	M/I, P/A	Thirteen adits 10 to 130 ft long, numerous prospect pits, and inaccessible shaft; locally high concentrations of gold, silver, lead, and zinc in quartz veins and fault zones. Inferred resources of approximately 770 tons averaging 0.19 oz gold per ton and 0.62 oz silver per ton.
19	Sunset (Lead Bullet)	W1/2 sec. 18, T. 14 N, R. 18 W., and E1/2 sec. 13, T. 14 N., R. 19 W.	Au, Ag, Pb, Zn, Ba	Lode	M/I, P/A	Five adits 10 to 110 ft long and numerous prospect pits; locally high concentrations of gold, silver, and lead with minor copper and zinc in quartz veins.
20	Sunrise	SE1/4 sec. 13, T. 14 N., R. 19 W., and SW1/4, sec. 18, T. 14 N., R. 18 W.	Au, Ag, Pb, Zn, W, Ba	Lode	M/I, P/A	Eleven adits 15 to 800 ft long and numerous prospect pits; locally high concentrations of gold, silver, and lead with minor copper and zinc in quartz veins. Inferred resources for workings just west of Sunrise claim are approximately 480 tons averaging 0.20 oz gold per ton and 0.18 oz silver per ton.
21	Unnamed prospects	SW1/4 sec. 18, T. 14 N., R. 18 W.	Au, Pb, Zn	Lode	P/I	Adits 35, 45, and 110 ft long; concentrations of gold with minor lead and zinc in quartz vein along fault zone. Inferred resources of approximately 750 tons averaging 0.08 oz gold per ton.
22	Unnamed prospects	SE1/4 sec. 17, T. 14 N., R. 18 W.	Cu	Lode	P/I	Shaft 21 ft deep and several prospect pits; anomalous copper concentration associated with diabase dike intruded along fault.

Table 1.--Continued

Location no.	Name	Location	Resource(s)	Deposit type	Development category[1]	Brief description
23	Unnamed prospect	SW1/4 sec. 21, T. 14 N., R. 19 W.	Au	Placer	P/A	Adit 25 ft long driven on bedrock-alluvium contact in search of placer gold concentrations; trace of gold detected in one sample.
24	Unnamed prospects	Cent. sec. 23, T. 14 N., R. 19 W.	Au, Ag, Ba	Lode	P/I	Adits 100 and 120 ft long; minor gold and silver concentrations along fault in Proterozoic gneiss.
25	R & R	NW1/4 sec. 24, T. 14 N., R. 19 W.	Au, Ag, W	Lode	M/I, P/A	Shaft 40 ft deep and adit 65 ft long; locally high concentrations of gold and silver with minor lead and zinc.
26	Unnamed prospects	S1/2 sec. 24, T. 14 N., R. 19 W.	Au, Cu	Lode	P/A	Adits 135, 125, and 70 ft long and several prospect pits; anomalously high concentrations of gold, with minor copper in quartz veins and fault zones. Inferred resources of approximately 920 tons averaging 0.14 oz gold per ton.
27	Unnamed prospects	NE1/4 sec. 24, T. 14 N., R. 19 W.	Au, Ag, Cu, Pb, W	Lode	P/A	Adit 15 ft long and several prospect pits containing anomalously high concentrations of gold and minor silver in quartz veins. Inferred resources of approximately 1,330 tons averaging 0.05 oz gold per ton.
28	Osiris and Ra (Schoolmarm)	SW1/4 sec. 19, T. 14 N. R. 18 W.	Au, Ag, Cu, Pb, Zn, W	Lode	M/I, P/A	Adits 700 and 90 ft long and a prospect pit; locally high concentrations of gold, silver, copper, lead, and zinc in quartz veins. Ra mine contains approximately 490 tons of indicated resources and 330 tons of inferred resources averaging 0.01 oz gold per ton and 0.57 oz silver per ton.
29	Unnamed prospects	NW1/4 sec. 19, T. 14 N., R. 18 W.	Au, Ag, Cu, Pb, Zn, W	Lode	P/I	Several prospect pits containing anomalously high concentrations of gold, silver, copper, lead, and zinc, with minor tungsten in quartz veins.
30	Little Maud[4]	NE1/4 sec. 19, T. 14 N., R. 18 W.	Au, Ag, Pb, Zn, W	Lode	M/I, P/A	Adits 75, 125, and 220 ft long; concentrations of gold, silver, lead, zinc, and tungsten in quartz veins in faults. Inferred resources of approximately 5,600 tons averaging 0.05 oz gold per ton and 100 tons containing 100-150 units of [2]WO_3.
31	Unnamed prospects[4]	NW1/4 sec. 20, T. 14 N., R. 18 W.	Au, W, Zn	Lode	P/I	Prospect pits with locally anomalous values of gold and zinc in quartz veins.
32	Green Water Spring[4]	NW1/4 sec. 21, T. 14 N., R. 18 W.	Cu	Lode	P/I	Prospect pits with anomalous copper concentration in quartz vein in fault.
33	Jupiter East[4]	SW1/4 sec. 21, T. 14 N., R. 18 W.	Au, Cu, Pb	Lode	M/I, P/A	Shafts 100+ and 120 ft deep, adits 52, 120, and 165 ft, plus numerous prospect pits; abundant anomalous copper values with minor gold and lead associated with quartz veins in faults and fractures.
34	Evelyn (Kampff)[4]	SW1/4 sec. 20, T. 14 N., R. 18 W.	Au, Ag, Pb, Zn, W, Ba	Lode and placer	M/I, P/A	Adits 190 and 90 ft long, shaft 90 ft deep, and numerous prospect pits; concentrations of gold, silver, lead, zinc, and tungsten with minor copper and barium in quartz veins and faults. Inferred resources of approximately 200 tons containing 250-300 units of [2]WO_3.

Table 1.--Continued

Location no.	Name	Location	Resource(s)	Deposit type	Development category[1]	Brief description
35	Pioneer Shaft[4]	SW1/4 sec. 20, T. 14 N., R. 18 W.	Au, Ag, Pb, W, Zn.	Lode	M/I, P/A	Shaft flooded at 90 ft; moderate concentrations of silver and gold with minor lead, tungsten, and zinc values, from diabase-gneiss fault contact.
36	Lost Dutchman and Gold Band[4]	SW1/4 sec. 20, T. 14 N., R. 18 W.	Au, Ag, Pb, W, Zn	Lode	M/I, P/A	Adits 25, 45, 70+, and 370 ft long and numerous shafts, pits, and trenches; several high gold values, with moderate to low values of silver, lead, tungsten, and zinc from quartz veins and faults in gneiss. The Lost Dutchman mine has inferred resources of approximately 610 tons averaging 1.35 oz gold per ton and 0.41 oz silver per ton.[3]
37	Unnamed prospect[4]	NE1/4 sec. 29, T. 14 N., R. 18 W.	Au, Cu	Lode	P/A	Shaft, inaccessible with minor gold and copper concentrations in quartz vein.
38	Jupiter[4]	NE1/4 sec. 30, T. 14 N., R. 18 W.	Au, Ag, Pb, Zn, Ba	Lode and placer	M/I, P/A	Five shafts, and adits 390 and 100+ ft long; anomalously high concentrations of gold, silver, copper, lead, and zinc in quartz veins and fault zones.
39	Unnamed prospects	NW1/4 sec. 30, T. 14 N., R. 18 W.	Au, Cu, Pb	Lode	P/A	Shaft, flooded, adit 40 ft long, and trench 15 ft long; minor concentrations of silver and lead in quartz veins.
40	Unnamed prospects	N1/2 sec. 25, T. 14 N., R. 19 W.	Au	Lode	P/I	Five adits 15 to 55 ft long, one shaft, and numerous prospect pits; minor concentrations of gold in quartz veins.
41	Pittsburg (Hot Spot)	S1/2 sec. 27, and N1/2, sec. 34, T. 14 N., R. 19 W.	Au, Ag, Cu, Pb, Zn, W, Ba	Lode	M/I, P/A	Adit 50 ft long, five shafts 20 to about 210 ft deep, and numerous prospect pits; locally very high concentrations of silver, lead, and gold with barium, copper, and zinc in quartz vein. Inferred resources of approximately 8,000 tons averaging 0.06 oz gold per ton, 3.1 oz silver per ton, 0.8 percent lead, and 0.6 percent zinc.
42	El Campo	SE1/4 sec. 8, T. 13 N., R. 18 W.	Au, Ag	Placer	P/I	Tunnel 85 ft long driven on bedrock-alluvium contact in search of placer gold; anomalous gold detected in one sample.
43	Manitowoc	SW1/4 sec. 16, and E1/2 sec. 17, T. 13 N. R. 18 W.	Au, Ag, Pb, Zn, Ba	Lode	M/I, P/A	Shafts 26, 51, and 150 ft deep, several caved shafts, adit 40 ft long, and several prospect pits; concentrations of gold in minor silver, lead, zinc, and barium in quartz veins and fault zones.

[1]Symbols used: P--Prospect
A--Active prospect, exploration or development since 1978.
I--Inactive prospect, no known exploration or development since 1978.
M--Mine
A--Active mine, production since 1978.
I--Inactive mine, no production since 1978.

[2]WO_3 resource figures are from Farnham (1951).

[3]Abnormally high gold value is due to one sample assaying 8.82 oz gold per ton.

[4]Included in the Dutch Flat group (location nos. 30-38).

Table 2.--Identified resources for mineral deposits in and near the Crossman Peak Wilderness Study Area

Number (fig. 4)	Name	Resources (tons) Indicated	Inferred	Grade Au (oz/ton)	Ag (oz/ton)	WO_3 (units)
2	Quail Placers	*	*	*	*	*
8	Arrastra Well	-	350	0.21	0.32	-
9	Green Feather	-	210	0.05	-	-
12	(Unnamed)	-	5,500	0.03	0.19	-
16	(Unnamed)	-	610	0.41	1.3	-
17	(Unnamed)	-	120	0.24	0.45	-
18	Scotts Well	-	770	0.19	0.62	-
20	Sunrise	*	*	*	*	*
		-	480	0.20	0.18	-
21	(Unnamed)	-	750	0.08	-	-
26	(Unnamed)	-	920	0.14	-	-
27	(Unnamed)	-	1,330	0.05	-	-
28	Ra	490	330	0.01	0.57	-
30	Little Maud		5,600	0.05	-	-
			100[1]			100-150[1]
34	Evelyn		200[1]			250-300[1]
36	Lost Dutchman		140	0.02	0.20	-
			470	1.74[2]	0.47	-
41	Pittsburg[3]		8,000	0.06	3.1	-
			1,125	0.64	-	-

* Confidential data
1 Farnham (1951)
2 Abnormally high value here due to one sample containing 8.82 oz gold per ton
3 Also contains Pb at grade 8 percent

Table 3.--Criteria used to define the mineral resource potential of areas GS-1, GS-2, and GS-3 (lode gold and silver; see fig. 5)

Area	Resource potential	Criteria used to define resource potential
GS-1	High	a) Past gold and silver production and (or) identified resources of gold and silver b) Presence of mines and prospects c) Presence of quartz veins and faults in Proterozoic gneiss d) Observed sulfide mineralization e) Observed hydrothermal alteration f) Anomalous metal values in geochemical samples
GS-2	Moderate	a) Presence of quartz veins and faults in Proterozoic gneiss b) Local occurrences of sulfide minerals c) Observed hydrothermal alteration d) Anomalous metal values in geochemical samples
GS-3	Moderate	a) Presence of mines and prospects b) Presence of quartz veins and faults in Proterozoic granitic rocks c) Observed sulfide mineralization d) Observed hydrothermal alteration e) Anomalous metal values in geochemical samples f) Proterozoic gneiss projected to occur at depth

Table 4.--Criteria used to define the mineral resource potential of areas P-1, P-2, and P-3 (placer gold; see fig. 6)

Area	Resource potential	Criteria used to define resource potential
P-1	High	a) Current or past production of placer gold b) Estimated resources c) Presence of placer mines and prospects d) Alluvial material derived from areas of known lode gold occurrences e) Anomalous metal values in geochemical samples
P-2	Moderate	a) Alluvial material derived from areas with high potential for resources of lode gold (GS-1) b) Anomalous metal values in geochemical samples c) Adjacent to areas of verified placer gold occurrences outside wilderness study area
P-3	Moderate	a) Alluvial material derived from areas with moderate potential for lode gold resources (GS-2, GS-3) b) Anomalous metal values in geochemical samples c) Adjacent to areas of unverified placer gold occurrences outside wilderness study area

Table 5.--Criteria used to define the mineral resource potential of areas T (tungsten) and C (base metals; see fig. 7)

Area	Resource potential	Criteria used to define resource potential
T	High	a) Past tungsten production b) Identified tungsten resources c) Presence of mines and prospects d) Presence of quartz veins and faults in Proterozoic gneiss e) Observed sulfide mineralization f) Observed hydrothermal alteration g) Anomalous metal values in geochemical samples
C	Moderate to low	a) Past production of base and precious metals b) Presence of mines and prospects c) Presence of quartz veins and faults in Proterozoic gneiss d) Observed sulfide mineralization e) Crudely zoned pattern of hydrothermal alteration f) Inferred zonation of metals from a central area of tungsten to more distal gold, lead, and silver mineralization g) Anomalous metal values in geochemical samples h) Identification of anomalous color areas on Landsat images i) Aeromagnetic and gravity anomalies

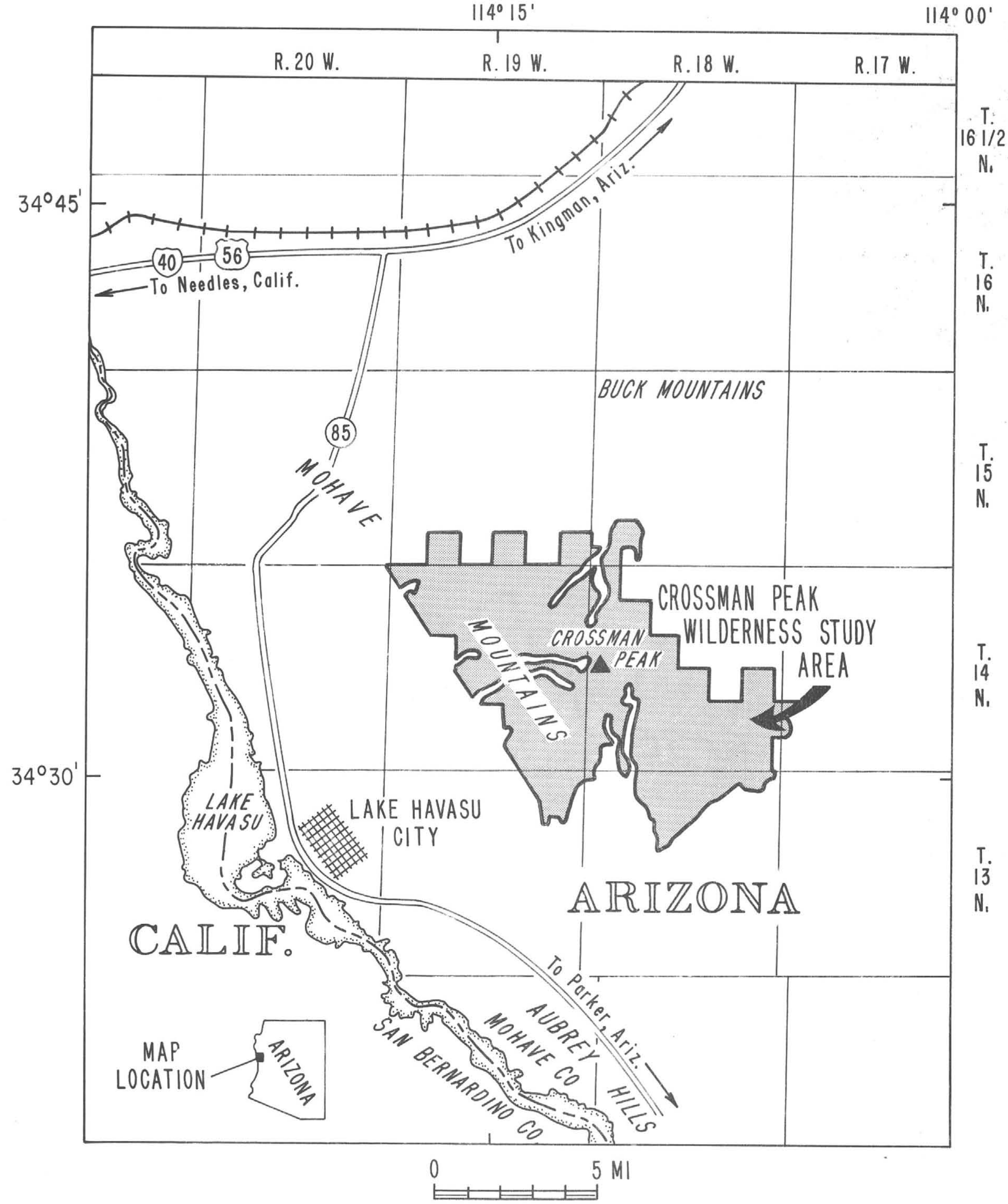


Figure 1.—Location of Crossman Peak Wilderness Study Area (5-7B), Mohave County, Ariz.

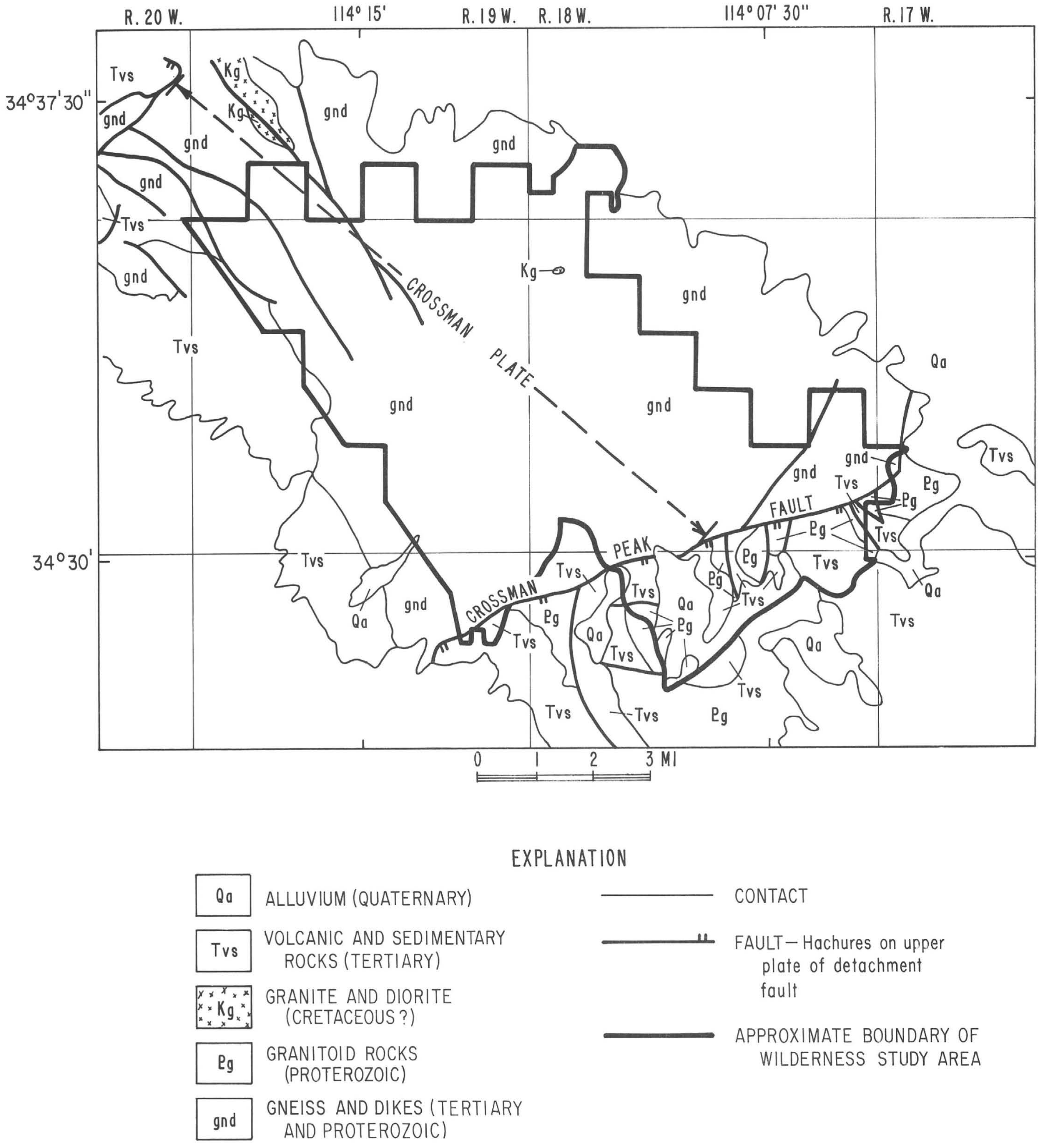
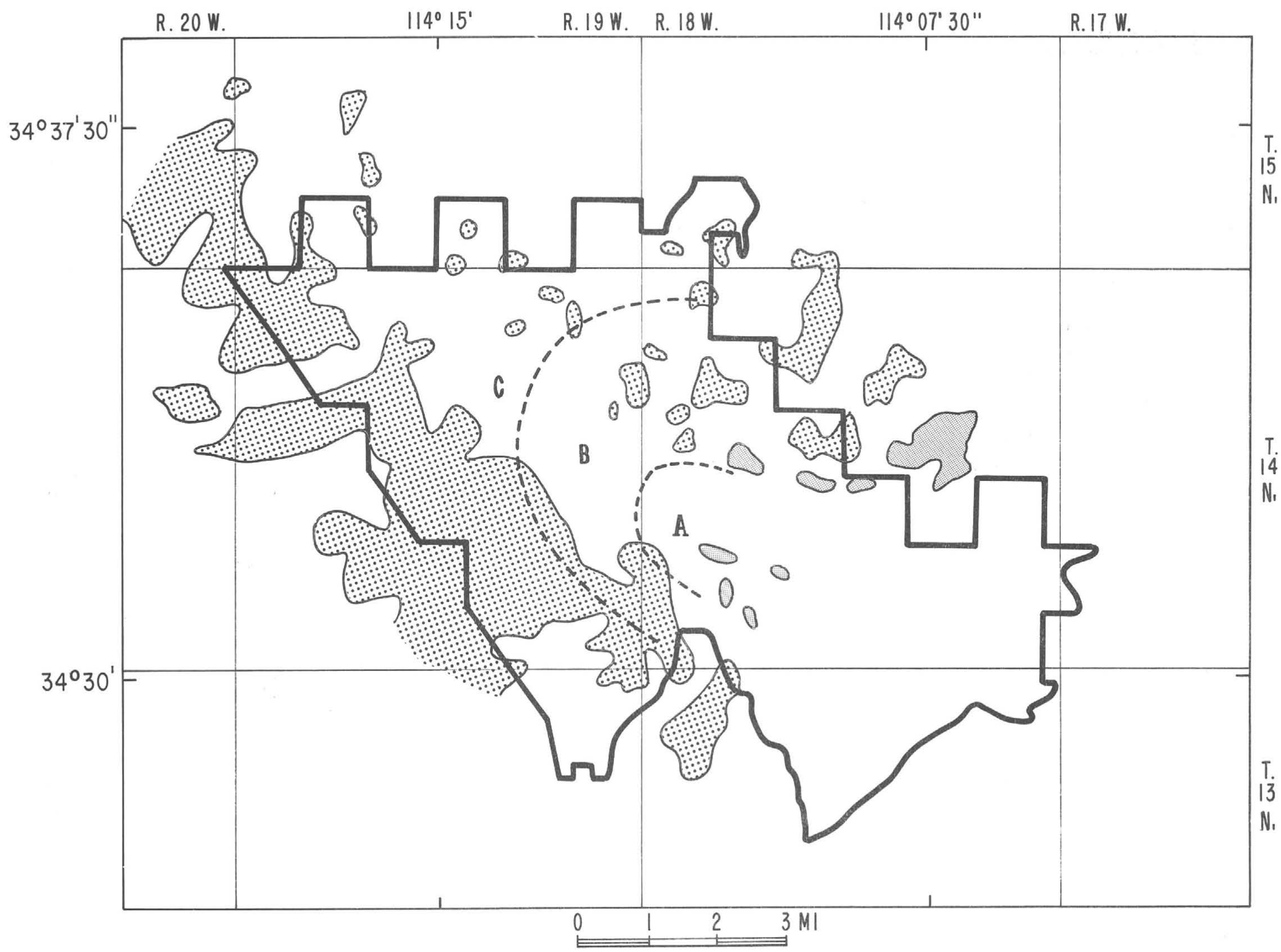


Figure 2.—Generalized geologic map of the Crossman Peak Wilderness Study Area.



EXPLANATION

AREA OF ALTERATION

Propylitic

Argillic

- - - - - AREA OF ALTERATION SHOWING DISTRIBUTION OF METALLIC MINERALS

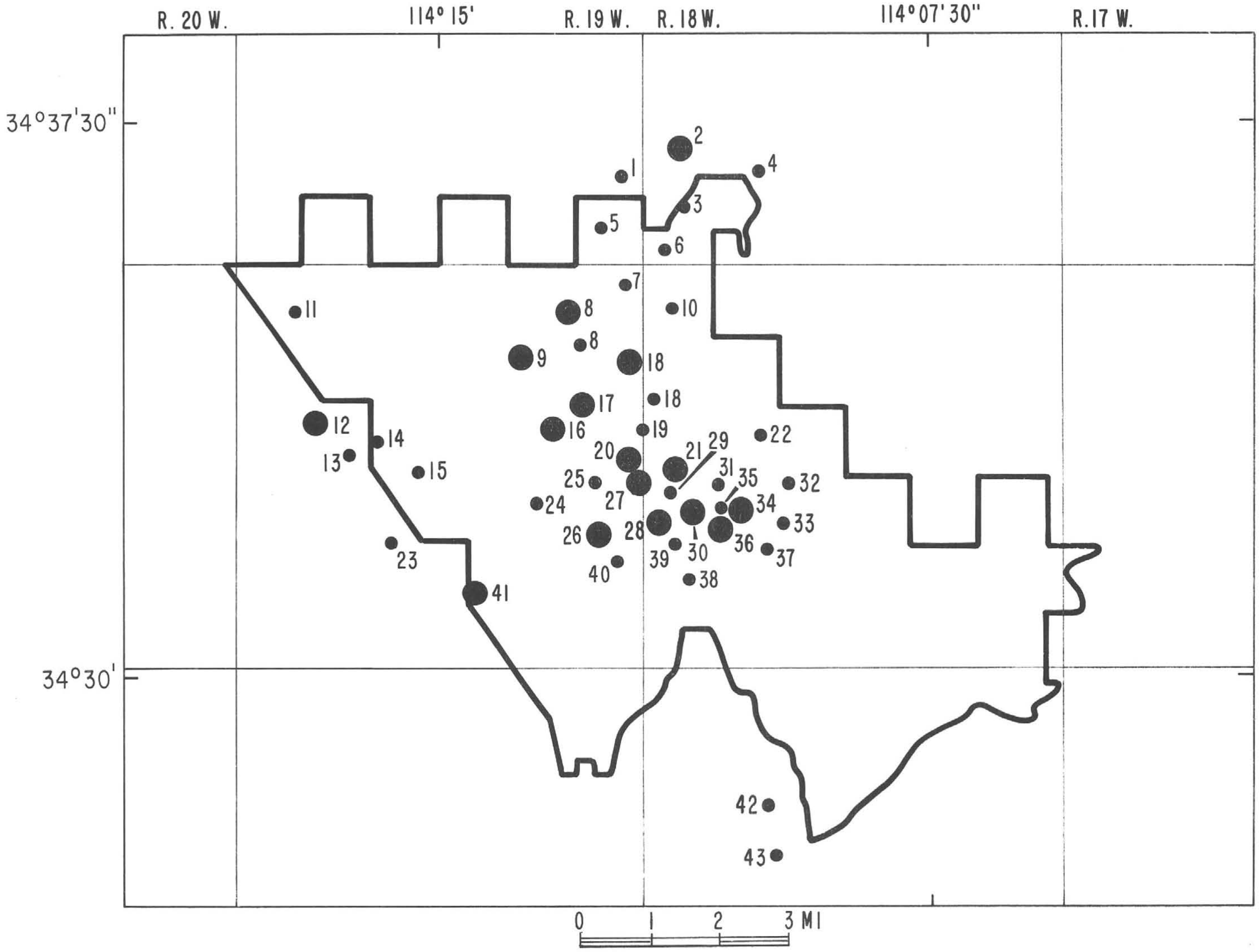
A Argillic alteration -- Gold, tungsten, copper

B Propylitic-sericitic alteration -- Gold, silver, lead, zinc, arsenic, molybdenum

C Propylitic alteration -- Silver, lead, zinc, barium, gold, molybdenum, arsenic, secondary copper

——— APPROXIMATE BOUNDARY OF WILDERNESS STUDY AREA

Figure 3.—Areas of argillic and propylitic alteration mapped by remote sensing and distribution of metallic minerals.



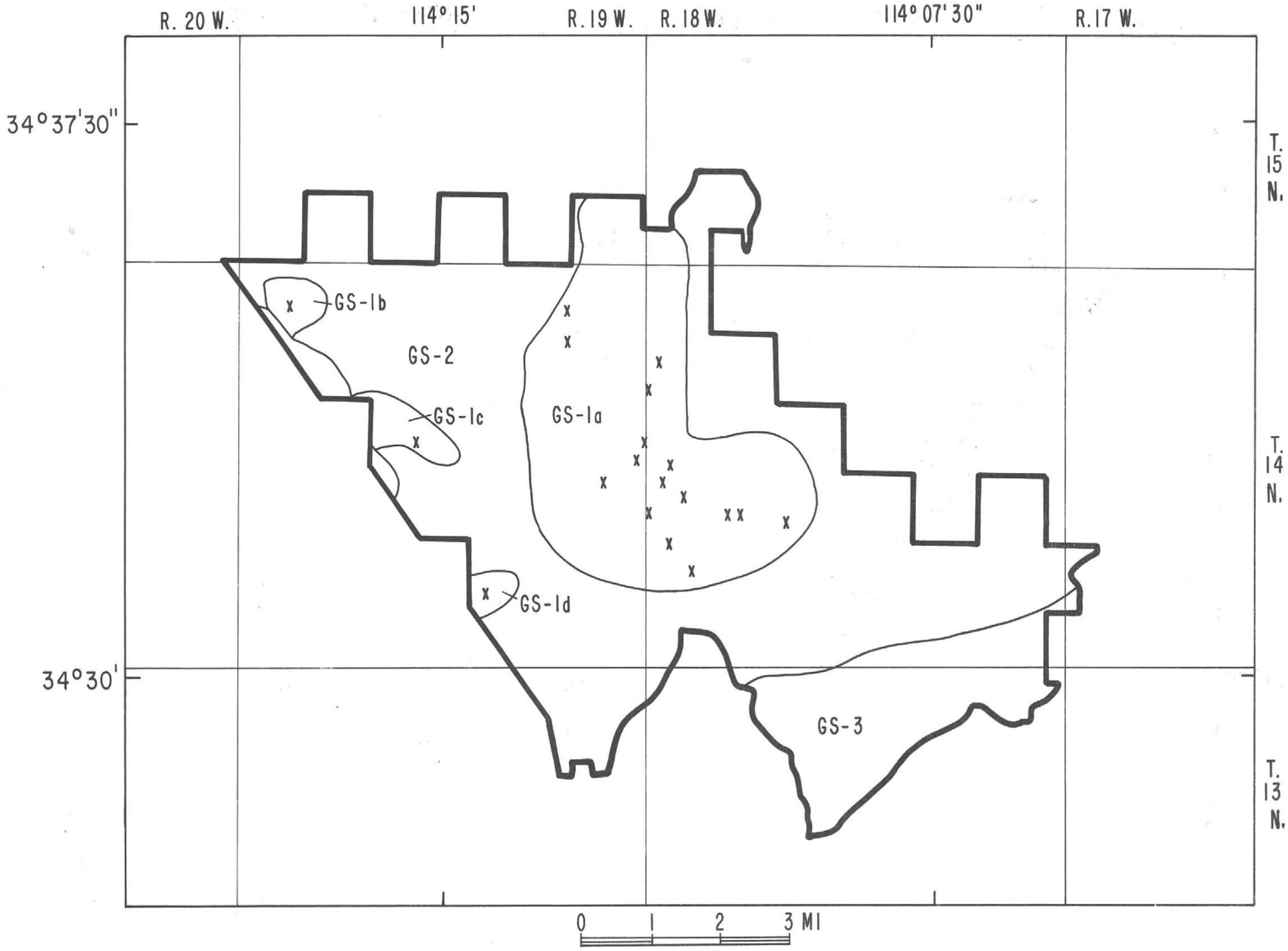
EXPLANATION

5 ● MINERAL DEPOSIT

9 ● DEPOSIT CONTAINING INDICATED OR INFERRED RESOURCES -- See table 2

APPROXIMATE BOUNDARY OF WILDERNESS STUDY AREA

Figure 4.—Locations of mineral deposits in and near the Crossman Peak Wilderness Study Area. Numbers refer to table 1.



EXPLANATION

AREA OF MINERAL RESOURCE POTENTIAL

GS-I High. Ia, numerous deposits known to have produced some gold or silver; Ib, area around Wing mine; Ic, area around J & J mine; Id, area around Pittsburg mine

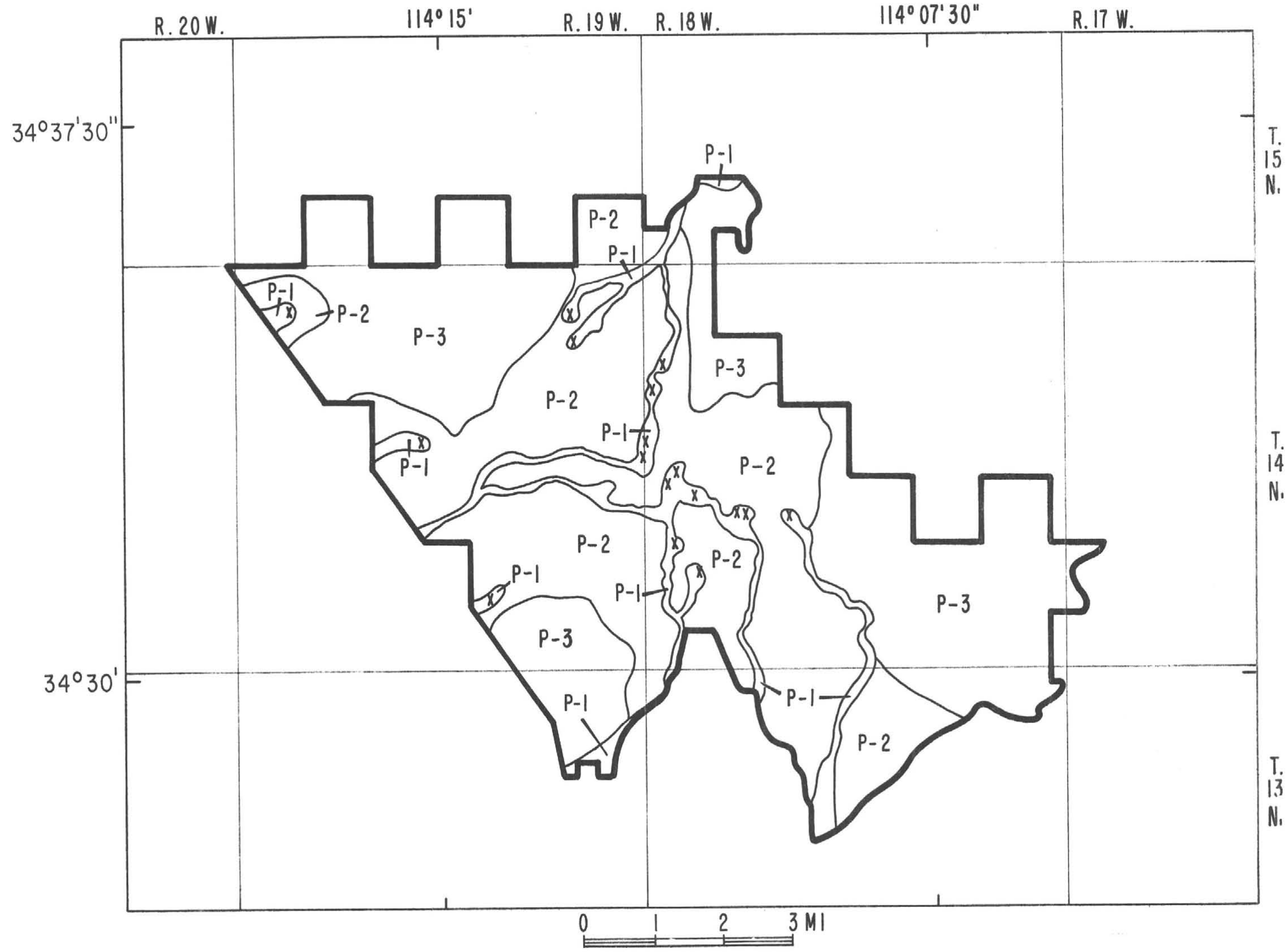
GS-2 Moderate

GS-3 Moderate

x MINE

APPROXIMATE BOUNDARY OF WILDERNESS STUDY AREA

Figure 5.—Areas of mineral resource potential for lode gold and silver (see table 3).

