MINERAL APPRAISAL OF THE CORONADO NATIONAL FOREST

PART 2, CHIRICAHUA-PEDREGOSA MOUNTAINS UNIT, COCHISE COUNTY, ARIZONA

by

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PREFACE

A January 1987 Interagency Agreement between the Bureau of Mines, U.S. Geological Survey, and U.S. Forest Service describes the purpose, authority, and program operation for the forest-wide studies. The program is intended to assist the Forest Service in incorporating mineral resource data in forest plans as specified by the National Forest Management Act (1976) and Title 36, Chapter 2, Part 219, Code of Federal Regulations, and to augment the Bureau's mineral resource data base so that it can analyze and make available minerals information as required by the National Materials and Minerals Policy, Research and Development Act (1980).

This open-file report summarizes the results of a Bureau of Mines forest-wide study. The report is preliminary and has not been edited or reviewed for conformity with the Bureau of Mines editorial standards. This study was conducted by personnel from the Resource Evaluation Branch, Intermountain Field Operations Center, Building 20, Denver Federal Center, Denver, CO 80225.

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UNIT OF MEASURE ABBREVIATIONS USED IN THIS REPORT

$	dollar (U.S.)
ft	foot
in.	inch
lb	pound
mi	mile
oz	troy ounce
oz/st	troy ounce per short ton
ppb	parts per billion
ppm	parts per million
%	percent
st	short ton (2,000 lb)

MINERAL APPRAISAL OF THE CORONADO NATIONAL FOREST, PART 2, CHIRICAHUA-PEDREGOSA MOUNTAINS UNIT, COCHISE COUNTY, ARIZONA

SUMMARY

Between 1990 and 1992, the Bureau of Mines reviewed the mining history and studied the mineral resources of the Chiricahua-Pedregosa Mountains part of the Coronado National Forest to appraise the mineral resources and to identify and describe areas with past mining activity. The study included a comprehensive literature search combined with a field investigation involving the examination of known mines, prospects, and mineralized areas. This study is part of the Bureau's overall mineral evaluation of the Coronado National Forest and will be included in a summary report of the Forest.

Mining activity has taken place in the Chiricahua Mountains intermittently from 1881 to present, with the periods of greatest production being the mid 1920's and the early 1950's. Since the early 1950's, there has been little mining activity or production in the Chiricahua Mountains. Many mines and prospects were developed at mineral occurrences, mostly confined to a one-to two-mile-wide-band in the California mining district, trending northwesterly from Portal to the northern part of the Chiricahua National Monument. Major commodities produced were lead, silver, zinc, and copper, mostly from replacement, metasomatic, and vein deposits. The majority of production came from one mine complex, the Hilltop Mine.

Numerous prospects and mineral occurrences were documented during this investigation, but no resources could be calculated due to the sporadic nature of the mineralization and lack of surface exposures. Based upon geologic inference, areas in or adjacent to the northwest-trending band of mineralization in the California mining

district were given ratings of moderate to high potential for mineral deposits at depth, in a mineral investigation by the U.S. Geological Survey and Bureau of Mines in the late 1970's (Drewes and Williams, 1973); the existence of resources can only be confirmed by drilling.

In the late 1980's and 1990, Newmont Mining Corporation proposed to drill four holes in the forest near Portal to test the minerals at depth, to augment a surface mineral exploration program for a disseminated precious metal target. The proposed drilling project was canceled because of public opposition to mining activity in this area, and because of a Bill put before Congress to withdraw this area from mining and mineral leasing laws.

INTRODUCTION

During 1990-92, the Bureau of Mines studied the mineral resources of the Chiricahua Mountains, on land administered by the U.S. Forest Service. This study is part of the Bureau's overall mineral evaluation of the Coronado National Forest.

Geographic setting

The Chiricahua Mountains include 284,375 acres (444 mi^2) of the Coronado National Forest, in Cochise County, in extreme southeastern Arizona (fig. 1). The range is nearly midway between the towns of Douglas and Willcox, Arizona, and Lordsburg, New Mexico. The small communities of Portal and Paradise are just outside the eastern Forest boundary. In the northwestern part of the range, the Forest surrounds the Chiricahua National Monument on three sides. The Chiricahua Wilderness encompasses a large part of the Forest in the central part of the range. The southern part of the range is generally referred to as the Pedregosa Mountains.

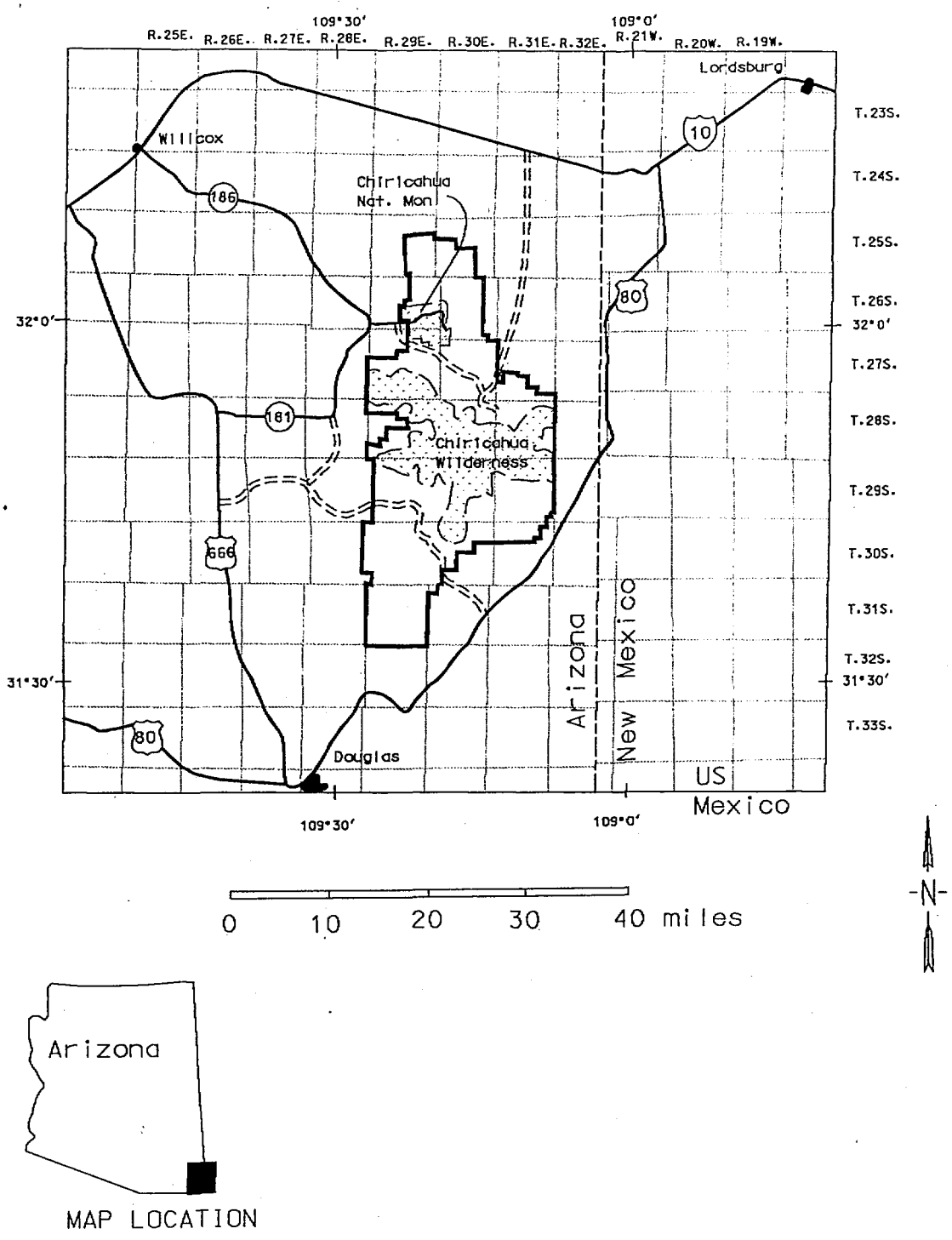


Figure 1.-- Index map of the Chiricahua-Pedregosa Mountains Unit, Coronado National Forest, Cochise County, Arizona.

The Chiricahua Range is bounded on the north and east by San Simon Valley, on the southeast by San Bernardino Valley, and on the west by Sulphur Spring Valley. Elevations range from about 4,400 ft near the valley floor on the east side, to 9,796 ft on Chiricahua Peak. U.S. Highway 80 is on the east side of the Chiricahua Range, U.S. Highway 666 is on the west side, and Interstate Highway 10 is north of the range. From these highways, numerous state and forest roads provide access to or near Forest areas.

Previous investigations

The Bureau of Mines and U.S. Geological Survey conducted mineral resource evaluations of the Chiricahua Wilderness (Drewes and Williams, 1973), and of the North End Roadless Area (Drewes and others, 1983; fig. 2). Brittain (1954) and Papke (1952) did M.S. Theses on the largest producing mine in the area, the Hilltop Mine. Dale and others (1960) investigated several smaller mines in the Chiricahua Mountains as part of a regional study of tungsten deposits. Tsuji (1984) did a M. S. Thesis on the mineralization of the El Tigre Mine, and Chakarun (1973) did a M. S. Thesis on the geology, mineralization, and alteration of the Jhus Canyon area in the northern part of the Chiricahua Mountains. Marjaniemi (1969) did a Doctorate dissertation on the Turkey Creek Caldera, a major center of volcanism in the Chiricahua Mountains, and more recently, Du Bray and Pallister (1991) did a study of the same caldera. Various other authors did studies of the geology and mineralization in the Chiricahua Mountains and some of these reports are listed in the references.

Methods of investigation

A detailed literature search for pertinent geologic and mining information for the Forest was made prior to the field investigation. Bureau of Land Management and county records were examined for location of patented and unpatented mining claims.

The Bureau's field study concentrated on the examination of known mines, prospects, and mineralized areas inside the Forest boundary. A total of 60 field-days was spent in the field during the winter, spring, and fall of 1991. Accessible mine and prospect workings were mapped and sampled. Veins, potentially mineralized structures, altered and/or mineralized outcrops, and dumps of inaccessible workings were sampled.

Two hundred fifteen samples were taken; they consisted of four types: 1) chip - a regular series of rock chips taken in a continuous line across a mineralized zone or rock face; 2) grab - rock collected randomly from a dump, stockpile, other rock at a mine working, or float; 3) select - sample intentionally selected from mineralized rock resulting in maximum mineral concentrations; 4) dump - rock collected from a mine dump on a grid or spaced such that a representative sample of the dump is taken. All samples were analyzed by Chemex Labs, Inc. of Vancouver, British Columbia for 32 elements by an inductively coupled plasma (ICP) method. Also, all samples were analyzed by Bondar-Clegg, Inc. of Vancouver, British Columbia for gold plus 33 elements by a neutron activation method. Selected samples were analyzed by Chemex for specific elements when the assay values were above the detection limits; these elements include barium, copper, lead, silver, strontium, and zinc. Sample descriptions are summarized in appendix A, and all the analytical results are in appendixes B and

C. Where sample analytical data is presented in this report, the higher of the two values between Chemex and Bondar-Clegg will be given.

Geologic setting

The Chiricahua Mountains are a typical mountain range in the Mexican Highland section of the Basin and Range Physiographic Province. The mountains are an uplifted fault block typical of the long, narrow north to northwest trending ranges in southeastern Arizona. The valleys between the ranges are wide, flat, and alluvial filled. The geology of the Chiricahua Mountains is quite varied and includes Precambrian- to Tertiary-age igneous, metamorphic, and sedimentary rocks. The Turkey Creek Caldera is near the middle portion of the range and was responsible for thick sequences of volcanic rocks. An unnamed major eruptive center is in the northern Chiricahua Mountains. The Precambrian basement complex underlying the range consists of granitic intrusions and the Penal Schist complex. Overlying the basement rocks are thick sequences of Paleozoic and Mesozoic sedimentary rocks, and numerous Tertiary extrusive and intrusive igneous units.

A band of sedimentary rocks of upper Paleozoic and Mesozoic age extends northwest to southeast across the range from the town of Dos Cabezos to the Portal area. Most of the mines and mineral occurrences in the Chiricahua Mountains are concentrated in and near this band. The Apache Pass fault zone, a 1- to 2-mi wide zone of branching fault strands, is in and parallel to the band of sedimentary rocks (fig. 2). This fault zone is believed to be a major, deeply penetrating crustal flaw that has been reactivated many times throughout geologic history, and is likely the major conduit for mineralizing fluids. The sedimentary rocks, especially the limestones, were a favorable chemical environment for the deposition of base- and precious-metal-

bearing minerals. The most important types of known ore deposits are replacement, metasomatic, and vein. Major commodities produced were lead, silver, zinc, and copper. More detailed geologic discussions are given in the following sections.

Mining history

The California mining district (also called the Chiricahua district), encompasses a large part of the northern Chiricahua Mountains. All mines and known mineralized areas of significance in the Chiricahua Mountains are in this district. The majority of production in the California district came from the Hilltop Mine, a mine with about 5 mi of underground workings on four major levels. Data for mines and prospects is summarized in Appendix D, and any pertinent history that is known is listed there. For many of the other workings in the Chiricahua Mountains, no literature could be found.

The earliest recorded claim in the Cochise County court house, the Hidden Treasure claim, was located in January, 1881, and the first known attempts at mining soon followed. This claim and others near the Hilltop Mine, were worked for rich oxidized lead-silver ore near the surface, and hand sorted ore was packed by mules and wagons to shipping points in Willcox, Arizona, or Lordsburg, New Mexico. (See Brittain, 1954, p. 65.) In 1884, a small lead-silver furnace was constructed, where the ore from several nearby prospects was smelted. The bullion from the smelter was hauled by wagon 86 miles to the nearest railroad shipping point, and then freighted to San Francisco. Despite these enormous shipping costs, the bullion netted good profit. (See Badger, 1911, p. 663.) This suggests that the ore being mined was extremely rich.

After several years of mining, lead became less abundant at depth, and copper became more abundant (Badger, 1911, p. 663). During this time it was not profitable

to mine copper, so most mines were abandoned. Brittain (1954, p. 65) states that all mining operations were forced to cease during the late 1880's because of hostilities with Apache Indians.

The next period of mining in this area was between 1902-1906. According to Brittain (1954, p. 65), a number of carloads of high-grade lead-silver ore were transported from the Hilltop Mine to Willcox by wagon and shipped to a smelter in El Paso, Texas. Later in this period some ore from the Blacksmith level of the Hilltop Mine was milled at Paradise.

The next period of mining, and period of greatest development, was between 1913-1929, when the Hilltop Metals Company was formed. The main production was between 1924-1926 during which time 11,372 st of ore was produced yielding approximately 5,150,000 lb of lead and 57,600 oz of silver. This production was mostly from stopes on the Kasper and Grey levels of the Hilltop Mine. The Hilltop Mine closed once again in 1929 due to low metal prices and exhausted ore reserves. (See Brittain, 1954, p. 66-67.) Between 1929 and 1949, the Hilltop Mine changed ownership a number of times with little production. Much of the salvageable equipment was removed or sold (Papke, 1952, p. 73). Bureau of Mines records show a small amount of production for the years 1938-1941. Between 1949-1951, Piedmont Mines, Inc. did some rehabilitation work and shipped a few tons of ore from the Blacksmith Tunnel (Brittain, 1954, p. 73). American Zinc, Lead, and Smelting Company leased the Hilltop Mine from Piedmont Mines between 1951-1955 and continued development and mining operations up until at least 1955, when it purchased the mine from Piedmont. During 1952-1953, the company shipped 8,055 st of ore that yielded about 57,500 lb of copper, 1,775,000 lb of lead, 18,800 oz of

silver, and 1,137,000 lb of zinc. The last record of production is in 1954; probably little work has been done at the mine since. At the present time unpatented mining claims on file with the Bureau of Land Management cover the Hilltop area.

During the early days and up until the 1950's, mining activities took place at a number of other sites in the California district. Brief mining histories will be presented for other small mines in the following individual sections. Known mines and prospects in the Forest are shown on plate 1 and accompanying insets in appendix E, and the data for these workings is summarized in appendixes A and D. The last known production for the California district was from the El Tigre Mine in 1974, when 700-800 st of low-grade silver ore was produced. According to Tsuji (1984, p. 14-16), work was done at the El Tigre Mine intermittently between 1941-1982, with the majority of production during 1973 and 1974. Approximately 2,200-2,300 st of ore was produced yielding 11 oz of gold, 2,662 oz of silver, and 73 lb copper with no lead or zinc (Tsuji, 1984, p. 16-17). At today's (1993) metal prices, this production would be worth about $14,000.

Drewes and Williams (1973, p. A 5) give total production for the California district between 1902-1954 as 28,000 st of ore and concentrates which had an estimated value of $1,072,000, and yielded 176 st copper, 290 oz gold, 4,035 st lead, 117,000 oz silver, and 582 st zinc. The majority of this production came from the Hilltop Mine. At today's (1993) metal prices this production would be worth about $5 million.

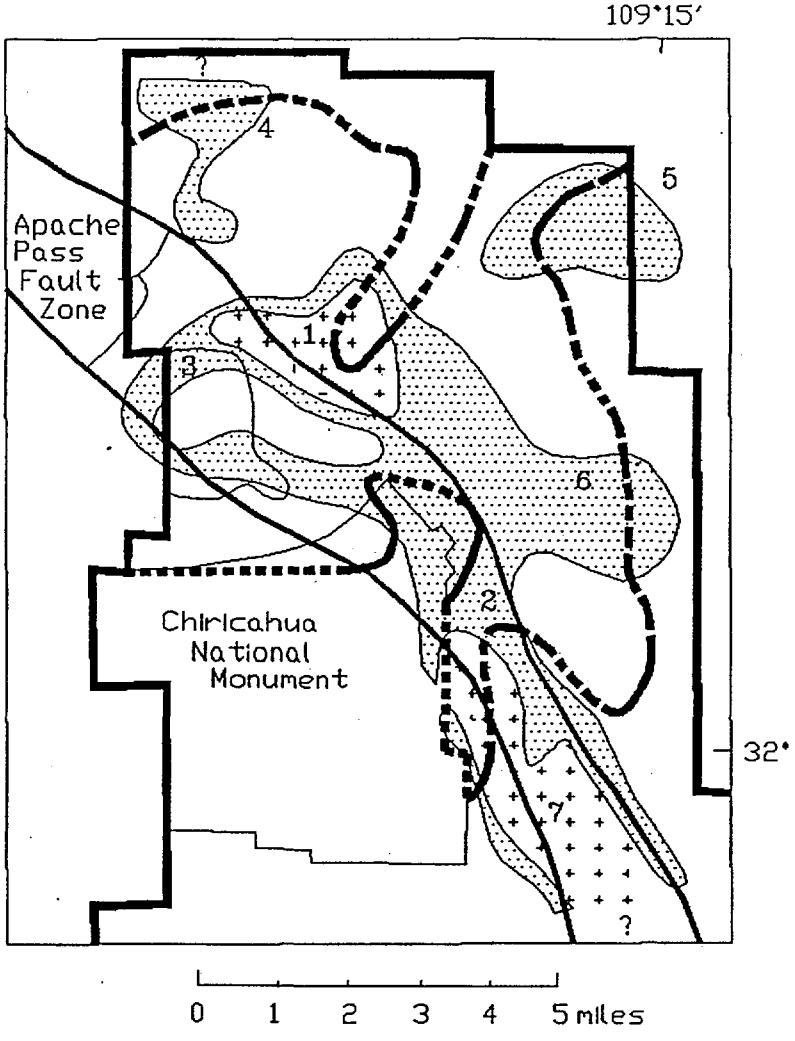
MINERAL APPRAISAL

Mines and mineralized areas are discussed geographically in this report from the northwest to the southeast.

North end of the Chiricahua Mountains

During the late 1970's, the Bureau of Mines and the U.S. Geological Survey conducted a mineral resource investigation of the North End Roadless Area, an area covering about 40 mi^2 adjacent to the north and east sides of the Chiricahua National Monument. (See Drewes and others, 1983; Bigsby, 1983.) Much of the information in this section is from these reports. This section discusses that area in the Forest north of Jhus and Horsefall Canyons. No mineral resources were identified during the previous investigations, but general areas were rated by the Geological Survey as having potential for various mineral deposits at depth, based upon geologic inference.

Drewes and others (1983) outlined one area in the north part of the Forest as having substantiated or high mineral resource potential (fig. 2, area 1). Area 1 contains a few small prospects and had a small amount of known production from two small shafts on what is known as the Clair Group. (See appendix D). The high rating is based upon several factors. Area 1 is partly in the Apache Pass fault zone, and is partly underlain by metamorphosed Paleozoic limestone, Tertiary rhyolitic plugs, and a Tertiary granodiorite stock. Volcanic rocks in the northeastern part of area 1 are extensively pyritized and oxidized. Chip samples taken from area 1 show the presence of barium, copper, lead, zinc, molybdenum, and silver. According to Drewes and others (1983), stream-sediment samples in area 1 suggest a possible focus of mineralization many hundreds to a few thousand feet below the center of area 1 and that three types of mineralization could occur: 1) vein or replacement deposits of lead,



Area of high mineral resource potential

Area of moderate mineral resource potential

2 Location discussed in text

Coronado National Forest Boundary

Approximate boundary of North End Roadless area of mineral investigation

Figure 2.--Map showing mineral resource potential of the north end of the Chiricahua Mountains, Coronado National Forest (map from Drewes and others, 1983, with modifications by Brown).

silver, and zinc in the sedimentary rocks, 2) skarn contact-metamorphic deposits of tungsten near the granodiorite stock, and 3) copper and/or molybdenum porphyry-type mineralization.

Five other areas in or partly within the north part of the Forest were delineated by Drewes and others (1983) as having moderate mineral-resource potential--areas 2-6 (fig. 2).

Hilltop Mine area

The Hilltop Mine area is in the northern part of the Chiricahua Mountains, east of the Chiricahua National Monument, in secs. 32 and 33, T. 16 S., R. 30 E., and in secs. 4 and 5, T. 17 S., R. 30 E. The area includes the main mountain ridge that trends northwesterly. (See fig. 3.) The area is accessible by jeep roads on the southwest side, and a dirt road on the northeast side, near the old townsite of Hilltop.

Hilltop Mine

The Hilltop Mine is the largest mine in the Forest, and consists of three major levels joined by raises and stopes (figs. 4a-4c, 5a-5c). These are the Kasper Tunnel (fig. 4a, 5a), the Grey Tunnel(fig. 4b, 5b) and the Rhem Tunnel (fig. 4c, 5c) as shown on the Rustler Park 7 1/2 minute quadrangle. The Kasper Tunnel has been driven through the main ridge at an elevation of about 6,450 ft. It is 3,125 ft long and has about 10,000 ft of drifts, crosscuts, raises, and stopes, and winzes. The Grey Tunnel was driven from the northeast side of the mountain at an elevation of about 6,180 ft. It is about 1,750 ft long and consists of 5,500 ft of drifts and crosscuts. The Rhem Tunnel was also driven from the northeast side at an elevation of about 5,780 ft. This working is 3,850 ft long with about 2,600 ft of drifts, crosscuts, raises, and winzes. (See Brittain, 1954, p. 69, 70.) The Blacksmith Tunnel is described by Papke (1952,

p. 69) as being part of the Hilltop mine also, even though it does not connect with the main workings. This 400-ft-long adit was part of the original exploration work, and is at an elevation of about 6,920 ft. The total footage for the Hilltop Mine is about 26,500 ft, or about 5 mi. Numerous smaller workings are present in this area (fig. 3), but little literature is available that describes them.

Geologic setting

A band of sedimentary rocks about 1 mi wide runs northwesterly through the Hilltop Mine area. Drewes (1982) shows about 13 formations in this area ranging in age from Cambrian to Cretaceous. The Hilltop Mine cuts thick sections of Pennsylvanian and Permian units dominated by limestone. The formations dip steeply, both to the southwest and to the northeast where they have been overturned. A Proterozoic igneous body (granodiorite and quartz monzonite) adjoins the sedimentary units on the northeast side, and Tertiary volcanic rocks cover the sediments southwest of the Hilltop Mine.

According to Brittain (1954, p. 10), mineralization is confined to Permian quartzite and limestone. High-angle shear faults, cutting across the sediments in a general northeast-southwest direction, were the main conduits for mineralizing fluids. Included in these faults are the Blacksmith, Eureka, and Maverick Faults as named by Papke (1952, p. 56). The largest and most productive stopes were associated with the Blacksmith Fault. Away from these fault zones, vein and replacement mineralized zones were localized by northeast-striking fissures, and by bedding planes.

The ore bodies are described by Brittain (1954, p. 72) as being small, scattered, and of four general types: 1) chimney or irregular replacement deposits, 2) vein deposits, 3) bedding replacement deposits, and 4) secondary or oxidized ore deposits.

According to Papke (1952, p. 74, 75), the principal ore shoots occur in the Hilltop Quartzite member and are found along the hanging wall of this unit, adjacent to limestone beds. The name Hilltop Quartzite is not used or mentioned in later geologic maps and is likely the same formation that Drewes (1982) describes as the Permian Scherrer Formation.

The ore is composed of lead and zinc sulfides, carbonates, and sulfates with some oxidized copper minerals. The sulphide ore minerals in order of abundance are galena, sphalerite, pyrite, chalcopyrite, and arsenopyrite. Varying amounts of silver and a minor amount of gold occur with these minerals. Secondary minerals are anglesite, azurite, cerussite, chrysocolla, hematite, jarosite, limonite, malachite, pyrolusite, smithsonite, and wulfenite. Accessory minerals include actinolite, clinozoisite, epidote, garnet, magnetite, scheelite, and wollastonite. Gangue minerals are mostly calcite, dolomite, and quartz. For the majority of the ore mined, the average grades were approximately 18% lead, 4% silver, 7% zinc, and 0.36% copper (See Papke, 1952, p. 84.). Some of the early oxidized ore mined was undoubtedly much richer than this. A small amount of gold may have been recovered from some of the ore.

Results of investigation

During the present investigation, the Kasper Tunnel was accessible from the western portal for about 1,800 ft, to the area where the major ore bodies were mined. Here the loose, dangerous rock condition of the mine prevents further investigation. The northwestern branch of the Kasper Tunnel is accessible for about 1,500 ft to the face. Three samples were taken from this branch. Sample CH 30 was taken from a fault zone in a small stope (fig. 4a). Galena is the major ore mineral present and

assays show 1.13% lead and 4,524 ppm (0.45%) zinc. Sample CH 31 was taken from a remnant of ore in a small stope. Assays show 12.2 oz/st silver, 35.6% lead, 8,168 ppm (0.82%) copper, and 6,700 ppm (0.67%) zinc. Sample CH 32 was also taken from a pocket of remaining ore in a small chimney-shaped stope and assays show 15.0 oz/st silver, 19.5% lead, and low concentrations of copper and zinc. (See appendixes B and C.) No resources could be calculated for the accessible portions of the Hilltop Mine, because the pockets of ore in small stopes have been virtually mined out.

On the northeast side of the mountain, the Kasper Tunnel level is accessible for several hundred feet, before dangerous rock conditions are encountered. The area of major mining is not safely accessible from this side. The portal of the Grey Tunnel level is open but was not entered due to deep water. Sample CH 29 was taken from ore material on the dump of the Grey Tunnel level, and the assays show 6.3 oz/st silver, 8.90% lead, 9.02% zinc, and 9,517 ppm (0.95%) copper (appendix B). The amount of ore material on the dump is small and does not constitute a resource. The portal of the Rhem Tunnel level is blocked by a locked gate, and a steady flow of water drains out of the mine through PVC pipe. The water is apparently used for irrigation purposes on private property below.

Examination of the Blacksmith level showed the adit to be caved. Sample CH 28 was taken of ore material near the portal, and the assays show 7.04% lead, 3.70% zinc, with small amounts of other metals (appendix B).

No resources could be calculated for the Hilltop Mine; the ore zones where most of the mining took place are inaccessible. Known ore bodies were most likely mined out, which is probably the reason the mine is idle. Similar ore bodies may exist in

unexplored portions of the Hilltop mine complex, and at unexplored depths. Geophysical exploration methods and drilling would be required to identify and quantify any resources present.

Workings northwest of the Hilltop Mine

Several smaller workings northwest of the Hilltop Mine were mapped and/or sampled for this investigation (fig. 3). No mention of these workings was found in the literature, and any production would have been small judging from the size of the workings.

Near the head of Blumberg Canyon is an adit with more than 850 ft of workings on the main level, at least two inaccessible lower levels, and stoping of unknown extent (fig. 6). Major ore minerals are galena, sphalerite, and chalcopyrite. Samples CH 8 and 9, taken from a vein at the bottom of a stope, have assay values of 12.8% and 12.7% lead, and 7.81% and 9,500 ppm (0.95%) zinc (appendixes B and C). The minerals in the vein occur irregularly. A small tonnage of lead-zinc ore was probably produced.

Several small mine workings are about one-half mi east of Hands Pass, in the area near the Lead Lily Shaft, as shown on the Rustler Park 7 1/2 minute Quadrangle (fig. 3). Samples CH 11-13 were taken from an adit with about 100 ft of workings, judging from the size of the dump, in altered limestone (fig. 7). No ore minerals were observed in this adit, and assays show low metal content (appendix B). Adjacent to this adit is a decline with at least 100 ft of workings. Sample CH 14 was taken at the portal, from a major fault zone in highly altered limestone. The assay shows low metal content. Adjacent to this decline is an adit with at least 330 ft of workings (fig. 8). The adit intersected several major fault zones in limestone and altered limestone. No

ore minerals were recognized in this adit and the samples show low metal concentrations (samples CH 15-22, appendixes B and C).

Sample CH 24 was taken from ore material on the dump of the Lead Lily Shaft. Ore minerals recognized were galena, sphalerite, and malachite, and the assay contained 16.7% lead, 3.41% zinc, and 10.2 oz/st silver (appendixes B and C). The majority of rock on the dump is altered limestone. The shaft contains about 80 ft of workings, judging from the size of the dump. Sample CH 23 was taken from the dump of a small trench adjacent to the shaft. Rock on the dump is mostly altered limestone, similar to the shaft dump. The sampled material contained chalcopyrite, chalcocite, galena, sphalerite, and malachite, and the assay shows 10.5% lead, 9.0% zinc, and 1.4% copper. No structure was recognized at these two workings due to ground cover and sloughing, but Drewes (1982) shows these workings to be on or very near a thrust fault between two limestone formations.

Samples CH 25-26 were taken from a 300-ft adit northeast of the west Kasper Tunnel portal (fig. 9). This adit has a high back with loose and dangerous rock, so sample sites were limited. The adit was driven in quartzite, and intersected a limestone unit near the face. Assays of the samples show low metal content (appendix B), and no ore minerals were recognized during the investigation.

West of the 300-ft adit is a 23-ft-deep shaft in quartzite. A dump sample (CH 27) was taken from a minor amount of altered quartzite containing sparse galena. This sample assayed 1.7% lead and 0.6% zinc (appendix B).

No resources were identified for the workings northwest of the Hilltop Mine due to inaccessibility of mineralized zones in the adits, lack of continuity of mineralized zones, and ground cover over potential mineralized zones.

Workings northeast of the Hilltop Mine

A number of small workings are on private land northeast of the Hilltop Mine. Permission was not granted to examine them. Keith (1973, p. 52) indexes the Hilltop Extension Mine as being in the area from SE. 1/4 sec. 28 to SW. 1/4 sec. 34, T. 16 S., R. 30 E. and notes the mine as being "tunnel" workings, from which a total of 400 st of ore was shipped intermittently from 1923 to 1940. According to Keith, lead and silver were the major commodities produced, with minor amounts of copper, zinc, and gold.

Another mine in this area listed by Keith (1973, p. 52) is the Sullivan Mine, with a general location given as secs. 33, 34, T. 16 S., R. 30 E. According to Keith, about 10 st of ore were produced in 1915, and about 2,160 st of ore were produced between 1943 and 1945. The commodities produced were copper, lead, zinc, silver, and gold. In 1943, the Bureau of Mines investigated this property and did a small amount of underground exploratory work and surface trenching. At this time the property consisted of 14 patented lode-mining claims, and workings consisted of about 400 ft of underground workings and numerous surface cuts. Copper mineralization predominates in the ore, with some silver and a minor amount of gold. The mineralization is mainly confined to shear zones in rhyolite near a contact with limestone. Seven samples taken by the Bureau in 1943 from the workings averaged 4.2% copper, 3.8 oz/st silver, and 0.02 oz/st gold. Four samples from three trenches excavated by the Bureau in 1943 averaged 1.7% copper. (See Kumke, 1947.)

A follow up report from the Bureau's field investigation of the Sullivan Mine concludes that the mineralization exposed in the trenches excavated by the Bureau of Mines was weak and spotty and gave no indication of substantial bodies of economic

ore deposits. Results of limited underground work were also negative, and the report states the ore body from which ore had been produced was virtually exhausted. The report concluded that the possibility of developing commercial bodies of ore was too remote to warrant further exploration work by the Bureau. (See U.S. Department of Interior, Bureau of Mines, 1945, p. 8.)

Rieder Tunnel area

The Rieder Tunnel and surrounding area is about 1 mi east of the Hilltop Mine in the S. 1/2 sec. 34, T. 16 S., R. 30 E. (fig. 10). The prospects in this area are not accessible by vehicle because of private property, but can be reached by foot through a corridor of Forest land from the East Whitetail Creek road. The workings are mostly small adits, and appear to be unsuccessful prospecting attempts.

Sample CH 33 is from a 35-ft decline that exposes a small pocket of ore containing massive chalcopyrite and galena (fig. 11). The assay shows 11.6% lead, 5.6% copper, and 2.2% zinc to be present in the sample (appendix B). Below this decline is an adit with 170 ft of workings (fig. 12). Samples CH 34-37 were taken in this adit and contained low concentrations of metals (appendix B), indicating weakly mineralized zones.

Samples CH 38-44 were taken from the Rieder Tunnel (fig. 13), as shown on the Rustler Park 7 1/2 minute Quadrangle. The adit has about 300 ft of workings with a 40-ft raise to the surface. The adit intersected numerous faults with spotty zones of sulfide minerals. Galena, sphalerite, pyrite, and chalcopyrite were the major ore minerals recognized in the faults. Sample CH 41 contained 8.0 oz/st silver, 8.3% galena, and 4.6% zinc (Appendix B). The other samples have lesser amounts of these

metals. No resources could be measured due to the irregular distribution of the minerals. A small tonnage of ore may have been produced.

Sample CH 45 was taken from an epidosite outcrop near the Rieder Tunnel. The sample contained abundant azurite, chalcocite, and malachite. The assay shows 9.3 oz/st silver, 3.7% copper, 3.8% lead, and 1.7% zinc to be present. Little of this material was seen in place due to ground cover.

Sample CH 46 was a high-grade from the dump of an adit southeast of the Rieder Tunnel. The adit was not entered due to deep water inside the portal. Most of the dump material is barren limestone. The sample was of a small amount of mineralized rock with sphalerite, pyrite, galena, and chalcopyrite, and contained 14.2 oz/st silver, 7.6% lead, 10.3% zinc, and 7,975 ppm (0.80%) copper to be present in the material sampled.

Samples CH 47-50 were taken from a 75-ft-long adit (fig. 14) southeast of the Rieder Tunnel. The adit intersected several faults, an igneous dike, and a contact between limestone and latite porphyry. Chalcopyrite and malachite were observed in one of the faults. Assays show generally low metal values for the four samples taken in this adit (appendix B).

Sample CH 51 was taken from a 25-ft-long adit in barren limestone. The sample is from a fault at the portal consisting of fractured and sheared limestone with intermixed limonitic gouge. The assay shows negligible metal concentrations (appendix B).

East of the Rieder Tunnel an adit with 200 ft of workings (fig. 15) intersected three major faults in limestone. The faults consist of altered, brecciated limestone and clayey gouge. A minor amount of malachite was observed in the adit, and a small

amount of lead, copper, and zinc was detected in the samples. One of the four samples (sample CH 53) has an assay of 4.5% lead; overall the metal content in the faults is well below ore grade (appendix B).

Northeast of this adit and northeast of the Rieder Tunnel is an adit with 675 ft of workings (fig. 16) in barren limestone. A major fault zone consisting of brecciated and altered limestone, and limonitic, clayey gouge was intersected near the face . Assays of three samples taken from this adit (CH 56-58) show low metal concentrations (appendix B). In the Rieder Tunnel area, no resources could be delineated because of overall low metal content samples and irregular occurrences of ore minerals.

Mines and prospects south of the Hilltop Mine

Unnamed workings

About 0.6 mi southeast of the Hilltop Mine is a caved adit with a large dump (pl. 1). Dump material is both limestone and quartzite. Sample CH 59 was taken from altered limestone with finely disseminated pyrite, and the assay shows negligible metal concentrations (appendix B). No other ore minerals were recognized on the dump.

South of the caved adit is a 50-ft adit in quartzite (fig. 17). Abundant galena and sphalerite are in an irregular fracture zone near the portal. Sample CH 61 from this zone contains 9.7% lead and 3.4% zinc. An adjacent decline of unknown extent follows this zone down dip. At the surface there is insufficient exposure to quantify a mineral resource.

About 0.7 mi northwest of Onion Saddle is a small open cut that exposes a major fault in altered rock and limonitic gouge (plate 1). The cut is near a contact with quartz monzonite. Ore minerals erratically distributed in the cut are bornite,

chalcopyrite, galena, and sphalerite. Two samples from this site (samples CH 76, 77) show less than 2% lead and zinc with over 2% copper. Judging from material on the dump, a small pocket of ore had been mined out; the fault could not be traced beyond the open cut.

Silver Prince Mine

The Silver Prince Mine (fig. 18) is about 1.1 mi southwest of the Hilltop Mine, near the North Fork of Pinery Canyon. The mine consists of an adit with at least 380 ft of workings (fig. 19), a shaft with workings of unknown extent, and an adit 70 ft long adjacent to the main workings. Keith (1973, p. 54) reports that the mine produced a few tons of ore in 1949 from spotty base-metal mineralization. The main adit intersected two contacts between limestone and quartzite, with several shear zones. No ore minerals were recognized in the adit, other than a small amount of pyrite. The assays from five samples (CH 65-69) taken in the adit all have low metal concentrations. Sample CH 70, from a small amount of ore material on the dump with galena and sphalerite, has 2.2% lead and 3.5% zinc (appendix B). Sample CH 72, from a small amount of ore material on the shaft dump, has 4.6% lead and 1.2% zinc. No ore minerals were recognized in the 70-ft adit, and sample CH 71 from this adit has low metal concentrations (appendix B). No resources were identified at the Silver Prince Mine area.

El Tigre Mine

The El Tigre Mine is on the south slope of Pinery Canyon and south of Forest Road 42, about 3 ½ mi south of the Hilltop Mine (figs. 20, 21). The mine consists of five major adits driven into a near vertical fault zone that trends up hill S. 38° E. There

is about 600-ft between the upper and lower adits, and an elevation difference of about 250 ft (fig. 21). Extent of the workings is unknown, but Tsuji (fig. 21) shows there could be more than 1,000 ft of underground drifting including winzes and raises between some of the levels. At the time of the present investigation, only three adits were partially accessible.

Tsuji (1984, p. 66) describes the major zone as a massive quartz-silica and calcite vein that has both stockwork-type mineralization and sheeting, with common gouge. Wall rock alteration extends from the vein outward several tens to several hundred feet. The massive stockwork portion of the vein is 5- to 25-ft-thick and is generally about 10 to 15 ft thick. The vein can be traced intermittently over 16,500 ft from south of Horsefall Canyon to south of Turkey Park, but the only mine workings on the vein are at the El Tigre Mine.

Host rock for the veins at the El Tigre Mine is mostly altered limestone and shale, adjacent to and intermixed with volcanic rocks. Cooper (1959) shows the El Tigre Mine at or near a contact between the Cretaceous Bisbee Formation and a mid-Tertiary rhyolite ash flow complex. The ash flow complex is the northeast fringe of the Turkey Creek Caldera as described by Marjaniemi (1969) and Du Bray and Pallister (1991).

Tsuji (1984, p. 104-106) estimated resources for the vein at the El Tigre Mine, and for a portion of the vein south of Turkey Park. The tonnage calculations of quartz-silica that could be used as a flux have a range between 313,000 and 8,890,000 st of resources. These figures are in a table in appendix D, p. 101. The average vein grade at the mine used in Tsuji's calculations is 0.005 oz/st gold and 0.52 oz/st silver, which is by far sub-economic for a precious metal vein-type deposit. Overall values

are low but variable due to scattered occurrences of high-grade ore pockets (Tsuji, 1984, p. 107). Past mining concentrated on the high-grade pockets, and much of the high-grade ore has been removed. However, much of the ore could be used for silica flux and the veins were mined for flux from 1973 to 1974, when approximately 700-800 st was shipped to a smelter in Douglas. According to Tsuji (1984, p. 103), to be acceptable for a silica flux, the ore must have at least 85% silica and no more than 4.5% alumina, as stipulated by a contractor for shipment to the Phelps Dodge Reduction Works in Douglas, Arizona. Most of the silica ore at the El Tigre Mine meets these specifications (Tsuji, 1984, p. 103). The economic viability of silica flux would depend upon gold and silver content and local market conditions. The smelter in Douglas is no longer in operation, and it is unlikely other smelters in southeastern Arizona would accept silica flux with a precious metal content as low as the flux at the El Tigre Mine.

During the present investigation, three of the adits were partially accessible but dangerous rock conditions limited the investigation. There are no known complete maps of the adits and underground workings. Sample CH 73 was taken from part of the vein in an opencut adjacent to the lower adit portal, and the assay shows 5.1 oz/st silver with low values for other metals (appendix B). Sample CH 74 was from vein material in an upper adit and the assay shows low metal concentrations (appendix B). Sample CH 75 is from a small quartz stockpile from the uppermost working, a caved decline. The assay shows 6.0 oz/st silver with low concentrations of other metals (appendix B). At the time of this field investigation no resources could be determined due to lack of good exposures of the vein.

Jhus Canyon area

The Jhus Canyon area consists of the Chiricahua Mine and a number of mines and prospects northwest and northeast of the Chiricahua Mine, near southern tributaries of Jhus Canyon, about 1 mi westerly from the old townsite of Galeyville (fig. 22). Only a small amount of literature could be found that discusses these workings. Chakarun (1973) studied the alteration in the Jhus Canyon area to determine if a large contact metasomatic or porphyry base metal-type of ore deposit may be present. His investigation involved geologic mapping, geochemical sampling, and a petrological study of the alteration. Chakarun's investigation did not delineate an ore deposit, and he did not find surface evidence to indicate a major ore deposit at depth. Chakarun noted that the alteration in Jhus Canyon is related to the Jhus Canyon Stock and other igneous intrusions, and that numerous prospect pits and small mines almost always are located at or near an igneous-limestone contact. A geologic map by Cooper (1959) shows the workings in the Jhus Canyon area to be near a contact between a Tertiary igneous intrusion and the Pennsylvanian Earp and Permian Horquilla Formations.

Between the 1960's and early 1980's, several large mining companies had an interest in the Jhus Canyon area and conducted exploration programs. According to Chakarun (1973, p. 10), Superior Oil Company conducted an induced polarization and small-scale drilling program in 1967, and in 1968, Duvall Corporation core-drilled two holes in the area. Two drill sites were observed during this investigation in secs. 14 and 15, T. 17 S., R. 30 E. Results of exploration work by the companies is unknown, but probably none located an economic ore deposit because all of the companies dropped their claims by the early 1980's.

Prospects northwest of the Chiricahua Mine

About 1/2 mi northwest of the Chiricahua Mine are an adit with 120 ft of workings (fig. 23), several small pits, and a 22-ft-deep shaft. The adit is in a zone of highly altered and fractured igneous rock (probably granodiorite porphyry), gossan, limonitic gouge, and hematite ochre. Malachite stains are commonly present in the adit, along with a high concentration of iron minerals. Assays of the three samples taken in this adit show generally low values for base and precious metals, with the highest value being 1.9% copper and 19,000 ppm (1.90%) zinc (appendixes B and C). A dump sample from small pits above the adit also has low metal values. About 400 ft southeast of the adit is a 22-ft-deep shaft (fig. 22) in granodiorite porphyry. Some of the rock on the dump contains finely disseminated chalcopyrite and sphalerite, and malachite stains. Sample CH 83 from this material contains 3.7% copper, with low values for other metals other than iron (appendix B). No other mineralization was seen nearby due to lack of rock exposures. No resources could be identified in this area.

About 900 ft northwest of the Chiricahua Mine is a 20-ft adit and a small prospect pit (fig. 22). The adit is in a zone of altered, brecciated, iron stained limestone with a tactite zone near the portal. Sample CH 84 from the tactite zone shows 4.8% copper and sample CH 85 taken near the face contains 7,039 ppm (0.70%) copper (appendix B). Malachite stains were the only ore mineral seen in the adit, and the two assays have low concentrations of other metals. A small, sloughed-in prospect pit is about 200 ft southeast of this adit. A select sample from a small amount of ore material on the dump assayed 13.7% copper and 6.7 oz/st silver (appendix B). Minerals in the sample include bornite, chalcocite, chalcopyrite, and

malachite. The pit is in an area of altered and iron-stained limestone. The amount of ore material exposed in this area is small and no resources were identified.

Chiricahua Mine

The Chiricahua Mine is at the head of an unnamed intermittent stream, about 1 1/2 mi northwest of Paradise (plate 1, fig. 22). According to Dale and others (1960, p. 16), the Chiricahua Mine was worked extensively in the early 1900's by the Lake Superior Mining Company. A 480-ft shaft was sunk with several levels on copper showings, with no known production. At the time of this investigation, the shaft was caved, but there was a 50-ft wide by 30-ft deep glory hole where the shaft apparently was. The collar of the shaft was on or near a near-vertical contact between limestone and granitic rock. No ore minerals were seen on the large shaft dump.

About 200 ft north of the Chiricahua Mine shaft is a straight adit that is caved at 490 ft from the portal (fig. 24). The adit, driven in limestone with varying amounts of alteration, intersected two igneous dikes, a tactite zone, and several minor faults. Ore minerals recognized were pyrite and a minor amount of malachite. Assays of 6 samples (CH 87-92) show low metal concentrations with the highest base or precious metal value being 2,754 ppm (0.28)% copper (sample CH 92, appendix B). This adit was probably an attempt to intersect an ore body; what was encountered past the caved portion is unknown. No resources could be identified at the Chiricahua Mine and vicinity due to lack of ore exposures.

Workings northeast of the Chiricahua Mine

About 1/3 mi northeast of the Chiricahua Mine is a major underground working with two major levels, with sublevels and stoping between (figs. 22, 25-26). The

workings intersected a major gossan zone, up to 100 ft across, in altered limestone near a contact with an igneous body. Within the gossan are irregular zones of copper and zinc mineralization, and abundant pyrite and malachite. Assays of 30 samples taken in this working (CH 93-122) averaged 4,670 ppm (0.47%) copper and 12,920 ppm (1.23%) zinc with a range of 0.02% to 2.6% copper and 0.01% to 11.4% zinc. Other metals have low assay values. Tungsten assays averaged 175 ppm (0.017%) with a high value of 1,000 ppm (0.1%). Silver assays were low with only two samples having a concentration near 1 oz/st. (See appendix B.) The remaining ore in the mine is too irregular and low grade to presently be of economic interest.

About 200 ft north of this mine are two adjacent adits with 385 ft of workings, also in a gossan zone (fig. 27). Most rock in these adits is a highly altered iron-rich rock with hematite, limonite, gouge, and common malachite stains. Part of one adit follows a contact between gossan, and marble and recrystallized limestone. Assays from 11 samples taken in the adits (CH 123-133) ranged from 266 ppm (0.03%) copper to 1.36% copper with an average of 4,270 ppm (0.43%) copper. For zinc, the average assay was 1,006 ppm (1.0%) with a range of 820 ppm (0.08%) to 4.52%. Other metals have negligible assay concentrations (appendix B). Similar to the nearby larger mine, the gossan body is too low of grade to presently be of economic interest.

About 550 ft north-northeast of the adits is a caved shaft with a large dump. Sample CH 134 was taken from a nearby outcrop consisting of gossan, altered rock, and limonitic gouge near the contact with an igneous body. The assay has a copper concentration of 2.7% (appendix B). A select sample of a small amount of ore material on the dump (CH 135) contains 9,493 ppm (0.95%) copper and 8.4% zinc (appendix B). Sphalerite, chalcopyrite, and magnetite were among the minerals in the sample.

Most of the dump material consisted of altered limestone with some porphyry rock. Due to lack of sufficient mineralized exposures, no resources could be identified.

Mines and prospects near Galeyville

Within 1/2 mi west and southwest of the old townsite of Galeyville are a number of mine workings known as the Texas Mine Group and the Columbia Mine (fig. 28).

Texas Mine group

The Texas Mine group is in a patented claim of about 24 acres, about 1/4 to 1/2 mi west of Galeyville (fig. 28). According to Dale and others (1960, p. 15), the claim was worked about 1880 to 1882. Keith (1973, p. 54) states that 50 or more tons of ore was produced in the 1880's, and one small lot was mined in 1937.

On the western edge of the patented claim is a 20-ft-deep shaft and a short adit. The shaft was sunk on an irregular fault zone in limestone with sporadic pockets of altered limestone and sulfides. A small amount of mineralized rock on the dump was sampled (CH 137) and contains 18.4 oz/st silver, 7.9% lead, and 6.0% zinc. Sample CH 138 from the adit has low metal concentrations (appendix B).

Sample CH 139 is a select sample from a caved adit dump; the assay shows 3 oz/st silver, 0.42% copper, 0.96% lead, and 2.5% zinc (appendix B). Just south of the caved adit is an adit that was driven on a contact between limestone and igneous rock (fig. 29). The adit was explored for 90 ft, until dangerous loose rock was encountered. Four samples from the adit have low metal concentrations, and no ore minerals were observed. A sample of pyritized rock on the dump also has low metal concentrations (appendix B).

Below this adit near an intermittent stream bed is an adit with 315 ft of workings in limestone and quartz monzonite (fig. 30). No ore minerals were recognized in this adit except for a minor amount of pyrite, and 5 samples from the adit (CH 145-149) have low metal concentrations (appendix B). Sample CH 150 from a small ore stockpile on the dump has an assay of 5,832 ppm (0.58%) lead and 1,700 ppm (1.7%) zinc. Across the intermittent stream from this adit is a 35-ft-long adit that was driven across a contact of an altered dike and limestone (fig. 30). The only ore mineral recognized in this adit was pyrite; two samples from this adit (CH 151-152) have low metal concentrations (appendix A).

Columbia Mine

The Columbia Mine workings consist of 3 adits southwest of and close to Galeyville and just inside the Forest boundary (figs. 28, 31, 32). According to Keith (1973, p. 52), small shipments of about 50 st of high-grade base-metal ore were made intermittently from 1902 to 1941; some tungsten ore was shipped in 1953. Dale and others (1960, p. 12) report that one carload of high-grade lead-silver ore was shipped in the 1940's; the ore assayed 54% lead, 0.65% bismuth, and 86 oz/st silver. The ore occurs in sheared tactite zones and along faults and fractures in altered limestone.

Samples CH 153-156 taken from the lower adit (fig. 31) have low metal concentrations (appendix B); the only ore mineral noted was pyrite. Samples CH 157-158 from the middle adit (fig. 32) also have low metal concentrations (appendix B). A sample from a fault zone in the upper adit (CH 159) contains 197.6 ppm (5.7%) oz/st silver, 3664 ppm (0.37%) bismuth, 5,664 ppm (0.57%) lead, and 16.7% zinc. Sample CH 160 from ore material on the dump contains 33.4 oz/st silver, 4,626 ppm (0.46%) bismuth, 3,797 ppm (0.38%) copper, 9.5% lead, and 9.2% zinc (appendix

B). The two samples have tungsten concentrations of 1,490 ppm (0.15%) and 1,330 ppm (0.13%). The upper adit intersected a small, high-grade zone of ore and likely produced a small amount of ore.

Mines and prospects northwest of Paradise

A number of adits, shafts, and prospects are within 2/3 mi northwest of the small community of Paradise (fig. 33, plate 1). The largest working, the Silver Hill Mine, consists of two connecting adit levels with more than 900 ft of workings (fig. 34). Keith (1973, p. 54) credits the mine with about 180 st of intermittent production of base-metal ore and a minor amount of tungsten ore from the 1890's to 1952. Dale and others (1960, p. 7) report that in 1954 approximately 10 st of tungsten ore was shipped from the Silver Hill Mine. No ore grades were reported in either reference. The adits were driven in limestone and altered limestone and intersected a number of faults and irregular, small tactite zones. Ore minerals observed in the mine are pyrite and galena. Fourteen samples were taken from the mine (CH 163-176) and, except for two samples, the metal concentrations are generally low (appendix B). Sample CH 163 was taken from a small fault-tactite zone with galena and contains 185.8 ppm (5.4 oz/st) silver and 12.4% lead. Sample CH 172 was taken from the top of a decline driven on a fault and the assay shows 12.8 oz/st silver and 7.4% lead. Tungsten concentrations were low in all the samples with the highest concentration being 0.15% in sample CH 172. (See appendix B.)

