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ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES AZMILS DATA

PRIMARY NAME: SILVER KING MINE

ALTERNATE NAMES:
STINGY LADY

YAVAPAI COUNTY MILS NUMBER: 1360

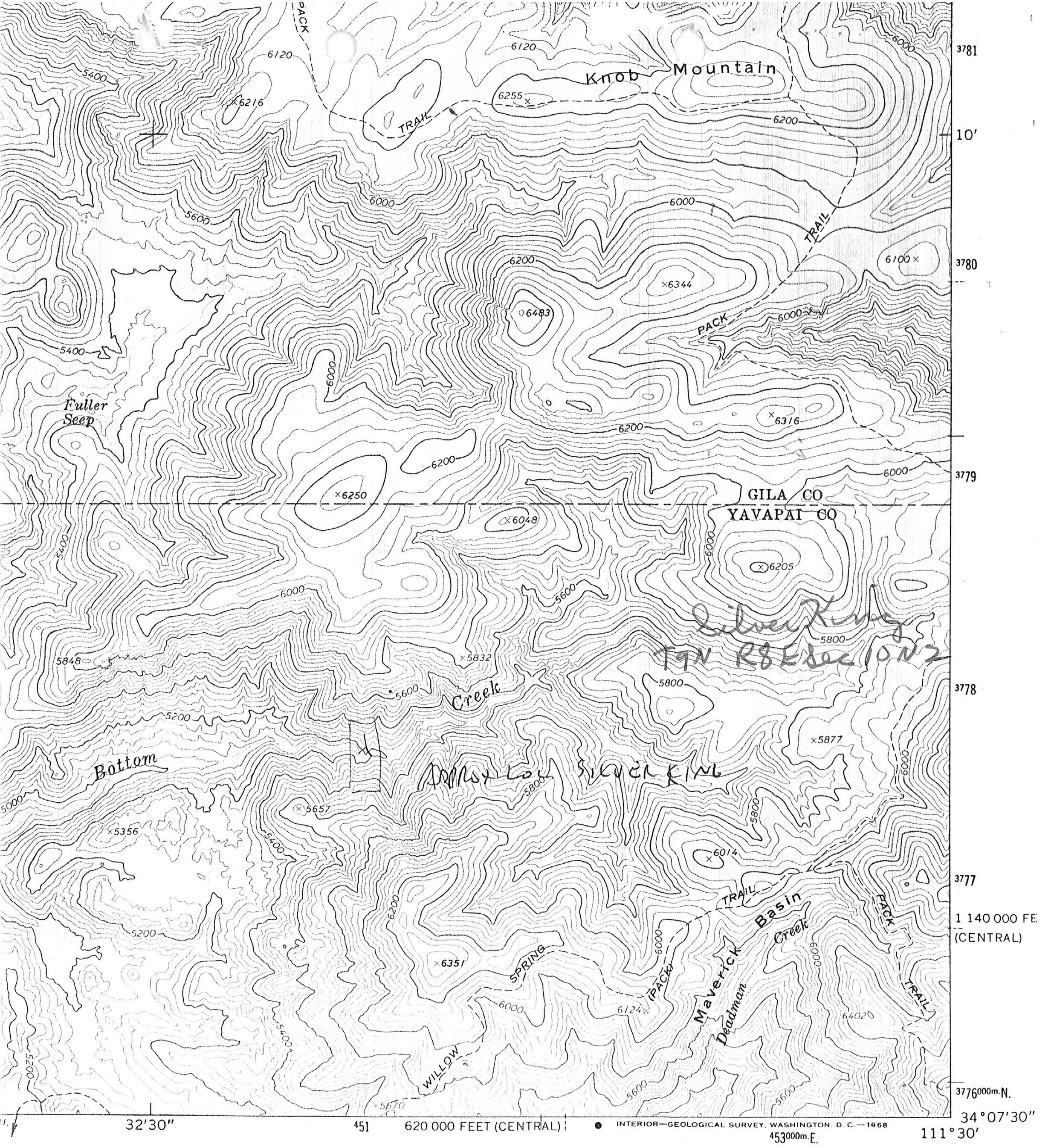
LOCATION: TOWNSHIP 9 N RANGE 8 E SECTION 10 QUARTER N2
LATITUDE: N 34DEG 08MIN 24SEC LONGITUDE: W 111DEG 31MIN 50SEC
TOPO MAP NAME: CYPRESS BUTTE - 7.5 MIN

CURRENT STATUS: RAW PROSPECT

COMMODITY:
SILVER
GOLD

BIBLIOGRAPHY:

ADMMR SILVER KING MINE FILE
DRIFT TO NORTH FROM WET BOTTOM CREEK
USGS MF1573-A P.5 MINERAL RESOURCE POTENTIAL
OF THE MAZATZAL WILDERNESS
USBM MLA 56-82 SEE PLATE 2 UG ASSAY MAP



