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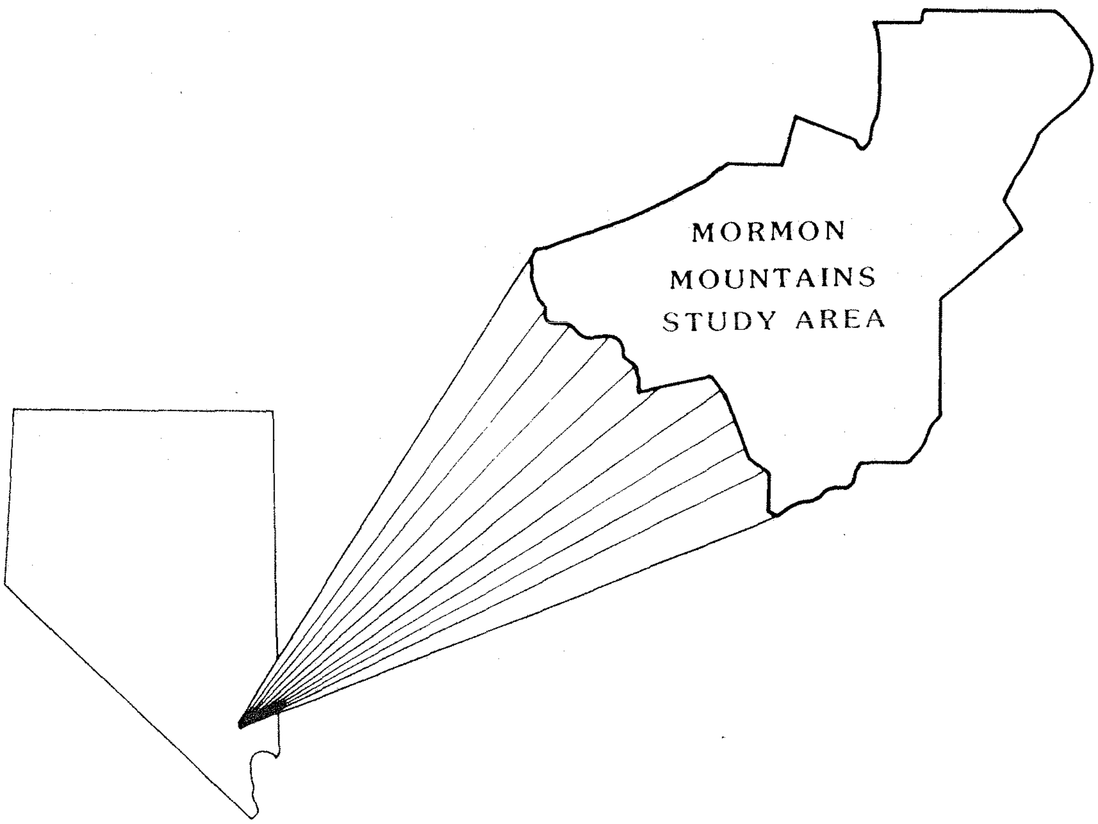
Open File Report

Mineral Resources of the Mormon Mountains Study Area, Lincoln County, Nevada



BUREAU OF MINES

UNITED STATES DEPARTMENT OF THE INTERIOR

MINERAL RESOURCES OF THE MORMON MOUNTAINS STUDY AREA, LINCOLN COUNTY, NEVADA

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PREFACE

The Federal Land Policy and Management Act (Public Law 94-579, October 21, 1976) requires the U.S. Geological Survey and U.S. Bureau of Mines to conduct mineral surveys on U.S. Bureau of Land Management administered land designated as Wilderness Study Areas ". . . to determine the mineral values, if any, that may be present . . . ." Results must be made available to the public and be submitted to the President and the Congress. This report presents the results of a Bureau of Mines mineral survey of a portion of the Mormon Mountains Wilderness Study Area (NV-050-161), Lincoln County, NV.

This open-file report will be summarized in a joint report published by the U.S. Geological Survey. The data were gathered and interpreted by Bureau of Mines personnel from Western Field Operations Center, East 360 Third Avenue, Spokane, WA 99202. The report has been edited by members of the Branch of Mineral Land Assessment at the field center and reviewed at the Division of Mineral Land Assessment, Washington, DC.

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UNIT OF MEASURE ABBREVIATIONS USED IN THIS REPORT

ft	feet
in.	inch
mi	mile
oz/ton	troy ounce per ton

SUMMARY

In 1984 and 1985, at the request of the Bureau of Land Management, the U.S. Bureau of Mines studied part of the 162,887-acre Mormon Mountains Wilderness Study Area (NV-050-161) in order to evaluate its identified mineral resources. The study area is located in Lincoln County, NV, about 60 miles northeast of Las Vegas.

The study area had no mines or mining claims in 1985, and no mineral resources were identified within the study area, or at the Whitmore mine or Iron Blossom prospect near the study area. The alluvial fans around the southern boundary are staked with about 450 placer claims. Chemical analyses of samples indicate that some limestone in the study area is suitable for manufacturing cement or for agricultural purposes but the limestone is distant from markets and therefore not economic in the foreseeable future. The study area is blanketed with oil and gas leases, but no known productive horizons were identified.

The Mormon Mountains were formed from Paleozoic sediments that were uplifted about 3,000 ft in the Mississippian Period. Folding, faulting, and thrusting occurred during the Laramide orogeny, resulting in two major thrust plates in or near the study area. Precambrian metamorphic and granitic rocks crop out southeast and west of the study area.