A number of smaller workings consisting of adits, shafts, declines, open cuts, and pits are present in this area. These workings are prospecting attempts that were developed in altered zones or fault zones, with small pockets of mineralization in some of the zones. Azurite, galena, malachite, pyrite, and sphalerite are present at some of

the workings, but the ore minerals were not continuous enough, at the surface, to justify larger excavations. All the sampled prospects are summarized in appendix D, and sample results are given in appendixes B and C. Figure 35 is an enlargement of part of fig. 33, where there are several workings close to each other.

Mines and prospects between Portal and Paradise

Several mines and prospects are north of Forest Route 42B, between Portal and Paradise (fig. 36). Several small prospects are at the end of a dirt road at sample sites CH 195-198. Sample CH 195 is from the northernmost prospect, a short decline. The sample is from a small, discontinuous mineralized zone in altered limestone and volcanic porphyry rock, and the assays show 1.6% copper, 4.9% lead, and 6.0% zinc (appendix B). Sample CH 196 is from a small decline in altered igneous rock, just south of sample site CH 195, at the edge of the dirt road. No ore minerals were seen in this prospect, and the assay shows the sampled rock to have low metal concentrations (appendix B). Sample CH 197 is from the largest working, a 25 ft long decline. The assay has low metal values; in this decline a small zone of mineralized rock had been mined out. Sample CH 198 is from the dump of the decline and was taken from ore containing azurite, chalcopyrite, galena, malachite, pyrite, and sphalerite. The assay of this sample has 45.6 ppm (1.3 oz/st) silver, 2.0% copper, 5.4 % lead, and 2.2% zinc. No resources could be identified at these workings due to lack of significant in-situ mineral exposures.

Samples CH 199-200 were taken from a small adjoining open cut and adit in highly oxidized, altered, brecciated limestone. An unusual note is that the two assays show 8.2% and 8.3% strontium to be present (CH 199, 200; appendix B). The source mineral of the strontium was not identified. The assays have low concentrations for

other metals. Sample CH 201 is from the dump of a nearby shaft that measured 61 ft deep. The sampled rock has low assay concentrations for all metals (appendix B).

About 1.8 mi east of Paradise is a shaft just north of Forest Route 42B. The shaft is either on or very close to the Forest boundary. The dump size indicates the shaft may have 150 to 200 ft of workings. The shaft was sunk on a calcite vein containing varying amounts of galena, malachite, pyrite, and a minor amount of azurite and chrysocolla. Sample 203, from the vein, has 156.6 ppm (4.5%) oz/st silver, with a low concentration of copper, lead, and zinc (appendix B). Sample CH 204 is from ore material on the dump and the assay shows concentrations of 11.2 oz/st silver, 4,879 ppm (0.49%) copper, 1.1% lead, and 8800 ppm (0.9%) zinc. Southwest of the shaft is a 15-ft-decline that was sunk on a zone of silicified limestone. Ore minerals on the dump include azurite, chalcocite, galena, malachite, sphalerite, and tetrahedrite. A sample of the ore material (CH 202) contains 23.1 oz/st silver, 1.2% copper, 7,058 ppm (0.71%) lead, and 3,732 ppm (0.37%) zinc (appendix B). East of the shaft is a trench 30 ft long and 20 ft deep, dug on a narrow calcite vein, likely the same vein the shaft was sunk on. A sample of the calcite vein (CH 205) has 93.2 ppm (2.4 oz/st) silver, and lower concentrations of other metals (appendix B). No resources could be calculated due to limited surface exposure of the vein.

Sample CH 206 was taken from a 30-ft-long decline located midway between Portal and Paradise, and just north of Forest Route 42B (fig. 36). The sample is from a shear zone up to 8 ft thick, with malachite and minor azurite and chrysocolla. The sample contains 4,068 ppm (0.41%) Cu, with lower concentrations for other metals. Sample CH 207 is from a dump of a shaft 42 ft deep sunk on a 5-ft-thick shear zone containing malachite and minor azurite and chrysocolla. A sample of mineralized rock

has assay values of 1.2% copper, 1,790 ppm (0.19%) lead, and 4,472 ppm (0.45%) zinc (appendix B). No resources could be identified.

Mines and prospects southeast of Portal

About 1 mi southeast of Portal are several shafts, pits, and an adit. The largest working, the Grace Mine (fig. 37), was developed by a 110-ft-deep shaft with 230 ft of drifting on 2 levels. The mine, developed in a thick section of limestone, intersected several faults and fracture zones that contain spotty lead-zinc minerals. There is no recorded production for the mine (Bureau of Mines file data). Sample CH 208 was taken from a small ore stockpile on the dump that contains abundant galena and sphalerite and lesser amounts of pyrite and malachite. The assays show the presence of 2.7 oz/st silver, 2,298 ppm (0.23%) copper, 4.6% lead, and 15.9% zinc in the material sampled (appendix B). Adjacent to the shaft is an adit with more than 100 ft of workings. Near the portal is a flat-lying contact between competent limestone and fractured, altered, iron-stained rock. A sample (CH 209) from the contact zone has low metal concentrations (appendix B).

Six other samples were taken from pits, trenches, or small shafts in this area. The assays from all of these samples have low metal concentrations (appendix B). The workings were dug mostly in altered limestone adjacent to a contact with volcanic rock. Finely disseminated pyrite is common throughout the area. The samples and workings are summarized in Appendixes A and D.

In 1990 Newmont Mining Corporation proposed to drill four holes in this area to augment a surface mineral exploration program for a disseminated precious metals target. In 1991 the company withdrew its application to drill exploratory holes because of public opposition to mining activity in this area, and because of a bill put

before Congress to withdraw approximately 13,000 acres in the Coronado National Forest from mining and mineral leasing laws. This Act is referred to as the Cave Creek Canyon Protection Act of 1991, and includes the area southeast of Portal. As this report was being published, the Bill was still under consideration by Congress.

According to Alan Branham (Geologist, Newmont Exploration Corporation, oral commun., June, 1992), the area of interest is at or near a contact between limestone and volcanic rocks. Jasperoid occurs across an area about 1/2 mi long, at or near the contact. Samples from the jasperoid contained gold and gold indicator elements such as antimony, arsenic, and mercury. In addition, other metals such as lead, zinc, and silver are present in the samples. Figure 37 shows altered and metamorphosed rock mapped by Newmont (Alan Branham, written commun., March, 1993).

CONCLUSIONS

During the Bureau's field investigation numerous mineral occurrences were documented at many mines and prospects throughout the northern part of the Forest in the California mining district. No mineral resources could be identified due to the irregular or spotty mineral occurrences and ground cover over possible mineralized areas. At many workings, pockets or zones of minerals had been mined out, or the grade of ore was too low to warrant further mining or prospecting.

Based upon geologic inference, areas throughout or adjacent to a northwest-trending band of mineralization in the California mining district were given ratings of moderate to high potential for mineral deposits at depth in a mineral investigation by the U.S.G.S. and Bureau of Mines in the late 1970's. Any such resources would need to be confirmed by drilling. In the late 1980's and 1990, Newmont Mining Corporation proposed to drill four holes in an area near Portal to augment a surface mineral

exploration program for a disseminated precious metals target. The proposed drilling project was canceled because of public opposition to mining activity in this area, and because of a bill put before Congress to withdraw this area and adjacent land in the Forest from mining and mineral leasing laws.

In a Master's Thesis by Tsuji (1984), tonnage calculations of quartz-silica that could be used as a flux gave a range between 313,000 st and 8,890,000 st of resources at and near the El Tigre Mine. The economic viability of this resource would depend upon local market conditions.

For the southern portion of the Chiricahua-Pedregosa Mountains unit, no mine workings are known and there is no known mineral production. No literature was located that discussed a favorable geological environment for mineral deposits at depth in the southern Forest area.

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APPENDIX A

DATA FOR SAMPLES FROM THE CHIRICAHUA-PEDREGOSA MOUNTAINS UNIT, CORONADO NATIONAL FOREST, COCHISE COUNTY, ARIZONA

Appendix A.--Data for samples from the Chiricahua-Pedregosa Mountains Unit, Coronado National Forest, Cochise County, Arizona.
{xx, not applicable}

Sample Number	Type	Length	Remarks
CH 1	Select	xx	Large dump, shaft, measured 92 ft deep, likely more extensive; altered, silicified rock, altered limestone, andesite porphyry, abundant pyrite; 3-ft-thick fault at shaft collar, strike N. 2° W., dip 80° E. (See plate 1.)
CH 2	Chip	4 ft	Pit, adjacent to shaft of sample 1; major fault, same as at shaft, contact between weathered andesite porphyry and altered limestone, limonitic gouge, minor copper stains, strike N.° 5 W., dip 70° E.
CH 3	Grab	xx	Adit, small [1], rock too dangerous to enter; vein material at portal; altered, gougy igneous rock.
CH 4	Select	xx	Dump, small, likely from same adit as sample 3; altered, silicified rock, abundant pyrite.
CH 5	Chip	5 ft	Adit, more than 850 ft of workings on main level, at least 2 inaccessible lower levels, inaccessible stoping of unknown extent; fault zone, strike N. 30° W., vertical dip; altered limestone and gouge; limestone country rock, some is recrystallized; secondary calcite veins. (See fig. 3, 6.)
CH 6	Chip	4 ft	Same adit as sample 5; intersection of 2 faults, main fault strikes N.° 60 W., dip 60° to 85° SW.; altered limestone, clayey gouge.
CH 7	Chip	2 ft	Same adit as sample 5; mineralized fault, strike E.-W., dip 80° N.; galena, sphalerite, minor malachite, epidote, calcite, marble.
CH 8	Chip	1 ½ ft	Same adit as sample 5; fault, strike N. 60° E., dip 80° NW.; spotty sulfides, galena, sphalerite, chalcopyrite, malachite, limonitic gouge.
CH 9	Chip	1.2 ft	Same adit as sample 5; mineralized fault, strike N. 60° W., dip 50° SW.; limestone, galena, sphalerite, chalcopyrite, pyrite.

1 Dump size was used to estimate length of a 4-ft x 6-ft adit.
Small dump = 10-100-ft-long adit.
Medium dump = 100-300-ft-long adit.
Large dump = over 300-ft-long adit.

Appendix A.--Data for samples from the Chiricahua-Pedregosa Mountains Unit, Coronado National Forest, Cochise County, Arizona.--Continued

Sample Number	Type	Length	Remarks
CH 10	Select	xx	Dump, same adit as sample 5; galena, chalcopyrite, sphalerite, pyrite, limonite, malachite; marble host rock.
CH 11	Chip	6 ft	Adit, at least 100 ft of workings; fault zone, strike N. 50° W., vertical dip; intermixed altered, brecciated limestone, and white, powdery, altered limestone. (See fig. 3, 7.)
CH 12	Chip	3 ft	Same adit as sample 11; altered rock, fractured, brittle, iron stained.
CH 13	Chip	3 ft	Do.
CH 14	Chip	9 ft	Decline, portal, medium-size dump; major fault zone at least 12 ft thick, strike N. 10° W.,, dip 65° SW.; highly altered and bleached limestone, sparse limonite. (See fig. 3.)
CH 15	Chip	2 ft	Adit, more than 330 ft of workings; fault zone, strike N. 35° W., dip 70° NE.; brecciated, altered limestone; limonitic, clayey gouge. (See fig. 3, 8.)
CH 16	Chip	2 ft	Same adit as sample 15; same fault zone and similar material.
CH 17	Chip	3 ft	Do.
Ch 18	Chip	3 ft	Same adit as sample 15; fault zone, strike N. 25° W., dip 78° SW.; clayey, limonitic gouge; brecciated, altered limestone, strike N. 65° W., vertical dip.
CH 19	Chip	8½ ft	Do.
CH 20	Chip	2½ ft	Same adit as sample 15; Fault zone, strike N. 25° W., vertical dip; brecciated, altered limestone; clayey gouge.
CH 21	Chip	5 ft	Do.
CH 22	Chip	5 ft	Same adit as sample 15; fault zone, strike N. 65° W., dip 70° NE.; clayey, limonitic gouge; altered, weathered limestone.
CH 23	Select	xx	Small dump, trench, 5 ft deep; altered limestone, chalcopyrite, chalcocite, sphalerite, sparse galena, malachite. (See fig. 3.)

Appendix A.--Data for samples from the Chiricahua-Pedregosa Mountains Unit, Coronado National Forest, Cochise County, Arizona.--Continued

Sample Number	Type	Length	Remarks
CH 24	Select	xx	Small dump, shaft; altered limestone, bleached white; limonite, galena, sphalerite, malachite. (See fig. 3.)
CH 25	Chip	5 ft	Adit, 300 ft of workings; fault zone, clayey gouge, brecciated quartzite, strike N. 70° E., dip 77° SE. (See fig. 3, 9.)
CH 26	Chip	2 ft	Same adit as sample 25; fault zone, strike N. 60° E., dip 60° SE., altered quartzite and limonitic gouge.
CH 27	Dump	xx	Dump, small shaft, 23 ft deep; quartzite, some is altered; minor galena. (See fig. 3.)
CH 28	Select	xx	Large dump, "Blacksmith Tunnel", caved adit; altered rock, abundant epidote; galena, sphalerite, limonitic gossan; rock sampled is from fault zone; quartzite at portal, adjacent to contact with limestone. (See fig. 3-5.)
CH 29	Select	xx	Large dump, Grey Tunnel; limestone and quartzite; pyrite, galena, sphalerite, malachite. (See fig. 3-5.)
CH 30	Chip	2 ft	Kasper Tunnel; fault zone, under small stope, strike N. 75° E., dip 75° SE.; galena, chalcocite, limonitic gossan; quartzite country rock (See fig. 3-5.)
CH 31	Chip	1 ½ ft	Same mine as sample 30; area of small stope; major fault zone, strike N. 15° E., dip 80° NW.; galena, sphalerite, abundant pyrite, minor malachite, chalcocite; quartzite country rock.
CH 32	Chip	1 ft	Same mine as sample 30; fault zone, under small stope; galena, chalcocite, limonitic gossan; quartzite country rock.
CH 33	Chip	2 ft	Decline, 35 ft long; fault, strike N. 63° E., vertical dip,; massive chalcopyrite, galena, abundant malachite and azurite stains, tactite, altered limestone, iron stains. (See fig. 3, 11.)
CH 34	Chip	3 ft	Adit, 170 ft of workings; fault, strike N. 60° W., dip 36° NE.; altered, fractured limestone intermixed with limonitic gouge. (See fig. 10, 12.)

Appendix A.--Data for samples from the Chiricahua-Pedregosa Mountains Unit, Coronado National Forest, Cochise County, Arizona.--Continued

Sample Number	Type	Length	Remarks
CH 35	Chip	2 ft	Same adit as sample 34, same fault zone; breccia, limestone fragments; limonitic, clayey gouge.
CH 36	Chip	1 ½ ft	Same adit as sample 34; fault, strike N. 70° W., dip 60° NE.; altered limestone, minor limonitic gouge; disseminated chalcopyrite, galena.
CH 37	Chip	½ ft	Same adit as sample 34; fault, strike N. 40° W.; altered limestone, limonite stains, finely disseminated pyrite, minor malachite stains.
CH 38	Chip	2 ½ ft	Rieder Tunnel, adit, 300 ft of workings; fault, strike N. 50° W., dip 60° NE.; altered limestone, limonitic gouge. (See fig. 10, 13.)
CH 39	Chip	2 ½ ft	Same adit as sample 38; major fault, strike N. 35° W., dip 55° NE.; bottom of raise; altered limestone, epidote, chalcocite, limonite and malachite stains.
CH 40	Chip	3 ft	Same adit as sample 38; fault fracture, strike N. 15° E., dip 85° NW.; limestone, gouge, disseminated chalcopyrite, malachite stains.
CH 41	Chip	4 ½ ft	Same adit as sample 38; major fault, strike N. 68° W., dip 55° NE.; altered limestone, limonitic gouge, tremolite, galena, sphalerite, minor chalcopyrite.
CH 42	Chip	4 ft	Same adit as sample 38; major fault, strike N. 33° E., dip 67° SE.; altered quartzite, limonitic gouge.
CH 43	Chip	6 ft	Same adit as sample 38; two major fault zones, strike N. 80° W., dip 45° NE.; altered and silicified limestone, limonitic gouge, minor chalcopyrite, pyrite.
CH 44	Chip	4 ft	Same adit as sample 38; major fault, strike N. 65° W., dip 45° NE.; altered limestone, minor gouge, sparse pyrite.
CH 45	Select	xx	Float, tactite zone, evident on surface for over 100 ft; epidosite, chalcocite, malachite, azurite. (See fig. 10.)

Appendix A.--Data for samples from the Chiricahua-Pedregosa Mountains Unit, Coronado National Forest, Cochise County, Arizona.--Continued

Sample Number	Type	Length	Remarks
CH 46	Select	xx	Adit, medium-size dump; deep water in adit at portal; most rock on dump barren limestone; sample of mineralized rock with sphalerite, galena, chalcopyrite, pyrite. (See fig. 10.)
CH 47	Chip	3 ft	Adit, 75 ft long; fault zone, strike N. 52° W., dip 45° NE.; limonitic gouge, altered and fractured limestone. (See fig. 10, 14.)
CH 48	Chip	3½ ft	Same adit as sample 47; dike, fine grained, dark; fault contact either side, strike N. 75° E., dip 60° NW.; gouge, tactite rock, epidote, limonite and manganese stains.
CH 49	Chip	2½ ft	Same adit as sample 47; fault zone, strike N. 47° W., dip 45° NE.; gouge, fractured and altered limestone, chalcopyrite, malachite.
CH 50	Chip	3½ ft	Same adit as sample 47; altered volcanic porphyry rock; limonitic gouge; 4-in.-thick calcite vein.
CH 51	Chip	4 ft	Adit, 25 ft long; barren limestone; fault, strike N. 85° W., dip 80° N.; fractured and sheared limestone, limonitic gouge. (See fig. 10)
CH 52	Chip	5 ft	Adit, 200 ft of workings; major fault, strike N. 77° W., dip 77° SW.; brecciated, altered limestone; limonitic gouge. (See fig. 10, 15.)
CH 53	Chip	3 ft	Same adit as sample 52; major fault, strike N. 45° W., dip 75° NE.; altered, brecciated limestone; clayey gouge; minor malachite.
CH 54	Chip	6 ft	Same adit as sample 52, same fault as sample 53; altered limestone, powdery gouge.
CH 55	Chip	3½ ft	Same adit as sample 52, major fault, strike E.-W., dip 45° N.; brecciated, altered limestone; limonitic gouge.
CH 56	Chip	5 ft	Adit, 675 ft of workings; fault, altered limestone, marble, clayey gouge, limonite. (See fig. 10, 16.)

Appendix A.--Data for samples from the Chiricahua-Pedregosa Mountains Unit, Coronado National Forest, Cochise County, Arizona.--Continued

Sample Number	Type	Length	Remarks
CH 57	Chip	5 ft	Same adit as sample 56; major fault, strike N. 40° W., near vertical dip; brecciated, altered limestone; limonitic, clayey gouge.
CH 58	Chip	2½ ft	Same adit as sample 56; limestone, pyrite stringers; disseminated pyrite.
CH 59	Grab	xx	Large dump, caved adit; limestone and quartzite; sample of altered limestone, very fine disseminated pyrite. (See plate 1.)
CH 60	Chip	3½ ft	Adit, 50 ft long; Country rock dirty quartzite; abundant galena, sphalerite. (See plate 1, fig. 17.)
CH 61	Chip	3½ ft	Same adit as sample 60; altered quartzite; 3-in.-thick vein of galena, strike N. 75° W., dip 57° SW.; abundant disseminated galena; sphalerite, minor chalcopyrite, malachite stains.
Ch 62	Chip	2 ft	Same adit as sample 60; fault zone; strike N. 25° W., dip 32° SW.; sheared, shaley, black rock.
CH 63	Chip	2 ft	Same adit as sample 60; calcite vein, strike N. 85° E., dip 85° N.; calcite and altered, brecciated rock; minor chrysocolla; limonite stains.
CH 64	Chip	4 ft	Do.
Ch 65	Chip	1½ ft	Adit, Silver Prince Mine, at least 380 ft of workings; fracture zone, strike N. 52° W., dip 66° SW.; fine-grained quartzite?, clayey gouge, limonite stains, minor pyrite. (See fig. 18, 19.)
CH 66	Chip	2½ ft	Same adit as sample 65; fault, strike N. 70° E., dip 75° SE.; sample similar to 65.
CH 67	Chip	7 ft	Same adit as sample 65; fault, strike N. 60° E., dip 80° NW.; footwall side; altered quartzite?, clay, disseminated pyrite.
CH 68	Chip	4 ft	Same adit as sample 65; fault, hanging wall side, adjacent to 67; altered limestone, clay.

Appendix A.--Data for samples from the Chiricahua-Pedregosa Mountains Unit, Coronado National Forest, Cochise County, Arizona.--Continued

Sample Number	Type	Length	Remarks
CH 69	Chip	3½ ft	Same adit as sample 65; fault, strike N. 15° W., dip 70° SW.; limonitic, clayey, gouge; altered quartzite?.
CH 70	Select	xx	Dump, same adit as sample 65; epidotized marble, pyrite, galena, sphalerite; fractured, sulfur-stained quartzite; most of dump is barren rock.
CH 71	Chip	2½ ft	Adit, 70 ft long, near Silver Prince Mine; fault, strike N. 30° W., 72° SW.; limestone, clay, limonite stains. (See fig. 18, 19)
CH 72	Select	xx	Dump, medium-size, Silver Prince Mine shaft, measured 50 ft deep; quartzite and limestone; altered rock; skarn, epidote, sparse galena, sphalerite.
CH 73	Chip	17 ft	El Tigre Mine, open cut, adjacent to lower adit; major zone oriented N. 33° W., dip 76° NE.; brecciated, altered limestone; limonitic gossan; quartz. (See fig. 20, 21).
CH 74	Grab	xx	El Tigre Mine, adit above lower adit; sample from backfall in adit; altered limestone, bleached white, clayey gouge, limonite stains.
CH 75	Grab	xx	El Tigre Mine, small dump, uppermost adit/decline; small stockpile of quartz; brecciated, silicified limestone.
CH 76	Chip	5 ft	Open cut; fault at least 5 ft thick, strike N. 45° W., dip 40° SW.; limonitic gouge, altered quartzite, chalcopyrite, bornite, galena, sphalerite. (See plate 1.)
CH 77	Select	xx	Dump, same cut as sample 76; silicified rock; chalcopyrite, galena, sphalerite, minor bornite.
CH 78	Chip	4 ft	Adit, 30 ft of workings; wide area of alteration, intense iron staining; quartzite? country rock. (See plate 1.)
CH 79	Chip	4 ft	Adit, 120 ft of workings; altered, granitic rock; limonitic, gougy, fractured gossan; numerous fractures and faults; minor malachite stains. (See fig. 22, 23.)
CH 80	Chip	2 ft	Do.
CH 81	Chip	3 ft	Do.

Appendix A.--Data for samples from the Chiricahua-Pedregosa Mountains Unit, Coronado National Forest, Cochise County, Arizona.--Continued

Sample Number	Type	Length	Remarks
CH 82	Dump	xx	Small dump, pits, about 50 ft above adit sample 79; iron ochre-gossan rock; country rock granodiorite porphyry.
CH 83	Select	xx	Small dump, shaft, 22 ft deep; granodiorite porphyry; altered, silicified rock; finely disseminated chalcopyrite, sphalerite, malachite stains. (See fig. 22.)
CH 84	Chip	1 ½ ft	Adit, 20 ft long; altered, brecciated, iron-stained limestone; tactite material, garnets, malachite stains. (See fig. 22.)
CH 85	Chip	3 ft	Same adit as sample 84; altered, brecciated limestone, gouge, limonite, minor malachite stains.
CH 86	Select	xx	Dump, prospect pit; altered limestone, intense iron staining; chalcopyrite, chalcocite, bornite, minor malachite stains. (See fig. 22.)
CH 87	Chip	2 ft	Adit, caved at 490 ft; fault, contact between limestone and altered igneous dike, strike N. 67° W., 60° NE.; limonite stains. (See fig. 22, 24.)
CH 88	Chip	2 ½ ft	Same adit as sample 87; intersection of 2 faults; highly altered limestone, abundant disseminated pyrite, limonite stains, gouge, minor chlorite stains.
CH 89	Chip	2 ft	Same adit as sample 87; altered mafic dike, abundant muscovite, disseminated pyrite, limonite, clayey gouge.
CH 90	Chip	3 ½ ft	Same adit as sample 87; oxidized tactite zone, altered limestone, abundant garnets, limonite, pockets of pyrite, minor malachite.
CH 91	Chip	2 ft	Same adit as sample 87; intersection of 2 faults bleached clayey gouge in limestone, disseminated pyrite.
CH 92	Chip	1 ½ ft	Same adit as sample 87; fault, strike N. 80° W., dip 80° N.; altered and oxidized rock, limonite.

Appendix A.--Data for samples from the Chiricahua-Pedregosa Mountains Unit, Coronado National Forest, Cochise County, Arizona.--Continued

Sample Number	Type	Length	Remarks
CH 93	Chip	2 ft	Adit, more than 750 ft of workings, lower level; prominent shear zone strike N. 3° E., dip 63° E.; altered limestone; limonitic, clayey gouge; limestone country rock. (See fig. 22, 25.)
CH 94	Chip	3 ft	Same adit as sample 93; weathered limestone.
CH 95	Chip	5 ft	Same adit as sample 93; altered and iron-stained limestone, sparse malachite.
CH 96	Chip	4 ft	Same adit as sample 93; altered and iron-stained limestone, sparse gouge.
CH 97	Chip	3 ft	Same adit as sample 93; prominent fault plane, strike N. 13° W., vertical dip; altered and iron-stained limestone.
CH 98	Chip	4 ft	Same adit as sample 93; prominent fault plane, strike N. 10° W., vertical dip; altered limestone, limonitic gouge, malachite stains.
CH 99	Chip	4 ft	Same adit as sample 93; prominent shear, strike N. 35° W., dip 55° NE.; altered, recrystallized limestone; iron stains; gouge; sparse malachite.
Ch 100	Chip	3 ft	Same adit as sample 93; edge of stoped area; altered limestone, abundant pyrite and malachite.
CH 101	Chip	7 ft	Same adit as sample 93; altered limestone, limonitic gouge, abundant malachite and pyrite, pyrite veins up to 1½ in. thick.
CH 102	Chip	5 ft	Same adit as sample 93; altered rock, limonitic gouge, abundant pyrite, malachite.
CH 103	Chip	3½ ft	Same adit as sample 93; limonitic gossan rock, abundant pyrite, malachite.
CH 104	Chip	3½ ft	Same adit as sample 93; under stoped area; altered, limonitic rock; malachite; sparse pyrite.
CH 105	Chip	4½ ft	Same adit as sample 93; iron-stained limestone, sparse malachite.

Appendix A.--Data for samples from the Chiricahua-Pedregosa Mountains Unit, Coronado National Forest, Cochise County, Arizona.--Continued

Sample Number	Type	Length	Remarks
CH 106	Chip	3 ft	Same adit as sample 93; under stoped area; altered, iron-stained rock; abundant pyrite; malachite.
CH 107	Chip	3 ft	Same adit as sample 93; under stoped area; gossan, limonitic gouge.
CH 108	Chip	4 ft	Same adit as sample 93; altered, iron-stained rock.
CH 109	Chip	4 ft	Same working as sample 93, upper level adit complex, 850 ft of workings; gossan, limonite, minor malachite.
CH 110	Chip	4 ft	Same adit as sample 109; gossan, limonite, malachite. (See fig. 22, 26.)
CH 111	Chip	3½ ft	Same adit as sample 109; altered, brecciated rock; abundant pyrite; limonitic gouge.
CH 112	Chip	3½ ft	Same adit as sample 109; altered, brecciated rock; abundant iron stains; caliche.
CH 113	Chip	4 ft	Same adit as sample 109; major fault zone, strike N. 30° W., dip 75° NE.; gossan, limonitic gouge, abundant disseminated pyrite.
CH 114	Chip	4 ft	Same adit as sample 109; altered, silicified rock; intense iron staining; gossan.
CH 115	Chip	3½ ft	Same adit as sample 109; altered, silicified rock; prominent limonite stains; minor pyrite; malachite.
CH 116	Chip	3 ft	Same adit as sample 109; major fault zone adjacent to winze connecting lower level, strike N. 47° W., dip 75° NE.; silicified rock, gossan, limonitic gouge, secondary quartz crystals.
CH 117	Chip	3 ft	Same adit as sample 109; iron-stained, altered rock; epidote.
CH 118	Chip	3½ ft	Same adit as sample 109; altered rock, some bleached; limonite; minor malachite.
CH 119	Chip	3 ft	Same adit as sample 109; contact between limonitic gossan and altered, bleached white rock; sparse malachite.

Appendix A.--Data for samples from the Chiricahua-Pedregosa Mountains Unit, Coronado National Forest, Cochise County, Arizona.--Continued

Sample Number	Type	Length	Remarks
CH 120	Chip	3½ ft	Same adit as sample 109; altered limestone; limonitic, clayey gouge.
CH 121	Chip	4 ft	Same adit as sample 109; altered rock, limonite, sparse malachite.
CH 122	Chip	2½ ft	Same adit as sample 109; brecciated, silicified rock; limonitic gouge; secondary quartz crystals.
CH 123	Chip	3 ft	Adit, 85 ft of workings; gossan; highly altered, iron-rich rock; hematite; limonite; gouge; malachite. (See fig. 22, 27.)
CH 124	Chip	4 ft	Same adit as sample 123; sample similar to 123.
CH 125	Chip	3 ft	Same adit as sample 123; shear zone in gossan; some of rock bleached white.
CH 126	Chip	3 ft	Adit, 300 ft of workings; limonitic gossan, near contact with limestone (See fig. 22, 27.)
CH 127	Chip	3 ft	Same adit as sample 126; gossan, limonitic gouge.
CH 128	Chip	3 ft	Same adit as sample 126; limonitic gossan, spongy texture.
CH 129	Chip	3½ ft	Same adit as sample 126: intermixed limonitic gouge and recrystallized limestone.
CH 130	Chip	4 ft	Same adit as sample 126; intermixed limonitic gouge and weathered, marbleized limestone; calcite; hematite.
CH 131	Chip	3 ft	Same adit as sample 126; clayey, limonitic gouge; altered rock; near contact with calcite and marble.
CH 132	Chip	3 ft	Same adit as sample 126; gossan, metallic hematite.
CH 133	Chip	3 ft	Same adit as sample 126; gossan.
CH 134	Chip	5 ft	Outcrop, near caved shaft; altered rock, limonitic gouge, gossan, near contact with igneous rock. See fig. 22.)
CH 135	Select	xx	Large dump, caved shaft; abundant chalcopyrite, magnetite, sphalerite; most rock on dump is altered limestone, some porphyry rock.

Appendix A.--Data for samples from the Chiricahua-Pedregosa Mountains Unit, Coronado National Forest, Cochise County, Arizona.--Continued

Sample Number	Type	Length	Remarks
CH 136	Chip	2½ ft	Pit; altered zone, fractured andesite porphyry, abundant epidote, near contact with limestone. (See fig. 28.)
CH 137	Select	xx	Small dump, shaft, 20 ft deep, decline at bottom; irregular fault, zones of altered limestone and sulfides, sample of altered limestone, abundant epidote, galena, sphalerite, pyrite. (See fig. 28.)
CH 138	Chip	3½ ft	Adit, 8 ft long, adjacent to shaft sample 137; fractured limestone, calcite, pockets of altered rock.
CH 139	Select	xx	Small dump, caved adit; altered and recrystallized limestone; chalcopyrite, galena, sphalerite, minor malachite and azurite, abundant epidote. (See fig. 28.)
CH 140	Chip	4 ft	Adit, 90 ft to unsafe backfall; fault zone, strike N. 47° W., dip 70° NE.; contact between limestone and volcanic rock; altered, weathered rock; gouge (See fig. 28, 29).
Ch 141	Chip	2½	Same adit/fault zone as sample 140; altered, brecciated limestone; abundant quartz fragments; limonitic, clayey gouge.
Ch 142	Chip	2½ ft	Same adit/fault as sample 140; brecciated, altered limestone and volcanic rock; limonitic, clayey gouge.
CH 143	Chip	2½ ft	Do.
CH 144	Select	xx	Large dump, same adit as sample 140; volcanic porphyry rock; pyrite, epidote.
CH 145	Chip	1 ft	Adit, 315 ft of workings; contact between limestone and quartz monzonite strike N. 75° W., dip 60° NE.; clayey gouge, calcite, altered quartz monzonite, limonite stains (see fig. 28, 30).
CH 146	Chip	½ ft	Same adit as sample 145; shear zone, contact between limestone and quartz monzonite, strike N. 40° W., dip 80° NE.; altered limestone, limonite stains, minor pyrite.

Appendix A.--Data for samples from the Chiricahua-Pedregosa Mountains Unit, Coronado National Forest, Cochise County, Arizona.--Continued

Sample Number	Type	Length	Remarks
CH 147	Chip	2½ ft	Same adit as sample 145; fault, footwall, strike N. 15° W., dip 80° NE.; quartz monzonite; minor limonite stains, pyrite, epidote.
CH 148	Chip	1 ft	Same adit as sample 145; shear zone, contact between limestone and quartz monzonite, strike N. 45° W., dip 80° NE.; pyrite; minor limonite.
CH 149	Chip	1½ ft	Same adit as sample 145; tactite zone; altered limestone, garnets, epidote.
CH 150	Select	xx	Same adit as sample 145; small ore stockpile; highly altered rock; abundant garnets, sphalerite, galena, limonite, manganese stains, minor malachite stains.
CH 151	Chip	1½ ft	Adit, 35 ft long; shear zone, contact between limestone and altered dike, strike N. 35° W., dip 24° NE.; clayey gouge, limonite, minor pyrite. (See fig. 28, 30.)
CH 152	Chip	2 ft	Same adit as sample 151; fault zone, strike N. 12° E., vertical dip; highly altered limestone; prominent limonite stains, gouge.
CH 153	Chip	1½ ft	Adit, 300 ft long; fault, strike N. 12° E., dip 75° W.; marble, chlorite, limonite stains. (See fig. 28, 31.)
CH 154	Chip	1½ ft	Same adit as sample 153; fault, strike N. 12° E., dip 75° W.; weathered limestone, minor pyrite.
CH 155	Chip	1 ft	Same adit as sample 153; fault, strike N. 4° E., dip 80° E.; recrystallized limestone, chlorite, epidote, minor pyrite.
CH 156	Chip	1 ft	Same adit as sample 153; minor fault in recrystallized limestone, strike N. 25° E., dip 80° NW.; pyrite, limonite, gouge.
CH 157	Chip	4½ ft	Adit, over 140 ft of workings; intersection of 2 faults, strike N. 65° W., dip 28° and 65° NE.; altered, recrystallized limestone; limonite stains; minor epidote; pyrite. (See fig. 28, 32.)

Appendix A.--Data for samples from the Chiricahua-Pedregosa Mountains Unit, Coronado National Forest, Cochise County, Arizona.--Continued

Sample Number	Type	Length	Remarks
CH 158	Chip	2½ ft	Same adit as sample 157; intersection of 2 faults, 1) strike N. 65° W., dip 30° NE., 2) strike N. 75° E., dip 55° NW.; altered, green limestone; heavy limonite stains; minor gouge.
CH 159	Chip	4½ ft	Adit, at least 110 ft of workings; fault, strike N. 30° E., dip 45° SE.; marble and limestone; gouge, limonite, pyrite, malachite, epidote, manganese stains (See fig. 28, 32.)
CH 160	Select	xx	Dump, medium size, same adit as sample 159; skarn rock; sphalerite, galena, chalcopyrite, malachite, limonite and malachite stains.
CH 161	Chip	5 ft	Decline, about 25 ft long; prominent iron ochre zone in quartzite. (See fig. 33.)
Ch 162	Select	xx	Dump, shaft, 30 ft deep; massive pyrite, hematite ochre; most of dump rock is barren quartzite; near contact with limestone. (See fig. 33.)
CH 163	Chip	1½ ft	Silver Hill Mine, lower adit, at least 700 ft of workings; fault zone, strike N. 30° E., dip 20° NW.; tactite, altered limestone, epidote, galena, garnets, gouge (see fig. 33, 34).
CH 164	Chip	4 ft	Same adit as sample 163; fault, strike N. 55° W., vertical dip; altered limestone, gouge, limonite.
CH 165	Chip	1½ ft	Same adit as sample 163; fault, strike N. 45° W., dip 78° NE.; altered limestone, limonitic gouge.
CH 166	Chip	2 ft	Same adit as sample 163; fault, strike N. 45° W., dip 82° SW.; white gouge, fragments of altered limestone.
CH 167	Chip	5 ft	Same adit as sample 163; fault, strike N. 30° W., dip 51° NE.; altered limestone, clayey gouge.
CH 168	Chip	4½ ft	Same adit as sample 163; fault zone, strike N. 70° W., dip 47° SW.; contact between limestone, and siliceous, igneous porphyry dike; altered, silicified limestone; gouge; limonite stains; disseminated pyrite.

Appendix A.--Data for samples from the Chiricahua-Pedregosa Mountains Unit, Coronado National Forest, Cochise County, Arizona.--Continued

Sample Number	Type	Length	Remarks
CH 169	Chip	3½ ft	Same adit as sample 163; fault, strike N. 38° W., dip 55° SW.; fractured, altered, silicified limestone; abundant limonite stains and disseminated pyrite.
CH 170	Chip	3 ft	Silver Hill Mine, upper adit, at least 220 ft of workings; tactite zone, epidosite. (See fig. 33, 34.)
CH 171	Chip	3 ft	Same adit as sample 170; fault, strike N. 36° W., dip 20° NE.; altered rock, limonitic gouge minor tactite.
CH 172	Chip	3 ft	Same adit as sample 170; fault, strike N. 80° W., dip 32° N.; limonitic gouge, iron ochre material.
CH 173	Chip	2 ft	Same adit as sample 170; fault, strike N. 83° E., dip 36° N., limonitic gouge, iron ochre material.
CH 174	Chip	3 ft	Same adit as sample 170; intersection 2 faults, 1) strike N.-S., dip 40° E., 2) strike N. 33° W., dip 40° NE., limonitic gouge, iron ochre material.
CH 175	Chip	3½ ft	Same adit as sample 170; fault, strike N. 42° E., dip 40° NW., limonitic gouge, altered quartzite, iron ochre material.
CH 176	Grab	xx	Dump, ore bin below Silver Hill Mine; quartzite, minor tactite, epidote, iron oxide rock.
CH 177	Grab	xx	Small dump, decline, at least 40 ft long; above Silver Hill adits; abundant iron ochre/limonitic gossan rock; some epidosite; dump rock both limestone and quartzite. (See fig. 33.)
CH 178	Chip	3 ft	Short adit; highly altered limestone, hematite ochre, limonitic gossan. (See fig. 33.)
CH 179	Select	xx	Dump, same adit as sample 178; altered limestone; highly oxidized, limonitic rock; abundant azurite; malachite.
CH 180	Chip	5½ ft	Pit; altered limestone, hematite ochre zone in limestone. (See fig. 33.)

Appendix A.--Data for samples from the Chiricahua-Pedregosa Mountains Unit, Coronado National Forest, Cochise County, Arizona.--Continued

Sample Number	Type	Length	Remarks
CH 181	Chip	1 ½ ft	Shaft, 42 ft deep; fault zone, strike trends north, vertical dip, altered limestone, clayey gouge, epidote, galena, sphalerite. (See fig. 33.)
CH 182	Chip	2 ft	Pit; altered limestone; limonitic, clayey gouge; galena; hematite ochre; epidote. (See fig. 33.)
CH 183	Dump	xx	Small dump, shaft, 38 ft deep; fault zone strike N. 75° W., vertical dip; altered, limonite-stained limestone; limonitic gouge; hematite ochre. (See fig. 33.)
CH 184	Chip	4 ft	Pit, adjacent to a 15 ft shaft and 15 ft decline; altered, brecciated, limonite-stained limestone; clayey gouge; hematite ochre; epidote. (See fig. 33.)
CH 185	Chip	2 ft	Shaft, 22 ft deep; fault zone, strike N. 15° W., vertical dip; altered limestone, limonitic gouge; near contact with volcanic rock. (See fig. 33.)
CH 186	Select	xx	Small dump, shaft, 20 ft deep; zone of intensely altered limestone, hematite ochre, epidote. (See fig. 33.)
CH 187	Select	xx	Decline, about 35 ft long; altered limestone; oxidized, iron-stained rock. (See fig. 33.)
CH 188	Select	xx	Small dump, decline, at least 50 ft of workings; most rock barren limestone; minor altered and iron-stained rock. (See fig. 33.)
CH 189	Chip	3 ft	Open cut, adjacent to decline sample 188; irregular limestone replacement zones, altered limestone, limonitic gossan, minor malachite. (See fig. 33.)
CH 190	Select	xx	Trench, adjacent to sample 189; limonitic gossan, altered limestone, jasperoid, minor malachite.
CH 191	Select	xx	Small dump, shaft, 26 ft deep; altered limestone, abundant epidote, disseminated pyrite, hematite, minor malachite, galena. (See fig. 33, 35.)
CH 192	Select	xx	Small dump, shaft, 35 ft deep; altered limestone, abundant pyrite, epidote, hematite, limonite, galena, sphalerite, malachite. (See fig. 33, 35.)

Appendix A.--Data for samples from the Chiricahua-Pedregosa Mountains Unit, Coronado National Forest, Cochise County, Arizona.--Continued

Sample Number	Type	Length	Remarks
CH 193	Chip	3 ft	Short decline; fault zone, strike N. 50° E., 80° NW.; limonitic, clayey gouge; altered limestone; epidote. (See fig. 33, 35.)
Ch 194	Chip	2 ft	Pit; same fault and similar rock as sample 193, fault strike N. 40° E., dip 70° NW. (See fig. 33, 35.)
CH 195	Chip	1 ½ ft	Short decline; altered limestone in volcanic porphyry rock; pyrite, chalcopyrite, malachite, galena, sphalerite. (See fig. 36.)
CH 196	Chip	4 ft	Short decline; zone of altered igneous porphyry rock; bleached; limonite stained. (See fig. 36.)
CH 197	Chip	4 ft	Decline, 25 ft; massive, fractured limestone; minor sulfides. (See fig. 36.)
CH 198	Select	xx	Small dump, below declines, samples 196, 197; altered limestone, pyrite, chalcopyrite, galena, sphalerite, malachite, minor azurite. (See fig. 36.)
CH 199	Chip	3 ft	Short adit, open cut; highly altered, brecciated limestone; oxidized rock; hematite; manganese stains. See fig. 36.)
CH 200	Chip	4 ft	Do.
CH 201	Grab	xx	Medium dump, shaft, measured 61 ft deep; limestone and igneous porphyry rock; sample of igneous rock, disseminated pyrite. (See fig. 36.)
CH 202	Select	xx	Small dump, 15 ft decline; zone of silicified limestone; chalcocite, azurite, malachite, tetrahedrite, sphalerite, galena. (See fig. 36.)
CH 203	Chip	8 in.	Moderate-size dump, shaft; calcite vein, pinches and swells, abundant disseminated galena; pyrite, malachite; minor azurite, chrysocolla; country rock massive, gray limestone. (See fig. 36.)
CH 204	Select	xx	Same dump as sample 203; calcite vein material; abundant disseminated galena; malachite, pyrite. (See fig. 36.)

Appendix A.--Data for samples from the Chiricahua-Pedregosa Mountains Unit, Coronado National Forest, Cochise County, Arizona.--Continued

Sample Number	Type	Length	Remarks
CH 205	Chip	7 in.	Trench, 20 ft deep; calcite vein, strike N. 40° W., vertical dip. (See fig. 36.)
CH 206	Chip	4 ft	Decline, 30 ft long; major shear at portal up to 8 ft thick, strike N. 42° W., dip 56° NE.; malachite, minor azurite and chrysocolla. (See fig. 36.)
CH 207	Select	xx	Shaft, 42 ft deep; major shear zone about 5 ft thick, strike N. 20° W., vertical dip; altered limestone, gouge, malachite, minor azurite and chrysocolla. (See fig. 36.)
CH 208	Select	xx	Stockpile, shaft, approximately 50 ft deep; brecciated, altered limestone; iron stained; abundant galena and sphalerite; some pyrite, stringers up to 1/8 in. thick; minor malachite. (See fig. 37.)
CH 209	Chip	Random	Adit, at least 100 ft long, unsafe rock conditions; flat lying contact between competent limestone and fractured, altered, iron-stained rock. (See fig. 37.)
CH 210	Chip	6 ft	Pit; limestone, silicified limestone, minor pyrite. (See fig. 37.)
CH 211	Chip	4½ ft	Trench; altered limestone; shear zone 6 in. thick, strike N. 23° E., dip 67° NW.; clayey gouge. (See fig. 37.)
CH 212	Grab	xx	Small dump, shaft; limestone and marble, close to contact with volcanic rock; very fine disseminated pyrite. (See fig. 37.)
CH 213	Grab	xx	Small dump, shaft, about 30 ft deep; Limestone, recrystallized and marbleized; abundant very fine disseminated pyrite, thin stringers of pyrite; close to contact with volcanic rock. (See fig. 37.)
CH 214	Grab	xx	Small dump, pit; dug on a dike, strike N. 50° E., vertical dip; highly altered and weathered; material sampled similar to 213. (See fig. 37.)
CH 215	Grab	xx	Small dump, shaft, about 35 ft deep; sample similar to 213. (See fig. 37.)

APPENDIX B

INDUCTIVELY COUPLED PLASMA-ATOMIC EMISSION SPECTROSCOPY MULTI-ELEMENT ANALYTICAL DATA FOR SAMPLES ANALYZED BY CHEMEX LABS, INC.

Appendix B.--Inductively coupled plasma-atomic emission spectroscopy multi-element analytical data for samples analyzed by Chemex Labs, Inc.

[<, less than lower detection limit (some elements have elevated lower detection limits due to interference from other elements); >, greater than; o/t, results, in ounces per ton, of overlimits rerun by fire assay; *, results of overlimits in %, rerun by AAS.]

Sample No.	Ag (Ppm)	Al (Pct)	As (Ppm)	Ba (Ppm)	Be (Ppm)	Bi (Ppm)	Ca (Pct)	Cd (Ppm)	Co (Ppm)	Cr (Ppm)	Cu (Ppm)	Fe (Pct)	Ga (Ppm)	Hg (Ppm)	K (Pct)	La (Ppm)	Mg (Pct)	Mn (Ppm)	Mo (Ppm)	Na (Pct)	Ni (Ppm)	P (Ppm)	Pb (Ppm)	Sb (Ppm)	Sc (Ppm)	Sr (Ppm)	Ti (Pct)	Tl (Ppm)	U (Ppm)	V (Ppm)	W (Ppm)	Zn (Ppm)
CH001	< 0.2	0.15	25	70	< 0.5	26	0.20	0.5	5	125	46	>15.00	< 10	< 1	0.41	< 10	0.04	85	6	0.02	9	100	76	5	1	33	0.02	< 10	< 10	43	< 50	96
CH002	< 0.2	2.22	10	110	< 0.5	52	4.99	1.0	12	82	478	11.56	40	< 1	0.60	20	0.92	470	2	0.04	35	800	46	5	5	96	0.15	< 10	< 10	142	< 10	68
CH003	0.2	2.22	< 5	110	< 0.5	52	4.92	1.0	13	88	460	11.16	40	< 1	0.59	20	0.90	465	1	0.04	17	850	26	10	5	97	0.15	< 10	< 10	137	< 10	66
CH004	< 0.2	0.21	< 5	30	< 0.5	122	0.10	0.5	10	178	43	14.98	10	< 1	0.29	< 10	0.02	80	5	0.06	8	150	8	5	1	63	0.02	< 10	< 10	49	< 10	16
CH005	26.8	3.76	< 5	70	0.5	132	>15.00	11.0	12	57	108	1.54	< 10	10	0.08	50	7.50	385	< 1	0.01	20	230	1864	10	6	606	< 0.01	< 10	< 10	53	50	2870
CH006	28.2	4.44	25	90	0.5	124	>15.00	8.5	8	68	145	1.75	< 10	32	0.19	40	8.16	515	10	0.01	35	250	2390	10	6	646	0.01	< 10	< 10	74	30	2090
CH007	5.6	1.90	20	30	< 0.5	18	>15.00	34.5	3	71	45	0.76	< 10	2	0.02	40	4.73	2440	5	0.02	4	2740	6430	5	2	114	0.06	< 10	< 10	43	30	7474
CH008	66.8	2.54	80	< 10	< 0.5	52	2.69	>100.0	7	132	3782	2.78	< 10	< 1	0.13	10	0.47	815	26	0.01	12	210	* 12.80%	5	2	549	0.02	< 10	< 10	29	160	* 7.81%
CH009	34.6 o/t	0.69	30	< 10	< 0.5	48	0.47	>100.0	< 1	123	1458	2.05	< 10	< 1	0.05	< 10	0.27	270	4	0.01	1	50	* 12.70%	65	< 1	49	< 0.01	< 10	< 10	8	40	> 10000
CH010	67.2	0.77	40	< 10	< 0.5	84	1.35	68.0	10	144	8475	8.67	< 10	< 1	0.01	< 10	0.41	605	18	<0.01	10	< 10	* 5.00%	5	1	85	< 0.01	< 10	< 10	10	550	* 1.72%
CH011	< 0.2	1.37	< 5	20	1.0	< 2	>15.00	1.5	2	78	111	1.32	50	7	0.10	40	1.40	1375	1	0.03	12	340	682	10	5	83	0.20	< 10	< 10	44	< 10	878
CH012	0.8	2.18	15	20	1.5	< 2	1.02	< 0.5	< 1	62	33	0.39	10	4	0.41	< 10	0.45	235	< 1	0.01	1	80	266	5	1	23	0.01	< 10	< 10	4	< 10	146
CH013	0.8	2.21	10	30	0.5	< 2	1.00	< 0.5	< 1	83	66	0.45	10	< 1	0.62	10	0.36	170	3	0.02	5	120	448	5	1	14	0.01	< 10	20	8	< 10	312
CH014	< 0.2	3.07	40	30	2.0	< 2	14.55	1.5	4	63	114	2.11	60	3	0.14	40	2.07	2830	8	0.03	15	170	2754	5	4	442	0.16	< 10	< 10	63	< 10	1150
CH015	7.2	2.70	15	20	1.5	14	11.56	9.0	8	140	113	1.83	50	6	0.15	30	3.28	790	83	0.01	21	310	2410	10	5	90	0.23	< 10	< 10	57	< 10	1826
CH016	11.6	2.14	40	10	1.0	16	>15.00	6.0	< 1	39	252	1.03	90	< 1	0.01	50	4.16	1920	43	0.02	6	470	2346	10	2	264	0.05	< 10	< 10	70	10	1206
CH017	4.8	2.34	15	40	1.0	10	>15.00	2.5	< 1	85	101	0.60	60	< 1	0.72	40	1.52	845	6	0.02	6	60	876	5	1	107	< 0.01	< 10	< 10	14	10	652
CH018	1.2	4.10	20	70	1.5	< 2	5.31	1.0	6	121	42	1.80	30	< 1	0.52	30	2.81	785	11	0.02	25	340	288	10	7	147	0.22	< 10	< 10	61	< 10	296
CH019	0.8	3.29	10	60	1.0	< 2	5.05	1.5	10	110	39	1.96	30	11	0.34	20	2.74	1000	2	0.02	22	370	174	5	7	45	0.25	< 10	< 10	58	< 10	422
CH020	0.2	5.86	20	20	2.0	< 2	6.70	86.0	16	147	354	2.39	40	< 1	0.39	30	2.40	3545	8	0.01	39	1150	2466	5	12	187	0.09	< 10	< 10	92	< 10	4142
CH021	0.2	2.99	< 5	50	1.5	< 2	9.59	9.5	6	100	67	1.80	30	1	0.09	30	2.25	2650	3	0.01	16	450	360	5	5	175	0.18	< 10	< 10	53	< 10	988
CH022	1.6	7.00	40	50	1.5	< 2	1.88	7.0	33	126	216	3.59	20	< 1	0.98	20	2.00	1180	7	0.02	67	2440	1586	5	15	39	0.08	< 10	< 10	134	< 10	3850
CH023	35.8	2.62	95	10	< 0.5	40	2.75	>100.0	10	82	* 1.38%	6.32	30	< 1	0.02	10	0.38	775	2212	0.01	16	200	* 10.50%	5	5	504	0.24	< 10	< 10	70	100	* 9.01%
CH024	10.20 o/t	3.18	50	30	< 0.5	774	2.92	>100.0	17	109	1652	3.86	40	< 1	0.05	20	0.47	985	5878	0.01	< 1	180	* 16.70%	5	3	508	0.13	< 10	< 10	36	100	* 3.41%
CH025	1.0	1.98	30	30	1.5	< 2	>15.00	38.0	7	145	236	1.50	70	2	0.26	60	0.65	3940	8	0.02	22	3000	4380	20	3	108	0.01	< 10	< 10	46	20	1368
CH026	2.4	1.27	30	30	0.5	< 2	>15.00	41.0	< 1	108	129	0.63	80	< 1	0.10	50	3.00	5260	10	0.03	11	4800	4776	5	2	179	0.03	< 10	< 10	60	20	3716
CH027	23.4	2.34	20	10	2.0	6	>15.00	40.0	2	125	126	1.61	70	2	0.03	40	0.50	2840	2	0.02	8	560	* 1.73%	5	3	140	0.14	< 10	< 10	33	20	5554
CH028	28.0	2.60	10	10	< 0.5	< 2	2.92	>100.0	< 1	120	629	3.52	20	< 1	0.12	10	0.53	2300	104	0.04	8	740	* 7.04%	5	3	365	0.21	< 10	< 10	33	80	* 3.70%
CH029	6.30 o/t	1.97	40	< 10	< 0.5	1062	6.94	>100.0	16	131	9517	14.17	< 10	< 1	0.01	20	0.20	4570	12	0.01	13	390	* 8.90%	5	3	147	0.09	< 10	< 10	23	230	* 9.02%
CH030	17.2	2.85	25	10	11.5	2	>15.00	35.5	6	98	649	1.50	60	< 1	0.58	40	1.00	6380	25	0.03	14	630	* 1.13%	5	2	131	< 0.01	< 10	10	25	10	4524
CH031	12.20 o/t	1.17	105	10	< 0.5	86	2.06	35.5	10	68	8168	>15.00	10	< 1	0.19	10	0.14	200	17	0.01	14	2320	* 35.60%	235	1	207	< 0.01	< 10	< 10	11	50	6308
CH032	15.00 o/t	0.39	160	40	< 0.5	8	0.15	< 0.5	< 1	186	2393	7.21	10	< 1	0.07	< 10	0.02	< 5	265	<0.01	9	280	* 19.50%	175	< 1	64	< 0.01	< 10	< 10	6	40	1148
CH033	53.4	1.38	< 5	< 10	< 0.5	< 20	10.07	>100.0	63	106	* 11.60%	9.72	70	< 1	< 0.01	30	0.11	5745	35	0.01	38	400	* 5.60%	5	5	108	0.12	< 10	< 10	36	200	* 2.23%
CH034	2.4	1.83	< 5	20	0.5	6	>15.00	14.5	3	84	844	1.22	90	5	0.10	40	1.00	720	4	0.04	48	890	848	5	4	139	0.11	< 10	< 10	32	10	4444
CH035	0.2	3.12	15	40	0.5	< 2	3.60	1.0	5	136	225	1.20	50	< 1	0.29	40	0.66	325	2	0.04	53	830	122	5	5	82	0.18	< 10	20	38	< 10	1272
CH036	9.6	6.00	55	< 10	1.0	74	14.84	7.0	15	261	629	2.95	100	< 1	0.35	50	1.21	3755	< 1	0.02	52	< 10	1792	5	13	300	0.46	< 10	10	56	10	1804
CH037	4.8	4.23	15	50	1.5	54	3.12	1.0	11	238	887	4.06	80	< 1	0.72	250	1.10	1090	26	0.07	81	1100	578	5	11	291	0.42	< 10	< 10	90	< 10	412
CH038	3.0	5.42	60	< 10	3.0	< 2	>15.00	1.0	11	276	1103	1.74	90	< 1	< 0.01	50	0.39	5255	33	0.03	44	190	1050	5	11	98	0.36	< 10	20	133	10	570
CH039	80.4	4.36	150	20	1.0	52	>15.00	13.5	8	129	6953	3.15	100	< 1	0.02	60	1.98	1905	6	0.02	24	60	476	10	7	93	0.21	< 10	10	85	< 10	3026
CH040	14.2	4.78	< 5	10	< 0.5	< 20	4.90	< 0.5	22	33	* 1.63%	3.93	60	< 1	0.08	30	0.69	315	17	0.62	35	1000	56	10	3	337	0.36	< 10	< 10	67	< 10	192

Appendix B.--Inductively coupled plasma-atomic emission spectroscopy multi-element analytical data for samples analyzed by chemex Labs, Inc.--Continued.