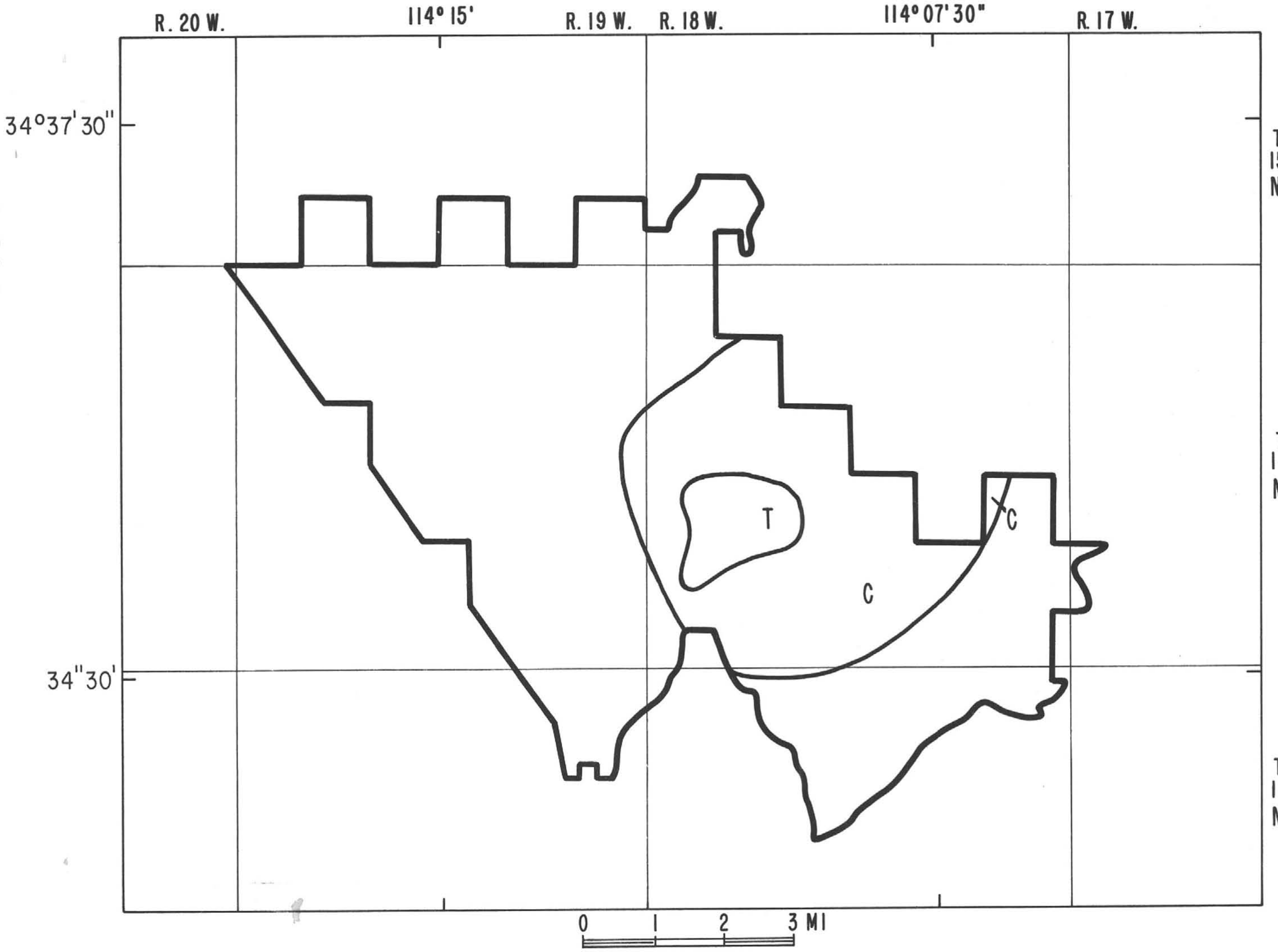


EXPLANATION

AREA OF MINERAL RESOURCE POTENTIAL

P-1	High
P-2	Moderate
P-3	Moderate
x	MINE
▬	APPROXIMATE BOUNDARY OF WILDERNESS STUDY AREA

Figure 6.—Areas of mineral resource potential for placer gold (see table 4).



EXPLANATION

AREA WITH MINERAL RESOURCE POTENTIAL

T Tungsten--High

C Base metals--Moderate to low

APPROXIMATE BOUNDARY OF WILDERNESS STUDY AREA

Figure 7.—Areas of mineral resource potential for tungsten and base metals (see table 5).

UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

Geochemical Data for the Crossman Peak Wilderness Study Area, Mohave County, Arizona

By

Thomas D. Light, Barbara Chazin, and David E. Detra

Open-File Report 83-581
1983

CONTENTS

ILLUSTRATIONS

TABLES

Studies Related to Wilderness

Bureau of Land Management Wilderness Study Areas

The Federal Land Policy and Management Act (Public Law 94-579, October 21, 1976) requires the U.S. Geological Survey and the U.S. Bureau of Mines to conduct mineral surveys on certain areas to determine their mineral resource potential. Results must be made available to the public and be submitted to the President and the Congress. This report presents the results of a mineral survey of the Crossman Peak Wilderness Study Area (5-7B), Mohave County, Arizona.

INTRODUCTION

The U.S. Geological Survey and the U.S. Bureau of Mines conducted field investigations to evaluate the mineral resource potential of the Crossman Peak Wilderness Study Area (WSA) from 1979 to 1982. Field studies included geologic mapping, geochemical sampling, geophysical surveys, and a survey of known mines, prospects, and mineralized zones (Light and others, 1983). This report presents a brief description of the procedure used in collecting and analyzing the geochemical samples and a list of the analytical results.

The Crossman Peak WSA is in western Arizona 3 mi (4 km) east of Lake Havasu City, Ariz., and 45 mi (72.4 km) southwest of Kingman, Ariz. The WSA boundary circumscribes approximately 38,000 acres (15,500 hectares) in the topographically rugged center and flanking foothills of the Mohave Mountains, sometimes called the Chemehuevi Mountains. The Mohave Mountains form a northwest-trending range adjacent to Lake Havasu (elevation 448 ft (137 m)) on the Colorado River. Both the Mohave Mountains and the WSA are dominated by Crossman Peak, which attains an elevation of 5148 ft (1544 m). The area is accessible from the north and west on numerous jeep trails that intersect either Interstate 40, Arizona State Highway 95, or some residential streets of Lake Havasu City, Ariz. (fig. 1). From the south, southeast, and northeast access to the area is on jeep trails that intersect the unimproved Dutch Flat Road, which skirts the south flank of the mountains.

GEOLOGIC SETTING

The Mohave Mountains, and the Crossman Peak WSA, lie in the Sonoran Desert section of the Basin and Range geologic province. Rocks in the WSA are dominantly Precambrian metamorphic and igneous rocks intruded by Precambrian and Tertiary igneous dikes (fig. 2). Mineralized veins within the Precambrian gneisses probably are Mesozoic and may be related to Cretaceous granitoid rocks such as occur in and adjacent to the study area. A dense swarm of northeast-dipping Tertiary mafic to silicic dikes intrudes the Precambrian gneiss throughout the WSA north of the Crossman Peak fault. The dike swarm accounts for about 20 percent of the rock volume (Nakata, 1982), and represents a series of major intrusive events.

The Crossman Peak WSA lies within a terrane characterized by major low-angle normal faults of Tertiary age, commonly called detachment faults (Carr and others, 1980; Davis and others, 1980; Carr, 1981; Rehrig and Reynolds, 1980; Reynolds, 1981; Frost, 1982). Structural analysis indicates that the main mass of the high Mohave Mountains, including most of the WSA, (Crossman plate of Howard and others, 1982) was tilted along with the volcanic

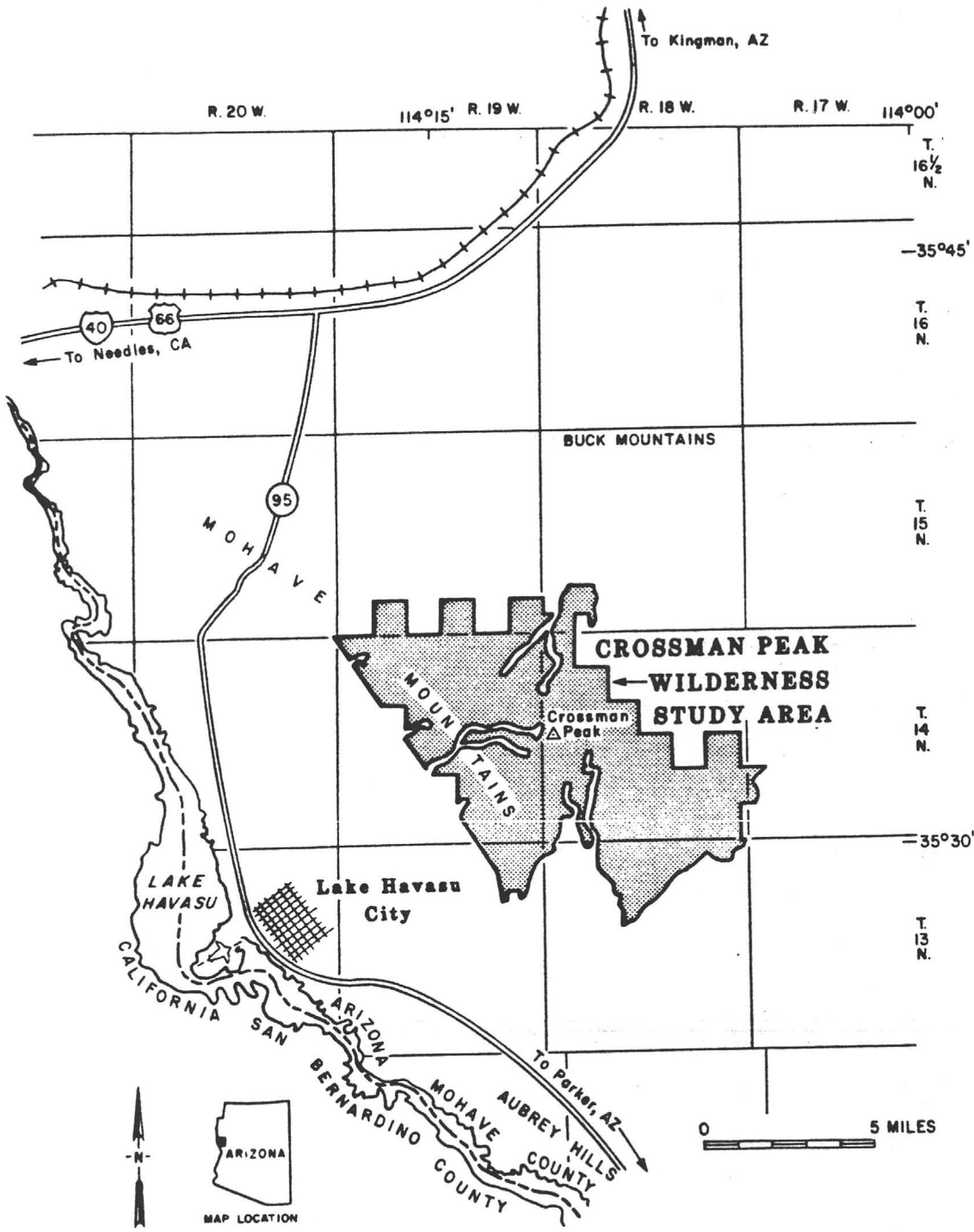


Figure 1.--Crossman Peak Wilderness Study area, Mohave County, Arizona.

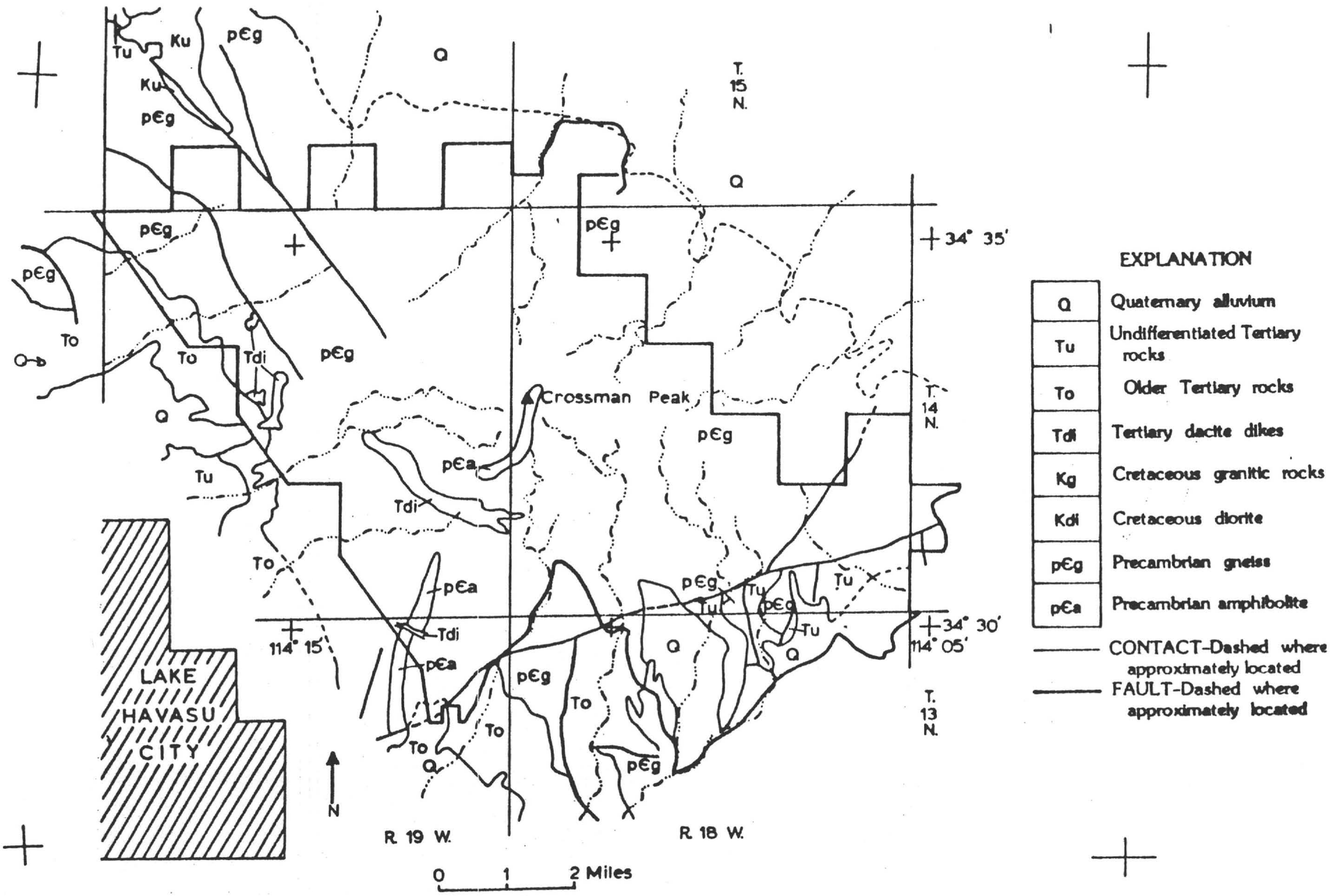


Figure 2.--Generalized geologic map of the Crossman Peak Wilderness Study Area (after Howard and others, 1982).

and sedimentary rocks. The evidence for tilting of the Crossman plate implies that pre-Tertiary features, including mineralized structures, are exposed in an oblique cross section that represents progressively greater crustal depths from southwest to northeast (Howard and others, 1982).

Gold, silver, and tungsten have been mined from quartz veins and faults at several localities within the WSA and inferred resources have been calculated for several deposits (Light and McDonnell, 1983). A preliminary interpretation of alteration and the distribution of selected base and precious metals in the Crossman Peak WSA suggests that the mineralization is all part of a large hydrothermal system related to a buried porphyry-type intrusion (Light, Marsh, and Raines, 1982).

METHODS

Sampling and sample-preparation methods

Geochemical rock and stream-sediment sampling was carried out by the U.S. Geological Survey during portions of 1981 and 1982. Access to the area was achieved by helicopter, 4-wheel drive, and foot traverses. Figure 3 illustrates the localities for samples collected in and around the Crossman Peak Wilderness Study Area.

Rock samples

Rock samples were collected from most of the altered and mineralized areas throughout the WSA to define the geochemical signature of the hydrothermal system. For the purpose of comparison, some rock samples were collected from areas which were not obviously altered or mineralized. A total of 87 rock samples was collected from locations throughout the study area. All rock samples were crushed and pulverized to minus 150 mesh (0.10 mm) before being analyzed.

Stream-sediment samples

Composite stream-sediment samples were collected from the active portion of intermittent drainages at 130 sites. These samples were sieved to minus 30 mesh (0.59 mm), and pulverized to minus 150 mesh (0.10 mm). Panned concentrates of stream sediments were also collected at 84 of the sites, and were further concentrated by liquid separation in bromoform (specific gravity 2.85). The magnetic fraction of these heavy-mineral concentrates was removed by magnetic separation on a Frantz Isodynamic Separator and the nonmagnetic fraction was analyzed.

Analytical methods

All rock samples and both the sieved stream-sediment samples and the nonmagnetic fraction of the heavy-mineral concentrates were analyzed for 31 elements by a D.C. arc six-step semiquantitative optical emission spectrographic method (Grimes and Marranzino, 1968). The elements analyzed and their lower limits of determination are listed in table 1. Some rock samples were also analyzed by atomic-absorption spectrophotometry techniques for antimony, arsenic, bismuth, cadmium, and zinc using a modification of Viets (1978), for mercury using a modification of Vaughn and McCarthy (1964) and McNerney and others (1972), and for gold (Ward and others, 1969).

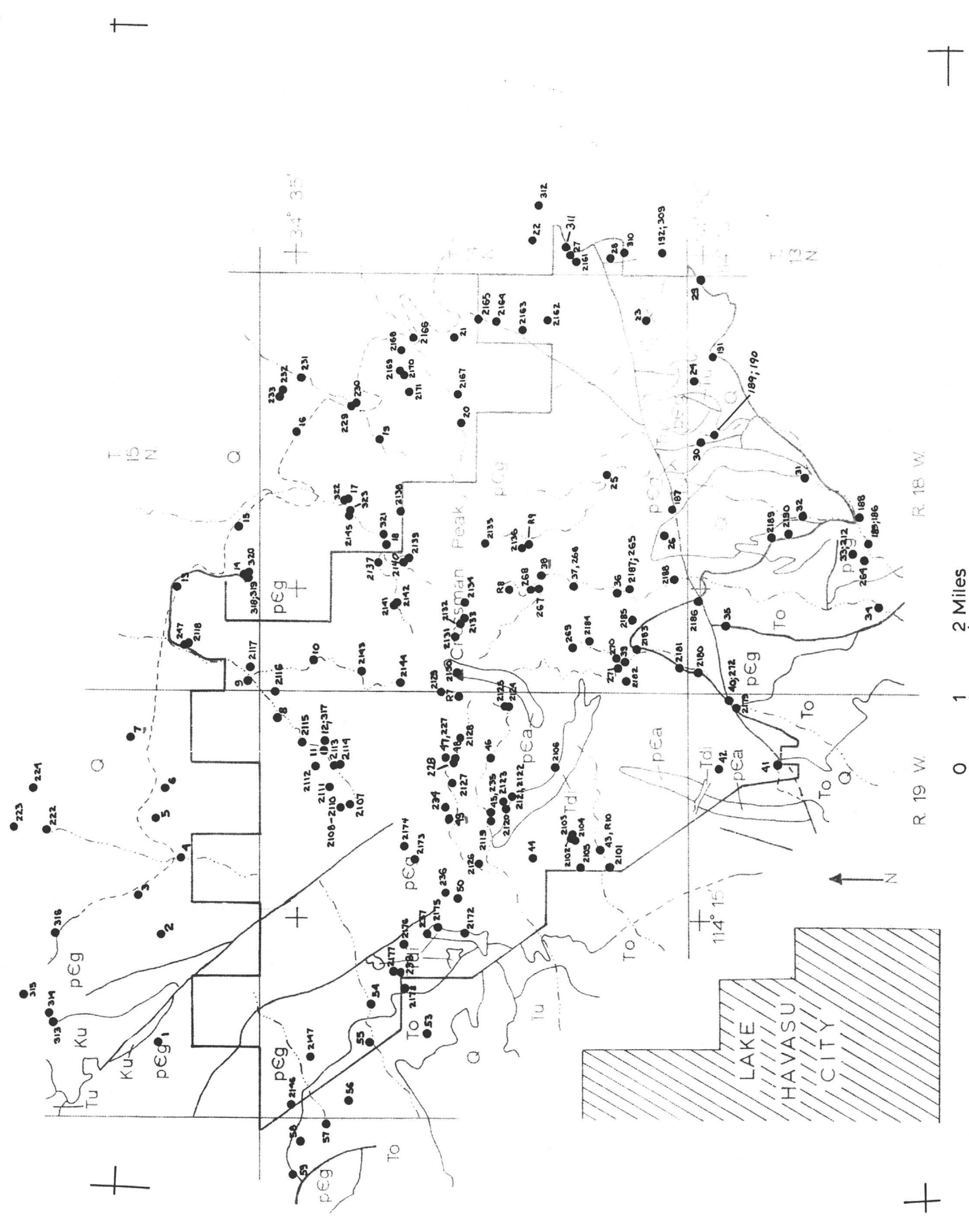


Figure 3.--Map showing sample localities for the Crossman Peak Wilderness Study Area, Arizona.

Table 1.--Lower limits of determination for elements analyzed by D.C. arc spectrographic method.

Element	Lower Limits of Determination	
	rocks and sediments	concentrates
Fe	0.05%	0.1%
Mg	0.02	0.05
Ca	0.05	0.1
Ti	0.002	0.005
Mn	10 ppm	20 ppm
Ag	0.5	1
As	200	500
Au	10	20
B	10	20
Ba	20	50
Be	1	2
Bi	10	20
Cd	20	50
Co	5	10
Cr	10	20
Cu	5	10
La	20	50
Mo	5	10
Nb	20	50
Ni	5	10
Pb	10	20
Sb	100	200
Sc	5	10
Sn	10	20
Sr	100	200
Th	100	200
V	10	20
W	50	100
Y	10	20
Zn	200	500
Zr	10	20

ANALYTICAL DATA

Analytical data for samples from the Crossman Peak WSA were entered into the USGS Rock Analysis Storage System (RASS). Analytical data for sieved sediments and for panned concentrate samples are listed in tables 2 and 3, respectively. The analytical data for rock samples are listed in table 4, and a brief description of rock samples is given in table 5. Abbreviations used on the element columns are as follows:

pct - percent

ppm - parts per million

s - semiquantitative emission spectrographic analyses

aa - atomic-absorption analyses

N - not detected

-- - no data available

< - detected but below lower limit of determination (value listed)

> - above upper limit of determination (value listed)

Table 2.__Analytical data for sieved sediment samples

Sample	Latitude	Longitude	Fe-pct. s	Mg-pct. s	Ca-pct. s	Ti-pct. s	Mn-ppm s	Ag-ppm s	As-ppm s	Au-ppm s	B-ppm s	Ba-ppm s
2165	34 32 45	114 5 0	15	2.0	7.00	>1.0	5,000	N	N	N	30	2,000
2166	34 33 30	114 6 15	15	5.0	7.00	>1.0	3,000	N	N	N	20	3,000
CP001	34 36 33	114 16 46	7	1.5	5.00	1.0	1,500	N	N	N	10	1,500
CP002	34 36 35	114 15 18	10	2.0	5.00	.7	1,500	N	N	N	10	1,000
CP003	34 35 50	114 14 38	10	2.0	7.00	1.0	1,500	N	N	N	20	700
CP004	34 36 23	114 14 4	10	2.0	3.00	.7	1,000	N	N	N	15	1,000
CP005	34 36 31	114 13 26	15	1.5	5.00	>1.0	3,000	N	N	N	15	1,000
CP006	34 36 34	114 13 4	20	2.0	7.00	>1.0	3,000	N	N	N	15	1,000
CP007	34 36 59	114 12 15	10	2.0	7.00	1.0	1,500	N	N	N	15	1,000
CP008	34 35 13	114 11 57	10	2.0	5.00	1.0	2,000	N	N	N	15	700
CP009	34 35 34	114 11 57	10	2.0	7.00	1.0	1,500	N	N	N	10	1,000
CP010	34 34 44	114 11 6	5	2.0	2.00	.5	700	N	N	N	15	1,000
CP011	34 34 38	114 12 30	5	2.0	1.50	.5	1,000	N	N	N	15	1,000
CP012	34 34 39	114 12 21	7	1.5	1.50	1.0	1,500	N	N	N	20	1,500
CP013	34 36 30	114 10 2	5	1.5	2.00	.5	700	N	N	N	20	1,000
CP014	34 35 36	114 9 52	7	2.0	2.00	.7	1,000	N	N	N	15	1,000
CP015	34 35 41	114 9 39	5	2.0	2.00	.5	700	N	N	N	20	1,000
CP016	34 34 58	114 7 47	3	1.5	1.00	.3	700	N	N	N	10	700
CP017	34 34 17	114 8 44	5	1.5	2.00	.5	1,000	N	N	N	10	1,500
CP018	34 33 49	114 9 24	5	1.5	2.00	.7	1,000	N	N	N	10	1,500
CP019	34 33 54	114 7 48	5	1.5	2.00	.5	1,000	N	N	N	15	1,500
CP020	34 32 52	114 7 31	20	1.5	1.50	>1.0	3,000	N	N	N	20	500
CP021	34 33 6	114 6 26	7	1.5	2.00	.7	1,000	N	N	N	10	1,000
CP022	34 32 12	114 4 40	5	.5	.07	.3	700	N	N	N	10	1,500
CP023	34 30 34	114 5 40	5	1.5	2.00	.3	500	N	N	N	15	1,000
CP024	34 30 0	114 6 56	7	1.5	2.00	.7	1,000	<.5	N	N	10	1,000
CP025	34 31 9	114 8 21	7	2.0	2.00	1.0	1,000	<.5	N	N	15	1,000
CP026	34 30 29	114 9 19	15	1.5	1.50	>1.0	2,000	N	N	N	20	700
CP027	34 31 40	114 6 0	10	1.5	2.00	1.0	3,000	N	N	N	15	500
CP028	34 31 10	114 4 58	7	1.5	2.00	.7	1,000	N	N	N	10	1,000
CP029	34 30 0	114 5 20	7	1.5	5.00	1.0	1,000	N	N	N	10	1,500
CP030	34 29 55	114 7 51	10	2.0	3.00	.3	1,000	N	N	N	10	1,000
CP031	34 28 39	114 8 24	7	2.0	2.00	.3	700	N	N	N	15	1,000
CP033	34 28 7	114 9 30	15	2.0	1.50	>1.0	3,000	N	N	N	20	700
CP034	34 27 44	114 10 20	7	2.0	1.50	1.0	1,000	N	N	N	20	1,000
CP035	34 29 43	114 10 36	5	2.0	1.50	.5	700	N	N	N	15	1,000
CP036	34 31 0	114 10 7	5	2.0	2.00	.5	1,000	N	N	N	15	1,000
CP037	34 31 34	114 9 58	3	1.5	2.00	.3	500	N	N	N	15	1,000
CP038	34 31 55	114 9 50	5	2.0	2.00	.5	1,000	N	N	N	15	1,500
CP039	34 30 53	114 11 4	5	1.5	2.00	.3	700	N	N	N	15	1,500
CP040	34 29 39	114 11 45	7	2.0	5.00	.7	1,000	N	N	N	20	1,500
CP041	34 29 0	114 12 40	5	2.0	5.00	.5	700	N	N	N	20	1,000
CP042	34 29 45	114 12 48	3	1.5	3.00	.5	700	N	N	N	15	700
CP043	34 31 13	114 13 57	7	1.5	3.00	.5	1,000	N	N	N	15	1,500
CP044	34 32 5	114 14 10	7	1.5	3.00	.5	1,000	N	N	N	20	1,500

Table 2.--Analytical data for sieved sediment samples

Sample	Be-ppm s	Bi-ppm s	Cd-ppm s	Co-ppm s	Cr-ppm s	Cu-ppm s	La-ppm s	Mo-ppm s	Nb-ppm s	Ni-ppm s	Pb-ppm s
2165	N	N	N	20	200	50	200	N	30	50	50
2166	N	N	N	50	500	70	200	N	20	100	10
CP001	2.0	N	N	20	100	50	100	N	20	50	30
CP002	2.0	N	N	20	100	50	100	N	N	50	50
CP003	1.5	N	N	30	200	70	100	N	20	100	50
CP004	2.0	N	N	20	100	50	100	N	20	70	30
CP005	1.5	N	N	50	200	70	150	N	30	70	20
CP006	1.5	N	N	70	200	100	150	N	20	70	30
CP007	1.5	N	N	30	100	70	100	N	<20	70	30
CP008	1.0	N	N	30	100	100	50	N	<20	70	50
CP009	1.5	N	N	50	100	70	150	N	<20	70	50
CP010	1.5	N	N	30	150	50	50	N	<20	50	20
CP011	1.5	N	N	20	100	50	50	N	<20	30	30
CP012	1.0	N	N	30	100	70	50	N	20	50	30
CP013	1.5	N	N	20	100	50	70	N	<20	50	30
CP014	1.5	N	N	30	150	50	70	N	<20	70	50
CP015	1.0	N	N	20	150	50	50	N	<20	70	30
CP016	1.0	N	N	15	70	20	30	N	<20	30	20
CP017	2.0	N	N	20	150	50	70	N	<20	30	30
CP018	1.5	N	N	20	100	50	100	N	<20	50	50
CP019	1.5	<10	N	20	70	30	70	N	<20	30	20
CP020	1.0	N	N	50	300	70	200	N	50	50	20
CP021	2.0	N	N	20	150	50	100	N	20	50	20
CP022	1.0	N	N	10	50	50	30	N	N	20	70
CP023	2.0	N	N	15	70	30	70	N	<20	50	15
CP024	2.0	N	N	20	150	30	100	N	20	50	10
CP025	1.5	N	N	30	150	70	100	N	<20	50	20
CP026	1.0	N	N	30	200	70	100	N	50	70	20
CP027	1.0	N	N	30	150	70	200	N	50	50	20
CP028	1.5	N	N	20	300	50	100	N	<20	50	15
CP029	1.5	N	N	15	70	30	200	N	<20	30	15
CP030	1.0	N	N	20	150	30	70	N	N	50	15
CP031	1.5	N	N	30	150	50	70	N	<20	70	20
CP033	1.0	N	N	50	70	100	100	N	30	50	20
CP034	1.5	N	N	30	300	70	70	N	20	50	30
CP035	1.5	N	N	20	150	30	70	N	<20	30	20
CP036	1.5	N	N	20	50	50	70	N	<20	70	20
CP037	2.0	N	N	15	100	20	50	N	<20	20	30
CP038	2.0	N	N	20	150	50	100	N	20	70	20
CP039	2.0	N	N	15	150	30	70	N	20	20	20
CP040	2.0	N	N	30	100	70	100	N	20	50	20
CP041	2.0	N	N	30	150	50	100	N	N	50	20
CP042	2.0	N	N	20	70	50	150	N	<20	30	15
CP043	2.0	N	N	20	100	50	100	N	20	50	50
CP044	2.0	N	N	15	70	50	100	N	20	50	50

Table 2.__Analytical data for sieved sediment samples

Sample	Sb-ppm s	Sc-ppm s	Sn-ppm s	Sr-ppm s	V-ppm s	W-ppm s	Y-ppm s	Zn-ppm s	Zr-ppm s	Th-ppm s
2165	N	--	N	300	150	N	150	<200	--	N
2166	N	--	N	500	300	N	100	N	--	N
CP001	N	20	N	200	150	N	100	N	500	N
CP002	N	20	N	200	100	N	50	N	300	N
CP003	N	20	N	300	150	N	50	N	300	N
CP004	N	20	N	500	100	N	50	N	300	N
CP005	N	30	N	300	150	N	100	<200	300	N
CP006	N	70	N	500	150	N	100	N	300	N
CP007	N	70	N	500	100	N	100	N	300	N
CP008	N	70	N	200	150	N	70	<200	300	N
CP009	N	30	N	500	150	N	100	N	500	N
CP010	N	15	N	300	100	N	30	N	200	N
CP011	N	20	N	150	100	N	50	N	200	N
CP012	N	20	N	150	150	N	50	N	200	N
CP013	N	15	N	200	70	N	30	N	200	N
CP014	N	20	N	200	100	N	50	N	300	N
CP015	N	15	N	200	100	N	30	N	200	N
CP016	N	15	N	150	70	N	20	N	150	N
CP017	N	20	N	200	100	N	30	N	200	N
CP018	N	20	N	200	150	N	50	N	200	N
CP019	N	15	N	200	70	N	30	N	300	N
CP020	N	20	N	150	300	N	100	300	300	N
CP021	N	20	N	300	100	N	50	<200	200	N
CP022	N	15	N	<100	100	N	10	<200	100	N
CP023	N	15	N	200	70	N	30	N	500	N
CP024	N	30	N	200	70	N	50	N	700	N
CP025	N	20	N	200	70	N	50	N	150	N
CP026	N	20	N	200	200	N	70	N	>1,000	N
CP027	N	50	N	200	150	N	100	N	700	N
CP028	N	30	N	200	100	N	50	N	1,000	N
CP029	N	50	N	300	150	N	100	N	300	N
CP030	N	20	N	200	200	N	30	N	300	N
CP031	N	15	N	200	100	N	50	N	300	N
CP033	N	30	N	200	150	50	100	200	300	N
CP034	N	20	N	200	100	N	50	N	200	N
CP035	N	15	N	200	100	N	50	N	300	N
CP036	N	15	N	200	100	N	30	N	300	N
CP037	N	10	N	200	70	N	30	N	200	N
CP038	N	15	N	200	100	N	50	N	500	N
CP039	N	15	N	200	70	N	30	N	300	N
CP040	N	20	N	200	150	N	50	N	200	N
CP041	N	15	N	200	100	N	50	N	200	N
CP042	N	15	N	150	100	N	50	N	500	N
CP043	N	15	N	200	100	N	50	N	200	N
CP044	N	15	N	200	100	N	50	N	500	N