1 MILE

000 FEET

ETER

ROAD CLASSIFICATION

Unimproved dirt

1-B

QUADRANGLE LOCATION

CYPRESS BUTTE, ARIZ.
N3407.5—W11130/7.5

G1

TON, D. C. 20242

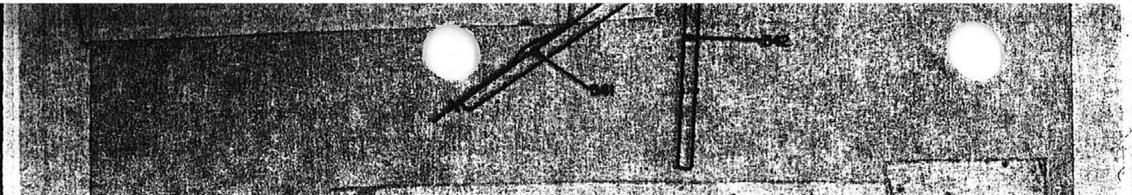
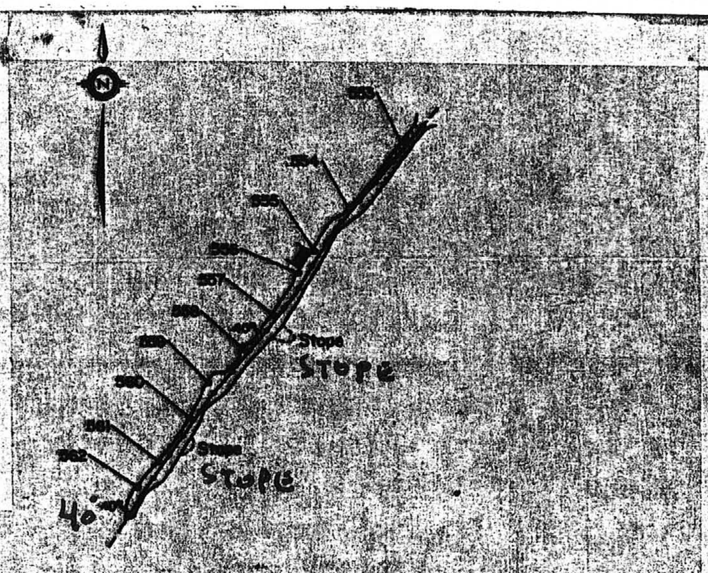


FIGURE 17.–Los Conquistadores adit map.

Sample		Analytical data					
	length	oz/ton		percent			
No.	of chip	Ag	Au	As	Bi	Cu	Pb
553	1.2 ft	18.2	-	25.6	0.14	1.81	1.46
554	3.0 ft	2.0	-	25.3	.16	3.81	.69
555	4.0 ft	-	-	21.2	.25	5.23	.92
556	3.0 ft	.4	-	23.7	.24	5.22	3.05
557	3.0 ft	-	-	5.6	.02	.81	.31
558	4.4 ft	-	0.27	6.9	.06	.37	1.28
559	4.2 ft	-	-	11.2	.11	1.41	1.29
560	3.7 ft	-	-	2.8	.08	.13	.98
561	2.4 ft	-	-	3.3	.18	.22	.77
562	3.2 ft	30.0	-	1.1	.04	.16	.40



553

554

...

561

562

FIGURE 18.–Stingy Lady adit map.

IGS WHICH DO NOT BELONG IN ANY MINING DISTRICT

USBM MLA 56-82, PLATE 2, ELLIS, C.E. 1982

SILVER KING YAVAPAI COUNTY

KAP WR 7/1/88: John Gutieriez, USFS inquired about markets for precious metals concentrates containing a high amount of arsenic. It would depend on the grade and quantity available, but a small tonnage, unless containing thousands of dollars in precious metals, would not be wanted by commercial smelters or refineries. Large tonnages might justify development or implementation of new processing technology. He is involved in a validity contest hearing on the Silver King Mine (file) Yavapai County. According to Mr. Guteriez there have been repeated extentions given to the claimants by the hearing officer for them to show a process by which the ore might be shown as economic.

SILVER KING YAVAPAI COUNTY

RRB WR 8/22/80: John Reynolds, 12643 N. 30th Drive, Phoenix, Arizona 85029, 863-2785 was in with some pretty good looking rock, mostly ilmanite, from the Silver King Mine, Sec 10, T9N R8E, Yavapai County, Mazatzal Wilderness area. He says the vein assays from 13 to 186 oz Ag and .11 oz Au. He says that there is a red clay type material on both sides of the vein approximately 10" thick on hanging wall and 3" to 10" thick on footwall, that assays 18 oz Au and 30 oz Ag. Said he'd bring some in. Mine is about a 4 hour walk into the Wilderness area.

RRB WR 2/7/86: John Reynolds (c) came in for some ore processing ideas. He has the Silver King Mine in Yavapai County in the Mazatzal Wilderness area. He said that the Forest Service is hinting at starting a validity contest. He reports assays by AST laboratories show 80 zo/ton silver over minable widths. I suggested that he take a sample to Mountain States in Tucson for analysis and to develop a flow sheet so he would have good data for the validity hearing if it is started. Short of that he should get assays done at registered assayers and get Stutenroth to run a gravity test on it.

NJN WR 10/10/86: Hilton Cass, Forest Service Zone Officer, reports that John Reynolds (c) has the Silver King Mine in the Mazatzal Wilderness area. He plans to visit the property soon as part of a validity examination necessary to approve Mr. Reynold's plan of operation. The N2 can be added to the legal desciption in MILS. Workings at the property consist of an adit that bears north just avove Wet Bottom Creek.

NJN WR 11/21/86: Hilton Cass (c) geologist, US Forest Zone Office, reported that he has visited the Silver King (file) Yavapai County as a part of a validity examination. Mr. Cass reports that about 20 tons of ore has been helicoptered out from a high grade silver vein.

NJN WR 12/12/86: Hilton Cass (c) Forest Service Zone Office, visited to do microscope examination of tennantite ore from the Silver King Mine (file) Yavapai County. This material assays up to 25% arsenic.

NJN WR 1/2/87: Hilton Cass (c) Forest Service Zone Officer, reported that samples from the Silver King Mine (file) Mazatzal area, Yavapai County, contain over 20% arsenic. Suspected mineral would be friebergite. Samples were taken during Mr. Cass' field examination visit.