Sample No.	Ag (Ppm)	Al (Pct)	As (Ppm)	Ba (Ppm)	Be (Ppm)	Bi (Ppm)	Ca (Pct)	Cd (Ppm)	Co (Ppm)	Cr (Ppm)	Cu (Ppm)	Fe (Pct)	Ga (Ppm)	Hg (Ppm)	K (Pct)	La (Ppm)	Mg (Pct)	Mn (Ppm)	Mo (Ppm)	Na (Pct)	Ni (Ppm)	P (Ppm)	Pb (Ppm)	Sb (Ppm)	Sc (Ppm)	Sr (Ppm)	Ti (Pct)	Tl (Ppm)	U (Ppm)	V (Ppm)	W (Ppm)	Zn (Ppm)
CH041	8.04 o/t	0.68	10	< 10	< 0.5	842	>15.00	>100.0	121	68	1065	1.41	70	1	< 0.01	40	1.54	5300	2	0.02	14	1760	* 8.25%	5	1	57	0.04	< 10	10	26	100	* 4.61%
CH042	41.4	0.77	10	< 10	< 0.5	80	>15.00	91.0	65	50	762	1.92	70	< 1	< 0.01	40	0.94	7355	10	0.02	7	720	* 1.79%	5	1	122	0.04	< 10	20	20	40	* 1.87%
CH043	7.4	2.59	< 5	< 10	1.0	24	14.15	5.5	3	88	205	1.25	60	< 1	0.07	40	0.55	1850	60	0.11	18	130	484	5	5	155	0.16	< 10	20	35	< 10	958
CH044	5.6	1.41	< 5	10	0.5	38	>15.00	5.5	7	63	108	0.90	80	< 1	0.03	50	1.56	575	30	0.03	16	460	1518	5	2	193	0.08	< 10	< 10	25	< 10	1040
CH045	9.26 o/t	0.97	45	20	< 0.5	3800	>15.00	27.0	39	46	* 3.67%	5.54	80	5	0.01	30	0.19	1380	1	0.01	11	< 200	* 3.83%	5	3	24	0.04	< 10	< 10	36	< 50	> 10000
CH046	14.20 o/t	2.54	< 5	< 10	0.5	1680	9.45	>100.0	289	122	7975	3.29	50	5	0.24	30	1.47	1560	3	0.11	153	680	* 7.56%	5	4	114	0.16	< 10	10	30	460	* 10.30%
CH047	3.2	5.23	60	70	0.5	10	>15.00	< 0.5	21	77	389	3.87	90	4	0.18	40	1.74	765	12	0.40	42	1130	182	5	6	294	0.64	< 10	10	116	10	366
CH048	23.6	4.14	90	30	0.5	90	7.21	< 0.5	25	65	447	5.55	70	< 1	0.04	50	1.28	1125	22	0.12	7	4240	1284	15	7	341	1.00	< 10	< 10	150	< 10	1174
CH049	19.4	6.37	165	70	1.0	70	10.92	< 0.5	24	81	6136	2.87	70	< 1	0.45	40	1.60	2405	18	0.15	34	1320	1310	10	5	194	0.66	< 10	20	104	< 10	540
CH050	0.6	2.87	60	< 10	< 0.5	< 2	>15.00	< 0.5	21	81	92	8.03	90	< 1	0.04	40	1.86	3925	23	0.01	10	160	48	15	6	200	0.13	< 10	10	63	20	124
CH051	< 0.2	3.05	< 5	30	0.5	18	11.83	< 0.5	7	39	23	1.13	70	< 1	0.08	30	0.25	210	2	0.07	14	210	26	15	2	298	0.22	< 10	10	27	< 10	78
CH052	< 0.2	3.86	25	50	1.0	< 2	10.69	3.0	5	40	148	1.40	60	7	0.04	30	0.53	2720	10	0.04	11	240	1514	40	5	434	0.25	< 10	< 10	47	10	508
CH053	14.6	2.40	30	< 10	1.0	16	11.19	40.0	24	52	4970	2.19	60	1	0.04	40	1.04	3055	4	0.03	13	60	* 4.51%	25	3	39	0.14	< 10	20	32	10	8874
CH054	< 0.2	2.61	10	10	0.5	< 2	15.00	1.0	3	32	115	1.13	70	4	0.02	40	0.98	1125	1	0.03	12	240	842	25	4	204	0.17	< 10	10	28	< 10	518
CH055	10.2	1.99	< 5	< 10	0.5	10	7.14	31.5	17	66	1599	1.63	50	< 1	0.03	20	1.29	1945	39	0.03	6	420	7390	5	2	127	0.17	< 10	< 10	34	10	5906
CH056	0.6	0.16	< 5	30	< 0.5	10	>15.00	0.5	< 1	13	28	0.32	90	< 1	0.07	30	2.26	1325	3	0.02	6	360	190	15	< 1	158	< 0.01	< 10	< 10	9	10	158
CH057	< 0.2	4.11	< 5	70	0.5	< 2	8.30	1.0	19	133	86	3.79	70	< 1	0.94	20	2.48	390	4	0.19	66	1010	68	5	7	175	0.54	< 10	< 10	148	< 10	302
CH058	< 0.2	2.71	< 5	< 10	< 0.5	< 2	6.09	< 0.5	3	14	31	1.03	50	22	0.10	30	0.49	50	9	0.07	19	130	22	5	1	187	0.17	< 10	< 10	20	< 10	32
CH059	< 0.2	2.69	< 5	30	< 0.5	4	9.64	2.0	10	38	34	3.97	< 10	< 1	0.13	30	0.66	370	2	0.36	17	1100	402	5	5	210	0.43	< 10	< 10	68	< 10	388
CH060	1.8	3.53	< 5	10	< 0.5	8	7.57	>100.0	9	131	122	1.66	< 10	< 1	0.01	30	0.29	2235	13	0.02	8	640	* 2.65%	5	2	501	0.25	< 10	< 10	33	50	* 2.36%
CH061	14.6	0.64	45	< 10	< 0.5	< 2	2.56	>100.0	8	84	990	2.18	10	2	< 0.01	10	0.24	2315	23	0.01	12	530	* 9.68%	5	1	218	0.10	< 10	< 10	15	140	* 3.40%
CH062	1.2	3.08	30	10	< 0.5	< 2	>15.00	19.5	1	43	96	1.20	70	2	0.04	40	0.67	775	2	0.03	9	630	2826	15	3	398	0.16	< 10	< 10	37	10	2472
CH063	0.8	3.65	40	10	2.5	< 2	>15.00	3.0	3	120	78	1.52	< 10	1	0.65	50	1.63	1225	5	0.02	14	620	1230	5	5	325	0.17	< 10	< 10	47	< 10	620
CH064	0.8	3.66	< 5	30	1.0	12	>15.00	2.0	4	75	35	0.97	< 10	< 1	0.20	40	0.91	945	1	0.02	8	510	424	5	2	227	0.18	< 10	< 10	28	< 10	320
CH065	2.4	1.81	555	60	0.5	< 2	1.12	9.5	< 1	141	141	1.60	< 10	10	0.63	20	0.18	90	3	0.02	12	520	2716	5	2	35	< 0.01	< 10	< 10	22	< 10	1672
CH066	4.4	1.33	955	210	< 0.5	< 2	2.91	3.0	4	134	60	2.70	< 10	< 1	0.53	20	0.10	180	7	0.03	8	440	3172	10	2	57	< 0.01	< 10	< 10	18	< 10	874
CH067	< 0.2	2.25	45	140	< 0.5	22	0.91	< 0.5	2	122	21	2.07	< 10	< 1	0.76	30	0.91	195	2	0.03	10	480	128	5	4	62	< 0.01	< 10	< 10	61	< 10	144
CH068	0.2	3.41	15	100	1.5	4	> 15.00	< 0.5	7	56	21	2.29	< 10	< 1	0.95	50	1.89	1260	3	0.03	43	770	72	5	5	236	< 0.01	< 10	< 10	40	< 10	130
CH069	< 0.2	2.75	60	110	0.5	2	0.98	< 0.5	2	100	25	2.44	< 10	6	0.80	20	1.30	245	15	0.02	8	1140	220	5	4	41	< 0.01	< 10	< 10	67	< 10	152
CH070	7.0	2.35	35	30	< 0.5	< 2	3.02	>100.0	56	146	142	2.28	< 10	< 1	0.09	10	1.01	805	3	0.04	25	300	* 2.18%	5	2	279	0.08	< 10	< 10	26	70	* 3.48%
CH071	< 0.2	4.01	15	70	1.5	14	9.13	6.0	2	75	22	2.14	< 10	< 1	0.90	40	1.61	400	2	0.05	18	510	590	5	6	127	0.24	< 10	< 10	41	< 10	1090
CH072	56.8	4.13	20	40	0.5	136	6.34	96.0	14	108	53	1.94	40	< 1	0.01	20	1.01	1560	7	0.01	4	680	* 4.57%	5	2	531	0.18	< 10	< 10	24	30	> 10000
CH073	5.09 o/t	1.01	10	60	2.0	2	0.41	2.5	2	148	539	1.71	10	6	0.15	10	0.41	915	5	0.02	19	320	398	5	2	16	0.01	< 10	20	28	< 10	530
CH074	23.4	2.14	50	40	2.0	< 2	0.65	2.0	15	79	192	3.55	20	< 1	0.30	20	1.11	755	59	0.02	39	980	194	5	3	11	< 0.01	< 10	< 10	48	< 10	378
CH075	6.00 o/t	0.27	5	20	0.5	18	0.07	< 0.5	2	151	107	0.79	< 10	1	0.03	< 10	0.08	105	7	< 0.01	13	130	76	5	< 1	6	< 0.01	< 10	20	8	< 10	100
CH076	32.8	3.21	< 5	10	1.0	40	8.16	46.0	84	139	* 2.20%	5.29	60	< 1	< 0.01	20	1.00	1370	7	0.02	41	1000	* 1.34%	5	7	117	0.25	< 10	< 10	72	< 50	> 10000
CH077	25.2	1.39	< 5	< 10	< 0.5	40	5.06	>100.0	67	154	> 10000	3.37	30	< 1	< 0.01	10	0.97	680	6	0.02	42	800	* 1.86%	5	4	33	0.18	< 10	10	36	< 50	> 10000
CH078	0.4	2.70	50	20	22.0	14	7.11	14.5	48	101	308	13.81	< 10	1	0.03	130	0.36	1370	15	0.04	52	3830	190	5	3	39	0.14	< 10	30	27	< 10	2032
CH079	0.6	2.10	120	10	2.5	24	0.17	5.0	13	90	9911	>15.00	10	3	0.05	< 10	0.20	165	71	0.05	4	130	38	15	4	9	0.01	< 10	< 10	85	< 50	1434
CH080	13.2	3.35	55	30	3.0	40	0.81	16.0	165	87	* 1.89%	>15.00	20	< 1	0.08	20	2.91	2985	6	0.10	15	< 200	14	5	5	12	0.04	< 10	10	90	< 50	> 10000
CH081	2.6	2.75	20	90	2.5	32	0.57	5.5	17	57	2869	>15.00	< 10	< 1	0.37	10	0.92	305	16	0.05	12	340	164	10	6	47	0.16	< 10	< 10	63	< 50	1654
CH082	5.4	0.90	80	10	2.5	48	1.84	12.0	17	73	2480	>15.00	< 10	< 1	0.03	10	0.84	1650	35	0.02	6	50	86	5	3	9	0.01	10	< 10	23	< 50	3350
CH083	18.2	0.26	< 5	< 10	2.0	100	0.12	< 0.5	33	201	* 3.69%	>15.00	< 10	< 1	< 0.01	< 10	0.16	315	15	0.02	1	< 200	34	5	2	1	< 0.01	< 10	< 10	89	< 50	830

Appendix B.--Inductively coupled plasma-atomic emission spectroscopy multi-element analytical data for samples analyzed by chemex Labs, Inc.--Continued.

Sample No.	Ag (Ppm)	Al (Pct)	As (Ppm)	Ba (Ppm)	Be (Ppm)	Bi (Ppm)	Ca (Pct)	Cd (Ppm)	Co (Ppm)	Cr (Ppm)	Cu (Ppm)	Fe (Pct)	Ga (Ppm)	Hg (Ppm)	K (Pct)	La (Ppm)	Mg (Pct)	Mn (Ppm)	Mo (Ppm)	Na (Pct)	Ni (Ppm)	P (Ppm)	Pb (Ppm)	Sb (Ppm)	Sc (Ppm)	Sr (Ppm)	Ti (Pct)	Tl (Ppm)	U (Ppm)	V (Ppm)	W (Ppm)	Zn (Ppm)
CH084	63.2	0.46	40	10	3.0	140	11.55	< 0.5	24	110	* 4.75%	>15.00	< 10	< 1	< 0.01	10	0.92	2290	11	0.03	3	< 200	142	5	3	40	0.05	10	10	23	< 50	1958
CH085	3.4	0.70	60	60	2.5	66	3.57	1.0	45	69	7039	>15.00	< 10	< 1	0.01	10	1.60	2205	57	0.06	16	< 10	34	10	2	24	0.02	< 10	< 10	3	< 50	786
CH086	6.71 o/t	0.38	50	10	1.5	< 20	0.18	< 0.5	39	173	* 13.70%	>15.00	< 10	< 1	< 0.01	< 10	0.36	400	61	0.02	4	1000	26	5	3	5	< 0.01	10	< 10	< 1	300	538
CH087	0.8	3.59	< 5	30	1.0	< 2	4.86	1.0	5	79	42	1.25	10	< 1	0.29	30	1.57	420	3	0.07	8	650	8	5	5	85	0.17	< 10	< 10	56	< 10	238
CH088	0.6	6.34	45	160	1.0	2	9.30	< 0.5	27	198	92	4.00	< 10	< 1	0.26	20	2.97	510	< 1	0.10	112	1550	< 2	5	12	404	0.78	< 10	< 10	130	< 10	32
CH089	1.0	4.70	65	30	2.0	16	>15.00	< 0.5	95	126	607	4.95	< 10	< 1	0.06	20	6.27	1405	< 1	0.03	56	450	90	5	12	120	0.38	< 10	< 10	88	< 10	350
CH090	< 0.2	1.33	55	10	2.0	34	>15.00	0.5	9	60	81	>15.00	< 10	< 1	< 0.01	20	0.44	1805	< 1	0.03	5	< 10	14	15	1	9	< 0.01	< 10	< 10	11	< 50	118
CH091	0.6	5.07	15	40	2.0	16	>15.00	1.5	16	92	214	2.75	< 10	< 1	0.29	30	2.87	2110	< 1	0.04	30	170	30	10	8	141	0.24	< 10	10	62	< 10	270
CH092	7.0	1.70	50	< 10	2.5	48	14.07	1.0	38	67	2754	>15.00	< 10	2	< 0.01	20	0.83	2990	27	0.03	8	10	70	15	3	54	0.06	< 10	< 10	35	< 50	242
CH093	< 0.2	2.18	< 5	10	< 0.5	< 2	5.25	< 0.5	101	37	465	14.12	10	< 1	0.02	10	1.30	1220	80	0.08	4	90	30	5	4	47	0.18	< 10	< 10	26	40	330
CH094	< 0.2	0.79	5	20	< 0.5	26	1.03	< 0.5	15	21	104	1.69	< 10	2	0.23	10	0.71	185	3	0.11	6	930	36	5	2	33	0.18	< 10	< 10	52	< 10	138
CH095	< 0.2	2.27	< 5	< 10	< 0.5	< 2	3.71	9.0	34	51	789	>15.00	20	< 1	0.04	20	1.40	2785	15	0.04	23	110	68	5	5	21	0.08	< 10	< 10	22	< 50	7656
CH096	< 0.2	3.20	< 5	< 10	< 0.5	10	1.82	77.5	22	22	426	9.74	10	< 1	0.11	20	2.06	2040	2	0.02	35	550	102	5	5	83	0.08	< 10	< 10	45	20	> 10000
CH097	< 0.2	3.24	< 5	< 10	< 0.5	8	2.80	49.0	57	23	4657	7.45	10	< 1	0.07	20	2.19	3515	8	0.02	29	500	30	5	6	68	0.11	< 10	< 10	49	10	7102
CH098	< 0.2	3.36	< 5	< 10	< 0.5	2	1.32	16.0	30	14	4000	4.81	10	< 1	0.09	20	2.11	2050	< 1	0.02	18	720	46	5	5	49	0.05	< 10	< 10	62	< 10	3948
CH099	0.2	2.73	30	< 10	< 0.5	< 2	6.24	19.0	25	20	582	3.62	< 10	< 1	0.02	30	3.14	1225	5	0.02	22	990	34	5	5	32	0.23	< 10	< 10	44	20	4216
CH100	2.6	0.90	< 5	< 10	< 0.5	< 20	1.82	>100.0	55	20	* 1.15%	9.55	10	3	0.01	20	1.36	2855	< 1	0.03	37	400	26	5	3	23	0.06	< 10	< 10	15	200	6532
CH101	1.4	0.82	35	< 10	< 0.5	< 2	1.58	>100.0	19	29	8233	11.77	10	< 1	0.10	10	1.18	560	6	0.03	23	90	18	5	2	14	0.03	< 10	< 10	14	800	9936
CH102	0.8	0.73	45	< 10	< 0.5	14	3.69	6.5	58	20	3230	8.55	20	< 1	< 0.01	10	0.75	780	< 1	0.04	23	1280	20	10	< 1	10	< 0.01	< 10	< 10	8	30	944
CH103	< 0.2	1.50	< 5	< 10	< 0.5	< 2	1.32	>100.0	44	38	1829	13.35	10	< 1	0.02	10	2.11	3525	16	0.02	40	220	26	5	2	16	0.05	< 10	< 10	20	130	* 2.42%
CH104	1.8	0.46	< 5	< 10	< 0.5	< 20	4.41	23.5	22	34	* 1.13%	>15.00	30	3	< 0.01	20	0.39	1925	20	0.02	1	< 200	86	5	2	4	0.02	< 10	< 10	15	300	* 0.46%
CH105	0.4	0.53	30	< 10	< 0.5	10	2.27	68.0	81	< 1	4111	6.43	10	4	0.01	10	1.16	3295	9	0.02	20	< 10	32	5	< 1	15	< 0.01	< 10	< 10	4	10	9586
CH106	0.2	2.12	< 5	20	< 0.5	4	0.41	>100.0	22	10	2761	6.36	10	< 1	0.23	10	1.70	1145	5	0.04	3	680	34	5	3	14	0.02	< 10	< 10	60	130	> 10000
CH107	< 0.2	0.85	5	< 10	< 0.5	94	2.35	>100.0	56	16	4570	>15.00	20	< 1	0.01	10	0.77	3035	15	0.02	17	80	72	5	2	10	0.01	< 10	< 10	16	250	* 11.40%
CH108	0.4	1.43	30	< 10	< 0.5	< 2	4.78	16.5	11	45	1841	7.85	30	2	0.08	20	1.44	1450	4	0.03	11	480	28	5	3	25	0.03	< 10	< 10	45	100	4190
CH109	9.6	0.59	80	30	< 0.5	120	1.74	>100.0	154	16	* 2.62%	>15.00	20	< 1	0.01	10	0.40	8210	26	0.02	36	< 200	3932	5	2	34	< 0.01	< 10	60	29	350	* 5.35%
CH110	16.8	0.34	45	20	< 0.5	98	7.16	>100.0	36	22	8642	>15.00	50	< 1	0.01	20	0.34	5550	30	0.04	17	120	848	5	2	26	< 0.01	< 10	< 10	30	600	* 5.27%
CH111	33.8	0.28	< 5	< 10	< 0.5	800	6.05	10.5	48	17	* 1.33%	>15.00	50	< 1	< 0.01	20	0.17	1940	30	0.06	< 1	< 200	848	5	2	38	< 0.01	< 10	10	17	400	4810
CH112	< 0.2	2.04	5	10	< 0.5	12	1.94	< 0.5	9	45	2470	11.23	20	< 1	0.08	10	0.67	125	< 1	0.04	4	460	126	5	4	85	0.09	< 10	< 10	59	30	2104
CH113	0.4	0.35	15	< 10	< 0.5	108	2.98	< 0.5	8	14	6007	>15.00	30	< 1	0.01	10	0.20	470	2	0.02	< 1	170	64	5	2	7	0.01	< 10	< 10	21	1000	2062
CH114	14.6	0.89	35	< 10	< 0.5	82	0.77	2.0	7	29	2586	>15.00	20	< 1	< 0.01	< 10	0.63	1240	92	0.02	< 1	310	512	5	2	15	< 0.01	< 10	< 10	30	100	6602
CH115	1.8	0.92	5	10	< 0.5	30	12.71	24.0	17	42	1782	4.11	50	2	0.09	30	0.96	1360	3	0.01	17	360	86	5	2	62	0.01	< 10	< 10	35	40	4882
CH116	3.6	1.66	< 5	< 10	< 0.5	284	3.20	21.5	10	38	1309	>15.00	30	< 1	0.03	10	1.11	1260	27	0.02	6	300	322	5	3	16	0.03	< 10	< 10	39	100	5300
CH117	5.8	0.40	< 5	< 10	< 0.5	68	12.72	5.5	35	6	203	7.95	50	< 1	< 0.01	30	1.84	4430	3	0.03	5	110	470	10	1	99	< 0.01	< 10	< 10	9	80	1526
CH118	39.2	1.54	105	< 10	< 0.5	232	9.65	15.0	29	36	3484	11.55	30	< 1	< 0.01	40	1.75	3355	38	0.02	9	980	2394	5	4	16	0.15	< 10	< 10	34	110	3936
CH119	1.2	1.39	< 5	< 10	< 0.5	14	3.00	9.0	80	27	6030	>15.00	10	< 1	0.01	20	0.95	540	< 1	0.02	35	800	56	5	4	15	0.12	< 10	10	26	50	2810
CH120	< 0.2	2.14	20	< 10	< 0.5	24	2.45	12.0	22	58	1113	13.90	20	< 1	0.05	20	2.27	2405	26	0.03	34	210	82	5	5	24	0.04	< 10	< 10	41	50	8456
CH121	4.0	2.72	30	10	< 0.5	34	5.64	2.0	18	25	6516	5.82	10	< 1	0.03	30	1.68	1290	5	0.03	20	1740	26	10	7	94	0.39	< 10	< 10	78	240	1474
CH122	1.8	1.92	40	10	< 0.5	28	5.05	4.0	7	78	332	3.65	30	< 1	0.08	20	1.98	1135	4	0.02	11	40	48	5	3	23	0.01	< 10	< 10	21	20	3042
CH123	6.2	1.46	< 5	10	< 0.5	< 20	1.69	15.0	136	45	* 1.29%	>15.00	< 10	< 1	0.08	10	0.42	835	34	0.05	19	1600	66	5	5	71	0.13	< 10	10	49	< 50	1420
CH124	1.2	1.18	55	< 10	< 0.5	< 20	7.44	< 0.5	174	55	* 1.05%	>15.00	30	< 1	< 0.01	30	0.48	1655	< 1	0.04	12	1400	60	5	3	24	0.06	< 10	< 10	25	< 50	1344
CH125	1.6	1.80	< 5	20	< 0.5	< 20	1.64	18.5	50	67	* 1.36%	>15.00	20	< 1	0.01	30	1.33	655	< 1	0.04	13	1800	36	5	4	38	0.05	< 10	110	25	< 50	8682

Appendix B.--Inductively coupled plasma-atomic emission spectroscopy multi-element analytical data for samples analyzed by chemex Labs, Inc.--Continued.

Sample No.	Ag (Ppm)	Al (Pct)	As (Ppm)	Ba (Ppm)	Be (Ppm)	Bi (Ppm)	Ca (Pct)	Cd (Ppm)	Co (Ppm)	Cr (Ppm)	Cu (Ppm)	Fe (Pct)	Ga (Ppm)	Hg (Ppm)	K (Pct)	La (Ppm)	Mg (Pct)	Mn (Ppm)	Mo (Ppm)	Na (Pct)	Ni (Ppm)	P (Ppm)	Pb (Ppm)	Sb (Ppm)	Sc (Ppm)	Sr (Ppm)	Ti (Pct)	Tl (Ppm)	U (Ppm)	V (Ppm)	W (Ppm)	Zn (Ppm)
CH126	< 0.2	0.65	5	260	< 0.5	16	1.51	19.0	9	67	851	>15.00	20	< 1	1.74	10	0.46	125	2	0.15	2	1200	136	10	2	318	0.08	< 10	< 10	83	< 50	3102
CH127	0.6	0.14	90	10	< 0.5	< 2	0.28	12.5	5	62	773	11.35	< 10	1	0.14	< 10	0.08	75	2	0.03	< 1	500	92	5	1	29	0.02	< 10	< 10	27	< 10	2044
CH128	4.2	0.36	< 5	10	< 0.5	8	0.23	8.5	44	52	1278	>15.00	10	< 1	0.03	10	0.06	285	4	0.02	< 1	440	56	5	7	31	0.03	< 10	< 10	119	600	4868
CH129	5.0	0.14	115	20	< 0.5	< 2	0.23	62.5	26	79	558	4.93	< 10	< 1	0.06	< 10	0.04	1290	7	0.02	12	620	38	10	< 1	30	< 0.01	30	< 10	20	30	6134
CH130	10.4	0.46	95	20	< 0.5	10	0.43	>100.0	54	59	2932	>15.00	< 10	< 1	0.01	< 10	0.09	1790	46	0.02	3	160	76	5	1	17	< 0.01	< 10	< 10	27	50	* 3.01%
CH131	5.2	0.94	135	30	< 0.5	< 2	0.64	65.0	7	65	2800	>15.00	10	< 1	< 0.01	< 10	0.66	1245	4	0.02	20	360	150	5	2	30	0.01	< 10	< 10	105	50	* 4.52%
CH132	< 0.2	0.14	< 5	10	< 0.5	< 2	0.53	47.5	11	13	461	>15.00	< 10	< 1	0.04	10	0.40	805	< 1	0.03	4	1410	94	5	2	26	< 0.01	< 10	< 10	13	< 50	7004
CH133	0.6	0.04	< 5	< 10	< 0.5	< 2	0.18	6.0	3	89	266	>15.00	10	< 1	0.02	< 10	0.13	435	< 1	0.02	< 1	490	74	5	2	11	< 0.01	< 10	< 10	142	< 50	820
CH134	3.8	0.93	5	< 10	< 0.5	< 20	2.42	< 0.5	419	40	* 2.65%	>15.00	50	< 1	0.02	120	0.28	2785	3	0.02	7	1600	56	5	3	27	0.02	< 10	50	15	< 50	2432
CH135	2.2	0.42	< 5	< 10	< 0.5	< 2	4.19	>100.0	81	33	9493	>15.00	40	< 1	0.04	20	0.48	1210	1	0.01	28	1400	38	5	2	18	0.01	< 10	< 10	34	200	* 8.37%
CH136	< 0.2	1.10	20	10	< 0.5	6	12.99	< 0.5	4	52	51	10.60	50	< 1	< 0.01	30	0.32	1765	< 1	0.05	1	90	146	5	1	22	0.03	< 10	< 10	17	60	142
CH137	18.40 o/t	1.79	15	< 10	< 0.5	1896	8.20	>100.0	107	33	1807	3.27	20	< 1	0.01	20	0.28	1120	39	0.04	43	440	* 7.88%	5	1	102	0.07	< 10	< 10	16	130	* 5.96%
CH138	19.6	2.58	5	20	< 0.5	96	6.50	8.0	23	82	124	1.56	< 10	< 1	0.11	30	1.99	1680	5	0.06	73	1630	2482	15	6	171	0.31	< 10	< 10	69	10	2020
CH139	102.4	0.79	< 5	10	< 0.5	546	>15.00	>100.0	150	31	4237	10.44	60	< 1	0.01	30	0.25	2965	< 1	0.03	36	30	9596	5	1	66	0.01	< 10	< 10	120	140	* 2.53%
CH140	< 0.2	1.16	< 5	30	< 0.5	14	7.03	21.5	14	10	400	1.35	20	3	0.08	30	0.69	690	1	0.06	5	670	54	5	3	46	0.08	< 10	< 10	32	< 10	2494
CH141	5.4	1.00	< 5	30	< 0.5	30	2.96	3.5	19	31	225	2.02	< 10	3	0.18	20	0.59	490	3	0.14	4	610	552	5	2	65	0.18	< 10	< 10	51	< 10	724
CH142	5.2	2.65	75	180	< 0.5	28	7.27	7.0	80	16	522	5.97	40	< 1	0.06	80	1.01	4560	7	0.05	45	470	538	5	2	160	0.01	< 10	< 10	95	60	1374
CH143	2.2	2.97	25	40	< 0.5	2	8.48	1.0	55	66	228	3.20	< 10	< 1	0.03	40	1.14	1735	3	0.08	88	1360	352	5	6	220	0.38	< 10	< 10	73	20	390
CH144	< 0.2	2.10	45	20	< 0.5	22	3.32	< 0.5	14	21	16	2.05	10	< 1	0.11	30	0.33	195	1	0.48	48	1090	60	5	1	98	0.12	< 10	< 10	17	< 10	78
CH145	< 0.2	2.62	15	10	0.5	14	10.48	< 0.5	< 1	42	49	3.84	< 10	< 1	0.12	40	1.40	265	3	0.04	17	380	78	10	3	162	0.09	< 10	< 10	56	< 10	92
CH146	2.6	2.60	30	< 10	< 0.5	< 2	8.88	< 0.5	15	47	298	3.59	< 10	< 1	0.03	50	1.74	1030	7	0.05	16	730	332	5	4	168	0.23	< 10	< 10	71	< 10	198
CH147	1.2	1.14	< 5	20	< 0.5	< 2	2.23	< 0.5	58	94	228	3.66	< 10	8	0.14	30	0.69	785	2	0.10	21	510	162	5	2	67	0.25	< 10	< 10	41	< 10	126
CH148	< 0.2	1.83	85	< 10	< 0.5	< 2	>15.00	< 0.5	16	112	347	11.83	< 10	< 1	< 0.01	40	1.03	2060	4	0.01	12	640	76	5	2	216	0.10	< 10	< 10	31	20	84
CH149	0.8	0.87	35	< 10	< 0.5	< 2	>15.00	< 0.5	< 1	100	77	4.41	< 10	< 1	0.03	40	0.80	1195	7	0.02	6	380	116	5	1	199	0.04	< 10	< 10	15	10	108
CH150	65.0	1.17	10	< 10	< 0.5	836	>15.00	45.5	84	77	1404	10.74	< 10	< 1	< 0.01	30	0.30	2180	3	0.01	64	320	5832	5	2	47	0.04	< 10	< 10	22	90	> 10000
CH151	0.4	3.07	60	30	< 0.5	< 2	14.35	< 0.5	21	83	69	4.12	< 10	< 1	0.44	40	2.71	595	< 1	0.11	80	1000	30	5	6	201	0.48	< 10	< 10	93	< 10	46
CH152	0.8	4.44	60	50	1.5	4	11.18	< 0.5	29	145	82	4.53	< 10	< 1	1.00	40	3.18	710	24	0.02	84	1610	60	5	9	140	0.14	< 10	< 10	113	< 10	244
CH153	3.6	3.98	35	60	< 0.5	28	4.11	1.5	16	32	201	3.75	< 10	< 1	0.08	20	2.27	920	1	0.16	14	1020	362	5	7	398	0.28	< 10	< 10	81	< 10	844
CH154	0.2	6.65	70	190	< 0.5	4	1.34	< 0.5	20	38	43	4.41	< 10	< 1	1.14	20	5.63	770	< 1	0.14	27	1130	26	5	13	206	0.35	< 10	< 10	137	< 10	86
CH155	0.4	3.70	< 5	10	0.5	16	8.53	0.5	32	78	26	3.66	< 10	< 1	< 0.01	30	4.80	1645	3	0.04	19	660	58	5	6	424	0.29	< 10	< 10	66	< 10	198
CH156	< 0.2	5.55	< 5	20	0.5	20	3.46	< 0.5	31	166	65	5.09	< 10	7	0.26	30	3.57	280	2	0.16	129	1520	28	5	8	289	0.83	< 10	< 10	122	< 10	44
CH157	0.4	5.04	25	10	< 0.5	< 2	8.60	< 0.5	12	56	41	2.13	< 10	1	0.10	30	0.56	130	< 1	0.50	48	1010	72	5	8	451	0.68	< 10	< 10	84	< 10	24
CH158	0.8	5.69	5	10	< 0.5	< 2	7.38	2.0	19	64	98	3.22	< 10	7	0.08	30	0.73	225	5	0.39	76	1550	16	5	5	424	0.62	< 10	< 10	56	< 10	470
CH159	197.6	0.31	< 5	< 10	< 0.5	3664	4.08	>100.0	208	25	2376	5.28	< 10	4	0.01	10	2.91	4310	3	0.02	36	450	5664	5	1	35	0.02	< 10	< 10	18	1490	* 16.70%
CH160	33.40 o/t	0.46	5	< 10	< 0.5	4626	9.87	>100.0	157	22	3797	3.09	< 10	< 1	< 0.01	20	0.20	2260	4	0.01	29	250	* 9.50%	5	1	31	0.01	< 10	< 10	11	1330	* 9.21%
CH161	0.8	6.79	20	140	2.5	32	3.97	3.5	47	141	188	>15.00	40	< 1	0.29	50	0.31	1925	18	0.03	107	580	324	5	19	118	0.31	< 10	< 10	113	< 50	248
CH162	3.2	0.84	60	20	< 0.5	516	11.84	2.0	21	52	61	>15.00	60	< 1	0.01	20	0.21	1840	2	0.01	15	320	366	20	3	61	0.05	< 10	< 10	27	< 50	50
CH163	185.8	1.45	5	100	0.5	362	>15.00	9.0	9	94	20	7.93	< 10	5	0.01	40	0.38	3170	2	0.03	13	100	* 12.40%	5	2	194	0.05	< 10	10	39	140	186
CH164	6.2	6.46	70	40	1.0	8	14.13	< 0.5	15	120	41	3.73	< 10	< 1	0.07	40	1.27	2630	1	0.10	35	890	2538	5	12	476	0.58	< 10	< 10	95	10	284
CH165	1.4	6.26	60	50	1.0	14	>15.00	1.0	15	232	59	6.68	< 10	< 1	< 0.01	50	1.50	4365	< 1	0.02	47	1660	1416	5	18	147	0.78	< 10	< 10	143	40	364
CH166	0.6	4.67	35	70	1.5	32	8.29	< 0.5	15	67	42	1.56	80	< 1	0.26	30	1.16	870	3	0.34	74	1090	188	5	7	260	0.56	< 10	< 10	67	30	94

Appendix B.--Inductively coupled plasma-atomic emission spectroscopy multi-element analytical data for samples analyzed by chemex Labs, Inc.--Continued.

Sample No.	Ag (Ppm)	Al (Pct)	As (Ppm)	Ba (Ppm)	Be (Ppm)	Bi (Ppm)	Ca (Pct)	Cd (Ppm)	Co (Ppm)	Cr (Ppm)	Cu (Ppm)	Fe (Pct)	Ga (Ppm)	Hg (Ppm)	K (Pct)	La (Ppm)	Mg (Pct)	Mn (Ppm)	Mo (Ppm)	Na (Pct)	Ni (Ppm)	P (Ppm)	Pb (Ppm)	Sb (Ppm)	Sc (Ppm)	Sr (Ppm)	Ti (Pct)	Tl (Ppm)	U (Ppm)	V (Ppm)	W (Ppm)	Zn (Ppm)
CH167	< 0.2	5.53	35	40	1.0	18	>15.00	< 0.5	12	51	56	2.97	100	< 1	0.28	40	2.54	310	3	0.04	22	960	54	15	10	125	0.31	< 10	< 10	99	20	166
CH168	< 0.2	3.76	20	100	1.0	< 2	8.90	< 0.5	14	43	58	2.45	80	< 1	0.28	30	1.42	760	1	0.12	19	890	6	5	7	198	0.40	< 10	20	75	10	30
CH169	< 0.2	3.32	30	20	1.0	< 2	2.42	< 0.5	17	50	42	2.30	60	< 1	0.31	10	0.93	140	1	0.16	36	210	6	5	7	195	0.28	< 10	10	49	10	16
CH170	2.4	2.27	15	< 10	0.5	32	>15.00	2.0	< 1	73	17	10.44	90	< 1	0.01	30	0.35	1830	4	0.03	10	310	426	15	3	53	0.09	< 10	< 10	28	170	78
CH171	24.2	2.89	30	40	0.5	76	12.93	10.5	97	48	226	>15.00	80	< 1	< 0.01	20	0.42	4060	2	0.03	42	240	4254	5	8	13	0.14	< 10	20	56	100	2996
CH172	12.80 o/t	1.72	5	40	2.0	1584	10.03	2.5	25	52	1980	>15.00	60	< 1	< 0.01	20	0.53	4230	34	0.01	35	130	* 7.40%	15	4	38	0.03	< 10	10	192	1450	242
CH173	47.2	5.72	90	< 10	5.0	110	>15.00	< 0.5	13	43	289	8.08	90	8	< 0.01	90	0.52	3485	22	0.02	11	490	* 1.58%	25	7	69	0.20	< 10	< 10	116	140	90
CH174	74.2	3.61	< 5	40	0.5	432	11.80	2.0	50	64	200	8.73	80	< 1	0.04	20	0.66	3695	12	0.07	60	450	9784	10	5	115	0.22	< 10	20	178	210	94
CH175	5.6	2.02	15	40	1.0	132	5.47	< 0.5	15	28	29	6.38	60	< 1	< 0.01	20	0.24	2390	2	0.01	10	220	1436	5	4	27	0.10	< 10	< 10	61	400	26
CH176	3.8	5.03	< 5	40	3.0	58	>15.00	2.0	16	102	65	5.13	80	< 1	< 0.01	40	0.87	3150	4	0.01	22	350	1144	10	6	186	0.24	< 10	10	65	20	138
CH177	151.0	1.23	5	30	< 0.5	490	10.08	9.0	10	38	45	10.66	60	< 1	0.01	20	0.29	2090	13	0.01	8	520	* 4.31%	5	4	114	0.11	< 10	< 10	40	470	794
CH178	35.8	1.22	85	20	1.5	20	>15.00	30.5	37	47	663	11.51	< 10	< 1	< 0.01	40	0.63	4340	4	0.03	35	20	* 4.94%	25	2	141	0.05	< 10	< 10	34	90	6572
CH179	125.8	0.44	135	130	< 0.5	< 20	3.51	< 0.5	33	29	* 17.20%	12.63	< 10	< 1	0.03	10	0.32	1270	5	0.01	34	1000	* 1.29%	5	5	37	0.05	< 10	< 10	24	750	3102
CH180	114.8	1.81	60	110	< 0.5	306	>15.00	4.0	22	59	1400	>15.00	< 10	< 1	< 0.01	30	0.27	2600	38	0.03	19	190	9474	15	4	75	0.10	< 10	< 10	42	200	546
CH181	111.0	0.48	< 5	40	< 0.5	10	5.41	55.0	88	21	1932	>15.00	20	< 1	0.05	10	0.17	4050	14	0.03	15	190	* 17.30%	30	2	104	0.05	< 10	< 10	45	100	> 10000
CH182	190.0	2.25	< 5	10	< 0.5	374	14.64	1.5	64	47	832	10.28	30	< 1	0.01	20	0.41	2620	71	0.03	10	160	* 8.24%	10	3	110	0.21	< 10	< 10	36	60	790
CH183	2.4	0.69	110	60	< 0.5	24	6.23	< 0.5	34	21	722	>15.00	20	< 1	0.02	20	0.14	430	33	0.02	7	370	5322	10	3	35	0.12	< 10	< 10	170	50	816
CH184	1.0	1.60	20	30	< 0.5	< 2	>15.00	< 0.5	11	35	54	2.31	50	< 1	0.03	30	0.99	555	< 1	0.04	15	210	744	5	5	268	0.14	< 10	< 10	44	10	86
CH185	19.8	3.46	< 5	20	< 0.5	36	4.30	3.5	25	90	34	3.05	< 10	3	0.02	20	0.64	3605	2	0.03	38	310	5224	5	8	409	0.29	< 10	< 10	44	< 10	824
CH186	< 0.2	0.69	265	60	< 0.5	< 2	5.61	< 0.5	14	41	819	>15.00	20	< 1	0.03	10	0.19	450	9	0.02	< 1	190	564	10	2	203	0.05	< 10	< 10	45	< 50	598
CH187	< 0.2	1.95	75	10	2.0	< 2	9.62	< 0.5	46	41	159	>15.00	< 10	< 1	0.03	10	0.32	685	22	0.03	9	130	32	25	2	34	0.03	< 10	< 10	93	< 50	48
CH188	2.0	0.63	30	40	0.5	2	0.90	< 0.5	5	186	67	2.53	< 10	4	0.30	< 10	0.37	175	5	0.02	16	280	116	5	1	98	0.01	10	10	42	< 10	60
CH189	57.6	3.29	35	10	2.0	342	13.53	0.5	54	126	2013	11.54	< 10	< 1	0.06	30	0.82	3010	82	0.04	37	430	* 1.21%	5	5	45	0.11	< 10	< 10	173	< 10	126
CH190	59.0	0.60	110	70	5.0	218	11.77	< 0.5	128	46	1908	>15.00	< 10	< 1	0.11	10	0.18	765	64	0.05	7	270	* 2.53%	15	1	78	0.03	< 10	< 10	73	50	328
CH191	15.0	1.95	30	60	< 0.5	324	11.17	1.5	19	37	179	7.33	30	< 1	0.33	20	0.84	1660	< 1	0.10	14	230	4802	10	2	272	0.13	< 10	< 10	34	100	366
CH192	71.4	0.45	15	30	< 0.5	10	6.19	50.5	41	46	1391	>15.00	20	< 1	0.01	10	0.34	1890	< 1	0.03	< 1	80	* 7.80%	5	2	196	0.05	< 10	< 10	14	< 50	4002
CH193	0.8	2.18	< 5	20	< 0.5	48	14.82	< 0.5	23	20	108	8.11	30	< 1	0.09	30	1.78	4810	1	0.04	10	350	316	15	3	234	0.24	< 10	< 10	50	130	160
CH194	44.2	2.04	< 5	10	< 0.5	184	14.07	4.5	28	18	2283	5.57	40	< 1	0.02	30	1.05	3780	38	0.02	2	130	* 1.84%	5	3	179	0.13	< 10	< 10	43	50	1262
CH195	18.6	1.81	30	50	< 0.5	< 20	5.70	>100.0	68	39	* 1.62%	4.35	30	< 1	0.20	20	1.44	2380	70	0.02	14	400	* 4.85%	5	3	369	0.06	< 10	< 10	34	< 50	* 5.98%
CH196	1.2	0.82	325	100	< 0.5	26	8.16	10.0	13	63	717	2.38	40	1	0.44	60	0.13	715	41	0.03	16	660	1350	10	2	516	< 0.01	< 10	< 10	20	< 10	1110
CH197	16.0	2.09	90	90	< 0.5	54	>15.00	23.0	18	29	1257	3.76	60	< 1	0.69	40	1.29	4415	12	0.05	18	2540	3530	5	7	268	0.02	< 10	< 10	53	10	3646
CH198	45.6	0.27	20	60	< 0.5	60	9.06	>100.0	23	100	* 2.02%	3.10	40	< 1	0.05	20	0.25	1250	58	0.03	3	800	* 5.35%	10	2	980	< 0.01	< 10	< 10	11	< 50	* 2.23%
CH199	2.6	1.53	< 5	4680	< 0.5	22	14.91	1.5	12	49	76	7.63	190	< 1	0.03	20	0.73	2670	3	0.07	25	150	108	20	5	* 8.15%	< 0.01	< 10	< 10	47	20	636
CH200	0.6	2.20	< 5	6370	< 0.5	22	10.11	4.0	28	44	53	4.68	180	< 1	0.28	20	1.34	3100	4	0.06	52	380	42	5	9	* 8.30%	< 0.01	< 10	< 10	40	20	1806
CH201	< 0.2	4.05	55	220	< 0.5	4	4.47	< 0.5	19	137	63	6.81	30	< 1	0.22	20	3.90	1155	< 1	0.06	55	1120	30	15	16	2739	0.08	< 10	< 10	188	< 10	194
CH202	23.10 o/t	0.07	255	120	< 0.5	< 20	1.27	>100.0	1	145	* 1.16%	0.78	10	1	0.03	< 10	0.02	115	91	0.02	< 1	200	7058	3285	< 1	124	< 0.01	< 10	< 10	4	< 50	3732
CH203	156.6	0.07	195	40	< 0.5	< 2	1.73	16.5	1	314	2546	0.89	10	3	< 0.01	< 10	0.06	480	34	0.03	2	210	8154	1135	< 1	29	< 0.01	< 10	< 10	18	< 10	932
CH204	11.20 o/t	0.03	240	10	< 0.5	10	1.38	>100.0	1	130	4875	0.49	10	< 1	< 0.01	< 10	0.02	185	27	0.02	< 1	< 10	* 1.06%	2565	< 1	23	< 0.01	< 10	< 10	2	20	> 10000
CH205	93.2	0.03	75	30	< 0.5	10	4.23	14.5	< 1	142	756	0.31	20	3	0.01	10	0.03	380	10	0.02	< 1	100	1010	720	< 1	55	< 0.01	< 10	< 10	3	10	772
CH206	2.0	0.32	1000	150	< 0.5	10	>15.00	16.5	17	32	4068	2.19	50	10	0.15	30	1.35	870	4	0.04	20	260	868	210	2	121	< 0.01	< 10	< 10	15	< 10	1994
CH207	7.4	0.21	875	200	< 0.5	20	5.00	24.0	12	95	* 1.20%	3.86	20	12	0.06	10	0.45	485	10	0.03	19	< 200	1790	810	1	67	< 0.01	< 10	< 10	11	< 50	4472
CH208	27.2	0.24	890	1310	< 0.5	358	>15.00	>100.0	3	19	2298	1.73	50	71	0.04	30	1.35	930	24	0.02	4	270	* 4.57%	5	2	222	< 0.01	< 10	< 10	15	230	* 15.90%
CH209	< 0.2	2.99	370	1030	< 0.5	16	0.46	3.0	15	6	164	9.09	10	< 1	0.48	< 10	0.60	35	2	0.04	19	2500	98	15	14	174	< 0.01	< 10	< 10	88	< 10	330

Appendix B.--Inductively coupled plasma-atomic emission spectroscopy multi-element analytical data for samples analyzed by chemex Labs, Inc.--Continued.

Sample No.	Ag (Ppm)	Al (Pct)	As (Ppm)	Ba (Ppm)	Be (Ppm)	Bi (Ppm)	Ca (Pct)	Cd (Ppm)	Co (Ppm)	Cr (Ppm)	Cu (Ppm)	Fe (Pct)	Ga (Ppm)	Hg (Ppm)	K (Pct)	La (Ppm)	Mg (Pct)	Mn (Ppm)	Mo (Ppm)	Na (Pct)	Ni (Ppm)	P (Ppm)	Pb (Ppm)	Sb (Ppm)	Sc (Ppm)	Sr (Ppm)	Ti (Pct)	Tl (Ppm)	U (Ppm)	V (Ppm)	W (Ppm)	Zn (Ppm)
CH210	1.8	0.96	70	8300	< 0.5	150	3.93	21.0	7	79	136	2.24	20	< 1	0.21	20	0.41	480	15	0.03	17	520	362	10	4	246	< 0.01	< 10	< 10	27	< 10	532
CH211	< 0.2	1.26	< 5	40	0.5	12	5.10	1.5	1	60	8	0.67	30	< 1	0.53	40	0.26	270	6	0.02	< 1	30	60	5	1	30	< 0.01	< 10	< 10	7	10	94
CH212	< 0.2	0.15	5	50	< 0.5	6	>15.00	< 0.5	1	14	4	0.41	< 10	< 1	0.02	< 10	1.02	665	2	<0.01	2	50	18	5	1	307	< 0.01	< 10	< 10	4	< 10	48
CH213	< 0.2	1.02	< 5	140	< 0.5	< 2	>15.00	0.5	4	18	22	1.03	70	1	0.15	40	2.79	960	3	0.03	5	40	20	5	1	206	0.03	< 10	< 10	18	10	36
CH214	< 0.2	0.34	< 5	2420	< 0.5	< 2	>15.00	1.0	6	11	16	1.04	80	< 1	0.07	40	2.02	2195	1	0.02	< 1	< 10	54	5	1	587	< 0.01	< 10	< 10	14	10	44
CH215	0.8	1.16	20	290	< 0.5	82	>15.00	1.5	16	30	50	1.25	60	4	0.23	40	2.84	995	2	0.03	19	120	96	5	3	540	0.06	< 10	< 10	26	10	122

APPENDIX C

NEUTRON ACTIVATION MULTI-ELEMENT ANALYTICAL DATA FOR SAMPLES ANALYZED BY BONDAR-CLEGG & COMPANY LTD.

Appendix C.--Neutron activation multi-element analytical data for samples analyzed by Bondar-Clegg & Company Ltd.

[<, less than lower detection limit (some elements have elevated lower detection limits due to intrference from other elements); >, greater than; ____ , rerun values are given in Appendix B.]