INTRODUCTION

This report describes the USBM (U.S. Bureau of Mines) portion of a cooperative study with the USGS (U.S. Geological Survey) to evaluate mineral resources and potential of the Mormon Mountains Wilderness Study Area as requested by the BLM (U.S. Bureau of Land Management). The USBM examines individual mines, prospects, claims, and mineralized zones, and evaluates identified (known) mineral and energy resources. The USGS evaluates potential for undiscovered resources based on areal geological, geochemical, and geophysical surveys. Results of the investigations will be used to help determine the suitability of the study area for inclusion into the National Wilderness Preservation System. Although the immediate goal of this and other USBM mineral surveys is to provide data for the President, Congress, government agencies, and the public for land-use decisions, the long-term objective is to ensure the Nation has an adequate and dependable supply of minerals at a reasonable cost.

Setting

The Mormon Mountains Wilderness Study Area (NV-050-161) contains 162,887 acres of which 23,690 acres were requested by the BLM for study by the USBM. This 23,690-acre area, referred to as the study area in this report, is in Lincoln County, NV, 10 mi southeast of Carp, NV, and 60 mi northeast of Las Vegas, in the core of the Mormon Mountains (fig. 1). Access into the study area is limited to one unimproved jeep trail from Meadow Valley Wash. Several jeep roads lead up to the boundary from Meadow Valley Wash and the Carp-Mormon Mesa Road.

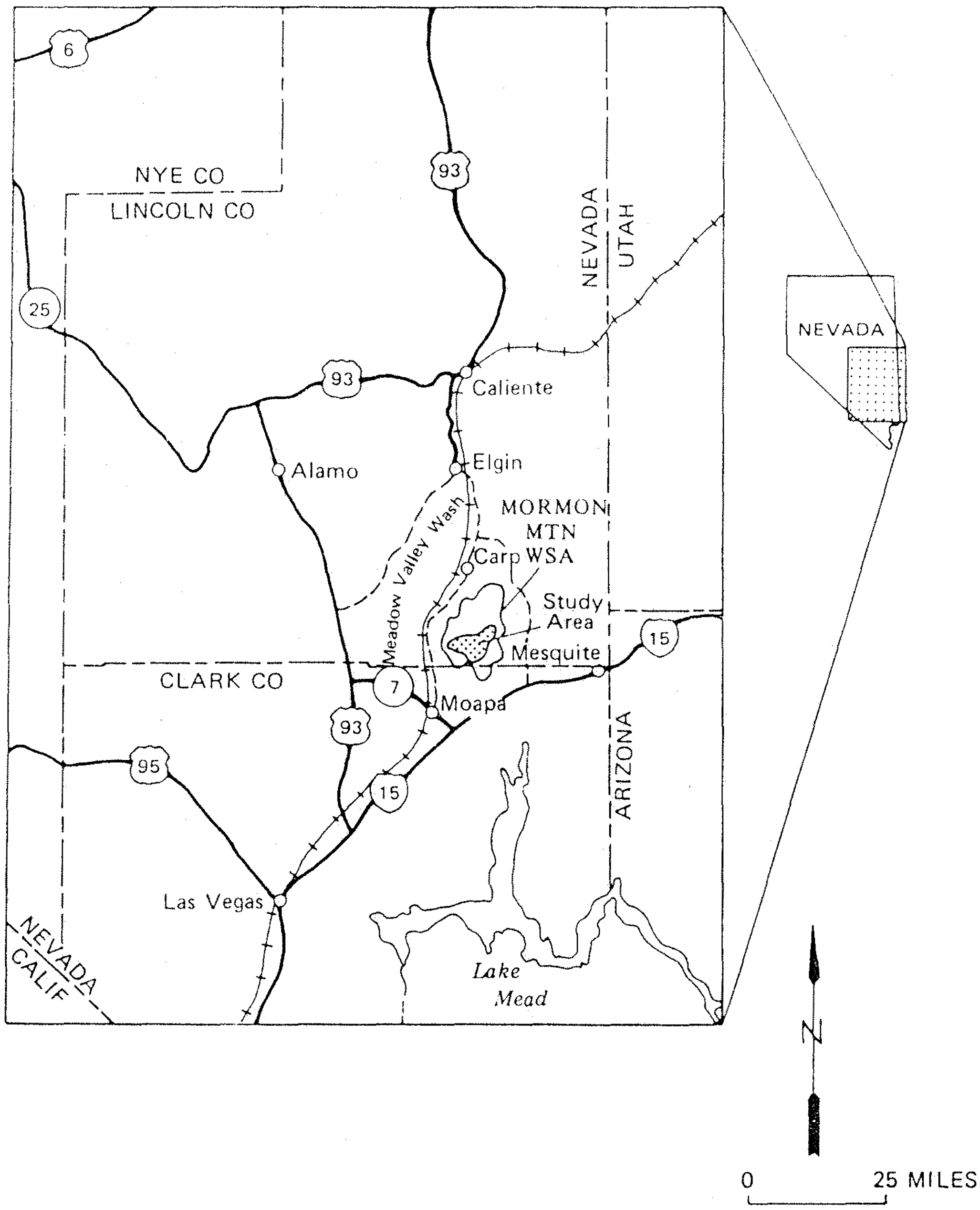

FIGURE 1. -- Location of the Mormon Mountains study area, Lincoln County, NV

Relief in the study area is about 4,000 ft ranging from 3,440 ft at the western boundary to 7,414 ft at Mormon Peak (fig. 2). Lower parts of the study area are covered by desert shrubs and Joshua trees. The higher elevations have pinon pine and juniper trees along with some ponderosa pine near Mormon Peak. Davies Spring is the only perennial spring in the study area.