(IN PART)

DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

TO ACCOMPANY MAP MF-1573-A

MINERAL RESOURCE POTENTIAL OF THE MAZATZAL WILDERNESS AND CONTIGUOUS ROADLESS AREA GILA, MARICOPA, AND YAVAPAI COUNTIES, ARIZONA

SUMMARY REPORT

By

Chester T. Wrucke[1], Sherman P. Marsh[1], Clay M. Conway[1],
Clarence E. Ellis[2], Dolores M. Kulik[1], Calvin K. Moss[1],
and Gary L. Raines[1]

STUDIES RELATED TO WILDERNESS

Under the provisions of the Wilderness Act (Public Law 88-577, September 3, 1964) and the Joint Conference Report on Senate Bill 4, 88th Congress, the U.S. Geological Survey and the U.S. Bureau of Mines have been conducting mineral surveys of wilderness and primitive areas. Areas officially designated as "wilderness," "wild," or "canoe" when the act was passed were incorporated into the National Wilderness Preservation System, and some of them are presently being studied. The act provided that areas under consideration for wilderness designation should be studied for suitability for incorporation into the Wilderness System. The mineral surveys constitute one aspect of the suitability studies. The act directs that the results of such surveys are to be made available to the public and be submitted to the President and the Congress. This report discusses the results of a mineral survey of the Mazatzal Wilderness (NF3048) and Mazatzal Wilderness Contiguous Roadless Area (3-016) in the Tonto and Coconino National Forests, Gila, Maricopa, and Yavapai Counties, Arizona. Mazatzal Wilderness was established by Public Law 88-577, September 3, 1964. The contiguous roadless area was classified as a further planning area during the Second Roadless Area Review and Evaluation (RARE II) by the U.S. Forest Service, January 1979.

SUMMARY

Small quantities of gold, silver, and copper have been produced from the Mazatzal Wilderness. The wilderness has a high potential for gold, silver, and lead resources in veins in the vicinity of the Story mine, a high potential for silver and copper resources in vein deposits near Copper Mountain, a moderate potential for silver, gold, and copper in vein deposits in one area along the eastern border, and a high potential for copper in vein deposits at Mineral Creek. The Copper Mountain area, the area of silver, gold, and copper vein deposits along the eastern border, and the Mineral Creek area also have a low potential for copper in massive sulfide deposits. Two additional areas in the eastern and northern parts of the wilderness have a low potential for copper in vein and massive sulfide deposits. The wilderness has a high potential for copper in massive sulfide deposits and a moderate potential for copper in carbonate veins at Copper Camp Creek. An area east of the Mazatzal Wilderness has a high potential for gold resources in rocks that also occur in the wilderness, though no gold was found in these rocks in the wilderness. Three areas in the southern part of the wilderness have high, moderate, and low potential for mercury resources. A low potential for molybdenum exists west of the wilderness in three areas, two of which extend into the roadless area and the wilderness. The central part of the wilderness has occurrences of tin, but little evidence of a resource potential for tin. Two areas southwest of the wilderness have low and moderate potential for uranium, and one of these areas extends into the roadless area and the wilderness. No evidence of a potential for fossil fuels was identified in this study.

INTRODUCTION

The Mazatzal Wilderness and the contiguous roadless area are located in the Tonto and Coconino National Forests, west and southwest of Payson, and are almost exactly in the geographic center of Arizona (fig. 1). This is a region of relatively small mining districts and few mines, but occurrences of many different metals are widespread. This report documents the geology, mining activity, and mineral potential of the Mazatzal Wilderness and adjacent areas and discusses long-known, as well as newly discovered, mineral occurrences and the possibility of undiscovered mineral resources.

Investigations summarized in this report were conducted in the field by the U.S. Bureau of Mines and the U.S. Geological Survey, principally in 1979-1980. A few areas were studied briefly in 1981 and 1982. The Bureau of Mines examined mines, prospects, mineral claims, and mineralized areas and searched mining records. The Geological Survey conducted geologic mapping, geochemical sampling, remote-sensing studies, and geophysical examinations.

Physiography

The Mazatzal Mountains constitute the dominant physiographic feature of the wilderness. The eastern slopes of these mountains rise steeply from about 3,500 ft in altitude along the valley of Rye Creek east of the range to 7,903 ft at Mazatzal Peak. To the west, the range slopes steeply from the crest, then more gently along the lower flanks to the Verde River, one of the main drainage channels of Arizona. In the northern part of the wilderness, the East Verde River, a tributary of the Verde, occupies a deep canyon that separates the Mazatzal Mountains from mesas to the north. The lowest parts of the wilderness have altitudes of about 2,200 ft and are located near Bartlett Reservoir in the southwestern part of the area studied.

Geologic setting

The Mazatzal Mountains lie at the margin of the Basin and Range physiographic province in a region of Arizona where the mountain ranges are about as wide as or wider than

[1]U.S. Geological Survey
[2]U.S. Bureau of Mines

the intervening basins. The Mogollon Rim, which defines the southern physiographic border of the Colorado Plateau, is about 5 mi north of the Mazatzal Wilderness. Paleozoic rocks, extensively exposed along the Mogollon Rim, have been largely eroded from the wilderness and roadless areas. The few remaining masses of Paleozoic rocks in the wilderness rest on thick sequences of mostly steeply tilted stratified Proterozoic rocks and on Proterozoic granitic rocks. These rocks are similar to Proterozoic layered and intrusive rocks exposed widely in central Arizona east and northwest of the wilderness. Tertiary volcanic rocks exposed within the wilderness are at the southern end of a large volcanic field that extends north and northwest for more than 100 mi in the western parts of the Colorado Plateau and adjacent areas of the Basin and Range province.