Sample No.	Ag (Ppm)	As (Ppm)	Au (Ppb)	Ba (Ppm)	Br (Ppm)	Cd (Ppm)	Ce (Ppm)	Co (Ppm)	Cr (Ppm)	Cs (Ppm)	Eu (Ppm)	Fe (Pct)	Hf (Ppm)	Ir (Ppb)	La (Ppm)	Lu (Ppm)	Mo (Ppm)	Na (Pct)	Ni (Ppm)	Rb (Ppm)	Sb (Ppm)	Sc (Ppm)	Se (Ppm)	Sm (Ppm)	Sn (Ppm)	Ta (Ppm)	Tb (Ppm)	Te (Ppm)	Th (Ppm)	U (Ppm)	W (Ppm)	Yb (Ppm)	Zn (Ppm)	Zr (Ppm)
CH001	< 5	19	3220	170	< 1	< 10	10	< 10	270	2	< 2	>10.0	< 2	< 100	< 5	< 0.5	3	0.07	23	85	2.5	1.5	< 10	< 0.2	< 200	< 1	< 1	< 20	2.0	1.2	19	< 5	< 200	< 500
CH002	< 5	25	5700	480	2	< 10	31	20	140	12	< 2	>10.0	3	< 100	18	1.0	< 2	0.41	< 20	250	3.9	8.1	< 10	3.2	< 200	< 1	< 1	< 20	7.6	3.4	10	< 5	< 200	< 500
CH003	< 5	26	6340	400	3	< 10	17	16	160	12	< 2	>10.0	3	< 100	17	0.6	< 2	0.42	54	270	3.9	8.8	< 10	3.2	< 200	< 1	< 1	< 20	7.8	3.4	12	< 5	< 200	< 500
CH004	< 5	23	4240	< 100	< 1	< 10	10	< 10	340	2	< 2	>10.0	< 2	< 100	6	< 0.5	5	< 0.05	22	88	2.7	1.3	< 10	0.4	< 200	< 1	< 1	< 20	0.9	< 0.5	16	< 5	< 200	< 500
CH005	24	10	< 5	< 100	< 1	< 10	26	13	57	4	< 2	1.6	< 2	< 100	12	0.5	3	0.07	23	14	2.3	5.2	< 10	2.3	< 200	< 1	< 1	< 20	4.5	3.5	29	< 5	2700	< 500
CH006	25	14	< 5	< 100	< 1	< 10	30	14	89	3	< 2	1.7	< 2	< 100	12	0.7	8	0.10	21	20	2.8	6.3	< 10	2.2	< 200	< 1	< 1	< 20	5.9	6.8	26	< 5	2000	< 500
CH007	< 5	7	21	< 100	< 1	21	15	< 10	98	< 1	< 2	0.8	3	< 100	6	0.8	4	0.07	< 20	< 10	1.9	1.7	< 10	1.5	< 200	< 1	< 1	< 20	1.5	6.0	5	< 5	7700	< 500
CH008	66	7	39	< 100	< 1	410	10	11	180	8	< 2	3.2	< 2	< 100	10	< 0.5	26	< 0.05	< 20	32	45.5	1.7	240	1.2	< 200	< 1	< 1	< 20	3.3	4.9	24	< 5	>20000	< 500
CH009	>100	16	39	< 100	3	54	17	< 10	280	3	< 2	1.8	< 2	< 100	< 5	< 0.5	7	< 0.05	< 20	16	110.0	< 0.5	180	0.5	< 200	< 1	< 1	< 20	< 0.5	< 0.5	13	< 5	9500	< 500
CH010	68	20	87	120	1	35	10	10	170	1	< 2	8.3	< 2	< 100	< 5	< 0.5	21	< 0.05	< 20	< 10	19.0	< 0.5	94	0.4	< 200	< 1	< 1	< 20	< 0.5	1.0	480	< 5	>20000	< 500
CH011	< 5	10	13	530	< 1	< 10	31	< 10	88	2	< 2	1.1	5	< 100	12	0.6	< 2	0.10	< 20	180	2.2	4.6	< 10	3.1	< 200	< 1	< 1	< 20	4.8	2.7	< 2	< 5	810	< 500
CH012	< 5	2	< 5	740	< 1	< 10	22	< 10	70	10	< 2	< 0.5	2	< 100	7	1.0	< 2	0.12	< 20	340	1.6	2.3	< 10	2.5	< 200	2	< 1	< 20	8.0	3.4	< 2	< 5	< 200	< 500
CH013	< 5	4	< 5	550	< 1	< 10	25	< 10	90	11	< 2	< 0.5	< 2	< 100	7	0.9	< 2	0.11	< 20	300	1.0	2.1	< 10	2.5	< 200	2	< 1	< 20	6.9	3.0	3	< 5	< 200	< 500
CH014	< 5	8	8	290	3	< 10	38	< 10	71	2	< 2	2.6	4	< 100	16	0.7	11	0.28	< 20	87	4.5	4.5	< 10	3.4	< 200	< 1	< 1	< 20	6.5	3.3	4	< 5	1100	< 500
CH015	6	9	5	420	< 1	< 10	39	< 10	150	5	< 2	1.6	8	< 100	16	1.2	75	0.08	< 20	140	2.7	4.8	< 10	3.4	< 200	< 1	< 1	< 20	7.1	7.2	2	< 5	1500	< 500
CH016	9	13	19	< 100	< 1	< 10	15	< 10	< 50	< 1	< 2	1.1	< 2	< 100	6	< 0.5	42	< 0.05	< 20	< 10	5.6	1.7	< 10	2.0	< 200	< 1	< 1	< 20	2.5	3.1	2	< 5	1000	< 500
CH017	< 5	5	7	< 100	< 1	< 10	17	< 10	88	8	< 2	0.5	< 2	< 100	11	0.7	6	0.05	< 20	160	2.9	2.0	< 10	3.3	< 200	1	< 1	< 20	5.1	2.4	< 2	< 5	490	< 500
CH018	< 5	8	< 5	440	< 1	< 10	41	< 10	160	18	< 2	1.8	8	< 100	21	0.9	9	0.08	25	160	2.9	6.6	< 10	3.7	< 200	1	< 1	< 20	8.2	6.0	< 2	< 5	260	< 500
CH019	< 5	8	< 5	620	< 1	< 10	50	< 10	150	13	< 2	1.9	8	< 100	21	0.9	4	0.11	< 20	170	2.4	7.0	< 10	4.5	< 200	< 1	< 1	< 20	7.7	4.7	< 2	< 5	370	< 500
CH020	< 5	6	< 5	< 100	< 1	43	56	15	230	27	< 2	2.6	5	< 100	21	1.2	7	0.06	39	160	4.2	14.0	< 10	5.3	< 200	2	1	< 20	5.5	5.4	15	< 5	4000	< 500
CH021	< 5	8	< 5	< 100	< 1	< 10	52	< 10	150	8	< 2	2.7	7	< 100	22	1.1	2	< 0.05	< 20	32	3.9	6.7	< 10	4.7	< 200	< 1	< 1	< 20	6.8	6.0	3	< 5	850	< 500
CH022	< 5	21	< 5	410	< 1	< 10	49	35	230	56	< 2	3.3	3	< 100	15	1.1	4	0.12	74	410	2.7	21.0	< 10	4.7	< 200	3	< 1	< 20	2.5	2.6	8	< 5	3500	< 500
CH023	35	74	41	< 100	< 1	280	28	12	83	2	< 2	6.0	6	< 100	20	1.9	1870	< 0.05	< 20	19	14.0	5.1	53	4.1	< 200	3	2	39	12.0	11.0	< 2	< 5	>20000	< 500
CH024	>100	15	75	< 100	< 1	120	59	14	190	2	< 2	5.6	5	< 100	30	1.7	5060	< 0.05	< 20	< 10	14.0	4.0	130	5.0	< 200	2	2	140	8.0	9.0	6	< 5	>20000	< 500
CH025	< 5	50	12	< 100	< 1	20	42	< 10	170	10	< 2	1.3	< 2	< 100	19	0.7	9	< 0.05	< 20	65	11.0	2.1	< 10	2.7	< 200	< 1	< 1	< 20	2.5	6.4	21	< 5	1000	< 500
CH026	< 5	19	26	< 100	< 1	20	10	< 10	100	10	< 2	< 0.5	< 2	< 100	13	0.6	15	< 0.05	< 20	27	6.3	1.6	< 10	1.8	< 200	< 1	< 1	< 20	1.7	4.7	9	< 5	3300	< 500
CH027	20	12	47	190	< 1	20	18	< 10	140	2	< 2	1.1	4	< 100	8	1.1	< 2	0.12	< 20	43	5.1	2.2	27	4.8	< 200	< 1	< 1	< 20	4.3	6.3	6	< 5	4600	< 500
CH028	29	17	21	< 100	1	110	22	< 10	140	10	< 2	4.2	8	< 100	13	1.3	88	< 0.05	32	50	51.5	3.9	48	3.7	< 200	1	< 1	< 20	6.4	7.4	7	< 5	>20000	< 500
CH029	>100	39	110	< 100	< 1	310	21	22	180	< 1	< 2	>10.0	< 2	< 100	12	1.1	13	< 0.05	< 20	< 10	21.5	1.7	54	1.6	< 200	< 1	< 1	91	1.8	5.5	120	< 5	>20000	< 500
CH030	16	36	9	< 100	< 1	15	25	< 10	120	31	< 2	1.0	< 2	< 100	9	1.0	24	< 0.05	< 20	170	12.0	2.0	< 10	2.1	< 200	< 1	< 1	< 20	3.1	7.4	10	< 5	3700	< 500
CH031	>100	145	190	< 240	7	< 10	48	< 10	< 170	11	< 2	>10.0	< 5	< 100	7	< 1.1	13	< 0.05	78	64	395.0	< 0.5	430	0.8	< 540	< 1	< 1	< 75	< 1.8	2.5	77	< 5	6700	< 500
CH032	>100	131	410	< 100	13	< 10	33	< 10	< 170	2	< 2	6.8	< 4	< 100	< 5	1.3	220	< 0.05	< 20	< 27	342.0	< 0.5	120	< 0.2	< 450	< 1	< 1	160	< 1.4	7.6	14	< 5	1100	< 500
CH033	69	15	15	< 100	1	93	35	94	300	1	< 2	>10.0	4	< 100	44	1.0	40	< 0.05	44	23	30.0	5.2	< 10	4.0	< 200	< 1	< 1	< 20	5.1	3.0	79	< 5	>20000	< 500
CH034	< 5	5	8	< 100	4	< 10	27	< 10	130	9	< 2	1.4	< 2	< 100	13	1.0	7	0.14	64	59	1.5	4.2	< 10	2.5	< 200	< 1	< 1	< 20	3.9	5.1	3	< 5	4800	< 500
CH035	< 5	6	< 5	< 100	< 1	< 10	100	< 10	450	35	< 2	2.4	8	< 100	45	1.2	< 2	0.23	71	280	2.5	11.0	< 10	8.4	< 200	2	1	< 20	12.0	6.1	< 2	< 5	1900	< 500
CH036	10	10	< 5	< 100	< 1	< 10	70	20	410	14	< 2	3.7	7	< 100	35	1.2	< 2	0.07	63	93	5.9	14.0	< 10	5.6	< 200	1	< 1	< 20	13.0	4.6	7	< 5	1900	< 500
CH037	< 5	3	< 5	< 100	< 1	< 10	500	14	390	9	8	4.6	7	< 100	310	5.2	9	1.10	95	110	2.0	12.0	< 10	48.1	< 200	< 1	7	< 20	12.0	6.3	2	21	200	< 500
CH038	< 5	5	< 5	< 100	2	< 10	97	13	490	< 1	< 2	2.7	7	< 100	52	1.6	49	0.07	80	< 10	5.8	14.0	< 10	10.0	< 200	2	1	< 20	17.0	6.6	79	5	640	< 500
CH039	83	157	12	< 100	2	15	60	14	140	2	< 2	3.5	3	< 100	31	1.4	10	< 0.05	55	12	27.4	5.6	< 10	5.5	< 200	< 1	< 1	< 20	7.2	7.2	5	< 5	3300	< 500
CH040	15	6	16	440	< 1	< 10	54	23	66	7	< 2	5.5	4	< 100	20	1.1	19	1.60	25	67	2.0	11.0	< 10	4.9	< 200	< 1	< 1	< 20	4.7	8.9	< 2	< 5	200	< 500

Appendix C.--Neutron activation multi-element analytical data for samples analyzed by Bondar-Clegg & Company Ltd.--Continued.

Sample No.	Ag (Ppm)	As (Ppm)	Au (Ppb)	Ba (Ppm)	Br (Ppm)	Cd (Ppm)	Ce (Ppm)	Co (Ppm)	Cr (Ppm)	Cs (Ppm)	Eu (Ppm)	Fe (Pct)	Hf (Ppm)	Ir (Ppb)	La (Ppm)	Lu (Ppm)	Mo (Ppm)	Na (Pct)	Ni (Ppm)	Rb (Ppm)	Sb (Ppm)	Sc (Ppm)	Se (Ppm)	Sm (Ppm)	Sn (Ppm)	Ta (Ppm)	Tb (Ppm)	Te (Ppm)	Th (Ppm)	U (Ppm)	W (Ppm)	Yb (Ppm)	Zn (Ppm)	Zr (Ppm)
CH041	>100	24	6	< 100	< 1	150	23	150	160	1	< 2	2.5	3	< 100	13	0.6	3	< 0.05	< 20	< 10	6.7	1.8	47	2.8	< 200	< 1	< 1	< 20	3.2	3.7	11	< 5	>20000	< 500
CH042	45	34	< 5	< 100	< 1	52	10	79	120	2	< 2	3.2	< 2	< 100	8	0.6	8	< 0.05	39	< 10	10.0	2.1	< 10	1.4	< 200	< 1	< 1	< 20	1.1	5.4	11	< 5	>20000	< 500
CH043	7	28	17	< 100	2	< 10	58	< 10	260	6	< 2	2.8	6	< 100	26	0.9	73	0.32	34	22	7.2	9.2	< 10	5.0	< 200	< 1	< 1	< 20	10.0	3.6	10	< 5	930	< 500
CH044	9	19	< 5	< 100	< 1	< 10	30	< 10	140	5	< 2	1.8	3	< 100	19	0.8	34	0.08	< 20	21	5.0	5.1	< 10	3.8	< 200	< 1	< 1	< 20	5.5	4.0	5	< 5	1100	< 500
CH045	>100	61	110	< 100	1	26	10	54	53	1	< 2	6.3	< 2	< 100	8	0.6	5	< 0.05	< 20	< 10	12.0	0.9	39	1.1	< 200	< 1	< 1	< 20	< 0.5	2.9	18	< 5	17000	< 500
CH046	>100	6	9	< 100	< 1	300	24	300	170	11	< 2	3.3	< 2	< 100	17	< 0.5	< 2	0.26	160	75	1.6	2.9	73	2.5	< 200	< 1	< 1	33	3.8	5.9	352	< 5	>20000	< 500
CH047	< 5	10	< 5	140	7	< 10	26	24	120	5	< 2	4.3	3	< 100	15	0.7	14	0.82	< 20	18	1.7	19.0	< 10	4.2	< 200	1	< 1	< 20	2.0	1.3	5	< 5	370	< 500
CH048	30	20	< 5	200	5	< 10	78	32	86	2	2	7.2	4	< 100	41	0.7	19	1.70	< 20	< 10	3.7	16.0	< 10	7.8	< 200	2	< 1	< 20	3.1	1.1	6	< 5	1200	< 500
CH049	22	113	< 5	190	5	< 10	28	32	170	10	< 2	3.8	4	< 100	18	0.8	23	0.41	50	56	51.1	21.0	< 10	4.4	< 200	< 1	< 1	< 20	1.7	1.4	25	< 5	550	< 500
CH050	< 5	44	6	< 100	< 1	< 10	20	29	96	< 1	< 2	8.9	< 2	< 100	10	0.6	31	< 0.05	< 20	< 10	1.0	5.7	< 10	2.3	< 200	< 1	< 1	< 20	3.4	2.5	56	< 5	< 200	< 500
CH051	< 5	4	< 5	< 100	2	< 10	37	< 10	120	8	< 2	2.4	3	< 100	21	0.6	< 2	0.18	< 20	91	1.2	7.1	< 10	3.7	< 200	< 1	< 1	< 20	6.7	2.6	< 2	< 5	< 200	< 500
CH052	< 5	101	< 5	< 100	3	< 10	42	15	96	< 1	< 2	3.1	4	< 100	22	0.7	10	0.28	< 20	17	62.5	9.0	< 10	4.2	< 200	1	< 1	< 20	10.0	2.7	20	< 5	550	< 500
CH053	20	67	< 5	< 100	4	29	31	36	130	1	< 2	4.1	< 2	< 100	15	< 0.5	< 2	0.06	36	< 10	46.7	5.6	< 10	2.4	< 200	< 1	< 1	< 20	6.4	2.2	53	< 5	10000	< 500
CH054	< 5	20	< 5	100	6	< 10	43	< 10	54	5	< 2	2.0	3	< 100	15	< 0.5	2	0.07	< 20	67	18.0	5.9	< 10	2.7	< 200	< 1	< 1	< 20	5.3	2.9	4	< 5	520	< 500
CH055	8	13	< 5	< 100	2	21	26	26	170	2	< 2	4.1	< 2	< 100	11	< 0.5	46	0.13	< 20	19	11.0	8.7	< 10	3.0	< 200	< 1	< 1	< 20	3.4	1.4	20	< 5	6900	< 500
CH056	< 5	3	< 5	< 100	< 1	< 10	10	< 10	< 50	< 1	< 2	0.6	< 2	< 100	< 5	< 0.5	3	< 0.05	< 20	< 10	0.3	< 0.5	< 10	0.6	< 200	< 1	< 1	< 20	0.6	0.6	< 2	< 5	< 200	< 500
CH057	< 5	5	< 5	560	< 1	< 10	30	25	270	19	< 2	4.8	< 2	< 100	14	< 0.5	< 2	0.73	78	110	0.7	19.0	< 10	4.8	< 200	< 1	< 1	< 20	2.1	1.3	< 2	< 5	360	< 500
CH058	< 5	3	< 5	< 100	< 1	< 10	29	< 10	71	9	< 2	2.4	3	< 100	15	0.6	12	0.18	30	140	0.8	6.7	< 10	3.1	< 200	< 1	< 1	< 20	6.3	3.3	< 2	< 5	< 200	< 500
CH059	< 5	12	< 5	490	< 1	< 10	46	19	52	10	< 2	4.0	3	< 100	21	< 0.5	< 2	1.80	< 20	86	1.7	10.0	< 10	4.7	< 200	< 1	< 1	< 20	3.8	1.6	< 2	< 5	260	< 500
CH060	< 5	3	< 5	< 100	< 1	90	30	14	210	1	< 2	2.7	5	< 100	16	0.7	13	0.07	48	< 10	2.8	5.8	38	3.2	< 200	< 1	< 1	< 20	6.4	3.6	5	< 5	>20000	< 500
CH061	16	3	21	< 100	1	110	22	14	200	< 1	< 2	4.6	5	< 100	10	0.6	24	< 0.05	< 20	< 10	8.8	4.3	250	1.9	< 200	< 1	< 1	39	4.2	4.4	56	< 5	>20000	< 500
CH062	< 5	3	5	< 100	< 1	10	23	< 10	< 50	2	< 2	2.0	3	< 100	14	0.9	3	0.06	< 20	12	1.1	4.8	< 10	2.6	< 200	< 1	< 1	< 20	4.9	8.4	3	< 5	2100	< 500
CH063	< 5	25	< 5	< 100	< 1	< 10	42	< 10	150	17	< 2	1.6	4	< 100	17	0.7	4	< 0.05	22	170	2.6	5.3	< 10	3.1	< 200	< 1	< 1	< 20	5.8	4.3	6	< 5	490	< 500
CH064	< 5	5	< 5	< 100	< 1	< 10	28	< 10	140	4	< 2	1.2	5	< 100	15	0.8	4	< 0.05	< 20	48	6.5	4.4	< 10	3.0	< 200	< 1	< 1	< 20	4.9	3.7	2	< 5	270	< 500
CH065	< 5	502	66	100	2	< 10	28	< 10	170	12	< 2	1.3	3	< 100	16	0.7	< 2	< 0.05	< 20	200	25.0	5.4	< 10	2.6	< 200	< 1	< 1	< 20	5.7	4.4	62	< 5	1400	< 500
CH066	< 5	778	110	260	3	< 10	10	< 10	210	10	< 2	2.3	< 2	< 100	14	1.0	7	< 0.05	35	170	26.5	4.3	< 10	2.2	< 200	< 1	< 1	< 20	3.5	4.1	31	< 5	690	< 500
CH067	< 5	26	8	900	< 1	< 10	31	< 10	130	24	< 2	1.6	< 2	< 100	17	< 0.5	4	0.08	< 20	280	6.2	7.3	< 10	1.7	< 200	< 1	< 1	< 20	2.8	3.1	21	< 5	< 200	< 500
CH068	< 5	23	< 5	280	< 1	< 10	44	< 10	51	25	< 2	1.9	2	< 100	18	0.7	6	0.09	53	200	1.8	5.5	< 10	3.8	< 200	< 1	< 1	< 20	7.0	4.4	< 2	< 5	< 200	< 500
CH069	< 5	49	6	1100	< 1	< 10	31	< 10	91	29	< 2	1.9	< 2	< 100	18	0.5	14	0.07	< 20	290	6.1	7.5	< 10	1.9	< 200	< 1	< 1	< 20	3.6	2.9	8	< 5	< 200	< 500
CH070	7	10	< 5	220	< 1	160	21	64	170	5	< 2	2.9	2	< 100	9	0.6	4	0.18	27	49	5.2	3.5	44	1.7	< 200	< 1	< 1	< 20	3.9	3.4	< 2	< 5	>20000	< 500
CH071	< 5	6	< 5	430	1	< 10	41	< 10	80	19	< 2	2.0	5	< 100	18	0.9	< 2	0.11	< 20	150	0.7	6.0	< 10	3.5	< 200	< 1	< 1	< 20	8.5	4.3	4	< 5	820	< 500
CH072	57	7	< 5	< 100	< 1	47	48	14	110	2	< 2	4.5	4	< 100	24	1.2	7	0.05	< 20	< 10	2.6	3.6	67	4.9	< 200	1	< 1	< 20	9.0	7.6	< 2	< 5	12000	< 500
CH073	>100	15	1440	< 100	< 1	< 10	20	< 10	230	7	< 2	1.4	< 2	< 100	9	< 0.5	7	0.05	21	83	12.0	2.5	< 10	2.2	< 200	< 1	< 1	< 20	3.2	1.2	6	< 5	380	< 500
CH074	23	53	240	340	< 1	< 10	34	13	170	10	< 2	3.1	2	< 100	17	0.7	59	0.07	36	220	3.2	7.8	< 10	4.2	< 200	< 1	< 1	< 20	4.9	2.1	3	< 5	270	< 500
CH075	>100	11	708	230	< 1	< 10	13	< 10	290	4	< 2	0.8	< 2	< 100	7	< 0.5	8	< 0.05	< 20	93	6.8	< 0.5	< 10	1.1	< 200	< 1	< 1	< 20	< 0.5	< 0.5	6	< 5	< 200	< 500
CH076	39	4	< 5	< 100	< 1	28	28	110	220	1	< 2	5.9	< 2	< 100	9	0.5	5	0.05	36	< 10	1.7	5.9	18	2.2	< 200	< 1	< 1	< 20	2.7	2.9	< 2	< 5	16000	< 500
CH077	17	2	< 5	< 100	< 1	61	15	79	310	1	< 2	4.3	< 2	< 100	5	< 0.5	6	0.06	65	< 10	1.9	4.8	16	1.6	< 200	< 1	< 1	< 20	0.7	0.7	4	< 5	19000	< 500
CH078	< 5	21	< 5	< 100	1	11	360	79	91	2	< 2	>10.0	5	< 100	160	< 0.5	13	0.14	62	< 10	1.7	5.0	< 10	6.3	< 200	< 1	< 1	< 20	14.0	44.0	< 2	5	2700	< 500
CH079	< 5	104	150	< 100	9	11	10	11	59	1	< 2	>10.0	4	< 100	< 5	< 0.5	52	0.06	< 20	33	1.0	3.4	190	0.9	< 200	< 1	< 1	< 20	4.4	7.0	14	< 5	2000	< 500
CH080	< 5	13	170	< 100	12	29	30	230	100	2	< 2	>10.0	4	< 100	22	< 0.5	3	0.15	< 46	< 27	1.6	5.1	15	3.8	< 200	< 1	< 1	< 20	12.0	12.0	73	< 5	19000	< 500
CH081	< 5	10	210	1500	< 1	15	35	25	< 50	11	< 2	>10.0	4	< 100	25	< 0.5	8	0.44	< 20	500	1.1	6.9	42	3.6	< 200	< 1	< 1	< 20	19.0	6.5	14	< 5	2200	< 500
CH082	< 5	21	110	< 100	1	19	10	16	< 50	1	< 2	>10.0	< 2	< 100	13	< 0.5	10	< 0.05	< 41	< 25	0.9	1.5	18	1.6	< 200	< 1	< 1	< 20	1.6	2.8	21	< 5	4400	< 500
CH083	19	2	440	< 100	< 1	< 10	10	41	200	< 1	< 2	>10.0	< 2	< 100	< 5	< 0.5	8	< 0.05	< 20	< 10	0.8	0.6	11	0.5	< 200	< 1	< 1	< 20	0.6	2.9	17	< 5	1100	< 500

Appendix C.--Neutron activation multi-element analytical data for samples analyzed by Bondar-Clegg & Company Ltd.--Continued.

Sample No.	Ag (Ppm)	As (Ppm)	Au (Ppb)	Ba (Ppm)	Br (Ppm)	Cd (Ppm)	Ce (Ppm)	Co (Ppm)	Cr (Ppm)	Cs (Ppm)	Eu (Ppm)	Fe (Pct)	Hf (Ppm)	Ir (Ppb)	La (Ppm)	Lu (Ppm)	Mo (Ppm)	Na (Pct)	Ni (Ppm)	Rb (Ppm)	Sb (Ppm)	Sc (Ppm)	Se (Ppm)	Sm (Ppm)	Sn (Ppm)	Ta (Ppm)	Tb (Ppm)	Te (Ppm)	Th (Ppm)	U (Ppm)	W (Ppm)	Yb (Ppm)	Zn (Ppm)	Zr (Ppm)
CH084	73	18	43	< 100	2	13	10	54	68	< 1	< 2	>10.0	< 2	< 100	< 5	< 0.5	9	< 0.05	< 20	< 10	3.1	1.2	< 10	< 0.2	< 200	< 1	< 1	< 20	2.1	11.0	40	< 5	2700	< 500
CH085	7	45	130	< 100	10	< 10	10	66	< 50	< 1	< 2	>10.0	< 2	< 100	5	< 0.5	52	0.09	< 20	< 10	1.6	1.4	< 10	0.5	< 200	< 1	< 1	< 20	< 0.5	3.1	14	< 5	1100	830
CH086	>100	43	67	< 100	2	< 10	10	66	280	< 1	< 2	>10.0	< 2	< 100	< 5	< 0.5	49	< 0.05	< 20	< 10	3.7	< 0.5	30	< 0.5	< 200	< 1	< 1	< 20	0.7	19.0	11	< 5	380	< 500
CH087	< 5	3	< 5	700	< 1	< 10	72	< 10	98	10	< 2	1.5	6	< 100	29	< 0.5	12	1.90	< 20	240	1.2	7.5	< 10	4.9	< 200	< 1	< 1	< 20	14.0	2.7	6	< 5	310	< 500
CH088	< 5	6	< 5	280	< 1	< 10	49	38	400	7	2	5.3	4	< 100	16	< 0.5	5	0.28	150	140	1.4	27.0	< 10	4.4	< 200	2	< 1	< 20	1.3	2.2	4	< 5	200	< 500
CH089	< 5	21	< 5	< 100	< 1	< 10	28	130	140	2	< 2	6.6	3	< 100	7	< 0.5	3	0.09	60	< 10	7.7	17.0	< 10	2.5	< 200	< 1	< 1	< 20	2.2	2.8	3	< 5	520	< 500
CH090	< 5	27	< 5	< 100	< 1	< 10	10	< 10	< 50	< 1	< 2	>10.0	3	< 100	< 5	< 0.5	< 2	< 0.05	< 20	< 10	0.2	0.6	< 10	0.4	< 200	< 1	< 1	< 20	< 0.5	3.7	71	< 5	< 200	< 500
CH091	< 5	17	< 5	120	< 1	< 10	53	21	120	6	< 2	3.4	4	< 100	23	< 0.5	2	0.39	41	70	11.0	11.0	< 10	3.9	< 200	< 1	< 1	< 20	6.9	2.9	3	< 5	330	< 500
CH092	6	43	7	< 100	< 1	< 10	10	59	65	< 1	< 2	>10.0	3	< 100	8	< 0.5	24	< 0.05	< 20	< 10	1.6	2.8	15	0.9	< 200	< 1	< 1	< 20	2.4	9.2	84	< 5	420	< 500
CH093	< 5	12	150	< 100	2	< 10	10	130	62	< 1	< 2	>10.0	3	< 100	11	< 0.5	110	0.33	< 20	32	1.8	7.1	< 10	2.6	< 200	< 1	< 1	< 20	4.2	7.6	21	< 5	350	< 500
CH094	< 5	< 1	17	530	< 1	< 10	56	15	78	4	< 2	3.1	3	< 100	24	< 0.5	< 2	2.90	< 20	270	0.4	11.0	< 10	5.5	< 200	1	< 1	< 20	6.9	2.5	7	< 5	< 200	< 500
CH095	< 5	8	23	< 100	4	19	12	49	130	3	< 2	>10.0	4	< 100	13	< 0.5	25	0.07	< 20	54	0.8	8.2	< 10	2.2	< 200	< 1	< 1	< 20	2.7	11.0	25	< 5	10000	< 500
CH096	< 5	6	31	< 100	3	93	42	29	< 50	8	< 2	>10.0	3	< 100	26	< 0.5	9	0.07	68	60	1.4	8.9	< 10	4.3	< 200	< 1	< 1	< 20	6.4	12.0	29	< 5	20000	< 500
CH097	< 5	3	< 5	< 100	3	64	36	66	60	3	< 2	9.2	5	< 100	21	< 0.5	10	0.06	22	100	1.0	10.0	< 10	3.9	< 200	< 1	< 1	< 20	7.1	17.0	22	< 5	8900	< 500
CH098	< 5	< 1	< 5	300	5	15	51	30	< 50	5	< 2	4.8	5	< 100	25	< 0.5	< 2	0.20	< 20	160	0.5	6.6	< 10	5.7	< 200	< 1	< 1	< 20	8.4	8.7	13	< 5	4500	< 500
CH099	< 5	10	5	< 100	1	29	50	32	< 50	< 1	< 2	5.3	3	< 100	32	< 0.5	6	0.08	< 20	< 10	2.5	11.0	< 10	3.9	< 200	1	< 1	< 20	2.3	14.0	9	< 5	5100	< 500
CH100	< 5	4	< 5	< 100	< 1	260	99	71	92	< 1	< 2	>10.0	7	< 100	130	< 0.5	4	0.08	< 20	< 10	0.9	5.3	< 10	3.0	< 200	< 1	< 1	< 20	6.4	50.0	418	< 5	8100	< 500
CH101	< 5	4	15	< 100	< 1	230	18	20	160	3	< 2	>10.0	5	< 100	28	< 0.5	12	0.12	30	82	0.7	3.8	< 10	2.6	< 200	< 1	< 1	< 20	3.4	20.0	973	< 5	12000	< 500
CH102	< 5	18	6	< 100	1	< 10	10	76	63	< 1	< 2	>10.0	< 2	< 100	5	< 0.5	4	0.10	31	< 10	0.4	< 0.5	22	1.0	< 200	< 1	< 1	< 20	1.0	5.6	61	< 5	1300	< 500
CH103	< 5	6	< 5	< 100	< 1	180	16	53	86	2	< 2	>10.0	3	< 100	19	< 0.5	22	0.06	< 20	31	1.0	4.5	< 10	2.1	< 200	< 1	< 1	< 20	8.2	14.0	180	< 5	>20000	< 500
CH104	< 5	11	10	< 100	< 1	31	10	28	81	< 1	< 2	>10.0	< 2	< 100	10	< 0.5	30	< 0.05	< 20	< 10	0.6	2.6	< 10	1.6	< 200	< 1	< 1	< 20	1.7	18.0	539	< 5	5600	< 500
CH105	< 5	2	< 5	< 100	< 1	87	10	100	< 50	< 1	< 2	9.0	< 2	< 100	6	< 0.5	16	0.07	31	< 10	0.5	< 0.5	< 10	0.4	< 200	< 1	< 1	< 20	0.5	5.1	36	< 5	12000	< 500
CH106	< 5	9	9	340	< 1	120	52	26	< 50	4	< 2	7.0	5	< 100	23	< 0.5	9	1.00	< 20	230	0.7	6.7	< 10	4.5	< 200	< 1	< 1	< 20	7.2	4.5	206	< 5	17000	< 500
CH107	< 5	39	29	< 100	< 1	840	10	71	< 50	< 1	< 2	>10.0	< 2	< 100	10	< 0.5	29	< 0.05	< 20	< 10	1.6	2.1	< 10	1.2	< 200	< 1	< 1	< 20	1.1	8.9	130	< 5	>20000	< 500
CH108	< 5	19	12	130	< 1	19	20	10	90	1	< 2	9.5	3	< 100	15	< 0.5	6	0.21	26	140	1.0	4.4	< 10	2.8	< 200	< 1	< 1	< 20	5.1	7.7	140	< 5	5100	< 500
CH109	15	97	42	< 260	< 1	150	10	190	< 50	1	< 2	>10.0	< 2	< 100	14	< 0.5	38	< 0.05	< 20	< 10	2.3	1.0	< 10	3.1	< 200	< 1	< 1	< 20	0.6	79.2	339	< 5	>20000	< 500
CH110	21	104	37	< 100	3	340	10	40	< 50	< 1	< 2	>10.0	4	< 100	9	< 0.5	49	< 0.05	< 20	< 10	0.6	< 0.5	< 10	0.9	< 200	< 1	< 1	< 20	< 0.5	19.0	677	< 5	>20000	< 500
CH111	41	54	65	< 100	5	21	10	62	69	< 1	< 2	>10.0	4	< 100	< 5	< 0.5	49	0.07	< 20	< 10	0.9	< 0.5	13	1.3	< 200	< 1	< 1	< 20	< 0.5	41.0	567	< 5	6700	< 500
CH112	< 5	6	< 5	< 100	2	< 10	10	< 10	82	3	< 2	>10.0	4	< 100	9	< 0.5	6	0.05	< 20	34	1.1	6.6	< 10	0.7	< 200	< 1	< 1	< 20	9.4	17.0	89	< 5	2800	< 500
CH113	< 5	74	19	< 100	< 1	< 10	10	< 10	51	< 1	< 2	>10.0	< 2	< 100	< 5	< 0.5	15	< 0.05	< 20	< 10	0.4	1.1	< 10	0.5	< 200	< 1	< 1	< 20	< 0.5	19.0	1050	< 5	2400	< 500
CH114	21	93	45	< 100	1	< 10	10	< 10	< 50	< 1	< 2	>10.0	< 2	< 100	< 5	< 0.5	110	< 0.05	32	< 10	1.6	0.8	13	0.4	< 200	< 1	< 1	< 20	1.5	10.0	180	< 5	7900	< 500
CH115	< 5	13	31	330	< 1	29	20	16	82	2	< 2	4.8	2	< 100	11	< 0.5	4	< 0.05	34	160	0.9	4.0	< 10	2.1	< 200	< 1	< 1	< 20	4.2	6.3	37	< 5	6000	< 500
CH116	7	35	23	< 100	1	30	10	14	62	1	< 2	>10.0	< 2	< 100	< 5	< 0.5	41	< 0.05	< 20	< 10	1.7	2.2	< 10	0.8	< 200	< 1	< 1	< 20	1.2	8.9	130	< 5	5700	< 500
CH117	7	14	28	< 100	1	< 10	10	75	< 50	2	< 2	>10.0	< 2	< 100	7	< 0.5	7	0.07	24	< 10	1.5	< 0.5	< 10	0.8	< 200	< 1	< 1	< 20	< 0.5	2.7	140	< 5	2000	< 500
CH118	42	118	31	< 100	1	24	40	41	100	1	< 2	>10.0	< 2	< 100	33	< 0.5	56	0.06	< 20	< 10	4.4	5.6	< 10	2.4	< 200	< 1	< 1	< 20	0.8	18.0	190	< 5	4900	560
CH119	< 5	28	11	< 100	1	22	32	94	94	< 1	< 2	>10.0	< 2	< 100	28	< 0.5	< 2	0.06	39	< 10	5.3	6.8	< 10	2.6	< 200	< 1	< 1	< 20	0.8	17.0	100	< 5	3900	< 500
CH120	< 5	26	46	< 100	3	20	23	27	140	1	< 2	>10.0	4	< 100	16	< 0.5	38	0.06	< 20	49	1.5	8.4	< 10	2.3	< 200	< 1	< 1	< 20	2.3	6.8	110	< 5	11000	< 500
CH121	< 5	14	11	110	3	< 10	57	14	99	1	2	8.7	4	< 100	40	< 0.5	8	0.31	< 20	19	3.0	17.0	< 10	4.5	< 200	1	< 1	< 20	1.5	17.0	327	< 5	1900	< 500
CH122	< 5	89	56	< 100	< 1	< 10	13	< 10	140	3	< 2	3.5	3	< 100	9	< 0.5	4	< 0.05	23	36	3.9	3.3	< 10	1.0	< 200	< 1	< 1	< 20	1.6	6.1	29	< 5	3200	< 500
CH123	< 5	29	30	< 100	3	36	31	160	110	4	< 2	>10.0	3	< 100	21	< 0.5	50	0.20	< 20	< 10	1.4	6.2	13	3.0	< 200	< 1	< 1	< 20	3.9	27.0	21	< 5	1800	< 500
CH124	< 5	31	20	< 100	2	< 10	63	210	99	2	< 2	>10.0	< 2	< 100	36	< 0.5	6	0.06	< 20	< 10	0.7	2.8	13	5.2	< 200	< 1	< 1	< 20	3.9	25.0	13	< 5	1900	< 500
CH125	8	14	120	< 450	2	28	70	65	67	2	< 2	>10.0	3	< 100	53	< 0.5	< 5	0.05	< 20	< 10	1.4	4.1	12	4.6	< 200	< 1	< 1	< 20	2.8	139.0	18	< 5	11000	< 500

Appendix C.--Neutron activation multi-element analytical data for samples analyzed by Bondar-Clegg & Company Ltd.--Continued.

Sample No.	Ag (Ppm)	As (Ppm)	Au (Ppb)	Ba (Ppm)	Br (Ppm)	Cd (Ppm)	Ce (Ppm)	Co (Ppm)	Cr (Ppm)	Cs (Ppm)	Eu (Ppm)	Fe (Pct)	Hf (Ppm)	Ir (Ppb)	La (Ppm)	Lu (Ppm)	Mo (Ppm)	Na (Pct)	Ni (Ppm)	Rb (Ppm)	Sb (Ppm)	Sc (Ppm)	Se (Ppm)	Sm (Ppm)	Sn (Ppm)	Ta (Ppm)	Tb (Ppm)	Te (Ppm)	Th (Ppm)	U (Ppm)	W (Ppm)	Yb (Ppm)	Zn (Ppm)	Zr (Ppm)
CH126	< 5	33	77	600	8	27	10	< 10	92	3	< 2	>10.0	5	< 100	10	< 0.5	12	0.14	< 20	410	1.1	4.7	< 10	0.6	< 200	< 1	< 1	< 20	4.6	13.0	14	< 5	4000	< 500
CH127	< 5	94	390	< 100	< 1	20	10	< 10	130	< 1	< 2	>10.0	3	< 100	< 5	< 0.5	5	< 0.05	< 20	23	3.4	1.9	11	0.4	< 200	< 1	< 1	< 20	1.1	10.0	22	< 5	2400	< 500
CH128	9	64	4140	< 100	1	23	34	53	130	< 1	< 2	>10.0	5	< 100	25	0.7	14	< 0.05	< 20	< 10	14.0	7.9	< 10	1.7	< 200	< 1	< 1	< 20	1.3	6.9	552	< 5	6600	< 500
CH129	15	126	250	< 100	1	70	10	29	190	1	< 2	5.0	< 2	< 100	< 5	< 0.5	12	< 0.05	25	18	29.2	0.8	< 10	0.4	< 200	< 1	< 1	< 20	0.7	5.1	27	< 5	7200	< 500
CH130	20	124	270	< 100	1	180	10	55	110	2	< 2	>10.0	< 2	< 100	5	< 0.5	55	< 0.05	< 20	< 10	15.0	1.0	< 10	0.7	< 200	< 1	< 1	< 20	0.7	8.4	66	< 5	>20000	< 500
CH131	10	199	230	< 100	1	80	10	14	89	< 1	< 2	>10.0	< 2	< 100	6	< 0.5	10	< 0.05	< 20	< 10	11.0	2.8	19	0.7	< 200	< 1	< 1	< 20	1.1	10.0	39	< 5	>20000	< 500
CH132	< 5	25	53	< 100	2	67	10	15	< 50	< 1	< 2	>10.0	< 2	< 100	11	< 0.5	< 2	< 0.05	< 20	< 21	0.8	0.6	< 10	0.5	< 200	< 1	< 1	< 20	< 0.5	14.0	12	< 5	9900	< 500
CH133	11	28	593	< 100	2	13	10	< 10	180	< 1	< 2	>10.0	< 2	< 100	10	< 0.5	6	< 0.05	< 20	< 10	3.1	2.3	< 10	0.6	< 200	< 1	< 1	< 20	< 0.5	6.7	23	< 5	1100	< 500
CH134	8	33	120	< 320	4	25	230	500	79	< 1	3	>10.0	< 2	< 100	150	< 0.5	< 2	< 0.05	< 20	< 10	2.0	1.9	< 10	19.0	< 200	< 1	3	< 20	2.2	98.9	24	13	2900	< 500
CH135	< 5	35	310	< 100	< 1	960	10	110	75	< 1	< 2	>10.0	< 2	< 100	14	< 0.5	4	< 0.05	< 20	83	2.3	2.7	< 10	2.6	< 200	< 1	< 1	< 20	2.6	13.0	14	< 5	>20000	< 500
CH136	< 5	55	6	< 100	< 1	< 10	23	< 10	100	< 1	< 2	>10.0	3	< 100	11	< 0.5	5	0.43	< 20	< 10	1.4	2.1	< 10	2.1	< 200	< 1	< 1	< 20	2.8	2.4	180	< 5	< 200	< 500
CH137	>100	13	20	< 100	1	280	10	140	160	2	< 2	5.8	< 2	< 100	9	< 0.5	55	0.09	41	27	2.6	2.9	180	1.8	< 200	< 1	< 1	56	1.7	2.0	50	< 5	>20000	< 500
CH138	13	25	< 5	< 100	1	< 10	62	32	220	3	< 2	4.3	3	< 100	39	< 0.5	3	0.55	110	52	18.0	19.0	< 10	5.1	< 200	2	< 1	< 20	2.6	6.5	8	< 5	2500	< 500
CH139	>100	47	9	< 100	< 1	180	21	190	98	< 1	< 2	>10.0	< 2	< 100	9	< 0.5	11	< 0.05	43	< 10	3.0	< 0.5	< 10	1.3	< 200	< 1	< 1	34	< 0.5	5.8	334	< 5	>20000	< 500
CH140	< 5	7	75	920	8	25	48	15	< 50	2	< 2	1.1	4	< 100	22	< 0.5	< 2	1.30	< 20	290	0.8	4.0	< 10	5.1	< 200	< 1	< 1	< 20	11.0	3.6	3	< 5	2600	< 500
CH141	7	7	7	540	< 1	< 10	73	20	70	3	< 2	2.1	5	< 100	34	< 0.5	3	2.00	43	200	1.3	4.6	< 10	5.2	< 200	< 1	< 1	< 20	16.0	4.4	7	< 5	770	< 500
CH142	< 5	73	< 5	480	1	< 10	93	100	52	2	< 2	6.1	4	< 100	61	< 0.5	11	0.56	48	160	3.1	3.4	< 10	7.0	< 200	< 1	< 1	< 20	11.0	5.1	67	< 5	1600	< 500
CH143	< 5	26	< 5	< 100	< 1	< 10	44	61	210	2	< 2	4.7	4	< 100	22	< 0.5	7	0.28	100	19	10.0	11.0	< 10	4.5	< 200	2	1	< 20	3.4	4.7	14	< 5	360	< 500
CH144	< 5	17	< 5	130	45	< 10	48	13	190	149	< 2	4.5	< 2	< 100	31	< 0.5	< 2	1.00	36	64	3.1	9.0	< 10	5.9	< 200	1	< 1	< 20	9.0	6.2	3	< 5	260	< 500
CH145	< 5	14	< 5	440	< 1	< 10	49	< 10	71	5	< 2	3.8	4	< 100	25	0.7	< 2	1.30	< 20	160	1.4	3.7	< 10	3.5	< 200	< 1	< 1	< 20	11.0	5.4	8	< 5	< 200	< 500
CH146	< 5	8	< 5	150	< 1	< 10	83	16	53	1	< 2	3.8	5	< 100	41	0.6	6	2.40	< 20	47	1.1	5.1	< 10	4.9	< 200	< 1	< 1	< 20	9.4	4.8	8	< 5	< 200	< 500
CH147	< 5	7	< 5	740	< 1	< 10	61	58	120	3	< 2	3.3	6	< 100	25	0.8	3	2.30	33	250	1.2	4.6	< 10	4.8	< 200	< 1	< 1	< 20	17.0	5.2	4	< 5	< 200	< 500
CH148	< 5	104	< 5	< 100	< 1	< 10	17	12	130	< 1	< 2	>10.0	< 2	< 100	13	< 0.5	5	0.06	< 20	< 10	1.2	2.0	< 10	2.0	< 200	< 1	< 1	< 20	3.3	5.0	60	< 5	< 200	< 500
CH149	< 5	26	< 5	< 100	< 1	< 10	16	< 10	150	< 1	< 2	4.7	< 2	< 100	12	< 0.5	7	< 0.05	< 20	< 10	1.0	1.0	< 10	1.1	< 200	< 1	< 1	< 20	1.4	3.3	43	< 5	< 200	< 500
CH150	80	27	11	< 100	1	28	10	110	120	< 1	< 2	>10.0	< 2	< 100	< 5	< 0.5	2	< 0.05	94	< 10	1.3	1.4	< 10	1.3	< 200	< 1	< 1	< 20	0.7	3.0	150	< 5	17000	< 500
CH151	< 5	50	< 5	280	1	< 10	29	25	130	17	< 2	4.1	< 2	< 100	12	0.7	< 2	0.32	78	150	3.6	8.9	< 10	2.9	< 200	1	< 1	< 20	1.2	2.5	2	< 5	< 200	< 500
CH152	< 5	65	< 5	290	< 1	< 10	23	29	210	26	< 2	3.9	< 2	< 100	15	< 0.5	26	0.22	100	320	2.6	14.0	< 10	3.6	< 200	2	< 1	< 20	1.8	1.6	17	< 5	< 200	< 500
CH153	< 5	9	< 5	260	5	< 10	53	27	< 50	6	< 2	4.7	4	< 100	25	0.7	3	1.60	38	92	2.7	11.0	< 10	5.6	< 200	< 1	< 1	< 20	7.1	2.5	6	< 5	760	< 500
CH154	< 5	4	< 5	320	< 1	< 10	52	21	72	15	< 2	4.6	5	< 100	24	0.6	< 2	1.20	< 20	110	0.8	13.0	< 10	5.7	< 200	< 1	< 1	< 20	6.9	2.3	2	< 5	< 200	< 500
CH155	< 5	5	< 5	< 100	< 1	< 10	34	51	140	< 1	< 2	5.3	4	< 100	17	0.9	2	0.41	23	< 10	3.8	8.7	< 10	4.2	< 200	< 1	< 1	< 20	5.0	5.0	< 2	< 5	< 200	< 500
CH156	< 5	14	< 5	530	6	< 10	37	44	290	12	< 2	5.7	4	< 100	17	0.8	< 2	1.40	130	100	2.7	19.0	< 10	4.2	< 200	2	1	< 20	2.7	2.6	< 2	< 5	< 200	< 500
CH157	< 5	8	< 5	350	12	< 10	29	17	180	13	< 2	3.2	< 2	< 100	14	0.6	< 2	1.20	39	93	2.2	28.0	< 10	4.0	< 200	< 1	< 1	< 20	1.1	1.9	3	< 5	< 200	< 500
CH158	< 5	13	< 5	150	8	< 10	44	32	300	11	< 2	5.0	5	< 100	23	0.7	< 2	0.85	83	72	3.7	18.0	< 10	4.8	< 200	2	< 1	< 20	2.0	2.4	3	< 5	590	< 500
CH159	>100	8	210	< 100	6	330	10	250	< 50	4	< 2	6.0	< 2	< 100	< 5	0.6	5	0.07	85	< 10	10.0	0.9	31	0.3	< 200	< 1	< 1	83	< 0.5	5.2	1470	< 5	>20000	< 500
CH160	>100	< 1	50	< 100	6	280	10	190	130	< 1	< 2	4.7	< 2	< 100	< 5	< 0.5	5	< 0.05	56	< 10	4.1	< 0.5	240	0.5	< 200	< 1	< 1	230	< 0.5	1.6	1310	< 5	>20000	< 500
CH161	< 5	36	14	470	2	< 10	88	62	180	2	< 2	>10.0	3	< 100	53	1.5	11	0.07	110	84	4.3	14.0	< 10	7.4	< 200	< 1	< 1	< 20	6.3	11.0	6	< 5	< 200	< 500
CH162	9	76	31	< 100	< 1	< 10	10	36	150	< 1	< 2	>10.0	< 2	< 100	< 5	< 0.5	4	< 0.05	< 20	< 10	1.8	2.0	57	0.9	< 200	< 1	< 1	170	0.6	2.6	130	< 5	< 200	< 500
CH163	>100	24	< 5	< 100	2	< 10	15	12	100	< 1	< 2	7.8	< 2	< 100	7	0.7	< 2	< 0.05	< 20	11	8.9	1.2	66	1.9	< 200	< 1	< 1	< 20	1.6	2.3	319	< 5	< 200	< 500
CH164	6	6	< 5	100	< 1	< 10	46	20	130	3	< 2	4.5	4	< 100	23	0.9	< 2	0.37	38	27	4.7	15.0	< 10	4.5	< 200	1	< 1	< 20	8.1	4.4	25	< 5	210	< 500
CH165	< 5	10	< 5	< 100	< 1	< 10	41	13	270	< 1	< 2	7.2	2	< 100	24	0.6	< 2	0.14	54	< 10	7.7	16.0	< 10	4.2	< 200	2	< 1	< 20	2.2	3.1	100	< 5	300	< 500
CH166	< 5	7	< 5	180	4	< 10	56	18	200	7	< 2	2.7	5	< 100	24	0.7	< 2	1.10	59	110	1.9	15.0	< 10	5.7	< 200	1	< 1	< 20	6.7	2.1	8	< 5	< 200	< 500
CH167	< 5	18	< 5	< 100	1	< 10	45	18	70	8	< 2	3.3	2	< 100	23	0.7	< 2	0.09	40	73	2.8	11.0	< 10	3.9	< 200	1	< 1	< 20	5.4	5.5	5	< 5	< 200	< 500

Appendix C.--Neutron activation multi-element analytical data for samples analyzed by Bondar-Clegg & Company Ltd.--Continued.