Previous Studies

Although much geological literature has been published about the Delamar mining district, 36 mi to the northeast, and the Pioche mining district, 70 mi to the north, little has been published about the geology of the Mormon Mountains. Raymond (1869) wrote about mining in Lincoln County, NV, for the U.S. Treasury Department. One master's thesis (Olmore, 1969) and two doctoral dissertations (Olmore, 1971 and Smosna, 1973) describe geology near the study area. The geology and mineral deposits of Lincoln County, including the Mormon Mountains are discussed by Tschanz and Pampeyan (1970). Great Basin GEM Joint Venture (1983) prepared a geology-energy-minerals report on the Mormon Mountains area for BLM.

Present Study

Records and publications of the USBM, USGS, and Nevada State agencies were researched for data related to mineral deposits in or near the Mormon Mountains study area prior to field examination. Lincoln County mining claim records and BLM records were examined for claim and lease information.

Personnel from the USBM, Western Field Operations Center, Spokane, WA, conducted a field examination of the study area in October-November 1984 and April 1985. During that time, 40 rock samples were collected and fire assayed for gold and silver and analyzed by colorimetric, atomic absorption, radiometric, or x-ray fluorescence methods for other elements of economic value. At least one sample from each mineralized structure was analyzed by semi-quantitative methods for 40 elements 1/; amounts of significant elements were then determined by one of the quantitative methods. Three samples were examined petrographically to determine rock types and mineral assemblages. All samples were analyzed by USBM Reno Research Center, Reno, NV, and are described in table 1 at the end of this report.

Four types of rock samples were taken: chip, a series of continuous rock chips across or along a vein, structure, or exposure; random chip, chips of rock taken at random intervals from an apparently homogenous exposure; select, handpicked rock material of either the highest grade rock available or possibly the unmineralized fraction; and grab, unselected rock pieces from a stockpile or dump.