Mining activity

Prospecting has been conducted intermittently in the Payson area, including the Mazatzal Wilderness, since the discovery of gold near Payson in the 1870's. Within the wilderness and contiguous roadless area, gold and silver were the object of prospecting activity before World War II (Lausen and Wilson, 1925) and may have been mined in small quantities from several deposits. Few records are available for this period. Sporadic exploration for precious and base metals since World War II has resulted in the production of small amounts of copper, gold, and silver in the wilderness. Within a few miles of the southeast corner of the wilderness, mercury was produced at several mines from 1913 to the 1960's (Beckman and Kerns, 1965), and exploration continued at a low level of activity to 1979. Ore containing copper, gold, and silver was mined in areas immediately east of the wilderness in the period 1938-1956. Uranium occurrences near Bartlett Reservoir were revealed in drill cores in the 1970's. Exploration for gold was being conducted a few miles southwest of Payson in 1980.

GEOLOGY, GEOCHEMISTRY, AND GEOPHYSICS PERTAINING TO MINERAL RESOURCE ASSESSMENT

General Geology

The geology of the Mazatzal Wilderness and contiguous roadless area was mapped during this study and is shown on the accompanying 1:48,000-scale map and on figure 2. The only previous description of the geology in the wilderness (Wilson, 1939) is of the Proterozoic rocks in higher parts of the Mazatzal Mountains between Cactus Ridge and North Peak. Ludwig (1973) mapped the geology of the mercury district, which is mainly outside the wilderness south of Cactus Ridge. Part of this mapping is included in the geologic map that accompanies this report.

The oldest rocks of the Mazatzal Wilderness and the surrounding area consist of sequences of Early Proterozic sedimentary and volcanic stratified rocks intruded by gabbro, diorite, and alkali granite. These rocks in turn are overlain depositionally by Early Proterozoic sedimentary strata. The aggregate thickness of the Proterozoic stratified rocks is 61,000 ft. The Proterozoic rocks locally are capped by Paleozoic strata or they are partly buried by Tertiary volcanic flows and interstratified sedimentary rocks.

The oldest of the Early Proterozoic rocks in the wilderness may be the structurally fragmented stratified sequence of mafic volcanic flows, pillow basalts, volcaniclastic rocks, graywacke, minor rhyolite, jasper, and siltstone exposed on the east flank of the Mazatzal Mountains, along the East Verde River, and on the south rim of Buckhead Mesa. This stratigraphic section is about 26,000 ft thick and is informally referred to here as the East Verde River sequence. It is thought to be older than the Early Proterozoic Alder Formation[3] and has lithologic similarities to the older (1,740-1,760 m.y.) Yavapai Series in the Jerome-Prescott region (Anderson and others, 1971; L. T. Silver, oral commun., 1982). A correlation with the Yavapai Series is not clearly established.

Proterozoic rocks of two stratigraphic sequences, each about 3,300 ft thick, crop out near the confluence of the Verde River and East Verde River in the northwestern part of the wilderness. One sequence, consisting of siltstone overlain by rhyolite conglomerate, rhyolite, and andesite is exposed in the Limestone Hills and rests in apparent conformity on the East Verde River sequence described above. The second sequence occurs to the west in the vicinity of Squaw Butte and is composed of graywacke, quartzite, and rhyolite. A contact between the two sequences has not been found. Both of these sequences have rocks similar to the upper part of the Alder Formation and the overlying rhyolite, and to the rhyolite that is widespread in the eastern part of the wilderness beneath quartzite. Both sequences are weakly metamorphosed to the greenschist facies and are largely unfoliated.

Diorite, gabbro, and minor syenite of Early Proterozoic age occur as small intrusive masses in the Proterozoic stratified rocks in the Limestone Hills in the northwestern part of the wilderness, and as a large complex east of the wilderness between Buckhead Mesa and Rye Creek. These rocks contain a few large inclusions of metasedimentary rocks in the eastern part of the area outside the wilderness.

Sedimentary and volcanic rocks of the Alder Formation, including felsic porphyry sills, are exposed in a tightly appressed syncline along the southern margin of the area. The formation comprises weakly to strongly foliated sandstone, graywacke, shale, conglomerate, rhyodacite and rhyolite tuffs and flows, and subordinate mafic volcanic rocks. These rocks are metamorphosed to the greenschist facies of regional metamorphism. According to Ludwig (1973), the formation is entirely volcanic or volcanogenic in origin. He estimated the thickness of the formation to be about 18,000 ft. During the present study an additional 5,000 ft of strata were found in the wilderness beneath the rocks mapped by Ludwig. Ludwig (1973) described the Alder Formation as conformably overlain by the Red Rock Rhyolite of Wilson (1937, 1939), a thick (more than 3,000 ft) sequence of alkali rhyolite, predominantly ash-flow tuff. The Alder Formation is in contact with other Proterozoic rocks of the area only along the northeast-trending Sheep Mountain fault. Lithologically the Alder Formation is dissimilar to the East Verde River sequence, and regional relations suggest that the Alder Formation is younger.

The central part of the Mazatzal Wilderness is underlain by a large complex of alkali granite and granophyre that intruded the East Verde River sequence and the gabbro-diorite complex. Regional relations indicate that the granite also is younger than the Alder Formation. Granophyre is widespread in the wilderness and was emplaced as huge sheet-like bodies high in the alkali granite complex. The granite contact dips shallowly northward beneath stratified rocks of the East Verde River sequence, which are intruded by dikes of tourmaline-bearing rhyolite porphyry that probably are related to the alkali granite. The alkali granite is thought to correlate with granite for which an apparent age of 1,730±15 m.y. was obtained by L. T. Silver (Conway, 1976) from a sample collected 3.5 mi east-northeast of Payson.