Sample No.	Ag (Ppm)	As (Ppm)	Au (Ppb)	Ba (Ppm)	Br (Ppm)	Cd (Ppm)	Ce (Ppm)	Co (Ppm)	Cr (Ppm)	Cs (Ppm)	Eu (Ppm)	Fe (Pct)	Hf (Ppm)	Ir (Ppb)	La (Ppm)	Lu (Ppm)	Mo (Ppm)	Na (Pct)	Ni (Ppm)	Rb (Ppm)	Sb (Ppm)	Sc (Ppm)	Se (Ppm)	Sm (Ppm)	Sn (Ppm)	Ta (Ppm)	Tb (Ppm)	Te (Ppm)	Th (Ppm)	U (Ppm)	W (Ppm)	Yb (Ppm)	Zn (Ppm)	Zr (Ppm)
CH168	< 5	7	< 5	480	< 1	< 10	46	17	96	10	< 2	3.3	3	< 100	22	0.7	< 2	1.40	43	150	1.0	12.0	< 10	5.0	< 200	2	< 1	< 20	8.3	3.0	5	< 5	< 200	< 500
CH169	< 5	17	7	650	< 1	< 10	65	24	160	10	< 2	3.5	4	< 100	25	0.8	3	0.66	52	310	0.9	14.0	< 10	5.8	< 200	1	< 1	< 20	12.0	3.0	3	< 5	< 200	< 500
CH170	< 5	40	< 5	< 100	3	< 10	10	< 10	150	< 1	< 2	>10.0	< 2	< 100	9	0.7	4	0.06	< 20	< 10	6.0	5.1	< 10	1.7	< 200	< 1	< 1	< 20	2.1	3.8	752	< 5	< 200	< 500
CH171	32	38	27	< 100	3	< 10	18	150	100	< 1	< 2	>10.0	4	< 100	9	0.9	< 2	< 0.05	80	< 10	9.4	7.6	< 10	2.5	< 200	< 1	< 1	< 20	4.0	5.0	219	< 5	4000	< 500
CH172	>100	24	62	200	12	< 10	10	34	< 50	< 1	< 2	>10.0	< 2	< 100	< 5	0.7	36	< 0.05	32	< 10	13.0	0.7	48	0.4	< 200	< 1	< 1	110	0.7	2.8	1720	< 5	270	< 500
CH173	51	98	< 5	< 100	5	< 10	160	24	< 50	< 1	4	>10.0	< 2	< 100	77	1.9	31	0.08	< 20	< 10	112.0	8.0	12	11.0	< 200	< 1	< 1	< 20	3.5	13.0	490	< 5	< 200	< 500
CH174	85	14	14	< 100	3	< 10	12	66	120	4	< 2	>10.0	3	< 100	10	0.8	17	0.15	80	30	3.6	8.7	< 10	2.1	< 200	< 1	< 1	< 20	1.7	2.2	357	< 5	< 200	< 500
CH175	14	31	26	170	6	< 10	86	34	92	2	< 2	>10.0	< 2	< 100	40	1.2	< 2	0.13	< 20	< 10	26.5	7.0	< 10	5.2	< 200	< 1	< 1	< 20	3.7	4.5	687	< 5	< 200	< 500
CH176	< 5	17	< 5	< 100	< 1	< 10	42	17	160	< 1	< 2	6.3	3	< 100	19	0.8	< 2	< 0.05	23	< 10	20.3	7.3	< 10	4.2	< 200	< 1	< 1	< 20	4.0	5.2	76	< 5	< 200	< 500
CH177	>100	27	51	< 100	1	< 10	10	16	99	< 1	< 2	>10.0	< 2	< 100	12	0.8	15	< 0.05	< 20	< 10	3.5	5.7	44	2.4	< 200	< 1	< 1	28	3.6	2.1	475	< 5	990	< 500
CH178	37	46	38	< 100	10	18	10	48	86	< 1	< 2	>10.0	< 2	< 100	< 5	0.6	3	< 0.05	45	< 10	28.1	1.4	19	1.2	< 200	< 1	< 1	< 20	0.5	6.7	160	< 5	6600	< 500
CH179	>100	133	64	210	2	17	10	48	73	1	< 2	>10.0	< 2	< 100	< 5	0.7	3	< 0.05	50	< 10	8.9	2.1	16	0.8	< 200	< 1	< 1	< 20	0.6	9.4	64	< 5	3100	< 500
CH180	>100	28	11	110	4	< 10	10	23	93	< 1	< 2	>10.0	< 2	< 100	< 5	0.5	49	< 0.05	< 20	< 10	4.9	3.0	10	1.0	< 200	< 1	< 1	47	1.5	3.8	240	< 5	490	< 500
CH181	>100	54	47	< 100	14	72	10	120	< 50	< 1	< 2	>10.0	< 2	< 100	8	< 0.5	29	< 0.05	48	< 10	125.0	1.9	18	0.5	< 200	< 1	< 1	< 20	1.2	3.0	100	< 5	18000	< 500
CH182	>100	13	8	< 100	3	< 10	10	100	76	< 1	< 2	>10.0	12	< 100	< 5	< 0.5	94	< 0.05	< 20	< 10	6.8	3.4	51	2.1	< 200	< 1	< 1	85	6.8	2.8	66	< 5	950	1100
CH183	8	209	< 5	110	1	< 10	10	53	< 50	< 1	< 2	>10.0	< 2	< 100	< 5	< 0.5	52	< 0.05	< 20	< 10	12.0	2.4	25	0.6	< 200	< 1	< 1	< 20	3.2	2.6	73	< 5	1100	< 500
CH184	< 5	18	< 5	110	2	< 10	13	12	72	1	< 2	3.0	< 2	< 100	7	< 0.5	2	0.05	26	13	2.2	7.1	< 10	2.1	< 200	< 1	< 1	< 20	1.9	1.9	2	< 5	< 200	< 500
CH185	26	5	6	< 100	1	< 10	51	34	160	< 1	< 2	5.8	4	< 100	32	< 0.5	3	0.08	52	< 10	3.6	13.0	< 10	5.3	< 200	1	< 1	< 20	11.0	2.8	< 2	< 5	1100	< 500
CH186	< 5	344	29	< 100	2	< 10	10	16	73	< 1	< 2	>10.0	< 2	< 100	< 5	< 0.5	21	< 0.05	< 20	< 10	5.7	1.3	24	0.6	< 200	< 1	< 1	41	2.9	4.9	10	< 5	700	< 500
CH187	< 5	32	32	< 100	2	< 10	10	65	< 50	< 1	< 2	>10.0	< 2	< 100	< 5	< 0.5	6	< 0.05	< 20	21	3.1	2.0	24	0.8	< 200	< 1	< 1	< 20	1.1	1.1	54	< 5	< 200	< 500
CH188	< 5	24	6	600	< 1	< 10	18	< 10	280	20	< 2	2.7	< 2	< 100	8	< 0.5	10	0.06	< 20	250	2.5	4.4	< 10	0.9	< 200	< 1	< 1	< 20	3.0	5.9	15	< 5	< 200	< 500
CH189	71	28	140	< 100	3	< 10	42	71	120	3	< 2	>10.0	5	< 100	22	< 0.5	78	< 0.05	83	87	9.0	5.7	44	2.1	< 200	< 1	< 1	130	3.8	5.4	100	< 5	230	< 500
CH190	85	98	93	< 100	3	< 10	10	200	< 50	1	< 2	>10.0	4	< 100	< 5	< 0.5	56	< 0.05	< 20	24	8.0	1.1	81	< 0.2	< 200	< 1	< 1	140	1.2	7.2	190	< 5	480	< 500
CH191	15	55	15	150	< 1	< 10	10	40	67	9	< 2	9.1	< 2	< 100	< 5	< 0.5	< 2	0.16	< 20	110	6.6	9.3	12	1.4	< 200	< 1	< 1	< 20	0.8	1.7	150	< 5	500	< 500
CH192	75	49	390	< 100	1	57	10	46	130	< 1	< 2	>10.0	< 2	< 100	< 5	< 0.5	< 2	< 0.05	< 20	< 10	20.6	3.1	120	1.0	< 200	< 1	< 1	65	< 0.5	0.8	40	< 5	5000	< 500
CH193	< 5	17	14	< 100	< 1	< 10	25	38	< 50	2	< 2	>10.0	5	< 100	14	< 0.5	3	0.07	< 20	20	4.2	5.8	< 10	3.7	< 200	< 1	< 1	< 20	2.8	4.3	160	< 5	< 200	< 500
CH194	54	27	340	< 100	2	< 10	36	35	< 50	< 1	< 2	7.9	3	< 100	21	< 0.5	53	0.05	< 20	< 10	16.0	4.9	40	3.5	< 200	< 1	< 1	66	2.7	5.0	81	< 5	1600	< 500
CH195	31	18	42	< 100	< 1	350	19	71	58	4	< 2	3.8	< 2	< 100	9	< 0.5	89	< 0.05	42	29	11.0	2.8	< 10	1.9	< 200	< 1	< 1	< 20	2.3	3.9	< 2	< 5	>20000	< 500
CH196	11	371	788	430	2	14	45	< 10	210	20	< 2	2.2	< 2	< 100	39	< 0.5	47	0.08	< 20	240	19.0	4.3	< 10	7.3	< 200	< 1	1	< 20	6.3	5.0	4	< 5	1100	< 500
CH197	18	116	19	200	5	20	15	12	72	21	< 2	3.2	< 2	< 100	12	< 0.5	16	0.09	34	290	3.7	14.0	< 10	3.1	< 200	1	< 1	< 20	2.3	11.0	16	< 5	3600	< 500
CH198	55	44	64	< 100	2	150	17	25	220	1	< 2	3.0	< 2	< 100	< 5	< 0.5	68	0.06	< 20	< 10	53.3	2.4	< 10	0.8	< 200	< 1	< 1	< 20	0.6	2.7	< 2	< 5	>20000	< 500
CH199	< 5	14	< 5	8600	3	< 10	10	16	65	2	< 2	7.5	< 2	< 100	< 5	< 0.5	9	1.00	< 20	< 10	23.9	7.1	< 10	1.1	< 200	< 1	< 1	< 20	< 0.5	2.6	< 2	< 5	740	< 500
CH200	< 5	20	8	8200	2	< 10	20	29	110	12	< 2	4.8	< 2	< 100	8	< 0.5	5	1.10	65	160	14.0	15.0	< 10	2.5	< 200	< 1	< 1	< 20	< 0.5	2.3	< 2	< 5	2200	< 500
CH201	< 5	4	< 5	780	< 1	< 10	28	20	180	9	< 2	6.3	3	< 100	13	0.7	< 2	2.50	65	140	3.0	31.0	< 10	4.7	< 200	< 1	1	< 20	1.2	0.7	< 2	< 5	230	< 500
CH202	>100	642	< 120	< 1000	152	< 120	160	< 25	< 520	< 4	< 16	< 1.4	< 16	< 650	< 5	< 4.2	120	< 2.00	< 140	< 100	4460.0	< 1.9	< 100	0.5	< 3300	< 3	< 1	< 360	< 7.0	< 5.8	< 33	120	2200	< 3300
CH203	>100	233	< 33	< 340	3	< 30	49	< 10	460	< 1	< 5	0.8	< 6	< 210	< 5	1.6	33	< 0.15	65	< 45	1170.0	< 0.5	< 32	0.7	< 1300	< 1	< 1	< 120	4.2	2.2	8	28	730	< 1300
CH204	>100	504	< 85	< 710	94	< 81	110	< 21	< 350	< 3	< 11	< 1.0	< 11	< 430	< 5	< 2.8	30	< 1.30	< 100	< 72	2830.0	< 1.4	< 67	< 0.2	< 2200	3	< 1	< 240	< 4.8	< 3.8	< 22	55	8800	< 2400
CH205	86	111	< 24	250	12	< 22	35	< 10	310	< 1	< 2	< 0.5	< 5	< 100	< 5	1.0	14	< 0.11	< 20	< 33	746.0	< 0.5	< 23	0.3	< 970	< 1	< 1	< 86	< 1.7	< 0.5	< 2	24	730	< 500
CH206	8	1020	< 15	210	12	< 10	24	16	< 110	9	< 2	2.2	< 2	< 100	10	0.9	< 2	< 0.05	< 20	66	306.0	2.9	< 10	1.4	< 620	< 1	< 1	< 56	< 1.3	3.2	< 2	10	2000	< 500
CH207	19	879	< 31	< 320	5	< 28	46	< 10	< 180	< 1	< 7	3.8	< 6	< 100	5	< 1.2	12	< 0.14	89	< 44	1030.0	< 0.5	< 30	0.9	< 1200	1	< 1	< 110	< 2.1	5.1	< 2	31	4300	< 1300
CH208	31	841	110	2400	5	990	26	< 10	< 50	3	< 2	1.3	< 2	< 100	6	< 0.5	27	< 0.05	< 20	< 10	14.0	0.9	< 10	1.2	< 200	< 1	< 1	< 20	1.0	3.5	< 2	< 5	>20000	< 500
CH209	< 5	387	34	2200	2	< 10	10	15	67	45	< 2	8.4	< 2	< 100	7	< 0.5	2	0.15	< 20	370	16.0	30.0	< 10	3.9	< 200	< 1	< 1	< 20	2.5	1.4	8	< 5	< 200	< 500
CH210	< 5	93	16	8800	< 1	< 10	10	< 10	180	12	< 2	1.8	< 2	< 100	7	< 0.5	21	0.19	< 20	110	7.9	6.7	< 10	1.5	< 200	< 1	< 1	< 20	2.3	2.6	3	< 5	440	< 500

Appendix C.--Neutron activation multi-element analytical data for samples analyzed by Bondar-Clegg & Company Ltd.--Continued.

Sample No.	Ag (Ppm)	As (Ppm)	Au (Ppb)	Ba (Ppm)	Br (Ppm)	Cd (Ppm)	Ce (Ppm)	Co (Ppm)	Cr (Ppm)	Cs (Ppm)	Eu (Ppm)	Fe (Pct)	Hf (Ppm)	Ir (Ppb)	La (Ppm)	Lu (Ppm)	Mo (Ppm)	Na (Pct)	Ni (Ppm)	Rb (Ppm)	Sb (Ppm)	Sc (Ppm)	Se (Ppm)	Sm (Ppm)	Sn (Ppm)	Ta (Ppm)	Tb (Ppm)	Te (Ppm)	Th (Ppm)	U (Ppm)	W (Ppm)	Yb (Ppm)	Zn (Ppm)	Zr (Ppm)
CH211	< 5	13	17	360	3	< 10	52	< 10	92	9	< 2	0.6	5	< 100	31	0.7	9	0.09	< 20	460	3.0	1.8	< 10	3.3	< 200	3	< 1	< 20	41.0	10.0	3	< 5	< 200	< 500
CH212	< 5	7	< 5	< 100	< 1	< 10	10	< 10	< 50	< 1	< 2	< 0.5	< 2	< 100	< 5	< 0.5	3	< 0.05	< 50	< 10	4.0	< 0.5	< 10	0.4	< 200	< 1	< 1	< 20	< 0.5	1.7	< 2	< 5	< 200	< 500
CH213	< 5	16	6	330	< 1	< 10	12	< 10	< 50	2	< 2	0.9	2	< 100	7	< 0.5	5	0.30	< 20	54	0.5	1.2	< 10	1.2	< 200	< 1	< 1	< 20	2.1	3.9	< 2	< 5	< 200	< 500
CH214	< 5	21	6	2800	< 1	< 10	10	< 10	< 50	< 1	< 2	1.3	< 2	< 100	< 5	< 0.5	< 2	< 0.05	< 20	< 10	1.2	0.5	< 10	0.7	< 200	< 1	< 1	< 20	0.5	3.1	< 2	< 5	< 200	< 500
CH215	< 5	44	9	1000	< 1	< 10	18	18	< 50	8	< 2	1.2	3	< 100	10	< 0.5	4	0.07	< 20	96	3.0	3.3	< 10	2.0	< 200	< 1	< 1	< 20	3.4	2.3	2	< 5	< 200	< 500

APPENDIX D

DATA FOR INDIVIDUAL MINES AND PROSPECTS IN THE CHIRICAHUA-PEDREGOSA MOUNTAINS UNIT, CORONADO NATIONAL FOREST, COCHISE COUNTY, ARIZONA

[organized geographically from northwest to southeast, generally following sample number order]

Mine Name or Mineralized Area

Clair Group mines

Location

Near Emigrant Pass (exact location unknown). SE. 1/4 Sec. 36, T. 15 S., R. 29 E.

Production

A "few tens of tons" of ore shipped in 1909 and 1910.

Development

Five claims (100 acres), first worked in 1879. Apparently idle since 1910. Development by 2 shafts, 60 ft and 100 ft deep, connected by an 80 ft tunnel.

Current Status

Inactive.

Geologic Description and Ore Mineralogy

Galena and chalcopyrite in a shear zone in faulted Pennsylvanian-Permian Naco Group limestone, cut by Tertiary dikes and plugs. One hundred-ft-shaft said to bottom in ore assaying 12-25% copper. Smelter shipment in 1909 gave returns of 23% lead, 9 oz/st silver, 1 1/2 oz/st gold.

References

Keith, 1973, p. 51
Stevens, 1911, p. 1385

Mine Name or Mineralized Area

Buckhorn Basin area

Location

Buckhorn Basin, NW. 1/4 Sec. 2, T. 16 S., R. 29 E.

Production

Unknown--small, if any.

Development

1 major shaft, measured 92 ft deep, dump size suggests several hundred feet of workings.
1 shaft 15 ft deep
1 small pit
1 adit--less than 100 ft in length.

Current Status

Inactive.

Miscellaneous

Samples CH 1-4, plate 1.
Over 500 tons of dump material adjacent to major shaft. Several smaller dumps adjacent to the other workings.

Geologic Description and Ore Mineralogy

Workings on and near contact with Horquilla Limestone and granitic rock. Major fault, altered rock, abundant pyrite containing minor amount of gold.

References

Richter and Lawrence, 1983, p. 52.
Drewes, 1981.

Mine Name or Mineralized Area

King of Lead Mine

Location

Inside NE. corner of the Chiricahua National Monument. NE. 1/4 Sec. 18, T. 16 S., R. 30 E.

Production

About 360 st of ore between 1927 and 1970; generally high lead and silver content with varying amounts of zinc; low values for copper and silver.

Development

1 300-ft-long adit
1 caved adit
1 35-ft-long adit
2 short shafts

Current Status

5 patented claims, patented in 1905 and 1914.

Miscellaneous

Permission not granted to examine claims.

Geologic Description and Ore Mineralogy

Lead-zinc mineralized faults and disseminated minerals in Permian limestone, intruded by Tertiary dikes. In the Apache Pass Fault Zone. Ore minerals consist of galena and sphalerite, with some secondary copper and lead minerals.

References

Keith, 1973, p. 53.

Mine Name or Mineralized Area

Hilltop Mine (four major levels: Kasper Tunnel, Grey Tunnel, Rhem Tunnel, Blacksmith Tunnel)

Location

Between North Fork Pinery Creek and East Whitetail Creeks, east of the Chiricahua National Monument. Secs. 32, 33, T. 16 S., R. 30 E.; Secs. 4, 5, T. 17 S., R. 30 E.

Production

1881-1923	Intermittent production--no production records.
1924-1926	11,370 st ore, yielding approximately 5,150,000 lb lead, 57,600 oz silver.
1938-1941	Small amount of production.
1949-1951	Small amount of production.
1952-1953	8,055 st ore, yielding approximately 18,800 oz silver, 1,775,000 lb lead, 1,137,000 lb zinc, 57,500 lb copper.
1954	Small amount of production.

No production records since 1954. One production figure for entire California district for 1902-1954 gives 28,700 st ore and concentrates yielding 290 oz gold, 117,000 oz silver, 4,035 st lead, 582 st zinc, and 176 st copper. At today's metal prices this production would be worth about $5 MM. By far the majority of this production came from the Hilltop Mine.

Development

Approximately 26,500 ft (about 5 mi) of workings on 4 major levels: 1) Kasper Tunnel, 2) Grey Tunnel, 3) Rhem Tunnel, 4) Blacksmith Tunnel.

Current Status

Unpatented mining claims, inactive.

Miscellaneous

Samples CH 28-32.
Large dump at Kasper Tunnel portal, SW. side of mountain. More than 20,000 st of dump material. No dump at Kasper Tunnel portal northeast side of mountain. Large dump at Grey Tunnel portal, may be 8,000 st of dump material. Large dump at Rhem level portal, may be partially on private land. Constant flow of water draining out of Rhem level through PVC pipe.

Geologic Description and Ore Mineralogy

Ore shoots occur in Permian sedimentary rocks controlled mainly by high angle shear faults. Four major deposit types are 1) chimney or irregular replacement deposits, 2) vein deposits, 3) bedding replacement deposits, and 4) secondary or oxidized ore deposits.

References

Badger, 1911, p. 663
Bigsby, 1983, p. 4
Brittain, 1954, 97 p.
Drewes and Williams, 1973, p. A5

Mine Name or Mineralized Area

Shaft between Kasper Tunnel and Hands Pass

Location

SW. 1/4 sec. 32, T. 16 S., R. 30 E.

Production

Most likely none.

Development

23-ft-deep shaft.

Current Status

Inactive.

Miscellaneous

Sample CH 27, fig. 3.
About 100 st dump.

Geologic Description and Ore Mineralogy

Quartzite, some altered; sparse pyrite and galena.

References

None

Mine Name or Mineralized Area

Adit north of Kasper Tunnel (named Blacksmith West Adit by Brittain, 1954)

Location

SW. 1/4 sec. 33, T. 16 S., R. 30 E.

Production

Most likely none.

Development

Adit, 300 ft of workings.

Current Status

Inactive

Miscellaneous

Samples CH 25-26, fig. 9.

Geologic Description and Ore Mineralogy

Quartzite, altered and brecciated areas and fault zones; limonite gouge in faults. Contact with a limestone unit near the face.

References

Brittain, 1954.

Mine Name or Mineralized Area

Lead Lily Shaft

Location

W. 1/4 sec. 33, T. 16 S., R. 30 E.

Production

Small, if any.

Development

Trench, 40 x 10 x 5 ft deep; mostly sloughed in.

Current Status

Inactive.

Miscellaneous

Sample CH 24, fig. 3.
about 60 st of dump.

Geologic Description and Ore Mineralogy

Rock on dump mostly altered limestone, bleached white; minor galena, malachite.

References

None.

Mine Name or Mineralized Area

Trench N. of Lead Lily Shaft

Location

W. 1/4 sec. 33, T. 16 S., R. 30 E.

Production

Most likely none.

Development

Trench, 40 x 10 x 5 ft deep; mostly sloughed in.

Current Status

Inactive.

Miscellaneous

Sample CH 23, fig. 3.
Small dump.

Geologic Description and Ore Mineralogy

Rock on dump mostly altered limestone; minor chalcopyrite, galena, malachite, sphalerite.

References

None.

Mine Name or Mineralized Area

Decline NW. of Lead Lily Shaft

Location

1/2 secs. 32, 33, T. 16 S., R. 30 E.

Production

Probably none.

Development

Decline; estimated 80 ft of workings.

Current Status

Inactive.

Miscellaneous

Sample CH 14, fig. 3.

Geologic Description and Ore Mineralogy

Major fault zone in altered and bleached limestone, minor limonite. About 100 st of dump.

References

None.

Mine Name or Mineralized Area

Adit NW of Lead Lily Shaft

Location

1/2 secs. 32,33, T. 16 S., R. 30 E.

Production

Most likely none.

Development

Adit, more than 330 ft of workings.

Current Status

Inactive.

Miscellaneous

Samples CH 15-22, fig. 8.
About 400 tons of dump.

Geologic Description and Ore Mineralogy

Limestone and altered limestone. Several major fault zones consisting of brecciated, altered limestone and limonitic, clayey gouge.

References

None.

Mine Name or Mineralized Area

Adit NW. of Lead Lily Shaft

Location

1/2 secs. 32, 33, T. 16 S., R. 30 E.

Production

Probably none.

Development

Adit, at least 100 ft of workings.

Current Status

Inactive.

Miscellaneous

Samples CH 11-13, fig. 7.
About 100 tons of dump material.

Geologic Description and Ore Mineralogy

Altered, brecciated limestone; intermixed white, altered, powdery rock. In or near major fault zone.

References

None.

Mine Name or Mineralized Area

Adit in upper Blumberg Canyon (named Eureka Lower Adit by Brittain, 1954)

Location

NE. 1/4 sec 32, T. 16 S., R. 30 E.

Production

Likely small production of lead and zinc, possible copper--no records.

Development

Adit, more than 850 ft of workings on main level. At least 2 sublevels, inaccessible. Stoping of unknown extent.

Current Status

Inactive.

Miscellaneous

Samples CH 5-10, fig. 6.

Geologic Description and Ore Mineralogy

Fault zones with irregular ore shoots containing galena, sphalerite, chalcopyrite, pyrite, malachite; some epidote, calcite, and limonitic gouge. Host rock is limestone, altered limestone, and marble.

References

Brittain, 1954.

Mine Name or Mineralized Area

Hilltop Extension

Location

Northeast of the Hilltop Mine, near East Whitetail Creek
From SE. 1/4 sec. 28 to SW. 1/4 sec. 34, T. 16 S., R. 30 E.

Production

Four hundred st of ore shipped intermittently from 1923 to 1940. Lead and silver were the major commodities produced.

Development

"Tunnel" workings of unknown extent.

Current Status

Patented land, inactive.

Miscellaneous

Permission not granted to examine workings.

Geologic Description and Ore Mineralogy

Base metal sulfides and carbonates in quartz veins and replacement deposits in silicified and tilted Paleozoic limestones cut by intrusives.

References

Keith, 1973, p. 52.

Mine Name or Mineralized Area

Sullivan Mine

Location

Northeast of the Hilltop Mine, near East Whitetail Creek.
Secs. 33, 34, T. 16 S., R. 30 E.

Production

About 10 st of ore in 1915, and 2,160 st of ore between 1943-1945. Copper and silver were the major commodities produced.

Development

As of May, 1943 development consisted of a 60-ft-deep shaft with a 120-ft-long crosscut; an 80-ft-long adit; a 35-ft-decline; an 80-ft-long adit with stoping to surface 60-ft deep, 18-ft diameter; numerous shallow surface cuts. No references as to additional work since.

Current Status

Patented claims (in 1943 the property consisted of 14 patented claims), inactive.

Miscellaneous

Permission not granted to examine property.

Geologic Description and Ore Mineralogy

Ore occurs in shear zones in rhyolite, near contact with limestone. Minerals consist of chalcocite, malachite, azurite, chrysocolla, chalcopyrite, and bornite. Grade of ore averaged about 4% copper and 4 oz/st silver, with a minute amount of gold.

References

Keith, 1973, p. 54.
Kumke, 1947, 4 p.

Mine Name or Mineralized Area

Adit NE. of Rieder Tunnel

Location

South of East Whitetail Creek.
SW. 1/4 sec. 34, T. 16 S., R. 30 E.

Production

Likely none.

Development

675-ft of adit workings, raise to surface about 60 ft.

Current Status

Inactive.

Miscellaneous

Fig. 16, samples CH 56-58.

Geologic Description and Ore Mineralogy

Barren limestone, some is marbleized, two major fault zones.
About 1400 st of dump material.

References

None.

Mine Name or Mineralized Area

Decline west of Rieder Tunnel.

Location

South of East Whitetail Creek.
SW. 1/4 sec. 34, T. 16 S., R. 30 E.

Production

Likely none.

Development

35-ft-long decline.

Current Status

Inactive.

Miscellaneous

Figure 11, sample CH 33.
About 160 st of dump material.

Geologic Description and Ore Mineralogy

Irregular fault zone containing massive chalcopyrite and galena, in altered limestone. Abundant malachite and azurite stains. Minor epidote.

References

None.

Mine Name or Mineralized Area

Rieder Tunnel

Location

South of East Whitetail Creek
SW. 1/4 sec. 34, T. 16 S., R. 30 E.

Production

Small, if any.

Development

300 ft of adit development with a 40-ft-long raise to the surface.

Current Status

Inactive.

Miscellaneous

Fig. 13, samples CH 38-44.
Approximately 1,000 st of dump.
A full case of old dynamite is near the face.

Geologic Description and Ore Mineralogy

Numerous faults in limestone, irregular occurrences of minerals consisting of galena, sphalerite, chalcopyrite, pyrite, malachite. Faults consist of altered limestone, some silicified; limonitic gouge.

References

None.

Mine Name or Mineralized Area

Adit SW. of Rieder Tunnel

Location

South of East Whitetail Creek.
SW 1/4 sec 34, T. 16 S., R. 30 E.

Production

Likely none.

Development

Adit, estimated 150 ft of workings.

Current Status

Inactive.

Miscellaneous

Sample CH 46.
Deep water inside portal.
About 200 st of dump material.

Geologic Description and Ore Mineralogy

Limestone, minor amount of ore material on dump containing sphalerite, galena, chalcopyrite, and pyrite.

References

None.

Mine Name or Mineralized Area

Adit SE. of Rieder Tunnel

Location

South of East Whitetail Creek.
SE. 1/4 sec. 34, T. 16 S., R. 30 E.

Production

Likely none.

Development

75-ft-long adit with a short raise to the surface.

Current Status

Inactive.

Miscellaneous

Fig. 14, Samples CH 47-50.

Geologic Description and Ore Mineralogy

Limestone, contact with altered latite porphyry near face. Altered, fine-grained, igneous dike in limestone. Contact between limestone and altered latite porphyry intrusion near face. Several high-angle faults. Minor amount of chalcopyrite and malachite in one fault.

References

None.

Mine Name or Mineralized Area

Short adit east of the Rieder Tunnel.

Location

South of East Whitetail Creek.
S 1/4 sec. 34, T. 16 S., R. 30 E.

Production

None.

Development

25-ft-long adit.

Current Status

Inactive.

Miscellaneous

Sample CH 51.
Small dump.

Geologic Description and Ore Mineralogy

Barren limestone with fault zone at portal consisting of fractured and sheared limestone with intermixed limonitic gouge.

References

None.

Mine Name or Mineralized Area

Adit east of Rieder Tunnel

Location

South of East Whitetail Creek.
SW. 1/4 sec. 34, T., 16 S., R. 30 E.

Production

Likely none.

Development

200 ft of adit workings.

Current Status

Inactive.

Miscellaneous

Fig. 15, samples CH 52-55.

Geologic Description and Ore Mineralogy

Three major fault zones in limestone consisting of altered and brecciated limestone, clayey gouge. Minor amount of lead, zinc, and copper minerals in the faults.

References

None.

Mine Name or Mineralized Area

Adit west of Rieder Tunnel

Location

South of East Whitetail Creek
SW 1/4 sec. 34, T. 16 S., R. 30 E.

Production

Likely none.

Development

125-ft-long adit with a 45 ft decline.

Current Status

Inactive.

Miscellaneous

Fig. 12, samples CH 34-37.
Small dump, most of dump has been eroded away by intermittent stream.
Live blasting caps in adit.

Geologic Description and Ore Mineralogy

One major fault zone and several minor faults in limestone and altered limestone. Fault zones contain brecciated, altered limestone and limonitic, clayey gouge. Minor amount of disseminated pyrite, chalcopyrite, and galena.

References

None.

Mine Name or Mineralized Area

Caved adit SE. of the Hilltop Mine.

Location

Near the head of an easterly branch of the North Fork of Pinery Creek.
NW. 1/4 sec. 4, T. 17 S., R. 30 E.

Production

Unknown, likely small if any.

Development

Caved adit, size of dump indicates at least several hundred ft of workings, maybe up to 1,000 ft.

Current Status

Inactive.

Miscellaneous

Sample CH 59, Plate 1.
Approximately 6,000 tons of dump material.

Geologic Description and Ore Mineralogy

Both limestone and quartzite present on dump, and a small amount of altered limestone with fine disseminated pyrite.

References

None.

Mine Name or Mineralized Area

Adit SE. of Kasper Tunnel

Location

Near upper tributary of North Fork of Pinery Canyon.
SW. 1/4 sec. 4, T. 17 S., R. 30 E.

Production

Small, if any.

Development

50-ft-long adit; decline of unknown extent, likely small.

Current Status

Inactive.

Miscellaneous

Fig. 16, samples CH 60-64.
Small amount of dump material, most has been eroded away by an intermittent stream.

Geologic Description and Ore Mineralogy

Quartzite, some alteration. An irregular zone of mineralization with abundant galena and sphalerite; minor chalcopyrite, malachite, and chrysocolla.

References

None.

Mine Name or Mineralized Area

Silver Prince Mine

Location

About 1.1 mi southwest of the Hilltop Mine, near the North Fork of Pinery Creek.
S. center sec. 5, N. center sec. 8, T. 17 S., R. 30 E.

Production

A few tons of ore produced in 1949.

Development

An adit with at least 380 ft of workings.
A shaft with workings of unknown extent, may connect with adit, measured 50-ft deep.
An adjacent adit 70-ft long.

Current Status

Inactive.

Miscellaneous

Samples CH 65-72.
Main adit dump approx. 500 st.
Shaft dump approx. 300 st.
Short adit dump approx. 20 st.
At time of visit water was being siphoned out of main adit through a garden hose at the rate of approx. 30 gal/hr

Geologic Description and Ore Mineralogy

Quartz and limestone units with common shear zones. Minor pyrite. Minor amount of ore material on dumps containing altered rock, skarn, epidote, pyrite, galena, sphalerite. No ore minerals observed in situ.

References

Keith, 1973, p. 54.

Mine Name or Mineralized Area

El Tigre Mine

Location

South slope of Pinery Canyon, south of Forest Road 42.
SW 1/4 sec. 21, NW 1/4 sec. 28, T. 17 S., R. 30 E.

Production

Intermittent production between 1941-1982 yielding 11 oz gold, 2,662 oz silver, 73 lb copper.

Table from Tsuji, 1984, p. 17

Years	Tonnage	Ag (oz/st)	Operator
1941-1942	?	>25(?)	W. S. Samson
1942-1945(?)	200	8	W. S. Samson
1945-1946	few 10's	?	W. S. Samson
1948	?	13	W. S. Samson
1964	210	6-7	R. Pursely and E. Riggs
1973	732	? (silica flux)	NONCO, Inc.
1974	700-800	0.75-1.10	Tamco Mining and Milling
	2,200-2,300		

Development

Five major adits of unknown extent; could be over 1,000 ft of workings; 3 of the adits were connected by winzes and raises. Three adits are currently partially accessible. Also three short adits, one now accessible. Recent bulldozing and trenching between upper and lower adits (probably done during the early to mid 1980's).

Current Status

Inactive.

Miscellaneous

Figs. 20, 21; samples CH 73-75.
A number of small- to- medium-sized dumps.
Common bulldozing scars.
Loose and dangerous rock in lower adit.
See resource calculations on following page.

Geologic Description and Ore Mineralogy

A major fault vein in altered limestone and shale with intermixed volcanics, trending about N. 50° W., dipping between 68° to 76° NE. A massive quartz-silica and calcite vein with both stockwork-type mineralization and sheeting, with common gouge. Widespread alteration in wall rock adjacent to the vein. Acanthite is the principal ore mineral.

References

Tsuji, 1984.

Table from Tsuji, 1984, p. 130

Tonnage calculations of quartz-silica at the El Tigre Mine and south of Turkey Park

Location of vein	Horizontal Distance (feet)	Elevation Difference (feet)	Width (feet)	Volume (ft^3)	Tonnage (st)	Minimum Au (oz/st)	Minimum Ag (oz/st)	Au (oz)	Ag (oz)
El Tigre Mine, top of continuous outcrops to level of lower adit.	700	250	max. 22	1,925,000	157,850	0.005	0.52	789[1]	82,082[2]
			min. 6	525,000	43,050	0.005	0.52	215[1]	22,386[2]
South of Turkey Park									
North-Northwest sector	1,250	420	max. 26	6,825,000	559,650	0.005	0.18	2,798	100,737
			min. 12	3,150,000	258,300	0.005	0.18	1,292	46,494
South-Southwest sector	300	160	ave. 6	144,000	11,808	0.005	0.18	59	2,125

1. Includes 11 oz gold recovered since 1941.
2. Includes 2,662 oz silver recovered since 1941.

Mine Name or Mineralized Area

Pine-Zinc Mine

Location

Near the intersection of Pinery Canyon and the North Fork of Pinery Canyon. NW. 1/4 sec 17, T. 17 S., R. 30 E.

Production

About 365 st of ore produced during 1947-1949.

Development

Shallow workings.

Current Status

Inactive

Miscellaneous

These workings could not be located during the present field investigation.

Geologic Description and Ore Mineralogy

"Oxidized lead-zinc mineralization, probably along fracture zone cutting Cretaceous beds" (Keith, 1973, p. 54).

References

Keith, 1973, p. 54.
Tsuji, 1984, p. 2, 16.

Mine Name or Mineralized Area

Prospect near Onion Saddle

Location

Near Onion Saddle, upper tributary of Pinery Canyon
1\2 secs. 21, 22, T. 17 S., R. 30 E.

Production

Small, if any.

Development

Open cut, 25 x 12 x 20 ft deep at face.

Current Status

Inactive

Miscellaneous

Plate 1, samples CH 76, 77.
Small dump.

Geologic Description and Ore Mineralogy

Major fault, at least 5 ft thick, limonitic gouge, altered quartzite, near contact with quartz monzonite; irregular mineralized zones in and adjacent to fault with chalcopyrite, bornite, sphalerite, galena.

References

None.

Mine Name or Mineralized Area

Short adit in upper Jhus Canyon

Location

Upper Jhus Canyon
NE. 1/4 sec 15, T. 17 S., R. 30 E.

Production

None

Development

Adit, 28-ft long.

Current Status

Inactive

Miscellaneous

Plate 1: sample CH 78.
Small dump.

Geologic Description and Ore Mineralogy

Heavily iron-stained and altered rock; appearance of quartzite; no structure or mineralization in adit; wide area of alteration at surface.

References

None.

Mine Name or Mineralized Area

Adit northeast of the Chiricahua Mine.

Location

Near a south tributary of Jhus Canyon.
E. 1/2 sec 14, T. 17 S., R. 30 E.

Production

Likely none.

Development

Adit, 120 ft of workings; several small pits.

Current Status

Inactive.

Miscellaneous

Figs. 22, 23; samples CH 79-82.
About 150-200 tons of dump material.

Geologic Description and Ore Mineralogy

Altered rock (probably granodiorite porphyry); limonitic gouge, fractured gossan; numerous fractures and faults; minor malachite stains; hematite ochre; wide area of alteration at surface.

References

None.

Mine Name or Mineralized Area

Shaft northwest of Chiricahua Mine

Location

Near south tributary of Jhus Canyon.
E. 1/2 sec. 14, T. 17 S., R. 30 E.

Production

None

Development

22-ft-deep shaft.

Current Status

Inactive

Miscellaneous

Figure 22, sample CH 83.
Small dump.

Geologic Description and Ore Mineralogy

Granodiorite porphyry; altered, silicified rock; finely disseminated chalcopyrite, sphalerite; malachite stains.

References

None.

Mine Name or Mineralized Area

Adit northwest of Chiricahua Mine

Location

Head of south tributary of Jhus Canyon.
SE. 1/4 sec. 14, T. 17 S., R. 30 E.

Production

None

Development

25-ft-long adit.

Current Status

Inactive

Miscellaneous

Figure 22, samples CH 84-85.
Small dump.

Geologic Description and Ore Mineralogy

Small tactite zone in altered and brecciated limestone, greenish-brown garnets, limonite, malachite stains.

References

None.

Mine Name or Mineralized Area

Prospect pit northwest of Chiricahua Mine

Location

Head of south tributary of Jhus Canyon.
SE. 1/4 sec. 14, T. 17 S., R. 30 E.

Production

None

Development

Prospect pit, 10 ft diameter, 4 ft deep, mostly sloughed in.

Current Status

Inactive

Miscellaneous

Figure 22, sample CH 86.
Small dump.

Geologic Description and Ore Mineralogy

Zone of altered limestone, extent of alteration unknown due to ground cover; small amount of altered rock contains malachite, chalcopyrite, chalcocite, limonite, minor bornit.

References

None.

Mine Name or Mineralized Area

Adit near Chiricahua Mine shaft

Location

About 1 1/2 mi northwest of Paradise, about 200 ft NNW. of the Chiricahua Mine shaft.
SE 1/4 sec. 14, T. 17 S., R. 30 E.

Production

Likely none.

Development

Adit, caved at 490 ft from portal.

Current Status

Inactive.

Miscellaneous

Figs. 22, 24; samples CH 87-92.

Geologic Description and Ore Mineralogy

Limestone with varying amounts of alteration and marbleization; adit intersected two altered igneous dikes, several narrow faults and a tactite zone. Abundant pyrite at places, sparse malachite stains.

References

None.

Mine Name or Mineralized Area

Chiricahua Mine

Location

At the head of an unnamed intermittent stream, about 1 1/2 mi NW. of Portal. SE 1/4 sec. 14, T. 17 S., R. 30 E.

Production

Small, if any.

Development

Reported 480-ft-deep shaft with several levels of workings. Now caved and a glory hole about 50 ft across and 30 ft deep.

Current Status

Inactive.

Miscellaneous

Fig. 22.
Approx. 6,000 st of dump.
Old foundation of a mill nearby.

Geologic Description and Ore Mineralogy

Shaft collar on or adjacent to near vertical contact between limestone and granitic rock. No ore minerals seen on dump; shaft reportedly sunk on weak copper mineralization.

References

Dale and others, 1960, p. 16.

Mine Name or Mineralized Area

Working 1/3 mi northeast of Chiricahua Mine

Location

Near a south fork of Jhus Canyon.
Center E. 1/4 sec. 13, T. 17 S., R. 30 E.

Production

Unknown, likely small copper and zinc production.

Development

Multi-level underground mine with raises, winzes, and stopes. More than 1,600 ft of accessible portion mapped. Could be several hundred ft of inaccessible workings.

Current Status

Inactive.

Miscellaneous

Figs. 22, 25-27; samples CH 93-122.
An old road leads to the mine from Jhus Canyon, now impassable by 4-wheel-drive vehicles.
Two large dumps mostly grown over with vegetation.

Geologic Description and Ore Mineralogy

Major gossan zone up to 100 ft diameter, in altered limestone; near contact with an igneous body. Abundant pyrite and malachite irregularly distributed in gossan. Prominent faults in mine. Common gouge, limonite stains; minor epidote.

References

Dale and others, 1960, p. 16-17.

Mine Name or Mineralized Area

Adits northeast of the Chiricahua Mine.

Location

Near a southern branch of Jhus Canyon.
Center W. 1/4 sec 13, T. 17 S., R. 30 E.

Production

Likely none.

Development

Two adjacent adits with 385 ft of workings.

Current Status

Inactive.

Miscellaneous

Figs. 22, 28; samples CH 123-133.
At the end of an old road out of Jhus Canyon, now impassable by 4-wheel-drive vehicles.
About 500 st dump material.

Geologic Description and Ore Mineralogy

Gossan; highly altered, iron-rich rock; hematite; limonite; gouge; malachite stains. Contact with marble and recrystallized limestone.

References

None.

Mine Name or Mineralized Area

Caved shaft northeast of Chiricahua Mine.

Location

Near a south branch of Jhus Canyon.
NW. 1/4 sec. 13, T. 17 S., R. 30 E.

Production

Unknown, possibly small production.

Development

Shaft of unknown extent, size of dump suggests several hundred ft of workings.

Current Status

Inactive, caved.

Miscellaneous

Samples CH 134-135, fig. 22.
At the end of an old road out of Jhus Canyon, now impassable by 4-wheel-drive vehicle.
Large dump--more than 1,000 st of dump material.

Geologic Description and Ore Mineralogy

Most of rock on dump is altered limestone, some granitic porphyry rock. A small amount of ore material on dump containing chalcopyrite, sphalerite, and magnetite. Outcrop near shaft consists of gossan, altered rock, limonitic gouge; near contact with igneous body.

References

None.

Mine Name or Mineralized Area

Prospect pit near Texas Mine group

Location

At head of intermittent stream west of Galeyville.
SE 1/4 sec 13, T. 17 S., R. 30 E.

Production

None.

Development

Prospect pit 10 x 8 x 3 ft deep.

Current Status

Inactive.

Miscellaneous

Sample 136, fig. 28.
Small dump.

Geologic Description and Ore Mineralogy

Altered zone in andesite porphyry, oriented N. 38° W., vertical dip; fractured rock, abundant epidote, close to contact with limestone.

References

None.

Mine Name or Mineralized Area

Texas Mine group--shaft

Location

At head of intermittent stream west of Galeyville.
SE 1/4 sec 13, T. 17 S., R. 30 E.

Production

Small, if any.

Development

20-ft-deep shaft with decline at bottom, of unknown extent, but at least 20 ft long.

Current Status

Inactive.

Miscellaneous

Samples 137, 138; fig. 28.
About 50 st of dump.

Geologic Description and Ore Mineralogy

Irregular fault in limestone with zones and pockets of mineralized and altered limestone. Epidote, galena, sphalerite, and pyrite.

References

None.

Mine Name or Mineralized Area

Texas Mine group, upper adit

Location

About 0.4 mi west of Galeyville.
SE 1/4 sec 13, T. 17 S., R. 30 E.

Production

Small, if any.

Development

Caved adit, size of dump indicates 60-80 ft of workings.

Current Status

Inactive.

Miscellaneous

Samples CH 139, fig. 28.
About 150 st dump.

Geologic Description and Ore Mineralogy

Altered and recrystallized limestone, Minor amount of rock on dump contains chalcopyrite, sphalerite, malachite, azurite.

References

Dale and others, 1960, p. 14-15.
Keith, 1973, p. 54.

Mine Name or Mineralized Area

Texas Mine group, upper adit

Location

About 0.4 mi west of Galeyville.
SE 1/4 sec 13, T. 17 S., R. 30 E.

Production

Small, if any.

Development

Adit, more than 120 ft of workings.

Current Status

Inactive.

Miscellaneous

Samples CH 140-144, fig. 28, 29.
Rockfall and loose rock 90 ft from portal.
About 800 st dump.

Geologic Description and Ore Mineralogy

Adit in fault-contact between limestone and volcanic rock; altered brecciated limestone, quartz fragments, limonitic and clayey gouge; minor amount of pyrite on dump.

References

Dale and others, 1960, p. 14-15.
Keith, 1973, p. 54.

Mine Name or Mineralized Area

Texas Mine group, lower adits

Location

About 0.4 mi west of Galeyville.
SE 1/4 sec 13, T. 17 S., R. 30 E.

Production

Small, if any.

Development

One adit with 315 ft of workings, adjacent to and across intermittent stream from a 35-ft-long adit.

Current Status

Inactive.

Miscellaneous

Samples CH 145-152; fig. 28, 30.
Small dumps; most of the dump material has been eroded away by an intermittent stream.

Geologic Description and Ore Mineralogy

The larger adit is in limestone with 2 quartz monzonite bodies, fault zones on contact between rock types, with altered rock and minor amounts of limonite, epidote, pyrite, and garnets. A small ore stockpile contained galena, sphalerite, malachite stains, and garnets. The smaller adit intersected a contact between altered limestone and an altered dike. Two small faults had altered rock, clayey gouge, limonite, and minor pyrite.

References

Dale and others, 1960, p. 14-15.
Keith, 1973, p. 54.

Mine Name or Mineralized Area

Columbia Mine-lower adit

Location

Southwest of and near Galeyville.
SE 1/4 sec 13, t. 17 S., R. 30 E.

Production

Likely none.

Development

315-ft-long adit.

Current Status

Inactive.

Miscellaneous

Samples CH 153-156; fig. 28, 31.
About 350 tons of dump material.

Geologic Description and Ore Mineralogy

Dark-colored, altered limestone; prominent fault; limonite, gouge, chlorite, epidote, pyrite.

References

Dale and others, 1960, p. 12-13.
Keith, 1973, p. 52.

Mine Name or Mineralized Area

Columbia Mine, middle adit

Location

Southwest of and near Galeyville.
SE 1/4 sec 13, T. 17 S., R. 30 E.

Production

Small, if any.

Development

Adit, over 140 ft of workings.

Current Status

Inactive.

Miscellaneous

Samples CH 157-158; fig. 28, 32.
About 250 st of dump.

Geologic Description and Ore Mineralogy

Altered limestone, 2 paralleling prominent faults; limonite, gouge, epidote, pyrite.

References

Dale and others, 1960, p. 12, 13.
Keith, 1973, p. 52.

Mine Name or Mineralized Area

Columbia Mine, upper adit

Location

Southwest of and near Galeyville.
SE 1/4 sec 13, T. 17 S., R. 30 E.

Production

About 50 st of high-grade base-and precious-metal ore. Small amount of tungsten ore.

Development

Adit, at least 110 ft of workings; stope to surface 20 ft deep.

Current Status

Inactive.

Miscellaneous

Samples CH 159, 160; fig. 28, 32.
About 400 st of dump.

Geologic Description and Ore Mineralogy

Altered limestone; 2 major paralleling faults; gouge, limonite, pyrite, malachite stains, epidote. Small amount of ore material on dump containing sphalerite, galena, chalcopyrite.

References

Dale and others, 1960, p. 12, 13.
Keith, 1973, p. 52.

Mine Name or Mineralized Area

Unnamed decline

Location

About 600 ft NNW. of Silver Hill Mine.
NE. 1/4 sec. 24, T. 17 S., R. 30 E.

Production

None

Development

Decline about 25 ft long.

Current Status

Inactive

Miscellaneous

Sample CH 161; fig. 33
Approximately 40 st of dump.

Geologic Description and Ore Mineralogy

Prominent iron ochre zone at least 5 ft thick, in quartzite.

References

None.

Mine Name or Mineralized Area

Unnamed shaft

Location

About 500 ft N. of the Silver Hill Mine.
NE. 1/4 sec. 24, T. 17 S., R. 30 E.

Production

Likely none.

Development

30-ft-deep shaft.

Current Status

Inactive

Miscellaneous

Sample CH 162; fig. 33.
About 150 st of dump

Geologic Description and Ore Mineralogy

Quartzite, near contact with limestone. Mostly barren quartzite on dump, small amount of hematite ochre, one chunk of massive pyrite.

References

None.

Mine Name or Mineralized Area

Silver Hill Mine

Location

About 2/3 mi NW. of Paradise
NE. 1/4 sec 24, T. 17 S., R. 30 E.

Production

Approximately 180 st of base metal ore between 1890's to 1952. About 10 st of tungsten ore in 1954. Grade of ore is unknown.

Development

Two connecting adits with workings of over 900 ft.

Current Status

Inactive.

Miscellaneous

Samples CH 163-176, figs. 33, 34.
Lower dump contains about 1,100 st of dump, upper dump contains about 130 st of dump.

Geologic Description and Ore Mineralogy

Limestone and altered limestone with fault zones; igneous dikes; small, irregular tactite zones; pyrite; galena; limonitic gouge; small zones with high lead and silver concentrations; minor tungsten concentrations.

References

Keith, 1973, p. 54.
Dale and others, 1960, p. 6-10.

Mine Name or Mineralized Area

Unnamed decline

Location

Above Silver Hill Mine.
NE. 1/4 sec. 24, T. 17 S., R. 30 E.

Production

Small, if any.

Development

Decline at least 40 ft long.

Current Status

Inactive.

Miscellaneous

Sample CH 177, fig. 33.
About 60 st of dump.

Geologic Description and Ore Mineralogy

Rock on dump both limestone and quartzite; abundant iron ochre/limonitic gossan rock; epidosite.

References

None.

Mine Name or Mineralized Area

Unnamed prospect

Location

Above Silver Hill Mine.
NE. 1/4 sec. 24, T. 17 S., R. 30 E.

Production

None.

Development

Short adit.

Current Status

Inactive.

Miscellaneous

Samples CH 178, 179; fig. 33.
Small dump.

Geologic Description and Ore Mineralogy

Fault zone, highly altered limestone, hematite ochre, limonitic gossan, abundant azurite and malachite.

References

None.

Mine Name or Mineralized Area

Unnamed prospect

Location

Above Silver Hill Mine.
NE. 1/4 sec. 24, T. 17 S., R. 30 E.

Production

None.

Development

Pit, 9 x 7 x 8 ft deep.

Current Status

Inactive.

Miscellaneous

Sample CH 180, fig. 33.

Geologic Description and Ore Mineralogy

Shear zone, altered limestone, hematite ochre.

References

None.

Mine Name or Mineralized Area

Unnamed shaft

Location

South of Silver Hill Mine.
NE 1/4 sec. 24, T. 17 S., R. 30 E.

Production

Small, if any.

Development

Shaft, 42 ft deep.

Current Status

Inactive.

Miscellaneous

Sample CH 181, fig. 33.
About 150 st of dump.

Geologic Description and Ore Mineralogy

Fault zone, altered limestone, clayey gouge, epidote, galena, sphalerite.

References

None.

Mine Name or Mineralized Area

Unnamed pit

Location

25 ft from shaft at sample locality CH 181.
NE 1/4 sec 24, T. 17 S., R. 30 E.

Production

Likely none.

Development

Pit, 25 x 15 x 13 ft deep.

Current Status

Inactive.

Miscellaneous

Sample CH 182, fig. 33.
Small dump.

Geologic Description and Ore Mineralogy

Altered limestone; limonitic, clayey gouge; galena; hematite ochre; epidote.

References

None.

Mine Name or Mineralized Area

Unnamed shaft.

Location

SE. of Silver Hill Mine.
NE. 1/4 sec. 24, T. 17 S., R. 30 E.

Production

Likely none.

Development

Shaft, 38 ft deep.

Current Status

Inactive.

Miscellaneous

Sample CH 183, fig. 33.
About 150 st dump.

Geologic Description and Ore Mineralogy

Fault zone, N. 75° W., vertical dip; limonite-stained limestone; limonitic gouge; hematite ochre.

References

None.

Mine Name or Mineralized Area

Unnamed working

Location

SE. of Silver Hill Mine.
NE. 1/4 sec. 24, T. 17 S., R. 30 E.

Production

Likely none.

Development

Pit, adjacent to a 15-ft-deep shaft and a 15-ft-long decline.

Current Status

Inactive.

Miscellaneous

Sample CH 184, fig. 34.
Small dump.

Geologic Description and Ore Mineralogy

Altered, brecciated, limonite-stained limestone; limonitic gouge; hematite ochre.

References

None.

Mine Name or Mineralized Area

Unnamed shaft

Location

North of Paradise.
NE. 1/4 sec. 24, T. 17 S., R. 30 E.

Production

None.

Development

Shaft, 22 ft deep.

Current Status

Inactive.

Miscellaneous

Sample CH 185, fig. 33.
About 100 st of dump.

Geologic Description and Ore Mineralogy

Fault zone, altered limestone, limonitic gouge, near contact with volcanic rock.

References

None.

Mine Name or Mineralized Area

Unnamed shaft

Location

North of Paradise.
NE. 1/4 sec. 24, T. 127 S., R. 30 E.

Production

None.

Development

Shaft, 20 ft deep.

Current Status

Inactive.

Miscellaneous

Sample CH 186, fig. 33.
Small dump.

Geologic Description and Ore Mineralogy

Zone of intensely altered limestone, hematite ochre, epidote.

References

None.

Mine Name or Mineralized Area

Unnamed decline

Location

West of Paradise.
SW. 1/4 sec. 24, T. 17 S., R. 30 E.

Production

None.

Development

Decline, about 35 ft long.

Current Status

Inactive.

Miscellaneous

Sample CH 187, fig. 33.
About 60 st of dump.

Geologic Description and Ore Mineralogy

Fault; altered limestone; oxidized, iron-stained rock.

References

None.

Mine Name or Mineralized Area

Unnamed decline

Location

West of Paradise.
SW. 1/4 sec. 24, T. 17 S., R. 30 E.