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

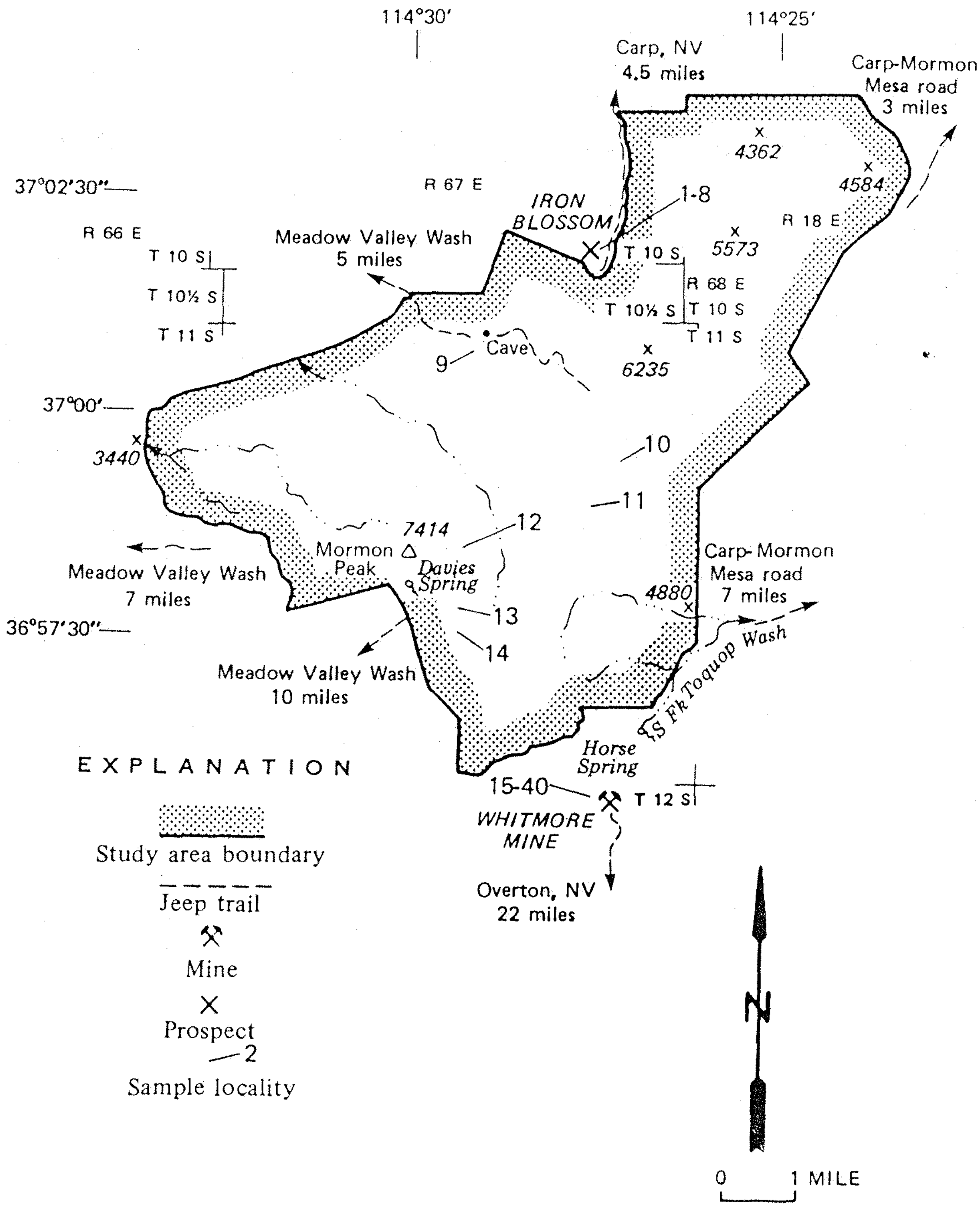

FIGURE 2. – Mine, prospect, and sample locations in and adjacent to the Mormon Mountains study area, Lincoln County, NV

ACKNOWLEDGEMENTS

The author thanks Arel McMahan and Ed McHugh, geologists from USBM, for their assistance with field examinations for this study.

GEOLOGIC SETTING

Several thousand feet of marine carbonate rocks in the Mormon Mountains were formed during the Paleozoic Era from sediments deposited in a transitional area between the continental shelf and a miogeosyncline. In the Mississippian Period a broad dome, now the Mormon Mountains, was uplifted about 3,000 ft (Tschanz and Pampeyan, 1970, p. 82, 104). During the Laramide orogeny (Cretaceous-early Tertiary), folding, faulting, and thrusting occurred. The thrust faulting is very complex in the study area. Two major thrust plates (Olmore, 1971, p. XI), and unconformities in the Paleozoic section, make the structure difficult to understand (Tschanz and Pampeyan, 1970, p. 105). Tertiary basin and range faulting has also complicated the structure in the study area.

Two types of mineral deposits are outside, but near the study area. The first, just south of the study area (fig. 2, Whitmore mine), is a copper-bearing quartz vein in the contact zone of the Mormon Mountain plate of Olmore (1971) and the Precambrian basement rock. The fractured vein is cemented with quartz. Iron-oxide staining occurs along most of the vein, and chalcopyrite, minor pyrite, and abundant secondary copper carbonate staining are found along northeastern outcrops of the vein. The quartz vein probably was emplaced toward the end of movement of the Mormon Mountain plate over the basement rock. The second type of deposit, just north of the study area (fig. 2, Iron Blossom prospect), occurs where Tertiary rhyolite is in contact with Paleozoic limestone. The limestone was baked and partially replaced by silica. Outcrops of silicified iron oxides and limestone have cracks and vugs lined with yellow jarosite crystals [$KFe_3(SO_4)_2(OH)_6$]. Iron oxides, mostly hematite, give the deposit a brick-red color.

MINING HISTORY

Mining in the Viola mining district, 15 mi north of the study area, started in the 1880's and probably spurred exploration in the Mormon Mountains, which led to the discovery of the Whitmore mine and Iron Blossom prospect. Mainly silver and copper ores were mined from the Viola district until 1958 when Wells Cargo mined about 11,500 tons of fluorspar (Tschanz and Pampeyan, 1970, p. 165). The Gourd Springs mining district in the East Mormon Mountains, about 10 mi east of the study area, has produced little ore. In 1929, 60 tons of manganese were mined. Tungsten prospecting began in the 1940's (Tschanz and Pampeyan, 1970, p. 176), although no tungsten was produced from the district.

In 1981, Vulcan Energy Inc. filed 440 placer claims on alluvial fans southeast and southwest of the study area. Currently (1986), about 10 placer claims are northeast of Horse Spring.

MINES, PROSPECTS, AND MINERALIZED AREAS

The Whitmore mine and the Iron Blossom prospect just outside the study area were examined in detail; no resources were identified. Samples from within the study area were collected to evaluate limestone.

Whitmore Mine

The Whitmore mine (figs. 3, and 4) was originally the Bradfute Copper mine. Samuel and Brig Whitmore claimed the Bradfute Copper mine as the Anna Laura, Climax, and Stanley quartz claims in 1899. Access is by jeep trail in a dry wash 22 mi north from Overton, NV, then 1/4 mi north by foot trail to the mine. A one-way trip by four-wheel-drive takes about 3 hours. Three adits totaling 190 ft, the longest 130 ft on a 20° decline, four shafts; the deepest 20 ft; and five prospects pits are on the property.

A 3- to 4- ft-thick quartz vein is in a thrust-fault zone. The upper-thrust plate is the Mormon Mountain plate of Olmore (1971), which is composed of Cambrian limestone with some interbedded quartzite. The lower-thrust plate is Precambrian undifferentiated metamorphic and granitic rock; the area of the workings is in granitic rock. Stringers and blebs of chalcopyrite and copper carbonates are exposed in the quartz vein and associated shearing along the easternmost exposure of the vein (figs. 3 and 4, sample sites 16-28). The rest of the vein consists of milky angular quartz fragments up to 6 in. across, cemented with white to light-reddish quartz, suggesting emplacement near the end of thrusting in the area. The vein strikes northeast, dips about 25° NW., and is exposed intermittently for 1,500 ft along strike. Small faults, which offset the vein, are exposed in drainages.