A quartz monzonite porphyry crops out in a 2.5 mi^2 area at Tangle Creek on the west border of the area, just outside the wilderness and adjacent roadless area. This rock type appears to be more calcic than the associated alkali granite and differs in geochemical signature from the alkali

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[3] Anderson and others (1971) geographically restricted the Alder Group to its type locality in the Mazatzal Mountains. The unit is here reduced in rank to Alder Formation since it contains no formations. Furthermore, the age of the unit is here revised from Precambrian to Early Proterozoic based on Pb-U dates of 1,730±20 m.y. from metavolcanic rocks as reported by Ludwig (1973).

granite in having anomalous amounts of molybdenum, boron, tungsten, thorium, niobium, and yttrium, and in having distinctive gravity and aeromagnetic signatures. The quartz monzonite porphyry is thought to have intruded the alkali granite, but the relative ages of these intrusive rocks have not been established, and it is not known if the quartz monzonite is Proterozoic.

A sequence of Early Proterozoic rocks underlying the higher parts of the Mazatzal Mountains consists of alkali rhyolite ash-flow tuff overlain in turn by the Deadman Quartzite of Wilson (1939), the Maverick Shale of Wilson (1939), and the Mazatzal Quartzite (Wilson, 1939). The close spatial association of the rhyolite with the upper parts of the alkali granite complex and the apparent chemical affinities of the rhyolite and granite suggest that the rhyolite may be the extrusive roof-rock equivalent of the granite that intruded it. Similar thicknesses and lithologic and chemical similarities suggest that this rhyolite and the Red Rock Rhyolite, which crops out south of the Sheep Mountain fault, may be equivalent. This is compatible with the sequence in Tonto Basin (Conway, 1976), where a thick alkali rhyolite rests on the Alder Formation and is overlain by a great thickness of quartzite that is similar to the Deadman and Mazatzal Quartzites. An obstacle to this idea, however, is the fact that the Alder Formation, thousands of feet thick south of Sheep Mountain fault, is apparently missing beneath the rhyolite north of the fault. Conway (1976) and Wilson (1939) suggested that the Deadman Quartzite of Wilson (1939) and the Mazatzal Quartzite correlate with quartzite at Natural Bridge. Silver (1967; oral commun., 1976) dated a rhyolite flow within the quartzite at Natural Bridge as 1,715 ±15 m.y.

Porphyritic quartz monzonite and pegmatite crop out in the southwest corner of the area outside the wilderness and resemble granitic rocks of Middle Proterozoic (Ruin Granite) age that have been recognized in a wide area farther south in the Mazatzal Mountains.

Cambrian and Devonian sandstone and carbonate rocks once were more abundant throughout the wilderness, but they crop out today only in the Limestone Hills, along lower Pine Creek, and, together with Mississippian and Pennsylvanian strata, in upper Pine Creek. These rocks have a total thickness of about 800 ft and are regarded as having been deposited in shallow seas at the western edge of the North American craton.

Rocks of Tertiary age cover about one-half of the area and record an intricate history of volcanism and sedimentation from the middle of the Miocene to about the middle of the Pliocene. Rocks emplaced during this time interval include basalt flows and intertonguing sandstone, limestone, and gravel, forming a composite section as thick as 2,000 ft. Dacite flows and tuffs occur locally in the Tertiary strata, and dacite porphyry exists as intrusive rocks at Lion Mountain, Squaw Butte, and near the northwest corner of the area.

The youngest rocks in the area are poorly consolidated Quaternary sand and gravel in pediment alluvium, terrace gravels, and stream deposits. Quaternary travertine accumulated at a locality in lower Pine Creek, and landslide masses are found in many parts of the area.

The rocks of the Mazatzal Wilderness record a long and complex structural history (Wilson, 1939; Conway and others, 1982). The oldest deformation that affected rocks in the area was the northwestward to northward tilting of the Proterozoic stratified rocks of the East Verde River sequence. The Alder Formation may have been deformed at this time, although the relative ages of the deformation experienced by these rocks and the stratified sequences along the East Verde River are unknown. The next recorded event was the emplacement of the alkali granite and associated granophyre into the roof rhyolite. After deposition of the Deadman Quartzite, Maverick Shale, and Mazatzal Quartzite, this sedimentary sequence and, locally, the underlying rocks were folded into a northeast-trending syncline and broken by thrust faults along which movement was to the northwest. Prominent northeast- to north-trending faults, including the arcuate Deadman and Sheep Mountain faults, formed subsequently, as did some northwest-trending faults. These faults are the youngest Proterozoic structural features in the area studied. Many north- and northwest-trending faults are of Tertiary age, and some of them merged with Proterozoic faults and reactivated them. The Tertiary faults appear to have been active as early as middle Miocene and to have contributed to the development of Basin and Range topography and structures.