Table 2.__Analytical data for sieved sediment samples--continued

Sample	Latitude	Longitude	Fe-pct. s	Mg-pct. s	Ca-pct. s	Ti-pct. s	Mn-ppm s	Ag-ppm s	As-ppm s	Au-ppm s	B-ppm s	Ba-ppm s
CP045	34 32 35	114 13 24	7	1.5	2.00	.5	1,500	N	N	N	20	1,000
CP046	34 32 35	114 12 36	5	2.0	2.00	.3	700	N	N	N	20	1,000
CP047	34 33 8	114 12 36	7	2.0	3.00	1.0	1,000	N	N	N	20	1,000
CP048	34 33 2	114 12 37	5	1.5	2.00	.5	1,000	N	N	N	15	1,000
CP049	34 33 4	114 13 31	7	1.5	1.50	.5	1,000	N	N	N	15	1,000
CP050	34 32 55	114 14 40	7	1.5	2.00	.5	1,000	N	N	N	15	1,500
CP051	34 25 33	114 12 10	7	1.0	3.00	.7	1,000	N	N	N	15	1,500
CP052	34 26 18	114 11 48	7	1.0	2.00	.7	700	N	N	N	20	1,000
CP053	34 33 18	114 16 36	7	1.5	2.00	.5	1,500	N	N	N	15	1,500
CP054	34 34 1	114 16 15	5	1.5	1.50	.5	700	N	N	N	15	1,500
CP055	34 34 5	114 16 45	5	1.5	1.50	.3	700	N	N	N	10	1,000
CP056	34 34 17	114 17 39	7	1.5	2.00	.7	1,000	N	N	N	15	1,000
CP057	34 34 34	114 17 59	7	1.5	1.50	.5	1,000	N	N	N	15	1,000
CP058	34 34 54	114 18 14	7	1.5	2.00	.5	1,000	N	N	N	15	1,500
CP059	34 35 0	114 18 46	7	.7	1.50	.7	1,000	N	N	N	15	2,000
CP2101	34 31 10	114 14 10	5	1.0	2.00	.7	1,000	<.5	N	N	10	700
CP2102	34 31 35	114 13 50	5	1.0	2.00	.7	1,000	N	N	N	10	1,500
CP2103	34 31 35	114 13 45	5	1.0	2.00	.7	1,000	N	N	N	10	1,000
CP2105	34 31 30	114 14 10	5	1.0	2.00	.5	1,000	N	N	N	10	1,000
CP2106	34 31 45	114 12 50	5	1.0	1.00	.5	1,000	<.5	N	N	10	1,000
CP2113	34 34 30	114 12 45	5	2.0	1.00	.5	1,000	<.5	N	N	10	700
CP2114	34 34 25	114 12 45	5	2.0	1.00	.5	1,000	N	N	N	10	500
CP2116	34 35 15	114 11 40	5	2.0	1.00	.5	1,000	N	N	N	10	300
CP2117	34 35 30	114 11 20	5	2.0	2.00	.7	1,000	<.5	N	N	10	300
CP2118	34 36 20	114 10 50	5	2.0	2.00	.5	700	N	N	N	10	300
CP2124	34 32 20	114 11 55	5	2.0	2.00	.5	700	N	N	N	10	200
CP2125	34 32 25	114 11 55	5	2.0	2.00	.5	700	N	N	N	10	200
CP2127	34 33 5	114 12 55	5	2.0	2.00	1.0	700	N	N	N	10	100
CP2138	34 33 40	114 9 0	5	1.0	1.00	.3	700	N	N	N	10	1,000
CP2139	34 33 35	114 9 40	5	1.0	1.00	.5	700	N	N	N	20	700
CP2140	34 33 40	114 9 40	5	1.0	1.00	.5	700	N	N	N	10	700
CP2141	34 34 10	114 10 15	7	2.0	1.00	1.0	2,000	N	N	N	15	500
CP2142	34 33 45	114 10 20	5	1.0	1.00	.5	700	N	N	N	10	700
CP2143	34 33 45	114 11 20	7	1.0	1.00	1.0	1,000	N	N	N	10	500
CP2144	34 33 40	114 11 30	7	1.0	1.00	.5	1,000	N	N	N	10	500
CP2145	34 34 15	114 9 30	5	1.0	1.00	.5	700	N	N	N	10	700
CP2146	34 35 0	114 7 40	5	1.0	1.00	.3	700	N	N	N	10	700
CP185	34 27 58	114 9 29	10	2.0	7.00	1.0	3,000	N	N	N	50	1,500
CP186	34 27 58	114 9 21	7	2.0	10.00	1.0	2,000	N	N	N	50	1,000
CP187	34 30 22	114 8 53	5	2.0	5.00	.5	2,000	N	N	N	50	500
CP188	34 28 2	114 8 53	7	2.0	5.00	>1.0	2,000	N	N	N	50	1,000
CP189	34 29 43	114 7 41	10	5.0	10.00	>1.0	3,000	N	N	N	70	1,000
CP190	34 29 43	114 7 43	15	5.0	10.00	>1.0	5,000	N	N	N	100	700
CP191	34 29 50	114 7 43	7	3.0	3.00	.5	1,500	N	N	N	20	700
CP192	34 30 28	114 4 52	10	5.0	5.00	.7	1,500	N	N	N	20	500

Table 2.--Analytical data for sieved sediment samples--continued

Sample	Be-ppm s	Bi-ppm s	Cd-ppm s	Co-ppm s	Cr-ppm s	Cu-ppm s	La-ppm s	Mo-ppm s	Nb-ppm s	Ni-ppm s	Pb-ppm s
CP045	2.0	N	N	20	150	50	150	N	20	50	30
CP046	2.0	N	N	20	100	50	70	N	20	50	30
CP047	1.5	N	N	30	150	70	70	N	<20	50	50
CP048	2.0	N	N	15	100	50	100	N	<20	30	50
CP049	2.0	N	N	20	100	50	100	N	<20	30	30
CP050	2.0	N	N	20	100	50	150	N	<20	20	20
CP051	1.0	N	N	15	100	50	50	N	<20	30	30
CP052	2.0	N	N	20	100	50	50	N	20	20	20
CP053	2.0	N	N	15	100	30	70	N	<20	20	30
CP054	2.0	N	N	20	70	30	100	N	<20	30	20
CP055	2.0	N	N	15	150	20	50	N	<20	30	20
CP056	2.0	N	N	15	70	30	100	N	<20	30	30
CP057	2.0	N	N	15	70	20	100	N	<20	20	20
CP058	2.0	N	N	15	70	30	100	N	<20	20	30
CP059	2.0	N	N	15	70	30	70	N	20	15	20
CP2101	1.0	N	N	20	100	15	100	N	<20	50	70
CP2102	1.0	N	N	20	70	20	500	N	<20	30	70
CP2103	1.0	N	N	20	100	15	200	N	<20	70	70
CP2105	1.0	N	N	20	70	15	100	N	<20	50	50
CP2106	1.0	N	N	20	70	15	100	N	<20	30	30
CP2113	1.0	N	N	20	150	15	70	N	<20	70	20
CP2114	1.0	N	N	20	100	15	70	N	<20	70	20
CP2116	1.0	N	N	20	100	15	50	N	N	100	20
CP2117	1.0	N	N	30	100	20	100	N	<20	100	30
CP2118	1.0	N	N	20	70	20	50	N	N	70	30
CP2124	1.0	N	N	30	200	20	100	N	<20	100	30
CP2125	1.0	N	N	30	200	20	50	N	<20	100	20
CP2127	<1.0	N	N	20	100	15	70	N	<20	70	150
CP2138	2.0	N	N	15	200	15	50	N	N	70	10
CP2139	2.0	N	N	15	200	15	50	N	N	70	10
CP2140	1.0	N	N	15	200	20	50	N	N	70	20
CP2141	1.0	N	N	50	300	20	100	N	N	70	20
CP2142	1.0	N	N	20	200	15	70	N	N	70	20
CP2143	1.0	N	N	30	200	20	50	N	N	70	20
CP2144	1.0	N	N	30	150	20	50	N	N	70	100
CP2145	1.0	N	N	20	100	15	50	N	N	70	20
CP2146	2.0	N	N	15	70	15	50	N	N	30	50
CP185	<5.0	N	N	20	150	150	200	5	20	50	70
CP186	<5.0	N	N	20	150	100	200	N	<20	50	50
CP187	N	N	N	15	200	70	200	N	<20	50	50
CP188	<5.0	N	N	15	100	50	200	15	20	50	50
CP189	<5.0	N	N	50	200	150	200	50	20	100	100
CP190	<5.0	N	N	30	200	200	300	10	20	70	70
CP191	N	N	N	15	150	70	200	N	<20	30	70
CP192	N	N	N	20	200	70	500	N	N	50	50

Table 2.__Analytical data for sieved sediment samples--continued

Sample	Sb-ppm s	Sc-ppm s	Sn-ppm s	Sr-ppm s	V-ppm s	W-ppm s	Y-ppm s	Zn-ppm s	Zr-ppm s	Th-ppm s
CP045	N	20	N	150	100	N	70	N	300	N
CP046	N	15	N	200	100	N	50	N	200	N
CP047	N	20	N	200	100	N	30	N	200	N
CP048	N	20	N	200	100	150	30	N	300	N
CP049	N	20	N	200	100	N	50	N	300	N
CP050	N	20	N	200	150	N	50	<200	200	N
CP051	N	15	N	500	100	N	30	N	700	N
CP052	N	10	N	300	100	N	30	N	300	N
CP053	N	15	N	200	70	N	50	N	200	N
CP054	N	15	N	200	70	N	50	N	200	N
CP055	N	15	N	200	70	N	30	N	300	N
CP056	N	15	N	200	70	N	50	N	300	N
CP057	N	10	N	200	70	N	50	N	300	N
CP058	N	15	N	200	50	N	50	N	300	N
CP059	N	20	N	150	70	N	150	N	5	N
CP2101	N	10	N	200	100	N	70	<200	300	N
CP2102	N	10	N	200	100	N	70	<200	500	N
CP2103	N	15	N	300	100	N	50	<200	500	N
CP2105	N	10	N	300	50	N	30	<200	200	N
CP2106	N	10	N	300	100	N	50	<200	500	N
CP2113	N	20	N	300	100	N	50	<200	200	N
CP2114	N	20	N	300	100	N	50	<200	200	N
CP2116	N	15	N	200	100	N	30	<200	200	N
CP2117	N	20	N	500	100	N	70	<200	200	N
CP2118	N	15	N	500	100	N	50	<200	200	N
CP2124	<100	15	N	500	100	N	50	<200	200	N
CP2125	<100	15	N	200	100	N	50	<200	200	N
CP2127	<100	15	N	200	100	N	70	<200	200	N
CP2138	N	15	N	200	100	N	30	<200	200	N
CP2139	N	20	N	200	100	N	50	<200	300	N
CP2140	N	15	N	200	100	N	50	<200	300	N
CP2141	N	20	N	200	200	N	70	<200	200	N
CP2142	N	20	N	200	100	N	50	<200	200	N
CP2143	N	15	N	200	100	N	50	<200	200	N
CP2144	N	20	N	200	100	N	50	<200	200	N
CP2145	N	15	N	200	100	N	30	<200	300	N
CP2146	N	15	N	200	50	N	50	<200	300	N
CP185	N	--	N	500	200	N	100	<200	--	N
CP186	N	--	N	500	200	N	100	200	--	N
CP187	N	--	N	200	100	N	50	200	--	N
CP188	N	--	N	300	200	N	100	200	--	N
CP189	N	--	N	1,000	200	N	100	200	--	N
CP190	N	--	N	700	300	N	150	200	--	N
CP191	N	--	N	200	100	N	70	<200	--	N
CP192	N	--	N	500	150	<50	50	N	--	N

Table 2.--Analytical data for sieved sediment samples--continued

Sample	Latitude	Longitude	Fe-pct. s	Mg-pct. s	Ca-pct. s	Ti-pct. s	Mn-ppm s	Ag-ppm s	As-ppm s	Au-ppm s	B-ppm s	Ba-ppm s
CP222	34 37 59	114 13 39	10	2.0	10.00	1.0	3,000	N	N	N	50	700
CP223	34 38 29	114 13 36	10	2.0	5.00	>1.0	5,000	N	N	N	30	700
CP224	34 38 11	114 12 53	5	1.5	5.00	1.0	2,000	N	N	N	20	1,000
CP227	34 33 9	114 12 35	5	2.0	2.00	.7	3,000	N	N	N	20	500
CP228	34 33 3	114 12 38	5	2.0	2.00	.7	3,000	N	N	N	30	700
CP229	34 34 17	114 7 12	5	1.5	3.00	.7	2,000	N	N	N	50	500
CP230	34 34 13	114 7 11	7	1.5	5.00	.5	2,000	N	N	N	30	700
CP231	34 34 52	114 6 54	5	1.5	3.00	.5	1,000	N	N	N	20	1,000
CP232	34 35 4	114 7 2	5	1.5	5.00	>1.0	1,500	N	N	N	50	1,000
CP233	34 35 7	114 7 6	5	1.0	5.00	.3	1,000	N	N	N	30	1,000
CP234	34 33 7	114 13 18	7	2.0	5.00	.7	1,500	N	N	N	20	700
CP235	34 32 34	114 13 22	5	1.0	2.00	.3	1,500	N	N	N	20	700
CP236	34 33 3	114 14 33	5	2.0	5.00	.5	1,500	N	N	N	50	700
CP237	34 33 21	114 15 15	5	2.0	3.00	.7	1,500	.5	N	N	50	1,000
CP238	34 33 40	114 15 47	7	2.0	5.00	.5	3,000	N	N	N	20	1,000
CP247	34 36 22	114 10 53	5	1.0	5.00	.5	2,000	N	N	N	20	1,500
CP264	34 27 57	114 9 32	7	2.0	5.00	1.0	2,000	N	N	N	50	1,000
CP265	34 31 1	114 10 8	5	1.5	5.00	.3	2,000	N	N	N	50	700
CP266	34 31 35	114 9 57	5	2.0	5.00	.7	2,000	N	N	N	50	1,000
CP267	34 31 57	114 9 59	7	3.0	5.00	.7	2,000	N	N	N	50	1,500
CP268	34 32 1	114 9 58	7	2.0	5.00	.5	1,500	N	N	N	50	1,500
CP269	34 31 34	114 10 53	10	10.0	7.00	1.0	3,000	N	N	N	30	1,000
CP270	34 30 58	114 11 8	7	5.0	10.00	.7	2,000	N	N	N	50	500
CP271	34 30 57	114 11 11	5	3.0	5.00	.5	2,000	N	N	N	50	1,000
CP272	34 29 38	114 11 46	7	1.5	5.00	.7	1,500	N	N	N	50	500
CP309	34 30 28	114 4 52	7	1.5	3.00	1.0	1,500	1.0	N	N	20	700
CP310	34 30 59	114 4 48	10	5.0	10.00	1.0	2,000	.5	N	N	20	700
CP311	34 31 43	114 4 49	3	2.0	2.00	.2	1,000	1.0	N	N	10	700
CP312	34 32 7	114 4 5	7	3.0	7.00	.7	2,000	.5	N	N	15	1,500
CP313	34 37 56	114 16 30	5	1.5	5.00	.7	1,500	.7	N	N	20	1,500
CP314	34 37 59	114 16 25	5	1.5	5.00	.7	1,500	1.0	N	N	70	700
CP315	34 38 18	114 16 6	7	1.0	7.00	.7	1,500	3.0	N	N	30	2,000
CP316	34 37 54	114 15 16	7	1.5	3.00	1.0	2,000	2.0	N	N	30	2,000
CP317	34 34 41	114 12 22	7	1.5	3.00	1.0	2,000	N	N	N	20	500
CP318	34 35 35	114 9 56	7	2.0	3.00	1.0	1,500	N	N	N	30	700
CP319	34 35 36	114 9 57	7	2.0	5.00	1.0	2,000	N	N	N	20	500
CP320	34 35 35	114 9 53	7	2.0	7.00	1.0	2,000	N	N	N	30	1,000
CP321	34 33 52	114 9 15	5	2.0	3.00	.7	1,500	N	N	N	20	700
CP322	34 34 17	114 8 55	7	2.0	3.00	1.0	2,000	N	N	N	20	700
CP323	34 34 20	114 8 46	3	1.5	5.00	.5	1,000	N	N	N	30	1,000

Table 2.--Analytical data for sieved sediment samples--continued

Sample	Be-ppm s	Bi-ppm s	Cd-ppm s	Co-ppm s	Cr-ppm s	Cu-ppm s	La-ppm s	Mo-ppm s	Nb-ppm s	Ni-ppm s	Pb-ppm s
CP222	N	N	N	30	200	200	150	N	<20	100	100
CP223	N	N	N	20	150	100	100	N	20	50	20
CP224	<5.0	N	N	15	100	30	100	N	20	30	30
CP227	N	N	N	20	150	50	100	N	<20	50	70
CP228	N	N	N	30	100	50	100	N	N	50	100
CP229	<5.0	N	N	15	150	30	100	5	<20	50	20
CP230	<5.0	N	N	15	150	30	70	<5	N	50	20
CP231	<5.0	N	N	15	100	20	150	N	N	70	20
CP232	<5.0	N	N	15	150	30	50	N	<20	50	15
CP233	<5.0	N	N	10	70	20	70	10	N	20	50
CP234	<5.0	N	N	15	150	50	50	20	N	30	30
CP235	5.0	N	N	10	100	30	150	N	N	20	50
CP236	<5.0	N	N	20	150	50	50	N	N	30	50
CP237	5.0	N	N	15	100	70	100	10	N	30	50
CP238	<5.0	N	N	15	200	100	100	15	N	30	70
CP247	N	N	N	15	150	50	100	N	N	50	30
CP264	<5.0	N	N	15	150	200	200	7	20	50	30
CP265	<5.0	N	N	15	100	100	100	10	N	50	100
CP266	<5.0	N	N	20	150	100	100	N	<20	70	100
CP267	<5.0	N	N	15	150	50	100	5	<20	70	20
CP268	<5.0	N	N	15	200	50	300	7	N	50	70
CP269	N	N	N	30	700	150	50	7	N	100	10
CP270	N	N	N	20	500	100	100	N	<20	70	20
CP271	N	N	N	20	300	50	50	<5	<20	50	50
CP272	<5.0	N	N	20	100	100	50	7	<20	30	30
CP309	N	N	N	15	50	30	1,000	5	<20	30	70
CP310	N	N	N	30	200	50	100	N	<20	50	20
CP311	<5.0	N	N	15	100	20	100	N	N	30	70
CP312	<5.0	N	N	20	150	70	150	N	N	50	50
CP313	N	N	N	15	100	50	200	N	<20	20	100
CP314	N	N	N	15	150	100	200	N	<20	50	200
CP315	<5.0	N	N	20	100	150	200	N	<20	50	70
CP316	N	N	N	50	150	70	150	N	<20	50	50
CP317	N	N	N	20	150	50	100	N	<20	30	50
CP318	N	N	N	20	200	50	100	N	20	70	70
CP319	N	N	N	30	300	50	70	N	<20	70	50
CP320	N	N	N	20	150	30	70	10	<20	50	50
CP321	N	N	N	20	150	30	70	7	<20	70	70
CP322	N	N	N	20	200	50	100	N	N	50	30
CP323	<5.0	N	N	10	100	30	100	N	<20	50	20

Table 2.__Analytical data for sieved sediment samples--continued

Sample	Sb-ppm s	Sc-ppm s	Sn-ppm s	Sr-ppm s	V-ppm s	W-ppm s	Y-ppm s	Zn-ppm s	Zr-ppm s	Th-ppm s
CP222	N	--	N	500	200	N	50	N	--	N
CP223	N	--	N	200	150	N	100	N	--	N
CP224	N	--	N	700	70	N	70	N	--	N
CP227	N	--	N	200	150	N	70	200	--	N
CP228	N	--	N	200	100	N	50	<200	--	N
CP229	N	--	N	500	100	N	50	200	--	N
CP230	N	--	N	300	150	N	50	N	--	N
CP231	N	--	N	300	100	N	30	N	--	N
CP232	N	--	N	300	100	N	30	N	--	N
CP233	N	--	N	200	100	N	15	N	--	N
CP234	N	--	N	200	100	N	30	N	--	N
CP235	N	--	N	100	100	N	100	N	--	N
CP236	N	--	N	300	150	N	50	200	--	N
CP237	N	--	N	200	100	N	50	<200	--	N
CP238	N	--	N	200	100	N	70	<200	--	N
CP247	N	--	N	300	100	N	70	N	--	N
CP264	N	--	N	500	200	N	100	<200	--	N
CP265	N	--	30	200	200	N	70	<200	--	N
CP266	N	--	N	300	200	N	50	<200	--	N
CP267	N	--	N	200	200	N	50	N	--	N
CP268	N	--	N	200	200	N	50	N	--	N
CP269	N	--	N	300	500	N	20	N	--	N
CP270	N	--	N	200	200	N	30	N	--	N
CP271	N	--	50	200	200	N	30	N	--	N
CP272	N	--	N	100	150	N	50	N	--	N
CP309	N	--	N	200	200	N	100	N	--	<100
CP310	N	--	N	500	200	N	70	<200	--	N
CP311	N	--	N	300	100	N	30	N	--	N
CP312	N	--	N	300	150	N	70	N	--	N
CP313	N	--	N	700	200	N	50	N	--	N
CP314	N	--	N	700	150	N	30	N	--	N
CP315	N	--	N	500	100	N	50	N	--	N
CP316	N	--	N	500	150	N	100	N	--	N
CP317	N	--	N	200	150	N	50	N	--	N
CP318	N	--	N	300	200	N	50	N	--	N
CP319	N	--	N	500	200	N	70	N	--	N
CP320	N	--	N	300	200	N	50	N	--	N
CP321	N	--	N	500	150	N	50	N	--	N
CP322	N	--	N	500	150	N	50	N	--	N
CP323	N	--	N	300	70	N	30	N	--	N

Table 3.__Analytical data for panned concentrate samples

Sample	Latitude	Longitude	Fe-pct. s	Mg-pct. s	Ca-pct. s	Ti-pct. s	Mn-ppm s	Ag-ppm s	As-ppm s	Au-ppm s	B-ppm s	Ba-ppm s
2165C	34 32 45	114 5 0	.7	.5	20.0	2.0	1,000	N	N	N	20	200
2166C	34 33 30	114 6 15	.5	.7	20.0	>2.0	700	N	N	N	30	200
CP001C	34 36 33	114 16 46	3.0	1.5	20.0	1.5	1,000	N	N	N	20	>10,000
CP002C	34 36 35	114 15 18	2.0	2.0	15.0	1.5	700	N	N	N	20	2,000
CP003C	34 36 50	114 14 38	2.0	2.0	15.0	>2.0	700	N	N	N	30	>10,000
CP004C	34 36 23	114 14 4	2.0	1.5	15.0	2.0	700	N	N	N	30	2,000
CP005C	34 36 41	114 13 26	3.0	5.0	15.0	2.0	1,000	N	N	N	30	1,500
CP006C	34 36 34	114 13 4	3.0	5.0	10.0	1.5	700	N	N	N	20	1,000
CP007C	34 36 59	114 12 15	5.0	3.0	10.0	2.0	1,000	N	N	N	20	1,000
CP008C	34 35 13	114 11 57	5.0	7.0	15.0	2.0	1,000	N	N	N	30	700
CP009C	34 35 34	114 11 22	3.0	3.0	15.0	1.0	700	N	N	N	20	700
CP010C	34 34 44	114 11 6	3.0	3.0	10.0	2.0	700	N	N	N	20	500
CP011C	34 34 38	114 12 30	3.0	5.0	15.0	2.0	700	N	N	N	20	1,000
CP012C	34 34 39	114 12 21	3.0	2.0	20.0	2.0	700	3	N	N	20	500
CP013C	34 36 30	114 10 2	3.0	2.0	10.0	>2.0	700	N	N	N	50	1,000
CP014C	34 35 36	114 9 52	3.0	5.0	15.0	>2.0	1,000	N	N	N	<20	500
CP015C	34 35 41	114 9 39	2.0	2.0	10.0	>2.0	700	N	N	N	20	700
CP016C	34 34 58	114 7 47	2.0	2.0	10.0	>2.0	700	N	N	N	<20	700
CP017C	34 34 17	114 8 44	3.0	5.0	15.0	>2.0	1,000	N	N	N	<20	200
CP018C	34 33 49	114 9 24	3.0	5.0	10.0	2.0	1,000	N	N	N	20	500
CP019C	34 33 54	114 7 48	2.0	3.0	10.0	>2.0	700	N	N	N	<20	300
CP020C	34 32 52	114 7 31	5.0	3.0	10.0	>2.0	1,000	N	N	N	<20	500
CP021C	34 33 6	114 6 26	2.0	3.0	15.0	>2.0	1,000	N	N	N	<20	700
CP022C	34 32 12	114 4 40	1.5	.3	20.0	>2.0	700	N	N	N	<20	200
CP023C	34 30 34	114 5 40	5.0	3.0	10.0	1.5	1,000	N	N	N	30	500
CP024C	34 30 0	114 6 56	3.0	2.0	10.0	1.5	700	N	N	N	20	500
CP025C	34 31 9	114 8 21	3.0	2.0	10.0	2.0	700	N	N	N	20	1,000
CP026C	34 30 29	114 9 19	5.0	5.0	10.0	2.0	1,000	N	N	N	20	500
CP027C	34 31 40	114 6 0	3.0	3.0	1.5	2.0	1,000	N	N	N	<20	300
CP028C	34 31 10	114 4 58	3.0	2.0	10.0	1.0	700	N	N	N	30	300
CP029C	34 30 0	114 5 20	3.0	2.0	10.0	>2.0	700	N	N	N	20	700
CP030C	34 29 55	114 7 51	5.0	2.0	10.0	>2.0	700	N	N	N	20	700
CP031C	34 28 29	114 8 24	3.0	2.0	15.0	>2.0	700	N	N	N	30	2,000
CP032C	34 28 42	114 8 58	5.0	5.0	15.0	2.0	1,000	N	N	N	30	1,000
CP033C	34 28 7	114 9 30	5.0	5.0	15.0	1.5	1,500	N	N	N	<20	700
CP034C	34 27 44	114 10 20	5.0	7.0	15.0	2.0	1,000	N	N	N	20	300
CP035C	34 29 43	114 10 36	7.0	7.0	15.0	2.0	1,000	N	N	N	20	300
CP036C	34 31 0	114 10 7	3.0	7.0	15.0	2.0	1,000	N	N	N	<20	200
CP037C	34 31 34	114 9 58	7.0	7.0	20.0	2.0	700	N	N	N	20	500
CP038C	34 31 55	114 9 50	5.0	3.0	15.0	2.0	700	50	N	100	30	700
CP039C	34 30 53	114 11 4	7.0	3.0	10.0	2.0	1,000	N	N	N	30	1,000
CP040C	34 29 39	114 11 45	5.0	2.0	15.0	>2.0	700	N	N	N	20	500
CP041C	34 29 0	114 12 40	3.0	5.0	10.0	2.0	700	N	N	N	20	700
CP042C	34 29 45	114 12 48	5.0	2.0	10.0	>2.0	700	N	N	N	20	2,000
CP043C	34 31 13	114 13 57	2.0	1.5	15.0	2.0	700	N	N	N	30	1,000

Table 3.__Analytical data for panned concentrate samples

Sample	Be-ppm s	Bi-ppm s	Cd-ppm s	Co-ppm s	Cr-ppm s	Cu-ppm s	La-ppm s	Mo-ppm s	Nb-ppm s	Ni-ppm s	Pb-ppm s
2165C	N	N	N	N	100	N	500	N	N	10	N
2166C	N	N	N	N	200	N	500	<10	100	15	150
CP001C	3	N	N	20	200	30	500	N	70	50	100
CP002C	3	N	N	20	500	50	500	N	100	70	50
CP003C	1	N	N	20	700	50	500	N	100	100	100
CP004C	7	N	N	20	500	50	500	N	70	70	50
CP005C	<2	N	N	30	2,000	70	1,000	15	100	100	500
CP006C	2	N	N	30	2,000	30	700	N	50	100	50
CP007C	3	N	N	30	700	50	500	N	50	70	50
CP008C	2	N	N	30	2,000	30	700	N	100	300	200
CP009C	<2	N	N	20	700	30	500	N	50	100	20
CP010C	2	N	N	20	700	100	300	N	50	100	1,000
CP011C	2	N	N	30	2,000	100	500	100	50	150	2,000
CP012C	2	N	N	20	1,000	100	700	2,000	100	70	30,000
CP013C	2	N	N	20	700	100	300	100	150	70	1,000
CP014C	<2	50	N	30	1,000	70	500	10	100	100	100
CP015C	2	N	N	15	500	100	200	10	200	50	70
CP016C	2	N	N	20	500	70	200	10	150	50	50
CP017C	<2	N	N	30	2,000	100	200	<10	200	100	100
CP018C	2	N	N	30	1,000	100	300	N	100	100	70
CP019C	<2	20	N	15	700	30	200	N	70	70	150
CP020C	2	N	N	20	500	30	700	N	150	70	100
CP021C	2	N	N	15	700	30	200	N	100	50	20
CP022C	<2	N	N	N	70	50	300	N	100	<10	20
CP023C	3	N	N	15	300	50	200	N	70	70	30
CP024C	3	N	N	20	300	20	300	10	50	50	50
CP025C	3	N	N	20	300	30	200	N	70	30	50
CP026C	<2	N	N	30	1,000	30	100	N	70	70	20
CP027C	2	N	N	20	700	30	300	N	100	50	30
CP028C	2	N	N	20	200	50	300	N	50	50	30
CP029C	3	N	N	20	200	50	300	10	150	30	150
CP030C	2	N	N	20	500	50	1,000	N	150	50	70
CP031C	2	N	N	20	500	50	500	15	200	50	100
CP032C	2	N	N	30	1,000	30	300	N	70	70	20
CP033C	<2	N	N	50	2,000	50	200	N	50	100	30
CP034C	2	N	N	50	2,000	50	300	N	50	100	30
CP035C	<2	N	N	50	1,500	50	500	N	100	100	50
CP036C	<2	N	N	50	2,000	100	300	70	70	100	2,000
CP037C	<2	N	N	50	2,000	50	300	N	<50	100	70
CP038C	2	N	N	30	1,000	150	300	N	100	70	500
CP039C	5	N	N	30	500	70	200	N	50	70	100
CP040C	5	N	N	20	500	50	500	N	150	50	50
CP041C	2	N	N	20	700	30	500	N	70	100	30
CP042C	3	N	N	30	200	100	2,000	10	100	30	100
CP043C	3	N	N	10	200	20	300	10	100	20	200

Table 3.--Analytical data for panned concentrate samples

Sample	Sb-ppm s	Sc-ppm s	Sn-ppm s	Sr-ppm s	V-ppm s	W-ppm s	Y-ppm s	Zn-ppm s	Zr-ppm s	Th-ppm s
2165C	N	--	N	N	50	N	1,000	N	--	N
2166C	N	--	N	N	150	200	1,000	N	--	N
CP001C	N	30	N	1,000	100	N	500	N	>2,000	300
CP002C	N	20	N	700	100	N	300	N	>2,000	N
CP003C	N	20	N	700	200	N	300	N	>2,000	<200
CP004C	N	20	N	700	150	N	500	N	>2,000	<200
CP005C	N	50	20	700	200	700	500	N	>2,000	1,000
CP006C	N	30	20	500	150	300	300	N	>2,000	500
CP007C	N	20	N	1,000	200	N	200	N	>2,000	500
CP008C	N	50	30	500	200	200	200	N	>2,000	500
CP009C	N	30	<20	1,000	150	N	500	N	>2,000	N
CP010C	N	30	N	500	200	300	200	N	>2,000	<200
CP011C	N	50	30	500	200	200	300	N	>2,000	1,000
CP012C	N	50	50	700	200	1,500	500	N	>2,000	1,000
CP013C	N	30	20	700	200	100	200	N	>2,000	N
CP014C	N	50	<20	700	200	500	200	N	>2,000	<200
CP015C	N	30	30	700	200	N	300	N	>2,000	<200
CP016C	N	20	30	700	150	N	300	N	>2,000	N
CP017C	N	50	30	1,000	100	N	700	N	>2,000	200
CP018C	N	50	20	500	100	300	200	N	>2,000	500
CP019C	N	50	20	500	100	<100	1,000	N	>2,000	200
CP020C	N	50	<20	300	100	150	500	N	>2,000	1,000
CP021C	N	50	N	200	100	N	700	N	>2,000	N
CP022C	N	30	20	200	100	N	1,000	N	>2,000	N
CP023C	N	20	N	500	100	N	200	N	>2,000	N
CP024C	N	20	N	500	100	100	200	N	>2,000	200
CP025C	N	20	N	500	100	N	200	N	>2,000	<200
CP026C	N	50	N	500	100	200	150	N	>2,000	N
CP027C	N	50	N	500	100	N	300	N	1,000	<200
CP028C	N	20	N	500	100	200	200	N	>2,000	<200
CP029C	N	50	150	700	150	N	1,000	N	>2,000	200
CP030C	N	30	20	700	150	300	500	N	>2,000	300
CP031C	N	50	50	1,000	150	N	500	N	>2,000	300
CP032C	N	50	20	500	150	N	200	N	>2,000	<200
CP033C	N	70	30	500	200	N	150	N	>2,000	N
CP034C	N	50	30	500	200	<100	200	N	>2,000	200
CP035C	N	150	20	500	150	150	200	N	>2,000	200
CP036C	N	70	20	500	300	200	150	N	>2,000	<200
CP037C	N	150	20	500	200	100	150	N	>2,000	<200
CP038C	N	30	N	500	150	200	200	N	>2,000	<200
CP039C	N	50	N	500	200	N	150	N	>2,000	N
CP040C	N	50	N	500	200	N	300	N	>2,000	<200
CP041C	N	30	N	300	150	N	200	N	>2,000	N
CP042C	N	50	N	300	100	300	500	N	>2,000	1,000
CP043C	N	70	20	500	100	N	500	N	>2,000	500