Production

Likely none.

Development

Decline, about 35 ft long.

Current Status

Inactive.

Miscellaneous

Sample CH 188, fig. 33.
Small dump.

Geologic Description and Ore Mineralogy

Mostly barren limestone, minor amount of altered and iron-stained rock.

References

None.

Mine Name or Mineralized Area

Unnamed open cut and shaft

Location

West of Paradise,
SW. 1/4 sec. 17, T. 24 S., R. 30 E.

Production

Likely none.

Development

Open cut; connects with decline at sample site 188, and a shaft about 20 ft deep.

Current Status

Inactive.

Miscellaneous

Samples CH 189-190, fig. 33.
Small dump.

Geologic Description and Ore Mineralogy

Irregular zones of limestone replacement, limonitic gossan, altered limestone, minor malachite.

References

None.

Mine Name or Mineralized Area

Unnamed shaft

Location

NW. of Paradise, S. of Silver Hill Mine.
NE. 1/4 sec 24, T. 17 S., R. 30 E.

Production

Likely none.

Development

Shaft, 26 ft deep.

Current Status

Inactive.

Miscellaneous

Samples CH 191, figs. 33, 35.

Geologic Description and Ore Mineralogy

Altered limestone, abundant epidote, disseminated pyrite, hematite, galena, minor malachite.

References

None.

Mine Name or Mineralized Area

Unnamed shaft

Location

NW. of Paradise, S. of Silverhill Mine.
NE. 1/4 sec. 24, T. 17 S., R. 30 E.

Production

Likely none.

Development

Shaft, 35 ft deep.

Current Status

Inactive.

Miscellaneous

Sample CH 192, figs. 33, 35.
Small dump.

Geologic Description and Ore Mineralogy

Altered limestone, abundant pyrite, epidote, hematite, limonite, galena, sphalerite, malachite.

References

None.

Mine Name or Mineralized Area

Unnamed decline

Location

NW. of paradise, S. of Silver Hill Mine.
NE. 1/4-sec 24, T. 17 S., R. 30 E.

Production

None.

Development

Decline, 12 ft long.

Current Status

Inactive.

Miscellaneous

Sample CH 193, figs. 33, 35.
Small dump.

Geologic Description and Ore Mineralogy

Fault zone; limonitic, clayey gouge; altered limestone, epidote.

References

None.

Mine Name or Mineralized Area

Unnamed prospect

Location

NW. of Paradise, S. of Silver Hill Mine.
NE. 1/4 sec. 24, T. 17 S., R. 30 E.

Production

None.

Development

Pit 6 x 6 x 3 ft deep.

Current Status

Inactive.

Miscellaneous

Sample CH 194, figs. 33, 35.
Small dump.

Geologic Description and Ore Mineralogy

Fault zone; limonitic, clayey gouge; altered limestone; epidote.

References

None.

Mine Name or Mineralized Area

Leadville Mine group

Location

Borders Paradise on the west.
SE. 1/4 sec. 24, T. 17 S., R. 30 E.

Production

According to Keith, 560 st of ore produced intermittently between 1904 and 1951.
According to Dale and others, 11 carloads of high-grade lead ore was shipped after 1943.
(These 2 amounts are comparable)

Development

According to Dale and others, one shaft is 90 ft deep with a drift at the bottom 150 ft long. Another shaft is 50 ft deep.

Current Status

Patented mining claims, no apparent current mining activity.

Miscellaneous

Permission was not granted to visit these patented claims.

Geologic Description and Ore Mineralogy

"Lead and copper carbonates and sulfides with spotty scheelite in weakly silicified , locally sheared, Permian limestone intruded by porphyry dikes." (Keith, 1973, p. 53)

References

Dale and others, 1960, p. 14.
Keith, 1973, p. 53.

Mine Name or Mineralized Area

Unnamed declines

Location

1 1/3 mi east of paradise, north of Forest Route 42B.
NE. 1/4 sec. 20, T. 17 S., R. 31 E.

Production

Small, if any.

Development

Three short declines, the largest one 25 ft.

Current Status

Inactive.

Miscellaneous

Samples CH 195-198, fig. 36.
About 100 st of dump.

Geologic Description and Ore Mineralogy

Small, discontinuous replacement zones in altered limestone; in and near contact with igneous rock. Ore minerals include pyrite, chalcopyrite, galena, sphalerite, malachite, azurite.

References

None.

Mine Name or Mineralized Area

Unnamed prospect

Location

About 1.6 mi east of Paradise, north of Forest Route 42B.
NE 1/4 sec. 20, T. 17 S.,R. 31 E.

Production

Likely none.

Development

Open cut about 20-ft diameter, with adjoining 12-ft-deep adit.

Current Status

Inactive.

Miscellaneous

Samples CH 199, 200; fig. 36.
Small dump.

Geologic Description and Ore Mineralogy

Highly oxidized, altered, brecciated limestone, hematite, manganese stains.
Notable strontium present.

References

None.

Mine Name or Mineralized Area

Unnamed shaft

Location

About 1.6 mi east of Portal.
NE 1/4 sec. 20, T. 17 S., R. 31 E.

Production

Likely none.

Development

Shaft, measured 61 ft deep.

Current Status

Inactive.

Miscellaneous

Sample CH 201, figure 36.
About 400 st of dump.

Geologic Description and Ore Mineralogy

Limestone and igneous porphyry rock on dump, minor disseminated pyrite.

References

None.

Mine Name or Mineralized Area

Unnamed shafts and prospects

Location

About 1.8 mi east of Paradise, north of Forest Route 24B.
E. 1/4 sec. 21, T. 17 S., R. 30 E.

Production

Possible small production, no records.

Development

Shaft, possible 150-200 ft of workings indicated by size of dump; trench 30 x 8 x 20 ft deep; 15-ft decline.

Current Status

Inactive.

Miscellaneous

Samples CH 202-205, fig. 36.

Geologic Description and Ore Mineralogy

Calcite vein, pinches and swells from 1/2 ft to 2-1/2 ft thick, N. 40° W., vertical dip, vein has abundant disseminated galena; pyrite, malachite, minor azurite and chrysocolla. Country rock is massive, gray limestone.

References

None.

Mine Name or Mineralized Area

Unnamed decline

Location

Midway between Portal and Paradise, just north of Forest Route 42B.
SE. 1/4 sec 21, T. 17 S., R. 31 E.

Production

None.

Development

30-ft-long decline.

Current Status

Inactive.

Miscellaneous

Sample CH 206, fig. 36.
About 60 st of dump.

Geologic Description and Ore Mineralogy

Major shear zone up to 8 ft thick in limestone and altered limestone, with malachite, minor azurite and chrysocolla.

References

None.

Mine Name or Mineralized Area

Unnamed shaft

Location

Midway between Portal and Paradise, just north of Forest Route 42B.

Production

Likely none.

Development

Shaft, 42 ft deep.

Current Status

Inactive.

Miscellaneous

Sample CH 207, fig. 36.
About 200 st dump.

Geologic Description and Ore Mineralogy

Major shear zone about 5 ft thick, in limestone and altered limestone. Malachite and minor azurite and chrysocolla.

References

None.

Mine Name or Mineralized Area

Grace Mine

Location

1 mi southeast of Portal
NE. 1/4 sec. 36, T. 17 S., R. 31 E.

Production

Small, if any.

Development

110-ft-deep shaft, 230 ft of drifting on 2 levels.

Current Status

Inactive.

Miscellaneous

Sample CH 208, fig. 37
About 200 st of dump.

Geologic Description and Ore Mineralogy

Limestone, several faults and fracture zones, spotty galena and sphalerite, minor malachite.

References

Bureau of Mines files.

Mine Name or Mineralized Area

Adit, adjacent to Grace Mine

Location

About 1 mi southeast of Portal.
NE 1/4 sec. 36, T., 17 S., R. 31 E.

Production

Likely none.

Development

Adit, at least 100 ft of workings.

Current Status

Inactive.

Miscellaneous

Sample CH 209, fig. 37.
Dangerous, loose rock in adit.
About 100 st of dump.

Geologic Description and Ore Mineralogy

Flat-lying contact between competent limestone and fractured, altered, iron-stained rock.

References

None.

Mine Name or Mineralized Area

Unnamed pit and trench

Location

About 1 mi southeast of Portal.
E. 1/2 sec 36, T. 17 S., R. 31 E.

Production

None.

Development

Pit, 10 ft diameter, 5 ft deep.
Trench, 20 x 10 x 4 ft deep.

Current Status

Inactive.

Miscellaneous

Samples CH 210, 211; fig. 37.
Small dumps

Geologic Description and Ore Mineralogy

Pit: limestone and silicified limestone; common limonite staining, minor pyrite.
Trench: altered, bleached limestone; shear zone 6 in. thick, clayey gouge.

References

None.

Mine Name or Mineralized Area

Unnamed shaft

Location

About 1 mi southeast of Portal.
SE 1/4 sec. 36, T. 17 S., R. 31 E.

Production

None

Development

Small shaft.

Current Status

Inactive.

Miscellaneous

Sample CH 212, fig. 37.
Small dump.

Geologic Description and Ore Mineralogy

Limestone and marble, finely disseminated pyrite, close to contact with volcanic rock.

References

None.

Mine Name or Mineralized Area

Unnamed shaft

Location

About 1 mi southeast of Portal.
SE 1/4 sec. 36, T. 17 S., R. 31 E.

Production

None.

Development

Shaft; about 30 ft deep.

Current Status

Inactive.

Miscellaneous

Sample CH 213, fig. 37.
Small dump.

Geologic Description and Ore Mineralogy

Marbleized limestone; abundant, very fine disseminated pyrite, and thin stringers of pyrite; near contact with volcanic rock.

References

None.

Mine Name or Mineralized Area

Unnamed pit

Location

About 1 mi southeast of Portal.
SE 1/4 sec. 36, T. 17 S., R. 31 E.

Production

None.

Development

Pit, 20 ft diameter, 12 ft deep.

Current Status

Inactive.

Miscellaneous

Sample CH 214, fig. 37.
Small dump.

Geologic Description and Ore Mineralogy

Dike, highly altered, weathered, fractured; abundant fine disseminated pyrite.

References

None.

Mine Name or Mineralized Area

Unnamed shaft

Location

About 1 mi southeast of Portal.
SE 1/4 sec. 36, T. 17 S., R. 31 E.

Production

None.

Development

Shaft, approximately 35 ft deep.

Current Status

Inactive.

Miscellaneous

Sample CH 215, fig. 37.
Small dump.

Geologic Description and Ore Mineralogy

Marbleized limestone; abundant fine disseminated pyrite.

References

None.

APPENDIX E

MINE LOCATION AND MINE MAP FIGURES FOR THE CHIRICAHUA-PEDEGROSA MOUNTAINS UNIT, CORONADO NATIONAL FOREST, COCHISE COUNTY, ARIZONA

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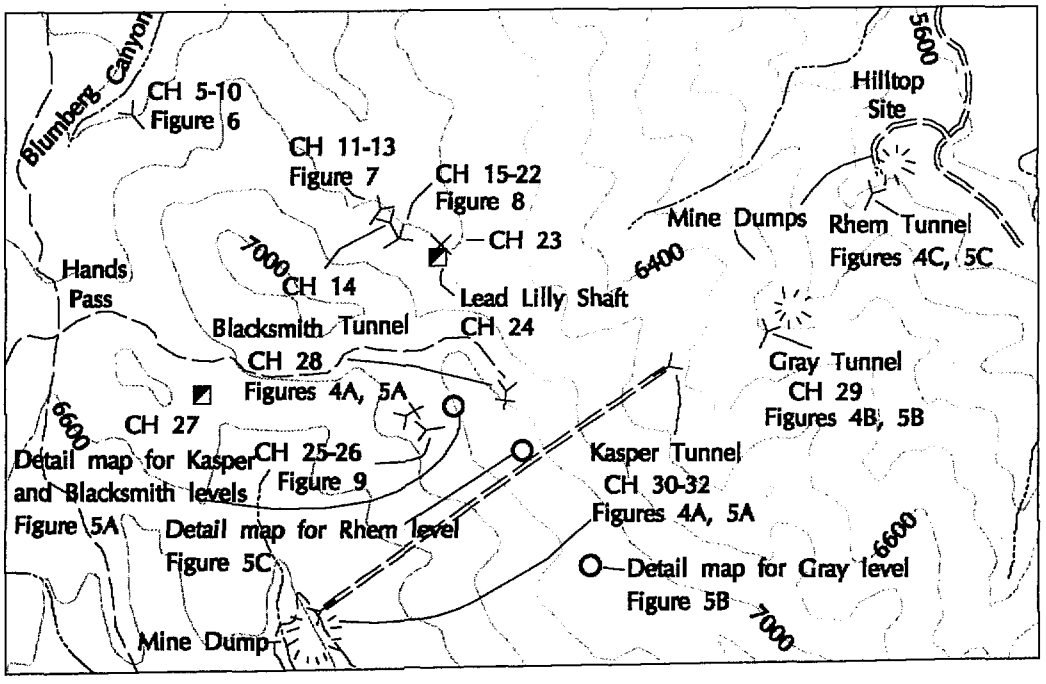
MINE LOCATION AND MINE MAP FIGURES FOR THE CHIRICAHUA-PEDEGROSA MOUNTAINS UNIT, CORONADO NATIONAL FOREST, COCHISE COUNTY, ARIZONA



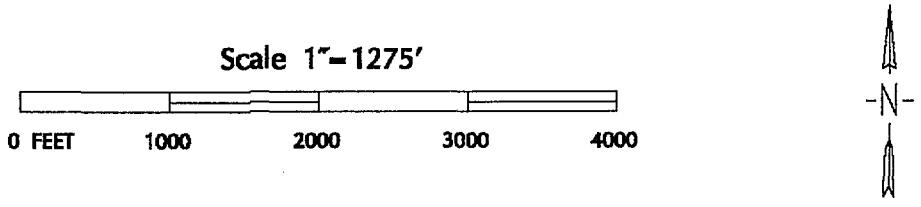


Figure 3.--Map of the Hilltop mine and area showing sample localities CH 5-32.

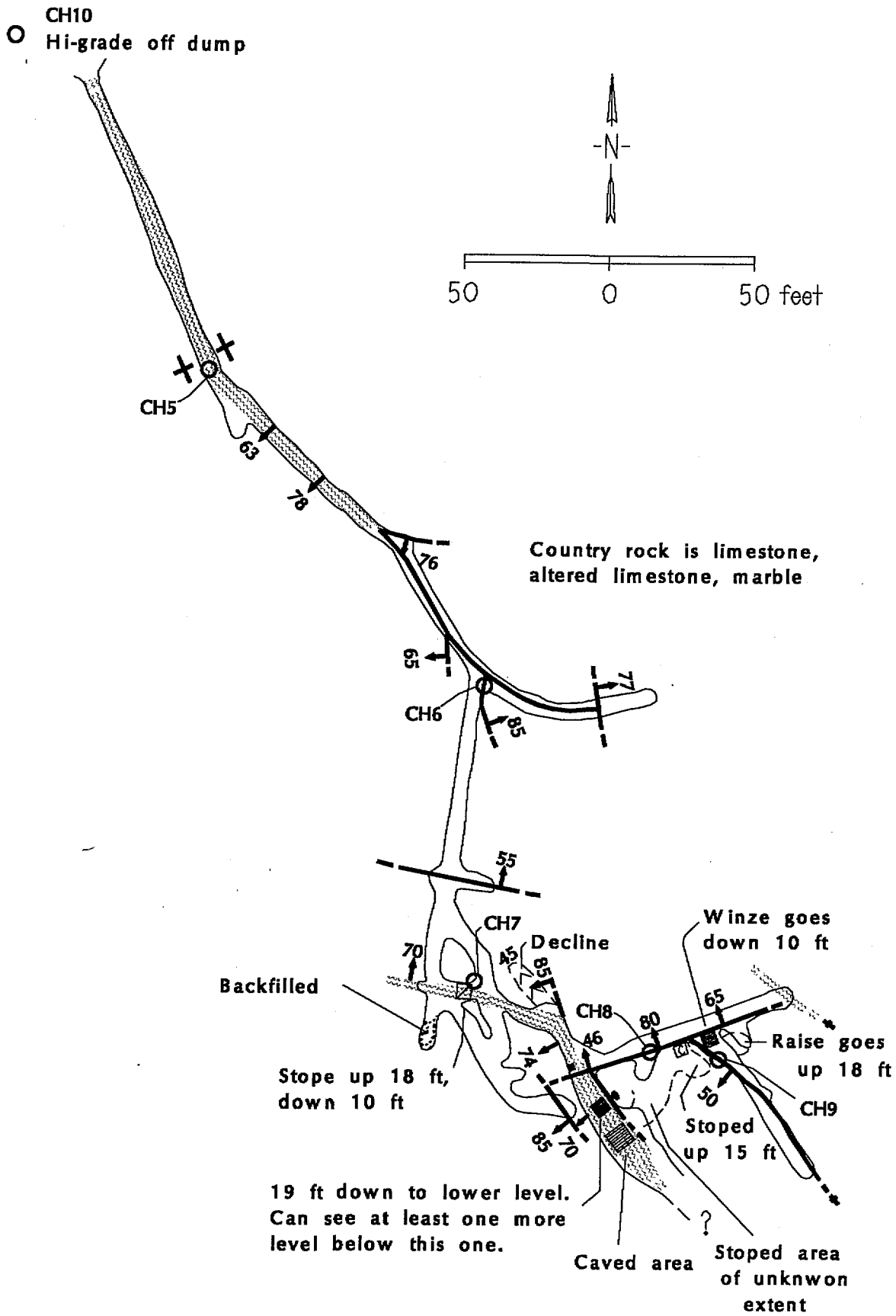
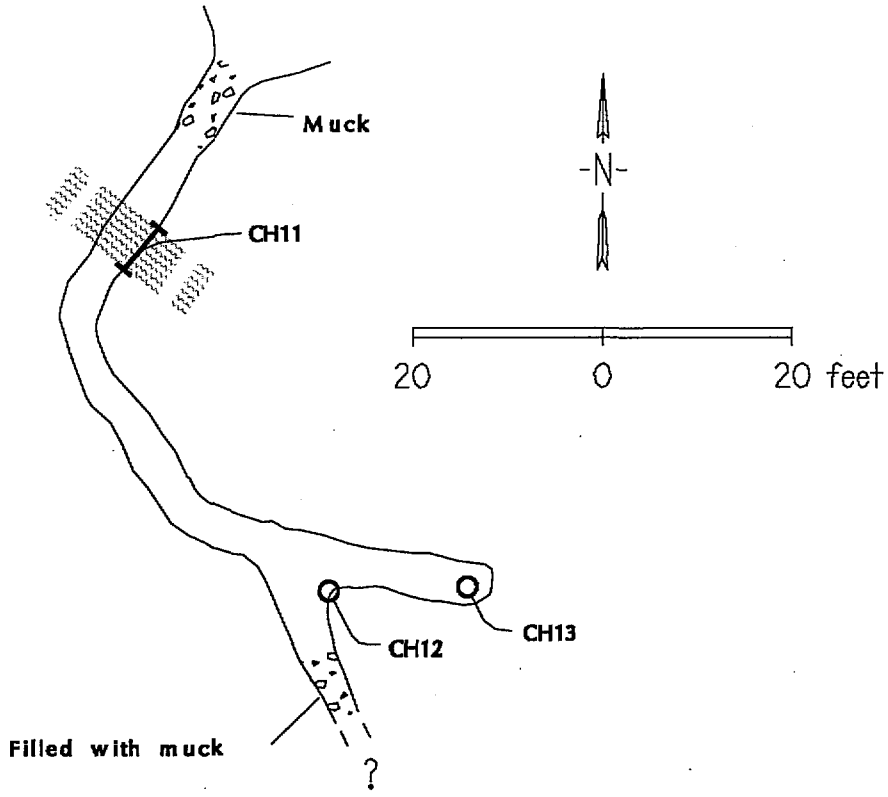


Figure 6.--Adit in Blumberg Canyon, NW of Hilltop Mine showing sample localities CH 5-10.



All of adit is in altered ls. and nondistinguishable altered rock.

Figure 7.--Adit NW of Lead Lilly Shaft showing sample localities CH 11-13.

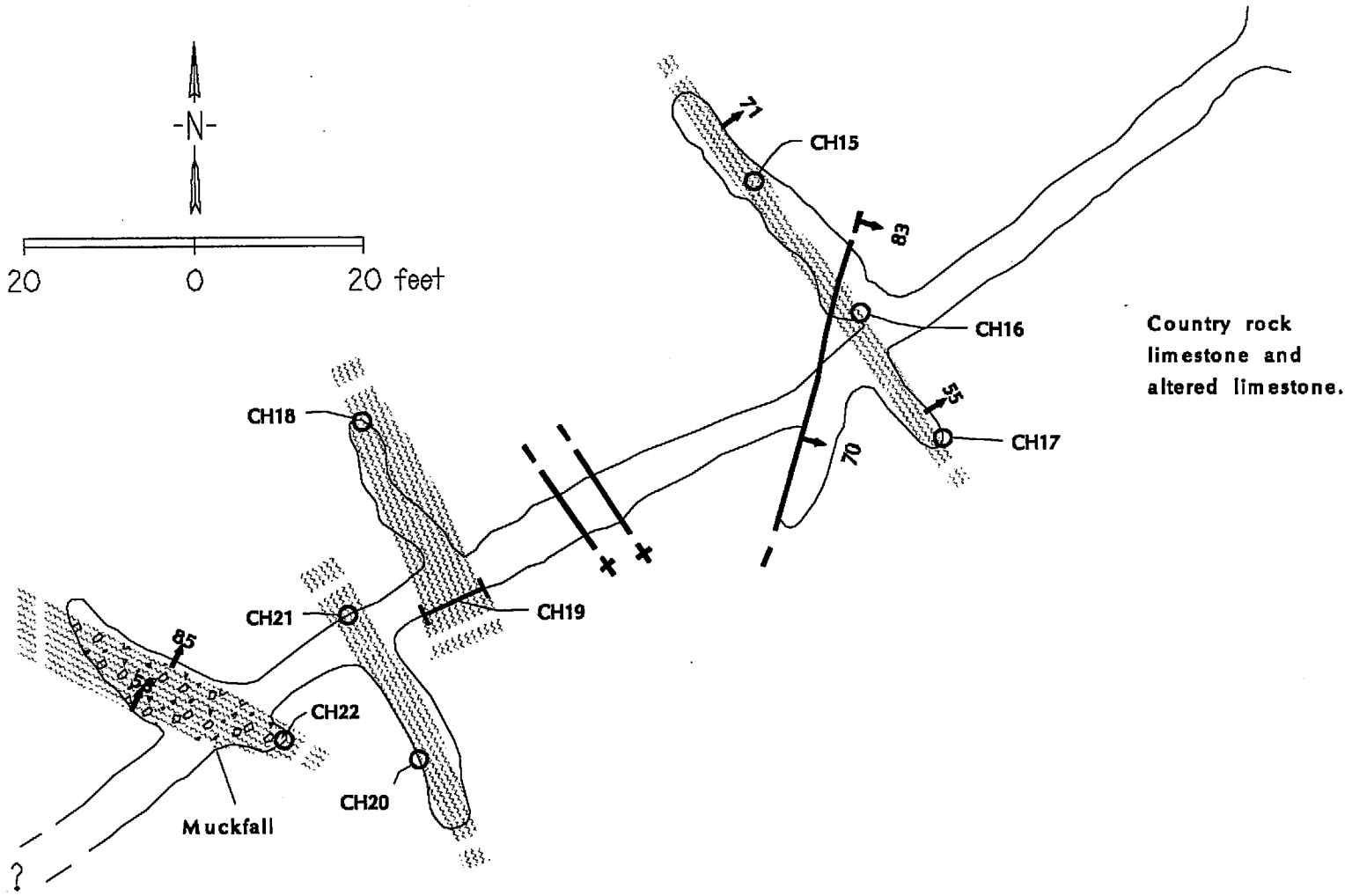


Figure 8.--Adit NW of Lead Lilly Shaft showing sample localities CH 15-22.

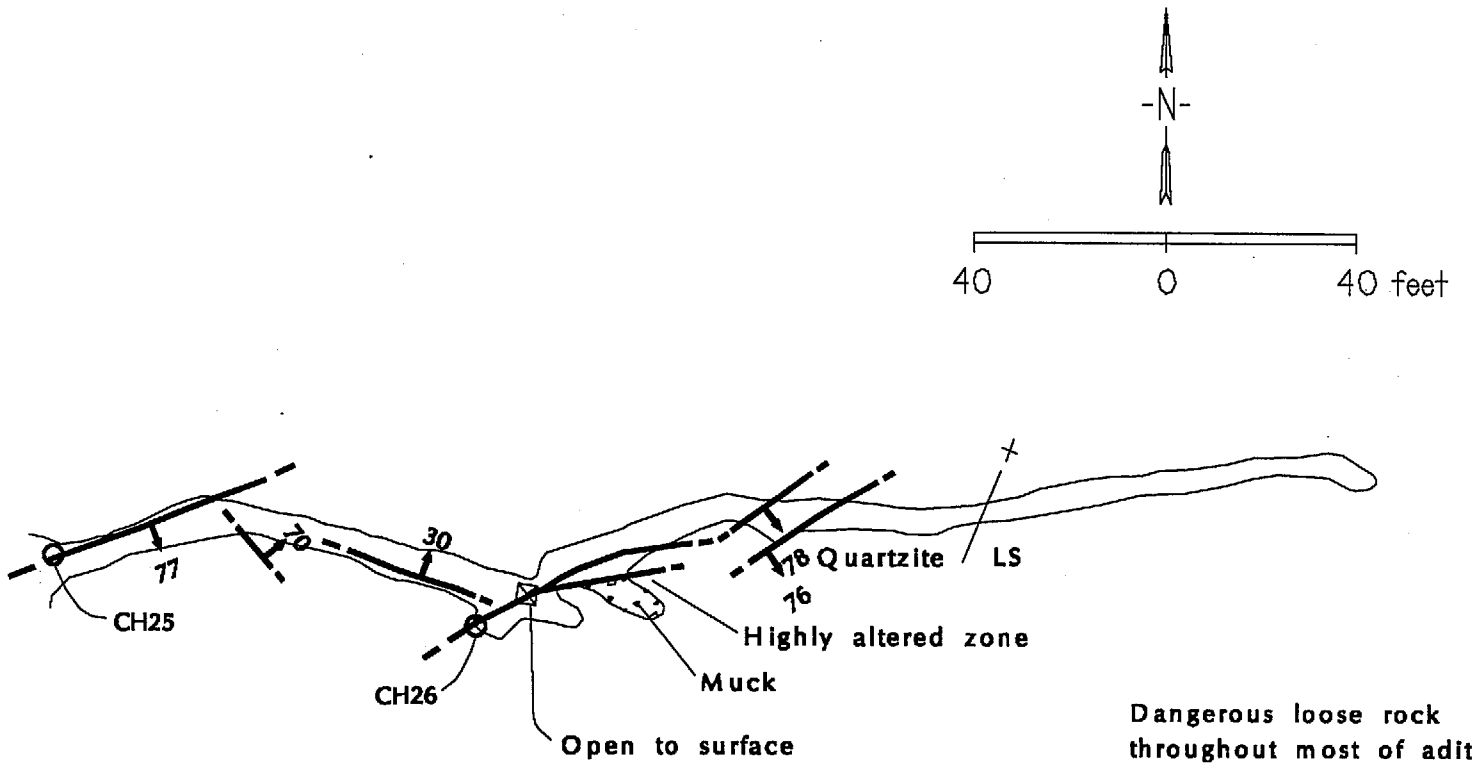
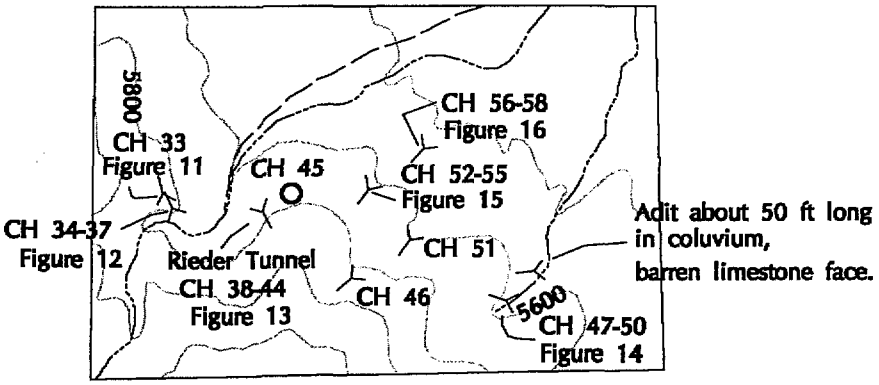


Figure 9.--Adit north of Kasper Tunnel showing sample localities CH 25-26.



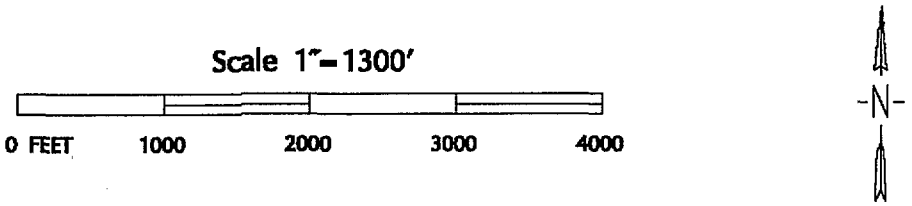


Figure 10.--Rieder Tunnel and nearby adits showing sample localities CH 33-58.

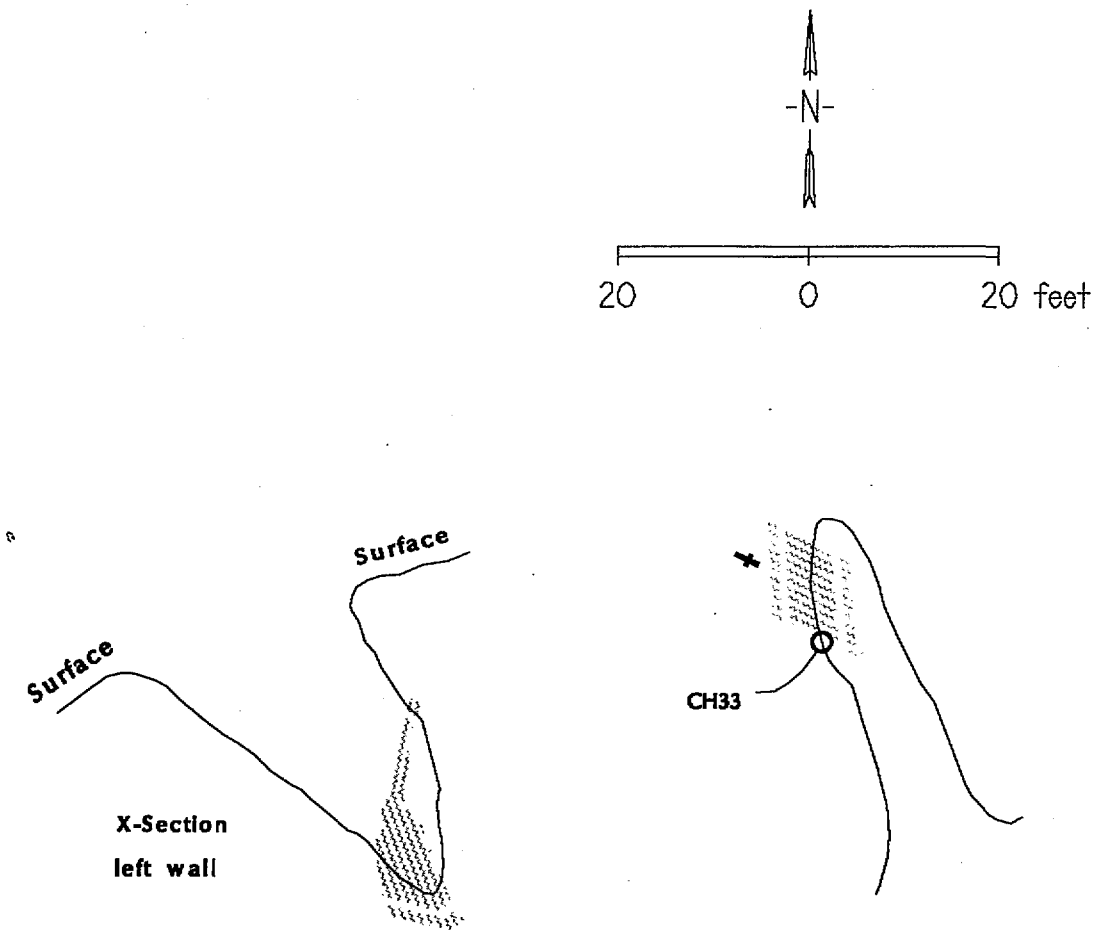


Figure 11.--Decline west of Rieder Tunnel showing sample locality CH 33.

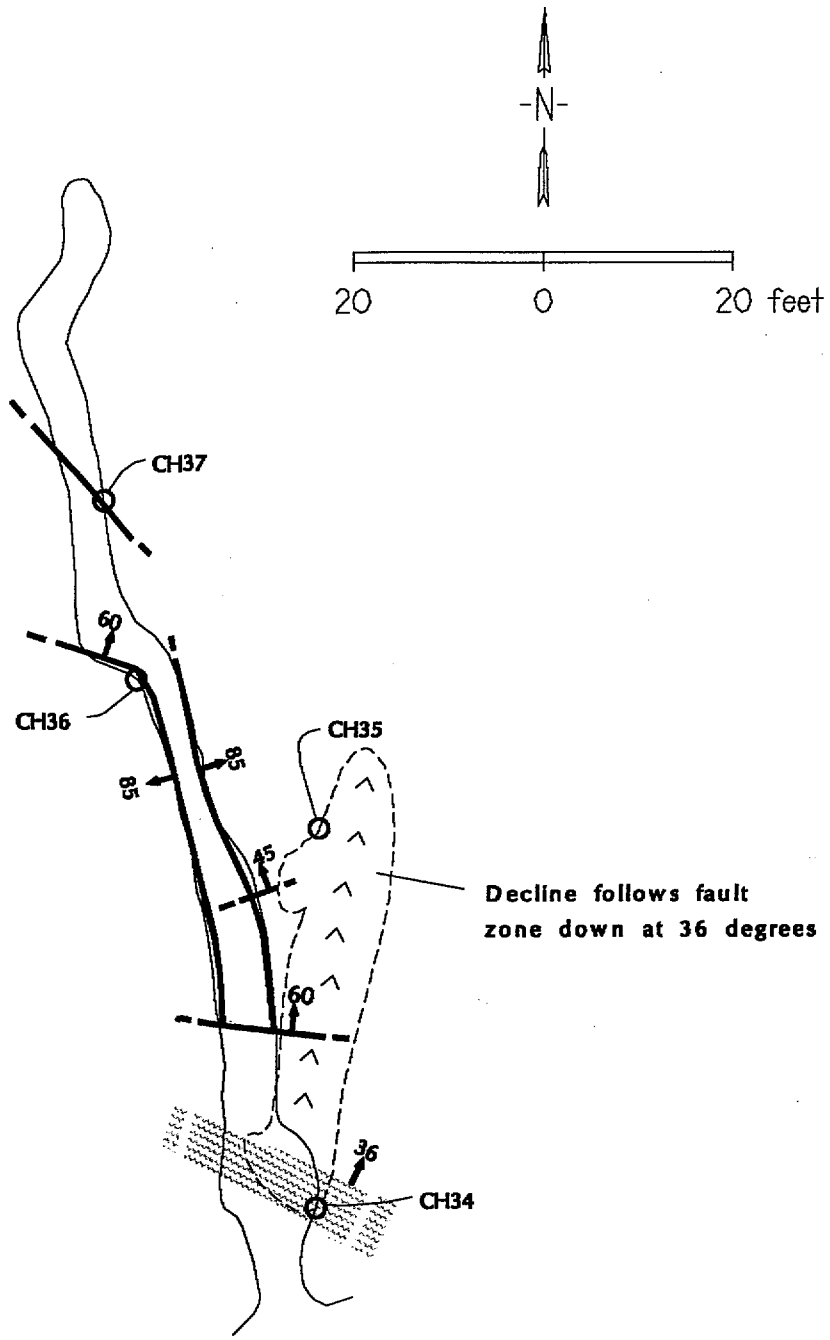


Figure 12.--Adit west of Rieder Tunnel showing sample localities CH 34-37.

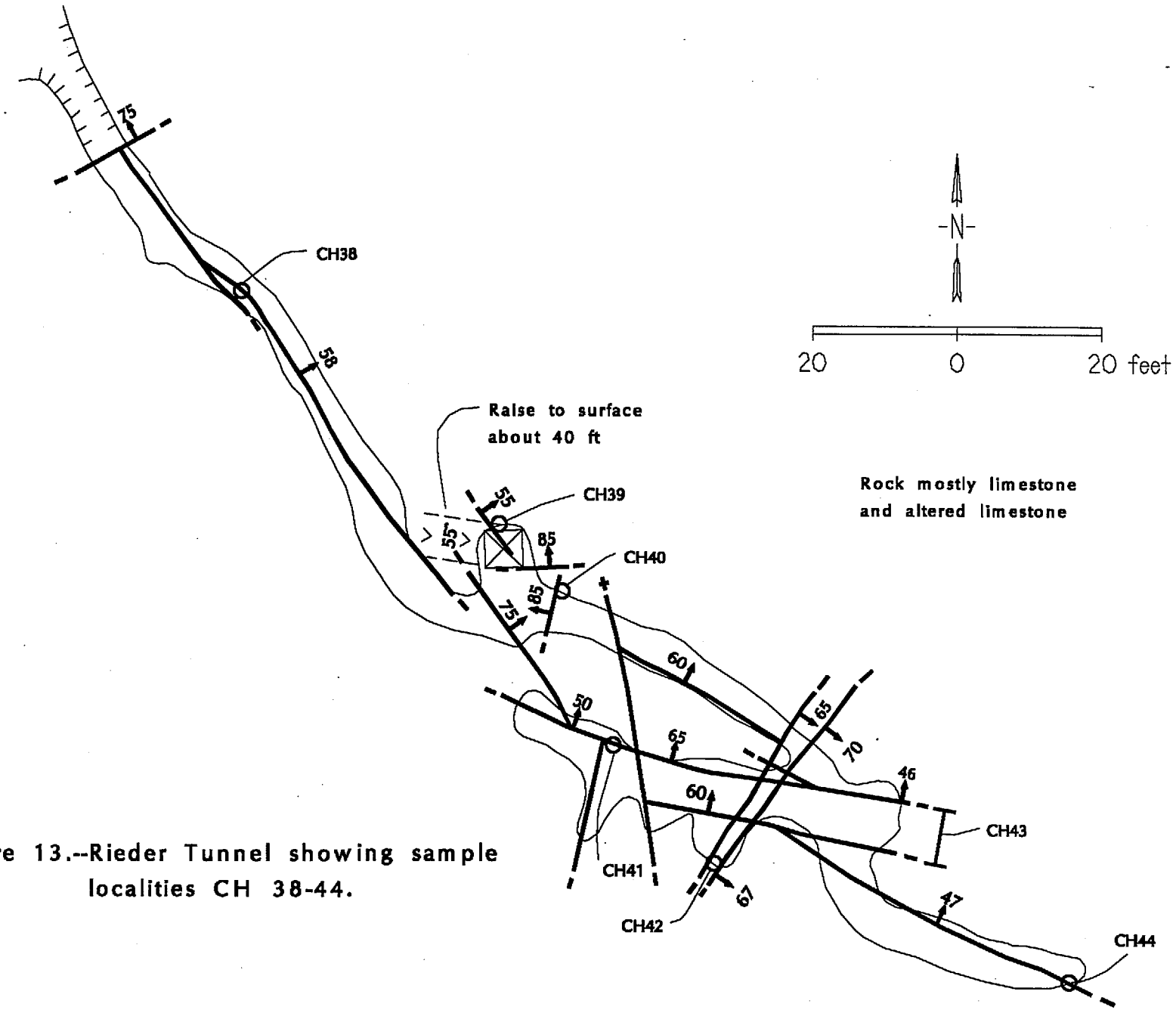


Figure 13.--Rieder Tunnel showing sample localities CH 38-44.

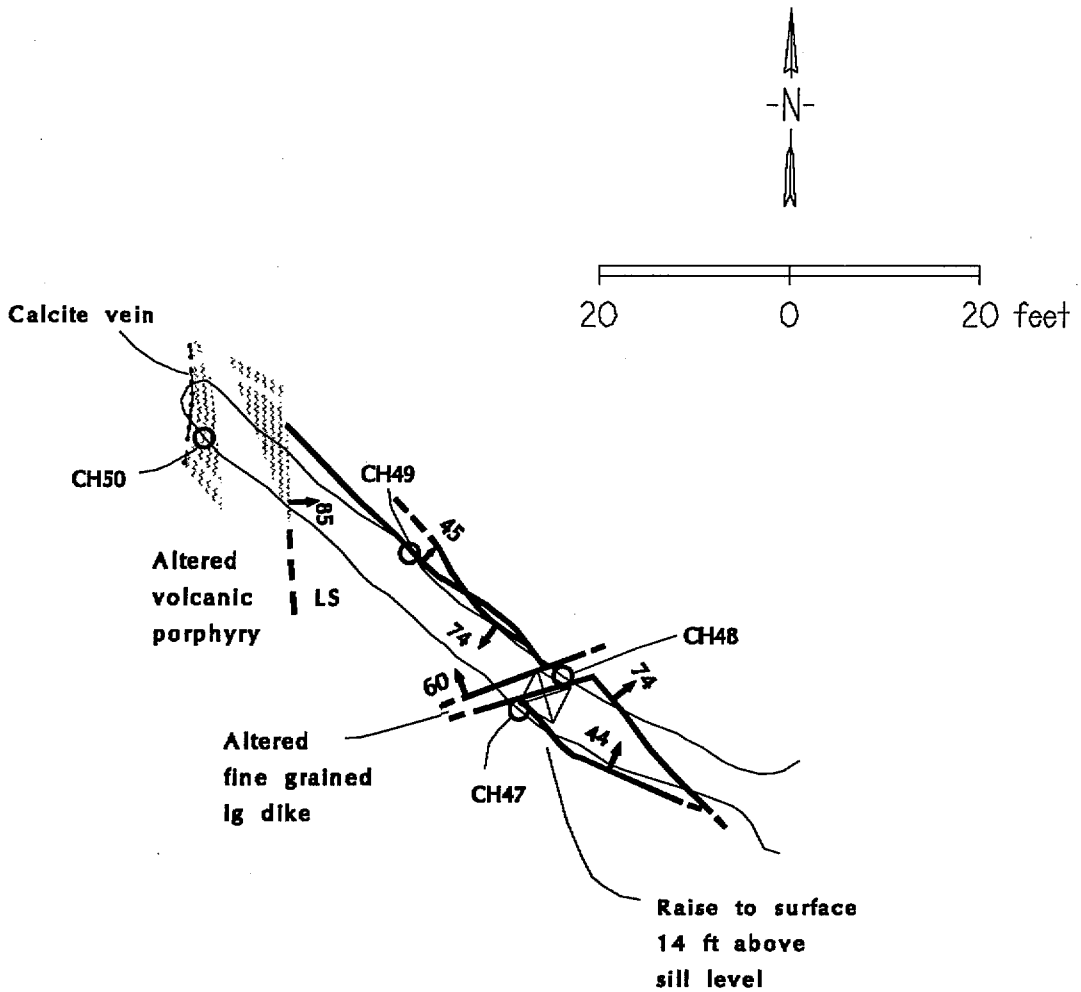


Figure 14.--Adit southeast of Rieder Tunnel showing sample localities CH 47-50.

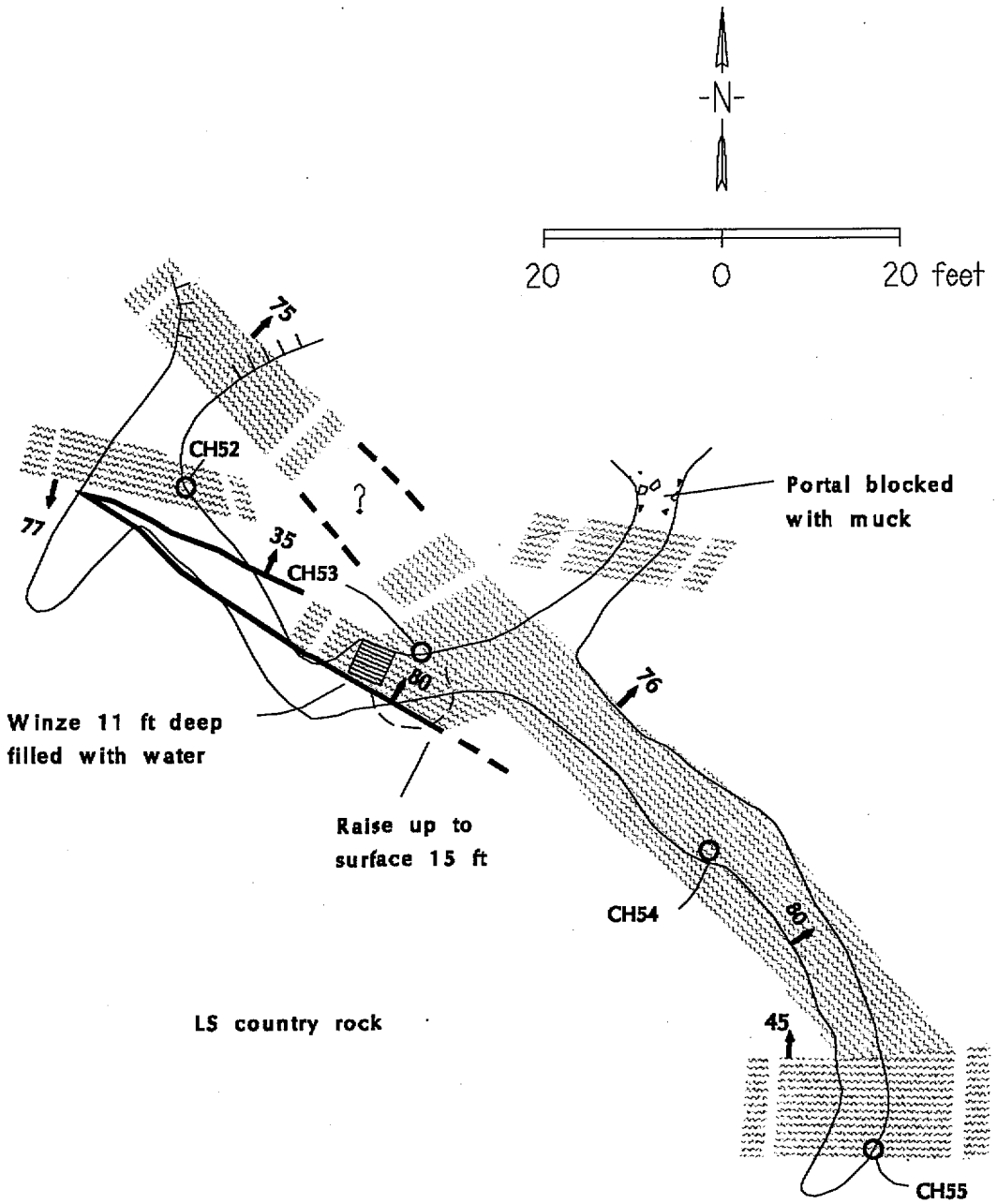


Figure 15.--Adit east of Rieder Tunnel showing sample localities CH 52-55.

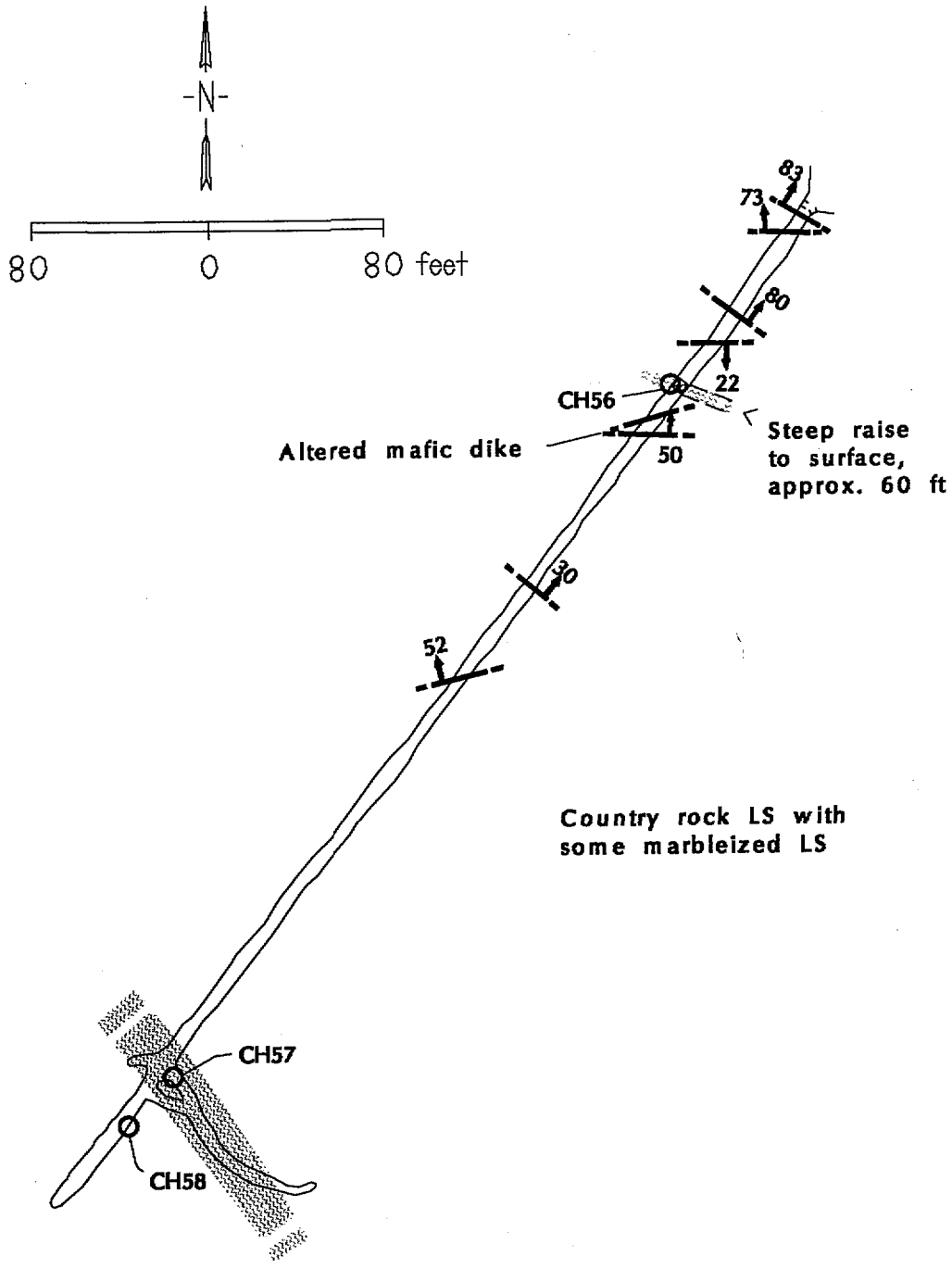


Figure 16.--Adit northeast of Rieder Tunnel showing sample localities CH 56-58.