Twenty-six samples were taken from surface and underground exposures. Four samples had trace amounts of gold, eight had 0.1 to 0.6 oz/ton silver, and all had minor amounts of copper. One select sample had 3.6 percent copper. Sample locations are shown on figures 2, 3 and 4 and analytical results are in table 1 at the end of this report.

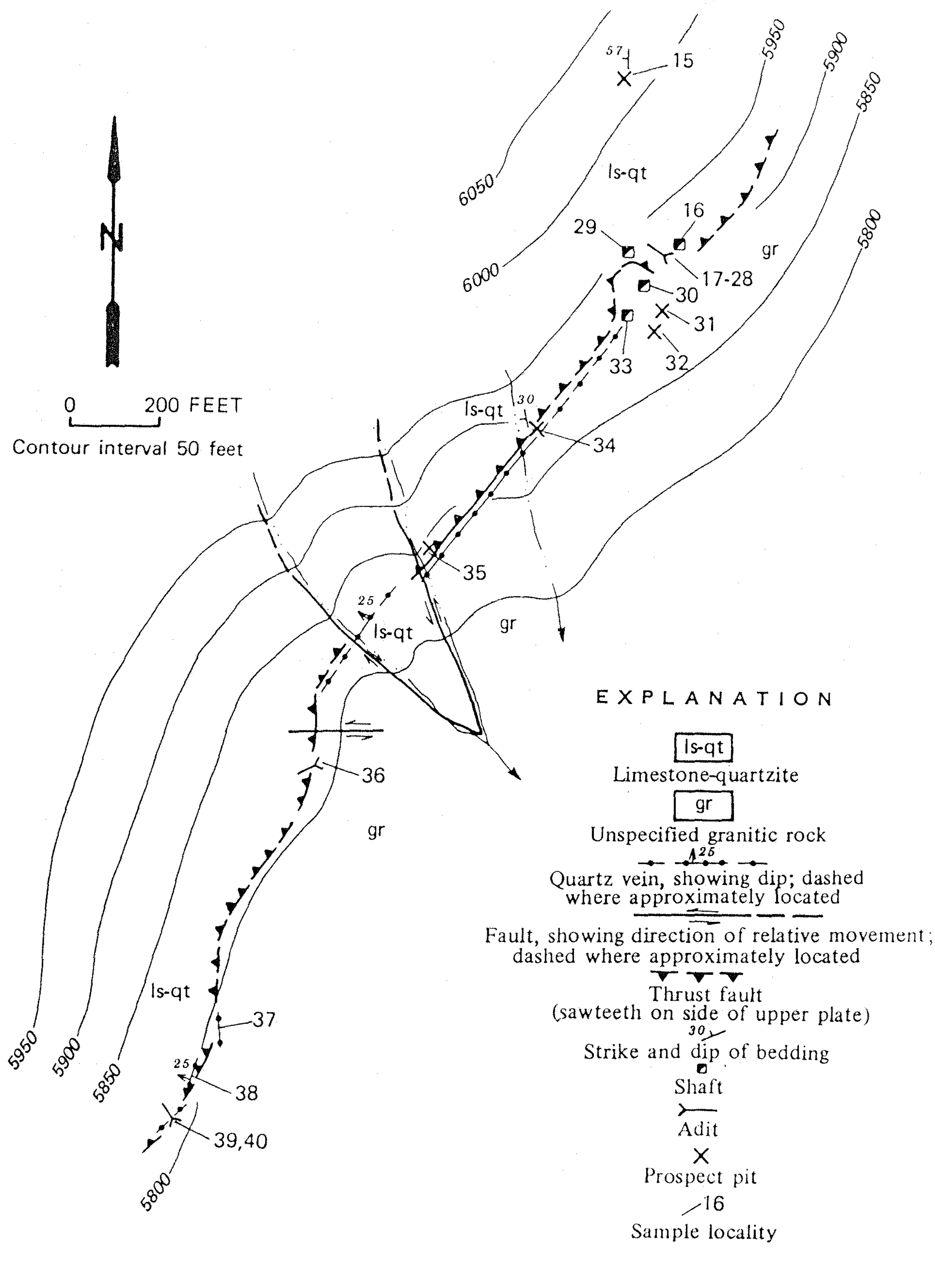

FIGURE 3.– Area map and sample locations for the Whitmore mine

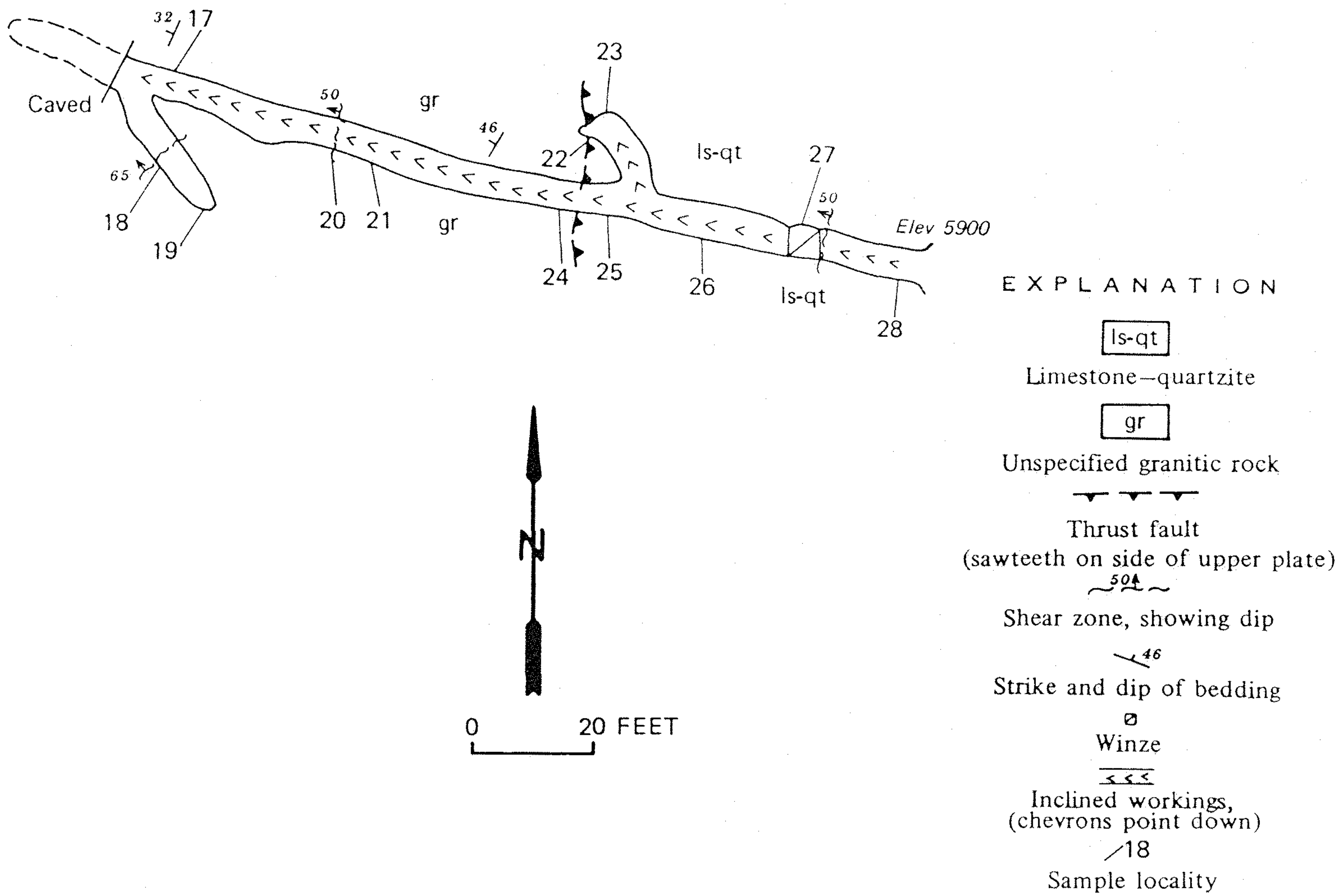

FIGURE 4.– Underground map and sample location for the Whitmore mine

Iron Blossom Prospect

The Iron Blossom prospect (fig. 5) is reached by traveling 1 mi south from Carp, NV, by graded road, then 8 mi southeast on an unimproved four-wheel-drive trail in a dry wash, then 1/8 mi west by trail to the prospect. A 12-ft shaft and two open cuts (8 by 30 ft and 50 by 100 ft) were probably excavated around the turn of the century. Howard Knighten claimed the prospect in 1960 and last did assessment work in 1983.

Tertiary rhyolite is in contact with Paleozoic limestone, forming a zone of iron oxides which are sheared and silicified. The iron oxides are concentrated in two localities, while pods of siliceous iron oxides are scattered along the contact. The iron oxides are deep reddish-brown to red and are friable. The siliceous iron oxides are brown, jasper-like, have conchoidal fracture, are up to 20 ft across, and are replacement of the limestone. Some cracks and vugs are filled with yellow jarosite crystals [$KFe_3(SO_4)_2(OH)_6$]. No metallic sulfides were observed.

Eight samples were taken from the iron-oxide zones. No gold or silver was detected; most samples had minor amounts of copper, lead and zinc. Sample locations are shown on figures 2 and 5 and analytical results are in table 1 at the end of this report.

Limestone

Six random chip samples of limestone were collected and analyzed. Sample sites are shown on figure 2; sample descriptions and analyses are in table 1. Samples 9 and 10 meet industry standards for cement manufacturing and for agricultural purposes (Danner, 1966, p. 55). Sample 11 contains too much silica and samples 12, 13, and 14 contain too much magnesia to meet industry standards for cement manufacturing. No gold or silver were detected in the six samples.