Table 3.__Analytical data for panned concentrate samples--continued

Sample	Latitude	Longitude	Fe-pct. s	Mg-pct. s	Ca-pct. s	Ti-pct. s	Mn-ppm s	Ag-ppm s	As-ppm s	Au-ppm s	B-ppm s	Ba-ppm s
CP044C	34 32 5	114 14 10	3.0	2.0	15.0	2.0	700	N	N	N	<20	10,000
CP045C	34 32 35	114 13 24	3.0	2.0	15.0	1.5	1,000	N	N	N	<20	1,500
CP046C	34 32 35	114 12 36	5.0	5.0	10.0	1.0	1,000	N	N	N	<20	>10,000
CP047C	34 33 8	114 12 36	3.0	3.0	15.0	2.0	1,000	N	N	N	20	5,000
CP048C	34 33 2	114 12 37	2.0	1.5	10.0	2.0	500	N	N	N	30	1,000
CP049C	34 33 4	114 13 31	3.0	3.0	15.0	1.5	500	700	N	>1,000	20	>10,000
CP050C	34 32 55	114 14 40	2.0	1.5	7.0	1.5	300	N	N	N	<20	>10,000
CP051C	34 25 33	114 12 10	2.0	2.0	10.0	>2.0	700	N	N	N	30	5,000
CP052C	34 26 18	114 11 48	5.0	5.0	15.0	2.0	700	N	N	N	20	700
CP053C	34 33 18	114 16 36	5.0	3.0	10.0	1.5	1,000	N	N	N	20	2,000
CP054C	34 34 1	114 16 15	5.0	3.0	10.0	1.5	700	N	N	N	20	7,000
CP055C	34 34 5	114 16 45	5.0	3.0	15.0	2.0	700	N	N	N	20	10,000
CP056C	34 34 17	114 17 39	5.0	3.0	20.0	.7	1,000	N	N	N	<20	1,000
CP057C	34 34 34	114 17 59	3.0	3.0	20.0	2.0	700	N	N	N	30	1,500
CP058C	34 34 54	114 18 14	3.0	2.0	15.0	2.0	1,000	N	N	N	20	1,000
CP059C	34 35 0	114 18 46	3.0	2.0	30.0	>2.0	700	N	N	N	20	10,000
CP2138C	34 33 40	114 9 0	.5	1.0	30.0	>2.0	1,000	N	N	N	20	1,000
CP2139C	34 33 35	114 9 40	.5	1.5	30.0	>2.0	1,000	N	N	N	20	500
CP2140C	34 33 40	114 9 40	.5	1.5	30.0	>2.0	1,000	N	N	N	30	300
CP2141C	34 34 10	114 10 15	.7	2.0	20.0	>2.0	700	N	N	N	30	500
CP2142C	34 33 45	114 10 20	.7	1.0	15.0	>2.0	500	N	N	N	20	500
CP2143C	34 33 45	114 11 20	.5	.7	15.0	>2.0	500	N	N	N	30	300
CP2144C	34 33 40	114 11 30	.7	1.5	15.0	>2.0	500	5	N	N	20	700
CP2145C	34 34 15	114 9 30	.7	1.0	15.0	>2.0	300	2	N	N	20	1,000
CP2146C	34 35 0	114 7 40	.2	1.0	30.0	1.5	700	N	N	N	<20	300
CP2101C	34 31 10	114 14 10	1.0	.5	30.0	2.0	1,000	70	N	N	50	>10,000
CP2102C	34 31 35	114 13 50	.2	.2	50.0	1.0	500	N	N	N	20	>10,000
CP2103C	34 31 35	114 13 45	.2	.3	30.0	1.0	700	N	N	N	20	>10,000
CP2104C	34 31 33	114 13 49	.7	.7	50.0	1.5	1,000	N	N	N	70	>10,000
CP2105C	34 31 30	114 14 10	1.0	1.0	30.0	>2.0	1,500	N	N	N	70	>10,000
CP2106C	34 31 45	114 12 50	1.0	.5	50.0	2.0	1,500	N	N	N	20	3,000
CP2113C	34 34 30	114 12 45	2.0	1.5	15.0	>2.0	500	7	N	N	30	2,000
CP2114C	34 34 25	114 12 45	1.0	.7	30.0	2.0	700	N	N	N	30	10,000
CP2116C	34 35 15	114 11 40	3.0	1.5	20.0	>2.0	700	20	N	N	50	1,500
CP2117C	34 35 30	114 11 20	1.0	.7	30.0	2.0	700	N	N	N	30	2,000
CP2118C	34 36 20	114 10 50	.7	.5	50.0	>2.0	700	N	N	N	30	1,000
CP2124C	34 32 20	114 11 55	1.0	1.0	30.0	>2.0	1,000	5	N	N	30	2,000
CP2125C	34 32 25	114 11 55	1.0	1.0	20.0	>2.0	1,000	10	N	N	30	1,000
CP2137C	34 33 5	114 12 55	3.0	1.0	20.0	>2.0	1,000	N	N	N	50	1,500

Table 3.__Analytical data for panned concentrate samples--continued

Sample	Be-ppm s	Bi-ppm s	Cd-ppm s	Co-ppm s	Cr-ppm s	Cu-ppm s	La-ppm s	Mo-ppm s	Nb-ppm s	Ni-ppm s	Pb-ppm s
CP044C	2	N	N	20	700	700	1,000	20	100	50	1,500
CP045C	5	N	N	30	150	30	700	30	100	50	300
CP046C	5	N	N	30	700	50	300	20	70	100	300
CP047C	3	N	N	30	700	70	200	N	50	100	3,000
CP048C	5	N	N	20	300	50	300	N	70	50	3,000
CP049C	2	N	N	20	700	50	300	30	70	70	2,000
CP050C	3	N	N	15	300	50	500	30	50	50	100
CP051C	2	N	N	15	300	30	200	10	100	30	50
CP052C	<2	N	N	30	1,000	50	500	N	70	100	100
CP053C	5	N	N	30	700	70	700	N	50	100	100
CP054C	5	N	N	30	1,000	50	300	N	100	100	50
CP055C	5	50	N	30	700	50	300	N	100	100	100
CP056C	3	N	N	30	700	50	300	N	N	100	200
CP057C	3	200	N	30	1,000	50	300	N	50	100	100
CP058C	3	N	N	15	500	30	300	N	70	50	70
CP059C	3	N	N	20	700	30	300	10	100	70	100
CP2138C	N	N	N	<10	150	30	300	10	70	10	100
CP2139C	N	150	N	10	200	20	300	20	70	15	100
CP2140C	N	N	N	<10	300	30	200	<10	<50	10	200
CP2141C	N	500	N	10	700	50	500	100	50	20	500
CP2142C	N	100	N	N	200	10	100	10	50	10	500
CP2143C	N	20	N	N	200	10	150	10	50	15	700
CP2144C	N	150	N	<10	150	20	150	50	70	15	50,000
CP2145C	N	2,000	N	<10	100	<10	150	15	50	15	300
CP2146C	N	N	N	N	150	N	500	<10	N	10	100
CP2101C	N	N	N	10	100	200	500	15	N	15	30,000
CP2102C	N	N	N	N	50	N	300	N	<50	N	2,000
CP2103C	N	<20	N	N	70	N	500	N	N	10	300
CP2104C	N	N	N	N	100	<10	500	N	N	10	7,000
CP2105C	N	N	N	10	200	<10	700	N	N	15	500
CP2106C	N	N	N	10	70	<10	700	N	N	10	300
CP2113C	N	N	N	10	300	70	500	100	50	20	7,000
CP2114C	N	N	N	10	100	10	700	150	50	10	7,000
CP2116C	10	N	N	10	700	15	700	10	70	30	300
CP2117C	N	70	N	N	70	15	1,000	N	50	15	200
CP2118C	N	N	N	N	100	N	2,000	N	70	10	70
CP2124C	N	N	N	10	200	10	1,500	1,000	100	20	30,000
CP2125C	N	N	N	10	200	15	500	100	70	20	50,000
CP2137C	N	N	N	15	500	20	500	N	70	30	1,000

Table 3.__Analytical data for panned concentrate samples--continued

Sample	Sb-ppm s	Sc-ppm s	Sn-ppm s	Sr-ppm s	V-ppm s	W-ppm s	Y-ppm s	Zn-ppm s	Zr-ppm s	Th-ppm s
CP044C	N	70	100	200	150	N	1,500	N	>2,000	500
CP045C	N	30	20	200	150	300	1,000	N	>2,000	3,000
CP046C	N	30	20	N	150	500	500	N	>2,000	700
CP047C	N	50	N	500	100	200	200	N	>2,000	N
CP048C	N	20	N	500	100	300	200	N	>2,000	200
CP049C	N	30	N	1,000	100	700	500	N	>2,000	2,000
CP050C	N	15	N	1,000	100	500	300	N	>2,000	1,000
CP051C	N	30	30	1,500	150	N	200	N	>2,000	<200
CP052C	N	50	30	700	200	N	200	N	>2,000	1,000
CP053C	N	50	N	500	200	N	300	N	2,000	700
CP054C	N	50	30	500	200	N	100	N	2,000	N
CP055C	N	50	100	700	200	N	150	N	>2,000	N
CP056C	N	50	N	700	100	200	500	N	>2,000	<200
CP057C	N	50	20	700	150	N	500	N	>2,000	<200
CP058C	N	30	N	700	100	N	500	N	>2,000	N
CP059C	N	50	50	1,000	150	150	1,000	N	>2,000	<200
CP2138C	N	--	30	500	100	100	5,000	N	--	N
CP2139C	N	--	20	500	70	500	3,000	N	--	300
CP2140C	N	--	50	500	100	200	2,000	N	--	<200
CP2141C	N	--	30	500	150	1,000	1,500	N	--	N
CP2142C	N	--	20	200	150	1,000	1,000	N	--	N
CP2143C	N	--	20	200	150	700	1,000	N	--	N
CP2144C	N	--	<20	200	150	1,000	1,500	N	--	N
CP2145C	N	--	<20	200	100	2,000	700	N	--	N
CP2146C	N	--	N	200	100	<100	5,000	N	--	200
CP2101C	500	--	30	N	200	N	3,000	2,000	--	300
CP2102C	N	--	N	3,000	300	N	1,000	N	--	N
CP2103C	N	--	N	5,000	70	N	3,000	N	--	<200
CP2104C	N	--	N	7,000	500	N	3,000	N	--	N
CP2105C	N	--	N	3,000	100	N	5,000	N	--	200
CP2106C	N	--	N	N	100	N	>5,000	N	--	N
CP2113C	N	--	N	200	300	200	700	N	--	N
CP2114C	N	--	N	200	100	2,000	3,000	700	--	<200
CP2116C	N	--	N	200	700	500	500	N	--	N
CP2117C	N	--	N	5,000	200	2,000	500	N	--	N
CP2118C	N	--	N	5,000	200	<100	700	N	--	N
CP2124C	N	--	70	N	1,000	500	>5,000	N	--	1,000
CP2125C	N	--	N	200	200	>20,000	1,500	N	--	<200
CP2137C	N	--	N	200	500	150	700	N	--	N

Table 4.--Analytical data for rock samples

Sample	Latitude	Longitude	Fe-pct. s	Mg-pct. s	Ca-pct. s	Ti-pct. s	Mn-ppm s	Ag-ppm s	As-ppm s	Au-ppm s	B-ppm s
CP007R	34 32 54	114 11 41	10.0	.15	.10	.030	700	100.0	1,500	100	50
CP007RA	34 32 56	114 11 38	1.5	.20	.20	.070	200	50.0	N	N	30
CP007RB	34 32 56	114 11 38	5.0	.05	<.05	.050	20	5.0	300	N	20
CP007RC	34 32 56	114 11 38	7.0	.10	<.05	.200	100	70.0	1,000	70	30
CP007RD	34 32 58	114 11 36	15.0	.50	.20	.200	300	50.0	700	150	50
CP008R	34 32 16	114 10 3	5.0	2.00	15.00	.020	5,000	3.0	N	N	<10
CP008RA	34 32 16	114 10 3	.3	.05	.20	.015	70	10.0	N	N	10
CP008RB	34 32 19	114 10 2	.5	.10	.70	.005	100	2.0	N	N	<10
CP009R	34 32 13	114 9 29	3.0	.50	.50	.100	300	2.0	N	N	10
CP009RA	34 32 13	114 9 29	7.0	.50	.70	.300	150	1.0	N	N	15
CP009RB	34 32 16	114 9 27	7.0	.10	.20	.500	50	<.5	N	N	10
CP009RC	34 32 16	114 9 27	7.0	.15	.70	.500	100	N	N	N	20
CP010R	34 31 11	114 14 2	7.0	2.00	.50	.700	>5,000	70.0	N	N	30
CP010RA	34 31 11	114 14 2	7.0	1.00	.30	.500	1,000	5.0	N	N	100
CP010RB	34 31 11	114 14 2	.7	.15	.50	.200	700	N	N	N	15
CP011R	34 34 44	114 17 6	7.0	<.02	.05	.005	70	20.0	N	50	20
CP011RA	34 34 44	114 17 6	.5	.50	.30	.002	3,000	3.0	N	N	15
CP011RB	34 34 48	114 17 3	2.0	1.00	.10	.100	1,500	7.0	N	N	20
CP011RC	34 34 46	114 17 3	3.0	.30	20.00	.150	>5,000	50.0	2,000	N	200
CP009RD	34 32 16	114 9 27	7.0	.30	.20	.700	100	N	N	N	20
CP2172R1	34 32 25	114 15 15	10.0	5.00	10.00	>1.000	5,000	N	N	N	10
CP2172R2	34 32 25	114 15 15	1.5	.50	5.00	.150	300	N	N	N	20
CP2173R	34 33 30	114 13 55	7.0	7.00	15.00	1.000	>5,000	N	N	N	10
CP2174R	34 33 35	114 14 10	10.0	2.00	10.00	>1.000	>5,000	N	N	N	20
CP2175R	34 13 15	114 15 10	1.0	.30	2.00	.100	500	N	N	N	20
CP2176R	34 13 40	114 15 25	10.0	1.00	3.00	>1.000	5,000	N	N	N	10
CP2177R1	34 33 45	114 15 45	5.0	1.50	7.00	.200	3,000	N	N	N	20
CP2177R2	34 33 45	114 15 45	.7	.30	.20	.070	300	N	N	N	10
CP2178R	34 33 40	114 16 0	7.0	1.50	.70	1.000	1,000	N	N	N	20
CP2179R	34 29 35	114 11 50	10.0	1.50	3.00	>1.000	700	N	N	N	15
CP2180R	34 29 55	114 11 20	5.0	1.00	.20	.500	1,500	N	N	N	20
CP2181R	34 31 0	114 11 10	.7	.20	1.00	.070	200	N	N	N	10
CP2182R	34 30 55	114 12 0	5.0	1.00	2.00	.500	1,500	N	N	N	20
CP2183R	34 30 45	114 11 0	5.0	1.00	2.00	.500	1,000	N	N	N	20
CP2184R	34 31 25	114 10 50	1.5	.30	1.50	.050	1,500	N	N	N	30
CP2185R	34 30 50	114 10 35	10.0	10.00	20.00	1.000	>5,000	N	N	N	500
CP2186R	34 30 5	114 10 10	10.0	5.00	15.00	>1.000	>5,000	N	N	N	20
CP2187R	34 30 55	114 10 5	5.0	1.00	2.00	.300	1,500	N	N	N	20
CP2188R	34 30 20	114 9 55	7.0	3.00	1.50	.700	2,000	N	N	N	30
CP2189R	34 29 10	114 9 15	15.0	2.00	3.00	>1.000	2,000	N	N	N	30
CP2190R	34 29 0	114 9 20	10.0	2.00	5.00	>1.000	3,000	N	N	N	30
CP2191R	34 28 35	114 9 30	20.0	2.00	7.00	>1.000	5,000	N	N	N	30
CP2106R	34 31 45	114 12 50	3.0	.50	3.00	.500	700	N	N	N	20
CP2107R	34 34 20	114 13 15	5.0	.30	.10	.150	150	50.0	N	N	20
CP2108R	34 34 25	114 13 15	20.0	10.00	20.00	>1.000	>5,000	.7	N	N	20

Table 4.__Analytical data for rock samples

Sample	Ba-ppm s	Be-ppm s	Bi-ppm s	Cd-ppm s	Co-ppm s	Cr-ppm s	Cu-ppm s	La-ppm s	Mo-ppm s	Nb-ppm s
CP007R	150	N	N	N	5	50	700	20	10	N
CP007RA	200	<5	N	500	10	N	3,000	70	N	N
CP007RB	100	N	N	N	15	N	50	50	N	N
CP007RC	200	N	N	N	N	10	150	70	7	N
CP007RD	100	N	N	N	10	70	500	50	N	N
CP008R	50	N	N	70	5	30	300	50	5	<20
CP008RA	30	N	N	300	N	10	15	50	N	N
CP008RB	20	N	N	150	N	10	15	50	N	<20
CP009R	150	N	N	N	50	30	15,000	N	N	N
CP009RA	500	N	10	N	70	70	300	N	N	N
CP009RB	70	N	N	N	150	50	50	N	N	N
CP009RC	500	N	N	N	15	30	30	N	N	N
CP010R	1,500	5	N	150	150	150	20,000	70	5	<20
CP010RA	1,000	5	N	50	20	10	5,000	70	N	20
CP010RB	500	5	N	N	N	N	30	70	N	<20
CP011R	50	N	100	N	N	N	100	50	50	N
CP011RA	30	10	N	20	10	N	1,000	300	N	N
CP011RB	500	7	N	N	N	N	15,000	200	N	<20
CP011RC	>5,000	15	N	N	30	10	500	100	500	N
CP009RD	500	N	N	N	15	10	50	50	N	<20
CP2172R1	300	N	N	N	50	30	50	100	N	<20
CP2172R2	500	N	N	N	N	10	5	70	N	N
CP2173R	300	N	N	N	100	1,500	30	50	N	N
CP2174R	700	N	N	N	30	100	150	150	N	20
CP2175R	100	<5	N	N	N	20	<5	100	N	<20
CP2176R	1,000	<5	N	N	10	10	100	200	N	30
CP2177R1	1,000	5	N	N	10	70	10	300	N	<20
CP2177R2	500	<5	N	N	5	N	<5	500	N	N
CP2178R	2,000	N	N	N	N	20	7	200	N	30
CP2179R	200	5	N	N	15	20	5	500	N	50
CP2180R	5,000	N	N	N	N	20	10	200	N	20
CP2181R	500	N	N	N	N	N	N	100	5	N
CP2182R	2,000	N	N	N	5	N	7	300	N	<20
CP2183R	2,000	N	N	N	5	10	7	300	N	<20
CP2184R	1,500	N	N	N	N	10	5	200	N	N
CP2185R	1,000	N	N	N	100	2,000	300	50	N	N
CP2186R	2,000	N	N	N	70	150	200	100	N	N
CP2187R	1,000	N	N	N	N	10	5	200	N	<20
CP2188R	700	<5	N	N	20	200	10	200	N	<20
CP2189R	2,000	<5	N	N	20	50	50	300	N	30
CP2190R	5,000	<5	N	N	20	50	30	200	N	30
CP2191R	5,000	N	N	N	20	50	30	200	N	20
CP2106R	1,500	N	N	N	N	10	5	200	N	20
CP2107R	200	N	<10	N	15	30	5,000	100	5	N
CP2108R	100	N	N	N	70	700	200	50	N	<20

Table 4.__Analytical data for rock samples

Sample	Ni-ppm s	Pb-ppm s	Sb-ppm s	Sc-ppm s	Sn-ppm s	Sr-ppm s	V-ppm s	W-ppm s	Y-ppm s	Zn-ppm s
CP007R	7	7,000	N	--	N	N	50	N	10	1,500
CP007RA	10	3,000	N	--	N	N	10	N	15	>10,000
CP007RB	10	1,000	N	--	N	N	<10	N	N	700
CP007RC	5	5,000	N	--	N	N	50	100	30	300
CP007RD	30	3,000	N	--	N	N	70	N	10	2,000
CP008R	10	1,500	N	--	N	200	100	700	30	700
CP008RA	N	5,000	N	--	N	N	50	300	N	1,500
CP008RB	N	2,000	N	--	N	N	10	1,000	N	1,000
CP009R	20	50	N	--	N	N	50	N	20	N
CP009RA	20	50	N	--	N	200	100	N	10	N
CP009RB	20	10	N	--	N	N	50	N	10	N
CP009RC	10	150	N	--	N	100	100	N	10	N
CP010R	70	5,000	N	--	N	100	150	N	50	>10,000
CP010RA	20	300	N	--	N	N	70	N	70	>10,000
CP010RB	N	50	N	--	N	100	<10	N	15	200
CP011R	N	10,000	N	--	N	N	<10	N	15	200
CP011RA	15	200	N	--	N	N	<10	N	100	>10,000
CP011RB	N	150	N	--	N	N	30	N	50	>10,000
CP011RC	20	10,000	N	--	N	5,000	200	50	20	300
CP009RD	7	N	N	--	N	100	50	N	10	N
CP2172R1	15	N	N	--	N	300	700	N	100	N
CP2172R2	N	50	N	--	N	500	50	N	10	N
CP2173R	200	10	N	--	N	700	500	N	30	N
CP2174R	20	20	N	--	N	500	150	N	100	N
CP2175R	N	150	N	--	N	N	20	N	70	N
CP2176R	N	100	N	--	N	100	15	N	100	N
CP2177R1	30	20	N	--	N	100	50	N	70	<200
CP2177R2	N	70	N	--	N	N	50	N	50	N
CP2178R	N	100	N	--	N	100	30	N	200	N
CP2179R	5	N	N	--	N	200	200	N	200	N
CP2180R	N	10	N	--	N	N	20	N	150	N
CP2181R	N	200	N	--	N	N	20	N	10	N
CP2182R	5	20	N	--	N	100	15	N	100	N
CP2183R	5	10	N	--	N	100	20	N	50	N
CP2184R	N	70	N	--	N	N	20	N	200	N
CP2185R	200	N	N	--	N	500	500	N	150	<200
CP2186R	30	10	N	--	N	700	700	N	70	300
CP2187R	5	70	N	--	N	100	20	N	100	<200
CP2188R	30	100	N	--	N	300	150	N	100	N
CP2189R	15	100	N	--	N	500	300	N	200	200
CP2190R	15	100	N	--	N	500	200	N	150	200
CP2191R	15	70	N	--	N	700	200	N	150	300
CP2106R	5	70	N	--	N	300	70	N	30	N
CP2107R	30	10,000	N	--	N	N	300	N	15	N
CP2108R	150	200	N	--	N	1,000	200	N	30	<200

Table 4.__Analytical data for rock samples

Sample	Zr-ppm s	Th-ppm s	Au-ppm aa	Hg-ppm inst	As-ppm aa	Zn-ppm aa	Cd-ppm aa	Bi-ppm aa	Sb-ppm aa
CP007R	--	N	--	--	--	--	--	--	--
CP007RA	--	N	--	--	--	--	--	--	--
CP007RB	--	N	--	--	--	--	--	--	--
CP007RC	--	N	--	--	--	--	--	--	--
CP007RD	--	N	--	--	--	--	--	--	--
CP008R	--	N	--	--	--	--	--	--	--
CP008RA	--	N	--	--	--	--	--	--	--
CP008RB	--	N	--	--	--	--	--	--	--
CP009R	--	N	--	--	--	--	--	--	--
CP009RA	--	N	--	--	--	--	--	--	--
CP009RB	--	N	--	--	--	--	--	--	--
CP009RC	--	N	--	--	--	--	--	--	--
CP010R	--	N	--	--	--	--	--	--	--
CP010RA	--	N	--	--	--	--	--	--	--
CP010RB	--	N	--	--	--	--	--	--	--
CP011R	--	N	--	--	--	--	--	--	--
CP011RA	--	N	--	--	--	--	--	--	--
CP011RB	--	N	--	--	--	--	--	--	--
CP011RC	--	N	--	--	--	--	--	--	--
CP009RD	--	N	--	--	--	--	--	--	--
CP2172R1	--	N	N	<.02	N	35	N	N	N
CP2172R2	--	N	N	N	N	5	N	N	N
CP2173R	--	N	N	<.02	N	15	N	N	N
CP2174R	--	N	N	<.02	N	50	N	2	N
CP2175R	--	N	N	<.02	N	20	N	<2	N
CP2176R	--	N	N	<.02	N	170	.1	N	N
CP2177R1	--	N	N	<.02	N	110	.2	<2	N
CP2177R2	--	<100	N	<.02	N	5	N	N	N
CP2178R	--	N	N	<.02	N	45	N	N	N
CP2179R	--	N	N	.02	N	20	N	N	N
CP2180R	--	N	N	.04	<10	130	N	2	N
CP2181R	--	N	N	.04	N	5	N	N	N
CP2182R	--	N	N	.02	N	100	N	N	N
CP2183R	--	N	N	.02	N	30	N	N	N
CP2184R	--	N	<.05	.02	N	10	N	N	N
CP2185R	--	N	N	.04	N	30	.1	N	N
CP2186R	--	N	N	.06	N	100	.1	<2	N
CP2187R	--	N	N	<.02	N	70	N	N	N
CP2188R	--	N	N	<.02	N	50	N	2	N
CP2189R	--	N	N	<.02	<10	120	N	<2	N
CP2190R	--	N	N	<.02	N	90	N	N	N
CP2191R	--	N	N	.02	N	110	.1	N	N
CP2106R	--	N	N	.02	N	10	N	N	N
CP2107R	--	N	11.50	.02	<10	60	.4	N	2
CP2108R	--	N	<.05	.02	N	40	N	N	N

Table 4.--Analytical data for rock samples--continued

Sample	Latitude	Longitude	Fe-pct. s	Mg-pct. s	Ca-pct. s	Ti-pct. s	Mn-ppm s	Ag-ppm s	As-ppm s	Au-ppm s	B-ppm s
CP2109R	34 34 25	114 13 15	2.0	.50	.70	.050	1,500	.5	N	N	30
CP2110R	34 34 25	114 13 15	10.0	7.00	20.00	>1.000	2,000	N	N	N	20
CP2111R	34 34 30	114 13 0	.7	.70	1.00	.070	150	N	N	N	100
CP2112R	34 34 45	114 12 45	1.5	.10	.05	.020	50	30.0	N	N	20
CP2113R	34 34 30	114 12 45	7.0	1.00	2.00	.500	2,000	3.0	N	N	20
CP2115R	34 34 50	114 12 20	.2	.10	1.00	.015	70	N	N	N	10
CP2116R	34 36 20	114 10 50	7.0	3.00	7.00	.500	2,000	N	N	N	15
CP2119R	34 32 35	114 13 30	10.0	1.00	5.00	.700	3,000	N	N	N	20
CP2120R	34 32 25	114 13 20	5.0	1.00	3.00	.500	2,000	N	N	N	30
CP2121R	34 32 20	114 13 10	2.0	.70	1.00	.300	300	N	N	N	20
CP2122R	34 32 20	114 13 10	5.0	1.50	3.00	1.000	2,000	N	N	N	20
CP2123R	34 32 25	114 13 10	10.0	10.00	20.00	>1.000	5,000	<.5	N	N	20
CP2124R	34 32 20	114 11 55	5.0	.70	5.00	.700	1,000	N	N	N	15
CP2125R	34 32 25	114 11 55	5.0	1.50	7.00	1.000	1,500	N	N	N	15
CP2126R	34 32 45	114 14 10	1.5	.20	.50	.200	300	N	N	N	20
CP2127R	34 33 5	114 12 55	7.0	1.00	1.00	.500	2,000	N	N	N	20
CP2128R	34 33 0	114 12 20	5.0	1.50	.70	.300	1,500	N	N	N	15
CP2129R	34 33 5	114 11 40	7.0	.50	.70	.500	1,000	N	N	N	20
CP2130R	34 32 55	114 11 20	20.0	10.00	20.00	>1.000	>5,000	N	N	N	10
CP2131R	34 33 0	114 10 50	15.0	7.00	15.00	>1.000	5,000	N	N	N	30
CP2132R	34 32 55	114 10 35	.7	.10	.50	.050	100	N	N	N	20
CP2133R	34 32 55	114 10 30	.3	.20	.50	.070	100	N	N	N	50
CP2134R	34 32 50	114 10 15	.2	.10	1.00	.030	70	N	N	N	50
CP2135R	34 32 35	114 9 25	7.0	2.00	1.00	.700	1,000	N	N	N	10
CP2136R	34 32 15	114 9 25	5.0	.10	.30	.300	50	.5	N	N	10
CP2139R	34 33 35	114 9 40	7.0	2.00	1.00	1.000	1,000	N	N	N	30
CP2142R	34 33 45	114 10 20	7.0	.70	.50	.500	1,000	N	N	N	20
CP2144R	34 33 40	114 11 30	3.0	.30	.30	.300	700	N	N	N	20
CP2145R	34 34 15	114 9 30	5.0	1.00	5.00	.500	500	N	N	N	50
CP2146R	34 35 0	114 17 40	.2	.10	1.50	.007	70	N	N	N	15
CP2147R1	34 34 50	114 16 35	10.0	.02	.10	.005	15	5.0	N	N	20
CP2147R2	34 34 50	114 16 35	1.0	.50	.15	.100	300	10.0	N	N	15
CP2161R	34 31 35	114 5 5	.2	.10	1.00	.030	100	N	N	N	10
CP2162R	34 31 55	114 6 0	10.0	7.00	1.00	>1.000	3,000	N	N	N	20
CP2163R	34 32 15	114 6 10	3.0	.70	7.00	.700	500	N	N	N	15
CP2164R	34 32 35	114 5 30	10.0	7.00	10.00	>1.000	2,000	N	N	N	20
CP2166R	34 33 30	114 6 15	5.0	1.00	5.00	.500	700	N	N	N	30
CP2167R	34 33 30	114 7 10	10.0	10.00	10.00	>1.000	2,000	N	N	N	30
CP2168R	34 33 40	114 6 30	2.0	.30	.70	.300	500	N	N	N	30
CP2169R	34 33 40	114 6 45	10.0	10.00	15.00	.500	2,000	N	N	N	30
CP2170R	34 33 40	114 6 50	2.0	.50	1.00	.200	500	N	N	N	10
CP2171R	34 33 30	114 7 5	1.5	.30	1.00	.150	200	N	N	N	10

Table 4.__Analytical data for rock samples--continued

Sample	Ba-ppm s	Be-ppm s	Bi-ppm s	Cd-ppm s	Co-ppm s	Cr-ppm s	Cu-ppm s	La-ppm s	Mo-ppm s	Nb-ppm s
CP2109R	300	N	N	N	5	20	20	100	N	70
CP2110R	500	N	N	N	50	700	100	100	N	<20
CP2111R	1,000	<5	N	N	N	20	5	100	N	N
CP2112R	150	N	15	N	20	20	1,000	100	70	N
CP2113R	500	5	N	N	10	10	500	200	N	20
CP2115R	200	N	N	N	N	N	5	100	N	N
CP2118R	300	N	N	N	20	N	10	50	N	N
CP2119R	500	7	N	N	15	70	10	200	N	30
CP2120R	1,000	<5	N	N	10	30	7	200	N	20
CP2121R	1,000	N	N	N	5	30	<5	100	N	N
CP2122R	2,000	5	N	N	10	30	<5	200	N	20
CP2123R	1,000	N	N	N	70	700	200	100	N	20
CP2124R	2,000	N	N	N	10	50	N	150	<5	<20
CP2125R	2,000	N	N	N	15	50	N	200	N	20
CP2126R	1,000	7	N	N	N	N	5	500	N	30
CP2127R	2,000	N	N	N	5	50	10	300	15	20
CP2128R	2,000	<5	N	N	N	10	50	500	N	20
CP2129R	2,000	N	N	N	N	10	10	200	N	<20
CP2130R	200	N	N	N	200	700	30	50	N	N
CP2131R	700	N	N	N	150	1,500	150	50	N	N
CP2132R	700	N	N	N	N	30	<5	300	N	N
CP2133R	500	N	N	N	N	10	7	100	N	N
CP2134R	300	N	N	N	N	10	N	50	N	N
CP2135R	1,000	N	N	N	15	150	10	200	N	20
CP2136R	200	N	N	N	15	30	<5	70	N	<20
CP2139R	500	N	N	N	20	200	<5	200	N	<20
CP2142R	1,000	N	N	N	N	20	5	300	N	20
CP2144R	700	5	N	N	N	10	N	500	N	30
CP2145R	1,500	5	N	N	10	100	7	100	N	N
CP2146R	500	10	N	N	N	10	N	100	N	<20
CP2147R1	50	N	20	N	5	10	20	50	7	N
CP2147R2	700	N	N	N	N	N	10	200	N	<20
CP2161R	500	N	N	N	5	N	N	150	N	N
CP2162R	2,000	N	N	N	30	500	7	1,000	N	20
CP2163R	50	N	N	N	5	N	N	150	N	20
CP2164R	700	N	N	N	70	70	70	200	N	<20
CP2166R	1,000	<5	N	N	10	30	7	100	N	<20
CP2167R	700	N	N	N	70	700	200	200	N	20
CP2168R	2,000	5	N	N	N	N	15	200	N	N
CP2169R	2,000	N	N	N	100	700	150	50	N	N
CP2170R	2,000	N	N	N	5	10	5	200	N	N
CP2171R	3,000	N	N	N	5	10	10	100	N	N

Table 4.--Analytical data for rock samples--continued

Sample	Ni-ppm s	Pb-ppm s	Sb-ppm s	Sc-ppm s	Sn-ppm s	Sr-ppm s	V-ppm s	W-ppm s	Y-ppm s	Zn-ppm s
CP2109R	10	300	N	--	N	100	20	N	70	N
CP2110R	70	70	N	--	N	2,000	200	N	50	N
CP2111R	10	100	N	--	N	700	30	N	10	N
CP2112R	20	15,000	N	--	N	N	200	N	70	N
CP2113R	10	1,500	N	--	N	N	20	N	100	1,000
CP2115R	N	200	N	--	N	N	10	N	N	N
CP2118R	7	100	N	--	N	200	100	N	50	N
CP2119R	10	150	N	--	N	300	70	N	300	N
CP2120R	15	200	N	--	N	1,500	100	N	50	N
CP2121R	5	70	N	--	N	500	70	N	10	N
CP2122R	10	100	N	--	N	1,000	100	N	30	N
CP2123R	200	70	N	--	N	2,000	300	N	50	<200
CP2124R	20	150	N	--	N	700	100	N	30	N
CP2125R	20	150	N	--	N	1,000	100	N	30	N
CP2126R	5	70	N	--	N	100	10	N	30	N
CP2127R	10	100	N	--	N	200	15	N	50	N
CP2128R	20	150	N	--	N	100	15	N	70	<200
CP2129R	5	30	N	--	N	100	10	N	50	N
CP2130R	150	N	N	--	N	1,000	500	N	70	<200
CP2131R	300	10	N	--	N	2,000	700	N	70	200
CP2132R	5	50	N	--	N	100	20	N	300	N
CP2133R	5	50	N	--	N	N	20	N	20	N
CP2134R	5	10	N	--	N	100	15	N	20	N
CP2135R	20	50	N	--	N	200	100	N	50	N
CP2136R	5	N	N	--	N	100	20	N	N	N
CP2139R	20	100	N	--	N	300	150	N	70	N
CP2142R	7	20	N	--	N	100	15	N	70	N
CP2144R	5	70	N	--	N	100	20	N	50	N
CP2145R	20	50	N	--	N	3,000	70	N	15	N
CP2146R	5	150	N	--	N	100	15	N	100	N
CP2147R1	5	500	N	--	N	N	100	N	N	<200
CP2147R2	N	200	N	--	N	N	30	N	50	N
CP2161R	5	70	N	--	N	N	20	N	20	N
CP2162R	100	150	N	--	N	N	200	N	>2,000	N
CP2163R	7	N	N	--	N	700	50	N	200	N
CP2164R	50	20	N	--	N	1,000	300	N	100	N
CP2166R	15	100	N	--	N	1,500	100	N	15	N
CP2167R	200	N	N	--	N	2,000	300	N	70	<200
CP2168R	10	30	N	--	N	500	20	N	10	N
CP2169R	300	N	N	--	N	300	300	N	20	N
CP2170R	5	50	N	--	N	100	50	N	15	N
CP2171R	10	20	N	--	N	500	30	N	N	N