Geology related to mineralization

Many of the mineral occurrences in the Mazatzal Wilderness appear to be related directly or indirectly to the alkali granite. The granite and associated granophyre are tin bearing. Cassiterite has been found in modern stream sediments in areas of greisen zones in the granitic terrane, although it has not been identified in bedrock samples. The greisen zones are composed of highly sericitized quartz-rich granitic rocks containing abundant quartz veins and locally tourmaline and hematite. The presence of cassiterite and tourmaline and high values of tungsten, beryllium, boron, fluorine, and rare-earth elements in stream sediments in areas of greisen in the granitic terrane are indicative of mineralization late in the crystallization history of the granite. This mineralization was followed by deposition of tin, silver, copper, gold, arsenic, antimony, mercury, bismuth, lead, and zinc in northeast-trending veins. The genetic relationship of this mineralization to the alkali granite is based on the presence of tin and mercurian, auriferous, and argentiferous sulfosalts in veins in both the granite and its host metamorphic rocks and on the existence of the same suite of trace elements (tin, boron, and niobium) in these veins as in the greisen zones in the alkali granite. Tourmaline and fluorite locally are abundant in the vein systems. The sulfide minerals contain silver, bismuth, arsenic, and other elements found in well-known tin mineralization systems in the world (Taylor, 1979). The northeast-trending faults that contain the veins displace rocks as young as the Mazatzal Quartzite and could have been active earlier. These relationships indicate that a significant time interval may have occurred between emplacement of the granite and the development of related vein mineralization, as has been described for tin granites elsewhere (Sainsbury and Reed, 1973; Jones and others, 1977).

Gold occurrences in diorite east of the Mazatzal Wilderness may be related to the alkali granite, but this association has not been firmly established. The gold deposits occur on northwest-trending faults that have had movement—presumably of Tertiary age—since the gold mineralization. It is not known if these faults existed in Proterozoic time, but Proterozoic faults of northwest trend occur in the area.

Secondary copper minerals occur in mafic volcanic rocks of the East Verde River sequence in the Eisenhauer Canyon area immediately east of the wilderness boundary. This copper may have been derived from syngenetic copper in the volcanic host.

The mafic volcanic rocks in the East Verde River sequence accumulated in a marine environment favorable for stratabound massive sulfide-type mineral deposits. Massive sulfide deposits occur in Proterozoic marine volcanic rocks at Jerome, Arizona (Anderson and Nash, 1972). Although no deposits of this type have been discovered in the area, the favorable rocks and the widespread copper vein deposits suggest that massive sulfide bodies may exist in the East Verde River sequence and could be the source of the secondary copper in Eisenhauer Canyon and elsewhere along the east and north sides of the Mazatzal Mountains as far northwest as Copper Mountain.

Copper occurrences in the same mafic volcanic unit from the Casterson mine to the House mine are spatially associated with apophyses of granitic rocks and include significant amounts of gold, silver, arsenic, mercury, and antimony, suggestive of a genetic relation to the hydrothermal system in the alkali granite. However, some of this copper may have come from the mafic volcanic host. These deposits were mined for their precious metal content with copper as a byproduct.

Primary and secondary copper minerals occur in mafic volcanic rocks in the Mineral Creek area near intrusive rhyolite related to the alkali granite. These minerals appear to be concentrated along faults that form a complicated pattern at the intersection of the Proterozoic Deadman and Tertiary East Verde fault zones. There is a weak expression in this area of the suite of elements related to the mineralization associated with the alkali granite. However, the location of copper minerals on or near Tertiary faults argues for remobilization.

Primary and secondary copper minerals with small amounts of gold, silver, and mercury occur at mines and prospects in the Copper Mountain area. These occurrences may represent extensions of vein systems in the granite. Widespread copper minerals in the mafic volcanic rocks and gossan interpreted as clasts in the graywacke are suggestive of earlier, syngenetic copper.

Abundant veinlets of secondary malachite are associated with stratiform lenses of gossan and chert at Copper Camp Creek in the wilderness south of Sheep Mountain fault. Primary sedimentary structures in the gossan and clasts of gossan in associated conglomerate attest to a syngenetic origin of the primary minerals and suggest that a massive sulfide body may occur in the Copper Camp Creek area. Extensive well-developed chlorite beneath the chert and gossan lenses is indicative of hydrothermal alteration and venting in the immediate vicinity. But here, as in copper deposits associated with mafic volcanic rocks immediately east of the wilderness, elements such as arsenic, antimony, bismuth, gold, silver, and mercury, typical of the hydrothermal system related to the alkali granite, are present and suggest an epigenetic overprint.

Mercury deposits of the Sunflower district east of the southern part of the Mazatzal Wilderness are in steeply dipping highly foliated strata of the Alder Formation and contain cinnabar near the surface and mercurian tennantite, tourmaline, and cinnabar at depth (Lausen and Gardner, 1927; Faick, 1958; Ransome, 1915). The mercurian sulfides and tourmaline suggest an affinity to the sulfide mineralization in the Proterozoic alkali granite. The cinnabar may have evolved from the breakdown of preexisting sulfides probably during Tertiary volcanism. Cenozoic basalt, apparently intrusive into the Alder Formation, occurs near Highway 87 immediately south of the Sunflower district, and Miocene volcanic rocks occur to the west in the wilderness. Aeromagnetic data suggest a possible buried intrusive body in the vicinity of the mercury district.

The quartz monzonite porphyry at Tangle Creek, immediately west of the Mazatzal Wilderness and contiguous roadless areas, was identified during this study as mineralized, although no prospects or mines were found. Unusual concentrations of molybdenum, bismuth, tungsten, uranium, thorium, and scandium were found in a narrow zone from the west side of Tangle Creek outside the wilderness and roadless area, north into the roadless area. Anomalous molybdenum and uranium concentrations in stream waters from the quartz monzonite porphyry at Tangle Creek were the highest found in the area. The geochemical suite and data from water analyses are suggestive of porphyry molybdenum mineralization.

Uranium in Tertiary tuffs and sedimentary rocks along the Verde River could have been derived from the siliceous tuffaceous debris they contain or from nearby Proterozoic granitic rocks. The granites of the area contain anomalous concentrations of uranium and were exposed when the sedimentary rocks accumulated.

A small occurrence of copper-stained quartz, locally considered a gem stone because it resembles turquoise, occurs in freshwater limestone and siltstone low on the east flank of Chalk Mountain.