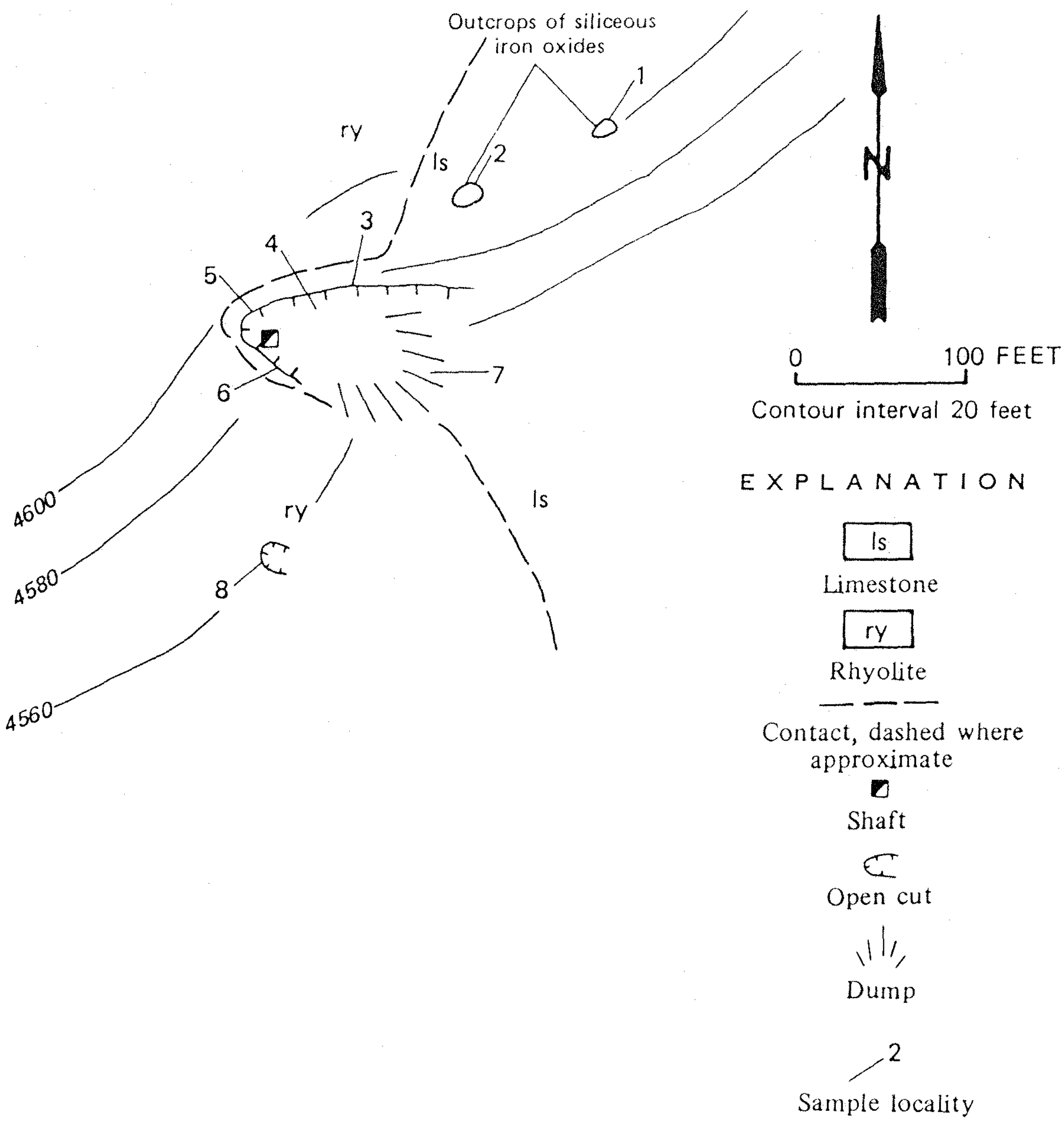

FIGURE 5.– Area map and sample locations for the Iron Blossom prospect

APPRAISAL OF RESOURCES

No mineral resources were identified within the study area. Only trace amounts of silver and minor amounts of copper were detected at the Whitmore mine. The quartz vein at the mine trends toward the study area, but could not be found there on the surface. The rhyolite-limestone contact at the Iron Blossom prospect extends into the study area but no precious or base metals were found.

Sample results suggest some limestone in the study area may meet industrial standards for cement manufacturing or agricultural purposes (fig. 2, nos. 9 and 10). Production of limestone is unlikely because it would have to be trucked or hauled by rail about 60 mi to Las Vegas, the nearest market, and compete with similar limestone being quarried about 10 mi northeast of Las Vegas.

No occurrences of oil, gas, or geothermal resources are known, although the entire study area is blanketed with oil and gas leases. According to Sandberg (1983, p. H8), the Mormon Mountains have a medium potential for oil and gas based on the presence of source rocks, suitable maturation history, reservoir rocks, and traps.

The study area contains minimal sand and gravel, but Meadow Valley Wash to the west contains enough sand and gravel to supply the needs of the local population for the foreseeable future.

TABLE 1.--Descriptions and analysis of samples, Mormon Mountain study area

[N, none detected; NA, not applicable]

Sample				Gold	Silver	Lead	Zinc	Copper
No.	Type	Length (ft)	Description	(oz/ton)	(oz/ton)	(ppm)	(ppm)	(ppm)
			Iron Blossom prospect					
1	Chip--	6.0	Siliceous, jasper-like, replaced limestone that is heavily iron- and manganese-oxide-stained----------------------------------	N	N	57	690	22
2	do----	8.5	do---	N	N	77	910	15
3	do----	3.3	Siliceous iron-oxide-rich shear zone which has jarosite crystals along fractures-----	N	N	N	21	N
4	Grab--	NA	Silicified iron oxides from open cut-------	N	N	82	220	20
5	Chip--	5.0	Shear zone is about 90% iron oxides; lower 1 ft is jasper-like material--------------	N	N	N	29	N
6	Select	NA	Yellow, fine grained jarosite from dump----	N	N	N	11	15
7	do----	NA	do---	N	N	180	83	N
8	Chip--	5.0	Iron-oxide-stained shear zone. Angular vugs have a jarosite coating--------------	N	N	83	360	18

TABLE 1.--Descriptions and analysis of samples, Mormon Mountain study area--Continued