Table 4.--Analytical data for rock samples--continued

Sample	Zr-ppm s	Th-ppm s	Au-ppm aa	Hg-ppm inst	As-ppm aa	Zn-ppm aa	Cd-ppm aa	Bi-ppm aa	Sb-ppm aa
CP2109R	--	N	N	.02	N	5	N	N	N
CP2110R	--	N	N	N	N	55	N	2	N
CP2111R	--	N	N	.04	N	5	N	N	N
CP2112R	--	N	.95	<.02	N	20	1.7	3	2
CP2113R	--	N	<.05	<.02	<10	420	2.3	N	1
CP2115R	--	N	N	<.02	N	<5	N	N	N
CP2118R	--	N	N	.06	N	80	N	<2	N
CP2119R	--	N	N	.04	N	45	N	<2	N
CP2120R	--	N	N	.02	N	30	N	<2	N
CP2121R	--	N	N	.08	N	10	N	N	N
CP2122R	--	N	N	.02	N	40	N	N	N
CP2123R	--	N	N	.02	N	45	N	N	N
CP2124R	--	N	N	.04	N	25	N	2	N
CP2125R	--	N	N	<.02	N	30	N	N	1
CP2126R	--	N	N	<.02	N	300	N	N	N
CP2127R	--	N	N	.12	N	25	N	N	N
CP2128R	--	N	N	.04	N	70	N	N	N
CP2129R	--	N	N	.04	N	60	<.1	<2	N
CP2130R	--	N	N	<.02	N	25	N	N	N
CP2131R	--	N	N	.02	N	15	N	N	N
CP2132R	--	N	N	.02	N	N	N	N	N
CP2133R	--	N	N	.02	N	N	N	N	N
CP2134R	--	N	N	.04	N	N	N	N	N
CP2135R	--	N	N	.04	N	50	N	N	N
CP2136R	--	N	N	<.02	N	N	N	2	N
CP2139R	--	N	N	<.02	N	25	N	2	N
CP2142R	--	N	N	.02	N	40	N	N	N
CP2144R	--	N	N	<.02	N	10	N	N	N
CP2145R	--	N	N	<.02	N	30	N	N	N
CP2146R	--	N	N	.06	N	N	N	N	N
CP2147R1	--	N	3.50	<.02	N	70	.1	40	N
CP2147R2	--	N	2.00	.04	N	45	.1	N	N
CP2161R	--	N	<.05	<.02	N	N	N	2	N
CP2162R	--	200	N	.02	N	100	N	<2	N
CP2163R	--	N	N	<.02	N	10	N	N	N
CP2164R	--	N	N	.02	N	50	N	N	N
CP2166R	--	N	N	<.02	N	35	N	2	N
CP2167R	--	N	N	<.02	N	150	N	N	N
CP2168R	--	N	N	<.02	N	20	N	N	N
CP2169R	--	N	N	<.02	N	10	N	N	N
CP2170R	--	N	N	<.02	N	5	N	<2	N
CP2171R	--	N	N	<.02	N	<5	N	4	N

Table 5.--Descriptive data for rock samples, Crossman Peak WSA

Sample number	Rock type	Alteration	Remarks
CP007R	Granitic gneiss	Propylitic	Pyrite
CP007RA	Quartz vein	Sericitic	Pyrite, galena, sphalerite, chalcopyrite
CP007RB	do.	do.	Pyrite
CP007RC	do.	do.	Abundant limonitic staining
CP007RD	do.	Argillic(?)	Do.
CP008R	do.	do.	Do.
CP008RA	do.	Sericitic	Galena, sphalerite, limonite
CP008RB	do.	do.	
CP009R	do.	Argillic	
CP009RA	Granitic gneiss	do.	Abundant limonitic staining
CP009RB	do.	do.	Pyrite, abundant limonitic staining
CP009RC	do.	do.	Abundant limonitic staining
CP009RD	do.	do.	Do.
CP010R	Diabase	Propylitic	Do.
CP010RA	Granitic gneiss	do.	
CP010RB	Dacite	None	
CP011R	Quartz vein	Propylitic	Hematite
CP011RA	do.	do.	Wulfenite, limonite, copper staining
CP011RB	do.		Galena, limonite
CP011RC	do.	do.	Abundant copper staining
CP2106R	Rhyolite	None	
CP2107R	Quartz vein	Propylitic	Pyrite, galena, malachite, azurite, hematite, limonite
CP2108R	Amphibolite gneiss	do.	
CP2109R	Granitic gneiss	do.	
CP2110R	Diorite(?)	do.	
CP2111R	Granitic gneiss	do.	Pegmatite zone in gneiss
CP2112R	Quartz vein	do.	Pyrite, galena, hematite, limonite
CP2113R	Garnetiferous gneiss	do.	
CP2115R	Granitic gneiss	do.	Pegmatitic zone in gneiss
CP2118R	do.	do.	
CP2119R	do.	do.	
CP2120R	Dacite	None	
CP2121R	Granitic gneiss	Propylitic	
CP2122R	Dacite	None	
CP2123R	Diabase	None	
CP2124R	Granitic gneiss	Propylitic	
CP2125R	Dacite	None	
CP2126R	Rhyolite	do.	
CP2127R	Granitic gneiss	Propylitic	
CP2128R	do.	do.	
CP2129R	do.	Argillic(?)	White mica and clay alteration
CP2130R	Diorite	None	
CP2131R	Amphibolite gneiss	Propylitic	
CP2132R	Granitic gneiss	do.	Pegmatitic zone with hematite pseudomorphs after pyrite
CP2133R	do.	Argillic(?)	Micaceous pegmatite

Table 5.--Descriptive data for rock samples, Crossman Peak WSA--Continued

Sample number	Rock type	Alteration	Remarks
CP2134R	do.	do.	Pegmatitic zone
CP2135R	do.	do.	
CP2136R	do.	do.	Pyrite, hematite, limonite
CP2139R	do.	Propylitic	
CP2142R	do.	do.	
CP2144R	Rhyolite	None	
CP2145R	Granitic gneiss	Propylitic	
CP2146R	do.	do.	Pegmatitic zone
CP2147R1	Quartz vein	do.	Abundant hematite
CP2147R2	do.	do.	Abundant limonite boxworks
CP2161R	Granitic gneiss	Propylitic	
CP2162R	do.	do.	
CP2163R	do.	do.	Abundant epidote
CP2164R	do.	do.	
CP2166R	do.	do.	
CP2167R	Diabase	do.	
CP2168R	Granitic gneiss	do.	
CP2169R	Amphibolite gneiss	do.	
CP2170R	Granitic gneiss	do.	
CP2171R	do.	do.	
CP2172R1	Amphibolite gneiss	do.	
CP2172R2	Granitic gneiss	do.	Abundant epidote
CP2173R	Amphibolite gneiss	do.	
CP2174R	Granitic gneiss	do.	
CP2175R	do.	do.	Pegmatitic zone
CP2176R	do.	do.	
CP2177R1	do.	do.	
CP2177R2	do.	do.	Pegmatitic zone
CP2178R	Amphibolite gneiss	do.	Abundant limonitic staining
CP2179R	Granite	None	
CP2180R	Granitic gneiss	Propylitic	Abundant epidote
CP2181R	do.	Propylitic(?)	
CP2182R	do.	Propylitic	
CP2183R	do.	do.	
CP2184R	do.	do.	
CP2185R	Amphibolite gneiss	None	
CP2186R	do.	do.	
CP2187R	Granitic gneiss	Propylitic	
CP2188R	do.	do.	Highly weathered
CP2189R	Granite		Do.
CP2190R	do.		
CP2191R	do.		

REFERENCES CITED

Carr, W. J., 1981, Tectonic history of the Vidal-Parker region, California and Arizona, in Tectonic framework of the Mojave and Sonoran Deserts, California and Arizona: U.S. Geological Survey Open-File Report 81-503, p. 18-20.

Carr, W. J., Dickey, D. D., and Quinlivan, W. D., 1980, Geologic map of the Vidal NW, Vidal Junction, and parts of the Savahia Peak SW and Savahia Peak quadrangles, San Bernardino County, California: U.S. Geological Survey Miscellaneous Geologic Investigations Map I-1126.

Davis, G. A., Anderson, J. L., Frost, E. G., and Shackelford, T. J., 1980, Mylonitization and detachment faulting in the Whipple-Buckskin Rawhide Mountains terrane, southeastern California and western Arizona, in Cordilleran metamorphic core complexes: Geological Society of America Memoir 153, p. 79-130.

Frost, E. G., 1982, Structural style of detachment faulting in the Whipple Mountains, California, and Buckskin Mountains, Arizona: Arizona Geological Society Digest, v. 13, p. 25-29.

Grimes, D. J., and Marranzino, A. P., 1968, Direct-current arc and alternating current spark emission spectrographic field methods for the semiquantitative analysis of geologic materials: U.S. Geological Survey Circular 591, 6 p.

Howard, K. A., Goodge, J. W., and John, B. E., 1982, Detached crystalline rocks of the Mohave, Buck, and Bill Williams Mountains, western Arizona, in Frost, E. G., and Martin, D. L., 1982, Mesozoic-Cenozoic tectonic evolution of the Colorado River region, California, Arizona, and Nevada: San Diego, Cordilleran Publishers, p. 377-392.

Light, T. D., Marsh, S. P., and Raines, G. L., 1982, Mineralization in the Crossman Peak Area, Mohave Mountains, Arizona: Geological Society of America Abstracts with Programs, v. 14, no. 4, p. 180-181.

Light, T. D., and McDonnel, J. R., Jr., 1983, Mineral investigation of the Crossman Peak Wilderness Study Area, Mohave County, Arizona: U.S. Bureau of Mines Open-File Report, in press.

Light, T. D., Pike, J. E., Howard, K. A., McDonnell, J. R., Jr., Simpson, R. W., Raines, G. L., Knox, R. D., Wilshire, H. G., and Pernokas, M. A., 1983, Mineral resource potential of the Crossman Peak Wilderness Study Area, Mohave County, Arizona: U.S. Geological Survey Miscellaneous Field Studies Map, scale 1:48,000, in press.

McNerney, J. J., Buseck, P. R., and Hanson, R. C., 1972, Mercury detection by means of thin gold films: Science, v. 178, p. 611-612.

Nakata, J. K., 1982, Preliminary report on diking events in the Mohave Mountains, Arizona, in Frost, E. G., and Martin, D. L., 1982, Mesozoic-Cenozoic tectonic evolution of the Colorado River region, California, Arizona, and Nevada: San Diego, Cordilleran Publishers, p. 85-90.

Rehrig, W. A., and Reynolds, S. J., 1980, Geologic and geochronologic reconnaissance of a northwest-trending zone of metamorphic core complexes in southern and western Arizona, in Cordilleran metamorphic core complexes: Geological Society of America Memoir 153, p. 131-158.

Reynolds, S. J., 1981, Geologic framework of west-central Arizona: Arizona Geological Society Digest, v. 12, p. 1-16.

Vaughn, W. W., and McCarthy, J. H., Jr., 1964, An instrumental technique for the determination of submicrogram concentrations of mercury in soils, rocks, and gas, in Geological Survey Research: U.S. Geological Survey Professional Paper 501-D, p. D123-D127.

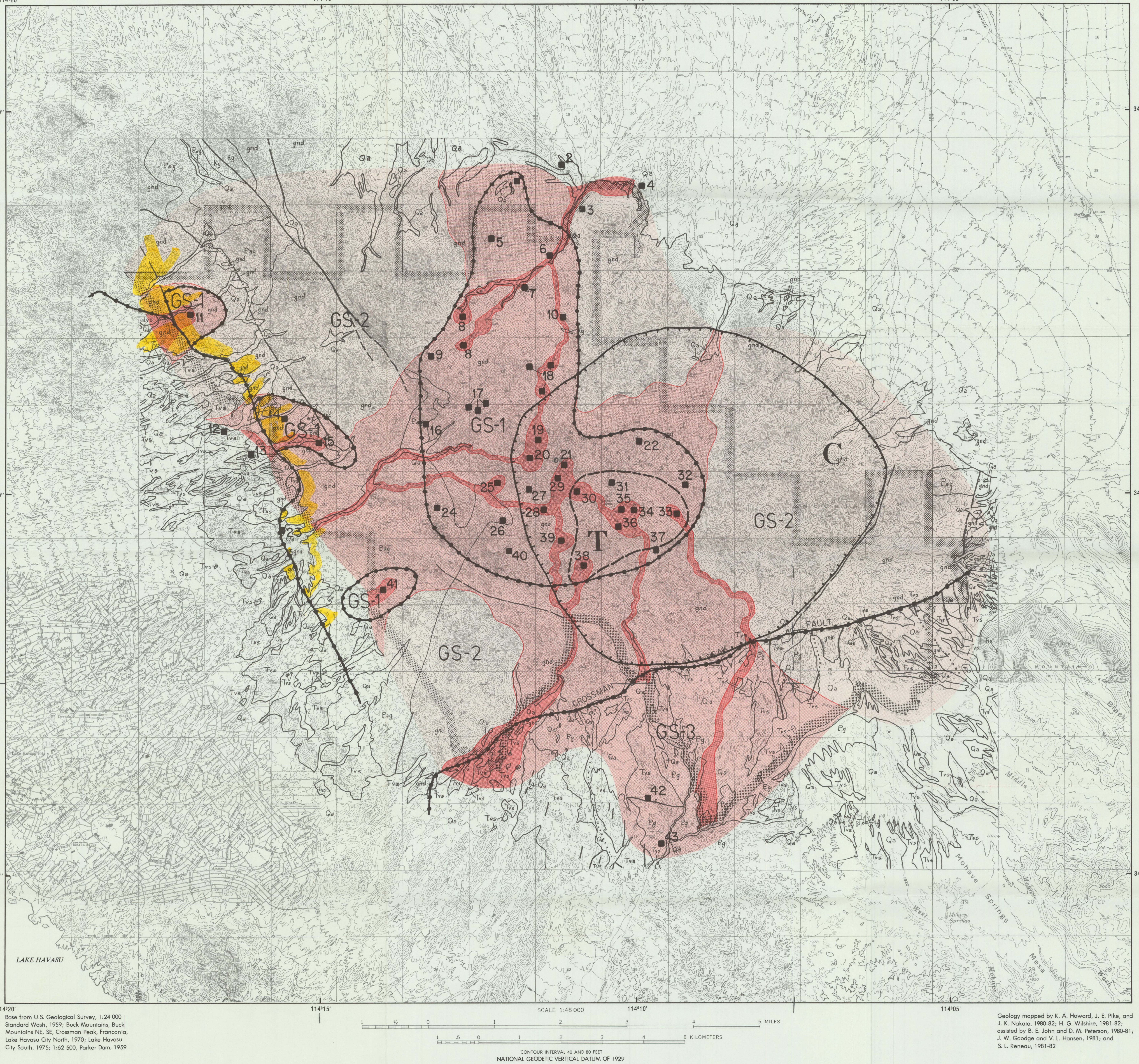
Viets, J. G., 1978, Determination of silver, bismuth, cadmium, copper, lead, and zinc in geological materials by atomic-absorption spectrometry with tricaprylylmethylammonium chloride: Analytical Chemistry, v. 50, no. 8, p. 1097-1101.

Ward, F. N., Nakagawa, H. M., Harms, T. F., and VanSickle, G. H., 1969, Atomic-absorption methods of analysis useful in geochemical exploration: U.S. Geological Survey Bulletin 1289, 45 p.

DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

PREPARED BY THE
U.S. GEOLOGICAL SURVEY AND THE U.S. BUREAU OF MINES
FOR THE
U.S. BUREAU OF LAND MANAGEMENT

MISCELLANEOUS FIELD STUDIES
MAP MF-1602-A



Base from U.S. Geological Survey, 1:24 000 Standard Wash, 1959; Buck Mountains, Buck Mountains NE, SE, Crossman Peak, Franconia, Lake Havasu City North, 1970; Lake Havasu City South, 1975; 1:62 500, Parker Dam, 1959

SCALE 1:48 000

CONTOUR INTERVAL 40 AND 80 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

Geology mapped by K. A. Howard, J. E. Pike, and J. K. Nakata, 1980-82; H. G. Wilshire, 1981-82; assisted by B. E. John and D. M. Peterson, 1980-81; J. W. Goodge and V. L. Hansen, 1981; and S. L. Reneau, 1981-82

MINERAL RESOURCE POTENTIAL MAP OF THE CROSSMAN PEAK WILDERNESS STUDY AREA (5-7B), MOHAVE COUNTY, ARIZONA

By

Thomas D. Light[1,2], Jane E. Pike[1], Keith A. Howard[1], John R. McDonnell, Jr.[2], Robert W. Simpson[1], Gary L. Raines[1], Richard D. Knox[3], Howard G. Wilshire[1], and Martha A. Pernokas[1]

1983

EXPLANATION

AREA WITH MINERAL RESOURCE POTENTIAL

Lode gold and silver–See table 3 in accompanying pamphlet

- GS-1 High
- GS-2 Moderate
- GS-3 Moderate

Placer gold–See table 4 in accompanying pamphlet

- High (P-1)
- Moderate (P-2)
- Moderate (P-3)

Tungsten and base metals–See table 5 in accompanying pamphlet

- T Tungsten–High
- C Base metals–Moderate to low

13 MINERAL DEPOSIT–Numbers refer to table 1 in accompanying pamphlet

BOUNDARY OF WILDERNESS STUDY AREA (APPROXIMATE)

CORRELATION OF MAP UNITS

Qa		QUATERNARY
Tvs	Miocene	TERTIARY
Kg		CRETACEOUS(?)
Pg, Pag		PROTEROZOIC
gnd		TERTIARY AND PROTEROZOIC

DESCRIPTION OF MAP UNITS

Qa ALLUVIUM (QUATERNARY)– Includes talus deposits on Black Mountain

Tvs VOLCANIC AND SEDIMENTARY ROCKS (MIOCENE)–Flows, breccia, and tuff of silicic to basaltic composition; fanglomerate, conglomerate, sandstone, and claystone

Kg GRANITE AND DIORITE (CRETACEOUS?)

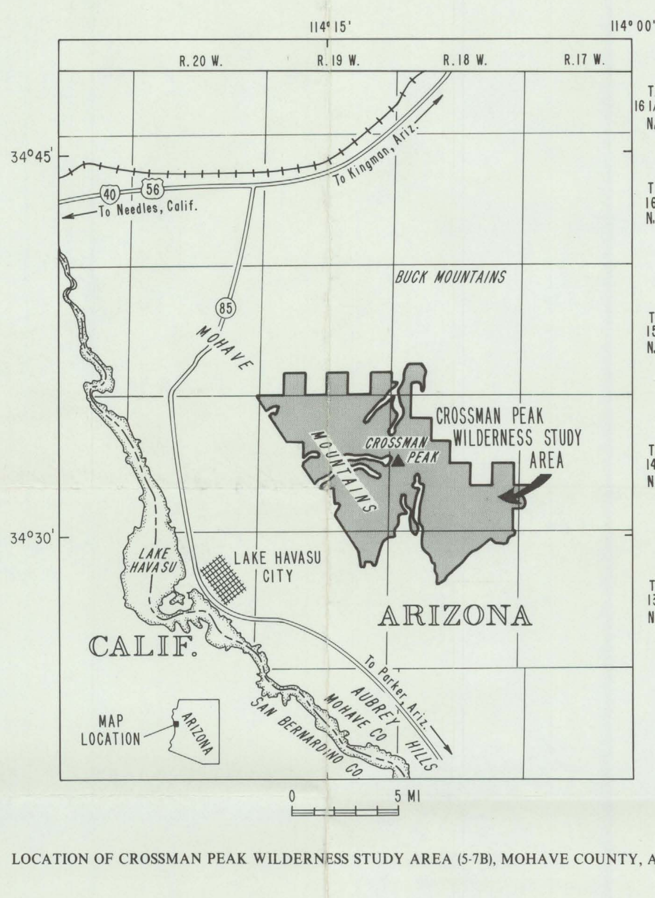
Pg GRANITOID ROCKS (PROTEROZOIC)–Porphyritic and equigranular granite and quartz monzodiorite

Pag AUGEN GNEISS (PROTEROZOIC)–Granite to granodiorite composition. Gradational to porphyritic granite of the granitoid rocks unit

gnd GNEISS AND DIKES (TERTIARY AND PROTEROZOIC)– Garnet granite gneiss, amphibolite, biotite granite gneiss, pegmatite, and rare pelitic gneiss and quartzite, of Proterozoic age, all intruded by a dense swarm of northwest-striking felsic and mafic dikes of Tertiary age

CONTACT– Dashed where approximately located

FAULT– Dashed where approximately located; dotted where concealed; hachures on upper plate of detachment fault. Bar and ball on downthrown side



LOCATION OF CROSSMAN PEAK WILDERNESS STUDY AREA (5-7B), MOHAVE COUNTY, ARIZ.

Explanatory pamphlet accompanies map

STUDIES RELATED TO WILDERNESS

Bureau of Land Management Wilderness Study Areas

The Federal Land Policy and Management Act (Public Law 94-579, October 21, 1976) requires the U.S. Geological Survey and the U.S. Bureau of Mines to conduct mineral surveys on certain areas to determine their mineral resource potential. Results must be made available to the public and be submitted to the President and the Congress. This report presents the results of a mineral survey of the Crossman Peak Wilderness Study Area (5-7B), Mohave County, Arizona.

SUMMARY

Mining history, results of recent mineral exploration, and geologic, geochemical, and geophysical data collected and evaluated as of 1982, indicate that the Crossman Peak Wilderness Study Area has potential for several mineral resources. The wilderness study area has high potential for small deposits of lode gold, silver, and tungsten, and for placer gold. Sixteen sites in or adjacent to the wilderness study area contain 100 to 8,000 tons of indicated or inferred gold or silver resources including grades of 0.05 to 0.62 oz gold per ton and 0.19 to 2.1 oz silver per ton. Favorable geologic terrane suggests that much of the wilderness study area has at least moderate potential for additional discoveries of lode gold and silver and placer gold. Positive geochemical anomalies and patterns of alteration in the central part of the wilderness study area provide evidence for speculating that there is moderate to low potential for additional deposits of base metals. There is high potential for resources of riprap and of sand and gravel, and moderate potential for small deposits of perlite, opal, and manganese in the wilderness study area. The potential for uranium, oil and gas, and geothermal resources is low.

INTRODUCTION

The Crossman Peak Wilderness Study Area is in western Arizona 3 mi east of Lake Havasu City, Ariz., and 45 mi southwest of Kingman, Ariz. The wilderness study area covers approximately 38,000 acres in the topographically rugged center and flanking foothills of the Mohave Mountains, sometimes included as part of the Chemehuevi Mountains. The Chemehuevi Mountains are in California adjacent to the northwest Mohave Mountains but across the Colorado River. The Mohave Mountains form a northwest-trending range adjacent to Lake Havasu (elevation 448 ft) on the Colorado River. Both the Mohave Mountains and the wilderness study area are dominated by Crossman Peak, which has an elevation of 5,148 ft. The area is accessible from the north and west by numerous jeep trails that intersect either Interstate 40, State Highway 95, or some residential streets of Lake Havasu City. From the south, southeast, and northeast access to the area is by jeep trails that intersect the unimproved Dutch Flat Road, which skirts the south flank of the mountains. Several small areas of mines and roads excluded from the wilderness study area proper are within the approximate boundary shown here for the study area.

GEOLOGY

Rocks in the wilderness study area are dominantly Proterozoic metamorphic and igneous rocks intruded by Proterozoic and Tertiary igneous dikes. Potassium-argon ages suggest that mineralized veins within the Proterozoic gneisses may be related to Cretaceous(?) intrusions such as occur adjacent to the study area. Tertiary volcanic and sedimentary rocks overlie Proterozoic rocks at the south and southwest margins of the study area. Several faults of Tertiary age cut these rocks. Quaternary alluvial deposits occur around the flanks and in drainages within the range:

GEOCHEMISTRY AND REMOTE SENSING

Rock, stream-sediment, and panned-concentrate samples from the Crossman Peak Wilderness Study Area characteristically contain anomalously high concentrations of silver, copper, lead, zinc, molybdenum, tungsten, barium, and lanthanum. In rock and panned-concentrate samples, gold and bismuth commonly accompany this assemblage. Numerous panned-concentrate samples contain anomalously high tin, cadmium, and arsenic values relative to the backgrounds defined in these studies. The gold-silver-tungsten-copper-lead-zinc metal assemblage is distributed throughout the wilderness study area and is considered to represent mineralization derived from a large hydrothermal system, probably of Cretaceous age.

Limonitic materials were identified in Landsat images using a color-ratio-composite method. Field examination of several limonitic areas associated with mineral deposits revealed that patches of argillic alteration, characterized by an assemblage that contains kaolinite-white mica-hematite-chlorite, occur in the central and eastern parts of the wilderness study area. An area of about 1/4 mi^2 at the Jupiter East mine (no. 33) has intensely altered feldspars and represents a more advanced stage of argillic alteration. The area of argillic alteration is bounded on the north and west by a propylitic alteration assemblage including chlorite, epidote, albite, and quartz at the Pittsburg (no. 41), J & J (no. 15), Scotts Well (no. 18), and Arrastra Well (no. 8) areas. Abundant sericitic alteration was observed at the Sunrise mine (no. 20). The mapped limonitic areas and observed alteration suggest a crudely zoned pattern of hydrothermal alteration from intermediate argillic at the Dutch Flat mines outward to sericitic alteration at the Sunrise mine and then to propylitic alteration along the western and northern parts of the wilderness study area.

The distribution of base and precious metals forms a crudely zoned, overlapping pattern that roughly correlates with the zones of alteration. The area of the Dutch Flat mines (nos. 30-38) is the most intensely altered and mineralized, with anomalously high concentrations of tungsten, copper, and gold. Outward from this area to the west and northwest, tungsten and copper values diminish and gold in association with lead, zinc, silver, and arsenic forms the dominant metal association in a zone that includes the Sunrise (no. 20) and Osiris (part of no. 28) mines, and the adits in the south-center of sec. 24, T. 14 N., R. 19 W. (no. 26). Peripheral to this zone the metal assemblage is dominated by silver and is accompanied by lead, zinc, gold, and barium in a zone containing the Pittsburg (no. 41) and J & J (no. 15) mines. At the Wing mine (no. 11), a gold, silver, lead, zinc assemblage is associated with arsenic, barium, and secondary copper and molybdenum.

GEOPHYSICS

A broad area of relatively high Bouguer gravity values overlies the northern and central parts of the wilderness study area that have exposures of Proterozoic gneisses. Slightly lower gravity values occur in the southeastern part of the wilderness study area, partly over Proterozoic gneisses and partly over Tertiary volcanic and sedimentary rocks. The portion of the gravity low over the gneisses could be caused by the alteration of the gneisses in this area or by lithologic changes. A steep gravity gradient along the east and north flanks of the Mohave Mountains is probably caused both by the presence under the Dutch Flat valley of low-density Cenozoic sedimentary deposits and by density changes across a structural boundary within the crust.

An elongate northwest-trending belt of magnetic highs extends through the west-central part of the wilderness study area. The highest values in the belt occur over outcrops of Proterozoic augen gneiss. A region of low aeromagnetic values lies over the northeastern and southeastern parts of the wilderness study area, overlapping areas that are altered. These magnetic lows may be produced by the destruction of magnetite minerals during alteration, or may simply be located over gneisses that are not very magnetic even if unaltered.

MINING DISTRICTS AND MINERALIZED AREAS

The Crossman Peak Wilderness Study Area contains numerous occurrences of gold, silver, tungsten, lead, and zinc, which have been prospected intermittently during the past 135 years. Several thousand mining claims are located in and around the study area. During this investigation, the U.S. Bureau of Mines mapped and sampled all the known mines and prospects where accessible. The Crossman Peak Wilderness Study Area and immediate environs contain 43 separate mineralized areas that have been mined or prospected. Sixteen of these areas are reported to have produced some ore and several other areas probably produced some high-grade ore.

ASSESSMENT OF MINERAL RESOURCE POTENTIAL

Mapped areas of mineral resource potential

Criteria used to define mapped areas of mineral resource potential are listed in tables 3-5 of the accompanying pamphlet.

Lode gold and silver.--All of the ground underlain by pre-Tertiary rocks in the Crossman Peak Wilderness Study Area has high to moderate potential for small lode deposits of gold and silver. Area GS-1 is considered to have high potential; areas GS-2 and GS-3 are considered to have moderate potential.

Placer gold.--Area P-1 has high potential for deposits of placer gold, and areas P-2 and P-3 have moderate potential for additional deposits of placer gold.

Lode tungsten.--Area T contains veins from which tungsten has been mined in the past and has high potential for further small deposits.

Base metals.--A crude zonation of metal assemblages and alteration, and supporting chemical and petrographic evidence, indicates area C may be underlain by a low-fluorine porphyry molybdenum system. Geologic evidence suggests that the area is also underlain by a low-angle fault, which detached the Crossman plate (which includes this area) and transported it away from a substrate that now lies [illegible] mi to the southwest. If the unexposed root of the mineralized system lies buried in the Crossman plate, area C has moderate potential for base and precious metals at depth. If the mineralizing system was detached by faulting, the potential of area C is low. Definition of the potential therefore depends on the (unknown) depth to the fault that defines the base of the Crossman plate.

Miscellaneous resources

Uranium: Aeroradiometric data and field studies indicate a low potential for uranium resources in the Crossman Peak Wilderness Study Area.

Manganese: Manganese mineralization is not known within the Crossman Peak Wilderness Study Area. However, Tertiary volcanic and sedimentary rocks contain three small deposits of very limited tonnage nearby to the west, southwest, and northwest of the wilderness study area. Where Tertiary rocks occur within the west and south boundaries of the wilderness study area, there is moderate potential for similar deposits.

Sand, gravel, and rock: Sand and gravel are present in the study area in washes, and potentially are resources for local construction. Large quantities of these materials occur outside the wilderness study area all around its margins. Hard dike rocks, potentially useful for riprap for dam and other local water projects, are abundant north of the Crossman Peak fault; similar dike rocks are available in large quantities immediately northwest of the wilderness study area.

Opal: Opal of non-gem quality occurs locally in Tertiary volcanic rocks within the southern and southwestern parts of the wilderness study area and geodes may occur in Tertiary volcanic rocks within the study area.

Perlite: Perlite of untested quality occurs in Tertiary volcanic rocks 1-4 mi northwest and west of the wilderness study area, and in very small amounts within the southwestern and southern boundaries of the wilderness study area.

Oil and gas: The Crossman Peak Wilderness Study Area is considered unfavorable for resources of oil and gas.

Geothermal Resources: No geothermal resources are known or suspected in the Crossman Peak Wilderness Study Area.

1 U.S. Geological Survey

2 U.S. Bureau of Mines: Light began his part of the investigation while with USBM, and continued the investigation after transferring to the USGS

3 U.S. Bureau of Land Management and U.S. Geological Survey

Interior—Geological Survey, Reston, Va.—1983

For sale by Branch of Distribution, U.S. Geological Survey, Box 25286, Federal Center, Denver, CO 80225

UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF MINES

MINERAL INVESTIGATION OF THE CROSSMAN PEAK WILDERNESS STUDY AREA, MOHAVE COUNTY, ARIZONA

By
Thomas D. Light
and
John R. McDonnell, Jr.

MLA 82-83
1983

This open file report summarizes the results of a Bureau of Mines wilderness study and will be incorporated in a joint report with the U.S. Geological Survey. The report is preliminary and has not been edited or reviewed for conformity with the U.S. Bureau of Mines editorial standards. Work on this study was conducted by personnel from Intermountain Field Operations Center, Building 20, Denver Federal Center, Denver, CO 80225.

BUREAU OF GEOLOGY
AND MINERAL TECHNOLOGY

Analytical data for samples 911-946 from the Jupiter Mine are listed in tables 3-5. Sample 911, from the dump of the upper shaft, contained 2.0 oz silver per ton. Gold was detected in 20 samples with the highest value being 0.168 oz per ton in sample 923, a 9-in. chip across a quartz vein in a stope. Sample 941 had 1.35 percent lead; this sample was the only highly anomalous lead value, and did not contain any detectable silver.

Pittsburg Mine

The Pittsburg Mine is about 3 mi northeast of Lake Havasu City in S1/2 sec. 27, and N1/2 sec. 34, T. 14 N., R. 19 W. along the western boundary of the WSA. The mine is easily accessible via dirt roads from the south and west.

The Pittsburg Mine was originally known as the Mohawk Mine and was discovered in 1933 by a Mr. Hutt. From 1933 to 1939 a shaft was sunk 210 ft and several hundred feet of lateral drift were driven. Before the mine shut down in 1939, ore reportedly ran $15 per ton with the values mostly in silver. (Note: 1939 prices were $35 per oz for gold and $0.90 per oz for silver.) High-grade shipments to the smelter contained as much as 126 oz silver per ton and 6.5 oz gold per ton (Arizona Department of Mineral Resources, file data). The old workings of the Pittsburg Mine are currently covered by the Hotspot lode claims.

Mineralization at the Pittsburg Mine is concentrated in a northeast-trending fault zone with a discontinuous quartz vein. This zone can be traced for approximately 1/2 mi. All the workings along and adjacent to this trend are discussed collectively as the Pittsburg Mine (fig. 63-69). Analytical data for samples 972-1071, collected from these workings are listed in tables 3-5.