Geochemistry

Three sample media were selected as best for geochemical sampling in the arid high desert environment of the Mazatzal Wilderness: stream sediment, heavy-mineral concentrates from stream sediment, and rock. Sediments and concentrates were collected from first- and second-order stream drainages at 472 localities in the wilderness and contiguous roadless areas, each drainage representing an area of approximately 1 to 2 mi^2. Selected rock samples also were taken from areas of altered outcrops and from existing mining areas to determine mineral suites and trace-element signatures of mineralized systems.

The samples were screened and the minus-80-mesh fraction of the sediment and the nonmagnetic heavy ($\geq$2.6 specific gravity) fraction of the concentrate were analyzed for 31 elements by a semiquantitative emission spectrographic method (Grimes and Marranzino, 1968). Rock samples were pulverized and also analyzed by semiquantitative emission spectrographic methods. The resulting analyses along with statistical data for the Mazatzal Wilderness and contiguous roadless area are listed in two reports by Marsh and others (1983).

Semiquantitative spectrographic analyses of the nonmagnetic fraction of the heavy-mineral concentrates from stream sediments proved to be the most useful in evaluating the Mazatzal Wilderness and contiguous roadless area and have provided the principal evidence for mineral systems related to the Proterozoic alkali granite and the quartz monzonite prophyry in the Mazatzal Wilderness and surrounding areas. This sample medium contains the common ore-forming sulfide and oxide minerals as well as barite and other nonmagnetic minerals (zircon, apatite, fluorite, cassiterite, rutile, and some sphene and tourmaline). The concentrate medium also provides data that give a greatly enhanced anomaly pattern, as all of the more common (low specific gravity, less than 2.6) rock-forming minerals (quartz and feldspar) that tend to dilute the anomalies have been removed.

Several suites of geochemically associated elements found in samples collected during this study were discussed earlier as having formed during two or more episodes of mineralization. In addition, chromium and nickel were identified in stream sediments and in panned stream-sediment concentrates from of Tertiary basalts that have not been mineralized. The highest concentrations of these elements form sharply defined geochemical map patterns at the east edge of the wilderness from the East Verde River north and in the west-central part of the Mazatzal Wilderness northeast of Horseshoe Reservoir. The source of the elements is thought to be a chromian pyroxene that formed the bulk of the concentrate samples taken from areas draining the basalts.

In an evaluation of uranium resource potential in conglomerate of several Proterozoic formations in central Arizona, Anderson and Wirth (1981) obtained data on the concentration of uranium in the Deadman Quartzite of Wilson (1939) and the Mazatzal Quartzite. Except for local minor enrichments of uranium (as much as 33 ppm) in hematite-rich conglomerate near the base of the Deadman, no significant sedimentary concentration of uranium was found in these quartzites in the Mazatzal Wilderness. Anderson and Wirth (1981) identified no resource potential.

Remote sensing

As part of this study, limonitic materials were identified in images of the Mazatzal Wilderness area using a color-ratio-composite method (Rowan and others, 1974). This technique combined with field data was used to map areas of hydrothermal alteration associated with limonitic materials and to help define mineralized systems. The term limonite, as defined by Blanchard (1968), is used as a general term for hydrous iron oxides but is modified to include any material with the unique spectral reflectance properties of the ferric oxide minerals such as hematite and goethite as defined by Hunt (1980). The minerals pyrite and (or) hematite are almost universally associated with hydrothermal alteration potentially related to mineralization and these minerals weather to produce limonite, which is detected by this technique. Areas of hydrothermal alteration that are totally lacking limonitic materials will not be detected by this technique; however, such areas missed by this approach are believed to be insignificant in the Mazatzal area. A more significant problem in the Mazatzal area was the presence of greater than 40 percent vegetation cover, which severely hindered the ability to map the distribution of limonitic rocks and soils by this technique. This vegetation problem was