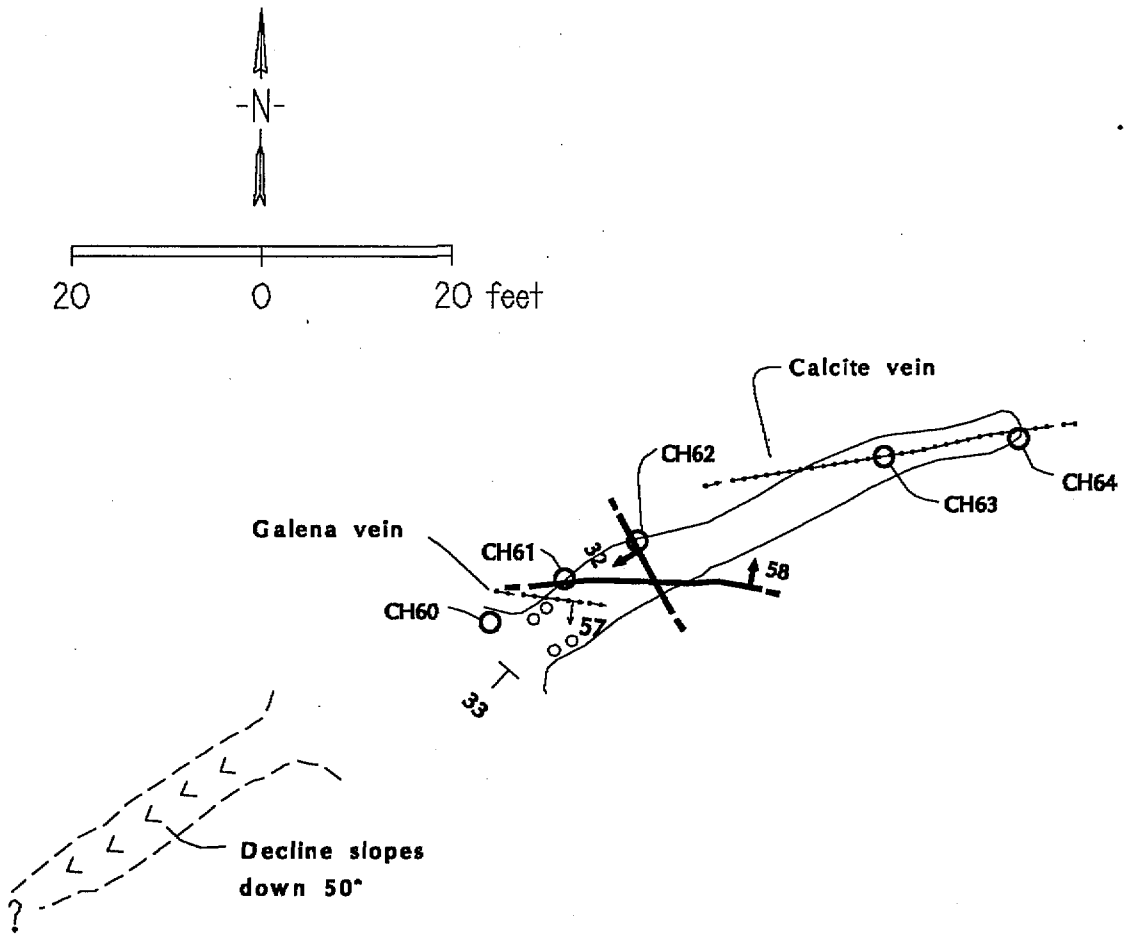
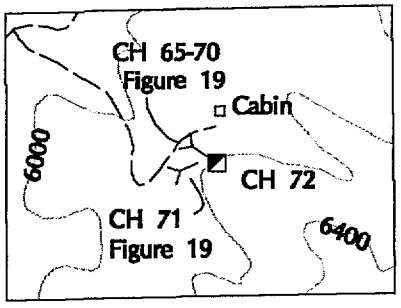
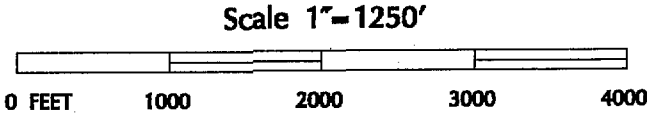


Figure 17.--Adit southeast of Kasper Tunnel showing sample localities. CH 60-64.





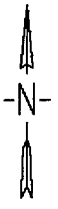


Figure 18.--Silver Prince Mine area showing sample localities CH 65-72.

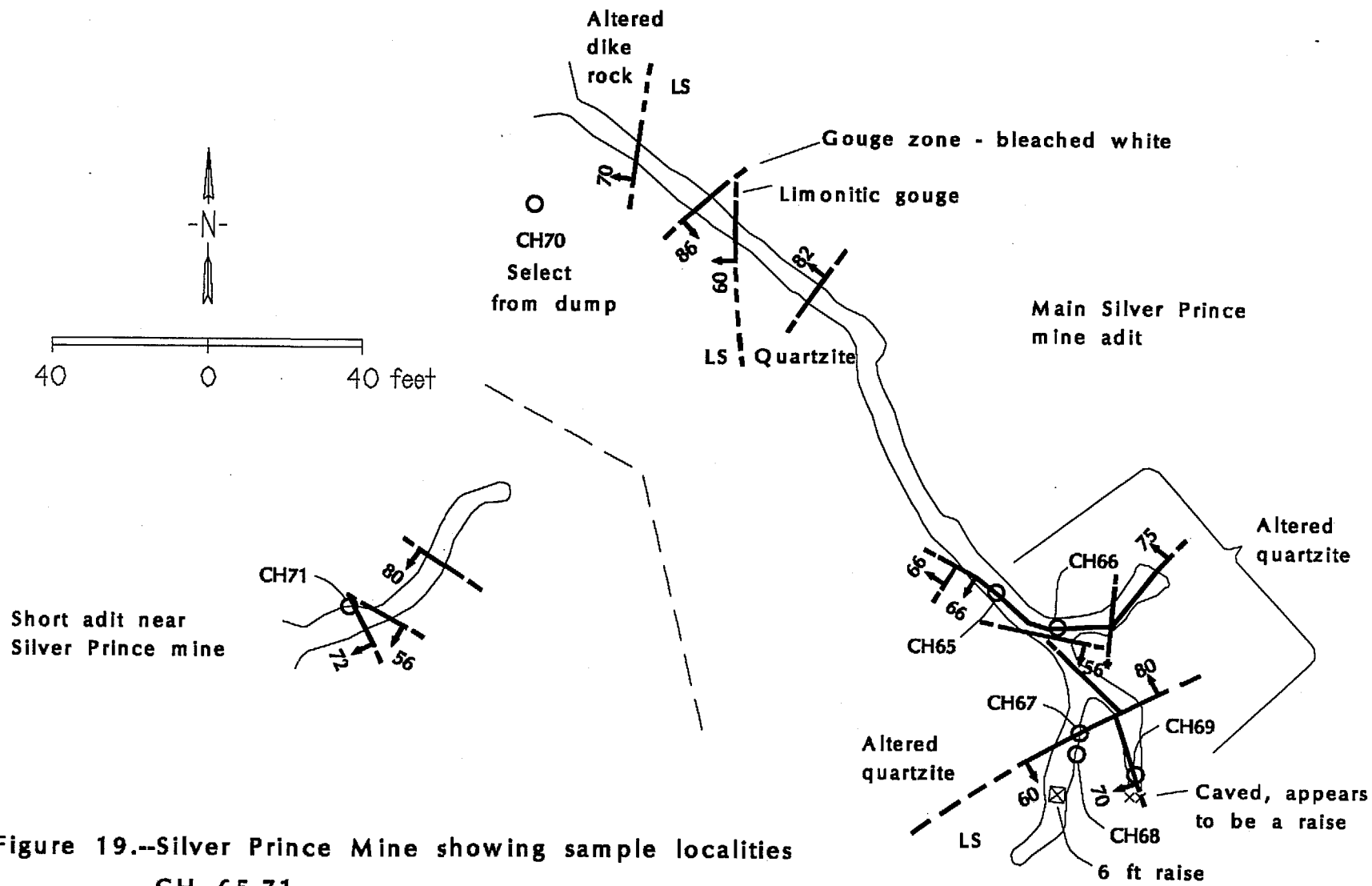
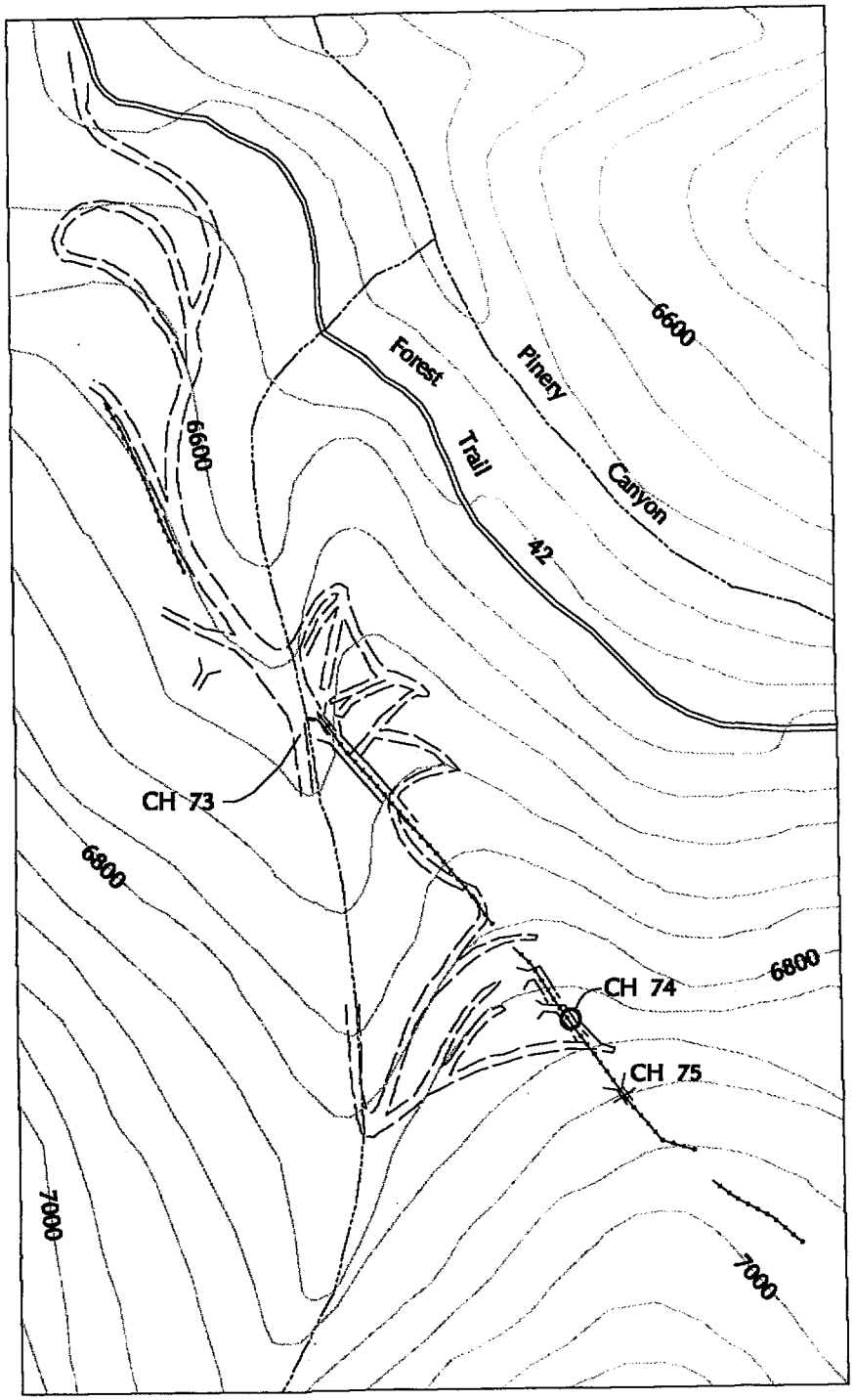


Figure 19.--Silver Prince Mine showing sample localities CH 65-71.



Scale 1"=250'

0 FEET 200 400 600 800

-N-

Figure 20.--El Tigre Mine showing sample localities CH 73-75. (from Tsuji, 1984)

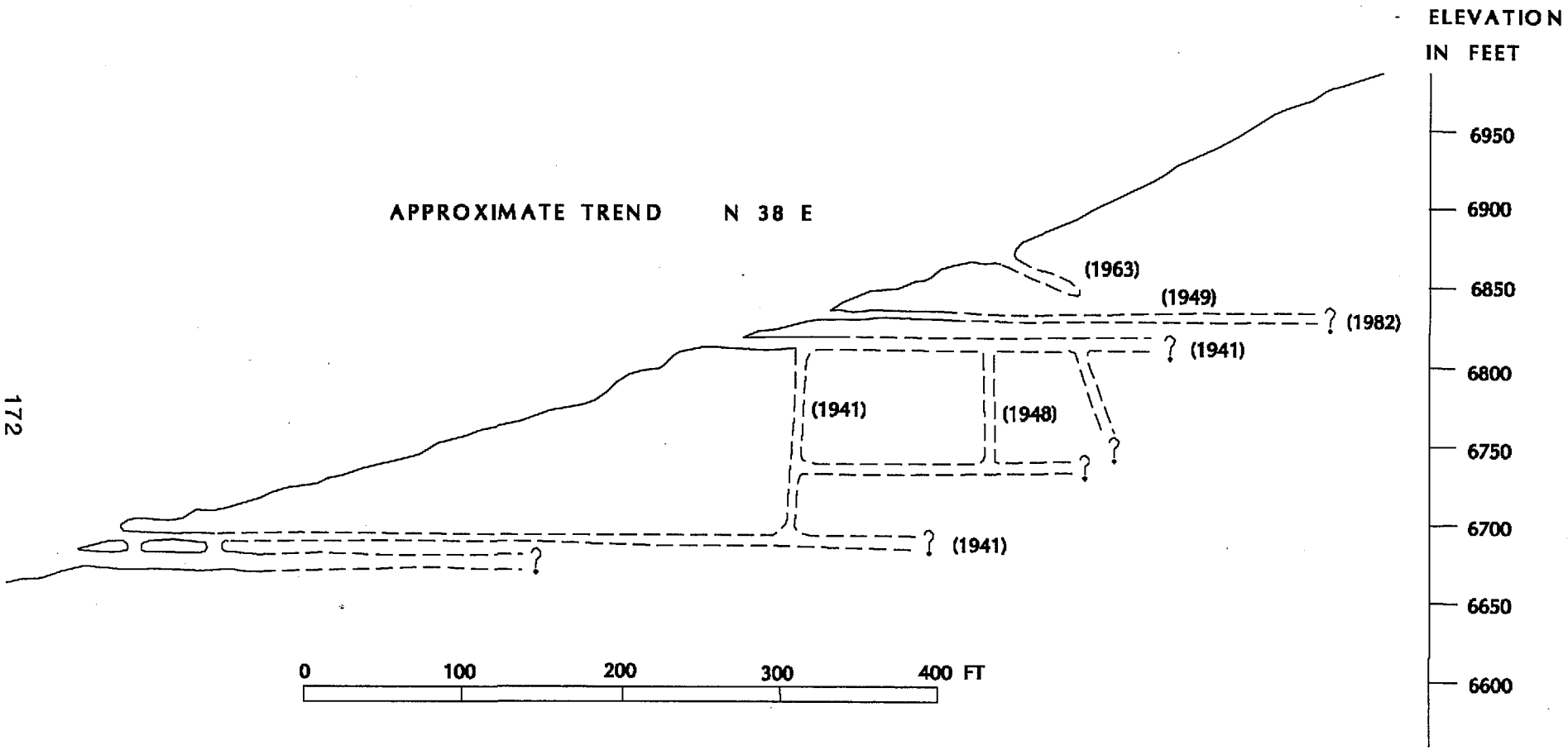
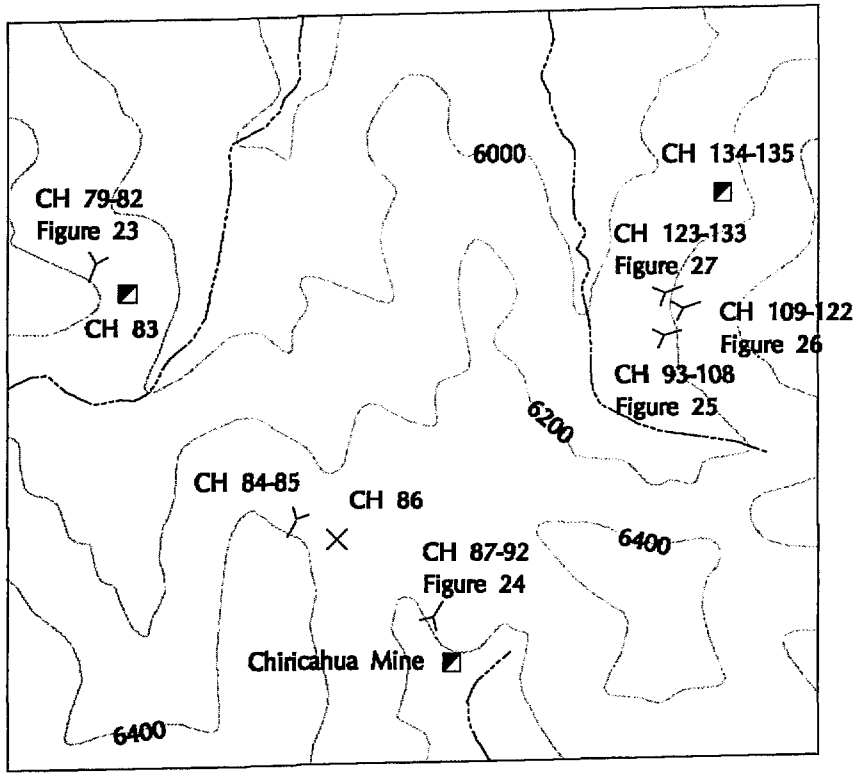


Figure 21.--Diagrammatic cross-section of the El-Tigre Mine workings (from Tsuji, 1984).



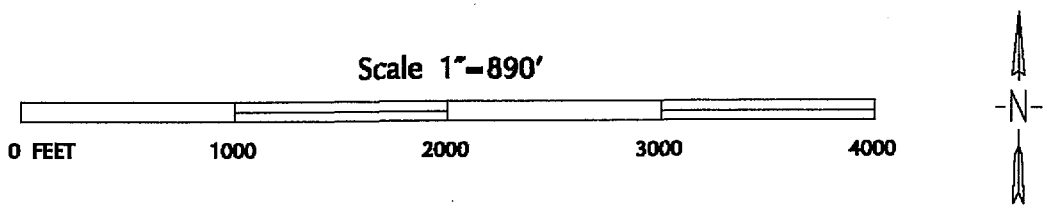


Figure 22.--Mines and prospects adjacent to a south fork of Jhus Canyon showing sample localities CH 79-135.

Rock a highly altered and fractured igneous rock; gossan, limonitic gouge, hematite ochre.

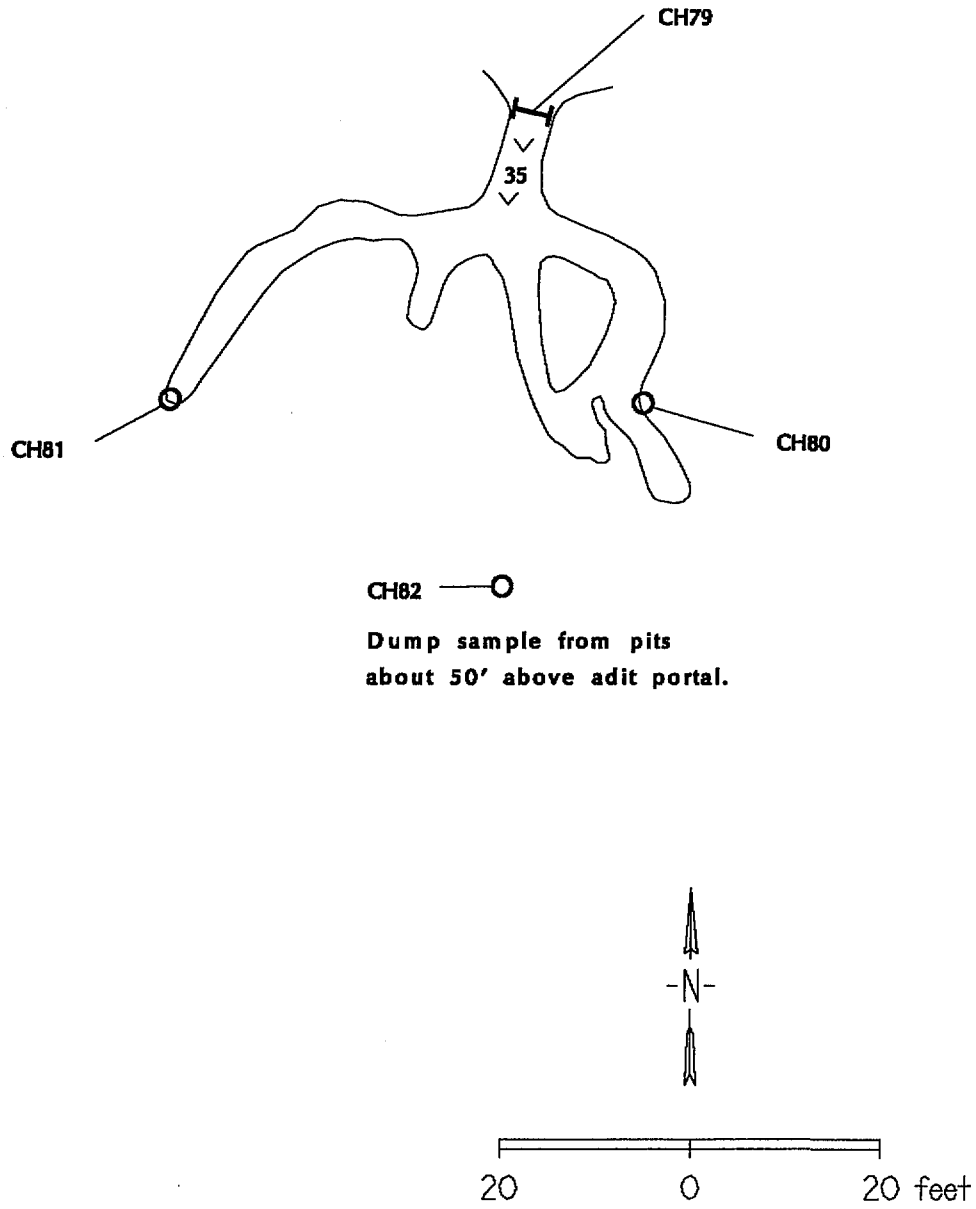


Figure 23.– Adit northwest of the Chiricahua Mine showing sample localities CH 79-82.

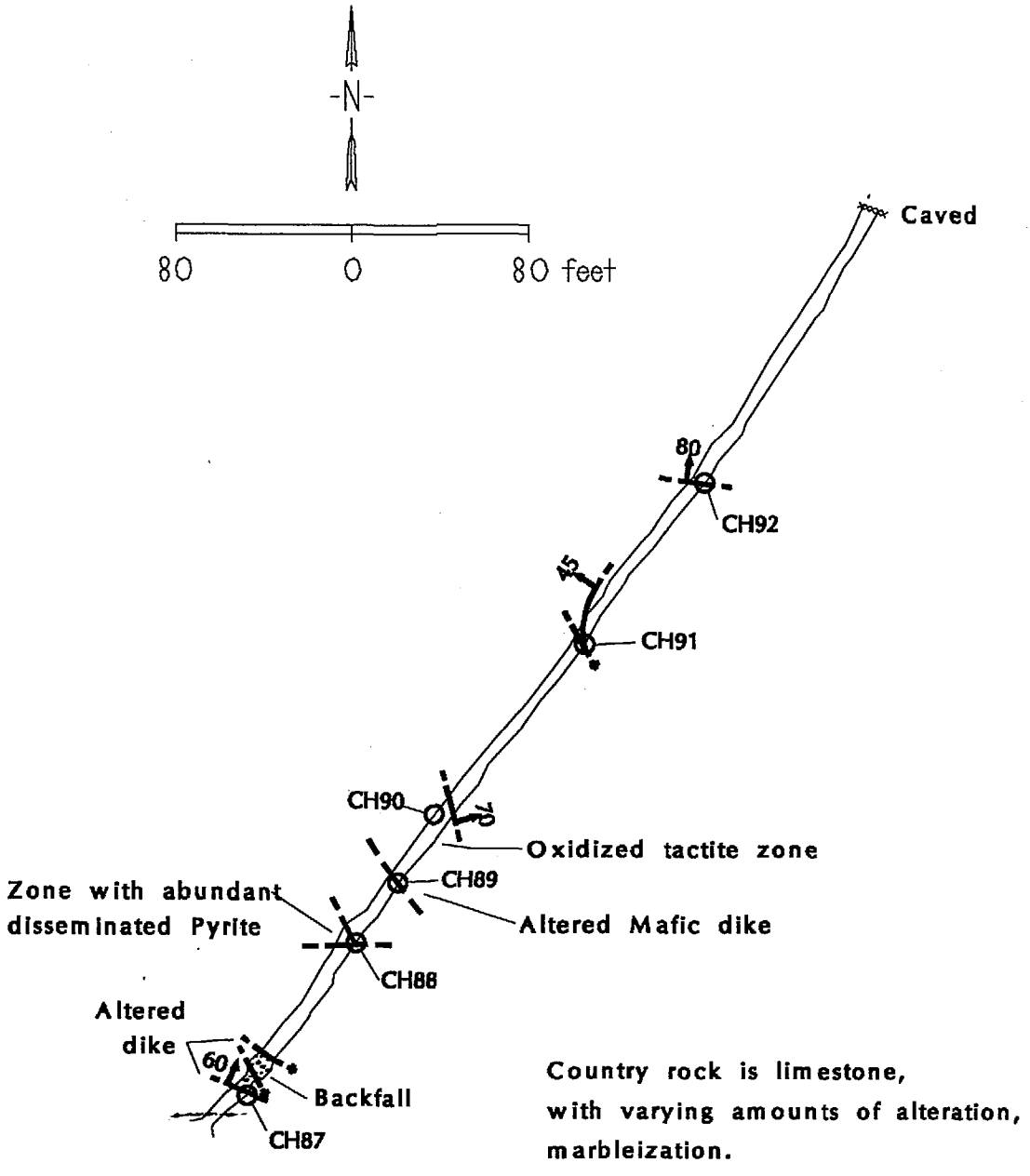
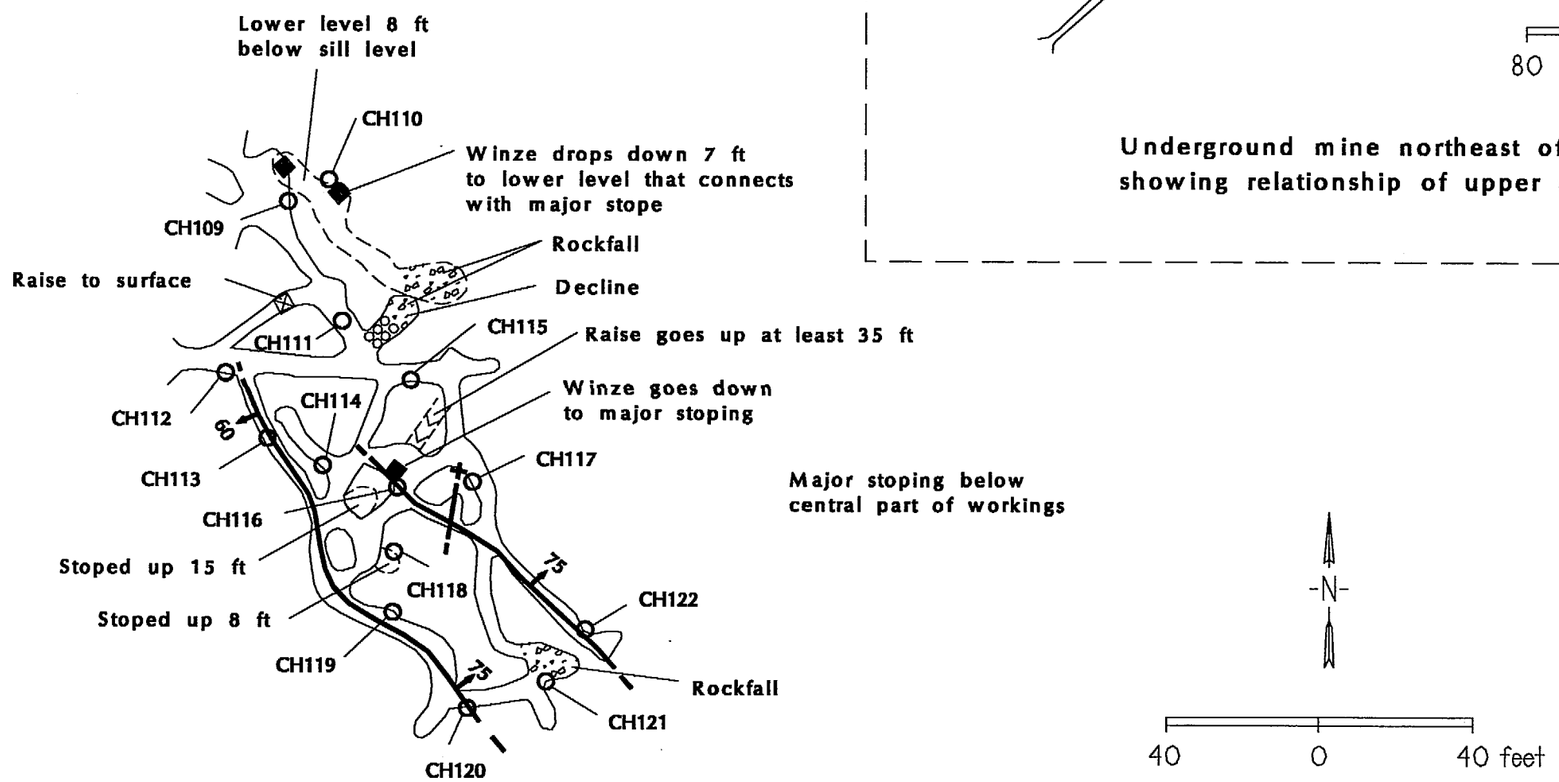
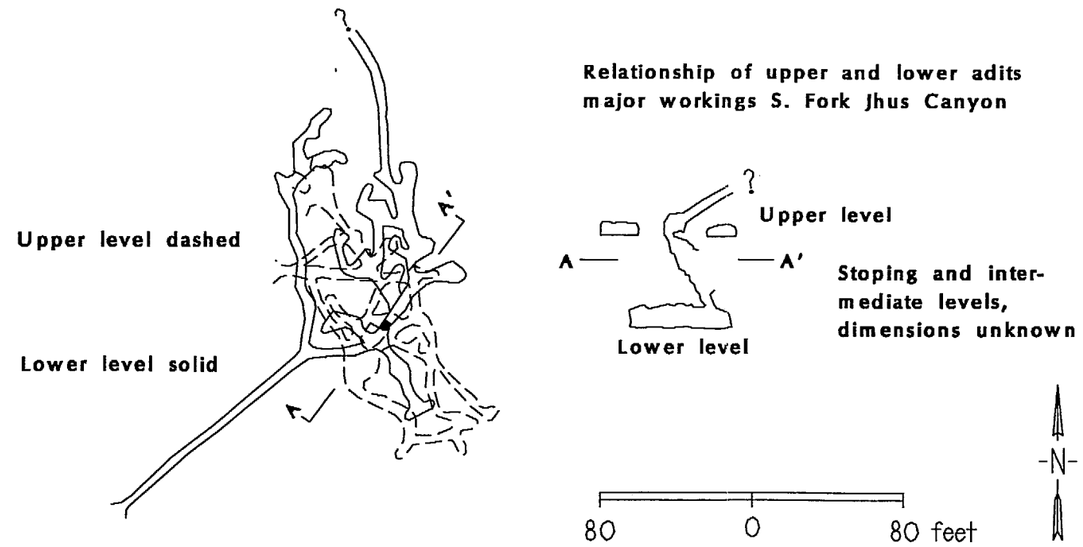


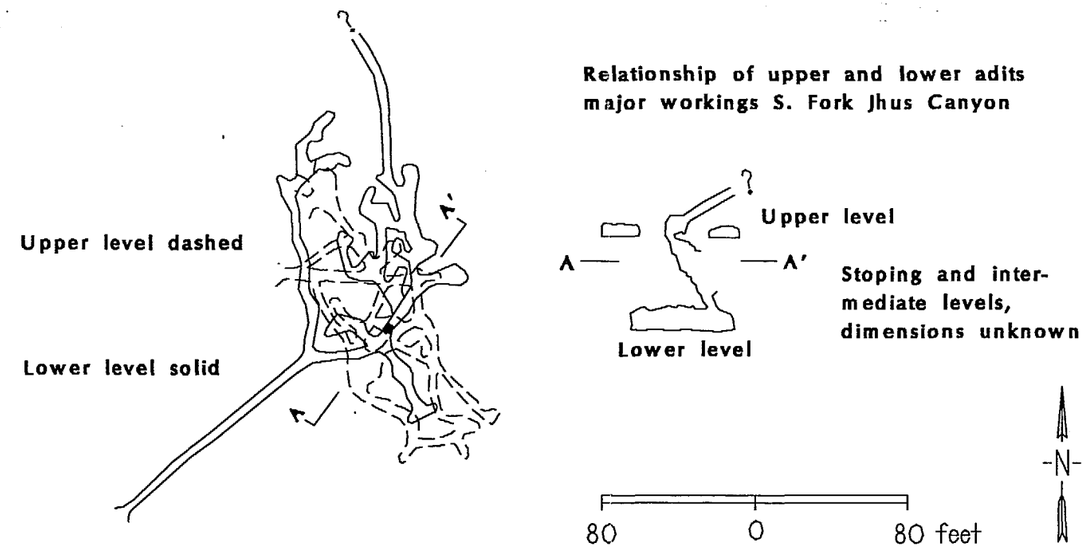
Figure 24.--Adit near Chiricahua Mine shaft showing sample localities CH 87-92.





Underground mine northeast of Chiricahua Mine showing relationship of upper and lower levels.

Figure 26.--Mine northeast of the Chiricahua Mine, upper level, showing sample localities CH 109-122.



Underground mine northeast of Chiricahua Mine showing relationship of upper and lower levels.

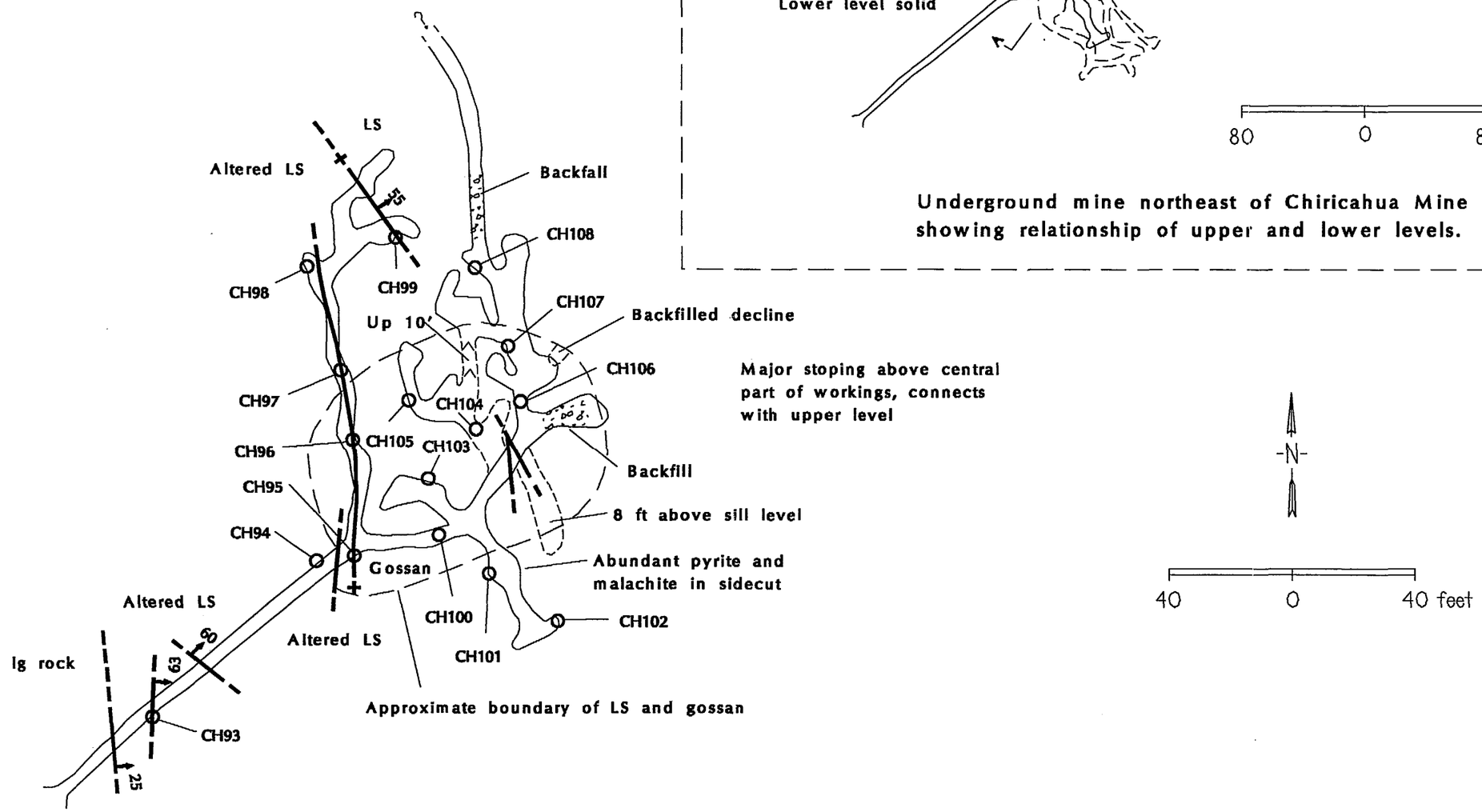


Figure 25.--Mine northeast of the Chiricahua Mine, lower level, showing sample localities CH 93-108.

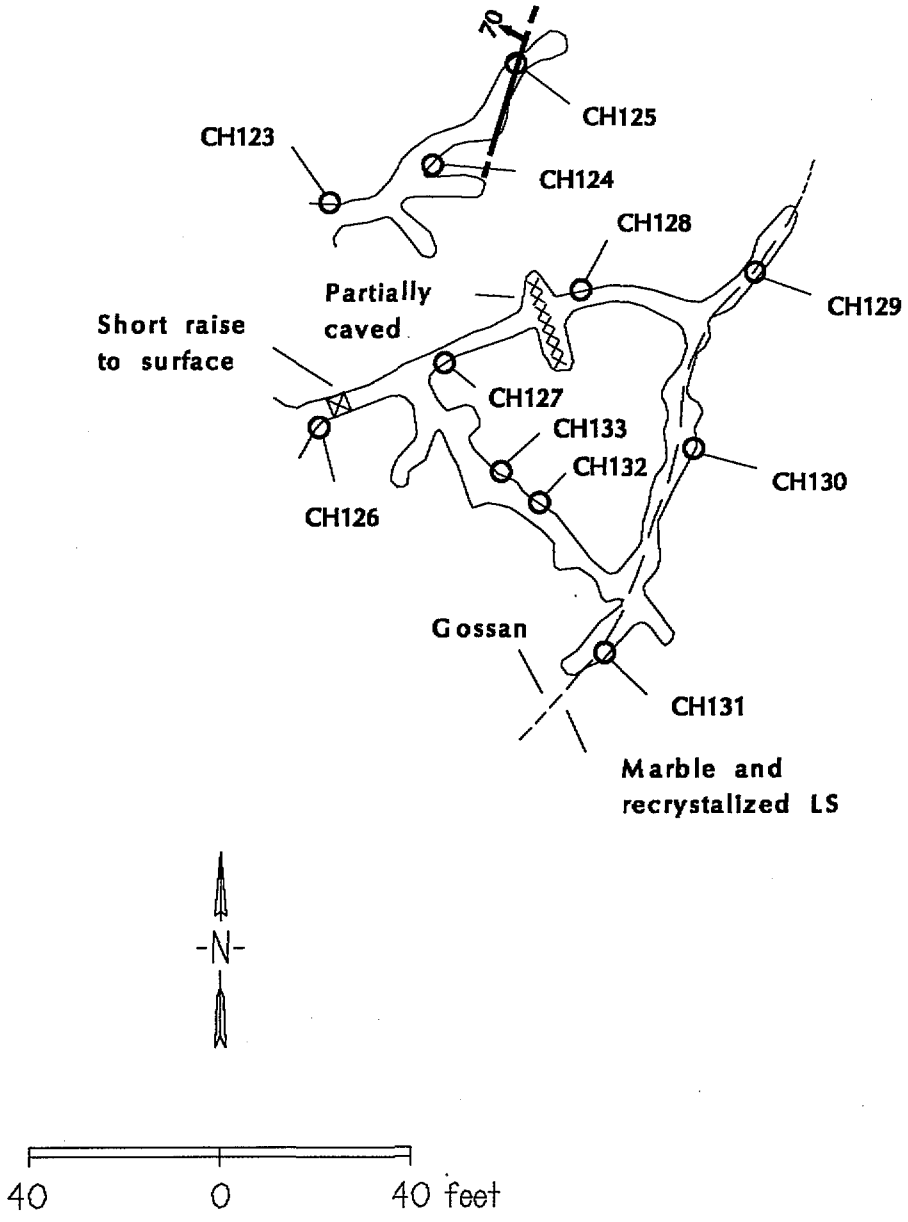
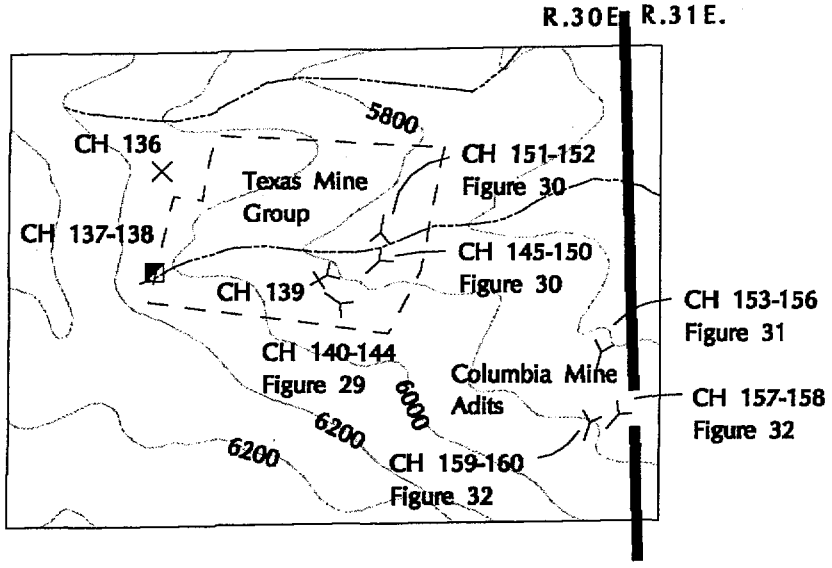


Figure 27.--Adits northeast of the Chiricahua Mine showing sample localities CH 123-133.



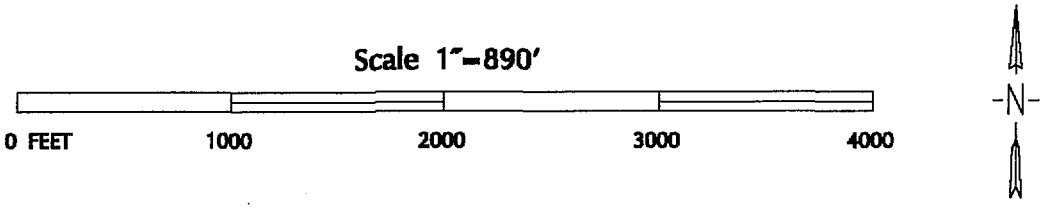


Figure 28.--Texas Mine group workings and the Columbia Mine adits showing sample localities CH 136-160.

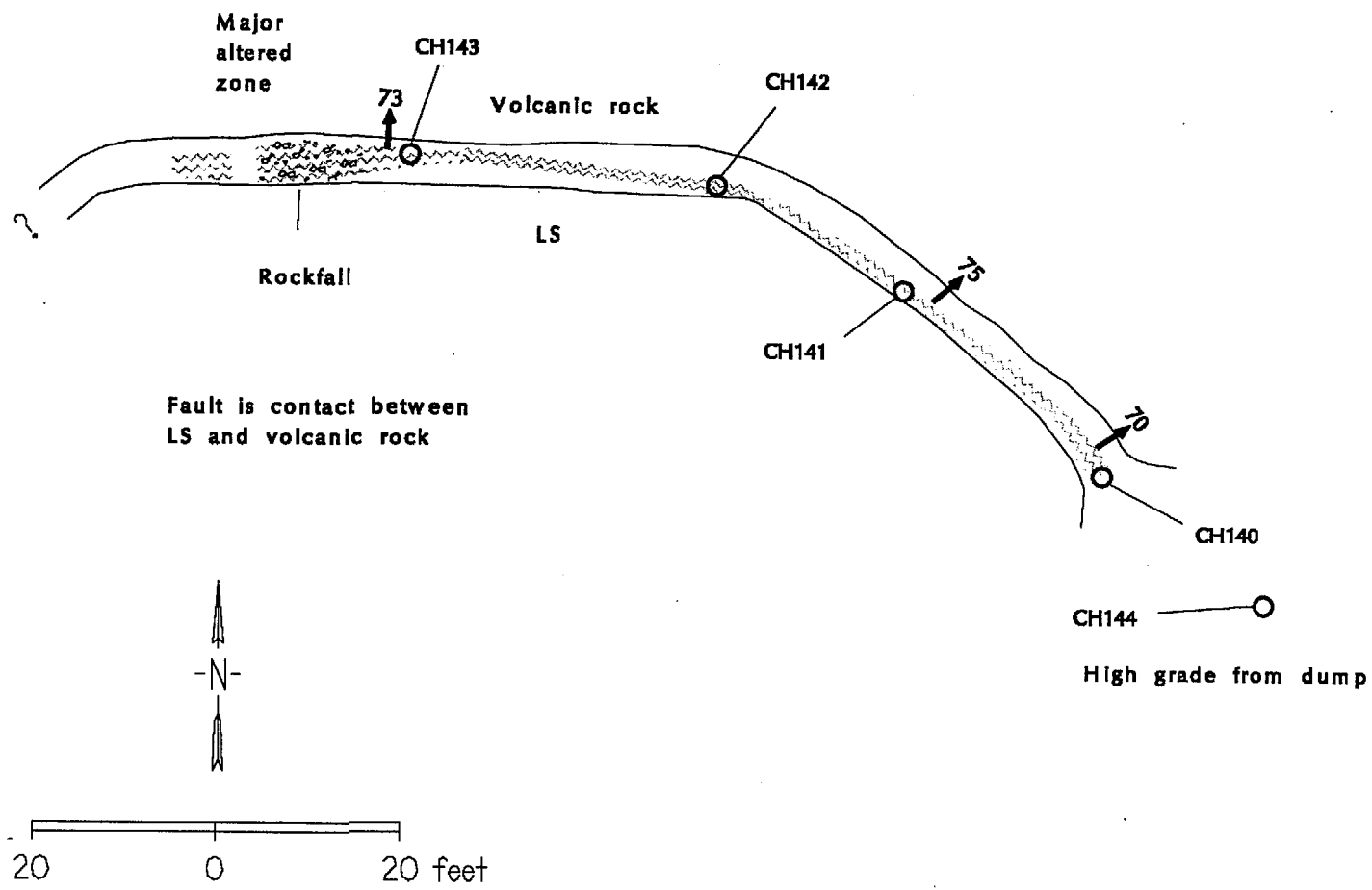


Figure 29.--Upper adit of Texas Mine group showing sample localities CH 140-144.

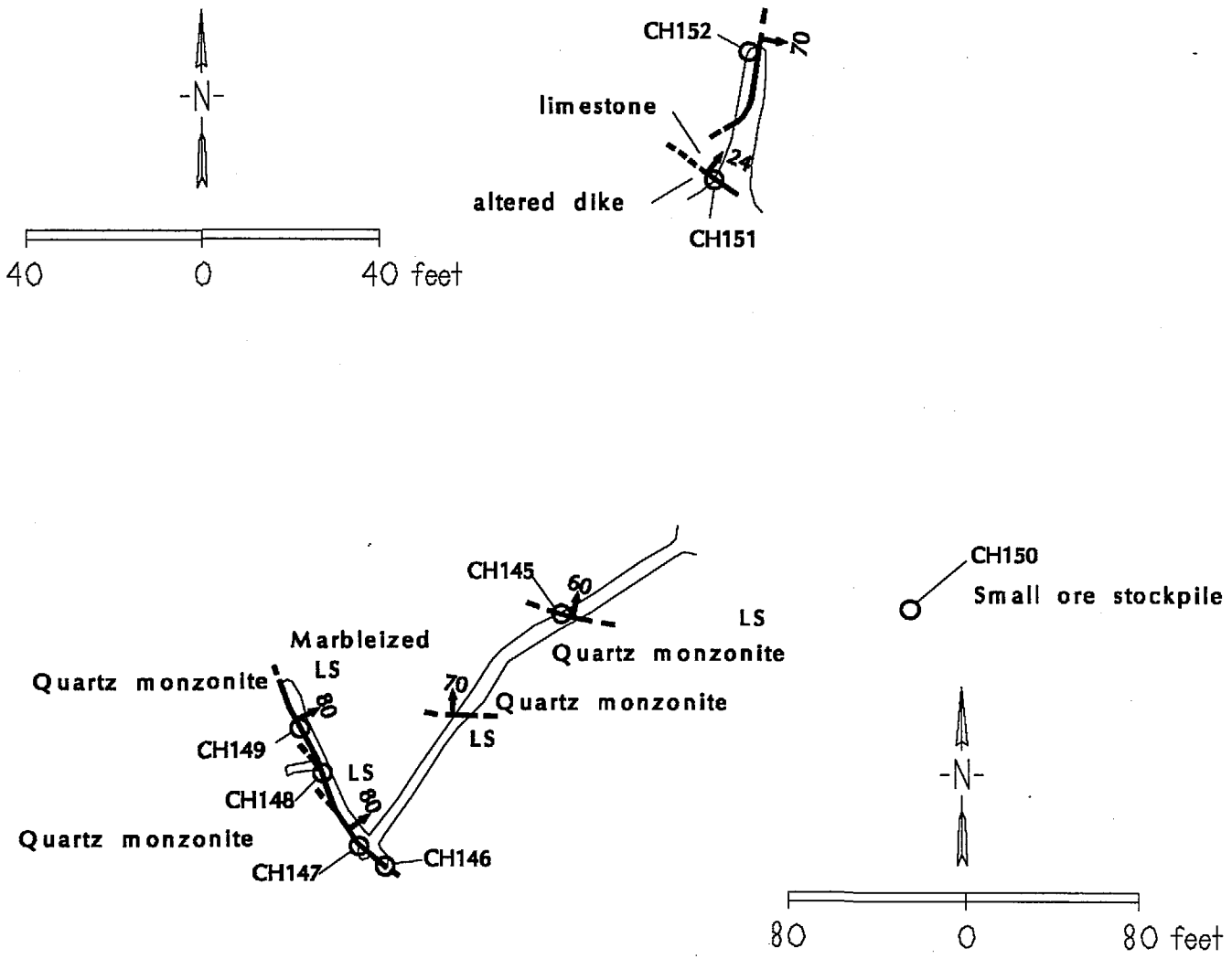


Figure 30.--Lower adits of Texas Mine group showing sample localities CH 145-152.

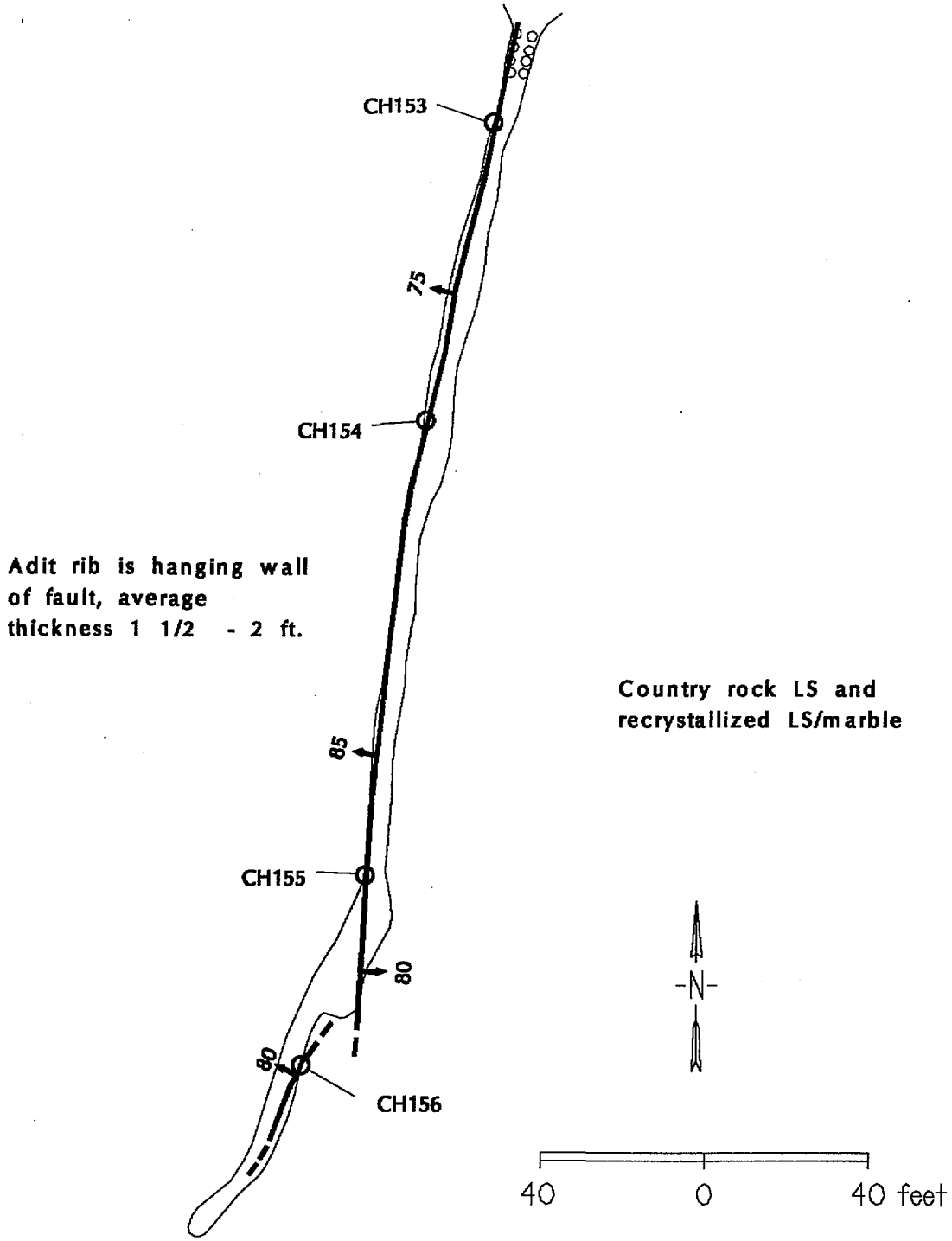


Figure 31.--Lower adit of Columbia Mine showing sample localities CH 153-156.