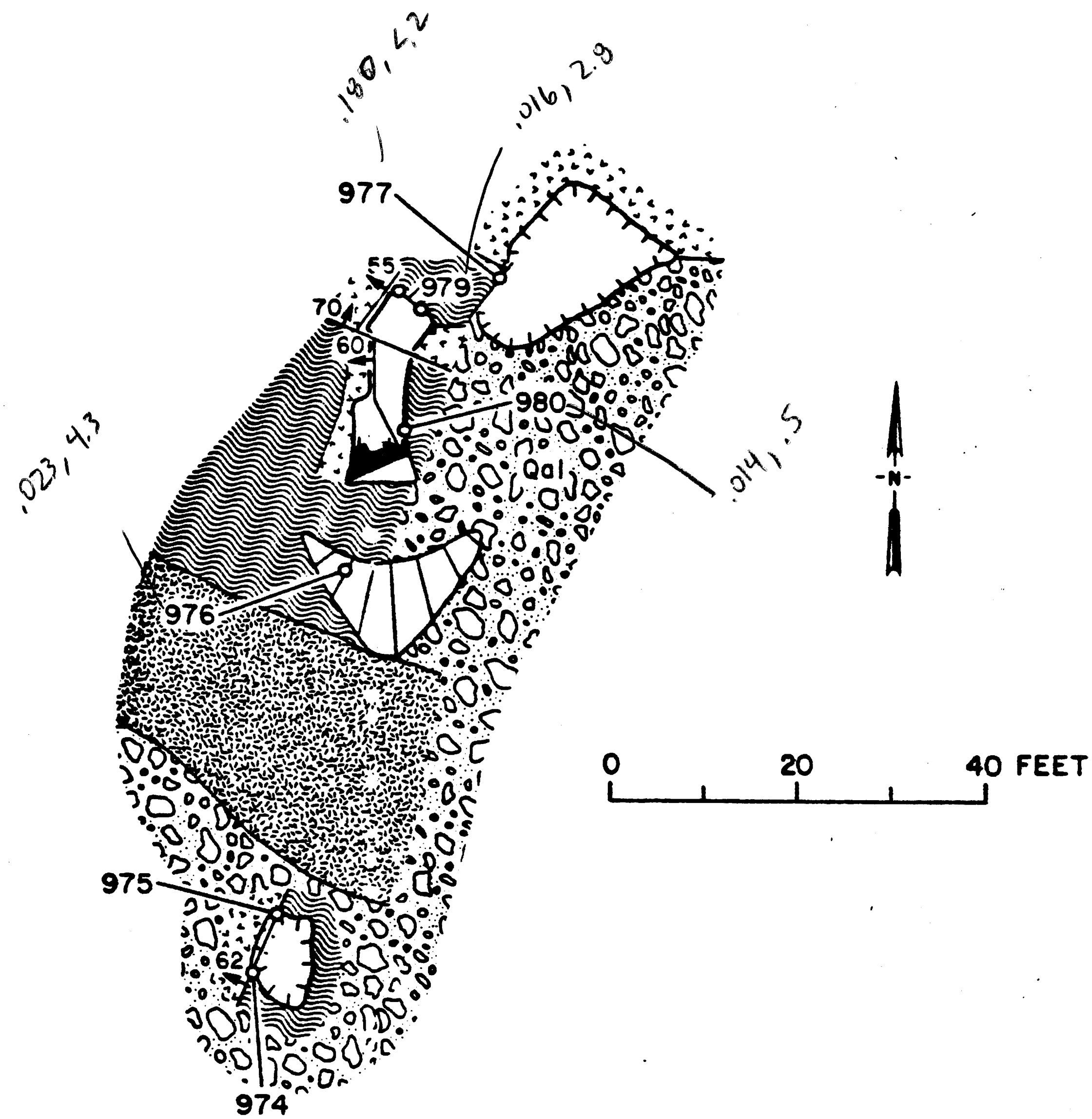


Figure 63.--Northernmost workings, Pittsburg Mine.

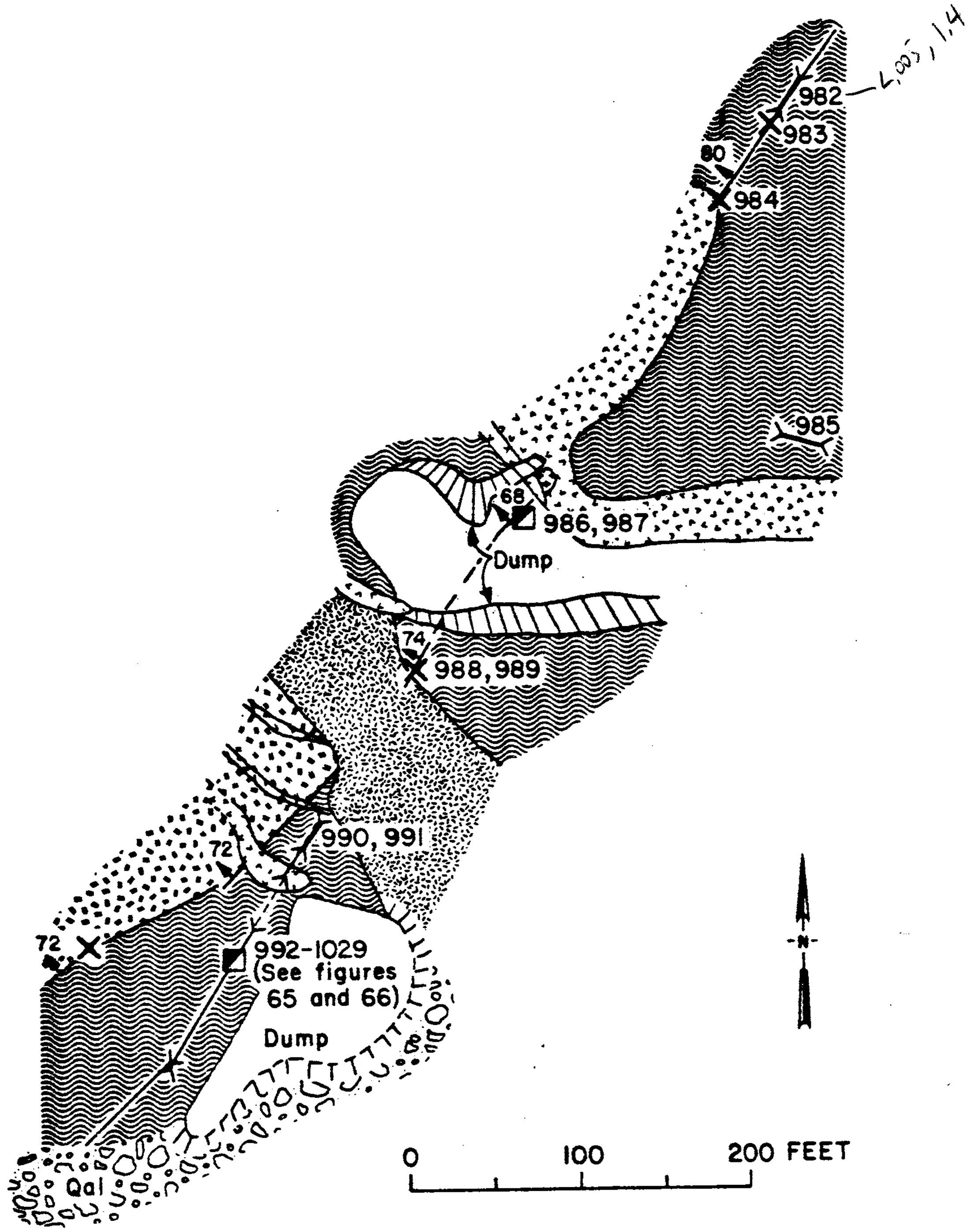


Figure 64.--Surface map, Pittsburg Mine main workings.

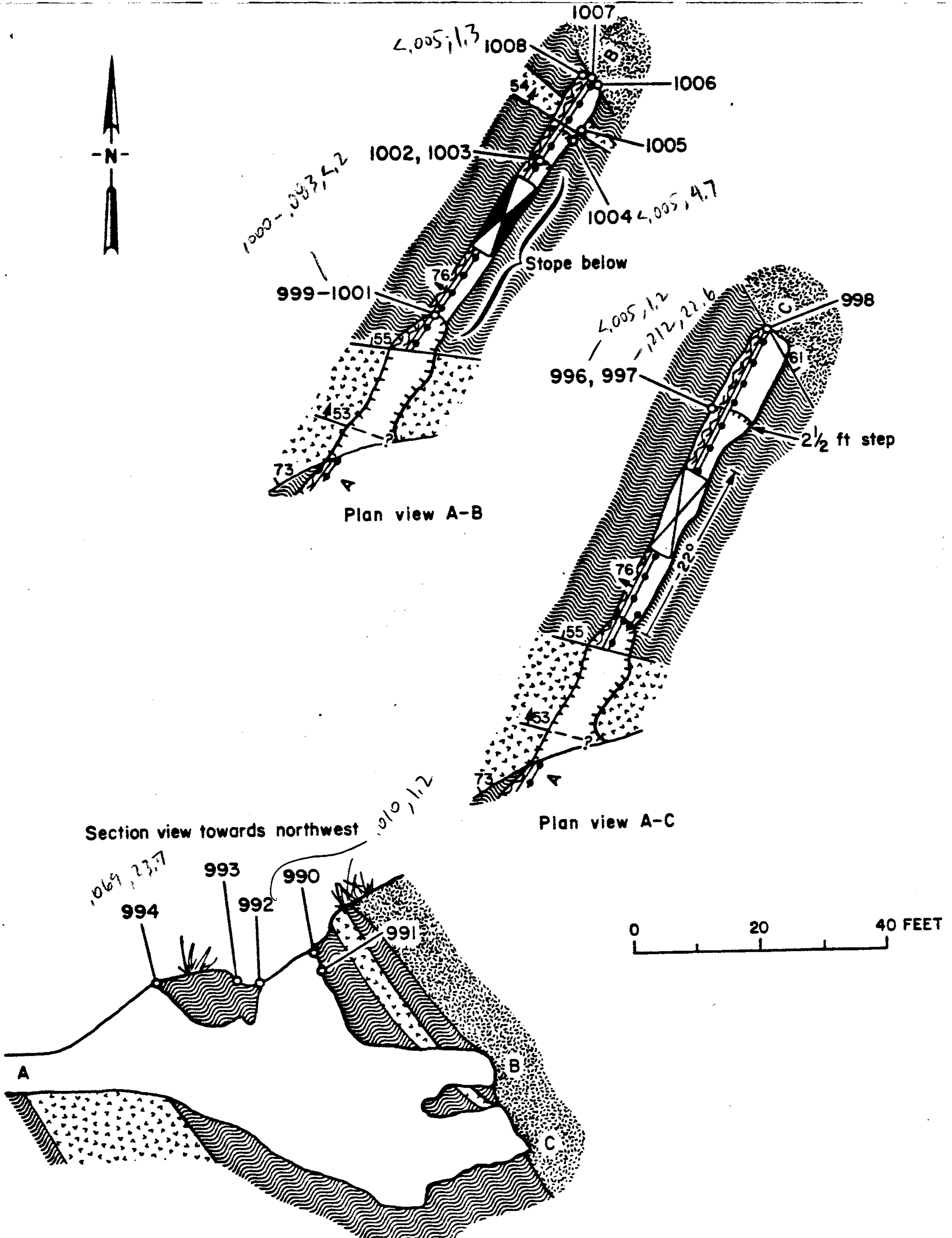


Figure 65.--Adit, Pittsburg Mine.

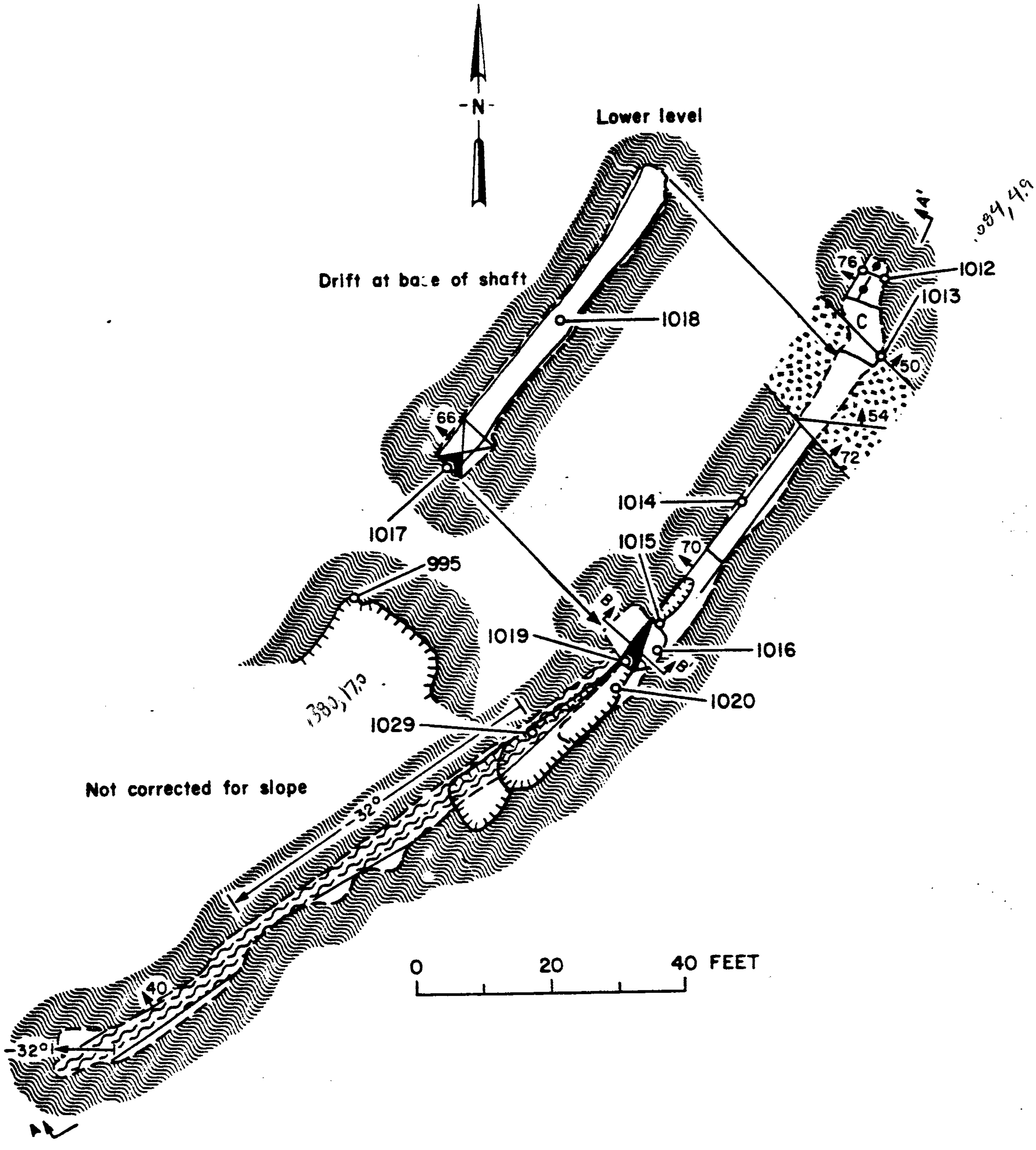


Figure 66a.--Plan view, inclined shaft, Pittsburg Mine.

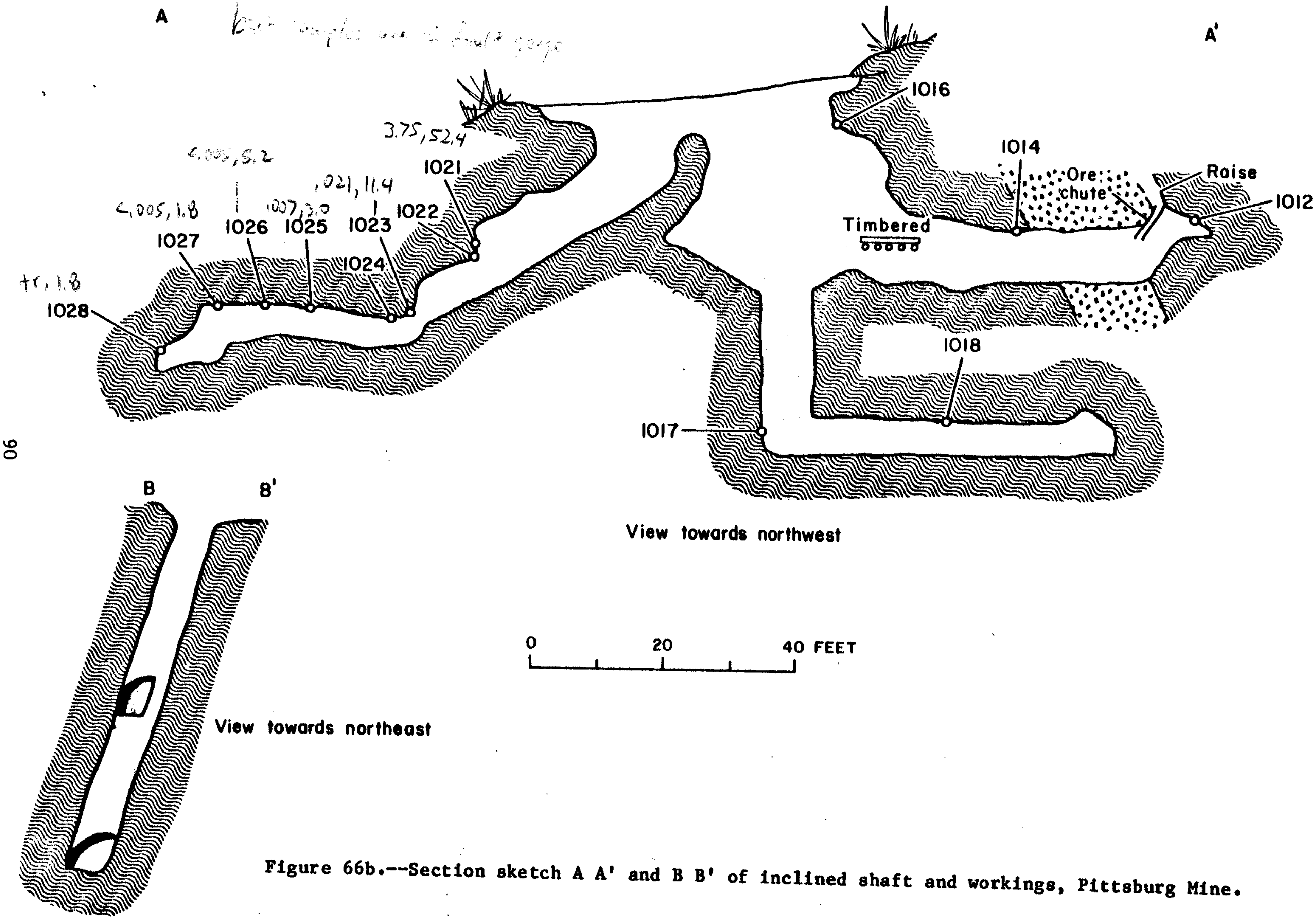


Figure 66b.--Section sketch A A' and B B' of inclined shaft and workings, Pittsburg Mine.

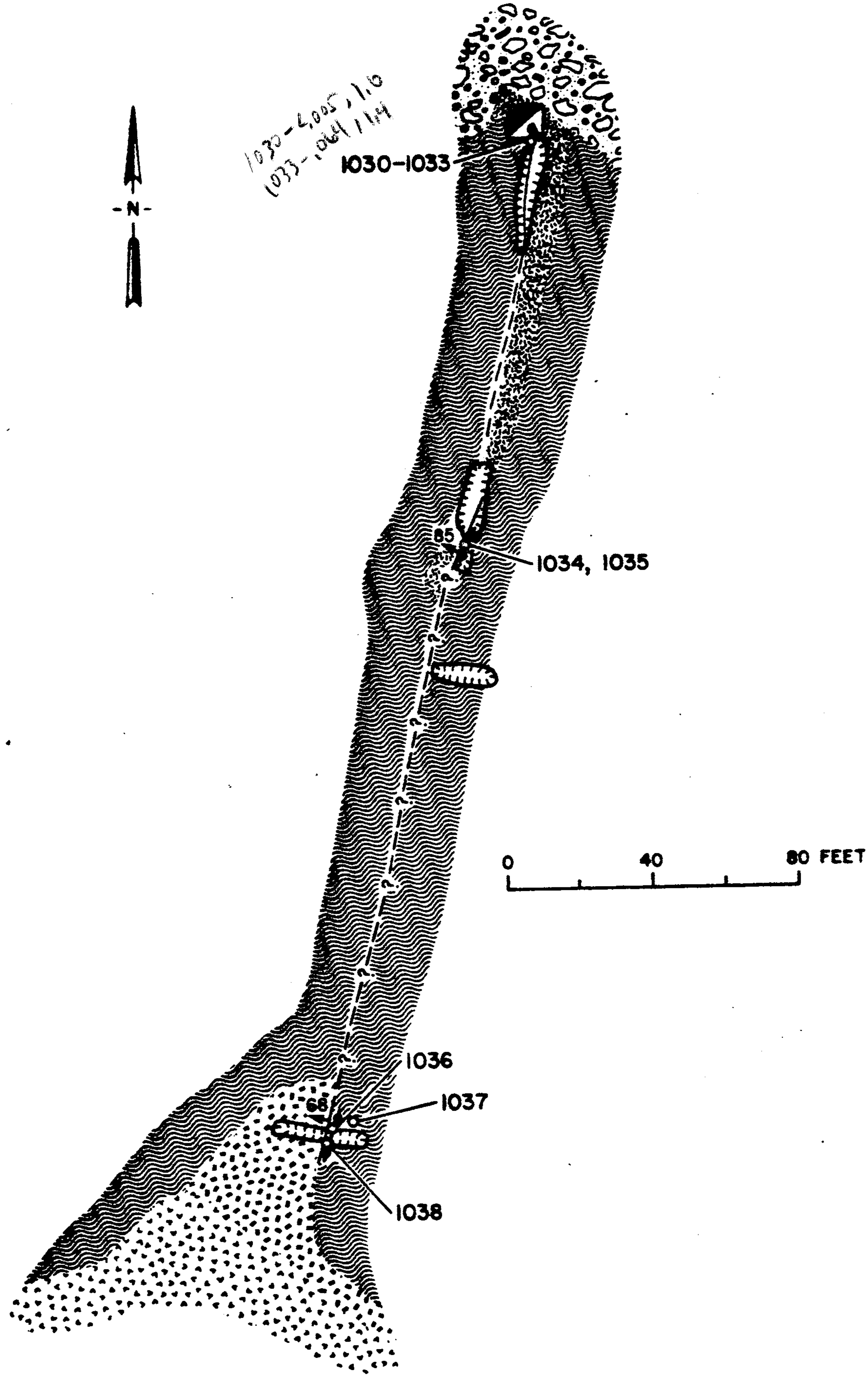


Figure 67.--Workings southwest of main Pittsburg Mine workings.

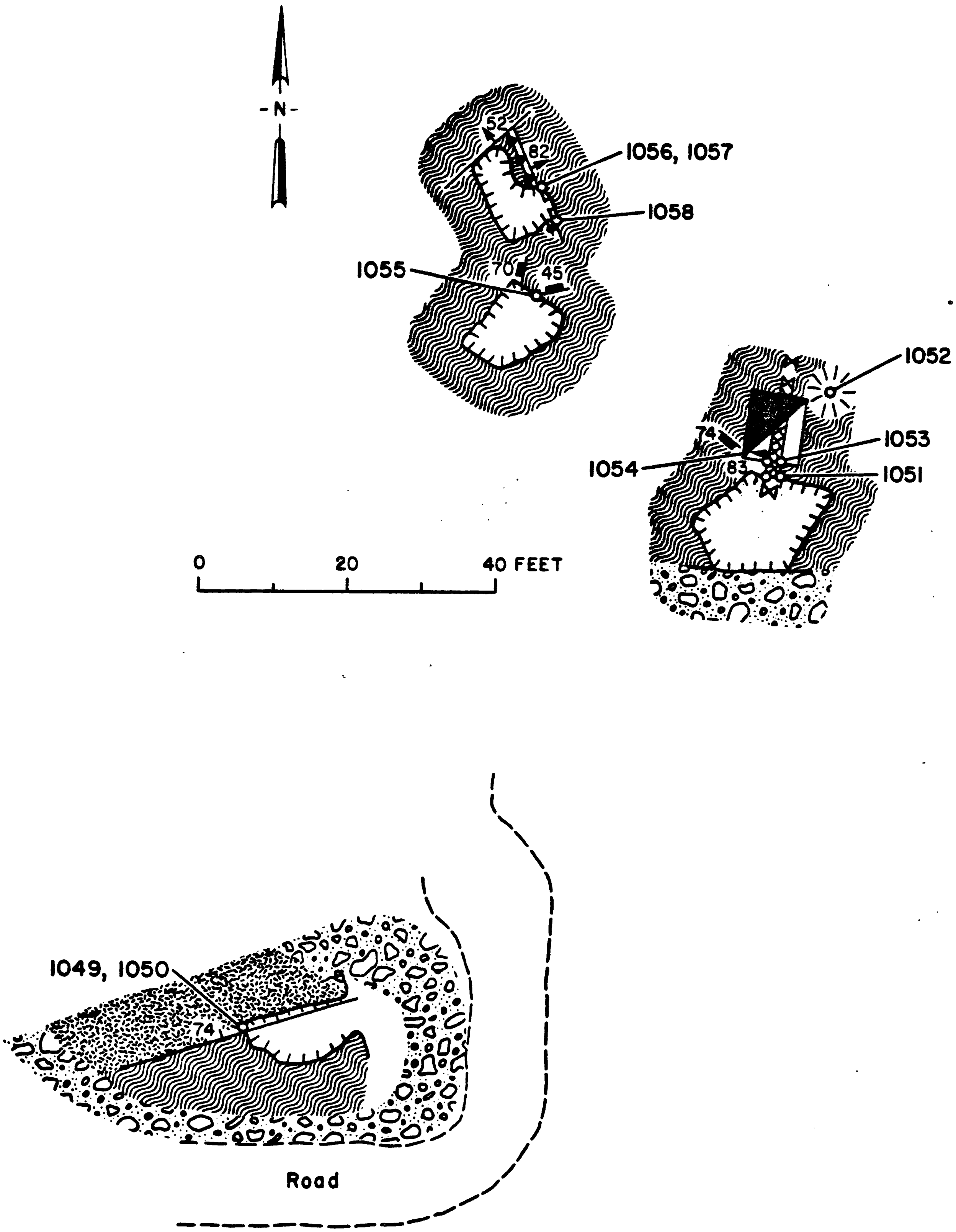


Figure 68.--Workings southwest of main Pittsburg Mine workings.

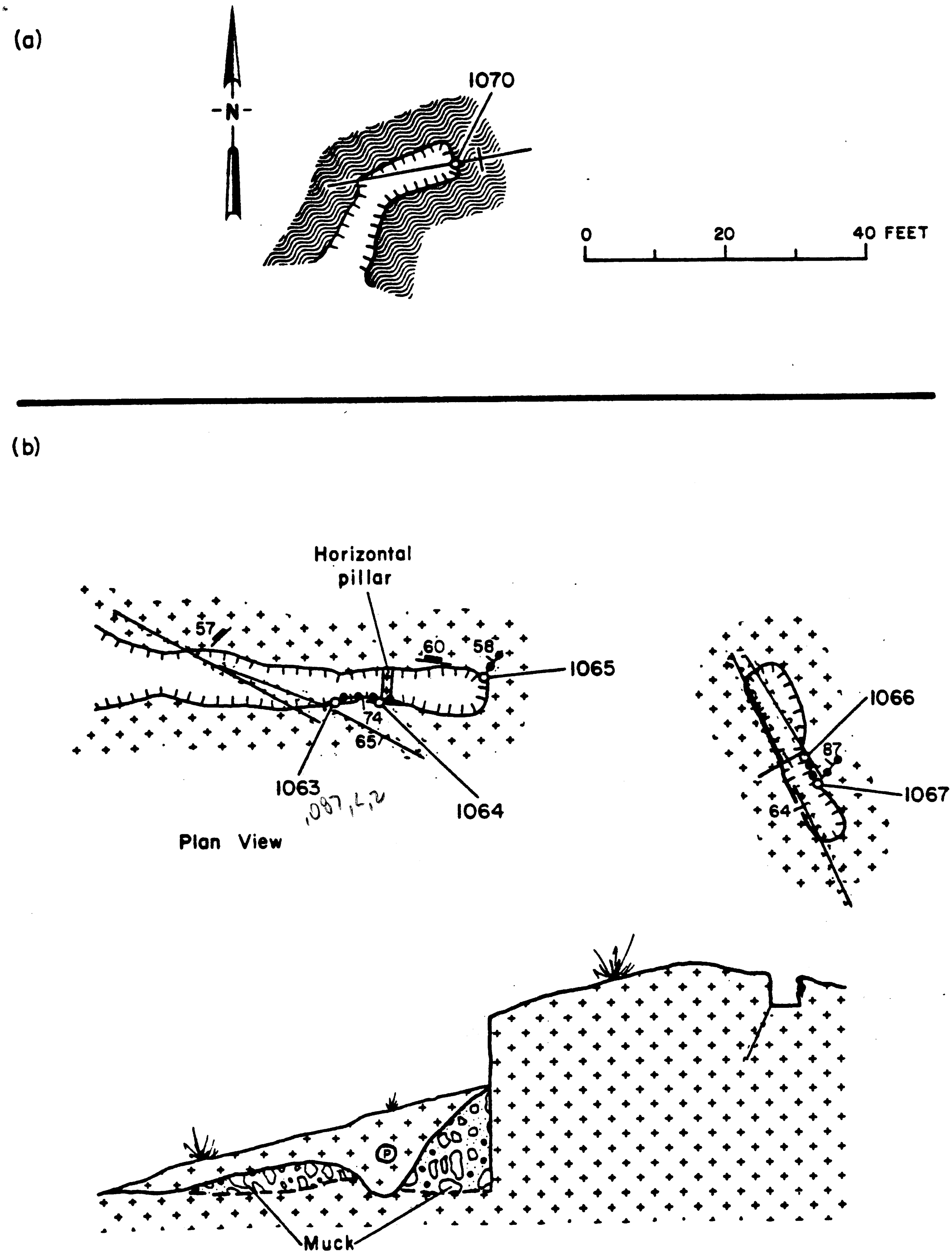


Figure 69.--Workings southeast (a) and southwest (b) of main Pittsburg Mine workings.

The northernmost workings in the Pittsburg trend consist of 2 prospect pits and 20-ft-deep decline approximately 1,000 ft northeast of the main shaft (fig. 63). The workings were cut on the northeast-trending fault zone in gneiss, diorite, and dacite. Analytical data for samples 972-980 from these workings contained as much as 4.3 oz silver per ton, 0.180 oz gold per ton, 0.92 percent barium, 0.44 percent copper, 1.35 percent lead, and 1.45 percent zinc. Sample 977 contained 0.008 percent molybdenum.

The main workings of the Pittsburg Mine consist of several prospect pits, a 210-ft-deep shaft, a 50-ft-long adit, a 100-ft-deep decline, and a 56-ft-deep shaft with drifts 45 and 60 ft long (fig. 64). The 210-ft-deep shaft was inaccessible, but all the other workings were mapped and sampled. The 50-ft-long adit was driven northeast along the fault to where the fault was truncated by a large Tertiary dacite dike (fig. 65). Fifty feet southwest of the portal is the decline and shaft (figs. 66a and b). The decline extends about 100 ft to the southwest along the fault. The shaft is 56 ft deep and has drifts at 30 and 55 ft that extend northeastward toward the main shaft. Samples 981-1029 taken from these workings contained as much as 52.4 oz silver per ton, 3.75 oz gold per ton, 9.0 percent barium, 1.1 percent copper, 9.0 percent lead, 0.4 percent tungsten, and 3.1 percent zinc. Resource calcuations based on samples from the main workings at the Pittsburg Mine suggest approximately 8,000 tons of inferred resources containing an average of 0.06 oz gold per ton, 3.1 oz silver per ton, 0.8 percent lead, and 0.6 percent zinc.

Southwest of the Pittsburg adit numerous prospects have been dug along the trend of the fault (figs. 67-69). Samples 1030-1067 from these pits contained as much as 1.6 oz silver per ton, 1.457 oz gold per ton, 0.21 percent lead, and 1.12 percent zinc. Resource calculations for these workings show the presence of approximately 1,120 tons of inferred resources containing approximately 0.64 oz silver per ton. If the vein is projected as continuous between the numerous pits, the inferred resources would be approximately 6,300 tons.

El Campo Mine

The El Campo Mine is near Gold Spring in the SE1/4 sec. 8, T. 13 N., R. 18 W., approximately 3/4 mi outside the WSA boundary. The workings are easily accessible via dirt road from Standard Wash.

The El Campo Mine was worked during the depression in the early 1930's as a placer gold deposit. The underground workings consist of a tunnel and horseshoe-shaped adit, 85 ft long, cut on the contact between a pebble conglomerate and Precambrian granodiorite in a paleochannel (fig. 70). Sample 1105, taken across the contact contained 0.89 oz gold per ton. There is no record of how much gold was produced from the mine, but some flakes and small nuggets may have been recovered from the contact.

Approximately 300 ft north of the El Campo adit a 10-ft-long adit has been cut in Tertiary diorite to prospect a small northeast-trending fault (fig. 70). Minor copper staining is associated with the fault, but no mineral concentrations were detected in the samples. Analytical data for samples 1098-1105, collected from the workings are listed in tables 3-5.

Manitowoc Mine

The Manitowoc Mine comprises three patented lode mining claims with numerous shafts in SW1/4 sec. 16 and the E1/2 sec. 17, T. 13 N., R. 18 W., at an elevation between 1,600 and 1,800 ft. Access to the mine is via the dirt road in Standard Wash. No record of production from the Manitowoc Mine was found and the shafts are inaccessible, but the size of the dumps indicate that the extent of the underground workings is from several hundreds

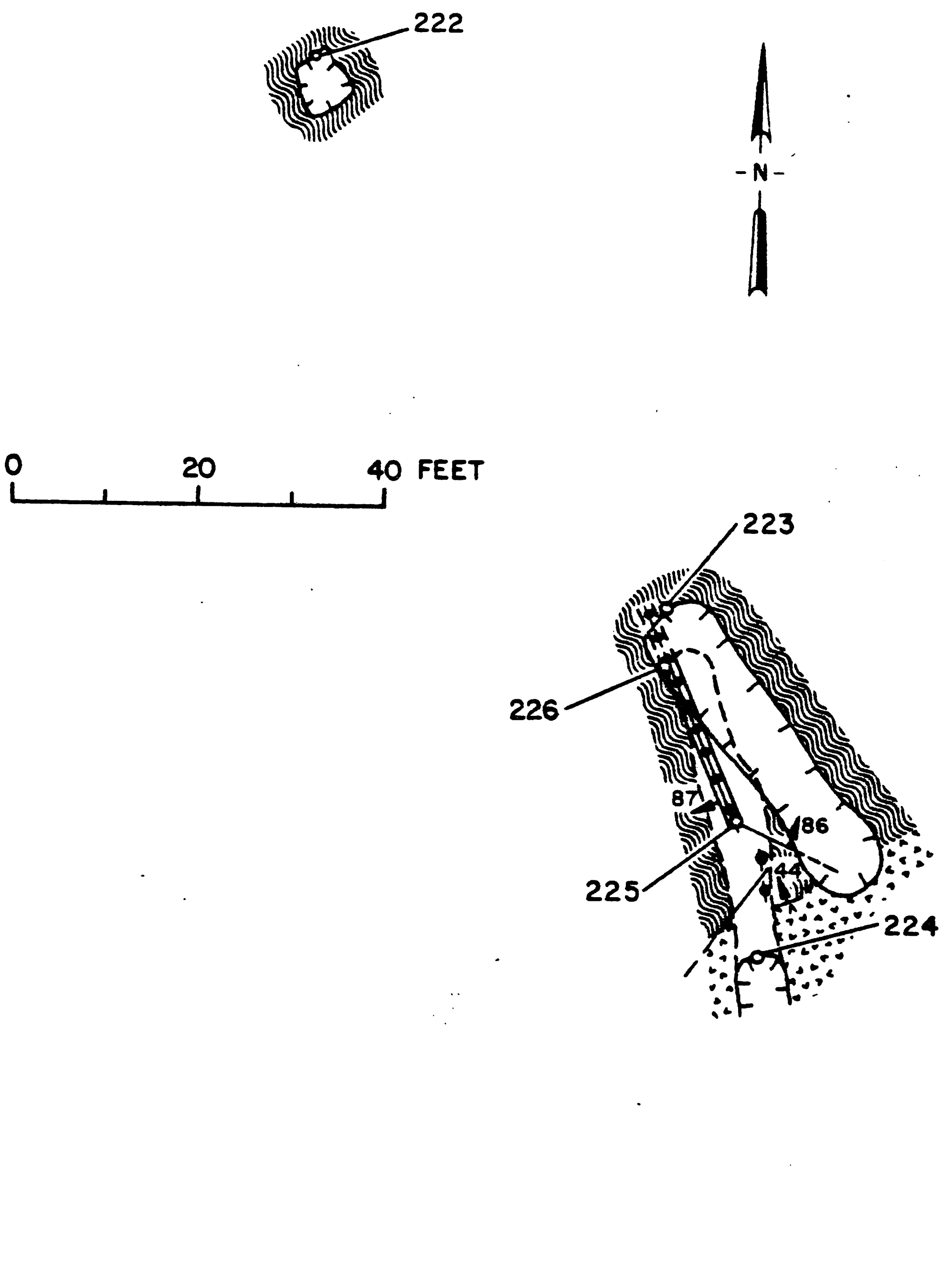


Figure 82.--Unnamed workings, NW1/4 sec. 16, T. 14 N., R. 19 W.

from the pit, contained 4.9 and 0.6 oz silver per ton, respectively. Sample 214 also contained 5.80 percent copper.