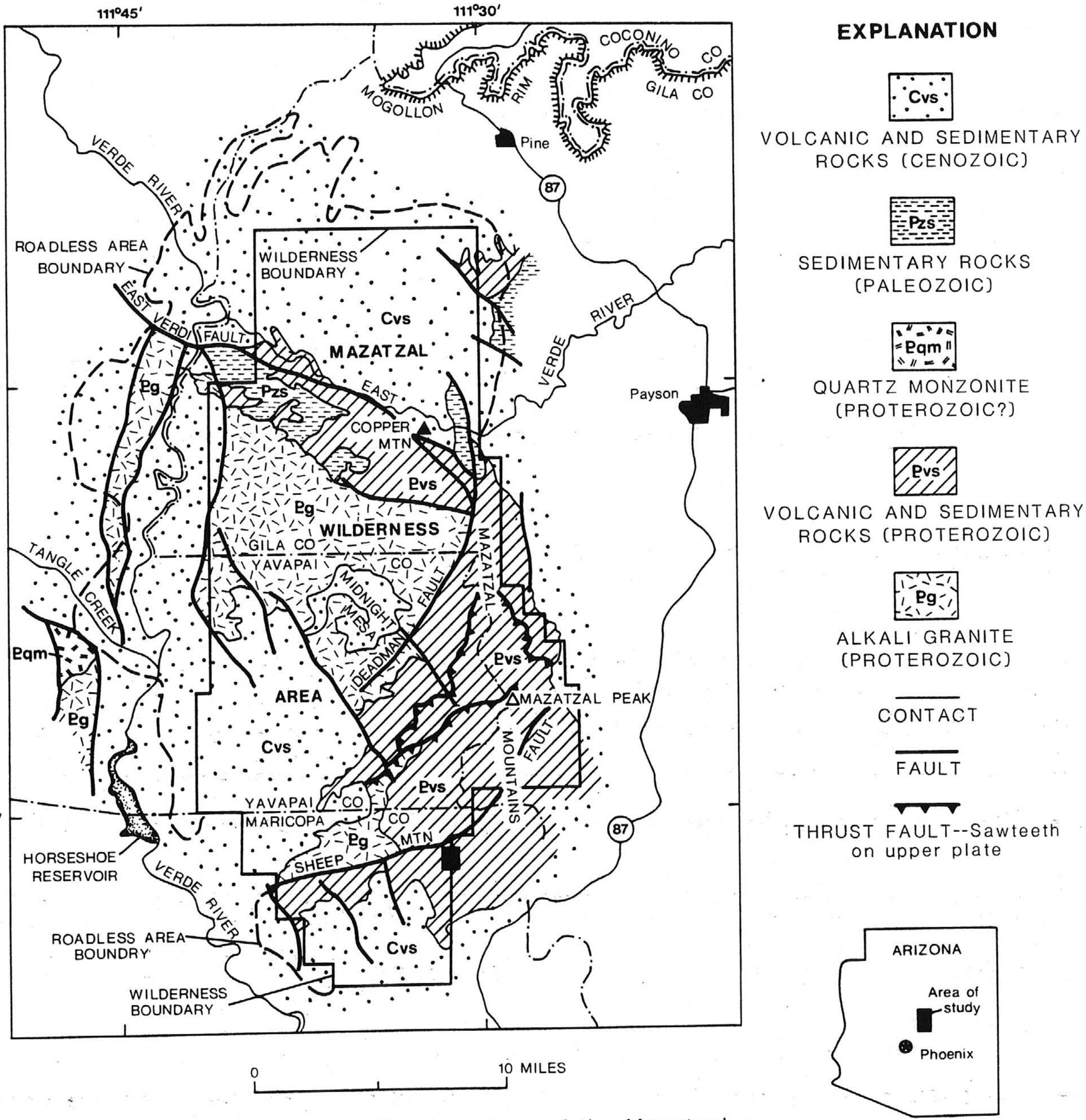

Figure 2.--Map showing generalized geology of the Mazatzal Wilderness and contiguous roadless area.

FIGURE 17.–Los Conquistadores adit map

Sample		Analytical data					
	length	oz/ton		percent			
No.	of chip	Ag	Au	As	Bi	Cu	Pb
553	1.2 ft	18.2	-	25.6	0.14	1.81	1.46
554	3.0 ft	2.0	-	25.3	.16	3.81	.69
555	4.0 ft	-	-	21.2	.25	5.23	.92
556	3.0 ft	.4	-	23.7	.24	5.22	3.05
557	3.0 ft	-	-	5.6	.02	.81	.31
558	4.4 ft	-	0.27	6.9	.06	.37	1.28
559	4.2 ft	-	-	11.2	.11	1.41	1.29
560	3.7 ft	-	-	2.8	.03	.13	.98
561	2.4 ft	-	-	3.3	.18	.22	.77
562	[illegible] ft	[illegible]	-	1.1	.04	.16	.40

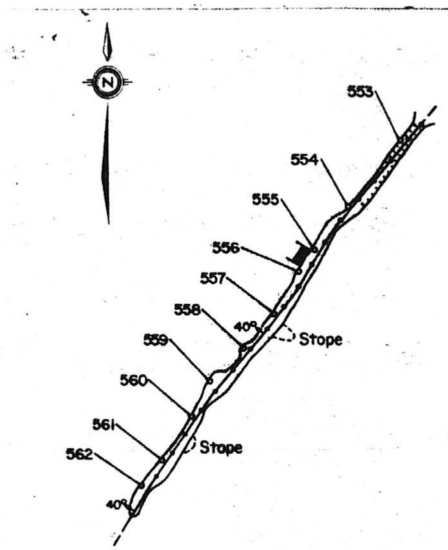

FIGURE 18.–Stingy Lady adit map.

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FIGURE 17.–Los Conquistadores adit map

Sample		Analytical data					
	length	oz/ton		percent			
No.	of chip	Ag	Au	As	Bi	Cu	Pb
553	1.2 ft	18.2	-	25.6	0.14	1.81	1.46
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561	2.4 ft	-	-	3.3	.18	.22	.77
562	3.2 ft	3[illegible].0	-	1.1	.04	.16	.40

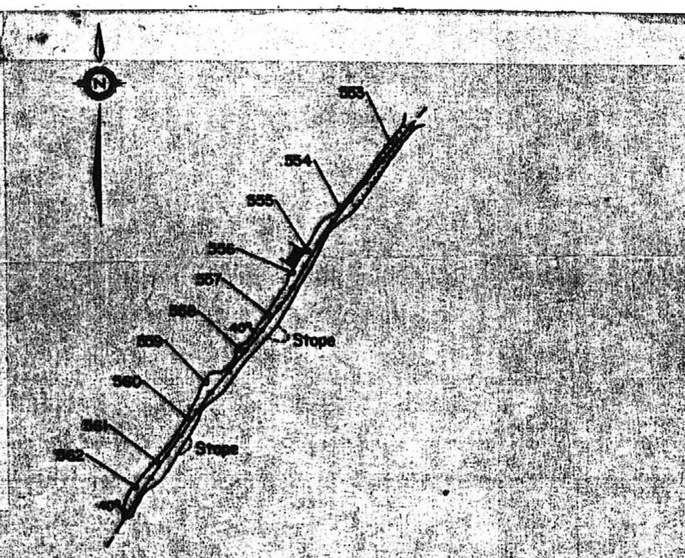

FIGURE 18.–Stingy Lady adit map.

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