Sample							
No.	Type	Description	CaO (%)	MgO (%)	SiO_2 (%)	Al_2O_3 (%)	Fe_2O_3 (%)
		Limestone samples					
9	Random chip--	Fine-grained, thin-bedded, dark-gray to black limestone. The limestone has a slightly fetid odor and contains chert nodules; and minor, secondary calcite veins with hematite-------------	49.3	0.50	9.1	0.10	940 1/
10	do----	Fossiliferous, medium-grained, gray limestone with some minor recrystallized calcite-----------------	53.3	.41	.59	470 1/	.14
11	do----	Fossiliferous, medium-grained, thick-bedded, limestone which has fetid odor when broken; trace amounts of pyrite were observed-------------------	41.2	.37	22.7	.15	.40
12	do----	Fine-grained, light-gray, thick-bedded dolomite crosscut by thin stringers of calcite-------------	30.3	20.7	.15	870 1/	.11
13	do----	Fine-grained, brown dolomite contains minor stringers of calcite and some vugs lined with calcite crystals-----------------------------------	24.4	16.6	16.1	2.1	.89
14	do----	Medium-grained, gray dolomite with minor chert nodules---	28.7	19.8	5.3	.30	.26

TABLE 1.--Descriptions and analysis of samples, Mormon Mountain study area--Continued

Sample				Gold (oz/ton)	Silver (oz/ton)	Copper (ppm)
No.	Type	Length (ft)	Description			
			Whitmore mine			
15	Chip--	15.0	Sheared iron-oxide-stained limestone. Many of the fractures were filled with quartz or siliceous-iron oxides--	N	0.1	10.3
16	do----	4.5	Sheared, iron-oxide-stained granitic rock with minor copper-carbonate staining------------------------	N	.1	.023 2/
17	do----	3.5	Iron-oxide-stained sheared limestone with quartz-vein fragments------------------------------------	N	N	.014 2/
18	do----	3.0	Slightly iron-oxide-stained, sheared, granitic rock with minor amounts of quartz vein fragments-------	Tr	N	40
19	do----	3.0	Medium-grained granitic rock crosscut by quartz veinlets--	N	N	27.7
20	do----	3.0	Iron-oxide-stained, sheared limestone with quartz-vein fragments------------------------------------	N	N	93
21	do----	5.0	Iron-oxide-stained, sheared granitic rock which has about 10% quartz-vein fragments------------------	N	N	16.7
22	do----	2.0	Sheared, iron-oxide-stained quartzite--------------	N	.1	79
23	do----	2.5	Iron-oxide-stained, sheared granitic rock which has about 10% quartz-vein fragments------------------	N	N	20.8

TABLE 1.--Descriptions and analysis of samples, Mormon Mountain study area--Continued

Sample				Gold (oz/ton)	Silver (oz/ton)	Copper (ppm)
No.	Type	Length (ft)	Description			
			Whitmore mine--Continued			
24	Chip--	2.5	Iron-oxide-stained, sheared limestone and fragments of granitic rock-------------------------------	Tr	N	47
25	do----	2.0	Iron-oxide-stained, sheared granitic rock, below sample 24, containing up to 10% sheared, quartz-vein material------------------------------------	N	N	39
26	do----	3.0	Sheared, silica-rich limestone--------------------	N	0.1	249
27	do----	5.0	Heavily copper-carbonate-stained shear zone in quartzite with thin veinlets of chalcopyrite------	N	.1	.294 2/
28	do----	3.0	Fractures in quartzite below sample 27 were cemented with silica-------------------------------------	N	N	55
29	do----	2.5	Iron-oxide-stained, sheared, dark-gray limestone---	N	N	.010 2/
30	do----	5.0	Iron-oxide and copper-carbonate-stained shear zone in granitic country rock----------------------------	N	N	.040 2/
31	do----	3.0	do--	N	N	.018 2/
32	Select	NA	Heavily iron-oxide and copper-carbonate-stained vuggy quartz--	Tr	.6	3.6 2/
33	Chip--	2.5	Shear zone containing about 10% iron-oxide-stained quartz fragments in granitic rocks----------------	N	.1	.075 2/

TABLE 1.--Descriptions and analysis of samples, Mormon Mountain study area--Continued

Sample				Gold (oz/ton)	Silver (oz/ton)	Copper (ppm)
No.	Type	Length (ft)	Description			
			Whitmore mine--Continued			
34	Chip--	5.5	Massive quartz vein has a 1.5-ft-thick shear zone in the middle. The zone contains fragments of granitic country rock and quartz----------------	Tr	N	50
35	do----	4.0	Brecciated quartz vein cemented with iron-oxide-stained quartz-------------------------------------	N	N	15.3
36	do----	3.0	Siliceous, jasper-like replaced limestone-----------	N	0.1	57
37	do----	3.0	Brecciated quartz fragments are lightly cemented with iron-oxide-stained quartz--------------------	N	N	29
38	do----	2.5	Shear zone in limestone and quartz vein. Most of the sample is quartz fragments--------------------	N	N	130
39	do----	23.0	Brecciated, thrust-fault-zone contact with clasts of limestone and quartz. Matrix is iron-oxide-stained, granitic rocks---------------------------	N	N	47
40	Select	NA	Chlorite coated quartz in the thrust-fault-zone-----	N	N	40

1/ Parts per million.
2/ Percent

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