Sec. 21, T. 14 N., R. 19 W.

A 25-ft-long adit (fig. 84) and a prospect pit are in the SW1/4SW1/4 sec. 21. The adit was driven northwest in alluvium overlying Tertiary dacite. No mineralization was detected in samples 612-615, collected from these workings.

Sec. 23, T. 14 N., R. 19 W.

In the center of sec. 23 are two parallel-trending adits with a connecting crosscut (figs. 85 and 86). Access is from the Falls Springs Wash jeep trail and a foot trail.

Both adits were driven southward into very fractured gneiss. The gneiss has been intruded by dacite and diorite dikes, and has been extensively faulted. Irregular drifting and stoping constitute much of the more than 200 ft of workings. Samples 618-633, collected from the adits, contained minor amounts of gold and silver.

Sec. 24, T. 14 N., R. 19 W.

A 15-ft-long adit, two trenches, and several prospect pits are in NE1/4 sec. 24. The adit and trenches were cut along a northeast-trending quartz vein in gneiss (fig. 87). The location and trend of this vein relative to the vein at the Sunrise Mine suggest both are part of the same mineralized system.

Samples 680-684, collected from these workings, contained as much as 0.55 oz gold per ton, with only sample 684 having less than a 0.005 oz gold

Table 1.--Mineral deposits and occurrences in and near the Crossman Peak Wilderness Study Area--Continued

Sample nos.	Name	Location	Commodi-tie(s)	Deposit type	Development category[1]	Brief description
154-203	Wing	SE1/4 sec. 6, T. 14 N., R. 19 W.	Au, Ag, Cu, Pb, Zn, Mo	Lode and placer	M/I, P/A	Shaft, inaccessible, adits 55 and 75 ft long, and numerous prospect pits; irregular concentrations of gold, silver, copper, lead, zinc, and molybdenum associated with sulfides in northeasterly trending quartz veins.
204-213	Unnamed prospects.	NW1/4 sec. 17, T. 14 N., R. 19 W.	Au, Ag, Ba, Zn	Lode	P/I	Shaft, 12 ft deep with 30 ft drift, and several prospect pits; anomalous gold and silver concentrations disseminated in host rhyolite. Inferred resources of approximately 5,500 tons averaging 0.03 oz gold per ton and 0.19 oz silver per ton.
214, 215	Unnamed prospects.	SE1/4 sec. 17, T. 14 N., R. 19 W.	Au, Cu, Zn, Ba	Lode	P/I	Prospect pit cut in porphyritic andesite with calcite veins and anomalous silver and copper concentrations.
218-227	Unnamed prospects.	NW1/4 sec. 16, T. 14 N., R. 19 W.	Au, Ag, Cu, Pb, Zn	Lode	P/I	Adit, 35 ft long, and several prospect pits; anomalous concentrations of gold, silver, copper, lead and zinc in quartz vein along fault zone.

01/12/83

TABLE 2 - SAMPLE IDENTIFICATION INFORMATION

SAMPLE NO.	TWN/RNG/SEC	1/4 SEC	SAMP TYPE	REMARKS
192	014N/019W/06	SE	CHIP	26IN.PT, 15IN.QV IN GN, HEM STN, WING MINE
193	014N/019W/06	SE	CHIP	12IN.PT, IRREG QZ STRING IN GN, ABD HEM, WING MINE
194	014N/019W/06	SE	CHIP	14IN.PT, ABD QZ VLETS IN GN, HEM STN, WING MINE
195	014N/019W/06	SE	CHIP	2FT TR, 20IN.QV IN ALT GN, WING MINE
196	014N/019W/06	SE	CHIP	24IN.PT, IRREG QV IN GN, WING MINE
197	014N/019W/06	SE	CHIP	16IN.PT,QV IN ALT GN,ABD MN/HEM/LIM STN,WING MINE
198	014N/019W/06	SE	CHIP	24IN.PT,IRREG QZ PODS IN GN,ABD MN/HEM/LIM, WING
199	014N/019W/06	SE	CHIP	18IN.PT, FLT IN GN, MN/HEM STN, WING MINE
200	014N/019W/06	SE	CHIP	5FT PT, IRREG QV IN GN W/HEM STN, WING MINE
201	014N/019W/06	SE	CHIP	3FT PT, IRREG QZ IN GN, HEM STN, WING MINE
202	NO SAMPLE			
203	014N/019W/06	SE	CHIP	30IN.PT, FLT W/QZ STRING/VLETS IN GN, WING MINE
204	014N/019W/17	NW	CHIP	32IN.SH, QV W/POSS SIDERITE
205	014N/019W/17	NW	CHIP	6IN.LR/XC/SH, QV W/POSS SIDERITE, HEM STN
206	014N/019W/17	NW	CHIP	2FT LR/XC/SH, V FRAC HOST RX W/QV
207	014N/019W/17	NW	CHIP	2.5FT FC/XC/SH, V FRAC HOST RX, QZ IN FRAC
208	014N/019W/17	NW	GRAB	FT DP SEL, ABD CALC, NO MINL STRUCTURE
209	014N/019W/17	NW	CHIP	40IN.PT, NO MINL STRUCTURE
210	014N/019W/17	NW	CHIP	2FT TR, QZT OR METARHYOLITE
211	014N/019W/17	NW	CHIP	2FT TR/OC, QZT OR METARHYOLITE
212	014N/019W/17	NW	CHIP	2.5FT PT, V FRAC, V WEATHERED, CALC, SERPENTINITE?
213	014N/019W/17	NW	CHIP	2FT PT, V WEATHERED, DACITE?, ABD QZ
214	014N/019W/17	SE	GRAB	PT DP SEL, ANDES/DACITE, ABD AZURITE, MINR MALA
215	014N/019W/17	SE	CHIP	38IN.PT,ANDES, ABD CALC/MINR DRUSY QZ/MALA/AZURITE
216	014N/019W/09	SWSW	STSED	12IN.PN-CN, 1FT DEEP, (SA 217)
217	014N/019W/09	SWSW	STSED	GRAB/BULK, 1FT DEEP, (SA 216)
218	014N/019W/16	NW	CHIP	17IN. TR, FLT ZNE IN GN & DIABASE, V FRAC
219	014N/019W/16	NW	CHIP	22IN. TR, FLT ZNE W/QV (N82W 66N)/GAL/PYR
220	014N/019W/16	NW	CHIP	TR, QV IN SHR ZNE N80W 85N, ABD FE/MINR CU STN
221	014N/019W/16	NW	CHIP	4IN.TR, QV IN ALT GN N80W 84N, HEM/MINR MALA/CALC
222	014N/019W/16	NW	CHIP	11IN.PT, FLT ZNE W/QV N40W 84SW, FE STN, ALT GN
223	014N/019W/16	NW	CHIP	18IN.TR, FLT ZNE W/QV N21W 86W, ALT GN, FE STN
224	014N/019W/16	NW	CHIP	PORT/AD, QZ-RICH ZNE N15W 86E IN GN
225	014N/019W/16	NW	CHIP	13IN. AD, QV N30W 87W IN GN, FRAC W/LIM/HEM STN
226	014N/019W/16	NW	CHIP	5IN. BK/AD, ALT & SHEARED GN W/QV
227	014N/019W/16	N CTR	CHIP	14IN.PT, DOZER CUT, GN W/ABD FE STN, NO VIS MINL
228	014N/019W/16	N CTR	STSED	12IN.PN-CN, 1FT DEEP, (SA 229)
229	014N/019W/16	N CTR	STSED	GRAB/BULK, 1FT DEEP, (SA 228)
230	014N/019W/16	SE	CHIP	20IN.BK@PORT/AD, FRAC ZNE W/QZ, J&J MINE
231	014N/019W/16	SE	CHIP	33IN.BK/AD, SHR ZNE, J&J MINE
232	014N/019W/16	SE	CHIP	18IN.BK/AD, ALT FLT GOUGE, VERT,J&J MINE
233	014N/019W/16	SE	CHIP	9IN.LR/AD, GN NO MINERALIZATION NOTED, J&J MINE
234	014N/019E/16	SE	CHIP	13IN.LR/AD, FLT GOUGE, N44E 85 SE, HEM STN, J&J
235	014N/019W/16	SE	CHIP	16IN.NR/SH, GN IN GOUGE, J&J MINE
236	014N/019W/16	SE	CHIP	4FT AD, GN, NO VIS MINL, J&J MINE
237	014N/019W/16	SE	CHIP	49IN.BK/DR/WZ
238	014N/019W/16	SE	CHIP	26IN.BK/DR/SH, GN, NO VIS MINL, J&J MINE
239	014N/019W/16	SE	CHIP	39IN.FC/DR/AD, GN, NO VIS MINL, J&J MINE
240	014N/019W/16	SE	CHIP	3FT FC/DR/WZ/AD, CHLORITE-RICH ZNE IN GN, J&J MINE
241	014N/019W/16	SE	GRAB	DP SEL, GN/QZ W/MALA/PYR/CPY/HEM/LIM, J&J MINE
242	014N/019W/16	SE	CHIP	13IN.S WALL TR, ALT GN, J&J MINE

01/12/83

TABLE 3 - FIRE ASSAY OR CHEMICAL DIGESTION ANALYSES

SAMPLE NO.	FIRE-AG OZ/TON	FIRE-AU OZ/TON	CHEM- %		CHEM- %		CHEM- %		CHEM- %		CHEM- %		CHEM- %		CHEM- %	
192	0.3	< 0.005	BA	0.02	CU	<0.01	MO	<0.01	PB	0.01	SN	<0.01	W	<0.01	ZN	0.01
193	0.3	< 0.005	BA	0.06	CU	0.01	MO	<0.01	PB	0.01	SN	<0.01	W	<0.01	ZN	0.07
194	0.2	< 0.005	BA	0.01	CU	0.01	MO	<0.01	PB	0.01	SN	<0.01	W	<0.01	ZN	0.02
195	0.3	< 0.005	BA	0.02	CU	<0.01	MO	<0.01	PB	<0.01	SN	<0.01	W	<0.01	ZN	<0.01
196	< 0.2	< 0.005	BA	0.04	CU	<0.01	MO	<0.01	PB	<0.01	SN	<0.01	W	<0.01	ZN	0.01
197	0.4	< 0.005	BA	0.01	CU	<0.01	MO	<0.01	PB	0.01	SN	<0.01	W	<0.01	ZN	0.01
198	1.0	< 0.005	BA	0.04	CU	<0.01	MO	<0.01	PB	<0.01	SN	<0.01	W	<0.01	ZN	0.02
199	0.5	< 0.005	BA	0.04	CU	0.01	MO	<0.01	PB	<0.01	SN	<0.01	W	<0.01	ZN	0.03
200	0.2	< 0.005	BA	0.04	CU	0.01	MO	<0.01	PB	<0.01	SN	<0.01	W	<0.01	ZN	0.02
201	0.4	< 0.005	BA	<0.01	CU	0.23	MO	<0.01	PB	0.06	SN	<0.01	W	<0.01	ZN	0.28
202	NO SAMPLE															
203	0.4	< 0.005	BA	0.02	CU	<0.01	MO	<0.01	PB	<0.01	SN	<0.01	W	<0.01	ZN	0.01
204	< 0.2	TRACE	BA	<0.01	CU	<0.01	MO	<0.01	PB	<0.01	SN	<0.01	W	<0.01	ZN	0.01
205	0.4	0.028	BA	<0.01	CU	<0.01	MO	<0.01	PB	0.01	SN	<0.01	W	<0.01	ZN	0.02
206	0.4	0.022	BA	<0.01	CU	<0.01	MO	<0.01	PB	<0.01	SN	<0.01	W	<0.01	ZN	0.02
207	0.2	0.115	BA	<0.01	CU	<0.01	MO	<0.01	PB	<0.01	SN	<0.01	W	<0.01	ZN	0.01
208	1.2	0.070	BA	<0.01	CU	0.02	MO	<0.01	PB	0.01	SN	<0.01	W	<0.01	ZN	0.04
209	0.2	0.026	BA	0.15	CU	0.01	MO	<0.01	PB	<0.01	SN	<0.01	W	<0.01	ZN	0.06
210	< 0.2	0.025	BA	0.06	CU	0.01	MO	<0.01	PB	<0.01	SN	<0.01	W	<0.01	ZN	0.05
211	0.4	0.031	BA	<0.01	CU	<0.01	MO	<0.01	PB	0.01	SN	<0.01	W	<0.01	ZN	0.02
212	< 0.2	TRACE	BA	0.20	CU	0.01	MO	<0.01	PB	<0.01	SN	<0.01	W	<0.01	ZN	0.02
213	0.2	0.024	BA	0.20	CU	0.01	MO	<0.01	PB	<0.01	SN	<0.01	W	<0.01	ZN	0.01
214	4.9	< 0.005	BA	0.02	CU	5.80	MO	<0.01	PB	0.01	SN	<0.01	W	<0.01	ZN	0.01
215	0.6	< 0.005	BA	0.05	CU	0.70	MO	<0.01	PB	0.01	SN	<0.01	W	<0.01	ZN	0.02
216	< 0.2	< 0.005	BA	<0.01	CU	<0.01	MO	<0.01	PB	<0.01	SN	<0.01	W	<0.01	ZN	0.02
217	< 0.2	< 0.005	BA	0.03	CU	0.01	MO	<0.01	PB	<0.01	SN	<0.01	W	<0.01	ZN	0.02
218	0.2	TRACE	BA	0.05	CU	0.20	MO	<0.01	PB	<0.01	SN	<0.01	W	0.01	ZN	0.43
219	1.0	TRACE	BA	<0.01	CU	0.06	MO	<0.01	PB	0.04	SN	<0.01	W	<0.01	ZN	0.03
220	0.2	0.065	BA	<0.01	CU	0.06	MO	<0.01	PB	<0.01	SN	<0.01	W	<0.01	ZN	0.05
221	1.6	0.006	BA	0.05	CU	0.10	MO	<0.01	PB	0.10	SN	<0.01	W	<0.01	ZN	0.13
222	< 0.2	< 0.005	BA	<0.01	CU	0.07	MO	<0.01	PB	<0.01	SN	<0.01	W	<0.01	ZN	0.04
223	< 0.2	< 0.005	BA	0.05	CU	0.04	MO	<0.01	PB	0.05	SN	<0.01	W	<0.01	ZN	0.07
224	< 0.2	0.005	BA	<0.01	CU	<0.01	MO	<0.01	PB	<0.01	SN	<0.01	W	<0.01	ZN	0.01
225	0.2	< 0.005	BA	<0.01	CU	0.02	MO	<0.01	PB	<0.01	SN	<0.01	W	<0.01	ZN	0.04
226	< 0.2	< 0.005	BA	0.03	CU	<0.01	MO	<0.01	PB	<0.01	SN	<0.01	W	<0.01	ZN	0.01
227	0.3	< 0.005	BA	0.05	CU	0.03	MO	<0.01	PB	0.07	SN	<0.01	W	<0.01	ZN	0.01
228	< 0.2	< 0.005	BA	0.10	CU	<0.01	MO	<0.01	PB	<0.01	SN	<0.01	W	<0.01	ZN	<0.01
229	0.2	< 0.005	BA	0.03	CU	<0.01	MO	<0.01	PB	<0.01	SN	<0.01	W	<0.01	ZN	<0.01
230	< 0.2	TRACE	BA	<0.01	CU	<0.01	MO	<0.01	PB	<0.01	SN	<0.01	W	<0.01	ZN	0.01
231	< 0.2	TRACE	BA	<0.01	CU	<0.01	MO	<0.01	PB	<0.01	SN	<0.01	W	<0.01	ZN	<0.01
232	< 0.2	0.008	BA	0.03	CU	<0.01	MO	<0.01	PB	<0.01	SN	<0.01	W	<0.01	ZN	<0.01
233	< 0.2	< 0.005	BA	<0.01	CU	<0.01	MO	<0.01	PB	0.02	SN	<0.01	W	<0.01	ZN	<0.01
234	< 0.2	< 0.005	BA	<0.01	CU	<0.01	MO	<0.01	PB	0.01	SN	<0.01	W	<0.01	ZN	<0.01
235	0.2	0.051	BA	0.01	CU	0.01	MO	<0.01	PB	0.02	SN	<0.01	W	<0.01	ZN	0.06
236	0.3	< 0.005	BA	<0.01	CU	<0.01	MO	<0.01	PB	<0.01	SN	<0.01	W	<0.01	ZN	<0.01
237	0.3	< 0.005	BA	0.03	CU	0.01	MO	<0.01	PB	0.07	SN	<0.01	W	<0.01	ZN	0.05
238	0.2	< 0.005	BA	<0.01	CU	<0.01	MO	<0.01	PB	<0.01	SN	<0.01	W	<0.01	ZN	<0.01
239	0.3	< 0.005	BA	0.10	CU	0.01	MO	<0.01	PB	<0.01	SN	<0.01	W	<0.01	ZN	0.08
240	0.2	< 0.005	BA	<0.01	CU	0.02	MO	<0.01	PB	0.01	SN	<0.01	W	<0.01	ZN	0.03
241	9.3	0.158	BA	0.01	CU	1.64	MO	<0.01	PB	4.30	SN	<0.01	W	<0.01	ZN	0.57
242	< 0.2	< 0.005	BA	<0.01	CU	<0.01	MO	<0.01	PB	0.01	SN	<0.01	W	<0.01	ZN	<0.01

S.E. ot rast

01/12/83

TABLE 2 - SAMPLE IDENTIFICATION INFORMATION

SAMPLE NO.	TWN/RNG/SEC	1/4 SEC	SAMP TYPE	REMARKS
937	014N/018W/30	NE	GRAB	DP 5FT GRID, MAIN HAULAGE LEVEL
938	014N/018W/30	NE	GRAB	SILT/POWDER FR THICKENER TANK
939	014N/018W/30	NE	STSED	12IN.PN-CN, (SA 940) 6IN. DEEP
940	014N/018W/30	NE	STSED	GRAB/BULK, (SA 939) 6IN. DEEP
941	014N/018W/30	SE	GRAB	DP RAND, NO VIS MINL
942	014N/018W/30	SE	CHIP	3IN.BK/AD, SHR ZNE, FE STN
943	014N/018W/30	SE	CHIP	BK/AD, SHR ZNE, FE STN
944	014N/018W/30	SE	CHIP	17IN.LR/AD, SHR ZNE, ABD FE STN
945	014N/018W/30	SE	GRAB	DP 6FT GRID, GN, QZ, FE STN
946	014N/018W/30	SE	GRAB	DP 6FT GRID, GN QZ, FE STN
947	014N/018W/30	NW	GRAB	SH DP 6FT GRID
948	014N/018W/30	NW	GRAB	SH DP 6FT GRID
949	014N/018W/30	NW	CHIP	24IN.TR, QV IN AMPHIB?
950	014N/018W/30	NW	CHIP	12IN.TR, QV
951	014N/018W/30	NW	CHIP	20IN. RIB/AD, QV W/ABD FE STN
952	014N/018W/30	NW	GRAB	DP RAND, QZ W/FE & CU STN
953	014N/019W/25	NE	CHIP	12IN.SR/AD, LIM STN ON HOST RX
954	014N/019W/25	NE	GRAB	AD DP 6FT GRID
955	014N/019W/25	NE	GRAB	AD DP SEL, QZ W/FE STN/PYR
956	014N/019W/25	NE	GRAB	SH DP RAND, ALT SCHIST/GN, FE STN
957	014N/019W/25	NE	CHIP	6IN.FC/AD, V ALT SCHIST & GR RX, FE STN
958	014N/019W/25	NE	CHIP	2FT PT
959	014N/019W/25	NE	CHIP	6IN.RR/AD, ALT GR RX, FE STN
960	014N/019W/25	NE	CHIP	8IN.WR/AD, FRAC/ALT GR RX
961	014N/019W/25	NE	CHIP	3FT PT, FLT ZNE
962	014N/019W/25	NE	GRAB	PT DP RAND, QV
963	014N/019W/25	NW	CHIP	3IN.BK/AD, FLT ZNE, FE STN
964	014N/019W/25	NW	CHIP	3IN.BK/AD, FLT ZNE, ALT GN, FE STN
965	014N/019W/25	NW	CHIP	BK/AD, FE STN GN IN FLT ZNE
966	014N/019W/25	NW	GRAB	PT DP 6FT GRID
967	014N/019W/25	NW	CHIP	3IN.PT
968	014N/019W/25	NW	GRAB	PT DP 6FT GRID
969	014N/019W/25	NW	CHIP	8IN.PT, GN/INTR CONT
970	014N/019W/26	SE	STSED	END OF RD PAST PITTS MINE, NO OBVIOUS BLACK SANDS
971	014N/019W/26	SW	STSED	NE OF PITTS MINE, NO VIS BLACK SANDS
972	014N/019W/27	SE	CHIP	40IN.PT, DACITE W/HEM STN, PITTSBURG MINE
973	014N/019W/27	SE	CHIP	6IN.PT,FRAC ZNE IN DACITE, HEM STN, PITTSBURG AREA
974	014N/019W/27	SE	CHIP	26IN. PT, FLT GOUGE IN GN NEAR DIOR CONT
975	014N/019W/27	SE	CHIP	26IN. PT, FLT GOUGE IN GN/DIOR CONT
976	014N/019W/27	SE	GRAB	DP SEL, GN W/GAL, PYR, MALA, BOXWORK
977	014N/019W/27	SE	CHIP	20IN. PT, 4IN. FLT IN GN, HEM, LIM
978	NO SAMPLE			
979	014N/019W/27	SE	CHIP	4 FT SH, GN AT DIOR CONT, MINR SULF, PITTSBURG
980	014N/019W/27	SE	CHIP	4FT BK/AD,GN/DIOR FLT CONT,ABD CU/HEM STN,NE PITTS
981	014N/019W/27	SE	CHIP	14IN.PT, FLT GOUGE IN GN, PITTSBURG MINE
982	014N/019W/27	SE	CHIP	2FT PT, QV IN SHR/GN, PITTSBURG AREA
983	014N/019W/27	SE	CHIP	13IN.PT, 8IN.QV IN GN, PITTSBURG MINE
984	014N/019W/27	SE	CHIP	26IN.PT, FLT GOUGE IN DIOR, PITTSBURG MINE
985	014N/019W/27	SE	CHIP	3FT TR, FRAC AUGEN GN, PITTSBURG AREA
986	014N/019W/27	SE	CHIP	5IN. SH N. SIDE,FLT ZNE,QZ/FELD/LIM/HEM,PITTS MINE
987	014N/019W/27	SE	CHIP	5.5FT SH N. SIDE,FLT ZNE N45E 68NW,PITTSBURG MINE

TABLE 2 - SAMPLE IDENTIFICATION INFORMATION

SAMPLE NO.	TWN/RNG/SEC	1/4 SEC	SAMP TYPE	REMARKS
988	014N/019W/27	SE	CHIP	33IN. PT (SA 989), FLT ZNE/GN, PITTSBURG MINE
989	014N/019W/27	SE	CHIP	3.5FT PT (SA 988), FLT ZNE/GN, PITTSBURG MINE
990	014N/019W/27	SE	CHIP	20IN. TR,FLT ZNE GN W/QZ/FELD/MALA/HEM, PITTS MINE
991	014N/019W/27	SE	CHIP	2FT SH, FLT ZNE W/QV/MALA/HEM/LIM, PITTS MINE
992	014N/019W/27	SE	CHIP	8IN.TR, FAULT GOUGE
993	014N/019W/27	SE	CHIP	18IN. TR, FLT ZNE W/QV/MALA/LIM/HEM, PITTS MINE
994	014N/019W/27	SE	CHIP	18IN. OP ABV AD, QV IN FLT ZNE, PITTSBURG
995	014N/019W/27	SE	CHIP	11IN.PT, FLT BTWN GN/ODIAB, PITTSBURG MINE
996	014N/019W/27	SE	CHIP	3FT BEN/AD (SA 997), GN W/QV/PYR/LIM, PITTS MINE
997	014N/019W/27	SE	CHIP	2FT BEN/AD (SA 996), GN W/QZ/PYR/LIM, PITTS MINE
998	014N/019W/27	SE	CHIP	4FT FC/AD, 10IN. FLT IN GN, PITTSBURG MINE
999	014N/019W/27	SE	CHIP	10IN. PORT/AD, FLT GOUGE W/CU STN, PITTS MINE
1000	014N/019W/27	SE	CHIP	9IN. PORT/AD, GN ADJ TO FLT ZNE(SA 999),PITTS MINE
1001	014N/019W/27	SE	CHIP	14IN. PORT/AD,FLT ZNE(SA 999) W/QV/HEM/LIM, PITTS
1002	014N/019W/27	SE	CHIP	32IN.AD, FAULT, MINR CPY, PITTSBURG MINE
1003	014N/019W/27	SE	CHIP	9IN.AD, FAULT, PITTSBURG MINE
1004	014N/019W/27	SE	CHIP	38IN. BEN/AD, BRECC GN W/ABD LIM STN, PITTS MINE
1005	014N/019W/27	SE	CHIP	7IN. RR/AD, FLT BTWN GN & DIABASE, PITTSBURG MINE
1006	014N/019W/27	SE	CHIP	7FT 2IN. FC/AD, FAULT
1007	014N/019W/27	SE	CHIP	12IN.FC/AD, FAULT, MINR ALT
1008	014N/019W/27	SE	CHIP	39IN. FC/AD, FLT GOUGE W/QZ/FELD/PYR, PITTS MINE
1009	014N/019W/27	SE	GRAB	DP 5FT GRID
1010	014N/019W/27	SE	GRAB	DP 5FT GRID
1011	014N/019W/27	SE	GRAB	DP 5FT GRID
1012	014N/019W/27	SE	CHIP	40IN. FC/DR/SH,FLT ZNE W/QV/GAL/HEM/LIM,PITTS MINE
1013	014N/019W/27	SE	CHIP	11IN. LR/DR/SH,FLT ZNE BRECC GN/DIABASE,PITTS MINE
1014	014N/019W/27	SE	CHIP	35IN.BK/DR/SH, FLT ZNE BRECC GN/MINR CU,PITTS MINE
1015	014N/019W/27	SE	CHIP	22IN. SH,FLT ZNE IN GN W/QV/GAL/MINR CU,PITTS MINE
1016	014N/019W/27	SE	CHIP	28IN. SH, BRECC GN W/QZ, PITTSBURG MINE
1017	014N/019W/27	SE	CHIP	41IN. SH S. SIDE BOT,FLT ZNE IN GN W/QV,PITTS MINE
1018	014N/019W/27	SE	CHIP	36IN. BK/DR/SH (SA 1017), FLT ZNE, PITTSBURG MINE
1019	014N/019W/27	SE	CHIP	5IN. SH, FLT ZNE W/QZ/SULF, PITTS MINE
1020	014N/019W/27	SE	CHIP	2FT SH E. WALL, FLT ZNE ALT GN, PITTSBURG MINE
1021	014N/019W/27	SE	CHIP	9IN.INSH, FLT GOUGE, CU STN
1022	014N/019W/27	SE	CHIP	3FT INSH, FLT GOUGE IN GN, PITTSBURG MINE
1023	014N/019W/27	SE	CHIP	35IN.INSH, FLT GOUGE, CU STN
1024	014N/019W/27	SE	CHIP	28IN. INSH, FLT GOUGE IN GN, PITTSBURG MINE
1025	014N/019W/27	SE	CHIP	15IN.INSH, FLT GOUGE, NO ALT NOTED
1026	014N/019W/27	SE	CHIP	28IN. INSH, FLT GOUGE IN GN, PITTSBURG MINE
1027	014N/019W/27	SE	CHIP	12IN.INSH, FAULT GOUGE
1028	014N/019W/27	SE	CHIP	28IN.INSH, FLT GOUGE, NO ALT NOTED
1029	014N/019W/27	SE	CHIP	TR SEL, FLT GOUGE, GRANODIORITE W/MALA
1030	014N/019W/27	SE	CHIP	10IN.SR/SH, QV W/ABD CU STN, PITTSBURG MINE
1031	014N/019W/27	SE	CHIP	16IN.SH, SHR ZNE IN DIOR, PITTSBURG MINE
1032	014N/019W/27	SE	CHIP	36IN.SH, DIOR/GN CONTACT, PITTSBURG MINE
1033	014N/019W/27	SE	CHIP	10IN.SH, QV W/MINR CU STN, ABD LIM/HEM, PITTSBURG
1034	014N/019W/27	SE	CHIP	16IN.TR, FLT ZNE/QV IN GN, NO VIS MINL, PITTSBURG
1035	014N/019W/27	SE	CHIP	24IN.TR, GN ADJ QV (SA 1034), NO VIS MINL, PITTS
1036	014N/019W/27	SE	CHIP	10IN.TR, FLT W/3IN.QV, MINR PYR/HEM, PITTSBURG
1037	014N/019W/27	SE	GRAB	TR DP SEL, QZ W/HEM/LIM, PITTSBURG
1038	014N/019W/27	SE	CHIP	10IN.TR, SHR ZNE W/QV, MINR PYR/HEM, PITTSBURG

01/12/83 TABLE 2 - SAMPLE IDENTIFICATION INFORMATION

not plotted

SAMPLE NO.	TWN/RNG/SEC	1/4 SEC	SAMP TYPE	REMARKS
1039	014N/019W/27	SE	CHIP	12IN.PT, FLT IN GN, PITTSBURG
1040	014N/019W/27	SE	CHIP	9IN.PT, V WEATHERED GN, PITTSBURG
1041	014N/019W/34	NE	CHIP	12IN.OP,FRAC IN DACITE, NO VIS MINL, PITTS AREA
1042	014N/019W/34	NE	GRAB	SH DP SEL, FLT IN GR, HEM/LIM, PITTS MINE AREA
1043	014N/019W/34	NE	CHIP	36IN.PT, GV IN GRGN, PITTSBURG MINE AREA
1044	014N/019W/34	NE	CHIP	3IN.PT, GV IN GR, HEM/LIM, PITTSBURG MINE AREA
1045	014N/019W/27	SW	CHIP	12IN.PT, FLT ZNE W/GV IN GN, PITTSBURG MINE AREA
1046	014N/019W/27	SW	GRAB	PT DP SEL,GV W/ABD HEM, MINR MALA, CPY, PITTS AREA
1047	014N/019W/27	SW	CHIP	10IN.PT, FLT W/GV IN GN, PITTSBURG MINE AREA
1048	014N/019W/27	SW	CHIP	10IN.OP,CONTACT GN/DACITE, NO VIS MINL, PITTS AREA
1049	014N/019W/34	NW	CHIP	45IN.PT, GN/DAC CONT, NO VIS MINL, SW OF PITTS
1050	014N/019W/34	NW	CHIP	12IN.PT, GN/DAC CONT ZNE, NO VIS MINL, SW OF PITTS
1051	014N/019W/34	NW	CHIP	30IN.PT, GOUGE MATERIAL IN GN, SW OF PITTS
1052	014N/019W/34	NW	GRAB	DP SEL, SILIC RX W/ABD HEM & PYR? BOXWORK
1053	014N/019W/34	NW	CHIP	18IN.NW WALL/SH, FLT ZNE IN GN, SW OF PITTSBURG
1054	014N/019W/34	NW	CHIP	20IN.NE WALL/SH, FRAC ZNE IN GN, NO VIS MINL
1055	014N/019W/34	NW	CHIP	8IN.PT, ALT FRAC ZNE IN GN, SW OF PITTSBURG MINE
1056	014N/019W/34	NW	CHIP	15IN.PT, MINR GV IN GN, SW OF PITTSBURG MINE
1057	014N/019W/34	NW	GRAB	PT SEL,GV, HEM, MINR PYR? BOXWORK, SW OF PITTSBURG
1058	014N/019W/34	NW	CHIP	18IN.PT, .5IN.GV IN FRAC IN GN, SW OF PITTSBURG
1059	014N/019W/27	SW	CHIP	3IN.NR/SH, FLT ZNE IN GR, SW OF PITTSBURG MINE
1060	014N/019W/27	SW	CHIP	25IN.WR/SH, (SA 1059) ALT ZNE IN GR, SW OF PITTS
1061	014N/019W/27	SW	CHIP	27IN.OP, GR/DIOR CONT ZNE, SW OF PITTSBURG MINE
1062	014N/019W/27	SW	CHIP	32IN.PT, DECOMPOSED GR OR GN, SW OF PITTSBURG
1063	014N/019W/27	SW	CHIP	1FT OP, 8IN.GV IN GR, NO VIS MINL, SW PITTSBURG
1064	014N/019W/27	SW	CHIP	10IN.OP, 5IN.GV IN GR, NO VIS MINL, SW PITTSBURG
1065	014N/019W/27	SW	CHIP	26IN.OP, 5IN.GV IN GR, NO VIS MINL, SW PITTSBURG
1066	014N/019W/27	SW	CHIP	14IN.OP, GZ PODS IN GR, NO VIS MINL, SW OF PITTS
1067	014N/019W/27	SW	CHIP	28IN.OP, GZ POD IN GR, NO VIS MINL, SW OF PITTS
1068	014N/019W/27	SW	CHIP	5FT PT, DIOR W/FLT (SA 1069), SW OF PITTS
1069	014N/019W/27	SW	CHIP	5IN.PT, FLT IN DIOR (SA 1068), SW OF PITTS
1070	014N/019W/27	SE	CHIP	7IN.OP, FLT W/QZ IN GN, PITTSBURG MINE AREA
1071	014N/019W/27	SE	CHIP	39IN.OP, GV/FLT ZNE IN GN, PITTSBURG MINE AREA
1072	014N/018W/31	NW	STSED	12IN.PN-CN, (SA 1073) 1FT DEEP
1073	014N/018W/31	NW	STSED	GRAB/BULK, (SA 1072) 1FT DEEP
1074	014N/018W/31	NW	STSED	12IN.PN-CN, (SA 1075) 1FT. DEEP
1075	014N/018W/31	NW	STSED	GRAB/BULK, (SA 1074) 1FT DEEP
1076	014N/018W/32	NW	STSED	12IN.PN-CN, (SA 1077) 1FT DEEP
1077	014N/018W/32	NW	STSED	GRAB/BULK, (SA 1076) 1FT DEEP
1078	013N/019W/01	SE	STSED	12IN.PN-CN, (SA 1079) 1FT DEEP
1079	013N/019W/01	SE	STSED	GRAB/BULK, (SA 1078) 1FT DEEP
1080	014N/018W/33	SE	STSED	PN-CN, (SA 1081)
1081	014N/018W/33	SE	STSED	GRAB/BULK, (SA 1080)
1082	014N/017W/20	SW	STSED	12IN.PN-CN, (SA 1083)
1083	014N/017W/20	SW	STSED	GRAB/BULK, (SA 1082)
1084	014N/017W/30	NW	STSED	12IN.PN-CN, (SA 1085)
1085	014N/017W/30	NW	STSED	GRAB/BULK, (SA 1084)
1086	014N/017W/31	NW	STSED	12IN.PN-CN, (SA 1087)
1087	014N/017W/31	NW	STSED	GRAB/BULK, (SA 1086)
1088	014N/017W/31	SW	STSED	12IN.PN-CN, 1.5FT DEEP, (SA 1089)
1089	014N/017W/31	SW	STSED	GRAB/BULK, 1.5FT DEEP, (SA 1088)