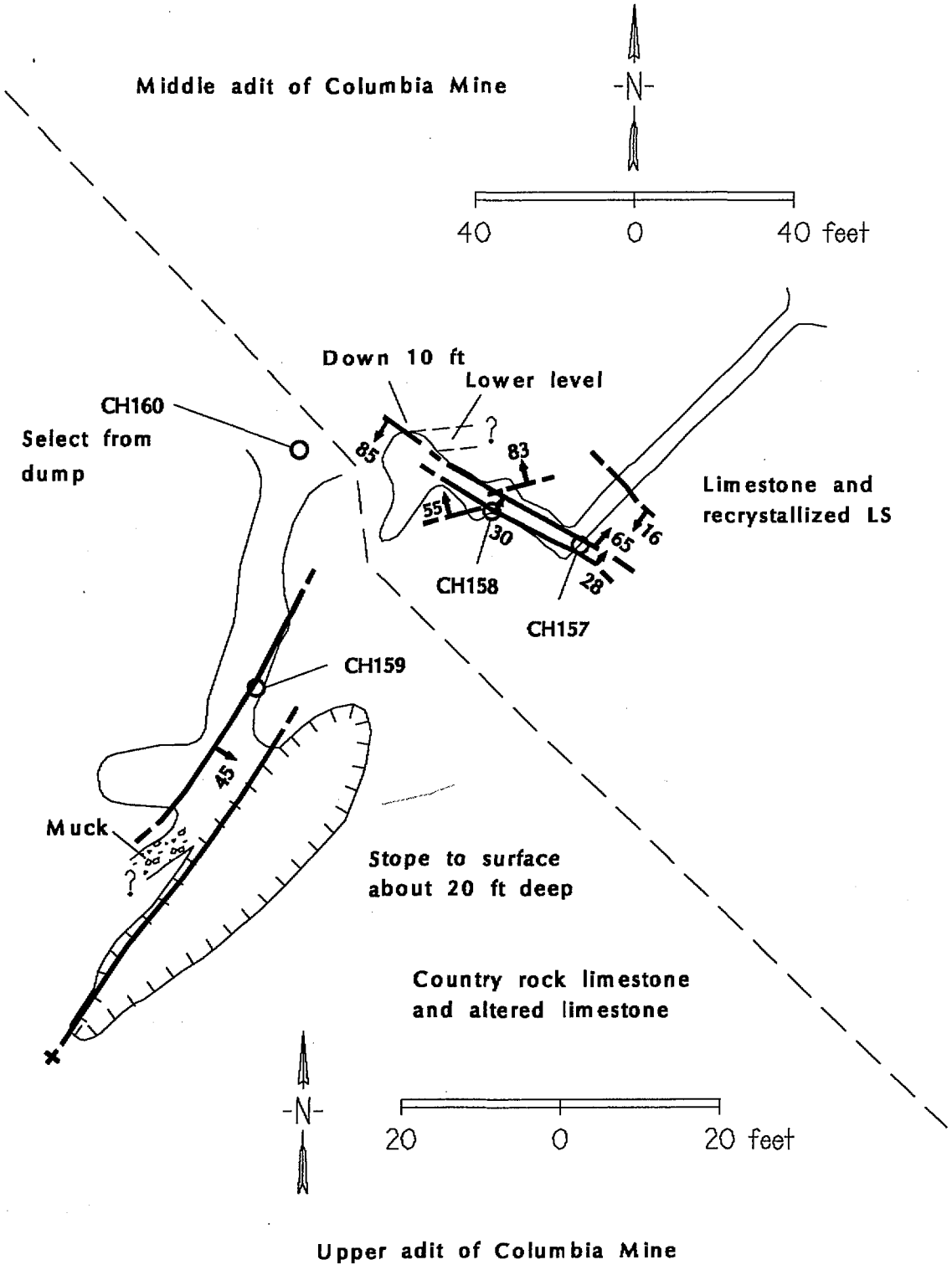
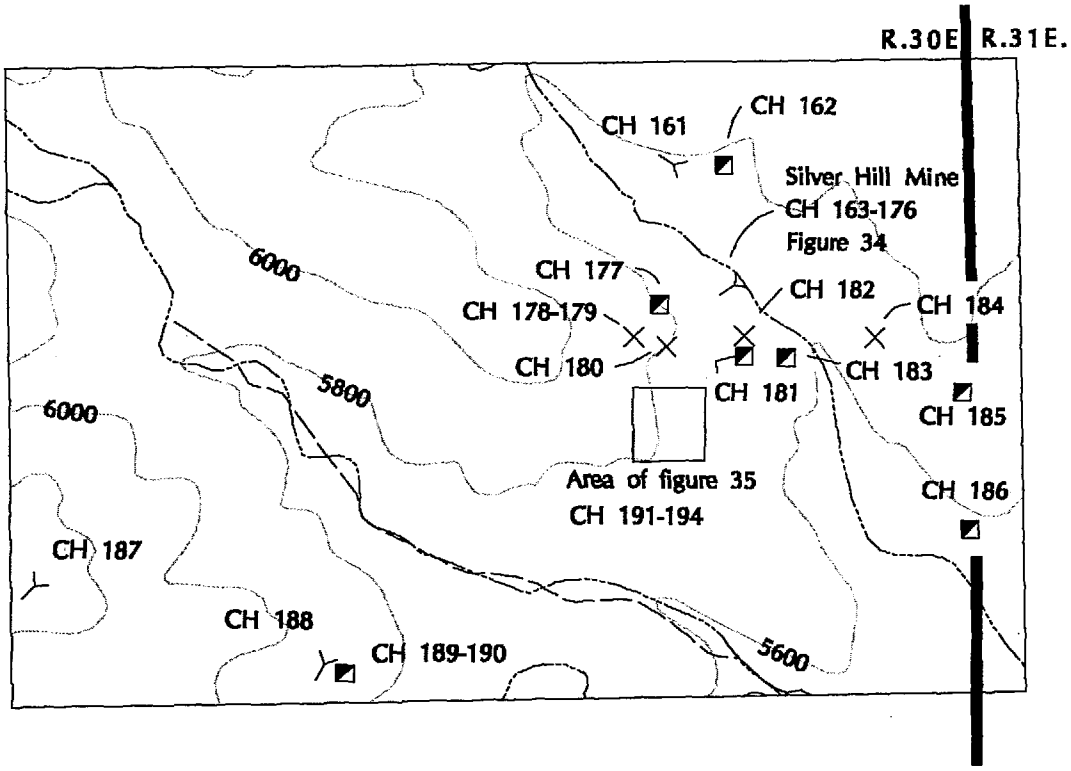


Figure 32.--Middle and upper adits of Columbia Mine showing sample localities CH 157-160.



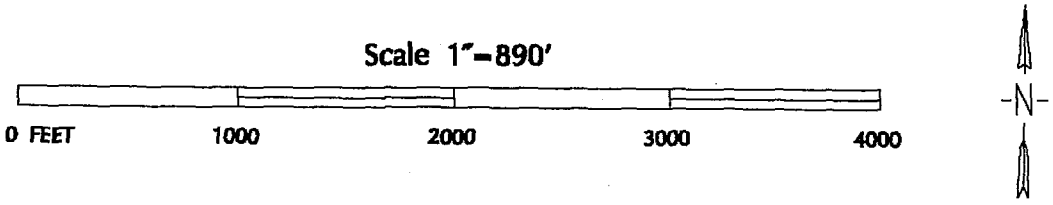


Figure 33.--Mines and prospects northwest of Paradise showing sample localities CH 161-194.

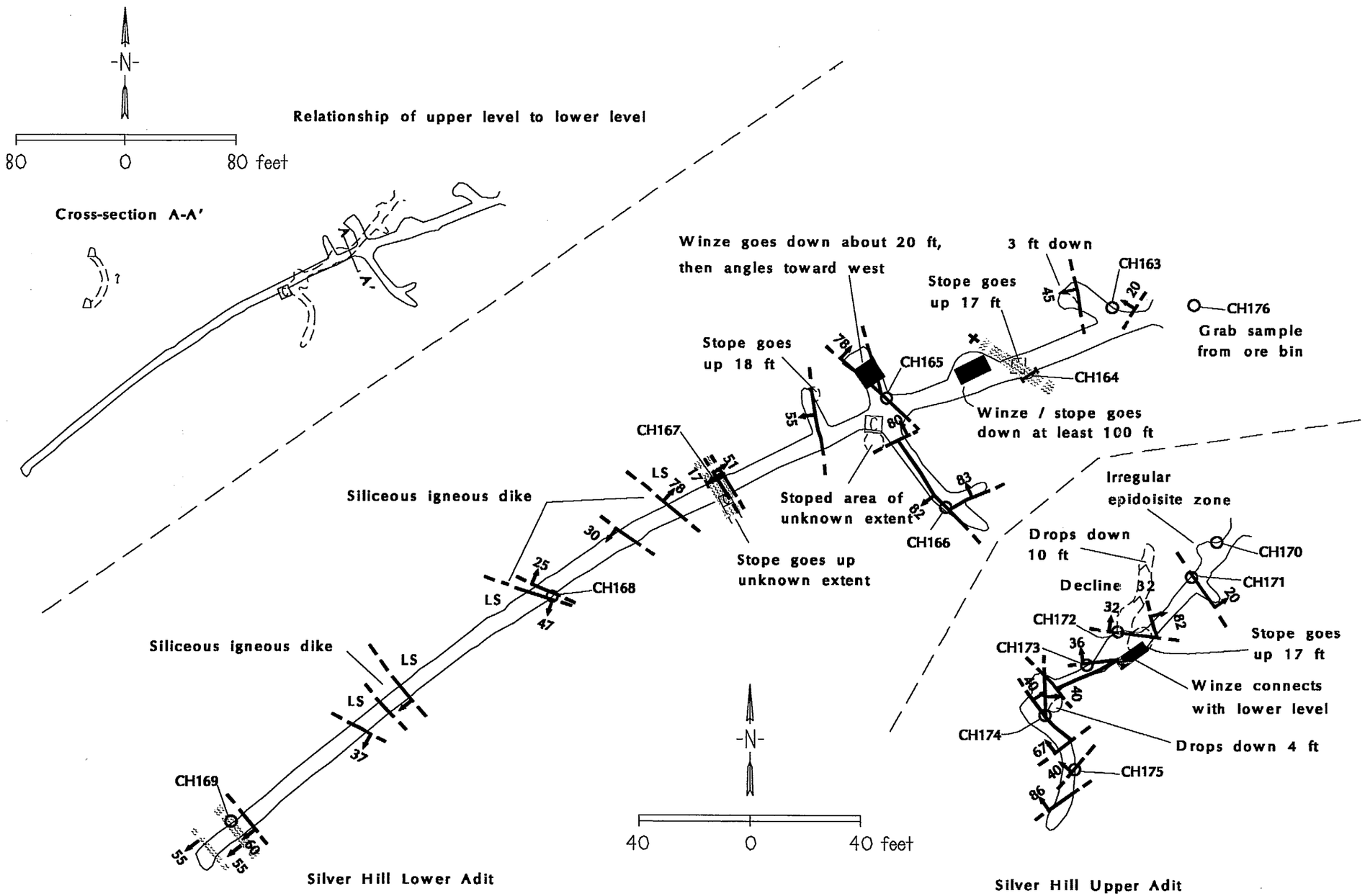
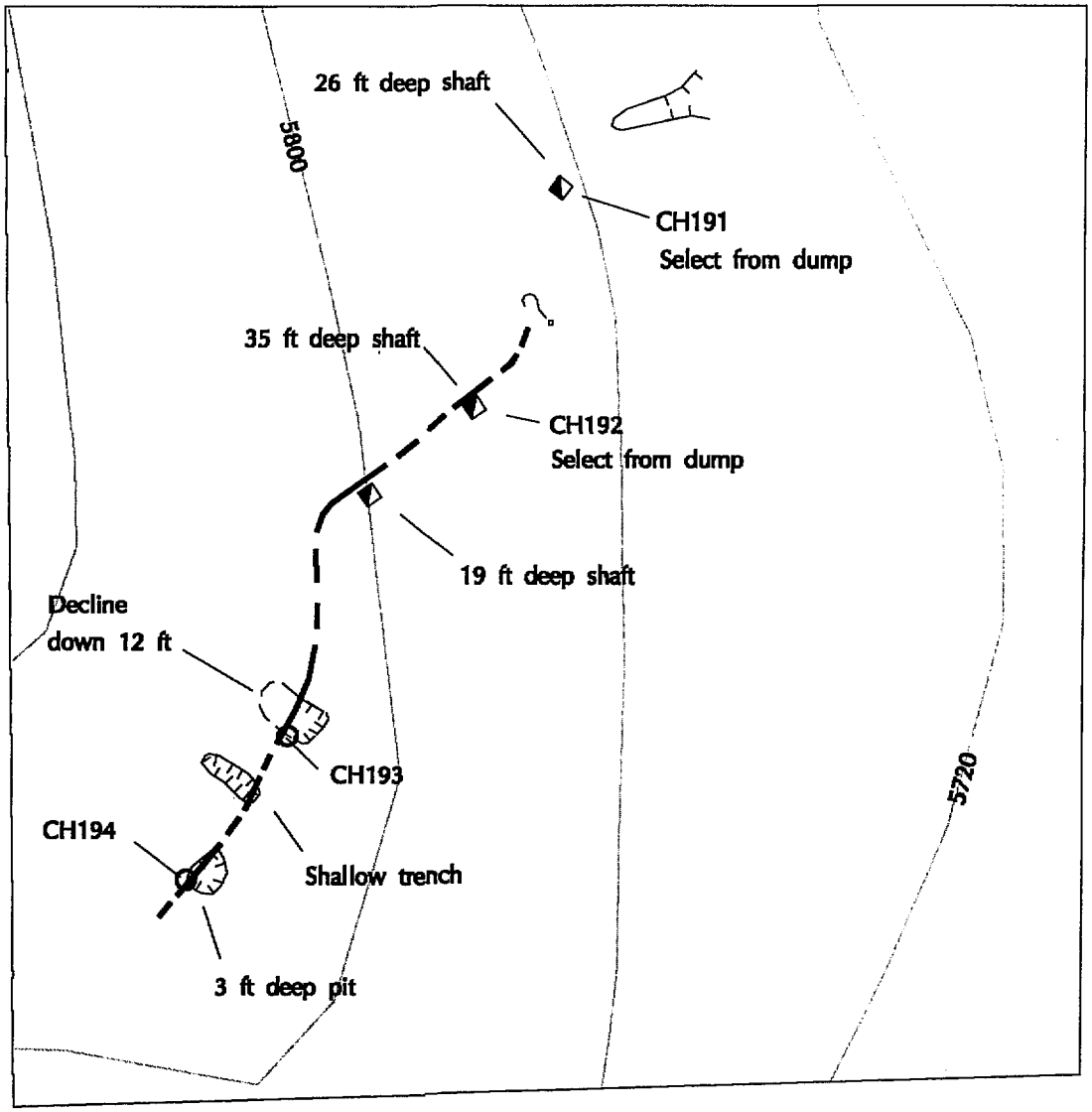


Figure 34.--Silver Hill Mine showing sample localities CH 163-176.



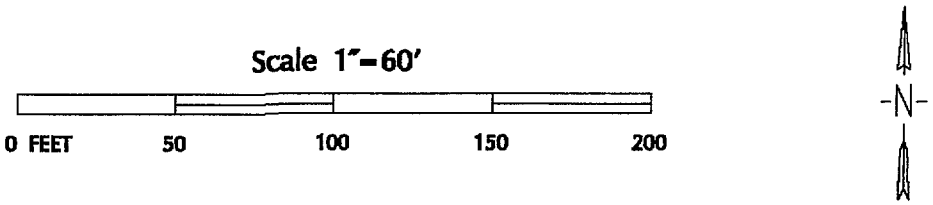
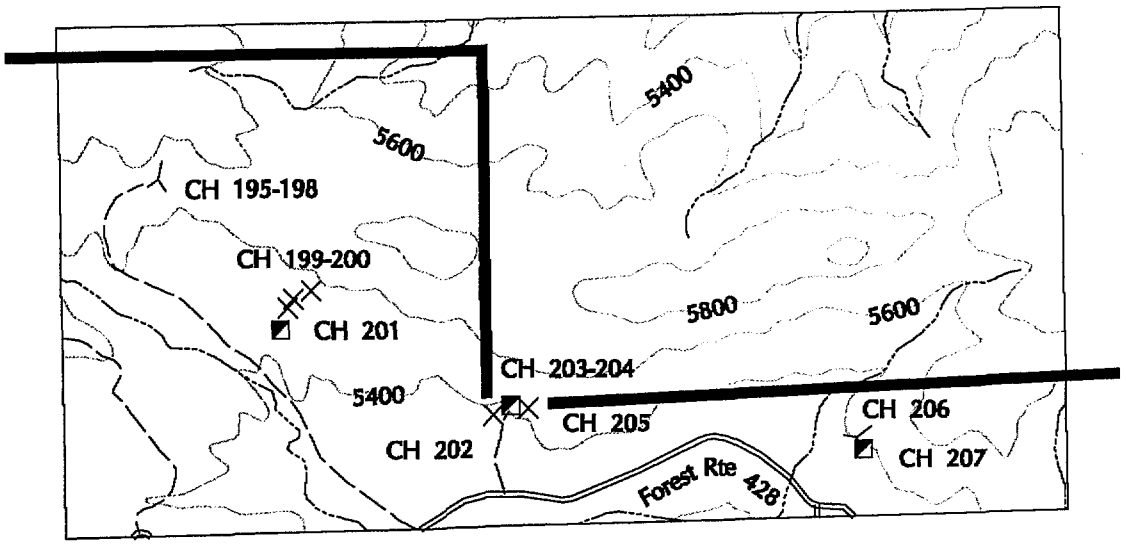


Figure 35.--Enlargement of area in figure 33 showing sample localities CH 191-194.



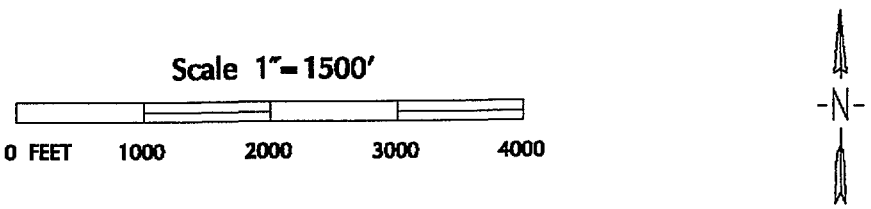


Figure 36.--Mines and prospects between Paradise and Portal showing sample localities CH 195-207.

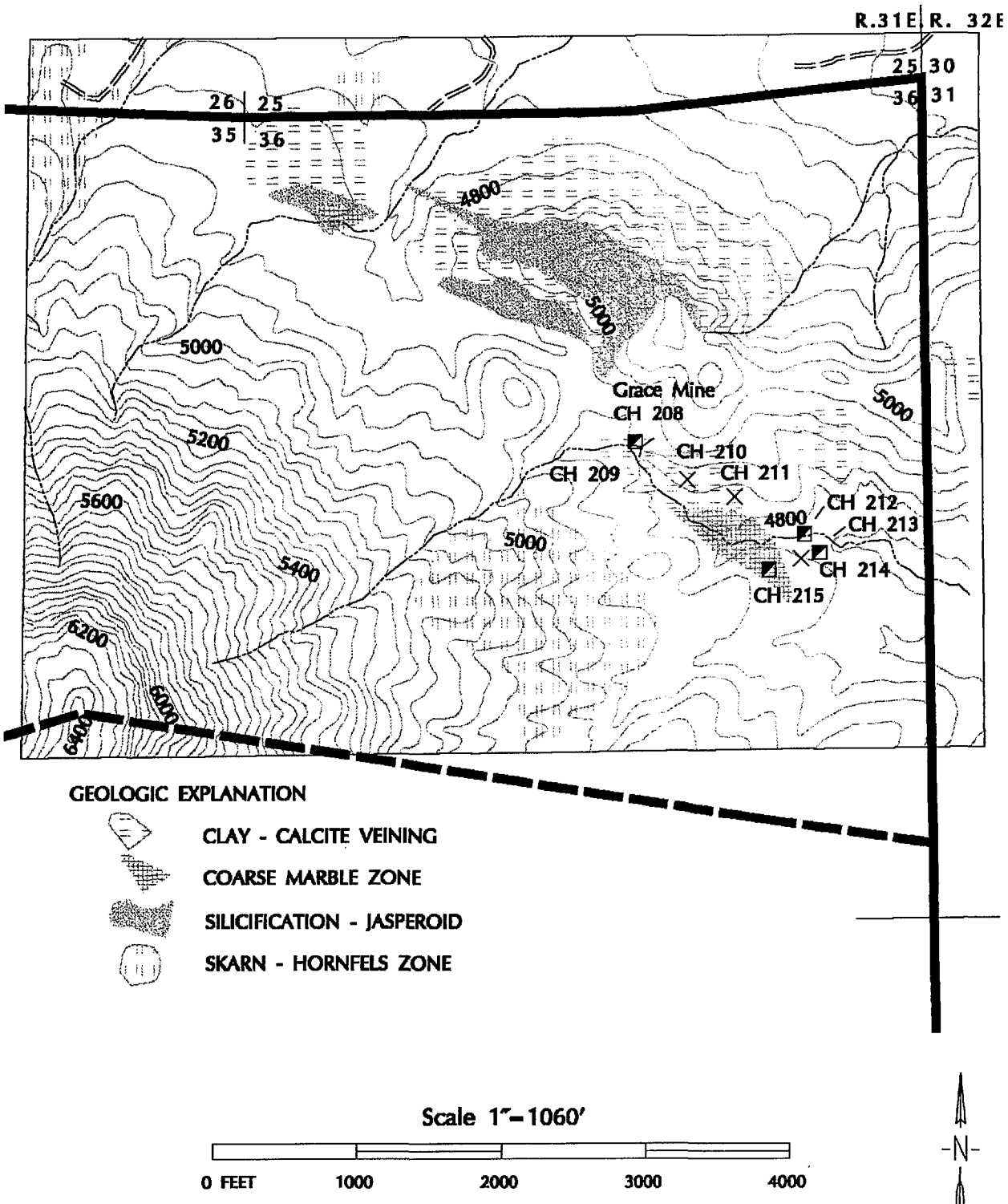
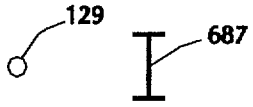


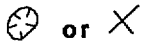
Figure 37.--Mines and prospects southeast of Portal showing sample localities CH 208-215. (Alteration and metamorphism geology by Newmont Exploration Ltd)

EXPLANATION OF SYMBOLS FOR REPORT FIGURES, INCLUDING:
Features of detailed mine maps, both surface and underground, at various scales (larger than 1:24,000).

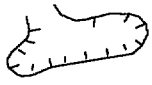


ROCK SAMPLE LOCALITY--Showing sample number

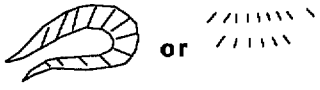
TRENCH



PITS

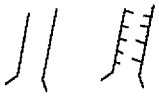


OPEN CUT

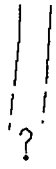


DUMPS

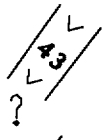
STOCKPILE



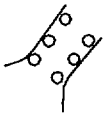
ADIT PORTAL (left);
ADIT PORTAL WITH TRENCH OR OPEN CUT (right)



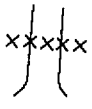
LEVEL WORKING--Dashed and/or queried where uncertain



INCLINED WORKING--Showing degree of inclination, chevrons pointing down; queried where uncertain or inaccessible



TIMBERED (Vertical timbers and/or lagging)



CAVED

RUBBLE (BACKFALL) FILLED, MUCK-FILLED, OR BACKFILLED WORKING--Queried where uncertain or inaccessible

EXPLANATION OF SYMBOLS FOR REPORT FIGURES, INCLUDING:
Features of detailed mine maps, both surface and underground, at various scales (larger than 1:24,000)--Continued.

STEP DOWN IN SILL--Showing drop in feet; hachures on down side

RAISE, head (left); RAISE, foot (right)

RAISE GOING UP AND WINZE GOING DOWN

WINZE--Noted if water filled

MANWAY (left); CHUTE (right)

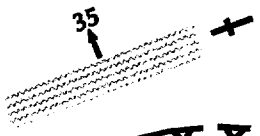
SHAFT, open at surface (left);
SHAFT, bottom (right)

PILLAR

GEOLOGIC SYMBOLS

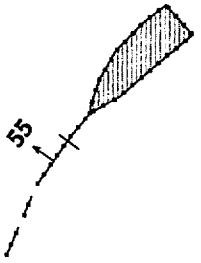
Strike and dip of bedding

Fault--Showing strike and dip (inclined or vertical, degrees); dashed where approximate



Fault zone or shear zone--Showing strike and dip (inclined or vertical, degrees); dashed where approximate

Thrust fault--Sawteeth on upthrown side



Vein--Showing strike and dip (inclined or vertical, degrees); dashed where approximate

EXPLANATION OF SYMBOLS FOR REPORT FIGURES, INCLUDING:
Features of detailed mine maps, both surface and underground, at various scales (larger than 1:24,000)--Continued.

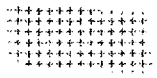
GEOLOGIC SYMBOLS–Continued

Contact--Showing strike and dip (inclined or vertical, degrees); dashed where approximate

Dike--Showing strike and dip (inclined or vertical, degrees); dashed where approximate

Shattered zones

Brecciated zones



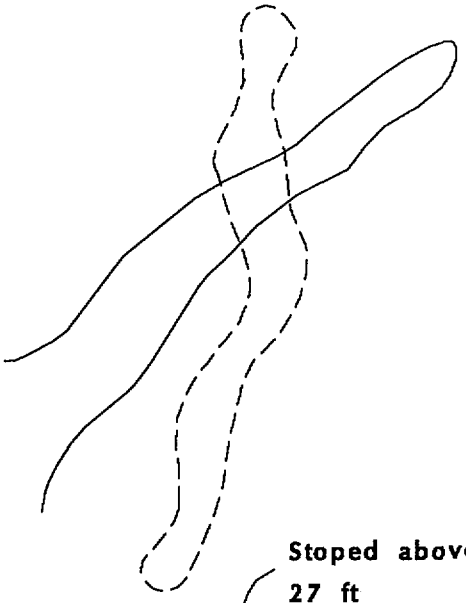
Igneous rock zone or structure

Mineralized zone, disseminated

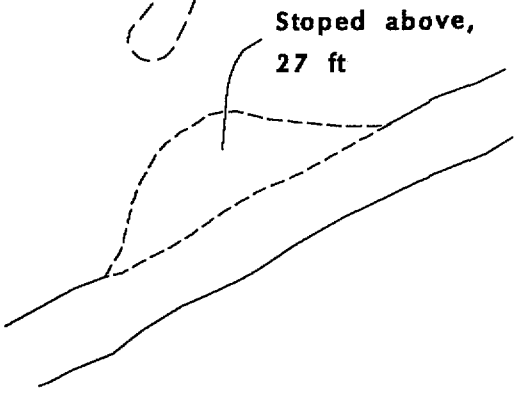
Mineralized zone, localized

Zone containing resources

EXPLANATION OF SYMBOLS FOR REPORT FIGURES, INCLUDING:
Features of detailed mine maps, both surface and underground, at various scales (larger than 1:24,000)--Continued.



Multiple level workings



Stope

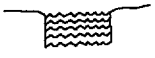
Symbols for vertical cross-section maps

Crosscut

Drift into facing wall

Drift into removed wall

Drift into facing and removed wall



Water-filled winze

EXPLANATION OF SYMBOLS FOR REPORT FIGURES AND PLATES, INCLUDING: Inset maps at various scales and 1:126,720-scale plates.

APPROXIMATE BOUNDARY OF THE FOREST MANAGEMENT AREA

APPROXIMATE BOUNDARY OF WILDERNESS

NATIONAL MONUMENT BOUNDARY

6000 TOPOGRAPHIC CONTOUR–Showing elevation in feet above sea level

STATE LINE

COUNTY LINE

PRIMARY SECONDARY ROADS

UNIMPROVED ROADS TRAILS

INTERMITTENT STREAMS

MINING CLAIM BOUNDARIES

GRID TICK MARK

PATENTED MINING CLAIM

SURFACE OPENINGS–Showing sample number(s); symbols may represent more than one working. Also, VARIOUS REPRESENTATIONS OF SAMPLE SITES:

616 Rock sample locality–Showing sample number

or or Adit open (left); Adit, inaccessible (right)

Trenches

Open cut

Glory hole, open pit, or quarry

EXPLANATION OF SYMBOLS FOR REPORT FIGURES AND PLATES, INCLUDING:
Inset maps at various scales and 1:126,720-scale plates–Continued.

SURFACE OPENINGS–Showing sample number(s);
symbols may represent more than one working. Also,
VARIOUS REPRESENTATIONS OF SAMPLE SITES–Continued:

846 — Prospect (pit, open cut, or small trench)

326-328 — Tunnel

Mine or quarry (active, left; inactive, right)

Placer mine or gravel pit (active, left; inactive, right)

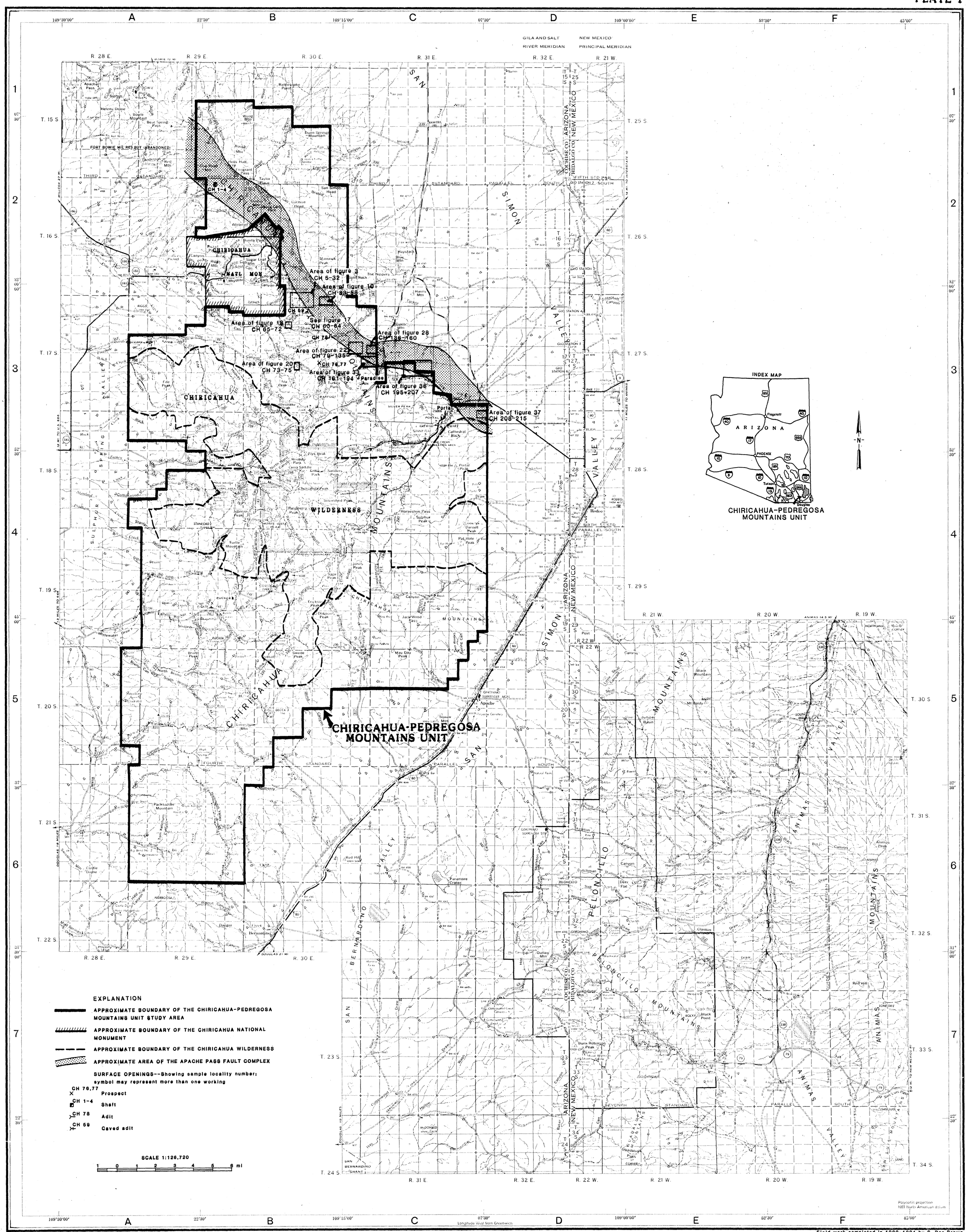
Shaft, open to surface (left);
Shaft, inclined (right)

Shaft, water filled (left);
Shaft, caved (right)

R — Shaft, reclaimed

Mine dump

DHxxx — Drill hole collar



Base map compiled and drafted at Regional Office, Albuquerque, New Mexico, from U.S. Forest Service Planimetric maps. Revised 1975.

Field work completed in 1990-1991 by S. Don Brown, assisted by Roger G. Villalobos.

SAMPLE LOCALITY MAP OF THE CHIRICAHUA-PEDREGOSA MOUNTAINS UNIT, CORONADO NATIONAL FOREST, COCHISE COUNTY, ARIZONA

BY

S. DON BROWN, U.S. BUREAU OF MINES

1993

Figure 4A. Geologic map of the Hill Top Mine, Kasper and Blacksmith levels, showing sample localities CH 28, 30–32 (modified from Brittain, 1954).

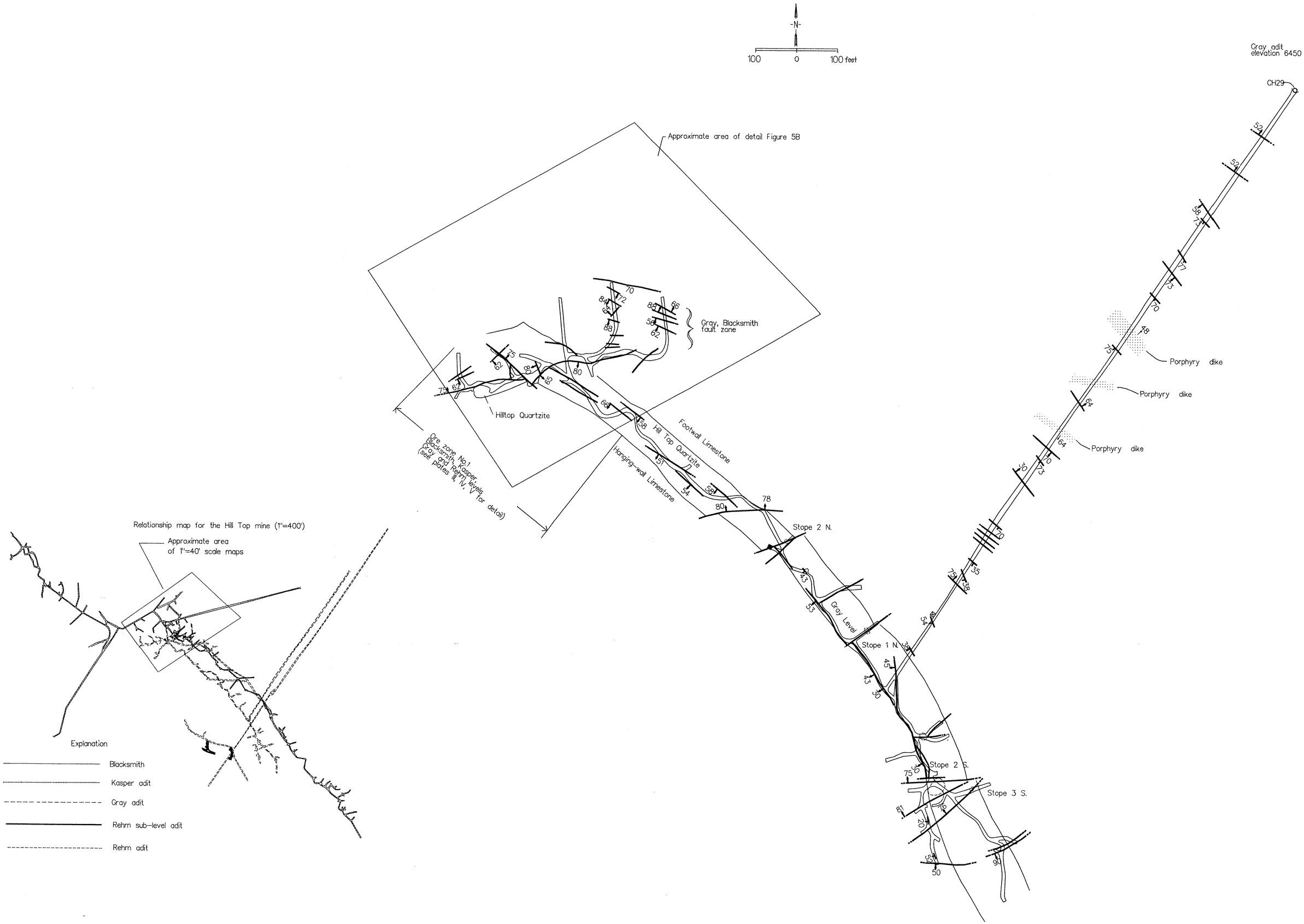


Figure 4B. Geologic map of the Hill Top Mine, Gray level, showing sample locality CH 29 (modified from Brittain, 1954).

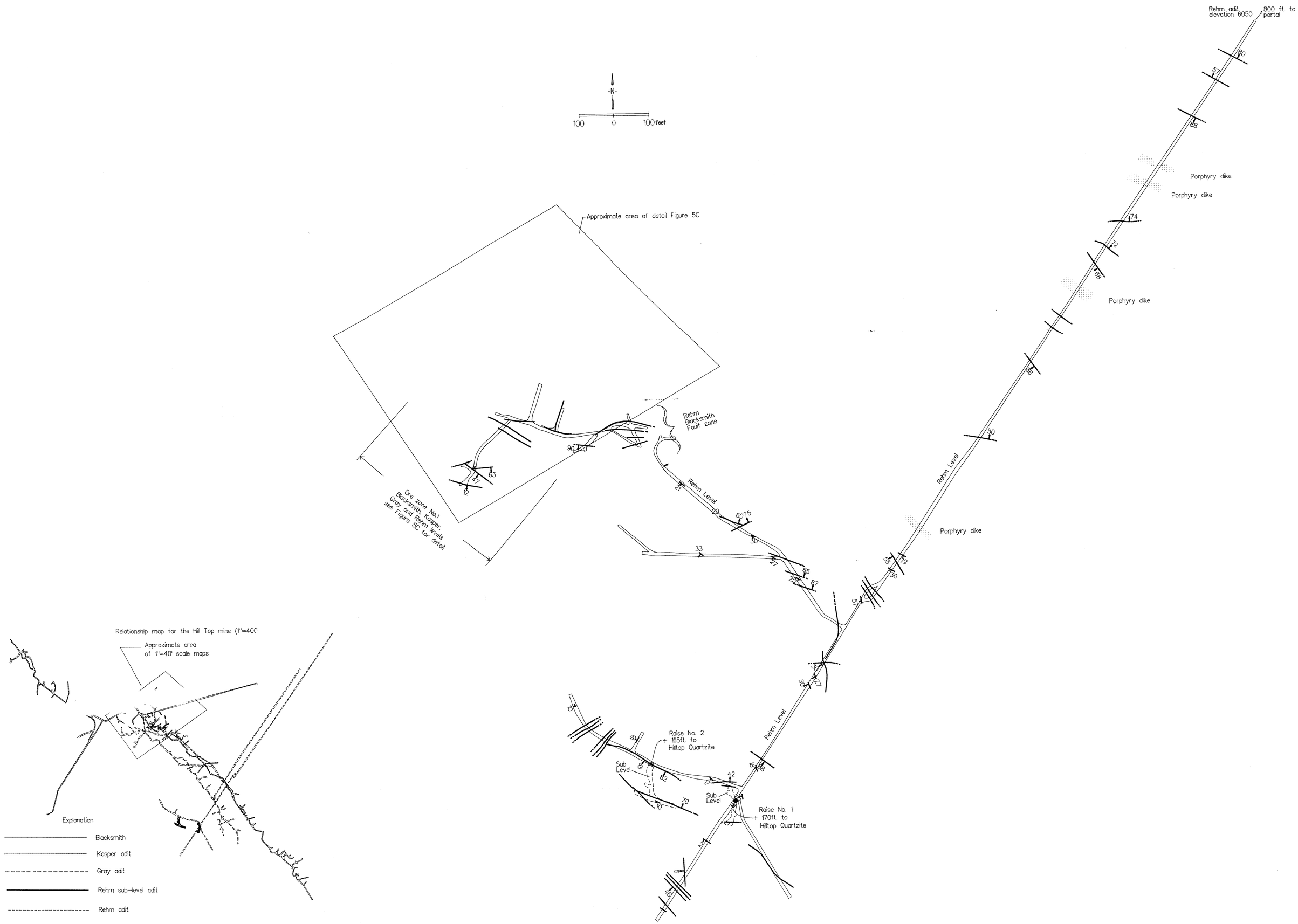


Figure 4C. Geologic map of the Hill Top Mine, Rhem level,
(modified from Brittain, 1954).

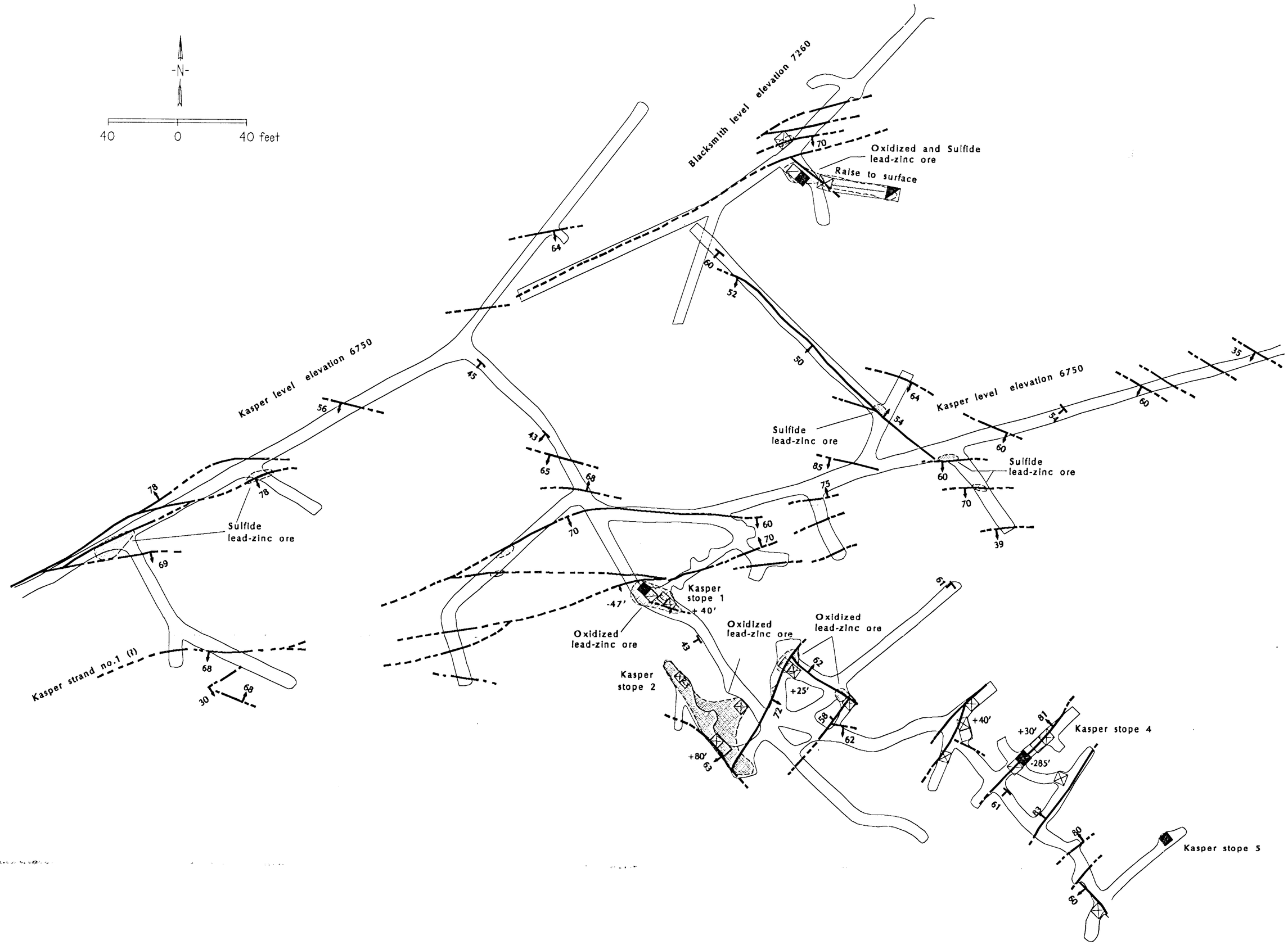
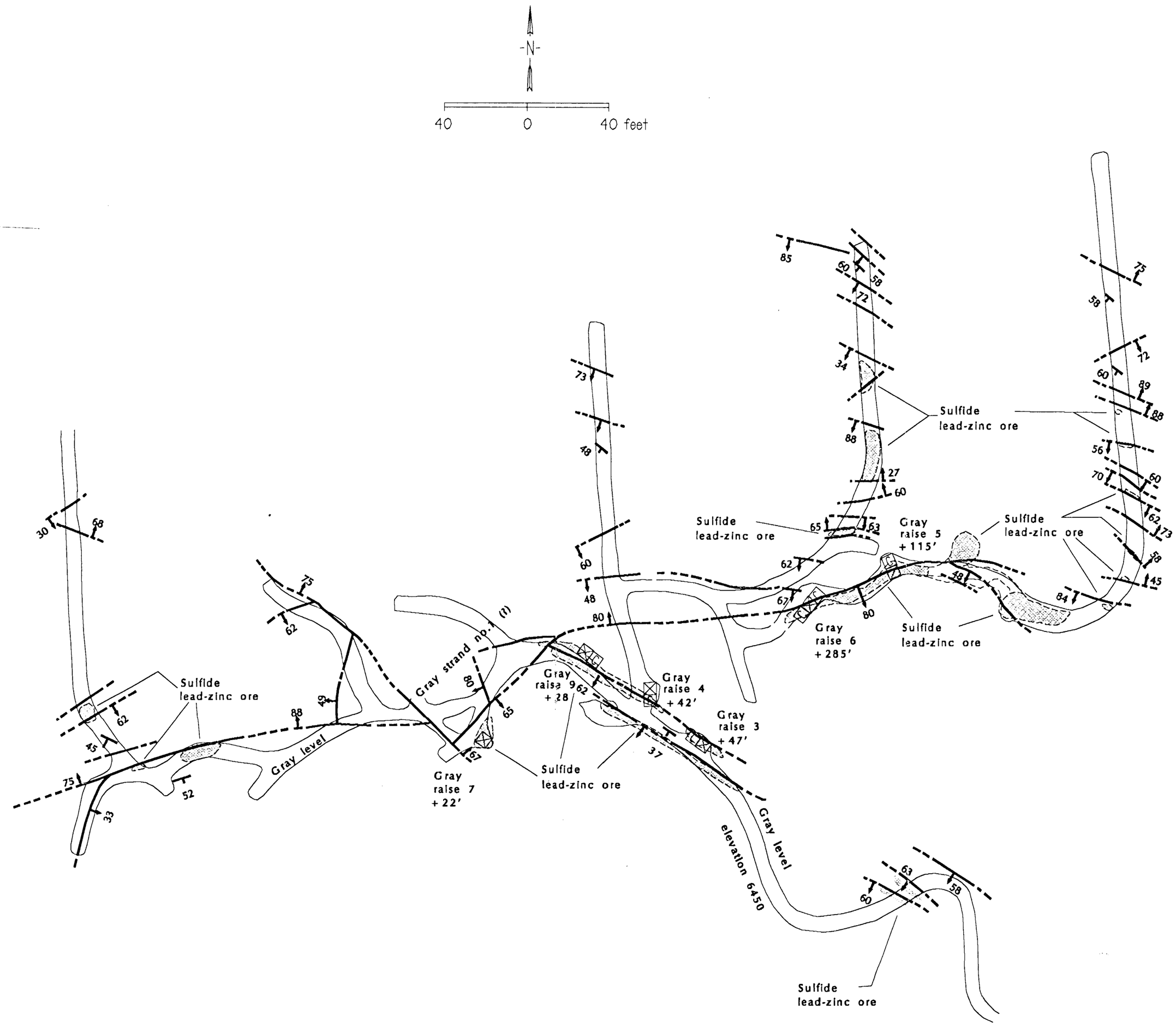
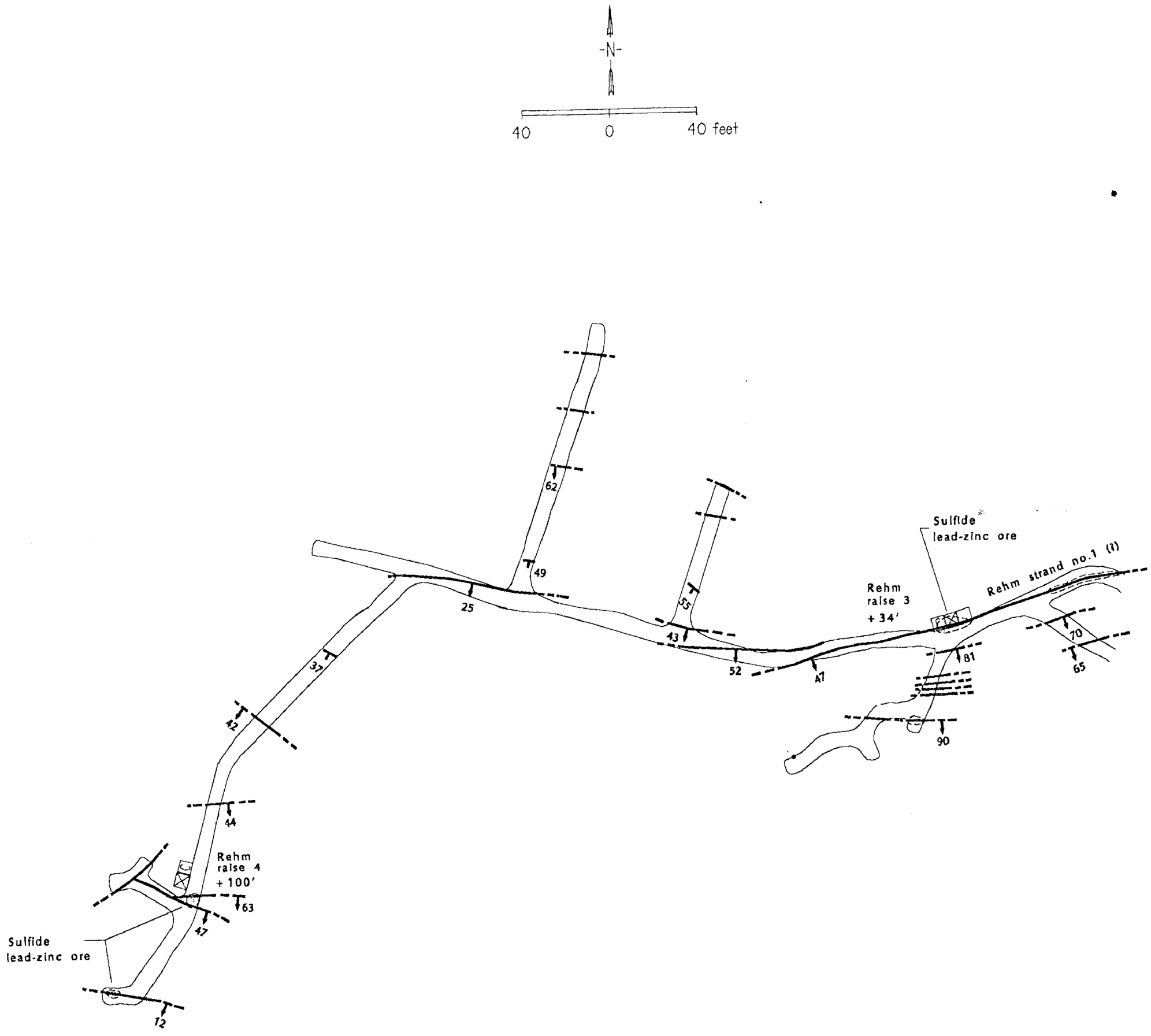


Figure 5A.--Geologic map of the Blacksmith Fault zone, Blacksmith and Kasper levels, (modified from Brittain, 1954).


N
40
0
40 feet
Sulfide lead-zinc ore
Gray raise 5 + 115'
Gray raise 6 + 285'
Gray raise 4 + 42'
Gray raise 3 + 47'
Gray raise 9 + 28
Gray raise 7 + 22'
Gray strand no. 1 (?)
Gray level
elevation 6450



logic map of the Blacksmith Fault zone, Rehm level, (modified from Brittain, 1954).