01/12/83 TABLE 3 - FIRE ASSAY OR CHEMICAL DIGESTION ANALYSES

SAMPLE NO.	FIRE-AG OZ/TON	FIRE-AU OZ/TON	CHEM-	%	CHEM-	%	CHEM-	%	CHEM-	%	CHEM-	%	CHEM-	%	CHEM-	%
937	< 0.2	< 0.005	BA	0.06	CU	<0.01	MO	<0.01	PB	<0.01	SN	<0.01	W	<0.01	ZN	0.02
938	< 0.2	0.065	BA	0.03	CU	0.04	MO	<0.01	PB	0.30	SN	<0.01	W	<0.01	ZN	0.13
939	< 0.2	< 0.005	BA	0.05	CU	<0.01	MO	<0.01	PB	<0.01	SN	<0.01	W	<0.01	ZN	<0.01
940	< 0.2	< 0.005	BA	<0.01	CU	0.01	MO	<0.01	PB	<0.01	SN	<0.01	W	<0.01	ZN	0.03
941	< 0.2	0.030	BA	<0.01	CU	0.01	MO	<0.01	PB	1.35	SN	<0.01	W	<0.01	ZN	0.03
942	0.2	TRACE	BA	<0.01	CU	0.01	MO	<0.01	PB	0.05	SN	<0.01	W	<0.01	ZN	0.01
943	< 0.2	< 0.005	BA	0.05	CU	0.01	MO	<0.01	PB	0.02	SN	<0.01	W	<0.01	ZN	0.02
944	< 0.2	0.014	BA	<0.01	CU	0.01	MO	<0.01	PB	<0.01	SN	<0.01	W	<0.01	ZN	0.13
945	< 0.2	< 0.005	BA	0.10	CU	0.01	MO	<0.01	PB	<0.01	SN	<0.01	W	<0.01	ZN	0.02
946	< 0.2	< 0.005	BA	0.05	CU	0.01	MO	<0.01	PB	<0.01	SN	<0.01	W	<0.01	ZN	0.01
947	< 0.2	< 0.005	BA	0.02	CU	0.02	MO	<0.01	PB	<0.01	SN	<0.01	W	<0.01	ZN	0.01
948	< 0.2	< 0.005	BA	0.01	CU	0.01	MO	<0.01	PB	0.01	SN	<0.01	W	<0.01	ZN	0.01
949	< 0.2	TRACE	BA	<0.01	CU	0.01	MO	<0.01	PB	<0.01	SN	<0.01	W	<0.01	ZN	0.01
950	< 0.2	TRACE	BA	<0.01	CU	0.05	MO	<0.01	PB	0.02	SN	<0.01	W	<0.01	ZN	0.01
951	< 0.2	0.007	BA	<0.01	CU	0.02	MO	<0.01	PB	0.21	SN	<0.01	W	<0.01	ZN	0.01
952	< 0.2	< 0.005	BA	<0.01	CU	0.13	MO	<0.01	PB	0.35	SN	<0.01	W	<0.01	ZN	0.03
953	0.2	0.012	BA	0.02	CU	0.01	MO	<0.01	PB	0.02	SN	<0.01	W	<0.01	ZN	0.02
954	< 0.2	0.076	BA	0.01	CU	0.01	MO	<0.01	PB	0.01	SN	<0.01	W	<0.01	ZN	0.03
955	< 0.2	0.363	BA	<0.01	CU	0.03	MO	<0.01	PB	0.03	SN	<0.01	W	<0.01	ZN	0.04
956	< 0.2	TRACE	BA	0.05	CU	0.01	MO	<0.01	PB	0.01	SN	<0.01	W	<0.01	ZN	0.02
957	< 0.2	< 0.005	BA	<0.01	CU	0.01	MO	<0.01	PB	0.02	SN	<0.01	W	<0.01	ZN	0.02
958	< 0.2	TRACE	BA	0.05	CU	0.01	MO	<0.01	PB	0.01	SN	<0.01	W	<0.01	ZN	0.01
959	< 0.2	0.077	BA	0.05	CU	0.05	MO	<0.01	PB	<0.01	SN	<0.01	W	<0.01	ZN	0.05
960	< 0.2	< 0.005	BA	0.02	CU	0.02	MO	<0.01	PB	0.01	SN	<0.01	W	<0.01	ZN	0.02
961	< 0.2	< 0.005	BA	0.02	CU	0.01	MO	<0.01	PB	<0.01	SN	<0.01	W	<0.01	ZN	0.03
962	< 0.2	0.019	BA	0.02	CU	0.04	MO	<0.01	PB	<0.01	SN	<0.01	W	<0.01	ZN	0.01
963	< 0.2	TRACE	BA	0.01	CU	0.01	MO	<0.01	PB	<0.01	SN	<0.01	W	<0.01	ZN	0.04
964	< 0.2	< 0.005	BA	0.09	CU	0.01	MO	<0.01	PB	<0.01	SN	<0.01	W	<0.01	ZN	0.03
965	0.2	< 0.005	BA	0.01	CU	0.01	MO	<0.01	PB	<0.01	SN	<0.01	W	<0.01	ZN	0.02
966	< 0.2	TRACE	BA	<0.01	CU	0.01	MO	<0.01	PB	<0.01	SN	<0.01	W	<0.01	ZN	0.01
967	< 0.2	< 0.005	BA	<0.01	CU	0.03	MO	<0.01	PB	<0.01	SN	<0.01	W	<0.01	ZN	0.03
968	< 0.2	0.044	BA	<0.01	CU	0.01	MO	<0.01	PB	<0.01	SN	<0.01	W	<0.01	ZN	0.02
969	< 0.2	0.009	BA	<0.01	CU	0.01	MO	<0.01	PB	<0.01	SN	<0.01	W	<0.01	ZN	0.01
970	< 0.2	< 0.005	BA	0.03	CU	<0.01	MO	<0.01	PB	0.01	SN	<0.01	W	<0.01	ZN	0.05
971	< 0.2	< 0.005	BA	0.03	CU	<0.01	MO	<0.01	PB	0.01	SN	<0.01	W	<0.01	ZN	0.06
972	< 0.2	< 0.005	BA	0.03	CU	<0.01	MO	<0.01	PB	<0.01	SN	<0.01	W	<0.01	ZN	0.01
973	< 0.2	< 0.005	BA	0.04	CU	<0.01	MO	<0.01	PB	0.01	SN	<0.01	W	<0.01	ZN	0.03
974	< 0.2	< 0.005	BA	0.06	CU	<0.01	MO	<0.01	PB	0.04	SN	<0.01	W	<0.01	ZN	0.08
975	< 0.2	< 0.005	BA	0.05	CU	0.02	MO	<0.01	PB	0.05	SN	<0.01	W	<0.01	ZN	0.24
976	4.3	0.023	BA	0.71	CU	0.38	MO	<0.01	PB	1.35	SN	<0.01	W	0.02	ZN	1.45
977	< 0.2	0.180	BA	0.12	CU	0.02	MO	<0.01	PB	0.15	SN	<0.01	W	<0.01	ZN	0.34
978	NO SAMPLE															
979	2.8	0.016	BA	0.76	CU	0.23	MO	<0.01	PB	0.39	SN	<0.01	W	<0.01	ZN	0.30
980	0.5	0.014	BA	0.92	CU	0.44	MO	<0.01	PB	0.77	SN	<0.01	W	<0.01	ZN	1.15
981	< 0.2	< 0.005	BA	<0.01	CU	<0.01	MO	<0.01	PB	<0.01	SN	<0.01	W	<0.01	ZN	0.01
982	1.4	< 0.005	BA	0.02	CU	0.01	MO	<0.01	PB	0.04	SN	<0.01	W	<0.01	ZN	0.05
983	0.7	< 0.005	BA	0.01	CU	0.01	MO	<0.01	PB	0.01	SN	<0.01	W	<0.01	ZN	0.03
984	0.2	< 0.005	BA	<0.01	CU	<0.01	MO	<0.01	PB	0.01	SN	<0.01	W	<0.01	ZN	0.02
985	< 0.2	< 0.005	BA	0.04	CU	<0.01	MO	<0.01	PB	<0.01	SN	<0.01	W	<0.01	ZN	0.04
986	< 0.2	< 0.005	BA	0.06	CU	0.01	MO	<0.01	PB	0.01	SN	<0.01	W	<0.01	ZN	<0.01
987	0.2	< 0.005	BA	0.10	CU	0.01	MO	<0.01	PB	<0.01	SN	<0.01	W	<0.01	ZN	0.01

01/12/83

TABLE 3 - FIRE ASSAY OR CHEMICAL DIGESTION ANALYSES

SAMPLE NO.	FIRE-AG OZ/TON	FIRE-AU OZ/TON	CHEM- %	CHEM- %	CHEM- %	CHEM- %	CHEM- %	CHEM- %	CHEM- %
988	< 0.2	< 0.005	BA 0.15	CU 0.01	MO <0.01	PB 0.02	SN <0.01	W <0.01	ZN 0.02
989	0.2	< 0.005	BA 0.10	CU 0.01	MO <0.01	PB 0.02	SN <0.01	W <0.01	ZN 0.02
990	< 0.2	< 0.005	BA 0.95	CU 0.18	MO <0.01	PB 2.40	SN <0.01	W 0.02	ZN 1.70
991	< 0.2	< 0.005	BA 0.20	CU 0.15	MO <0.01	PB 1.45	SN <0.01	W 0.01	ZN 0.75
992	1.2	0.010	NA	CU 0.01	NA	PB 0.19	NA	W <0.01	ZN 0.39
993	< 0.2	< 0.005	BA 0.63	CU 0.19	MO <0.01	PB 1.35	SN <0.01	W 0.03	ZN 2.60
994	23.7	0.069	NA	CU 0.40	NA	PB 9.00	NA	W <0.01	ZN 2.6
995	< 0.2	< 0.005	BA <0.01	CU <0.01	MO <0.01	PB 0.01	SN <0.01	W <0.01	ZN 0.02
996	1.2	< 0.005	BA 0.02	CU <0.01	MO <0.01	PB 0.03	SN <0.01	W <0.01	ZN 0.10
997	22.6	0.212	BA 0.16	CU 0.26	MO <0.01	PB 1.20	SN <0.01	W 0.4	ZN 0.58
998	0.4	< 0.005	BA 0.11	CU <0.01	MO <0.01	PB <0.01	SN <0.01	W <0.01	ZN 0.03
999	< 0.2	< 0.005	BA 0.20	CU 1.10	MO <0.01	PB 1.20	SN <0.01	W <0.01	ZN 0.61
1000	< 0.2	0.083	BA 0.15	CU 0.06	MO <0.01	PB 0.10	SN <0.01	W 0.02	ZN 1.65
1001	< 0.2	< 0.005	BA 4.1	CU 0.29	MO <0.01	PB 5.50	SN <0.01	W <0.01	ZN 0.15
1002	0.6	TRACE	NA	CU <0.01	NA	PB 0.06	NA	W <0.01	ZN 0.13
1003	0.2	TRACE	NA	CU 0.64	NA	PB 0.08	NA	W <0.01	ZN 1.1
1004	4.7	< 0.005	BA 1.55	CU 0.10	MO <0.01	PB 0.60	SN <0.01	W <0.01	ZN 0.35
1005	0.6	0.013	BA 0.03	CU <0.01	MO <0.01	PB <0.01	SN <0.01	W <0.01	ZN 0.10
1006	0.2	0.006	NA	CU <0.01	NA	PB 0.04	NA	W <0.01	ZN 0.05
1007	0.4	TRACE	NA	CU <0.01	NA	PB 0.02	NA	W <0.01	ZN 0.10
1008	1.3	< 0.005	BA 0.01	CU 0.04	MO <0.01	PB 0.05	SN <0.01	W 0.01	ZN 0.48
1009	5.8	0.020	NA	CU 0.08	NA	PB 0.68	NA	W <0.01	ZN 1.4
1010	2.0	0.006	NA	CU 0.01	NA	PB 0.20	NA	W <0.01	ZN 0.25
1011	7.2	0.011	NA	CU 0.05	NA	PB 0.44	NA	W <0.01	ZN 0.80
1012	4.9	0.084	BA <0.01	CU 0.08	MO <0.01	PB 1.60	SN <0.01	W 0.01	NA
1013	0.2	< 0.005	BA 0.04	CU <0.01	MO <0.01	PB 0.01	SN <0.01	W <0.01	ZN 0.03
1014	< 0.2	< 0.005	BA 0.70	CU 0.13	MO <0.01	PB 1.60	SN <0.01	W <0.01	ZN 0.17
1015	< 0.2	< 0.005	BA 2.0	CU 0.37	MO <0.01	PB 1.50	SN <0.01	W <0.01	ZN 0.10
1016	< 0.2	< 0.005	BA 9.0	CU 0.06	MO <0.01	PB 4.90	SN <0.01	W <0.01	ZN 0.08
1017	< 0.2	< 0.005	BA 0.08	CU 0.01	MO <0.01	PB 0.02	SN <0.01	W <0.01	ZN 0.52
1018	< 0.2	< 0.005	BA 0.05	CU 0.01	MO <0.01	PB 0.01	SN <0.01	W <0.01	ZN 0.25
1019	< 0.2	< 0.005	BA 0.05	CU 0.70	MO <0.01	PB 1.00	SN <0.01	W 0.02	ZN 1.70
1020	0.2	< 0.005	BA 0.05	CU 0.10	MO <0.01	PB 0.65	SN <0.01	W <0.01	ZN 0.25
1021	52.4	3.75	NA	CU 0.29	NA	PB 2.29	NA	W <0.01	ZN 2.5
1022	< 0.2	< 0.005	BA 0.22	CU 0.02	MO <0.01	PB 0.08	SN <0.01	W <0.01	ZN 0.37
1023	11.4	0.021	NA	CU 0.11	NA	PB 0.40	NA	W <0.01	ZN 2.1
1024	< 0.2	< 0.005	BA 0.04	CU 0.17	MO <0.01	PB 0.55	SN <0.01	W 0.01	ZN 1.05
1025	3.0	0.007	NA	CU 0.02	NA	PB 0.16	NA	W <0.01	ZN 2.9
1026	5.2	< 0.005	BA 0.20	CU 0.02	MO <0.01	PB 0.13	SN <0.01	W <0.01	ZN 0.35
1027	1.8	0.005	NA	CU <0.01	NA	PB 0.18	NA	W <0.01	ZN 0.50
1028	1.8	TRACE	NA	CU 0.02	NA	PB 0.09	NA	W <0.01	ZN 2.0
1029	17.0	0.380	NA	CU 0.37	NA	PB 1.41	NA	W <0.01	ZN 3.1
1030	1.6	< 0.005	BA 0.02	CU 0.24	MO 0.01	PB 0.19	SN <0.01	W <0.01	ZN 0.50
1031	0.6	< 0.005	BA <0.01	CU 0.02	MO <0.01	PB 0.20	SN <0.01	W <0.01	ZN 0.45
1032	0.5	< 0.005	BA 0.01	CU <0.01	MO <0.01	PB 0.02	SN <0.01	W <0.01	ZN <0.01
1033	1.4	0.064	BA <0.01	CU 0.01	MO <0.01	PB 0.21	SN <0.01	W 0.01	ZN 0.11
1034	0.4	< 0.005	BA <0.01	CU 0.09	MO <0.01	PB <0.01	SN <0.01	W <0.01	ZN 1.12
1035	0.3	< 0.005	BA 0.09	CU <0.01	MO <0.01	PB <0.01	SN <0.01	W <0.01	ZN 0.02
1036	0.4	< 0.005	BA 0.02	CU 0.01	MO <0.01	PB <0.01	SN <0.01	W <0.01	ZN 0.02
1037	0.4	< 0.005	BA 0.01	CU 0.01	MO <0.01	PB <0.01	SN <0.01	W <0.01	ZN 0.01
1038	0.3	< 0.005	BA 0.01	CU 0.03	MO <0.01	PB <0.01	SN <0.01	W <0.01	ZN 0.02

not plotted

01/12/83 TABLE 3 - FIRE ASSAY OR CHEMICAL DIGESTION ANALYSES

SAMPLE NO.	FIRE-AG OZ/TON	FIRE-AU OZ/TON	CHEM- %	CHEM- %	CHEM- %	CHEM- %	CHEM- %	CHEM- %	CHEM- %
1039	0.3	< 0.005	BA <0.01	CU 0.05	MO <0.01	PB <0.01	SN <0.01	W <0.01	ZN 0.01
1040	0.2	< 0.005	BA 0.03	CU 0.01	MO <0.01	PB <0.01	SN <0.01	W <0.01	ZN 0.01
1041	0.6	< 0.005	BA 0.02	CU 0.01	MO <0.01	PB <0.01	SN <0.01	W <0.01	ZN <0.01
1042	0.3	1.457	BA 0.05	CU 0.01	MO <0.01	PB 0.05	SN <0.01	W <0.01	ZN <0.01
1043	0.3	0.072	BA 0.04	CU <0.01	MO <0.01	PB <0.01	SN <0.01	W <0.01	ZN <0.01
1044	0.3	0.220	BA <0.01	CU 0.01	MO <0.01	PB 0.02	SN <0.01	W <0.01	ZN <0.01
1045	0.2	< 0.005	BA 0.02	CU 0.01	MO <0.01	PB <0.01	SN <0.01	W <0.01	ZN <0.01
1046	< 0.2	< 0.005	BA 0.03	CU 0.06	MO <0.01	PB 0.01	SN <0.01	W <0.01	ZN <0.01
1047	0.3	< 0.005	BA 0.03	CU 0.05	MO <0.01	PB 0.02	SN <0.01	W <0.01	ZN <0.01
1048	< 0.2	< 0.005	BA <0.01	CU <0.01	MO <0.01	PB <0.01	SN <0.01	W <0.01	ZN <0.01
1049	0.3	< 0.005	BA 0.05	CU <0.01	MO <0.01	PB 0.01	SN <0.01	W <0.01	ZN 0.01
1050	0.2	< 0.005	BA 0.04	CU <0.01	MO <0.01	PB <0.01	SN <0.01	W <0.01	ZN 0.01
1051	< 0.2	< 0.005	BA 0.02	CU <0.01	MO <0.01	PB <0.01	SN <0.01	W <0.01	ZN 0.01
1052	0.6	< 0.005	BA 0.01	CU 0.01	MO <0.01	PB 0.16	SN <0.01	W <0.01	ZN <0.01
1053	0.3	0.010	BA <0.01	CU <0.01	MO <0.01	PB 0.03	SN <0.01	W <0.01	ZN 0.01
1054	0.5	< 0.005	BA 0.04	CU <0.01	MO <0.01	PB 0.01	SN <0.01	W <0.01	ZN 0.01
1055	0.3	< 0.005	BA 0.04	CU <0.01	MO <0.01	PB 0.01	SN <0.01	W <0.01	ZN 0.01
1056	0.4	< 0.005	BA 0.05	CU <0.01	MO <0.01	PB 0.08	SN <0.01	W <0.01	ZN 0.01
1057	0.2	0.014	BA <0.01	CU 0.01	MO <0.01	PB 0.18	SN <0.01	W <0.01	ZN 0.01
1058	0.4	< 0.005	BA 0.02	CU <0.01	MO <0.01	PB 0.04	SN <0.01	W <0.01	ZN <0.01
1059	0.2	< 0.005	BA 0.02	CU <0.01	MO <0.01	PB <0.01	SN <0.01	W <0.01	ZN 0.01
1060	0.3	0.018	BA 0.01	CU <0.01	MO <0.01	PB 0.01	SN <0.01	W <0.01	ZN 0.01
1061	0.2	< 0.005	BA 0.01	CU <0.01	MO <0.01	PB <0.01	SN <0.01	W <0.01	ZN 0.09
1062	< 0.2	< 0.005	BA <0.01	CU <0.01	MO <0.01	PB <0.01	SN <0.01	W <0.01	ZN 0.04
1063	< 0.2	0.087	BA <0.01	CU 0.01	MO <0.01	PB 0.01	SN <0.01	W <0.01	ZN 0.01
1064	< 0.2	< 0.005	BA <0.01	CU 0.01	MO <0.01	PB 0.04	SN <0.01	W <0.01	ZN 0.02
1065	< 0.2	< 0.005	BA <0.01	CU 0.01	MO <0.01	PB <0.01	SN <0.01	W <0.01	ZN <0.01
1066	0.3	< 0.005	BA 0.01	CU 0.01	MO <0.01	PB <0.01	SN <0.01	W <0.01	ZN 0.01
1067	0.3	< 0.005	BA <0.01	CU 0.01	MO <0.01	PB <0.01	SN <0.01	W <0.01	ZN 0.01
1068	0.4	< 0.005	BA <0.01	CU <0.01	MO <0.01	PB <0.01	SN <0.01	W <0.01	ZN 0.15
1069	0.2	< 0.005	BA 0.03	CU <0.01	MO <0.01	PB <0.01	SN <0.01	W <0.01	ZN 0.01
1070	0.3	< 0.005	BA 0.05	CU <0.01	MO <0.01	PB <0.01	SN <0.01	W <0.01	ZN <0.01
1071	0.3	< 0.005	BA 0.04	CU 0.01	MO <0.01	PB <0.01	SN <0.01	W <0.01	ZN <0.01
1072	< 0.2	< 0.005	BA 0.06	CU <0.01	MO <0.01	PB <0.01	SN <0.01	W <0.01	ZN <0.01
1073	< 0.2	< 0.005	BA <0.01	CU <0.01	MO <0.01	PB <0.01	SN <0.01	W <0.01	ZN 0.01
1074	< 0.2	< 0.005	BA 0.05	CU 0.01	MO <0.01	PB <0.01	SN <0.01	W <0.01	ZN <0.01
1075	< 0.2	< 0.005	BA 0.04	CU <0.01	MO <0.01	PB <0.01	SN <0.01	W <0.01	ZN 0.01
1076	< 0.2	< 0.005	BA <0.01	CU <0.01	MO <0.01	PB 0.01	SN <0.01	W <0.01	ZN 0.01
1077	< 0.2	< 0.005	BA 0.05	CU <0.01	MO <0.01	PB <0.01	SN <0.01	W <0.01	ZN <0.01
1078	< 0.2	< 0.005	BA <0.01	CU <0.01	MO <0.01	PB <0.01	SN <0.01	W <0.01	ZN 0.01
1079	1.6	TRACE	BA 0.10	CU 0.01	MO <0.01	PB <0.01	SN <0.01	W <0.01	ZN <0.01
1080	0.2	< 0.005	BA 0.05	CU <0.01	MO <0.01	PB <0.01	SN 0.03	W 0.03	ZN <0.01
1081	< 0.2	< 0.005	BA 0.05	CU <0.01	MO <0.01	PB <0.01	SN <0.01	W <0.01	ZN <0.01
1082	0.2	< 0.005	BA <0.01	CU <0.01	MO <0.01	PB <0.01	SN <0.01	W <0.01	ZN <0.01
1083	< 0.2	< 0.005	BA 0.06	CU <0.01	MO <0.01	PB <0.01	SN <0.01	W <0.01	ZN <0.01
1084	< 0.2	< 0.005	BA 0.05	CU <0.01	MO <0.01	PB <0.01	SN <0.01	W <0.01	ZN <0.01
1085	0.2	TRACE	BA 0.09	CU <0.01	MO <0.01	PB <0.01	SN <0.01	W <0.01	ZN <0.01
1086	0.4	TRACE	BA 0.09	CU <0.01	MO <0.01	PB <0.01	SN <0.01	W <0.01	ZN <0.01
1087	0.4	< 0.005	BA 0.10	CU <0.01	MO <0.01	PB <0.01	SN <0.01	W <0.01	ZN <0.01
1088	< 0.2	< 0.005	BA <0.01	CU <0.01	MO <0.01	PB <0.01	SN <0.01	W <0.01	ZN 0.01
1089	< 0.2	< 0.005	BA 0.05	CU <0.01	MO <0.01	PB <0.01	SN <0.01	W <0.01	ZN <0.01

DETACHED CRYSTALLINE ROCKS OF THE MOHAVE, BUCK, AND BILL WILLIAMS MOUNTAINS, WESTERN ARIZONA

Keith A. Howard
John W. Goodge
Barbara E. John

U. S. Geological Survey
345 Middlefield Road
Menlo Park, California 94025

And-Ham Vol.

ANDERSON-HAMILTON VOL

PRELIMINARY REPORT ON DIKING EVENTS IN THE MOHAVE MOUNTAINS, ARIZONA

JOHN K. NAKATA

U.S. Geological Survey
345 Middlefield Road
Menlo Park, California 94025

Ard-Nev Volume, 1986

COMPLEX TERTIARY STRATIGRAPHY AND STRUCTURE, MOHAVE MOUNTAINS, ARIZONA: A PRELIMINARY REPORT

by

J.E.N. Pike
U. S. Geological Survey
Menlo Park, CA 94025

and

V.L. Hansen
Department of Geology
University of Montana
Missoula, MT 59801

And-Ham Vol., 1982

GEOLOGIC FRAMEWORK OF THE CHEMEHUEVI MOUNTAINS, SOUTHEASTERN CALIFORNIA*

Barbara E. John
U.S. Geological Survey
345 Middlefield Road
Menlo Park, California 94025

dips almost vertically, and is about 4 feet thick. Its croppings are chiefly iron-stained quartz and breccia. The ore contains free gold, silver sulphide, sphalerite, and galena and occurs mainly near the hanging wall of the vein. Some of the ore mined during the early days was of high grade, but the material milled by the Flores Company ran as low as $6 per ton.

ESMERALDA MINE[154]

The Esmeralda mine is in the foothills about one mile northwest of the Golden Gem property. Its vein, which occurs in schist, strikes N. 35° W., dips 75° SW., and is 4 to 5 feet wide. The gangue is quartz and altered breccia. Oxidation extends to a depth of 90 feet, below which the ore minerals consist mainly of pyrite and chalcopyrite with gold and silver. One carload of the concentrates is reported to have averaged 13.42 ounces of gold and 40 ounces of silver per ton. Underground developments include a 200-foot shaft, about 200 feet of drifts, and some stoping near the surface.

CERBAT MINE[155]

The Cerbat mine is about one mile northeast of the Golden Gem property, at an altitude of 4,600 feet.

This deposit was worked to a considerable extent during the early days, and was equipped with a mill about 1880. The property has long been inactive.

The vein strikes north-northwestward, with bold croppings 4 to 10 feet wide. Its gangue consists of quartz with some brecciated country rock. The ore contains chiefly gold with some silver and copper. Underground workings include a 180-foot shaft with some drifts and stopes.

ORO PLATA MINE[156]

The Oro Plata mine is east of the Cerbat mine, at an altitude of about 4,300 feet.

This deposit was worked by Mexicans during the early seventies. Later, it was operated by J. P. Lane, by H. Wilson after 1882, and by J. W. Garret after 1895. During 1897-1898, its production amounted to $150,000. As shown by sheets of the Arizona Sampler Company, which bought the ore at Kingman, the mine produced, from 1896 to 1901, 2,527 tons of ore that averaged $80 per ton. Approximately 75 per cent of this value was in gold and the balance in silver and lead. About 1906, the Oro Plata Mining Company purchased the property. The total production of the mine is reported to have been worth $500,000.

Here, gneiss has been extensively intruded by granite porphyry. The vein strikes N. 55° W., dips 80° NE., and is about 4 feet wide.

[154] Abstracted from Schrader, work cited, p. 97.
[155] Abstracted from Schrader, work cited, pp. 97-98.
[156] Abstracted from Schrader, work cited, pp. 100-101.

Its ore, which occurs mainly in banded quartz, contains principally gold and silver, with some chalcopyrite, sphalerite, pyrite, and galena. The mine is developed to a depth of 280 feet by shafts, drifts, adits, and stopes that aggregate about 7,000 feet.

COTTONWOOD DISTRICT

WALKOVER MINE

The Walkover mine is in the northern portion of the Cottonwood Cliffs plateau, about 9 miles by road east of Hackberry.

This mine produced intermittently from about 1911 to 1918. Sheriff sales of the Walkover Mining Company's property were held in 1921 and 1923. Lessees made a small production in 1925. In 1927, the Walkover Mines, Inc., was formed and later changed to the Calizona Mining Company. In 1928, El Paloma Mining Company was formed. During 1928 and 1929, a little bullion and two cars of shipping ore were produced. A 30-ton concentration-cyanidation mill, installed early in 1930, proved unsuccessful. In 1933, the property was leased to F. Nielson and associates who, up to February, 1934, had shipped four carloads of ore that contained from 1.00 to 1.29 ounces of gold per ton.[157]

The Cottonwood Cliffs represent the southeastward continuation of the Grand Wash Cliffs and mark the western limit of a plateau that here attains an elevation of about 5,000 feet above sea level or 1,300 feet above Hackberry. This portion of the plateau consists mainly of granite and schist overlain by essentially horizontal Tertiary volcanic rocks.

The Walkover vein strikes S. 25° E., dips 75° W., and occurs in mediumly foliated dark-colored schist. It has been explored to a depth of 365 feet and for a maximum length of 200 feet south of the main shaft, to where it is cut off by a fault that strikes S. 60° W. Thirty feet south of this shaft, the vein is displaced 75 feet westward by a fault that strikes S. 70° W. and dips 80° S.

The gangue of the vein is brecciated, glassy, gray quartz and altered fragments of schist. Above the 100-foot or water level, it was accompanied by considerable iron oxide and some copper stain. Below that level, it contains abundant banded sulphides, mainly pyrite, arsenopyrite, and chalcopyrite.

The vein has been largely stoped from the surface to the 100-foot level. As indicated by these openings, the width of the ore shoot ranged from 8 inches to 5 feet and averaged about 2 feet.

CHEMEHUEVIS DISTRICT

The Chemehuevis district is in the Mohave Mountains of southwestern Mohave County. These mountains constitute a rugged range, about 34 miles long by a maximum of 12 miles wide, that trends southeastward from the Colorado River at a point a few

[157] Oral communication from F. Nielson.

miles south of Topock. The highest peak has an altitude of about 4,300 feet, but most of the mountains are considerably lower. The region as a whole is very arid. Sandy roads from Topock and Yucca, on the Santa Fe railway, lead around the base of the range.

In their main or northeastern portion, these mountains are made up of banded schist, intruded by dikes of diorite and granite-porphyry. The southwestern flank of the range consists of generally westward-dipping volcanic rocks.

The typical gold deposits of the Mohave Mountains are veins of coarse-textured brecciated white quartz in schist. Their gold occurs mainly in association with pyrite and galena that show but little oxidation near the surface. The veins are locally of high grade, but tend to be narrow and pockety. During the present century, they have produced generally less than a thousand dollars' worth of gold per year.

The *Best Bet* or *Kempf* property is in the southwestern portion of the range, about 55 miles by road from Topock. It was located during the early days and held for several years by A. Kempf. Early in 1933, Mrs. Isabella Greenway obtained control of the ground, built many miles of new road, and installed a 50-ton flotation mill at the Colorado River, 12 miles west of the mine. According to local reports, the mill treated about 540 tons of $15 gold ore from the Kempf mine, some 300 tons of silver-lead ore from the Mohawk mine, and a little gold ore from the Santa Claus and other properties. Operations were discontinued in the summer of 1933, and the property reverted to Mr. Kempf. At the Best Bet mine are a few veins that strike northeastward, transverse to the schistosity, and dip steeply southeastward. As seen in several shallow shafts and short tunnels, their widths range from less than an inch up to about 1½ feet and average only a few inches. According to local reports, the mined portion of the principal vein was about 30 inches in maximum width.

The *Gold Wing* property, a few miles north of the Best Bet, has produced a small tonnage of ore that was treated in a 3-stamp mill near the Colorado River. The *Susan* and *Santa Claus* prospects, also in this vicinity, have recently yielded a small production.

The *Dutch Flat* mine, on the opposite side of the range, for many years has produced a small tonnage of ore that was treated in a 10-ton mill on the property.

CHAPTER IV—COCHISE COUNTY

Cochise County, as shown by Figure 12 (page 186), comprises an area about 80 miles long by 75 miles wide. It consists of wide plains surmounted by large mountain ranges of complexly faulted pre-Cambrian schist and granite, Paleozoic and Cretaceous sedimentary beds, Cretaceous and Tertiary intrusives, and Tertiary volcanic rocks.

This county, which ranks third among the gold-producing counties of Arizona, to the end of 1931, produced approximately $30,230,000 worth of gold. Of this amount, about $25,475,000 worth was a by-product from copper ores, mainly from the Bisbee and Courtland districts, and $273,500 worth was a by-product of lead mining.[158]

DOS CABEZAS MOUNTAINS

The Dos Cabezas Mountains, of northeastern Cochise County, constitute a northwestward-trending range, about 20 miles long by 3 to 10 miles wide, with a maximum altitude of 8,300 feet above sea level or more than 4,000 feet above the adjacent plains. Its principal settlement, Dos Cabezas, is at the southwestern foot of the range, 15 miles by road and branch railroad from Willcox, a station on the Southern Pacific Railway.

The range is made up of pre-Cambrian schist and granite, Paleozoic to Mesozoic sedimentary beds, Tertiary volcanic rocks, and Mesozoic or Tertiary intrusives of acid to basic composition. These formations have been affected by complex faulting of both normal and reverse character.

Gold deposits occur in the vicinity of Dos Cabezas; in upper Gold Gulch, northwest of Dos Cabezas; in the Teviston district, at the northern end of the range; and in the vicinity of Apache pass, at the southeastern end of the range. These deposits were discovered prior to the Civil War and have been worked intermittently since the seventies. Up to 1933, they yielded approximately $182,000 worth of gold.[159] Most of this production was made by the Dos Cabezas district, which has also yielded notable amounts of copper, lead, and silver. During the past few years, the Dives, Le Roy, Gold Ridge, and Gold Prince gold mines have been actively worked. According to the U. S. Mineral Resources, the gold production of the district amounted to $3,841 in 1930, $11,132 in 1931, and $33,901 in 1932.

In the Dos Cabezas gold district, the formations outcrop in westward-trending belts with pre-Cambrian granite on the south, succeeded northward by steeply dipping, metamorphosed Cretaceous shales and sandstones and Carboniferous limestones. These rocks are intruded by dikes of rhyolite-porphyry and diabase. The thrust-fault zone that separates the Cretaceous strata from the granite contains a vein of coarse-grained white quartz, called the "Big Ledge," that attains a maximum width of 100 feet but locally branches and pinches out. In places, this vein carries a little gold, but most of it is of very low grade.

The gold-bearing veins consist of coarse-textured, white to grayish-white quartz with scattered small bunches and dissem-

[158] Statistics compiled by J. B. Tenney.
[159] Figures compiled by J. B. Tenney.